



166 South Carter, Genoa City, WI 53128

Company: D&H Global Enterprise, LLC  
Model Tested: OBee00  
Report Number: 18903  
DLS Project: 5563

## **Code of Federal Regulations 47 Part 15 – Radio Frequency Devices**

Subpart C – Intentional Radiators

Section 15.247

Operation within the bands 902 - 928 MHz,  
2400 - 2483.5 MHz, 5725 - 5875 MHz,  
and 24.0 - 24.25 GHz.

&

Subpart B – Unintentional Radiators

Section 15.109(a)

Radiated Emission Limits

**THE FOLLOWING MEETS THE ABOVE TEST SPECIFICATION**

Formal Name:	OBee
Kind of Equipment:	903 MHz to 927 MHz Radio Module
Frequency Range:	903 - 927 MHz
Test Configuration:	DC powered transceiver module
Model Number(s):	OBee00
Model(s) Tested:	OBee00
Serial Number(s):	prototype
Date of Tests:	December 6, 2012 to March 20, 2013
Test Conducted For:	D&H Global Enterprise, LLC N84 W13562 Leon Road Menomonee Falls, WI 53051, USA

**NOTICE:** “This test report relates only to the items tested and must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government”. Please see the "Description of Test Sample" page listed inside of this report.

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## SIGNATURE PAGE

Tested By:

A handwritten signature in black ink that reads "James R. Ochoa". The signature is written in a cursive style with a large, looped "J" and "O".

James Ochoa  
Test Engineer

Reviewed By:

A handwritten signature in black ink that reads "William Stumpf". The signature is written in a cursive style with a large, looped "W" and "S".

William Stumpf  
OATS Manager

Approved By:

A handwritten signature in black ink that reads "Brian J. Mattson". The signature is written in a cursive style with a large, looped "B" and "M".

Brian Mattson  
General Manager



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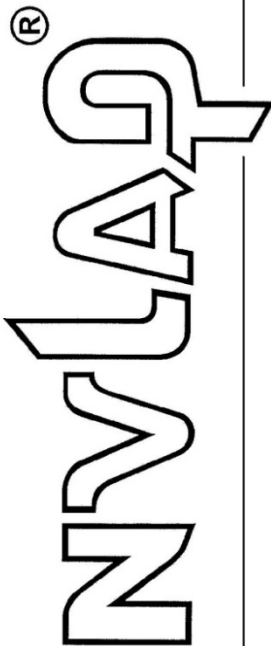


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United States Department of Commerce  
National Institute of Standards and Technology



## Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 100276-0

**D.L.S. Electronic Systems, Inc.**  
Wheeling, IL

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,  
listed on the Scope of Accreditation, for:*

### **ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS**

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.  
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality  
management system (refer to joint ISO-ILAC-IAF Communiqué dated January 2009).*



2012-10-01 through 2013-09-30

*Effective dates*

*Wm. D. M. L.*

*For the National Institute of Standards and Technology*

NVLAP-01C (REV. 2009-01-28)



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Company: D&H Global Enterprise, LLC  
Model Tested: OBee00  
Report Number: 18903  
DLS Project: 5563

## 1.0 Summary of Test Report

It was determined that the D&H Global Enterprise, LLC OBee, Model: OBee00, complies with the requirements of CFR 47 Part 15 Subpart C Section 15.247.

### Subpart C Section 15.247 Applicable Technical Requirements Tested:

Section	Description	Procedure	Note	Compliant?
15.247(a)(2)	6 dB Emission Bandwidth	558074 D01 DTS Meas Guidance v02	1	Yes
15.247(b)(3)	Fundamental Emission Output Power	558074 D01 DTS Meas Guidance v02	1	Yes
15.247(e)	Maximum Power Spectral Density	558074 D01 DTS Meas Guidance v02	1	Yes
15.247(d)	Maximum Unwanted Emission Levels	558074 D01 DTS Meas Guidance v02	1	Yes
15.247(d)	Band-Edge Measurements – Conducted	558074 D01 DTS Meas Guidance v02	1	Yes
15.247(d) 15.35(b) 15.35(c)	Duty Cycle Correction	ANSI C63.10-2009	1	Informative
15.247(d) 15.205(a) 15.209(a)	Unwanted Emissions into Restricted Frequency Bands – Radiated	558074 D01 DTS Meas Guidance v02	2	Yes
15.109 15.209	Transmitter & Receiver Radiated Emissions - 30 to 1000 MHz	ANSI C63.4-2009	2	Yes
15.109	Receiver Radiated Emissions - 1 to 5 GHz	ANSI C63.4-2009	2	Yes
15.207	AC Power-Line Conducted Emissions	ANSI C63.10-2009	3	Yes

Note 1: RF conducted measurement.

Note 2: Radiated emission measurement.

Note 3: AC power line conducted measurement.



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## **2.0 Introduction**

In December 2012 to March 2013, the OBee00 that was provided from D & H Global Enterprise, LLC was tested to the requirements of CFR 47 Part 15 Subpart C Section 15.247. To meet these requirements, the procedures contained within this report were performed by personnel of D.L.S Electronic Systems, Inc.

## **3.0 Test Facilities**

D.L.S. Electronic Systems, Inc. is a full service EMC/Safety Testing Laboratory accredited to ISO 17025. NVLAP Certificate and Scope can be viewed at <http://www.dlsemc.com/certificate>. Our facilities are registered with the FCC, Industry Canada, and VCCI.

### **Wisconsin Test Facility:**

D.L.S. Electronic Systems, Inc.  
166 S. Carter Street  
Genoa City, Wisconsin 53128

### **Wheeling Test Facility:**

D.L.S. Electronic Systems, Inc.  
1250 Peterson Drive  
Wheeling, IL 60090

## **4.0 Description of Test Sample (from the Part A form)**

### **Description:**

The OBee is an Open Hardware design, low power wireless module. It uses the Open Source ONE-NET protocol. The OBee is powered by a microcontroller from the popular Atmel AVR family. A ONE-NET network can consist of up to 4,096 unique devices, offers simple, block, and streaming transactions, integrated encryption, and prioritized traffic.

### **Type of Equipment / Frequency Range:**

903 MHz to 927 MHz radio module

### **Physical Dimensions of Equipment Under Test:**

34mm X 25mm X 9mm



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#### **4.0 Description of Test Sample (continued)**

##### **Power Source:**

3.3 Volts DC

##### **Internal Frequencies:**

22.1184 MHz, 11.0592 MHz, 1 MHz, 0.0384 MHz

##### **Transmit / Receive Frequencies Used For Test Purpose:**

Low channel: 903 MHz, Middle channel: 914 MHz, High channel: 927 MHz

##### **Type of Modulation(s) / Antenna Type:**

FSK Modulation / 1/4 wave dipole with 3 dBi (highest) gain tested

##### **Description of Circuit Board(s) / Part Number:**

OBee Module	220000324, rev B
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## 5.0 Test Equipment

A list of the equipment used can be found in the table below. All primary equipment was calibrated against known reference standards with a verified traceable path to NIST.

### D.L.S. Wisconsin - G1

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Dates	Cal Due Dates
Receiver	Rohde & Schwarz	ESI 40	837808/005	20 Hz – 40 GHz	7-23-12	7-23-13
Preamp	Ciao	CA118-4010	101	1GHz-18GHz	2-26-13	2-26-14
Horn Antenna	EMCO	3115	9502-4451	1-18GHz	3-18-13	3-18-15
Filter- High-Pass	Q-Microwave	100462	2	4.2GHz-18GHz	5-18-12	5-18-13
Preamp	Miteq	AMF-8B-180265-40-10P-H/S	438727	18GHz-26GHz	8-13-12	8-13-13
10 dB attenuator	narda	4768-10	0702	DC – 40 GHz	8-13-12	8-13-13
Horn Antenna	ETS Lindgren	3116	00062917	18 – 40GHz	10-4-11	9-23-13
High Pass Filter	Planar	CL22500-9000-CD-SS	PF1229/0728	15-40 GHz	8-13-12	8-13-13
20 dB attenuator	Aeroflex/weinschel	75A-20-12	1071	DC – 40 GHz	8-13-12	8-13-13
Multimeter	Fluke	77	43390985	N/A	8-16-12	8-16-13





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## 5.0 Test Equipment - continued

### D.L.S. Wisconsin – OATS 2

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Dates	Cal Due Dates
Receiver	Rohde & Schwarz	ESI 26	837491/010	20 Hz – 26 GHz	1-3-13	1-3-14
Preamplifier	Rohde & Schwarz	TS-PR10	032001/004	9 kHz – 1 GHz	1-10-13	1-10-14
Antenna	EMCO	3104C	00054892	20 MHz – 200 MHz	9-13-12	9-13-14
Antenna	EMCO	3146	1205	200 MHz – 1 GHz	9-19-12	9-19-14
Preamplifier	Rohde & Schwarz	TS-PR10	032001/004	9 kHz – 1 GHz	1-10-13	1-10-14

### D.L.S. Wisconsin – Screen Room

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Dates	Cal Due Dates
Receiver	Rohde & Schwarz	ESI 40	837808/005	20 Hz – 40 GHz	7-23-12	7-23-13
LISN	Solar	9252-50-R-24-BNC	961019	9 kHz – 30 MHz	5-24-12	5-24-13
Filter- High-Pass	SOLAR	7930-10	921541	9 kHz – 30 MHz	1-7-13	1-7-14
Filter- High-Pass	SOLAR	7930-120	090702	120 kHz – 30 MHz	1-7-13	1-7-14
Limiter	Electro-Metrics	EM-7600	706	9 kHz – 30 MHz	1-7-13	1-7-14



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## 6.0 Test Arrangements

### Radiated Emissions Measurement Arrangement:

All radiated emission measurements were performed at D.L.S. Electronic Systems, Inc. and set up according to FCC KDB 558074 D01 DTS Meas Guidance v02, ANSI C63.4-2009 and ANSI C63.10-2009, unless otherwise noted. Description of procedures and measurements can be found in Appendix B – Measurement Data. See Appendix A for additional photos of the test set up.

Unless otherwise noted, the bandwidth of the measuring receiver / analyzer used during testing is shown below.

Frequency Range	Bandwidth (-6 dB)
10 to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz
30 MHz to 1 GHz	120 kHz
Above 1 GHz	1 MHz

### RF Conducted Emissions Measurement Arrangement:

All RF conducted emission measurements were performed at D.L.S. Electronic Systems, Inc. and set up according to FCC KDB 558074 D01 DTS Meas Guidance v02, ANSI C63.4-2009 and ANSI C63.10-2009, unless otherwise noted. Description of procedures and measurements can be found in Appendix B – Measurement Data. See Appendix A for additional photos of the test set up.

## 7.0 Test Conditions

### Normal Test Conditions:

#### Temperature and Humidity:

66°F at 33% RH (or noted otherwise)

#### Supply Voltage:

3.3 VDC



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## **8.0 Modifications Made To EUT For Compliance**

None.

## **9.0 Additional Descriptions**

The EUT's were powered with an external 3.3VDC battery pack supplied by D.L.S. Electronic Systems, Inc...

The EUT was tested stand-alone for Limited Modular Approval.

The EUT was programmed to transmit continuously at Low, Mid, and High channels.

A 2nd EUT was programmed to receive continuously and used for all receiver testing.

A 3rd EUT (normal operation) was used to calculate the worst case duty cycle measurement.

The EUT was rotated through 3 orthogonal axis to find worst-case.

The EUT was tested with the highest gain 1/4 wave dipole antenna. (3 dBi) See Operational Description exhibit for additional antenna information.

## **10.0 Results**

Measurements were performed in accordance with FCC KDB 558074 D01 DTS Meas Guidance v02, ANSI C63.4-2009 and ANSI C63.10-2009. Graphical and tabular data can be found in Appendix B at the end of this report.

## **11.0 Conclusion**

The OBee Radio Module that was provided from D & H Global Enterprise, LLC, tested December 2012 - March 2013 **meets** the requirements of CFR 47 Part 15 Subpart C Section 15.247.



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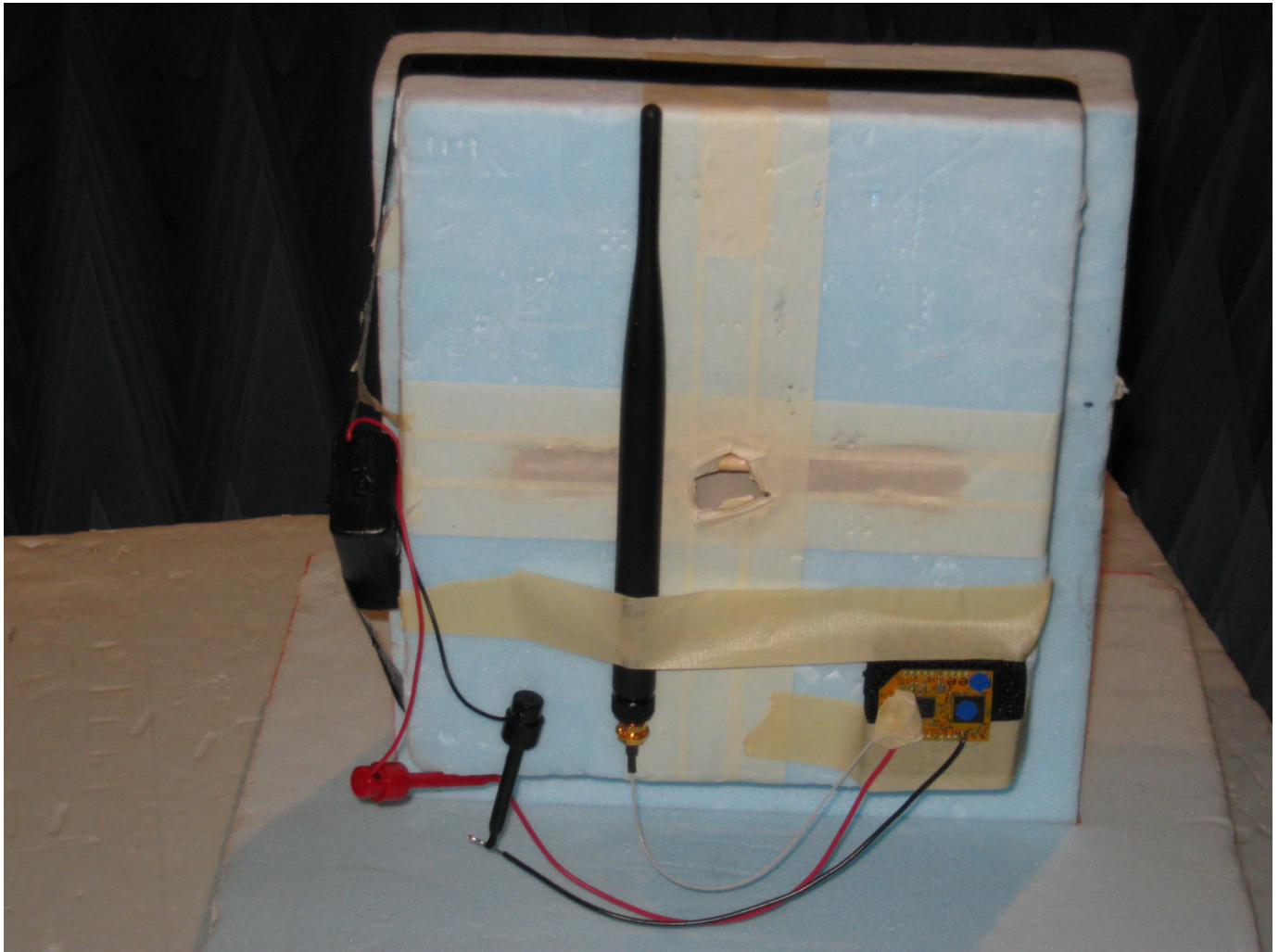
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## Appendix A – Test Photos

### Photo Information and Test Setup:

Item 0: OBee Radio Module with 3dBi antenna

#### Radiated Emissions – X Position





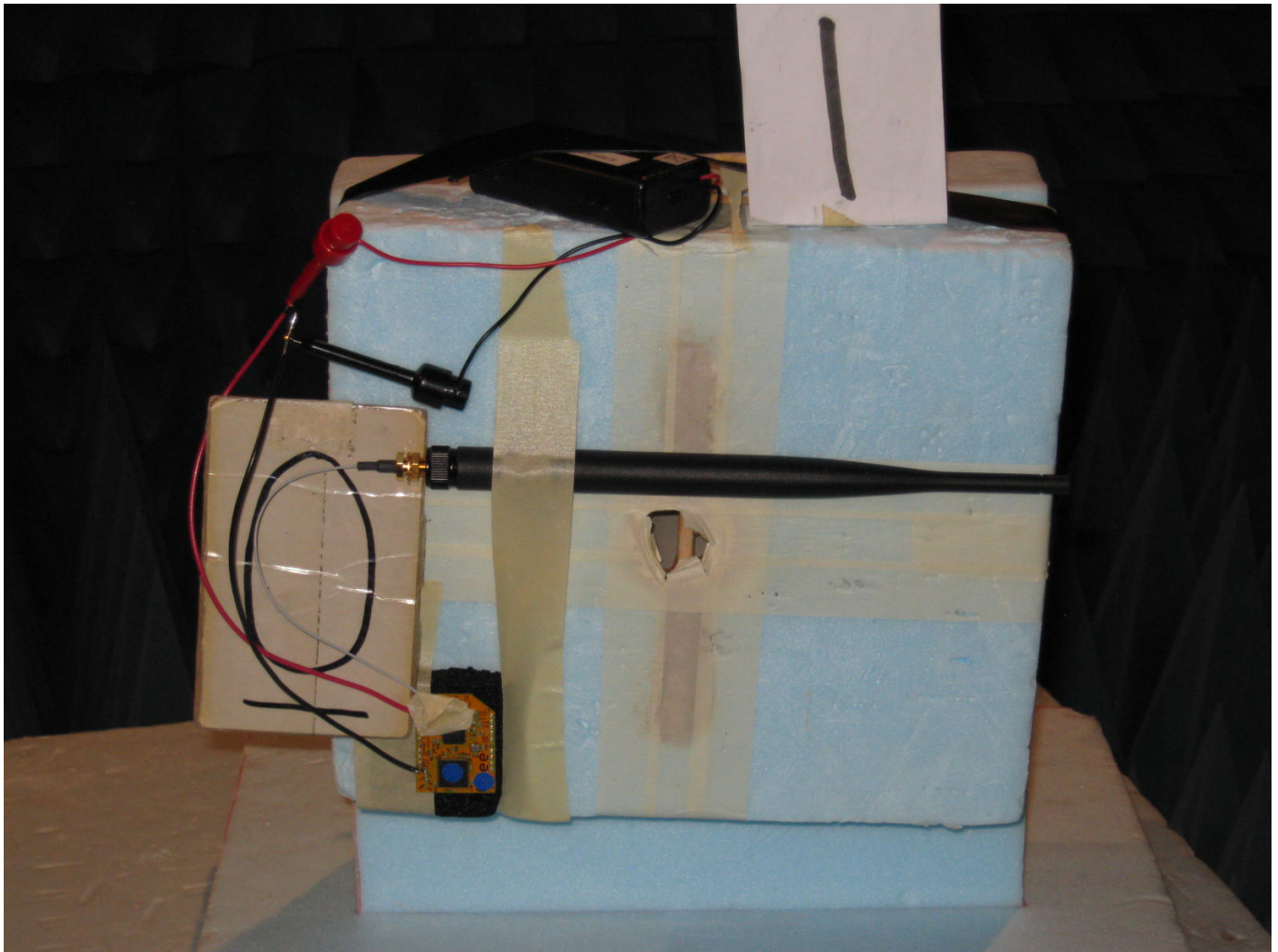
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## Appendix A – Test Photos

### Radiated Emissions – Y Position







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## Appendix A – Test Photos

### Radiated Emissions – Z Position



## Appendix A – Test Photos

### Radiated Emissions – below 1 GHz, Front



Item 0: OBee Radio Module with 3dBi antenna

Item 1: Non-shielded DC power cord from remote power supply, 1.5 meters





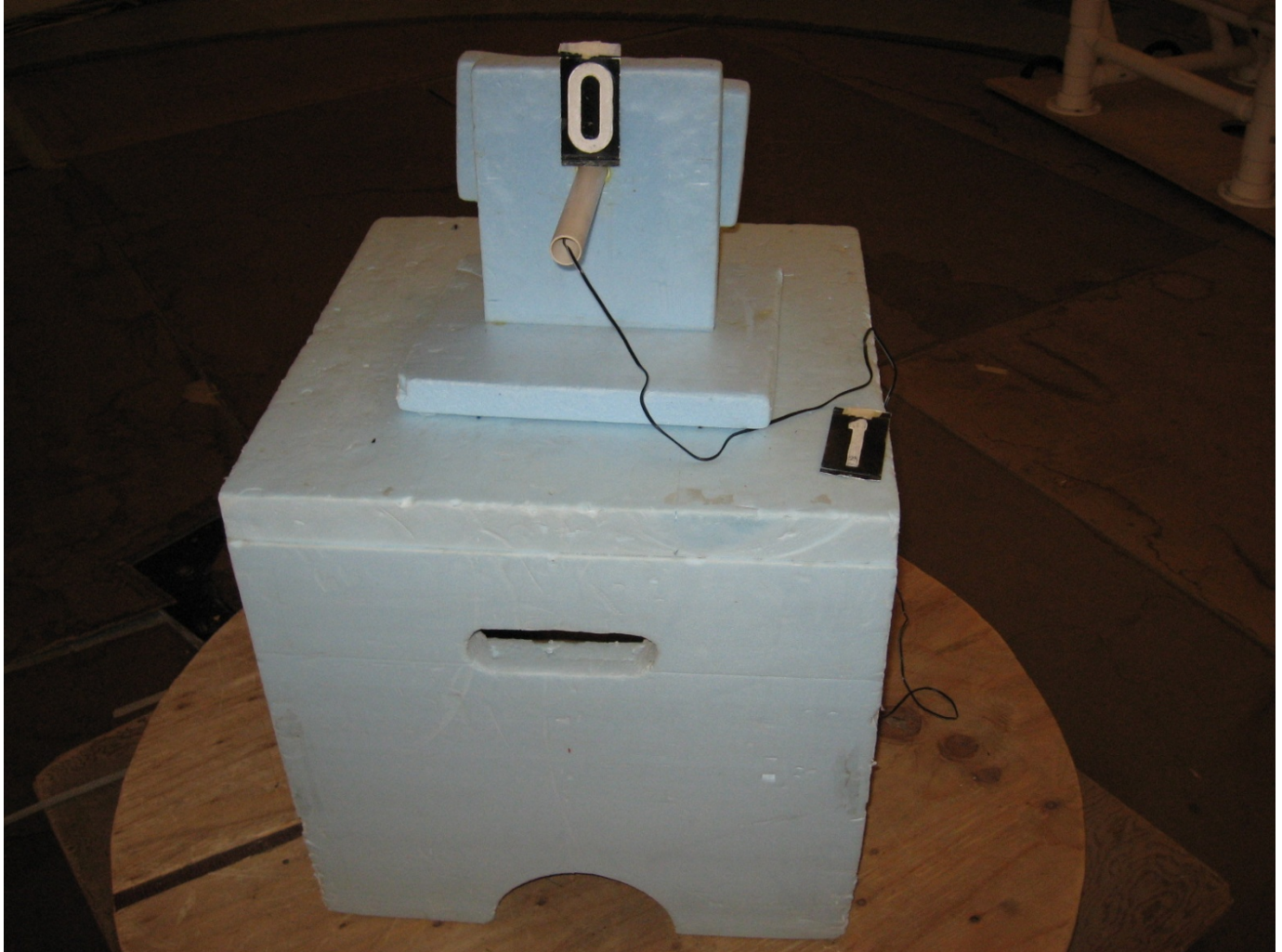
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Model Tested:  
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## Appendix A – Test Photos

### Radiated Emissions – below 1 GHz, Back







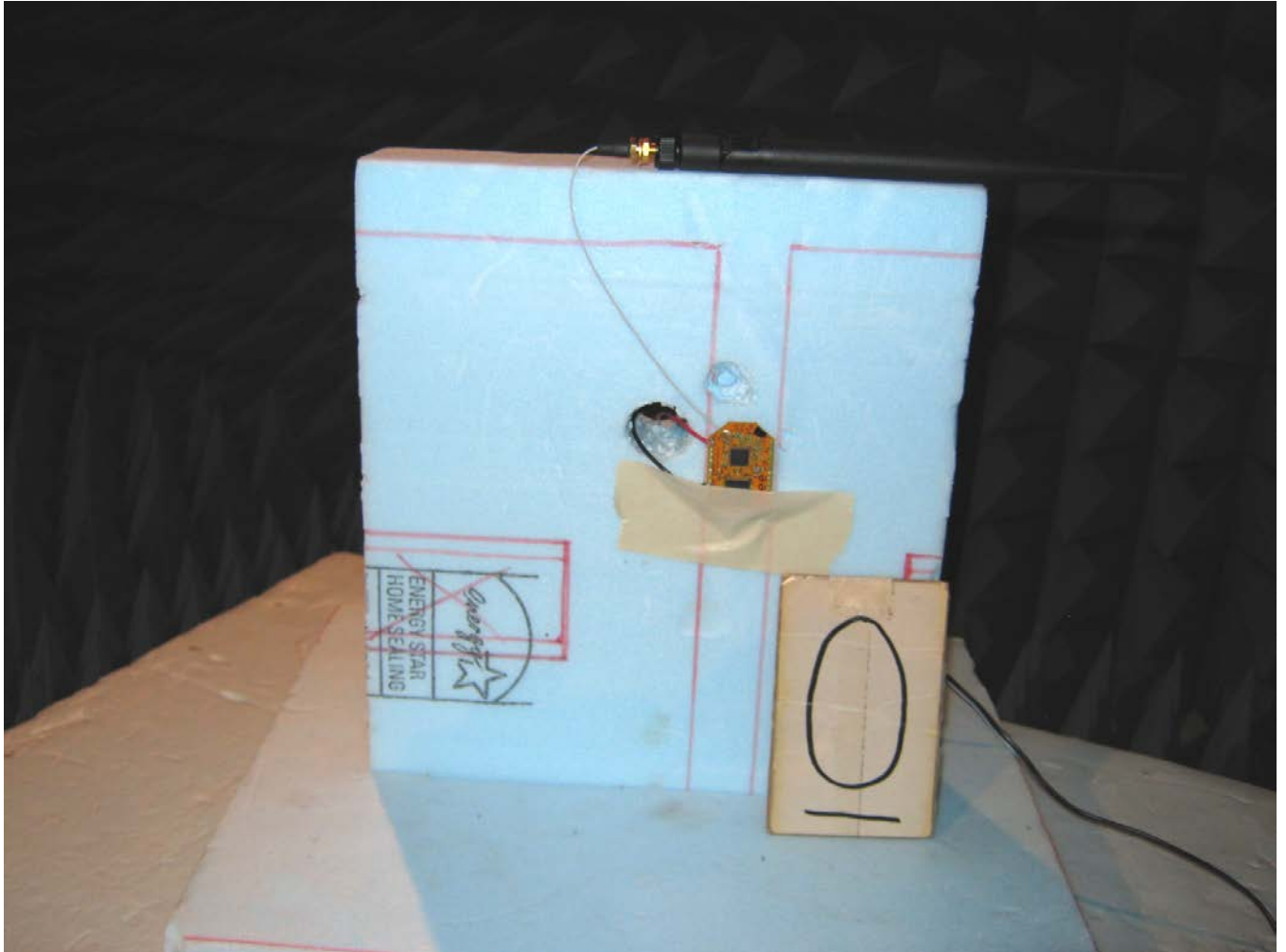
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Model Tested:  
Report Number:  
DLS Project:

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## Appendix A – Test Photos

### Radiated Emissions – above 1 GHz





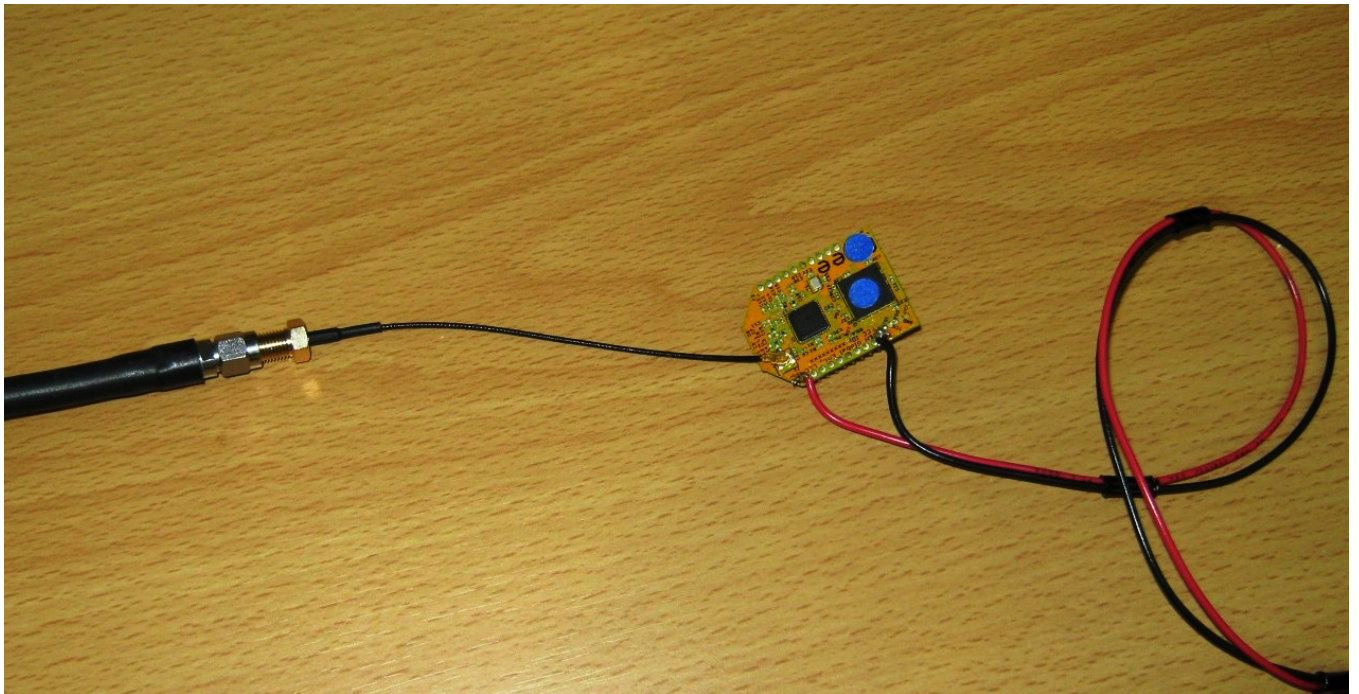
166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
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## Appendix A - Test Photos

### RF Conducted





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DLS Project:

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## Appendix A - Test Photos

### Line Conducted





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## **Appendix B – Measurement Data**

### **1.0 6 dB Emission Bandwidth**

#### **Rule Part:**

Section 15.247(a)(2)

#### **Test Procedure:**

558074 D01 DTS Measured Guidance v02  
Emission Bandwidth (EBW), Section 7.0  
EBW Measurement Procedure, Section 7.1

#### **Limit:**

6 dB bandwidth shall be at least 500 kHz

#### **Results:**

Compliant  
Minimum 6 dB bandwidth: **525 kHz**  
Maximum 6 dB bandwidth: **529 kHz**

#### **Notes:**

This was an RF conducted measurement. The EUT was connected to the measuring equipment through an RF cable and attenuator.

The EUT was powered by 3.3 V DC. The EUT was set to transmit continuously (100% duty cycle) at its maximum output power on the low, middle, and high channels of the operating band.





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Company:  
Model Tested:  
Report Number:  
DLS Project:

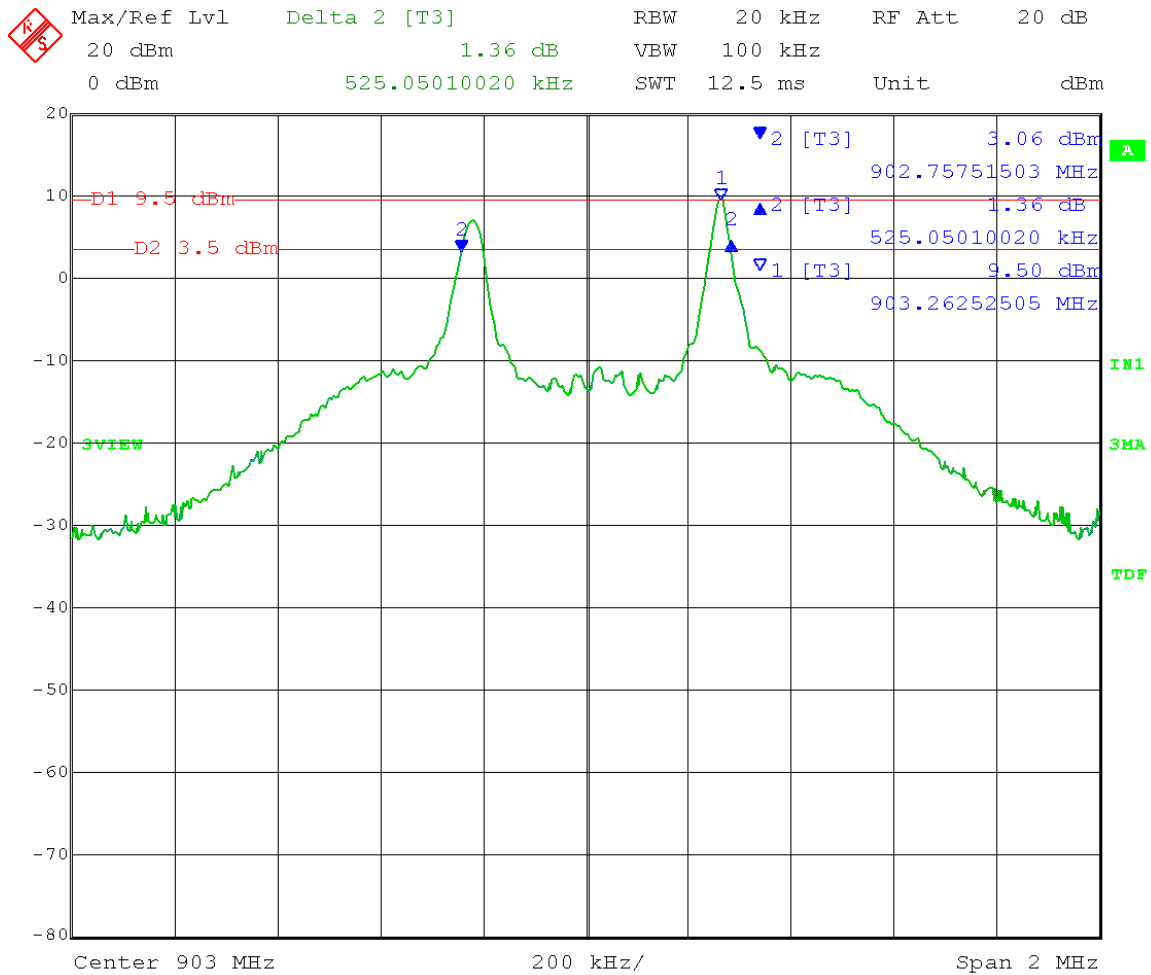
D&H Global Enterprise, LLC  
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18903  
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Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900MHz Radio Module  
Test: Emission Bandwidth (6 dB) - Conducted  
Operator: Craig B

Comment: RBW = 1-5% of EBW  
VBW  $\geq 3 \times$  RBW  
Detector = Peak  
Sweep = auto couple

Comment: Low Channel: Frequency – 903 MHz  
Limit  $\geq 500$  kHz

6 dB Emission Bandwidth = 525 kHz



Date: 13.JAN.2013 14:42:47



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Company:  
Model Tested:  
Report Number:  
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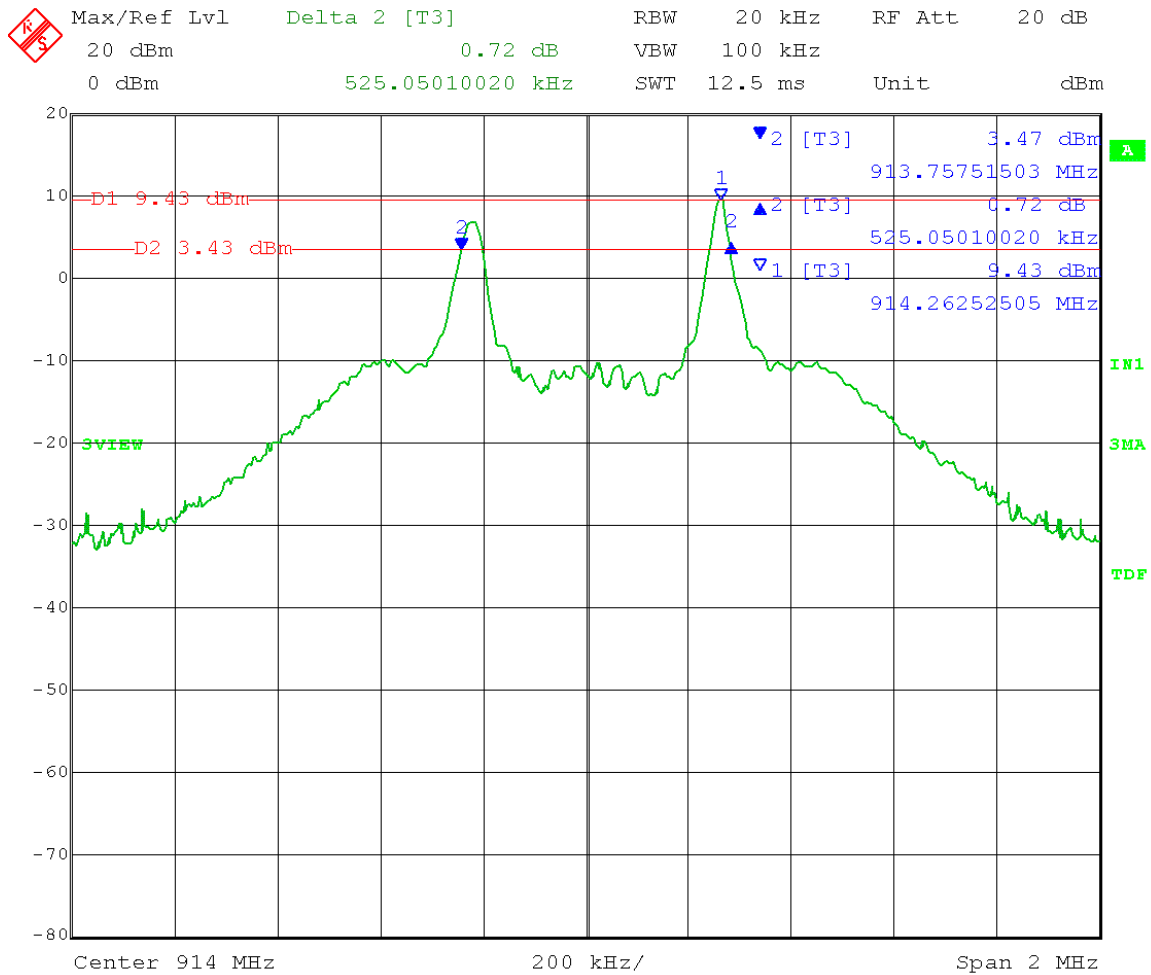
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18903  
5563

Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900MHz Radio Module  
Test: Emission Bandwidth (6 dB) - Conducted  
Operator: Craig B

Comment: RBW = 1-5% of EBW  
VBW  $\geq 3 \times$  RBW  
Detector = Peak  
Sweep = auto couple

Comment: Mid Channel: Frequency – 914 MHz  
Limit  $\geq 500$  kHz

6 dB Emission Bandwidth = 525 kHz



Date: 13.JAN.2013 14:28:26



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Company:  
Model Tested:  
Report Number:  
DLS Project:

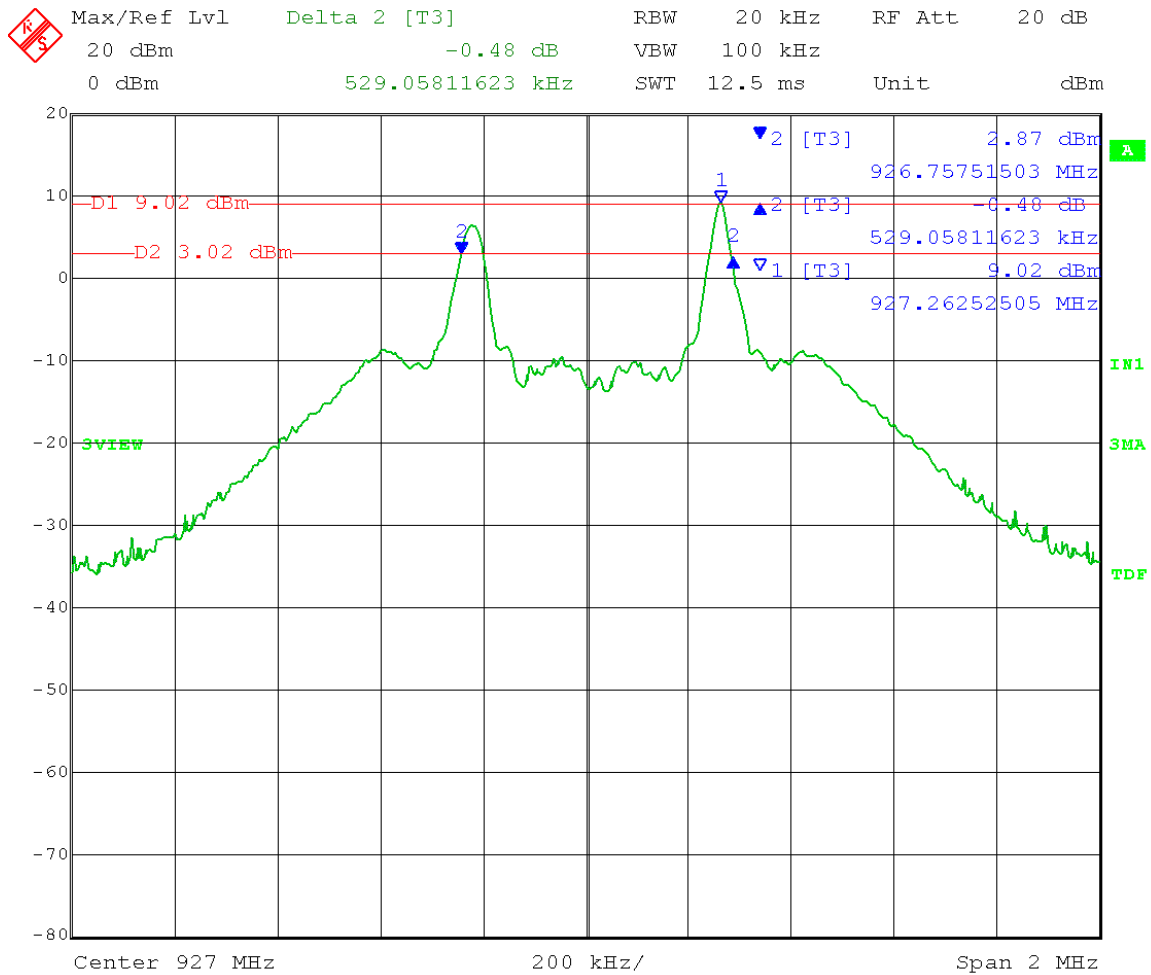
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Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900MHz Radio Module  
Test: Emission Bandwidth (6 dB) - Conducted  
Operator: Craig B

Comment: RBW = 1-5% of EBW  
VBW  $\geq 3 \times$  RBW  
Detector = Peak  
Sweep = auto couple

Comment: High Channel: Frequency – 927 MHz  
Limit  $\geq 500$  kHz

6 dB Emission Bandwidth = 529 kHz



Date: 13.JAN.2013 13:55:43



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## Appendix B

### 2.0 Fundamental Emission Output Power

#### Rule Part:

15.247(b)(3)

#### Test Procedure:

558074 D01 DTS Meas Guidance v02  
8.1 Maximum Peak Conducted Output Power  
8.1.1 Option 1 ( $RBW \geq DTS\ BW$ )

#### Limit:

The maximum peak conducted output power is 1 watt (30dBm).

#### Results:

Compliant  
Maximum peak conducted output power: **9.84mW (9.9dBm)**

#### Notes:

This was an RF conducted measurement. The EUT was connected to the measuring equipment through an RF cable and attenuator. Cable loss and attenuation was accounted for in the transducer factors set in the analyzer.

The EUT was powered by 3.3 V DC. The EUT was set to transmit continuously (100% duty cycle) at its maximum output power on the low, middle, and high channels of the operating band.





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Company:  
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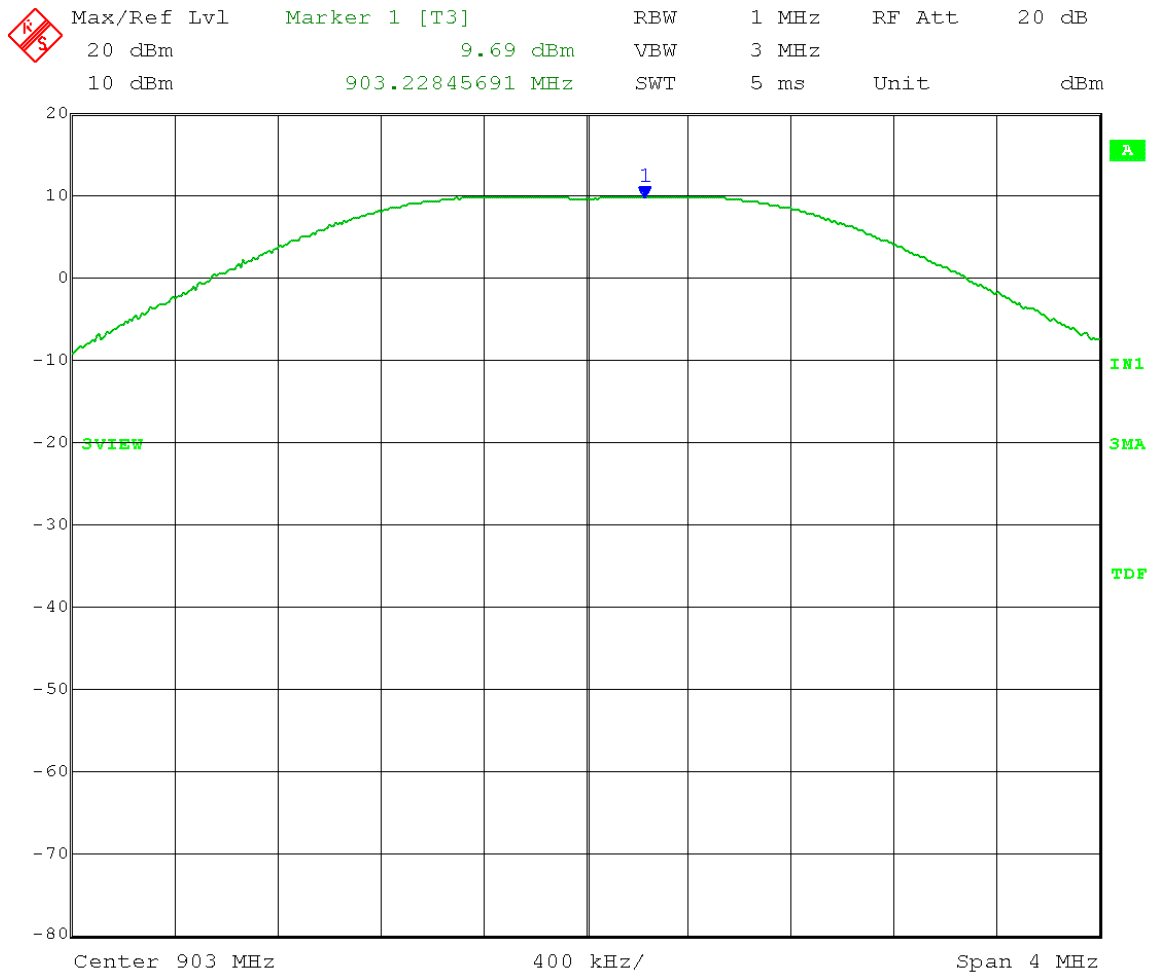
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Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900 MHz Radio Module  
Test: Fundamental Emission Output Power - Conducted  
Operator: Craig B

Comment: RBW  $\geq$  DTS bandwidth  
VBW  $\geq 3 \times$  RBW  
Span  $\geq$  RBW  
Sweep = auto couple  
Detector = Peak  
Trace = max hold

Comment: Low Channel: Frequency – 903 MHz

Fundamental Emission Output Power = 9.69 dBm = **9.31 mW**



Date: 13.JAN.2013 13:12:14



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Company:  
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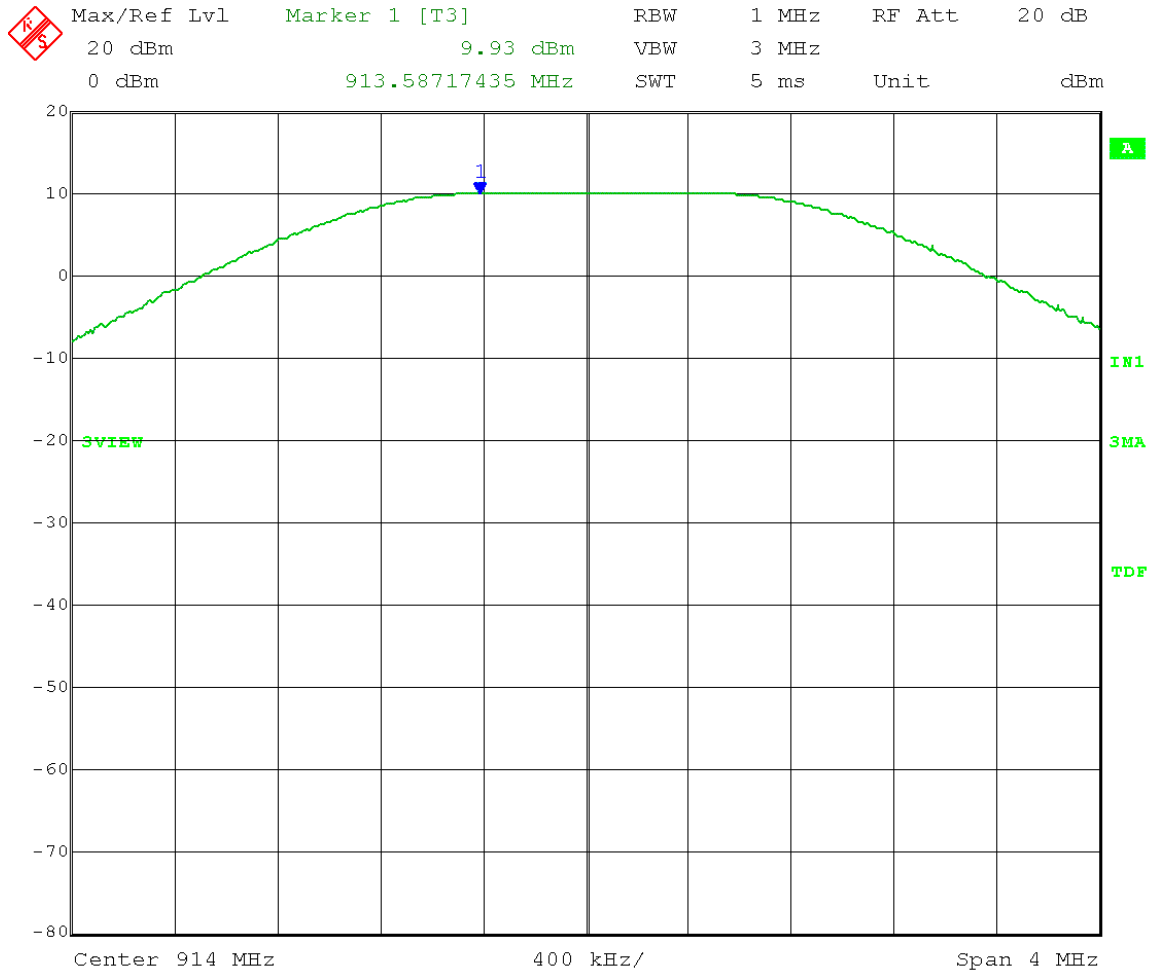
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Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900 MHz Radio Module  
Test: Fundamental Emission Output Power - Conducted  
Operator: Craig B

Comment: RBW  $\geq$  DTS bandwidth  
VBW  $\geq 3 \times$  RBW  
Span  $\geq$  RBW  
Sweep = auto couple  
Detector = Peak  
Trace = max hold

Comment: Mid Channel: Frequency – 914 MHz

Fundamental Emission Output Power = 9.93 dBm = **9.84 mW**



Date: 13.JAN.2013 14:24:38



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Model Tested:  
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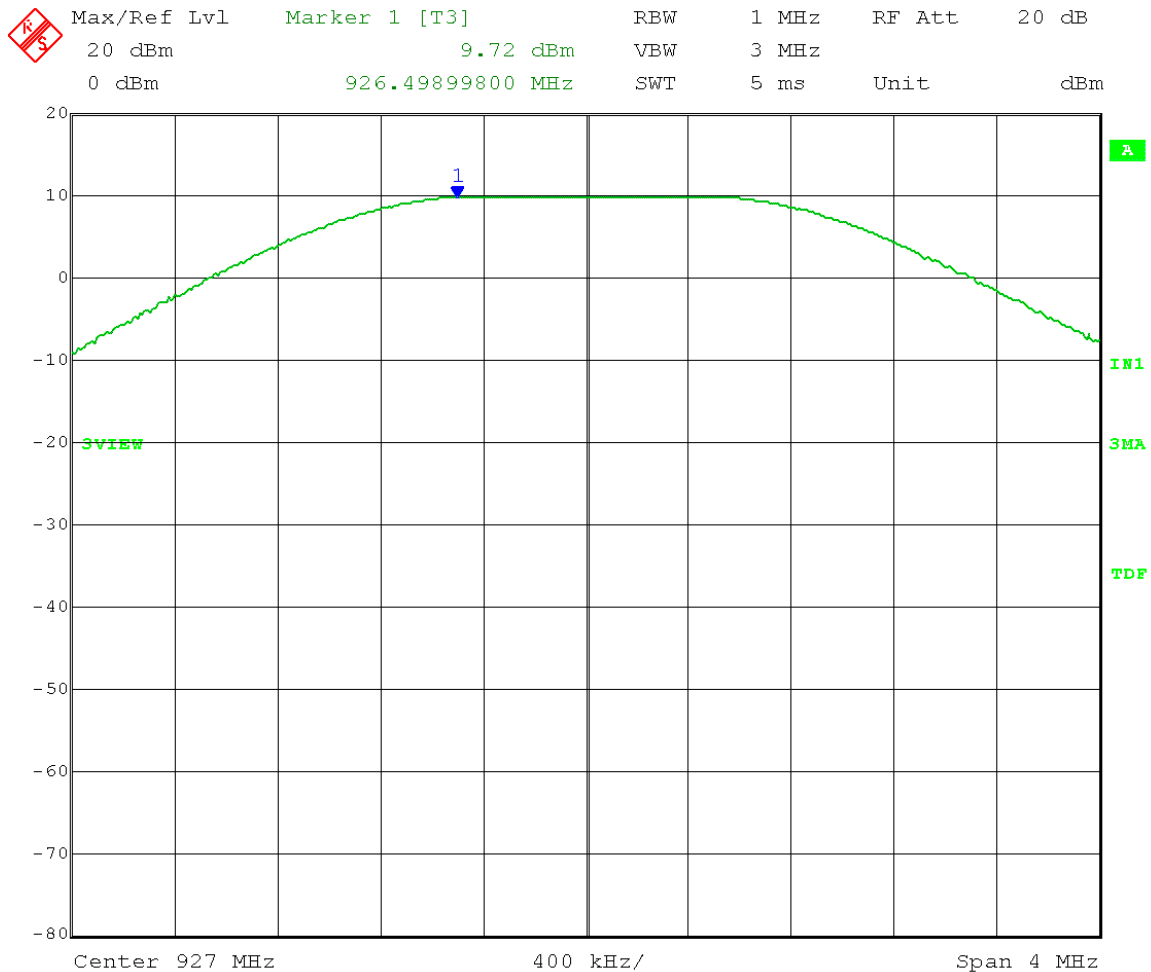
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Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900 MHz Radio Module  
Test: Fundamental Emission Output Power - Conducted  
Operator: Craig B

Comment: RBW  $\geq$  DTS bandwidth  
VBW  $\geq 3 \times$  RBW  
Span  $\geq$  RBW  
Sweep = auto couple  
Detector = Peak  
Trace = max hold

Comment: High Channel: Frequency – 927 MHz

Fundamental Emission Output Power = 9.72 dBm = **9.38 mW**



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## Appendix B

### 3.0 Maximum Power Spectral Density (PSD)

#### Rule Part:

15.247(e)

#### Test Procedure:

558074 D01 DTS Meas Guidance v02  
9.0 Maximum Power Spectral Density Level in the Fundamental Emission  
9.1 Option 1 (Peak)

#### Limit:

+8dBm in any 3 kHz band segment within the fundamental EBW during any time interval of continuous transmission.

#### Results:

Compliant  
Maximum conducted power spectral density (PSD): **3.19dBm**

#### Notes:

This was an RF conducted measurement. The EUT was connected to the measuring equipment through an RF cable and attenuator. Cable loss and attenuation was accounted for in the transducer factors set in the analyzer.

The EUT was powered by 3.3 V DC. The EUT was set to transmit continuously (100% duty cycle) at its maximum output power on the low, middle, and high channels of the operating band.



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Company:  
Model Tested:  
Report Number:  
DLS Project:

D&H Global Enterprise, LLC  
OBee00  
18903  
5563

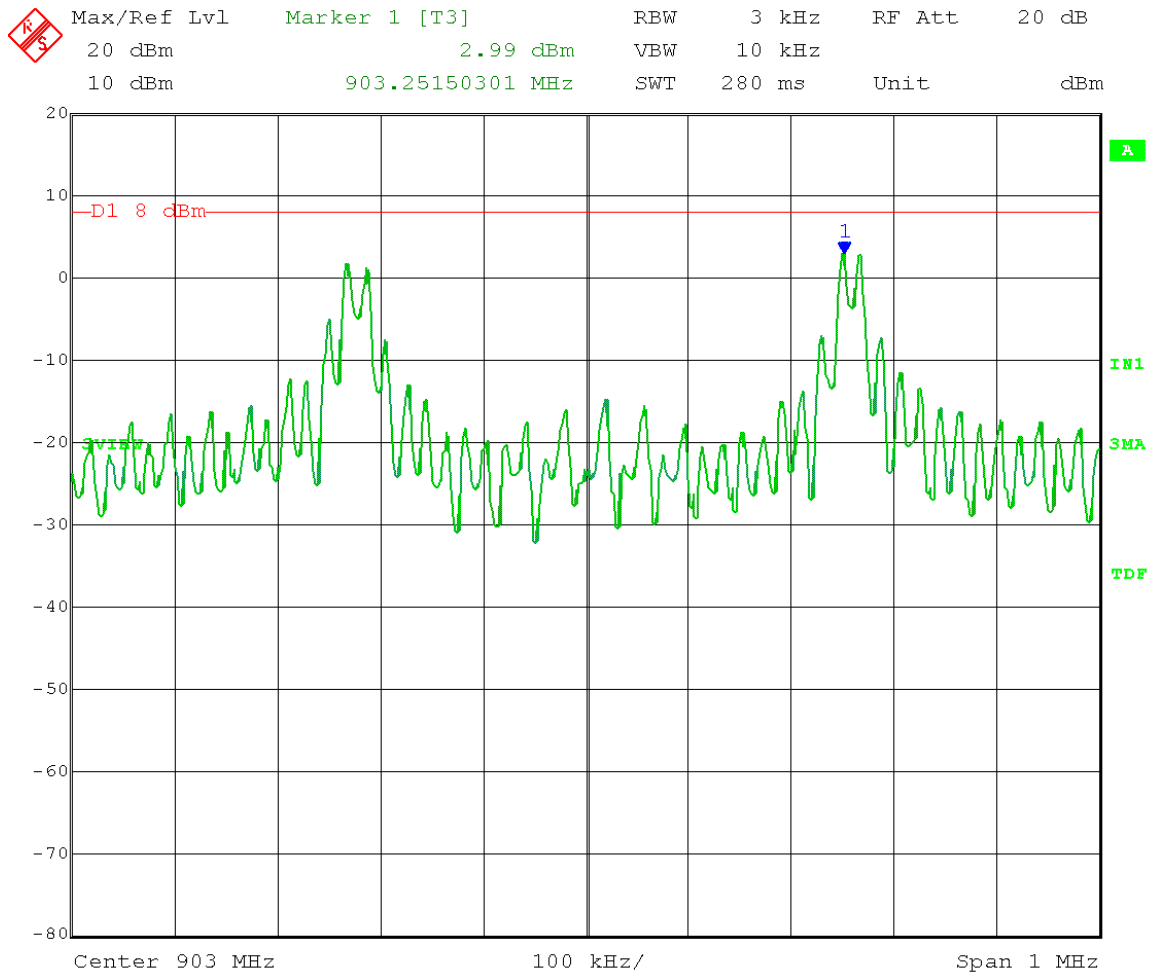
Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900 MHz Radio Module  
Test: Maximum Power Spectral Density - Conducted  
Operator: Craig B

Comment: RBW  $\geq$  3 kHz  
VBW  $\geq$  3 x RBW  
Span = 1.5 x DTS channel bandwidth  
Detector = Peak  
Sweep = auto couple  
Trace = max hold

Low Channel: Frequency – 903 MHz

Limit: 8dBm

Power Level in 3 kHz bandwidth = 2.99dBm



Date: 13.JAN.2013 13:05:24



166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

D&H Global Enterprise, LLC  
OBee00  
18903  
5563

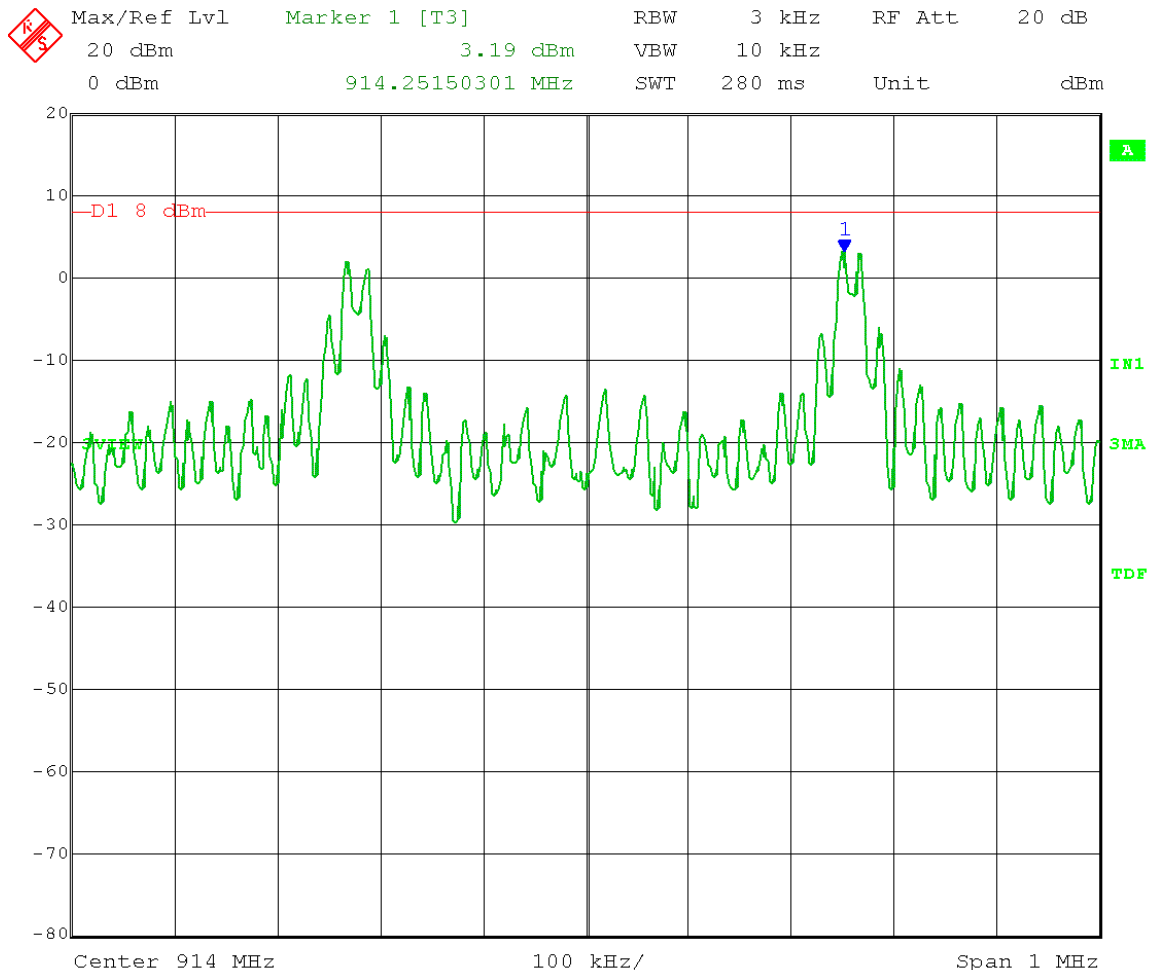
Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900 MHz Radio Module  
Test: Maximum Power Spectral Density - Conducted  
Operator: Craig B

Comment: RBW  $\geq$  3 kHz  
VBW  $\geq$  3 x RBW  
Span = 1.5 x DTS channel bandwidth  
Detector = Peak  
Sweep = auto couple  
Trace = max hold

Mid Channel: Frequency – 914 MHz

Limit: 8 dBm

Power Level in 3 kHz bandwidth = 3.19 dBm





166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

D&H Global Enterprise, LLC  
OBee00  
18903  
5563

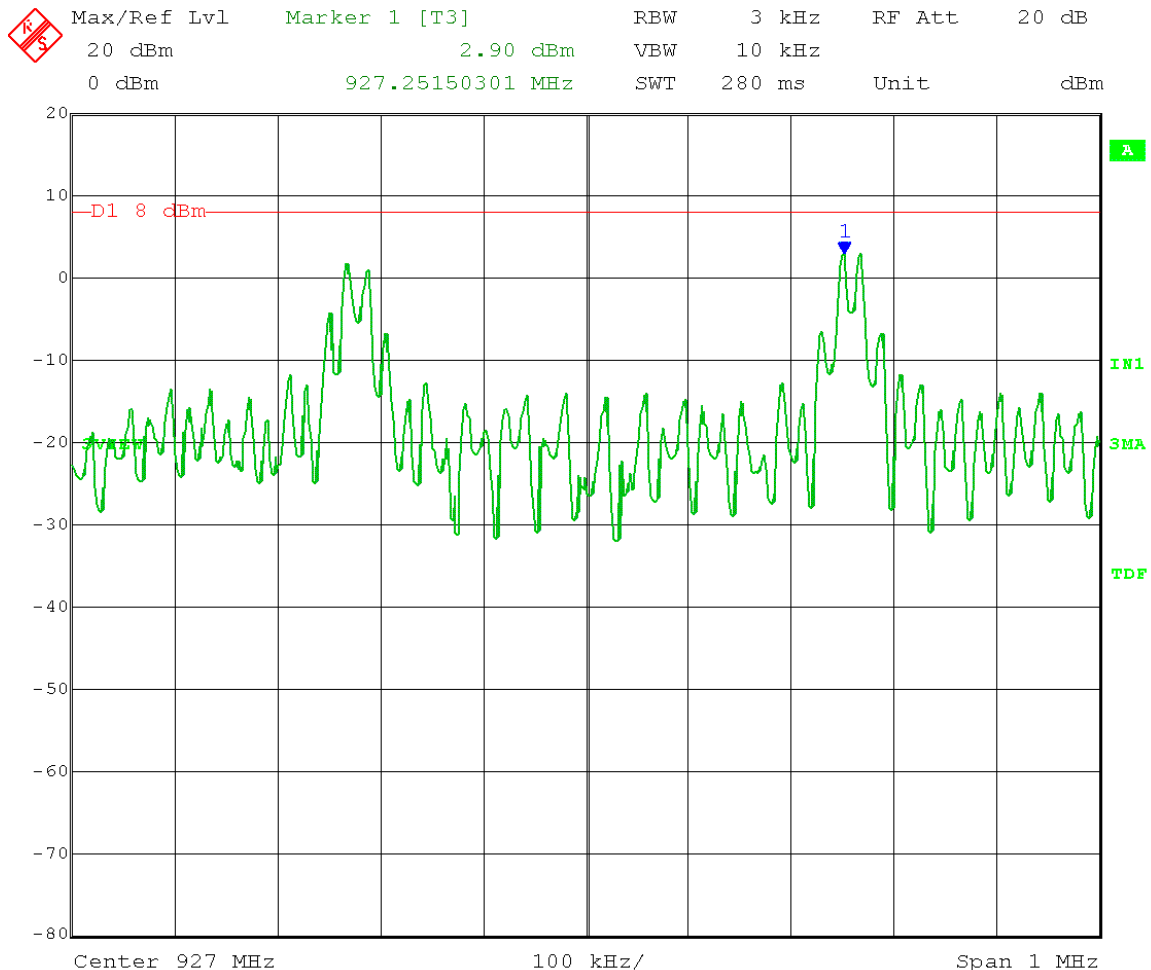
Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900 MHz Radio Module  
Test: Maximum Power Spectral Density - Conducted  
Operator: Craig B

Comment: RBW  $\geq$  3 kHz  
VBW  $\geq$  3 x RBW  
Span = 1.5 x DTS channel bandwidth  
Detector = Peak  
Sweep = auto couple  
Trace = max hold

High Channel: Frequency – 927 MHz

Limit: 8 dBm

Power Level in 3 kHz bandwidth = 2.90 dBm



Date: 13.JAN.2013 14:12:27



166 South Carter, Genoa City, WI 53128

Company:

D&H Global Enterprise, LLC

Model Tested:

OBee00

Report Number:

18903

DLS Project:

5563

## **Appendix B**

### **4.0 Maximum Unwanted Emission Levels - RF Conducted**

#### **Rule Part:**

15.247(d)

#### **Test Procedure:**

558074 D01 DTS Meas Guidance v02

10.0 Maximum Unwanted Emission Levels

10.1 Unwanted Emissions into Non-Restricted Frequency Bands

10.1.1 Reference Level Measurement

10.1.2 Unwanted Emissions Level Measurement

#### **Limit:**

The peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

#### **Results:**

Compliant

#### **Notes:**

This was an RF conducted measurement. The EUT was connected to the measuring equipment through an RF cable and attenuator. Cable loss and attenuation was accounted for in the transducer factors set in the analyzer.

The EUT was powered by 3.3 V DC. The EUT was set to transmit continuously (100% duty cycle) at its maximum output power on the low, middle, and high channels of the operating band.





166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

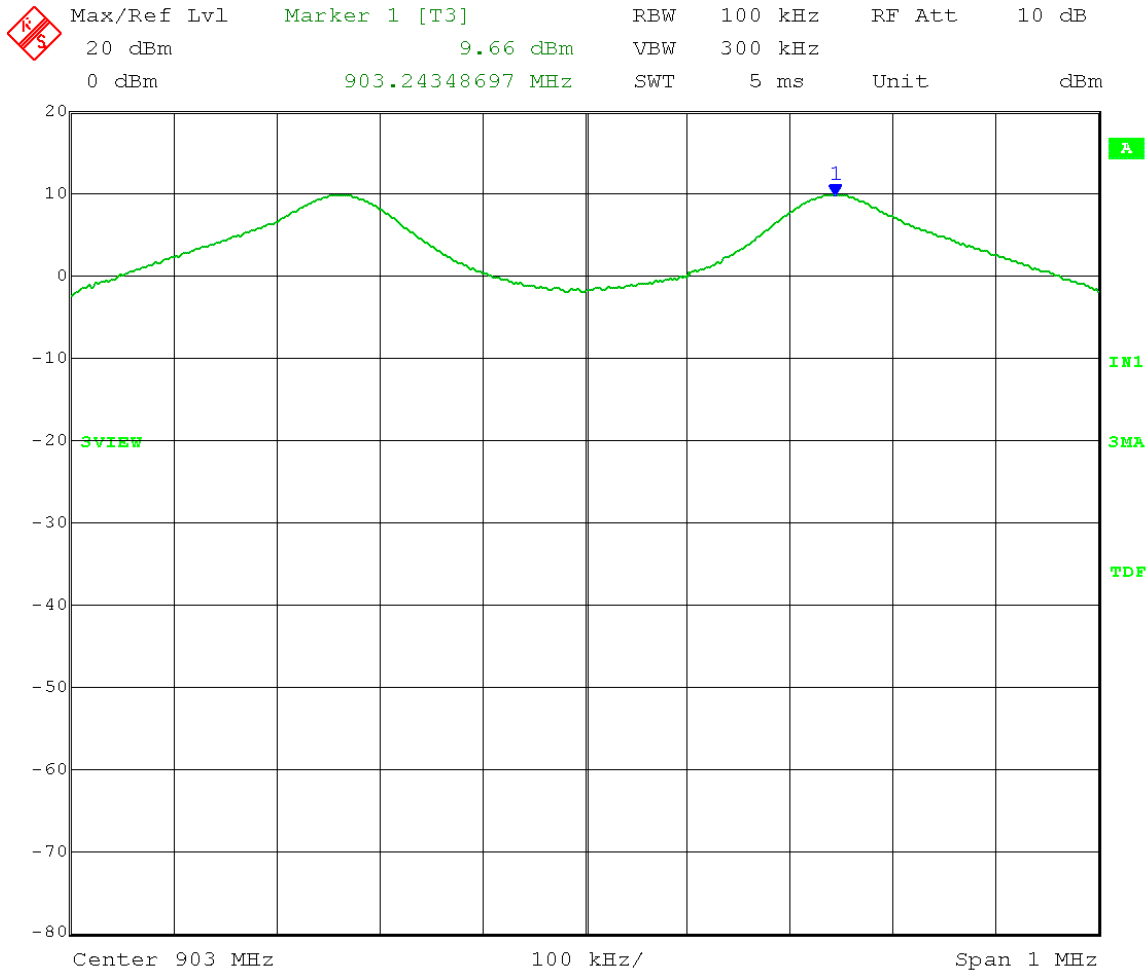
D&H Global Enterprise, LLC  
OBee00  
18903  
5563

Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900MHz Radio Module  
Test: Maximum Unwanted Emission Levels - Conducted  
Operator: Craig B

Comment: RBW = 100 kHz  
VBW  $\geq$  300 kHz  
Detector = Peak  
Sweep = auto couple  
Trace = max hold

Low Channel Transmit = 903 MHz

Reference Level measurement  
Limit = 9.66dBm - 20 dB = -10.34dBm



Date: 13.JAN.2013 13:21:02



166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

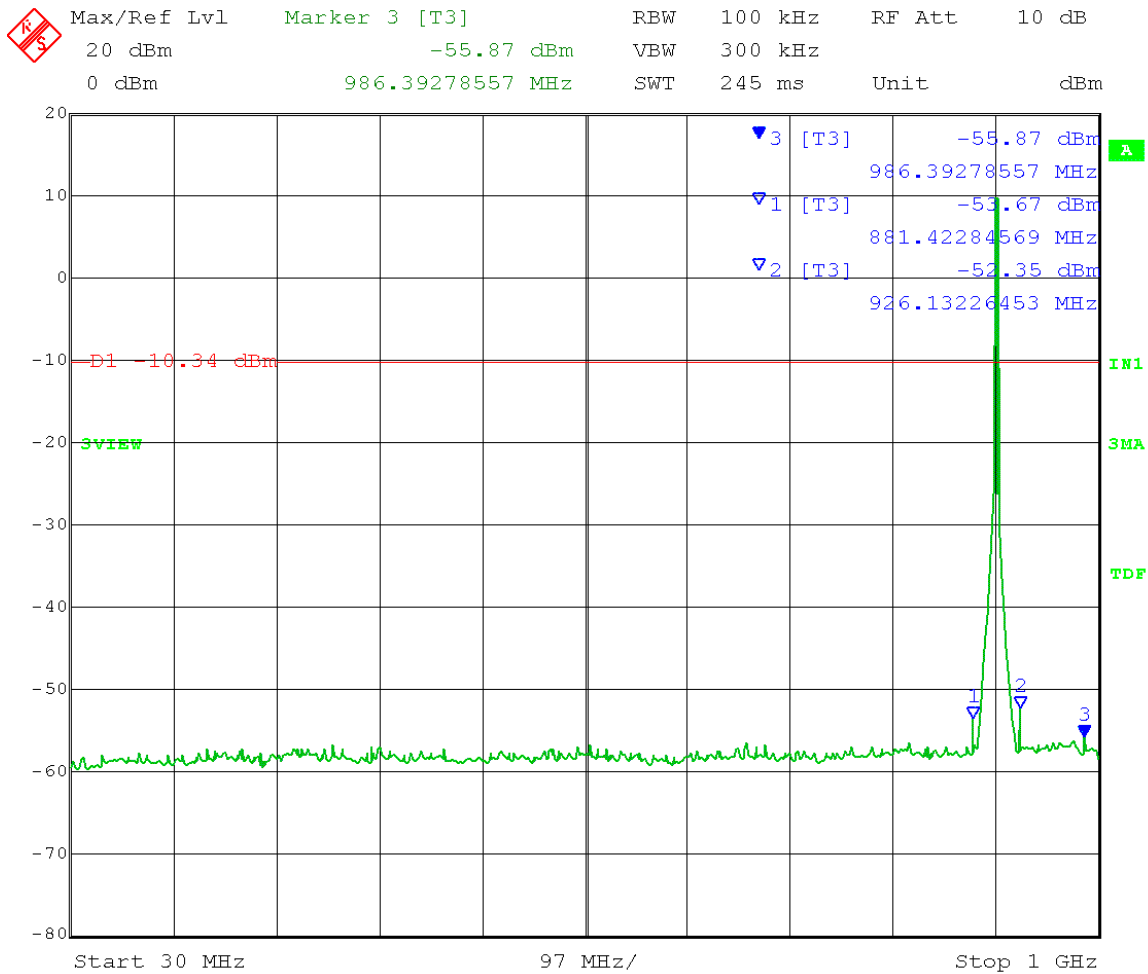
D&H Global Enterprise, LLC  
OBee00  
18903  
5563

Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900MHz Radio Module  
Test: Maximum Unwanted Emission Levels - Conducted  
Operator: Craig B

Comment: RBW = 100 kHz  
VBW  $\geq$  300 kHz  
Detector = Peak  
Sweep = auto couple  
Trace = max hold

Low Channel Transmit = 903 MHz

Frequency Range: 30 – 1000 MHz  
Limit = 9.66dBm – 20 dB = -10.34dBm



Date: 13.JAN.2013 13:24:31



166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

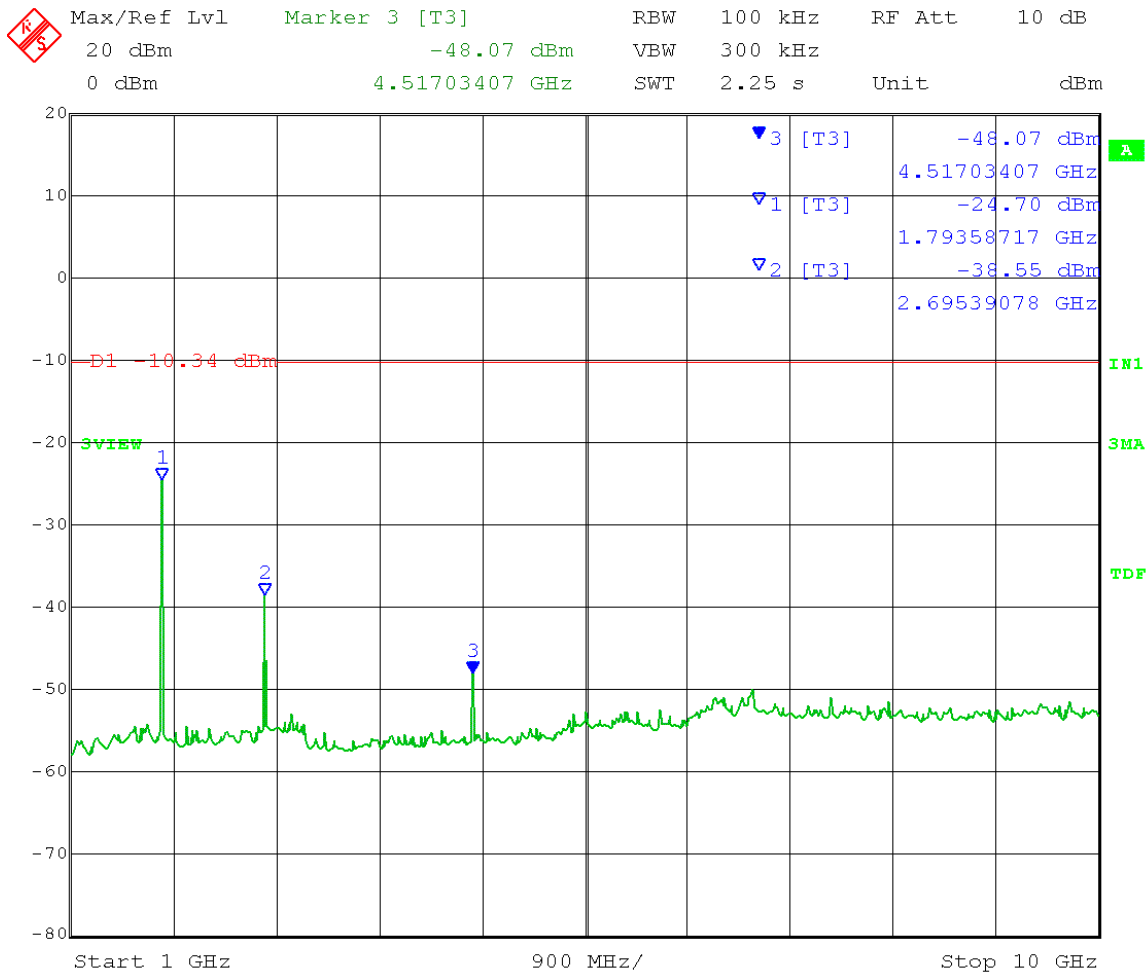
D&H Global Enterprise, LLC  
OBee00  
18903  
5563

Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900MHz Radio Module  
Test: Maximum Unwanted Emission Levels - Conducted  
Operator: Craig B

Comment: RBW = 100 kHz  
VBW  $\geq$  300 kHz  
Detector = Peak  
Sweep = auto couple  
Trace = max hold

Low Channel Transmit = 903 MHz

Frequency Range: 1 – 10 GHz  
Limit = 9.66dBm – 20 dB = -10.34dBm



Date: 13.JAN.2013 13:27:37



166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

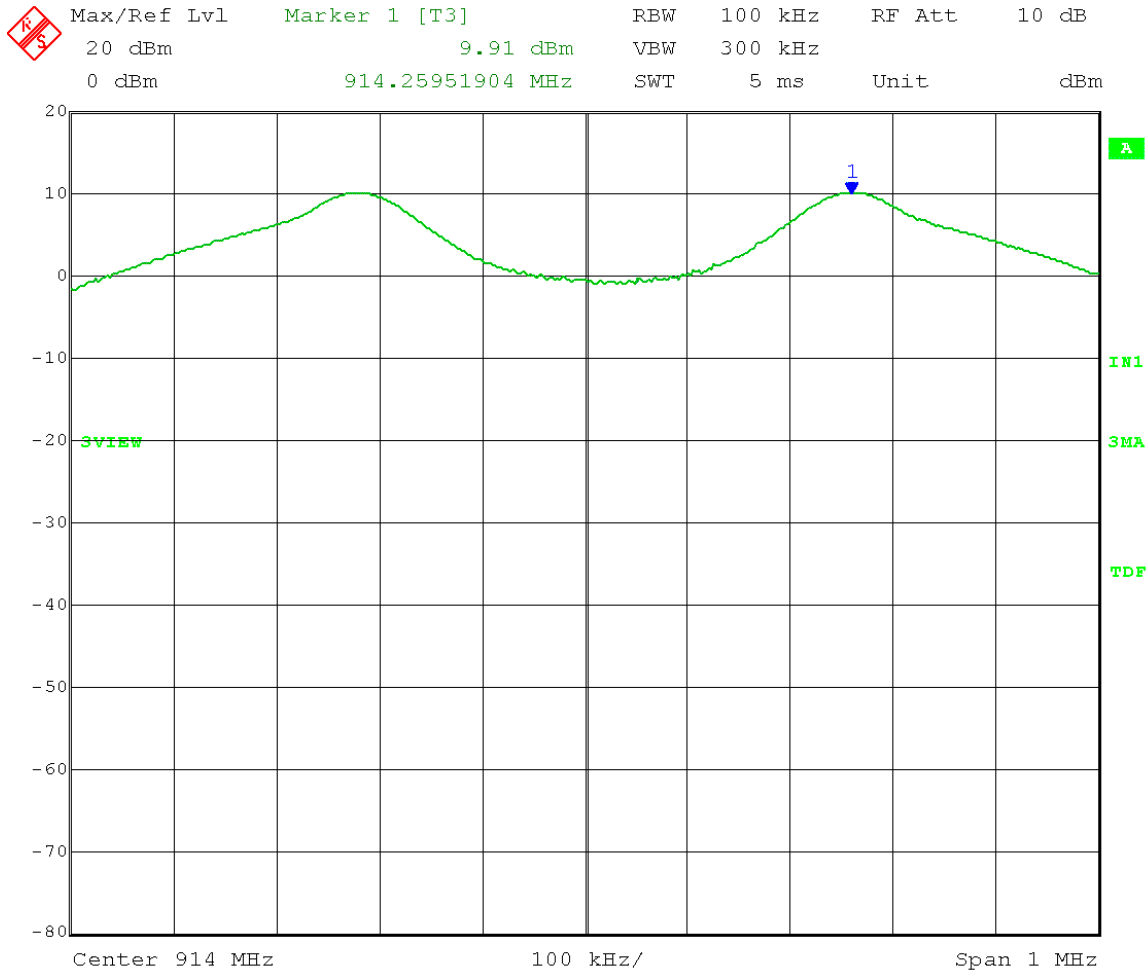
D&H Global Enterprise, LLC  
OBee00  
18903  
5563

Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900MHz Radio Module  
Test: Maximum Unwanted Emission Levels - Conducted  
Operator: Craig B

Comment: RBW = 100 kHz  
VBW  $\geq$  300 kHz  
Detector = Peak  
Sweep = auto couple  
Trace = max hold

Mid Channel Transmit = 914 MHz

Reference Level measurement  
Limit = 9.91dBm - 20 dB = -10.09dBm



Date: 13.JAN.2013 14:30:46



166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

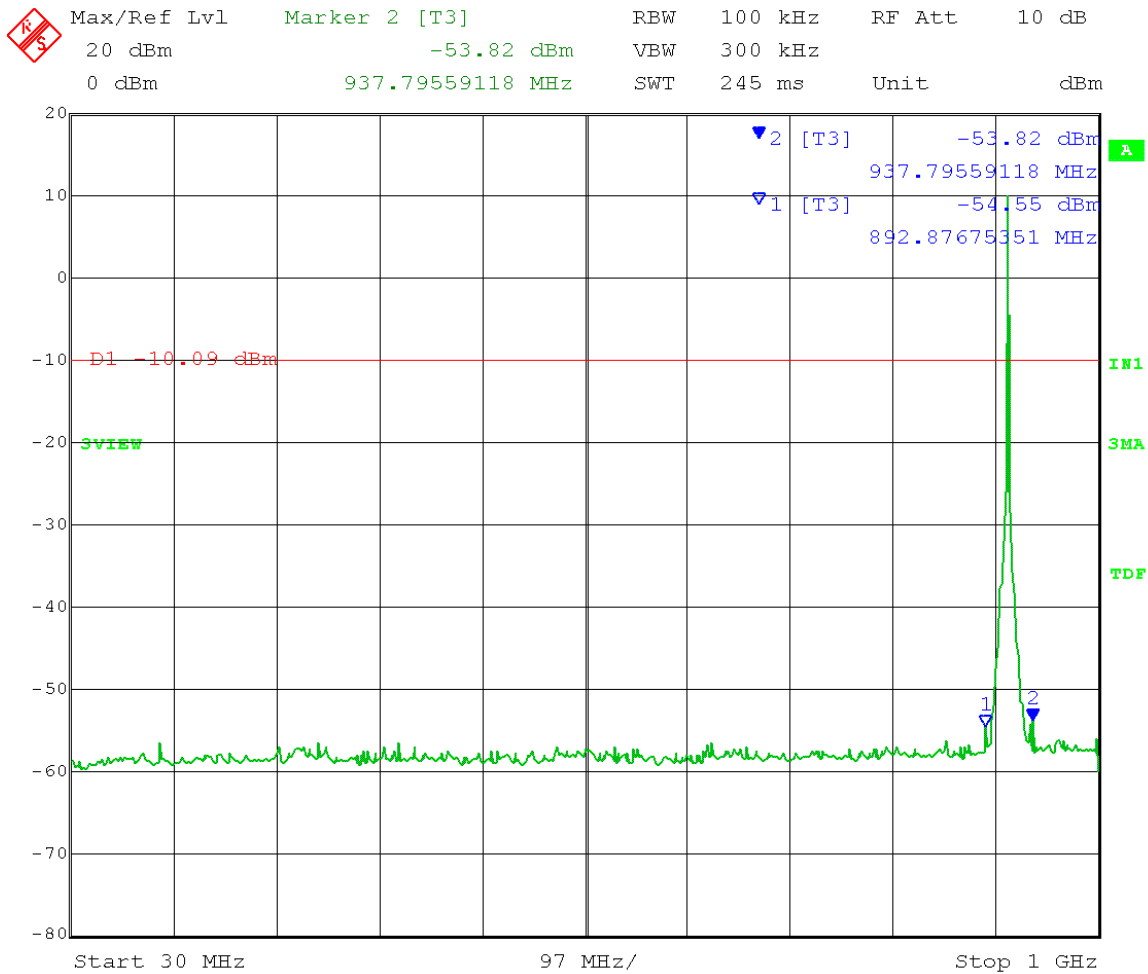
D&H Global Enterprise, LLC  
OBee00  
18903  
5563

Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900MHz Radio Module  
Test: Maximum Unwanted Emission Levels - Conducted  
Operator: Craig B

Comment: RBW = 100 kHz  
VBW  $\geq$  300 kHz  
Detector = Peak  
Sweep = auto couple  
Trace = max hold

Mid Channel Transmit = 914 MHz

Frequency Range: 30 – 1000 MHz  
Limit = 9.91dBm – 20 dB = -10.09dBm



Date: 13.JAN.2013 14:33:40



166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

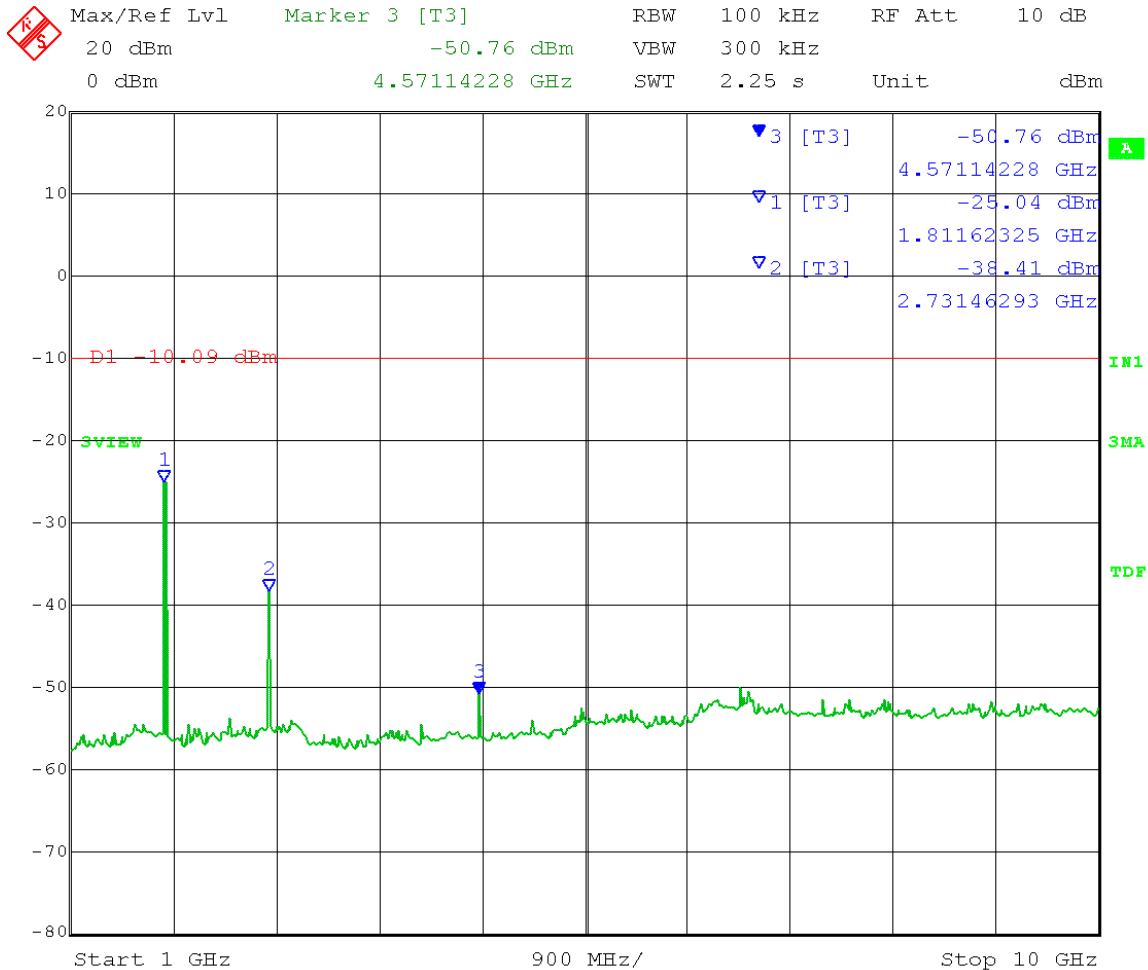
D&H Global Enterprise, LLC  
OBee00  
18903  
5563

Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900MHz Radio Module  
Test: Maximum Unwanted Emission Levels - Conducted  
Operator: Craig B

Comment: RBW = 100 kHz  
VBW  $\geq$  300 kHz  
Detector = Peak  
Sweep = auto couple  
Trace = max hold

Mid Channel Transmit = 914 MHz

Frequency Range: 1 – 10 GHz  
Limit = 9.91 dBm – 20 dB = -10.09 dBm



Date: 13.JAN.2013 14:35:31



166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

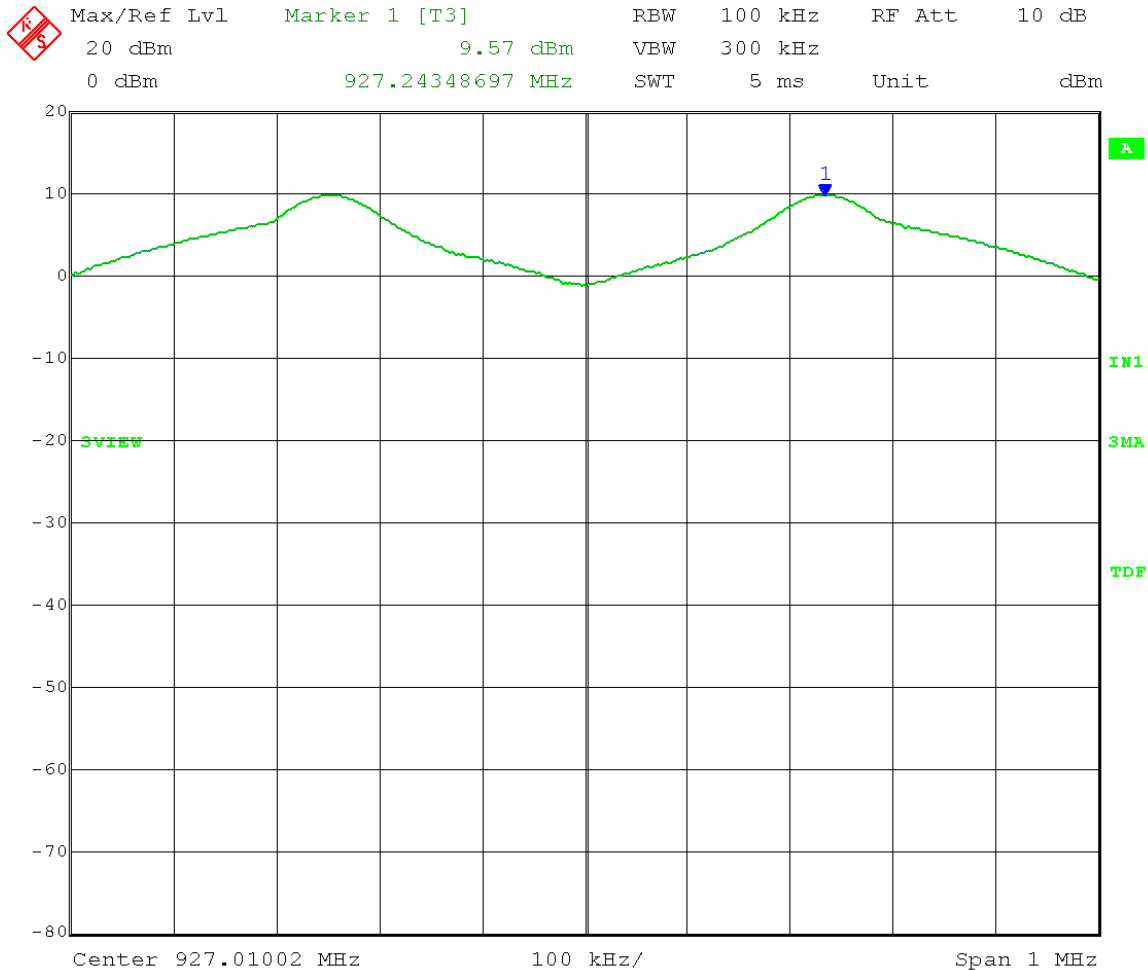
D&H Global Enterprise, LLC  
OBee00  
18903  
5563

Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900MHz Radio Module  
Test: Maximum Unwanted Emission Levels - Conducted  
Operator: Craig B

Comment: RBW = 100 kHz  
VBW  $\geq$  300 kHz  
Detector = Peak  
Sweep = auto couple  
Trace = max hold

High Channel Transmit = 927 MHz

Reference Level measurement  
Limit = 9.57 dBm – 20 dB = -10.43 dBm



Date: 13.JAN.2013 13:42:55



166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

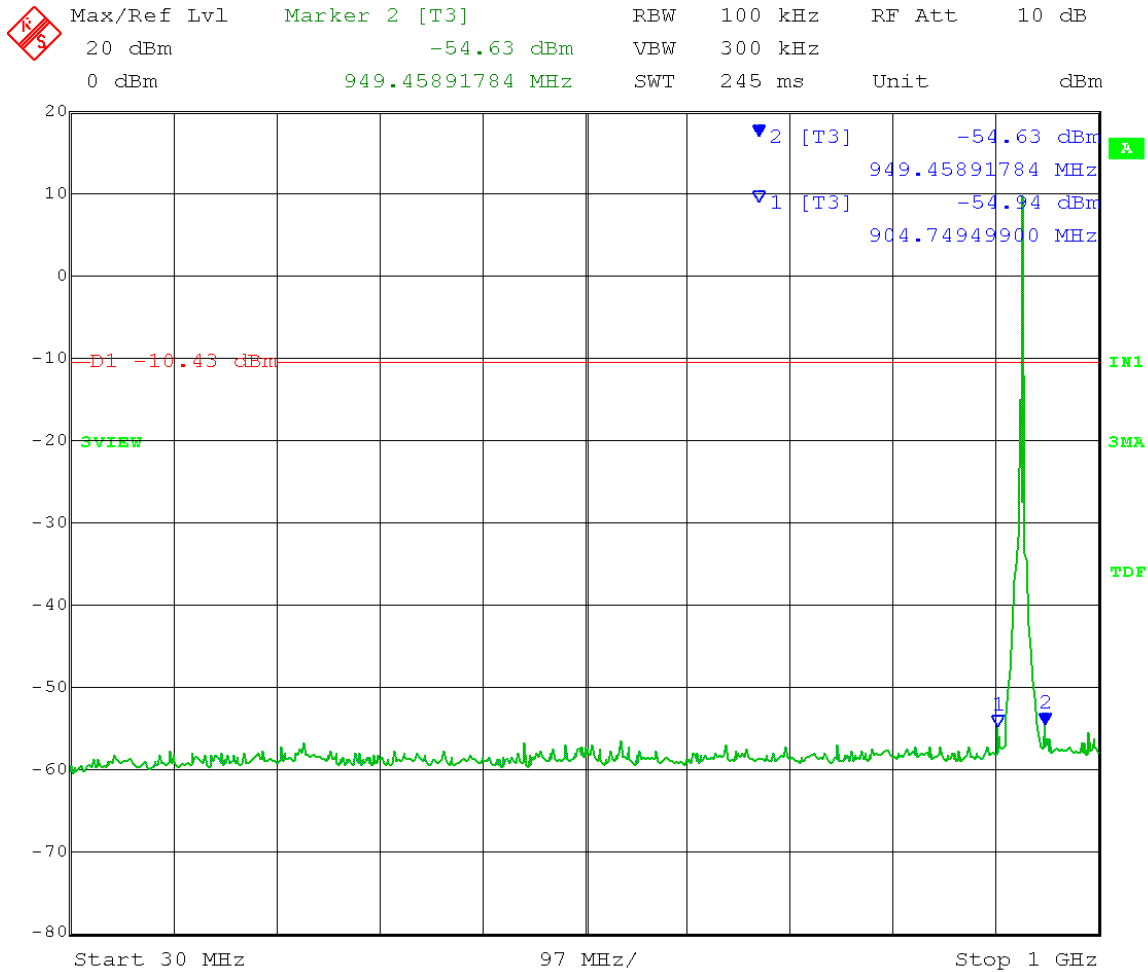
D&H Global Enterprise, LLC  
OBee00  
18903  
5563

Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900MHz Radio Module  
Test: Maximum Unwanted Emission Levels - Conducted  
Operator: Craig B

Comment: RBW = 100 kHz  
VBW ≥ 300 kHz  
Detector = Peak  
Sweep = auto couple  
Trace = max hold

High Channel Transmit = 927 MHz

Frequency Range: 30 – 1000 MHz  
Limit = 9.57dBm – 20 dB = -10.43dBm



Date: 13.JAN.2013 13:48:13





166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

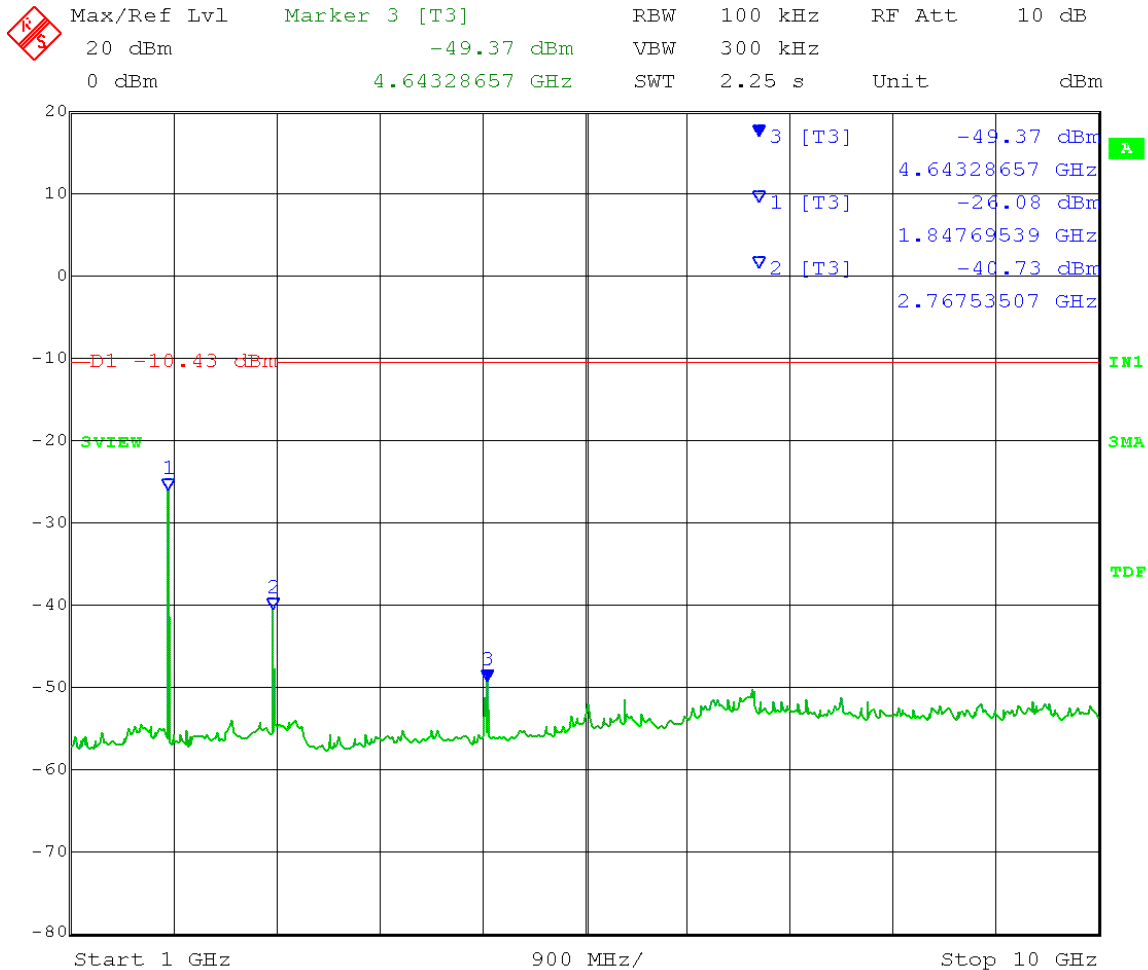
D&H Global Enterprise, LLC  
OBee00  
18903  
5563

Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900MHz Radio Module  
Test: Maximum Unwanted Emission Levels - Conducted  
Operator: Craig B

Comment: RBW = 100 kHz  
VBW  $\geq$  300 kHz  
Detector = Peak  
Sweep = auto couple  
Trace = max hold

High Channel Transmit = 927 MHz

Frequency Range: 1 – 10 GHz  
Limit = 9.57dBm – 20 dB = -10.43dBm



Date: 13.JAN.2013 13:46:26



166 South Carter, Genoa City, WI 53128

Company:

D&H Global Enterprise, LLC

Model Tested:

OBee00

Report Number:

18903

DLS Project:

5563

## **Appendix B**

### **5.0 Band-Edge Measurements – RF Conducted**

#### **Rule Part:**

15.247(d)

#### **Test Procedure:**

558074 D01 DTS Meas Guidance v02

10.0 Maximum Unwanted Emission Levels

10.1 Unwanted Emissions into Non-Restricted Frequency Bands

10.1.1 Reference Level Measurement

10.1.2 Unwanted Emissions Level

#### **Limit:**

The peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

#### **Results:**

Compliant

#### **Notes:**

This was an RF conducted measurement. The EUT was connected to the measuring equipment through an RF cable and attenuator. Cable loss and attenuation was accounted for in the transducer factors set in the analyzer.

The EUT was powered by 3.3 V DC. The EUT was set to transmit continuously (100% duty cycle) at its maximum output power on the lowest and highest channels of the operating band.



166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

D&H Global Enterprise, LLC  
OBee00  
18903  
5563

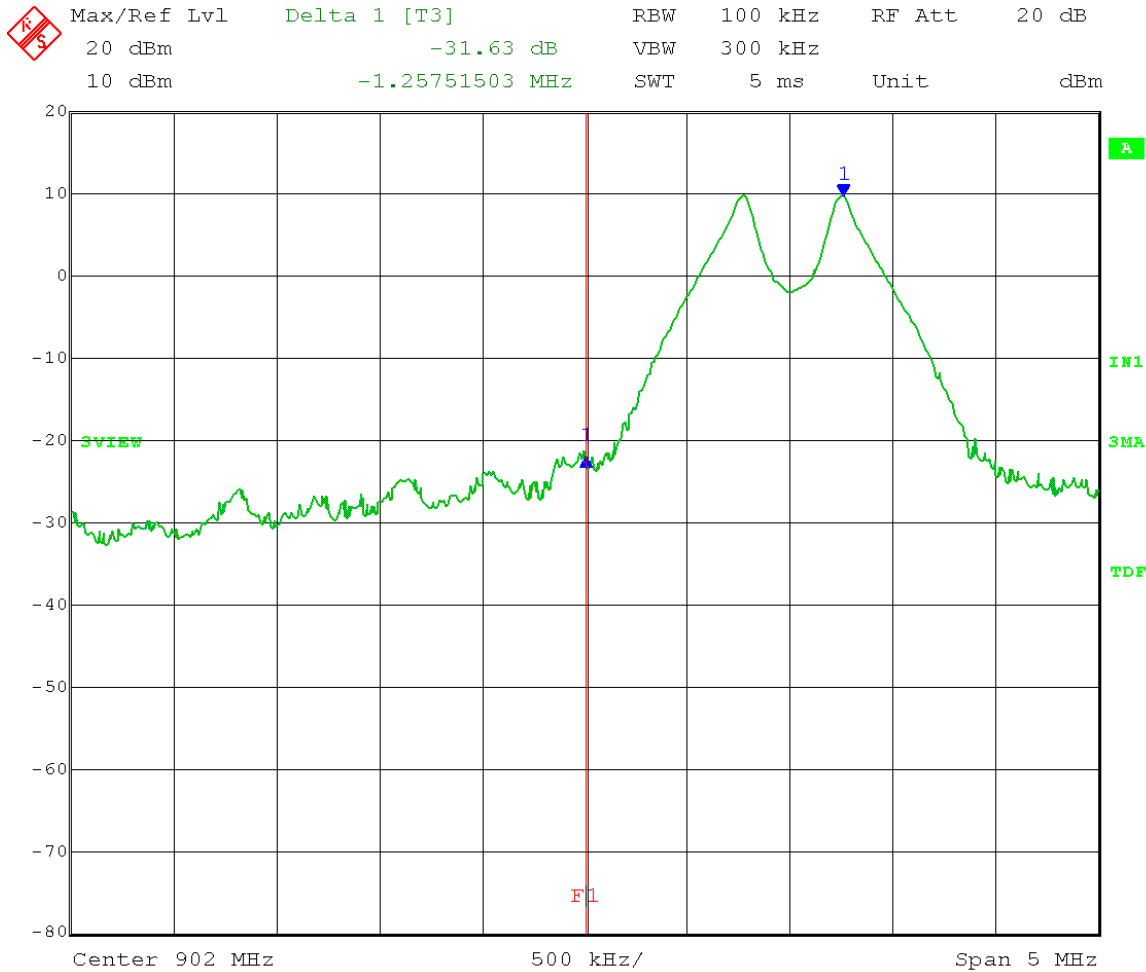
Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900 MHz Radio Module  
Test: Lower Band-Edge Measurements - Conducted  
Operator: Craig B

Comment: RBW = 100 kHz  
VBW  $\geq$  300 kHz  
Detector = Peak  
Sweep = auto couple  
Trace = max hold

Low Channel: Transmit = 903 MHz

Limit: Band-Edge > 20 dB Below Peak In-Band Emission

Band-Edge Frequency = 902MHz



Date: 13.JAN.2013 12:58:36



166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

D&H Global Enterprise, LLC  
OBee00  
18903  
5563

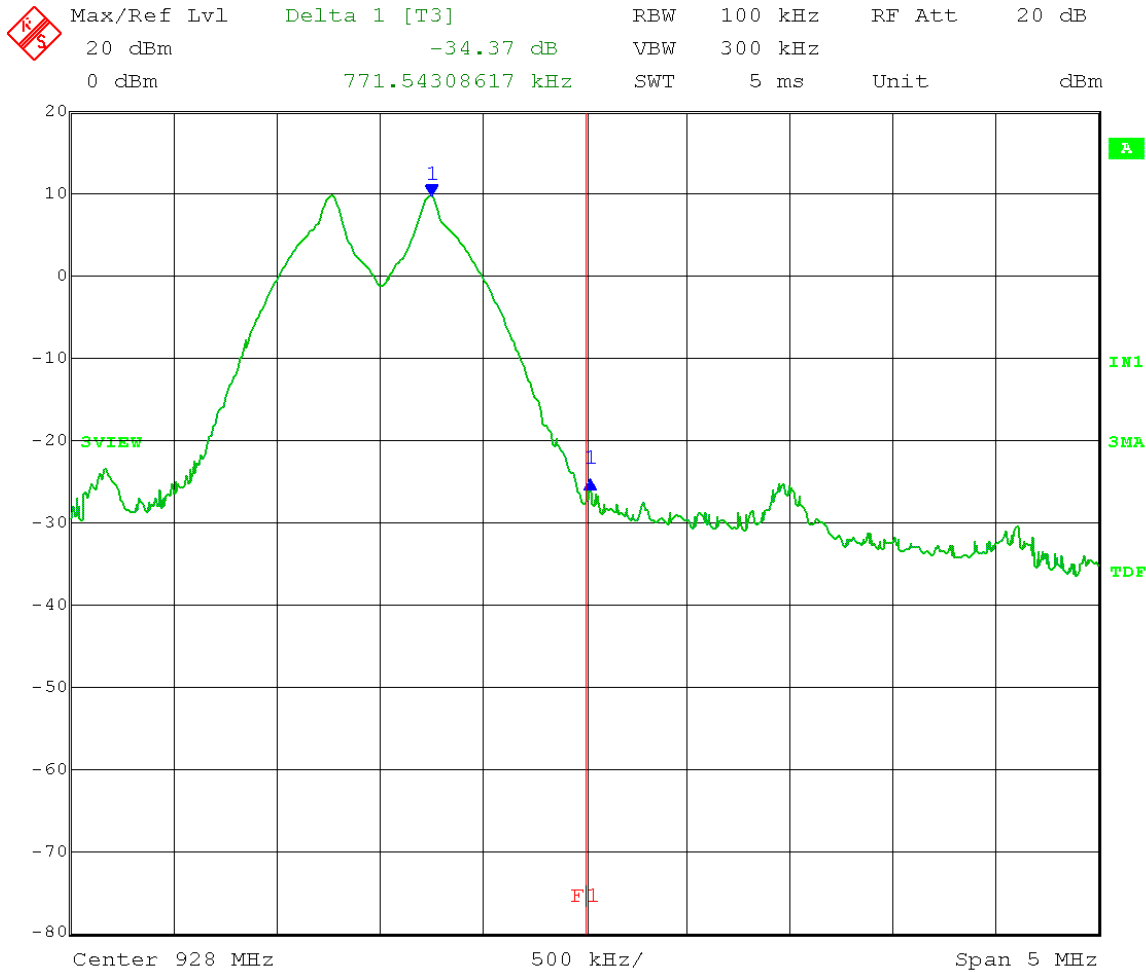
Test Date: 01-13-2013  
Company: D & H Global  
EUT: 900 MHz Radio Module  
Test: Upper Band-Edge Measurements - Conducted  
Operator: Craig B

Comment: RBW = 100 kHz  
VBW  $\geq$  300 kHz  
Detector = Peak  
Sweep = auto couple  
Trace = max hold

High Channel: Transmit = 927 MHz

Limit: Band-Edge > 20 dB Below Peak In-Band Emission

Band-Edge Frequency = 928 MHz



Date: 13.JAN.2013 13:51:55



166 South Carter, Genoa City, WI 53128

Company:	D&H Global Enterprise, LLC
Model Tested:	OBee00
Report Number:	18903
DLS Project:	5563

## **6.0 Duty Cycle Correction**

### **Rule Part:**

15.247(d); 15.35(b); 15.35(c)

### **Test Procedure:**

558074 D01 DTS Meas Guidance v02  
10.2.1 Radiated Emissions Measurements  
10.2.3 Measurement Detectors  
FCC 15.35(b) and 15.35(c)  
ANSI C63.10

### **Limit:**

Informative

### **Results:**

3.35dBm (See next page)

### **Notes:**

This was an RF conducted measurement. A shielded SMA to U.FL cable (appx. 3" long) was supplied by D & H Global to connect from the antenna port of the module (EUT) to an RF cable and attenuator to the test equipment.. The EUT was set to transmit at its maximum duty cycle that could occur in a real world application.

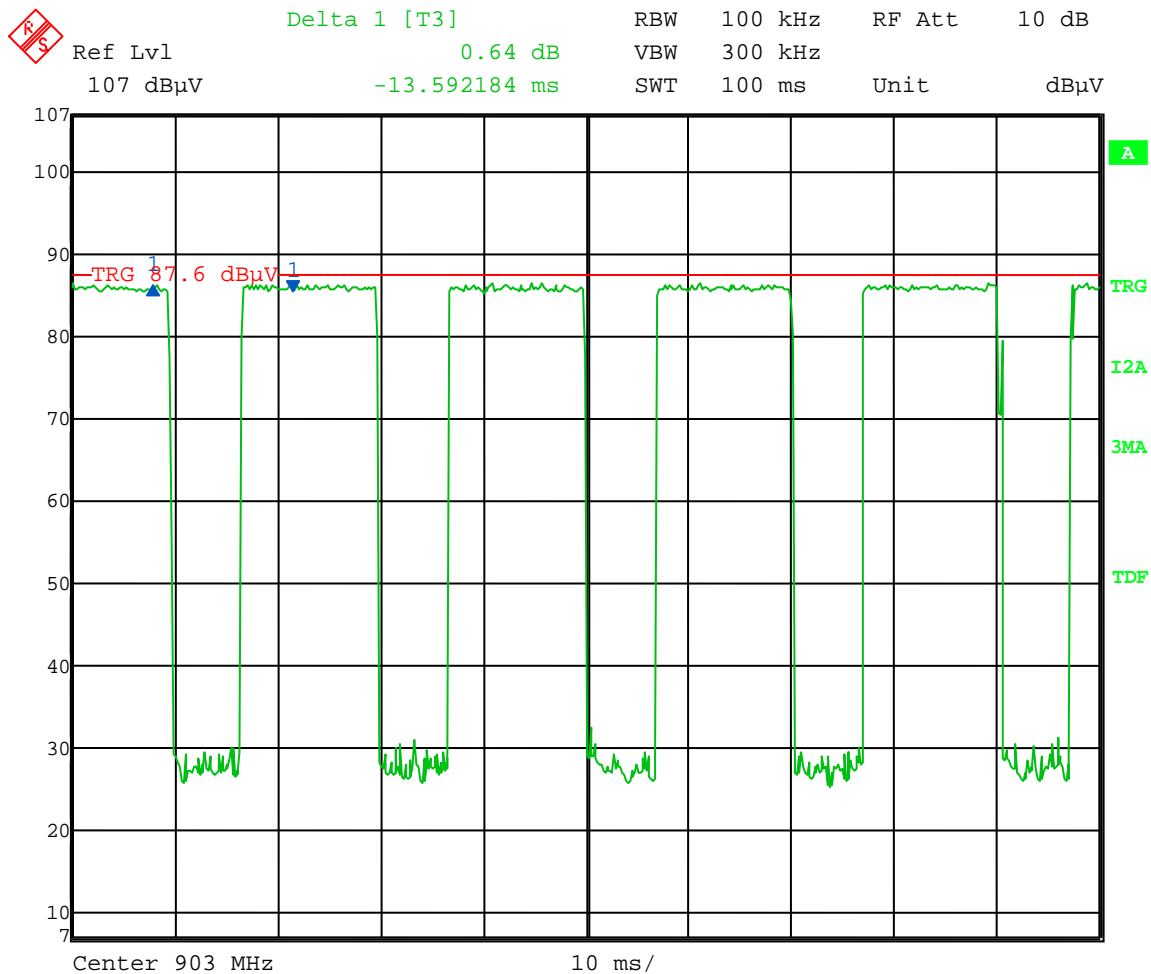


166 South Carter, Genoa City, WI 53128

Company: D&H Global Enterprise, LLC  
Model Tested: OBee00  
Report Number: 18903  
DLS Project: 5563

Test Date: 3-20-2013  
Company: D & H Global  
EUT: 900MHz Radio Module  
Test: Duty Cycle – worst case during normal operation  
Operator: Jim O

Comment: Total on Time = 13.6ms x 5 times = 68 ms during 100 ms Sweep  
 $20 \log (68 / 100) = -3.35$   
**Duty Cycle Correction Factor = 3.35dB**



Date: 20.MAR.2013 13:43:45



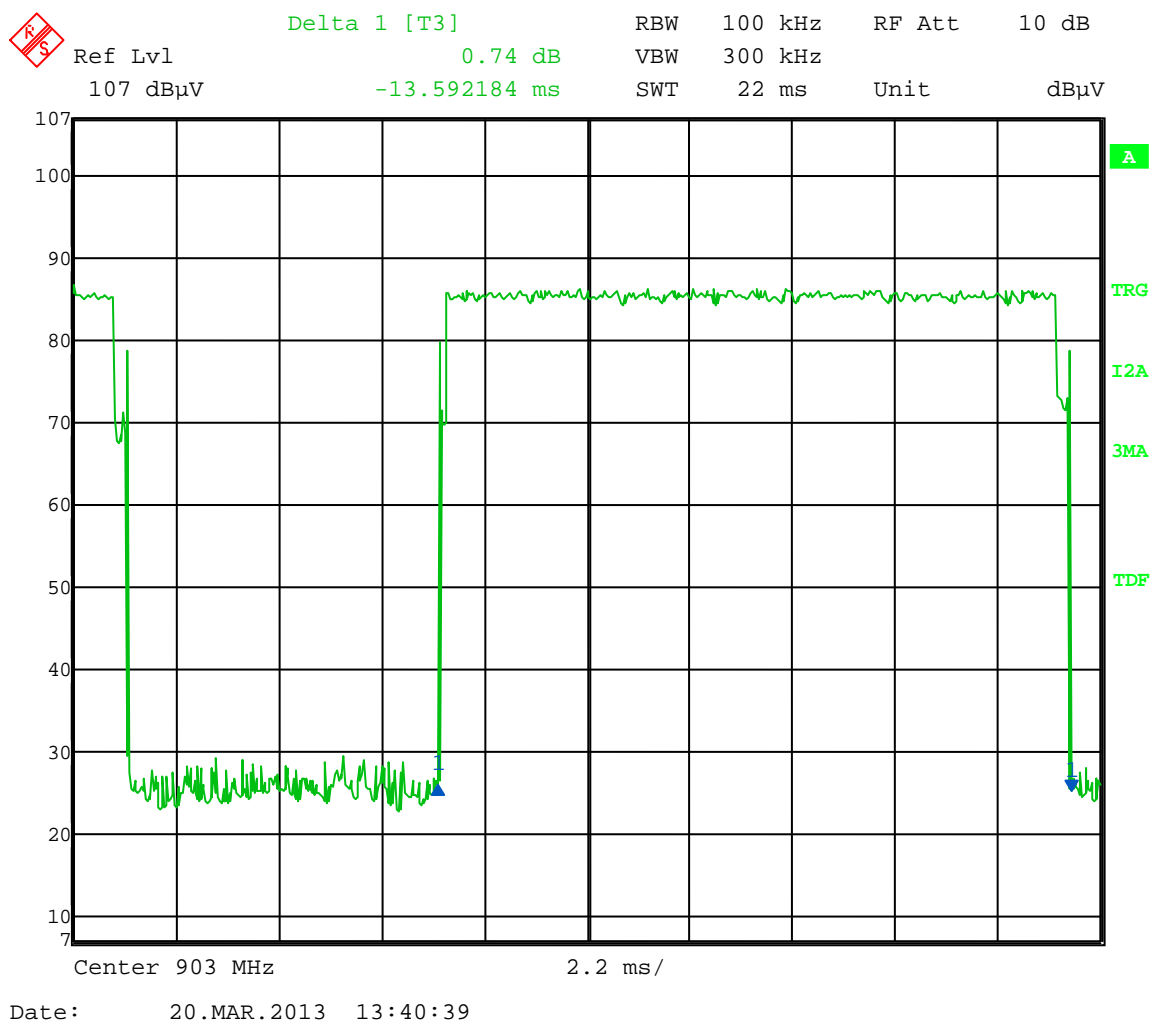
166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

D&H Global Enterprise, LLC  
OBee00  
18903  
5563

Test Date: 3-20-2013  
Company: D & H Global  
EUT: 900MHz Radio Module  
Test: Duty Cycle – worst case during normal operation  
Operator: Jim O

Comment: Duration of one pulse: 13.6mS





166 South Carter, Genoa City, WI 53128

Company:	D&H Global Enterprise, LLC
Model Tested:	OBee00
Report Number:	18903
DLS Project:	5563

## Appendix B

### 7.0 Unwanted Emissions into Restricted Frequency Bands – Radiated 1 to 10 GHz

#### Rule Part:

15.247(d), 15.205(a), 15.209(a)

#### Test Procedure:

558074 D01 DTS Meas Guidance v02  
10.2 Unwanted Emissions into Restricted Frequency Bands  
10.2.1 Radiated Emissions Measurements  
10.2.3 Measurement Detectors  
FCC 15.35(b) and (c)  
ANSI C63.10-2009

#### Limits:

15.209(a)

#### Results:

Compliant

#### Notes:

This was an RF radiated measurement. The EUT was transmitting from the Pulse W1063 antenna (highest gain antenna).

The EUT was powered by 3.3 V DC. The EUT was set to transmit continuously (100% duty cycle) at its maximum output power on the low, middle, and high channels of the operating band.





166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

D&H Global Enterprise, LLC  
OBee00  
18903  
5563

## Radiated Spurious Emissions in Restricted Bands Tested at a 3 Meter Distance 1 GHz to 10 GHz

**EUT:** 900MHz Radio Module  
**Manufacturer:** D & H Global  
**Operating Condition:** 70 deg F; 48% R.H.  
**Test Specification:** FCC Part 15.247 (d) and FCC Part 15.205  
**Comment:** IEEE 802.15.4; Continuous transmit mode; Maximum Output power setting  
**Notes:** (1) Peak measurements were taken with RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.  
(2) Average measurements were taken with RBW = 1 MHz, VBW = 3 MHz, Detector = CISPR Average.  
(3) All other restricted band emissions at least 20 dB under the limit.

### Channel 1 (Low) = 903MHz

Frequency MHz	Measurement Type	Ant Pol	Level (dBμV)	Antenna Factor (dBμV/m)	System Loss (dB)	Total Level (dBμV/m)	Duty Cycle Correction (dB)	Final Corrected (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
2710	Average	Hz	64.9	28.86	-37.3	56.5	3.35	53.15	54	0.85	Restricted Band
2710	Max Peak	Hz	70.32	28.86	-37.3	61.9	0	61.9	74	12.1	Restricted Band
2710	Average	Vt	64.49	28.86	-37.3	56.1	3.35	52.75	54	1.25	Restricted Band
2710	Max Peak	Vt	69.95	28.86	-37.3	61.6	0	61.6	74	12.4	Restricted Band
3613	Average	Vt	44.35	31.67	-39	37	3.35	33.65	54	20.35	Restricted Band
3613	Max Peak	Vt	53.14	31.67	-39	45.8	0	45.8	74	28.2	Restricted Band
3613	Average	Hz	44.83	31.67	-39	37.5	3.35	34.15	54	19.85	Restricted Band
3613	Max Peak	Hz	53.27	31.67	-39	45.9	0	45.9	74	28.1	Restricted Band
4516	Average	Vt	52.63	32.52	-40.2	44.9	3.35	41.55	54	12.45	Restricted Band
4516	Max Peak	Vt	59.43	32.52	-40.2	51.7	0	51.7	74	22.3	Restricted Band
4516	Average	Hz	54.41	32.52	-40.2	46.7	3.35	43.35	54	10.65	Restricted Band
4516	Max Peak	Hz	61.16	32.52	-40.2	53.5	0	53.5	74	20.5	Restricted Band
5420	Average	Hz	42.73	34.32	-40.6	36.5	3.35	33.15	54	20.85	Restricted Band
5420	Max Peak	Hz	51.79	34.32	-40.6	45.5	0	45.5	74	28.5	Restricted Band
8129	Average	Hz	32.28	37.18	-34.2	35.2	3.35	31.85	54	22.15	Restricted Band
8129	Max Peak	Hz	45.43	37.18	-34.2	48.4	0	48.4	74	25.6	Restricted Band
8129	Average	Vt	33.8	37.18	-34.2	36.7	3.35	33.35	54	20.65	Restricted Band
8129	Max Peak	Vt	45.97	37.18	-34.2	48.9	0	48.9	74	25.1	Restricted Band
9033	Average	Hz	36.65	38.1	-35.8	38.9	3.35	35.55	54	18.45	Restricted Band
9033	Max Peak	Hz	47.7	38.1	-35.8	50	0	50	74	24	Restricted Band
9033	Average	Vt	36.44	38.1	-35.8	38.7	3.35	35.35	54	18.65	Restricted Band
9033	Max Peak	Vt	47.7	38.1	-35.8	50	0	50	74	24	Restricted Band



166 South Carter, Genoa City, WI 53128

Company: D&H Global Enterprise, LLC  
 Model Tested: OBee00  
 Report Number: 18903  
 DLS Project: 5563

**Radiated Spurious Emissions in Restricted Bands - Tested at a 3 Meter Distance 1 GHz to 10 GHz**

**EUT:** 900MHz Radio Module  
**Manufacturer:** D & H Global  
**Operating Condition:** 70 deg F; 48% R.H.  
**Test Specification:** FCC Part 15.247 (d) and FCC Part 15.205  
**Comment:** IEEE 802.15.4; Continuous transmit mode; Maximum Output power setting  
**Notes:** (1) Peak measurements were taken with RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.  
 (2) Average measurements were taken with RBW = 1 MHz, VBW = 3 MHz, Detector = CISPR Average.  
 (3) All other restricted band emissions at least 20 dB under the limit.

**Channel 13 (Mid) = 915MHz**

Frequency MHz	Measurement Type	Ant Pol	Level (dBμV)	Antenna Factor (dBμV/m)	System Loss (dB)	Total Level (dBμV/m)	Duty Cycle Correction (dB)	Final Corrected (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
2746	Average	Hz	62.33	28.9	-37.8	53.5	3.35	50.15	54	3.85	Restricted Band
2746	Max Peak	Hz	68.06	28.9	-37.8	59.2	0	59.2	74	14.8	Restricted Band
2746	Average	Vt	61.83	28.9	-37.8	53	3.35	49.65	54	4.35	Restricted Band
2746	Max Peak	Vt	67.57	28.9	-37.8	58.7	0	58.7	74	15.3	Restricted Band
3661	Average	Hz	45.06	31.99	-39.8	37.3	3.35	33.95	54	20.05	Restricted Band
3661	Max Peak	Hz	53.78	31.99	-39.8	46	0	46	74	28	Restricted Band
3661	Average	Vt	44.7	31.99	-39.8	36.9	3.35	33.55	54	20.45	Restricted Band
3661	Max Peak	Vt	53.52	31.99	-39.8	45.8	0	45.8	74	28.2	Restricted Band
4576	Average	Hz	53.34	32.56	-41	44.9	3.35	41.55	54	12.45	Restricted Band
4576	Max Peak	Hz	60.21	32.56	-41	51.7	0	51.7	74	22.3	Restricted Band
4576	Average	Vt	50.34	32.56	-41	41.9	3.35	38.55	54	15.45	Restricted Band
4576	Max Peak	Vt	57.88	32.56	-41	49.4	0	49.4	74	24.6	Restricted Band
7322	Average	Vt	32.6	36.6	-34.9	34.3	3.35	30.95	54	23.05	Restricted Band
7322	Max Peak	Vt	45.29	36.6	-34.9	47	0	47	74	27	Restricted Band
7322	Average	Hz	33.23	36.6	-34.9	34.9	3.35	31.55	54	22.45	Restricted Band
7322	Max Peak	Hz	46.5	36.6	-34.9	48.2	0	48.2	74	25.8	Restricted Band
8237	Average	Hz	35.02	37.25	-34.7	37.6	3.35	34.25	54	19.75	Restricted Band
8237	Max Peak	Hz	46.63	37.25	-34.7	49.2	0	49.2	74	24.8	Restricted Band
8237	Average	Vt	35.5	37.25	-34.7	38.1	3.35	34.75	54	19.25	Restricted Band
8237	Max Peak	Vt	47.17	37.25	-34.7	49.8	0	49.8	74	24.2	Restricted Band
9152	Average	Vt	34.43	38.02	-36	36.5	3.35	33.15	54	20.85	Restricted Band
9152	Max Peak	Vt	46.9	38.02	-36	48.9	0	48.9	74	25.1	Restricted Band
9153	Average	Hz	35.95	38.02	-36	38	3.35	34.65	54	19.35	Restricted Band
9153	Max Peak	Hz	47.97	38.02	-36	50	0	50	74	24	Restricted Band



166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

D&H Global Enterprise, LLC  
OBee00  
18903  
5563

## Radiated Spurious Emissions in Restricted Bands

Tested at a 3 Meter Distance 1 GHz to 10 GHz

**EUT:** 900MHz Radio Module  
**Manufacturer:** D & H Global  
**Operating Condition:** 70 deg F; 48% R.H.  
**Test Specification:** FCC Part 15.247 (d) and FCC Part 15.205  
**Comment:** IEEE 802.15.4; Continuous transmit mode; Maximum Output power setting  
**Notes:** (1) Peak measurements were taken with RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.  
(2) Average measurements were taken with RBW = 1 MHz, VBW = 3 MHz, Detector = CISPR Average.  
(3) All other restricted band emissions at least 20 dB under the limit.

**Date:** 2/12/2013  
**Test Site:** Site G1  
**Operator:** Jim O

### Channel 25 (High) = 927MHz

Frequency MHz	Measurement Type	Ant Pol	Level (dBμV)	Antenna Factor (dBμV/m)	System Loss (dB)	Total Level (dBμV/m)	Duty Cycle Correction (dB)	Final Corrected (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
2782	Average	Vt	62.34	28.93	-37.9	53.4	3.35	50.05	54	3.95	Restricted Band
2782	Max Peak	Vt	68.18	28.93	-37.9	59.2	0	59.2	74	14.8	Restricted Band
2782	Average	Hz	61.6	28.93	-37.9	52.7	3.35	49.35	54	4.65	Restricted Band
2782	Max Peak	Hz	67.57	28.93	-37.9	58.6	0	58.6	74	15.4	Restricted Band
3709	Average	Vt	47.22	32.31	-39.5	40.1	3.35	36.75	54	17.25	Restricted Band
3709	Max Peak	Vt	55.41	32.31	-39.5	48.2	0	48.2	74	25.8	Restricted Band
3709	Average	Hz	44.54	32.31	-39.5	37.4	3.35	34.05	54	19.95	Restricted Band
3709	Max Peak	Hz	53.27	32.31	-39.5	46.1	0	46.1	74	27.9	Restricted Band
4636	Average	Vt	50.38	32.65	-40.1	42.9	3.35	39.55	54	14.45	Restricted Band
4636	Max Peak	Vt	57.63	32.65	-40.1	50.2	0	50.2	74	23.8	Restricted Band
4636	Average	Hz	52.78	32.65	-40.1	45.3	3.35	41.95	54	12.05	Restricted Band
4636	Max Peak	Hz	59.82	32.65	-40.1	52.3	0	52.3	74	21.7	Restricted Band
7418	Average	Vt	32.39	36.67	-35.8	33.3	3.35	29.95	54	24.05	Restricted Band
7418	Max Peak	Vt	45.02	36.67	-35.8	45.9	0	45.9	74	28.1	Restricted Band
7418	Average	Hz	32.6	36.67	-35.8	33.5	3.35	30.15	54	23.85	Restricted Band
7418	Max Peak	Hz	45.97	36.67	-35.8	46.8	0	46.8	74	27.2	Restricted Band
8345	Average	Vt	35.1	37.42	-36.3	36.3	3.35	32.95	54	21.05	Restricted Band
8345	Max Peak	Vt	47.3	37.42	-36.3	48.5	0	48.5	74	25.5	Restricted Band
8345	Average	Hz	35.18	37.42	-36.3	36.3	3.35	32.95	54	21.05	Restricted Band
8345	Max Peak	Hz	47.04	37.42	-36.3	48.2	0	48.2	74	25.8	Restricted Band



166 South Carter, Genoa City, WI 53128

Company:	D&H Global Enterprise, LLC
Model Tested:	OBee00
Report Number:	18903
DLS Project:	5563

## **8.0 Transmitter & Receiver Radiated Emissions - 30 to 1000 MHz**

### **Rule Part:**

15.109 / 15.209

### **Test Procedure:**

ANSI C63.4-2009

### **Limit:**

15.109(a) / 15.209

### **Results:**

Compliant

### **Notes:**

This was an RF radiated measurement. The EUT was connected to the Pulse W1063 antenna (highest gain antenna).

The EUT was powered by 3.3 V DC. The EUT was set to transmit continuously (100% duty cycle) at its maximum output power on the low, middle, and high channels of the operating band. The EUT was also tested in continuous receive mode (low, mid, and high channels). The data shows the combined worst-case emissions.

"NF" indicates a "Noise Floor" reading.

## **FCC Part 15.109/15.209**

### **Electric Field Strength**

EUT: 900 MHz radio module  
Manufacturer: D & H Global  
Operating Condition: 66 deg. F; 33% R.H.  
Test Site: DLS O.F. Site 2  
Operator: Jim O  
Test Specification: 15.247  
Comment: Radio module w/3dBi WIP antenna  
Date: 12-6-2012

### **TEXT: "Horz 3 meters"**

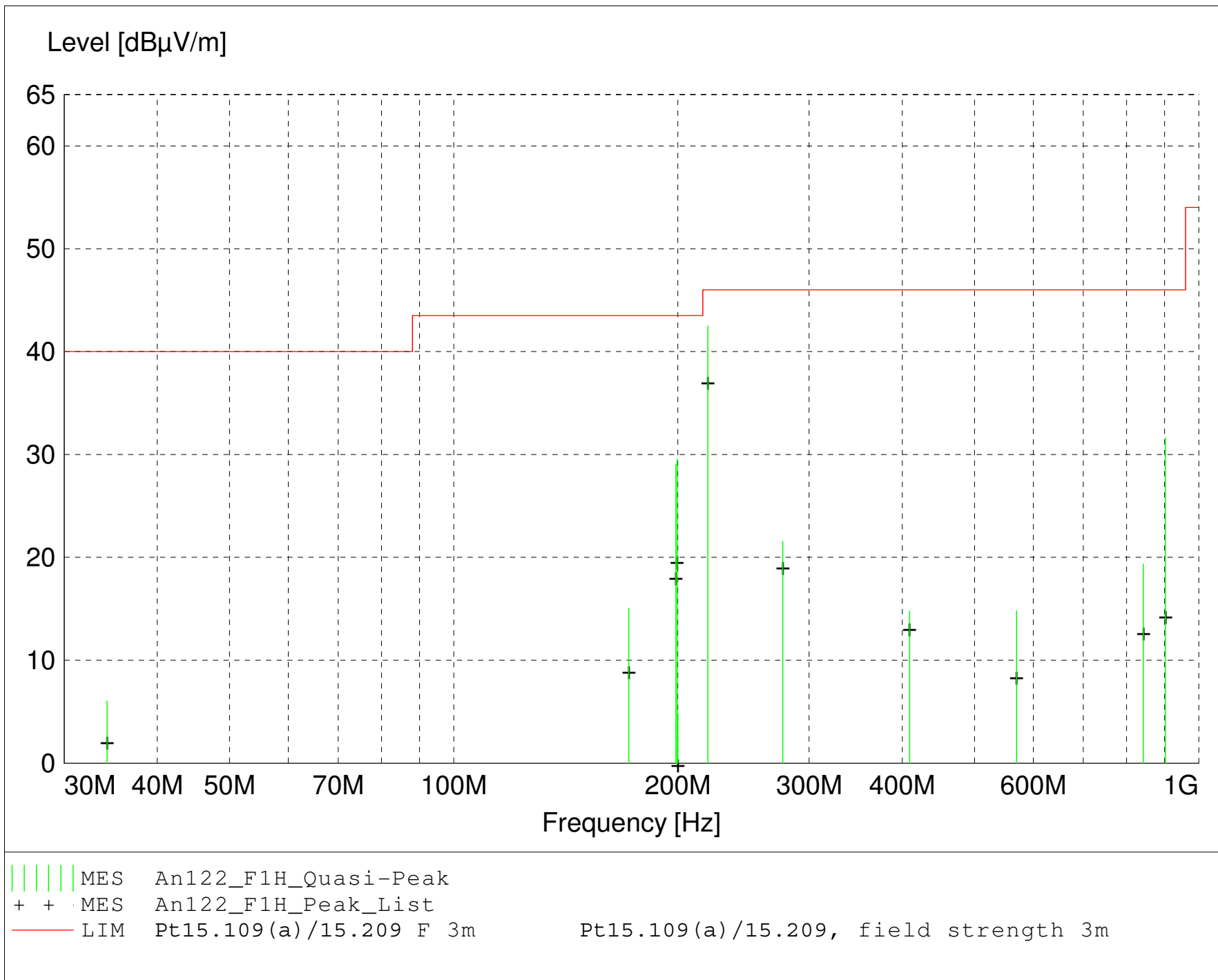
Short Description: Test Set-up

Test Set-up: EUT Measured at 3 Meters with HORIZONTAL Antenna Polarization

Sample Equations: 
$$\begin{array}{rclclcl} \text{Total Level (dB}\mu\text{V/m)} & = & \text{Level (dB}\mu\text{V)} & + & \text{System Loss (dB)} & + & \text{Antenna Factor (dB}\mu\text{V/m)} \\ 24.6 & & = 35.51 & & + (-22.1) & & + 11.20 \end{array}$$

$$\begin{array}{rclcl} \text{Margin (dB)} & = & \text{Limit (dB}\mu\text{V/m)} & - & \text{Total Level (dB}\mu\text{V/m)} \\ 15.4 & & = 40 & & - 24.6 \end{array}$$

Graph Markers: + Frequency marker (Level of marker not related to final level)  
| Final maximized level using Quasi-Peak detector  
X Final maximized level using Average detector  
# Final maximized level using Peak detector



**MEASUREMENT RESULT: "An122\_F1H\_Final"**

12/7/2012 10:52AM

Frequency	Level	Antenna	System	Total	Limit	Margin	Height	EuT	Final	Comment
MHz	dBμV	Factor	Loss	Level			Ant.	Angle	Detector	
		dBμV/m	dB	dBμV/m	dBμV/m	dB	m	deg		
219.380000	53.07	11.41	-22.0	42.5	46.0	3.5	1.00	350	QUASI-PEAK	None
199.440000	33.94	17.54	-21.9	29.6	43.5	13.9	1.00	340	QUASI-PEAK	None
902.360000	25.90	23.55	-17.8	31.6	46.0	14.4	1.00	0	QUASI-PEAK	None
198.720000	33.48	17.53	-21.9	29.1	43.5	14.4	1.00	10	QUASI-PEAK	None
276.440000	29.89	13.43	-21.8	21.5	46.0	24.5	1.00	160	QUASI-PEAK	None
842.960000	14.94	22.46	-18.0	19.4	46.0	26.6	1.00	0	QUASI-PEAK	NF
171.780000	22.37	14.86	-22.2	15.1	43.5	28.4	1.00	350	QUASI-PEAK	None
569.180000	16.05	18.80	-20.0	14.8	46.0	31.2	1.00	0	QUASI-PEAK	NF
409.160000	19.92	16.00	-21.1	14.8	46.0	31.2	1.00	160	QUASI-PEAK	None
34.260000	18.22	11.30	-23.5	6.0	40.0	34.0	1.00	0	QUASI-PEAK	NF
199.940000	26.75	0.00	-21.9	4.8	43.5	38.7	1.00	160	QUASI-PEAK	None

## **FCC Part 15.109/15.209**

### **Electric Field Strength**

EUT: 900 MHz radio module  
Manufacturer: D & H Global  
Operating Condition: 66 deg. F; 33% R.H.  
Test Site: DLS O.F. Site 2  
Operator: Jim O  
Test Specification: 15.247  
Comment: Radio module w/3dBi WIP antenna  
Date: 12-6-2012

### **TEXT: "Vert 3 meters"**

Short Description: Test Set-up

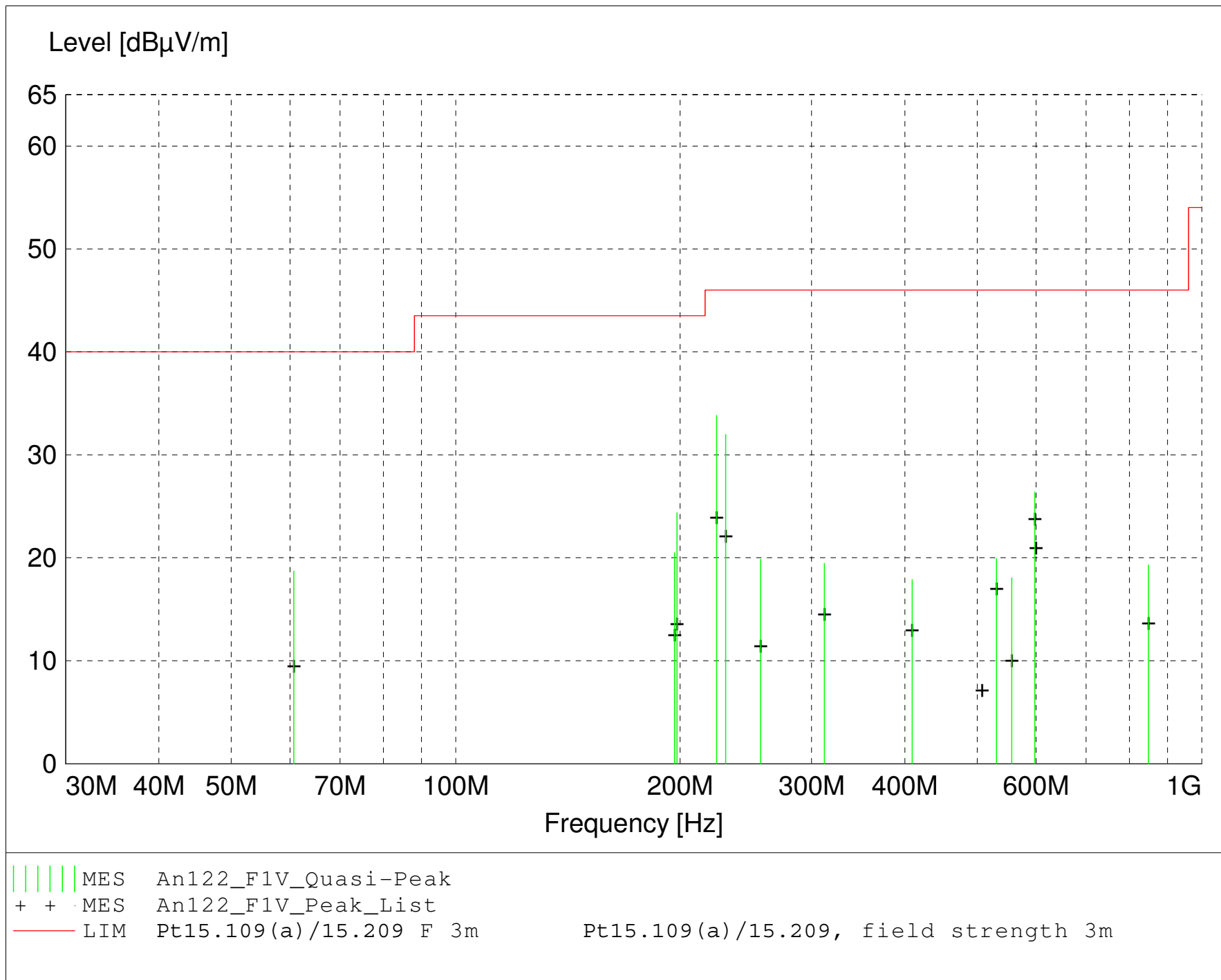
Test Set-up: EUT Measured at 3 Meters with VERTICAL Antenna Polarization

Sample Equations: 
$$\begin{array}{rclclcl} \text{Total Level (dB}\mu\text{V/m)} & = & \text{Level (dB}\mu\text{V)} & + & \text{System Loss (dB)} & + & \text{Antenna Factor (dB}\mu\text{V/m)} \\ 24.6 & & = 35.51 & & + (-22.1) & & + 11.20 \end{array}$$

$$\begin{array}{rclcl} \text{Margin (dB)} & = & \text{Limit (dB}\mu\text{V/m)} & - & \text{Total Level (dB}\mu\text{V/m)} \\ 15.4 & & = 40 & & - 24.6 \end{array}$$

Graph Markers: + Frequency marker (Level of marker not related to final level)  
| Final maximized level using Quasi-Peak detector  
X Final maximized level using Average detector  
# Final maximized level using Peak detector





**MEASUREMENT RESULT: "An122\_F1V\_Final"**

12/7/2012 10:28AM

Frequency	Level	Antenna	System	Total	Limit	Margin	Height	EuT	Final	Comment
MHz	dBμV	Factor	Loss	Level			Ant.	Angle	Detector	
		dBμV/m	dB	dBμV/m	dBμV/m	dB	m	deg		
223.640000	44.41	11.33	-21.9	33.8	46.0	12.2	1.00	45	QUASI-PEAK	None
230.060000	42.46	11.40	-21.9	32.0	46.0	14.0	1.00	45	QUASI-PEAK	None
198.000000	28.70	17.60	-21.9	24.4	43.5	19.1	1.00	100	QUASI-PEAK	None
597.180000	27.23	19.14	-20.0	26.4	46.0	19.6	1.00	0	QUASI-PEAK	NF
60.660000	31.77	9.97	-23.0	18.7	40.0	21.3	1.00	0	QUASI-PEAK	NF
196.560000	24.87	17.54	-21.9	20.5	43.5	23.0	1.00	170	QUASI-PEAK	None
530.840000	21.82	18.40	-20.3	19.9	46.0	26.1	1.00	30	QUASI-PEAK	none
256.340000	28.86	12.78	-21.8	19.9	46.0	26.1	1.00	40	QUASI-PEAK	None
312.020000	25.79	15.06	-21.4	19.4	46.0	26.6	1.00	20	QUASI-PEAK	None
848.660000	15.19	22.50	-18.4	19.3	46.0	26.7	1.00	0	QUASI-PEAK	NF
556.260000	19.60	18.63	-20.2	18.1	46.0	27.9	1.00	350	QUASI-PEAK	none
409.160000	23.00	16.00	-21.1	17.9	46.0	28.1	1.00	20	QUASI-PEAK	None



166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

D&H Global Enterprise, LLC  
OBee00  
18903  
5563

## **Appendix B**

### **9.0 Receiver Radiated Emissions - 1 to 5 GHz**

#### **Rule Part:**

15.109

#### **Test Procedure:**

ANSI C63.4-2009

#### **Limit:**

15.109(a)

#### **Results:**

Compliant

#### **Notes:**

This was an RF radiated measurement. The EUT was connected to a Pulse W1063 antenna.

The EUT was powered by 3.3 V DC. The EUT was set to continuously receive on the low, middle, and high channels of the operating band.

"NF" indicates a "Noise Floor" reading.

## **FCC Part 15.109 Class B**

### **Electric Field Strength**

EUT: 900 MHz radio module  
Manufacturer:  
Operating Condition: 70 deg C 26% R.H.  
Test Site: DLS O.F. G1  
Operator: Jim O  
Test Specification: FCC 15.109  
Comment: LO, MID & HI Channels  
Date: 12-6-2012

### **TEXT: "Horz 3 meters"**

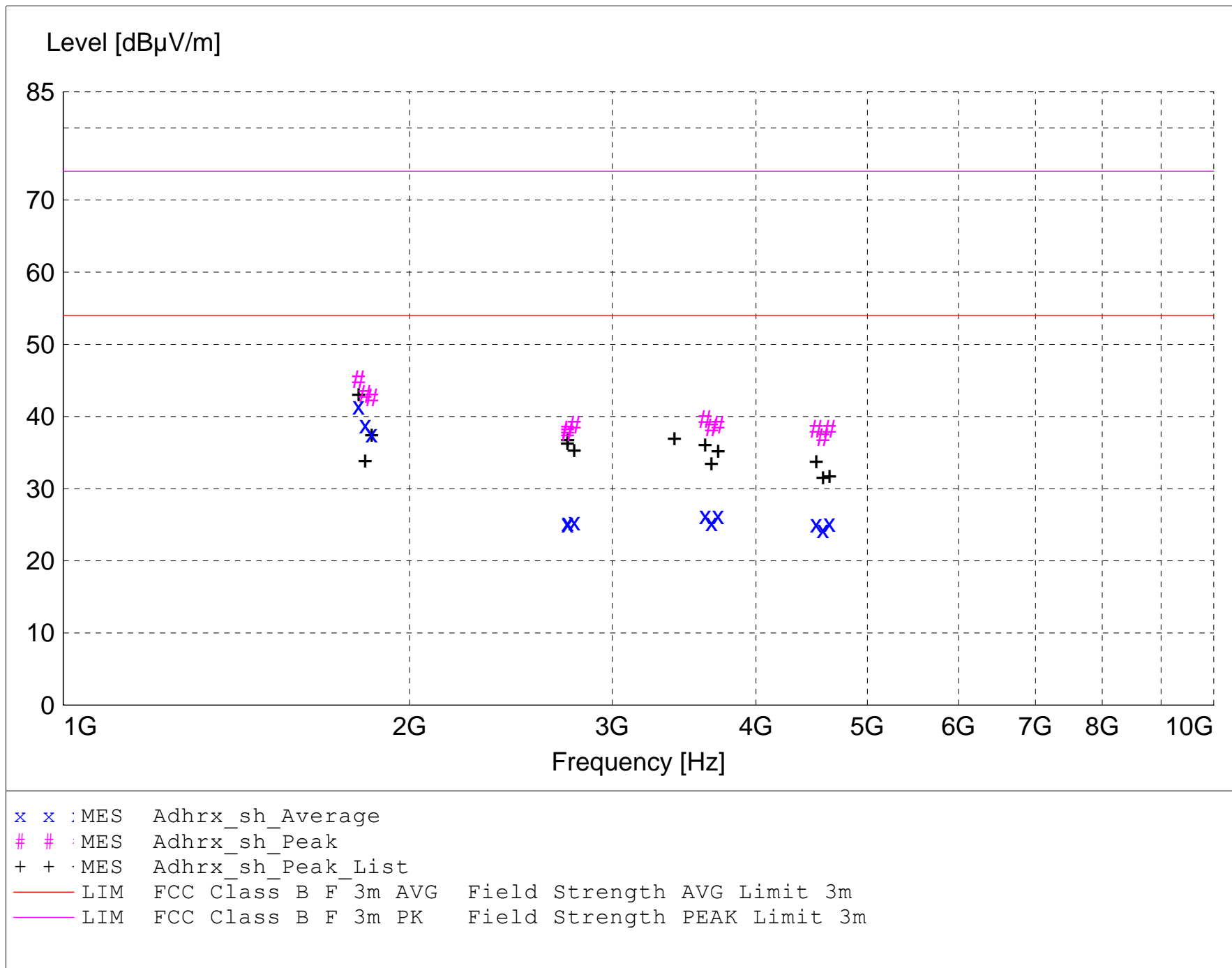
Short Description: Test Set-up

Test Set-up: EUT Measured at 3 Meters with HORIZONTAL Antenna Polarization

Sample Equations: 
$$\begin{array}{rclclcl} \text{Total Level (dB}\mu\text{V/m)} & = & \text{Level (dB}\mu\text{V)} & + & \text{System Loss (dB)} & + & \text{Antenna Factor (dB}\mu\text{V/m)} \\ 24.6 & & = 35.51 & + & (-22.1) & + & 11.20 \end{array}$$

$$\begin{array}{rclcl} \text{Margin (dB)} & = & \text{Limit (dB}\mu\text{V/m)} & - & \text{Total Level (dB}\mu\text{V/m)} \\ 15.4 & = & 40 & - & 24.6 \end{array}$$

Graph Markers: + Frequency marker (Level of marker not related to final level)  
| Final maximized level using Quasi-Peak detector  
X Final maximized level using Average detector  
# Final maximized level using Peak detector  
- Background Scan Peak Detector (Optional)  
- Background Scan Average Detector (Optional)



**MEASUREMENT RESULT: "Adhrx\_sh\_Final"**

12/6/2012 1:53PM

Frequency	Level	Antenna	System	Total	Limit	Margin	Height	EuT	Final	Comment
MHz	dBμV	Factor	Loss	Level	dBμV/m	dB	Ant.	Angle	Detector	
		dBμV/m	dB	dBμV/m			m	deg		
1806.000000	50.46	26.47	-35.5	41.4	54.0	12.6	1.25	56	AVERAGE	2nd LO CH HZ
1830.000000	47.90	26.58	-35.6	38.9	54.0	15.1	1.55	53	AVERAGE	2nd MID CH HZ
1854.000000	46.61	26.69	-35.7	37.6	54.0	16.4	1.51	125	AVERAGE	2nd HI CH HZ
3708.200000	30.83	31.67	-36.2	26.3	54.0	27.7	1.00	0	AVERAGE	NF 4th HI HZ
3613.600000	30.56	31.46	-35.8	26.3	54.0	27.7	1.00	0	AVERAGE	NF 4th LO HZ
2781.200000	31.94	29.59	-36.1	25.4	54.0	28.6	1.00	0	AVERAGE	NF 3rd HI HZ
3660.000000	30.28	31.57	-36.5	25.4	54.0	28.6	1.00	0	AVERAGE	NF 4th MID HZ
2743.600000	31.82	29.49	-36.0	25.3	54.0	28.7	1.00	0	AVERAGE	NF 3rd MID HZ
4635.200000	29.55	32.64	-37.0	25.2	54.0	28.8	1.00	0	AVERAGE	NF 5th HI HZ
2744.800000	31.70	29.49	-36.0	25.2	54.0	28.8	1.00	0	AVERAGE	NF 3rd LO HZ
4514.000000	29.70	32.43	-37.0	25.1	54.0	28.9	1.00	0	AVERAGE	NF 5th LO HZ
1806.000000	54.16	26.47	-35.5	45.1	74.0	28.9	1.25	56	MAX PEAK	2nd LO CH HZ
4575.200000	29.70	32.54	-37.9	24.3	54.0	29.7	1.00	0	AVERAGE	NF 5th MID HZ
1830.000000	52.17	26.58	-35.6	43.2	74.0	30.8	1.55	53	MAX PEAK	2nd MID CH HZ
1854.000000	51.67	26.69	-35.7	42.7	74.0	31.3	1.51	125	MAX PEAK	2nd HI CH HZ
3613.600000	43.90	31.46	-35.8	39.6	74.0	34.4	1.00	0	MAX PEAK	NF 4th LO HZ
3708.200000	43.39	31.67	-36.2	38.9	74.0	35.1	1.00	0	MAX PEAK	NF 4th HI HZ
2781.200000	45.37	29.59	-36.1	38.8	74.0	35.2	1.00	0	MAX PEAK	NF 3rd HI HZ
3660.000000	43.39	31.57	-36.5	38.5	74.0	35.5	1.00	0	MAX PEAK	NF 4th MID HZ
4514.000000	42.88	32.43	-37.0	38.3	74.0	35.7	1.00	0	MAX PEAK	NF 5th LO HZ
4635.200000	42.62	32.64	-37.0	38.3	74.0	35.7	1.00	0	MAX PEAK	NF 5th HI HZ
2744.800000	44.68	29.49	-36.0	38.2	74.0	35.8	1.00	0	MAX PEAK	NF 3rd LO HZ
2743.600000	44.29	29.49	-36.0	37.8	74.0	36.2	1.00	0	MAX PEAK	NF 3rd MID HZ
4575.200000	42.50	32.54	-37.9	37.1	74.0	36.9	1.00	0	MAX PEAK	NF 5th MID HZ

## **FCC Part 15.109 Class B**

### **Electric Field Strength**

EUT:

Manufacturer:

Operating Condition: 70 deg C 26% R.H.

Test Site: DLS O.F. G1

Operator: Jim O

Test Specification: FCC 15.109

Comment: LO, MID & HI Channels

Date: 12-6-2012

### **TEXT: "Vert 3 meters"**

Short Description: Test Set-up

Test Set-up: EUT Measured at 3 Meters with VERTICAL Antenna Polarization

Sample Equations: 
$$\begin{array}{rclclcl} \text{Total Level (dB}\mu\text{V/m)} & = & \text{Level (dB}\mu\text{V)} & + & \text{System Loss (dB)} & + & \text{Antenna Factor (dB}\mu\text{V/m)} \\ 24.6 & & = 35.51 & & + (-22.1) & & + 11.20 \end{array}$$

$$\begin{array}{rclcl} \text{Margin (dB)} & = & \text{Limit (dB}\mu\text{V/m)} & - & \text{Total Level (dB}\mu\text{V/m)} \\ 15.4 & = & 40 & - & 24.6 \end{array}$$

Graph Markers: +      Frequency marker (Level of marker not related to final level)

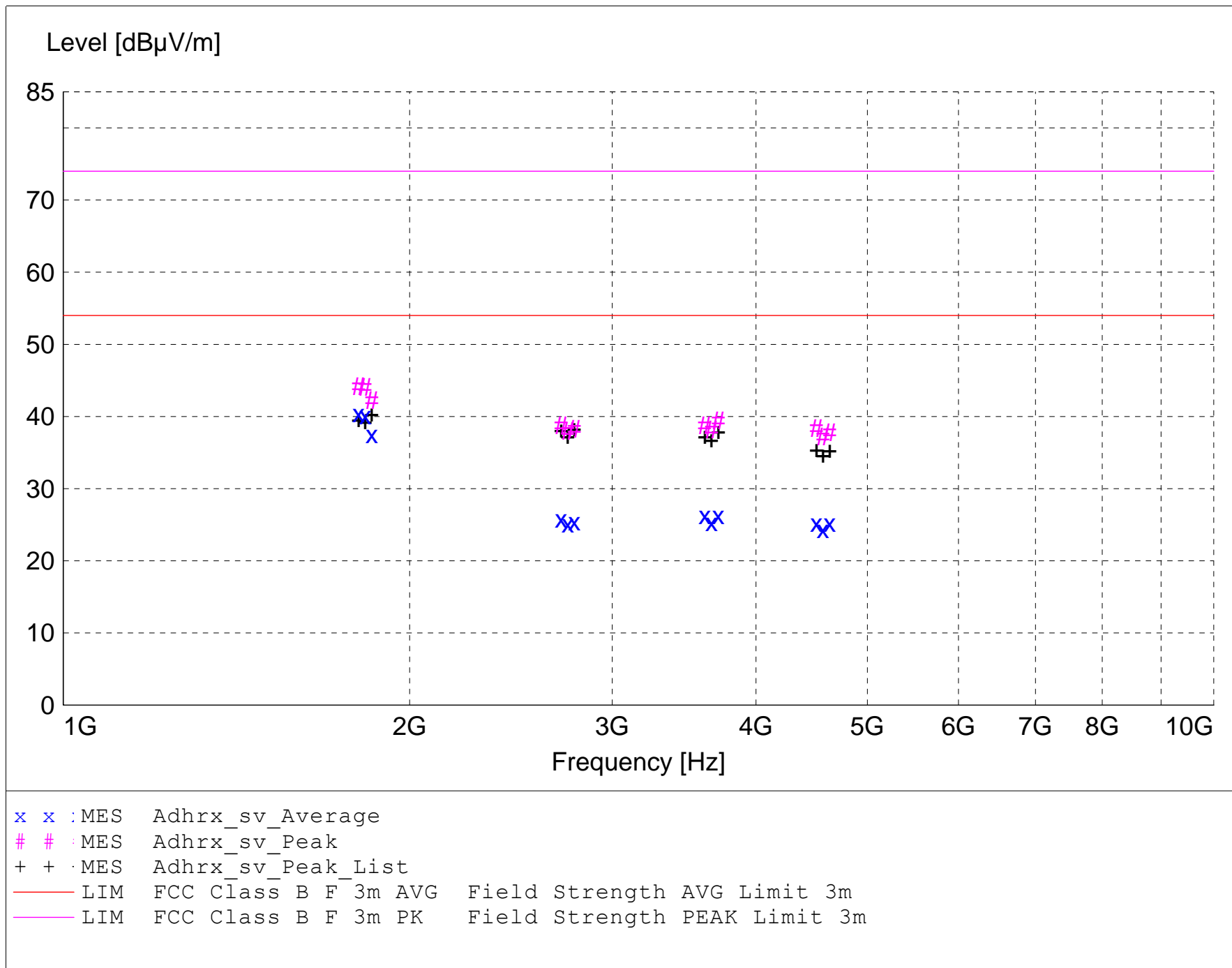
                 |      Final maximized level using Quasi-Peak detector

                 X      Final maximized level using Average detector

                 #      Final maximized level using Peak detector

                 -      Background Scan Peak Detector (Optional)

                 -      Background Scan Average Detector (Optional)





**MEASUREMENT RESULT: "Adhrx\_sv\_Final"**

12/6/2012 1:16PM

Frequency	Level	Antenna	System	Total	Limit	Margin	Height	EuT	Final	Comment
MHz	dBμV	Factor	Loss	Level	dBμV/m	dB	Ant.	Angle	Detector	
		dBμV/m	dB	dBμV/m	dBμV/m		m	deg		
1806.000000	49.44	26.47	-35.5	40.4	54.0	13.6	1.00	295	AVERAGE	None
1830.080000	49.16	26.58	-35.6	40.2	54.0	13.8	1.46	92	AVERAGE	2nd MID VT
1854.040000	46.52	26.69	-35.7	37.5	54.0	16.5	1.76	26	AVERAGE	2nd HI CH VT
3710.440000	30.83	31.68	-36.2	26.3	54.0	27.7	1.00	0	AVERAGE	NF 4th HI VT
3610.980000	30.56	31.46	-35.7	26.3	54.0	27.7	1.00	0	AVERAGE	NF 4th LO CH
2708.760000	31.82	29.39	-35.4	25.8	54.0	28.2	1.00	0	AVERAGE	NF 3rd LO CH
2781.400000	31.94	29.59	-36.1	25.4	54.0	28.6	1.00	0	AVERAGE	NF 3rd HI VT
3660.020000	30.28	31.57	-36.5	25.4	54.0	28.6	1.00	0	AVERAGE	NF 4th MID VT
4636.560000	29.55	32.65	-36.9	25.3	54.0	28.7	1.00	0	AVERAGE	NF 5th HI VT
4515.040000	29.85	32.44	-37.0	25.3	54.0	28.7	1.00	0	AVERAGE	NF 5th LO CH
2745.020000	31.70	29.49	-36.0	25.2	54.0	28.8	1.00	0	AVERAGE	NF 3rd MID VT
4575.260000	29.70	32.54	-37.9	24.3	54.0	29.7	1.00	0	AVERAGE	NF 5th MID VT
1806.000000	53.21	26.47	-35.5	44.2	74.0	29.8	1.00	295	MAX PEAK	2nd LO CH VT
1830.080000	53.07	26.58	-35.6	44.1	74.0	29.9	1.46	92	MAX PEAK	2nd MID VT
1854.040000	51.29	26.69	-35.7	42.3	74.0	31.7	1.76	26	MAX PEAK	2nd HI CH VT
3710.440000	43.90	31.68	-36.2	39.4	74.0	34.6	1.00	0	MAX PEAK	NF 4th HI VT
2708.760000	44.82	29.39	-35.4	38.8	74.0	35.2	1.00	0	MAX PEAK	NF 3rd LO CH
3610.980000	43.01	31.46	-35.7	38.8	74.0	35.2	1.00	0	MAX PEAK	NF 4th LO CH
4515.040000	43.01	32.44	-37.0	38.4	74.0	35.6	1.00	0	MAX PEAK	NF 5th LO CH
2781.400000	44.82	29.59	-36.1	38.3	74.0	35.7	1.00	0	MAX PEAK	NF 3rd HI VT
3660.020000	43.14	31.57	-36.5	38.2	74.0	35.8	1.00	0	MAX PEAK	NF 4th MID VT
2745.020000	44.55	29.49	-36.0	38.0	74.0	36.0	1.00	0	MAX PEAK	NF 3rd MID VT
4636.560000	42.11	32.65	-36.9	37.8	74.0	36.2	1.00	0	MAX PEAK	NF 5th HI VT
4575.260000	42.62	32.54	-37.9	37.3	74.0	36.7	1.00	0	MAX PEAK	NF 5th MID VT



166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

D&H Global Enterprise, LLC  
OBee00  
18903  
5563

## Appendix B

### 10.0 AC Line Conducted Emissions

#### Rule Part:

15.207

#### Test Procedure:

ANSI C63.10-2009

#### Limit:

15.207(a)

#### Results:

Compliant

#### Notes:

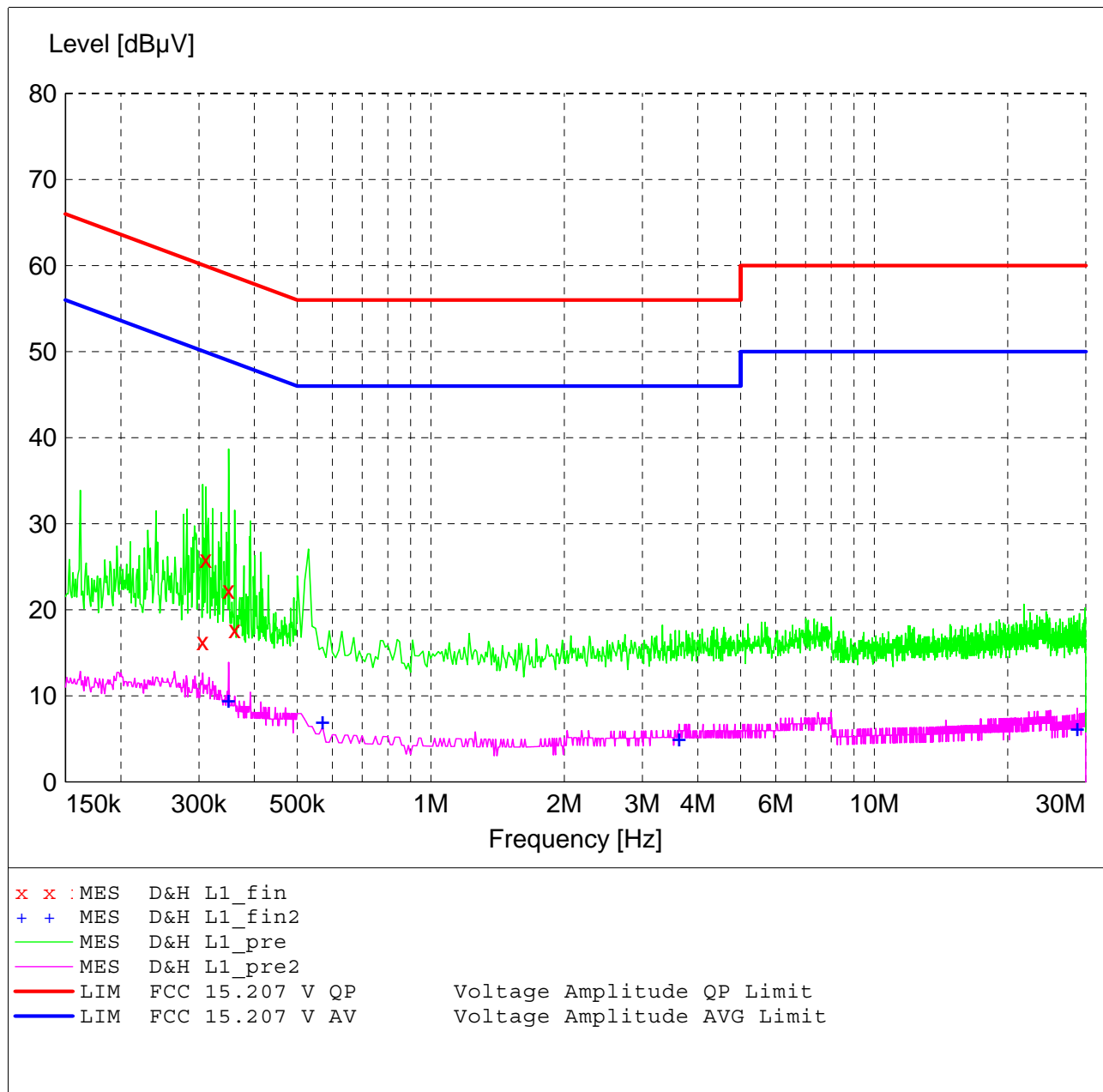
The EUT was powered by 3.3 V DC through an off-the-shelf external AC/DC power supply (120Vac/3Vdc) that was connected to a Line Impedance Stabilization Network, this supplied 3Vdc to the EUT. The EUT was set to transmit continuously at its maximum output power.

**Voltage Mains Test**

EUT: 900MHz Module  
 Manufacturer: D & H Global  
 Operating Condition: 72 deg. F, 30% R.H.  
 Test Site: DLS O.F. Screen Room  
 Operator: Jim O  
 Test Specification: 120 V 60 Hz  
 Comment: Line 1  
 Date: 02-07-2013

**SCAN TABLE: "Line Cond SR Final"**

Short Description:			Line Conducted Emissions				Transducer
Start	Stop	Step	Detector	Meas. Time	IF Bandw.		
150.0 kHz	30.0 MHz	4.0 kHz	QuasiPeak	3.0 s	9 kHz	LISN DLS#128	
CISPR AV							



**MEASUREMENT RESULT: "D&H L1\_fin"**

2/7/2013 2:20PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector
0.306000	16.30	11.8	60	43.8	QP
0.311000	25.90	11.7	60	34.0	QP
0.350000	22.30	11.5	59	36.7	QP
0.361000	17.70	11.5	59	41.0	QP

**MEASUREMENT RESULT: "D&H L1\_fin2"**

2/7/2013 2:20PM

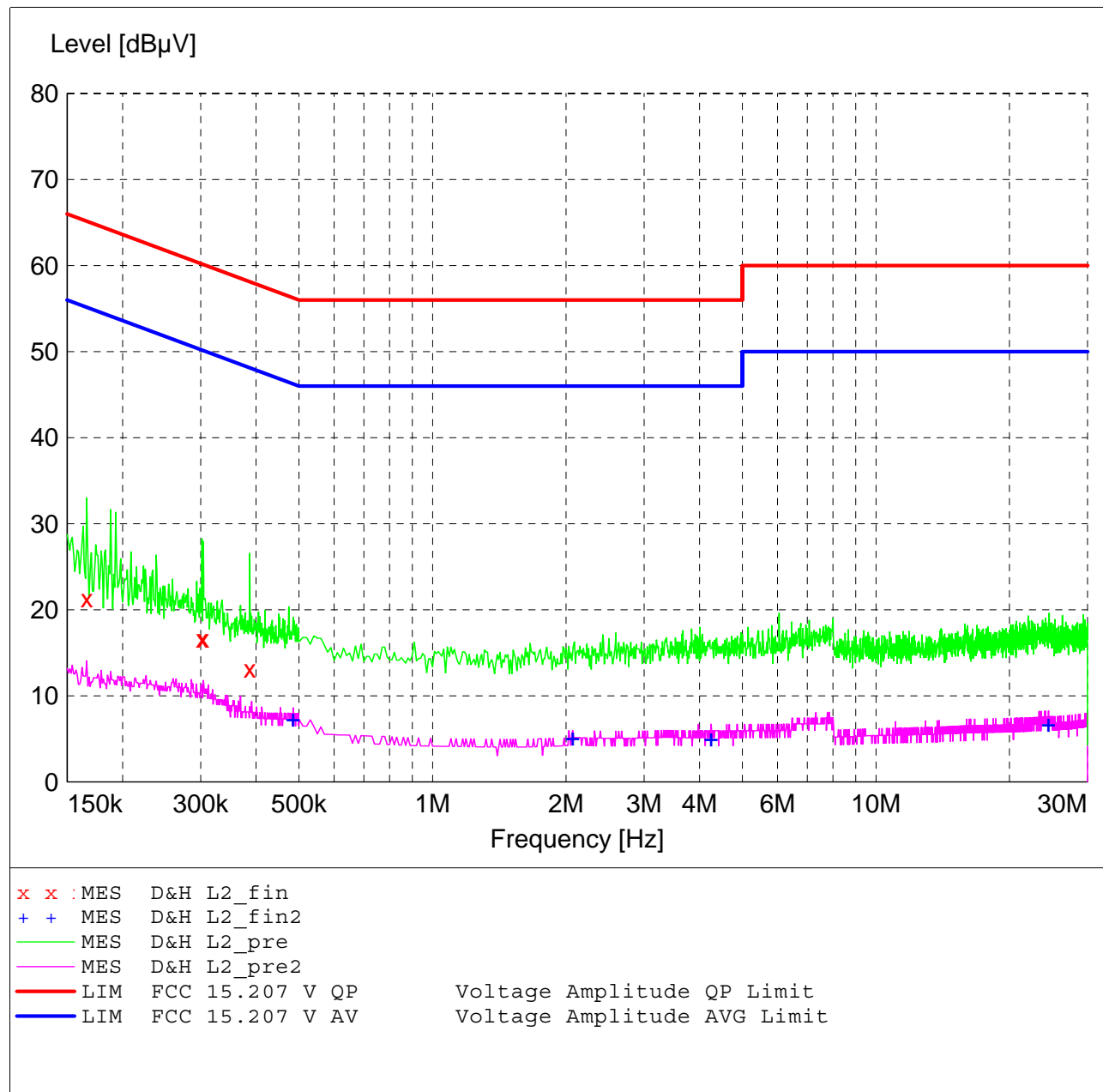
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector
0.350000	9.50	11.5	49	39.5	CAV
0.570000	7.10	11.1	46	38.9	CAV
3.630000	5.10	10.7	46	40.9	CAV
28.700000	6.30	11.8	50	43.7	CAV

**Voltage Mains Test**

EUT: 900MHz Module  
 Manufacturer: D & H Global  
 Operating Condition: 72 deg. F, 30% R.H.  
 Test Site: DLS O.F. Screen Room  
 Operator: Jim O  
 Test Specification: 120 V 60 Hz  
 Comment: Line 2  
 Date: 02-07-2013

**SCAN TABLE: "Line Cond SR Final"**

Short Description:			Line Conducted Emissions				Transducer
Start	Stop	Step	Detector	Meas. Time	IF Bandw.		
Frequency 150.0 kHz	Frequency 30.0 MHz	Width 4.0 kHz	QuasiPeak	3.0 s	9 kHz	LISN DLS#128	
CISPR AV							



**MEASUREMENT RESULT: "D&H L2\_fin"**

2/7/2013 2:23PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector
0.166000	21.30	13.2	65	43.9	QP
0.302000	16.60	11.8	60	43.6	QP
0.304000	16.60	11.8	60	43.5	QP
0.387000	13.10	11.4	58	45.0	QP

**MEASUREMENT RESULT: "D&H L2\_fin2"**

2/7/2013 2:23PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector
0.485000	7.30	11.3	46	39.0	CAV
2.070000	5.20	10.7	46	40.8	CAV
4.250000	5.10	10.7	46	40.9	CAV
24.500000	6.80	11.6	50	43.2	CAV



166 South Carter, Genoa City, WI 53128

Company:  
Model Tested:  
Report Number:  
DLS Project:

D&H Global Enterprise, LLC  
OBee00  
18903  
5563

## END OF REPORT

Revision #	Date	Comments	By
1.0	02-07-2013	Preliminary Release	CB
1.1	04-22-2013	Added product info from client	JS
1.2	05-06-2013	Final calculations on pages 50 & 51 corrected	JS