



**POWERWAVE TECHNOLOGIES, INC. TEST REPORT**

**FOR THE**

**REPEATER, RH308022/03A**

**FCC PART 90**

**TESTING**

**DATE OF ISSUE: APRIL 1, 2008**

**PREPARED FOR:**

Powerwave Technologies, Inc.  
1801 E. St. Andrew Place  
Santa Ana, CA 92705

P.O. No.: 118433  
W.O. No.: 87767

**PREPARED BY:**

Mary Ellen Clayton  
CKC Laboratories, Inc.  
5046 Sierra Pines Drive  
Mariposa, CA 95338

Date of test: March 25-27, 2008

**Report No.: FC08-038**

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## ADMINISTRATIVE INFORMATION

**DATE OF TEST:** March 25-27, 2008

**DATE OF RECEIPT:** March 25, 2008

**REPRESENTATIVE:** Sean Doan

**MANUFACTURER:**  
Powerwave Technologies, Inc.  
1801 E. St. Andrew Place  
Santa Ana, CA 92705

**TEST LOCATION:**  
CKC Laboratories, Inc.  
110 Olinda Place  
Brea, CA 92823

**FREQUENCY RANGE TESTED:** 9 kHz-10 GHz

**TEST METHOD:** FCC Part 90

**PURPOSE OF TEST:** To perform the testing of the Repeater, RH308022/03A with the requirements for FCC Part 90 devices.

## APPROVALS

**QUALITY ASSURANCE:**

Steve Behm, Director of Engineering Services

**TEST PERSONNEL:**

A handwritten signature in black ink, appearing to read 'Eddie Wong', is written over a horizontal line.

Eddie Wong, EMC Engineer

**SUMMARY OF RESULTS**

<b>Test</b>	<b>Specification/Method</b>	<b>Results</b>
RF Power Output	FCC 2.1033(c)(14)/2.1046/90.635(a)	Pass
Input and Output Plots	FCC 2.1033(c)(14)/2.1049(i)/Part 90	Pass
Spurious Emissions at Antenna Terminal	FCC 2.1033(c)(14)/2.1051/90.691(a)(2)	Pass
Field Strength of Spurious Radiation	FCC 2.1033(c)(14)/2.1051/90.691(a)(2)	Pass
Block Edge	FCC Part 90	Pass

**CONDITIONS DURING TESTING**

No modifications to the EUT were necessary during testing.



## EQUIPMENT UNDER TEST (EUT) DESCRIPTION

The customer declares the EUT tested by CKC Laboratories was representative of a production unit.

The following device name was used during testing by CKC Laboratories: **Dual Band Transceiver**

Since the time of testing the manufacturer has chosen to use the following device name in its place. Any differences between the names does not affect their EMC characteristics and therefore meets the level of testing equivalent to the tested model name shown on the data sheets: **Repeater**

## EQUIPMENT UNDER TEST

### Repeater

Manuf: Powerwave Technologies  
Model: RH308022/03A  
Serial: NA  
FCC ID: pending

## PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

### Spectrum Analyzer

Manuf: HP  
Model: 8563E  
Serial: 3337A01565

### Power Meter

Manuf: Agilent  
Model: E4419B  
Serial: MY0510694

### ESG

Manuf: Aeroflex  
Model: IFR3417  
Serial: 341005/018



**TEMPERATURE AND HUMIDITY DURING TESTING**

The temperature during testing was within +15°C and + 35°C.  
The relative humidity was between 20% and 75%.

**FCC 2.1033(c)(3) USER’S MANUAL**

The necessary information is contained in a separate document.

**FCC 2.1033 (c)(4) TYPE OF EMISSIONS**

D7W

**FCC 2.1033 (c)(5) FREQUENCY RANGE**

935MHz – 940MHz

**FCC 2.1033 (c)(6) OPERATING POWER**

20 watts

**FCC 2.1033 (c)(7) MAXIMUM POWER RATING**

100 watts

**FCC 2.1033 (c)(8) DC VOLTAGES**

The necessary information is contained in a separate document.

**FCC 2.1033 (c)(9) TUNE-UP PROCEDURE**

The necessary information is contained in a separate document.

**FCC 2.1033(c)(10) SCHEMATICS AND CIRCUITRY DESCRIPTION**

The necessary information is contained in a separate document.

**FCC 2.1033(c)(11) LABEL AND PLACEMENT**

The necessary information is contained in a separate document.

**FCC 2.1033(c)(12) SUBMITTAL PHOTOS**

The necessary information is contained in a separate document.

**FCC 2.1033 (c)(13) MODULATION INFORMATION**

iDEN

**FCC 2.1033(c)(14)/2.1046/90.635(a) - RF POWER OUTPUT**

**Test Equipment**

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
RF Power meter	02778	HP	EPM-441A	GB37170458	020508	021510
Power Sensor	02777	HP	E4412A	MY41499662	020508	021510

**Test Conditions**

The EUT was a RF amplifier. The manufacturer does not provide an antenna for sale with the product, hence EIRP was not measured nor calculated. The dual band EUT was placed on the wooden table. Service port Local 1 and Local 2 were left unpopulated, WLI communication (non ethernet, proprietary handshake protocol) port 1 and 2 were connected in loop back manner via UTP. Antenna port Service 1 was terminated to 50 ohm load. Donor 2 out, Donor 1 In and Donor 1 out were connected to 50 ohm loads. Donor 2 In was connected to a remote RF signal source, antenna port Service 2 was connected to a power meter. The input RF level was adjusted to maintain a constant output power. Emission profile of the output signal was evaluated at the antenna port, Service 2. The RF output power of the EUT was measured at the antenna port, the measured conducted output power met the rated output power of the product.

**Test Setup Photos**



**Test Data**

Part90

Modulation: iDEN

935.5MHz

937.5MHz

939.5 MHz

Power (dBm)

43

43

43

Power (Watts)

20

20

20

**FCC 2.1033(c)(14)/2.1049(i)/PART 90- INPUT AND OUTPUT PLOTS**

**Test Equipment**

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02672	Agilent	E4446A	US44300438	010307	010309

**Test Conditions**

The dual band EUT was placed on the wooden table. Service port Local 1 and Local 2 were left unpopulated, WLI communication (non ethernet, proprietary handshake protocol) port 1 and 2 were connected in loop back manner via UTP. Antenna port Service 1 was terminated to 50 ohm load. Donor 2 out, Donor 1 In and Donor 1 out were connected to 50 ohm loads. Donor 2 In was connected to a remote RF signal source, antenna port Service 2 was connected to a remote power meter. The input RF level was adjusted to maintain a constant output power. Emission profile of the output signal was evaluated at the antenna port, service 2 /Service 1. Input signal profile was evaluated at Donor in 1/ Donor in 2.

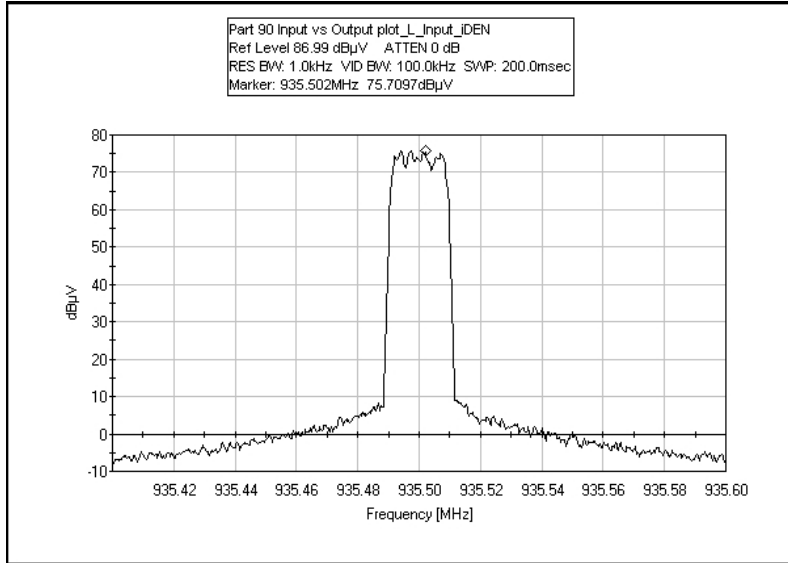
**Test Setup Photos**



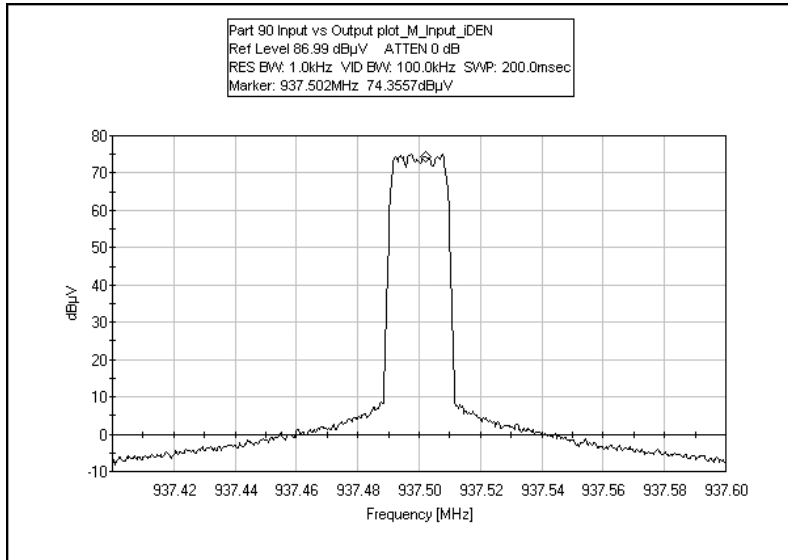


## Test Plots

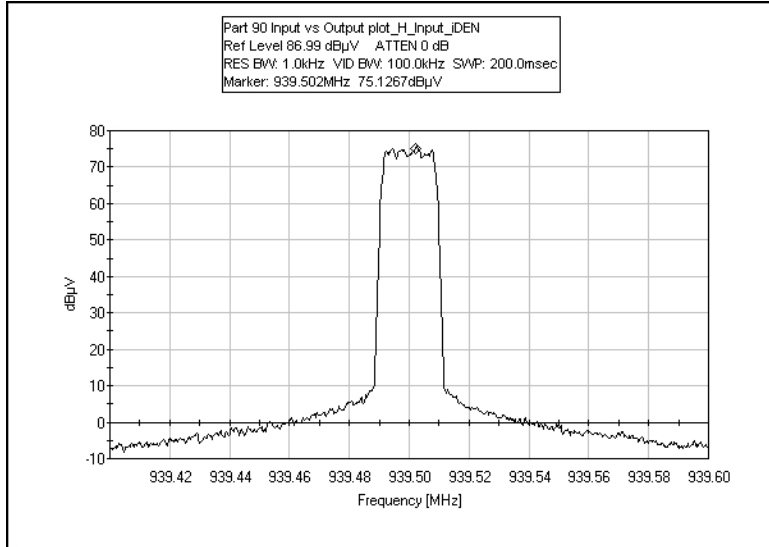
### FCC PART 90 INPUT PLOT - LOW CHANNEL iDEN



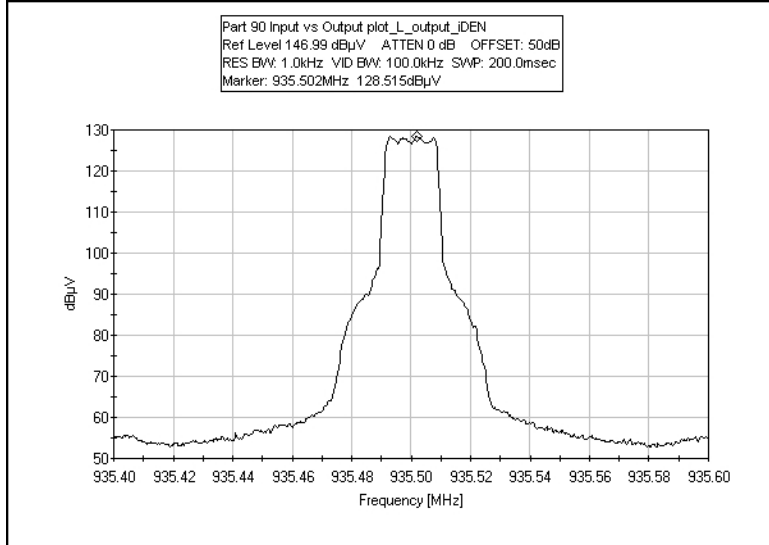
### FCC PART 90 INPUT PLOT - MIDDLE CHANNEL iDEN



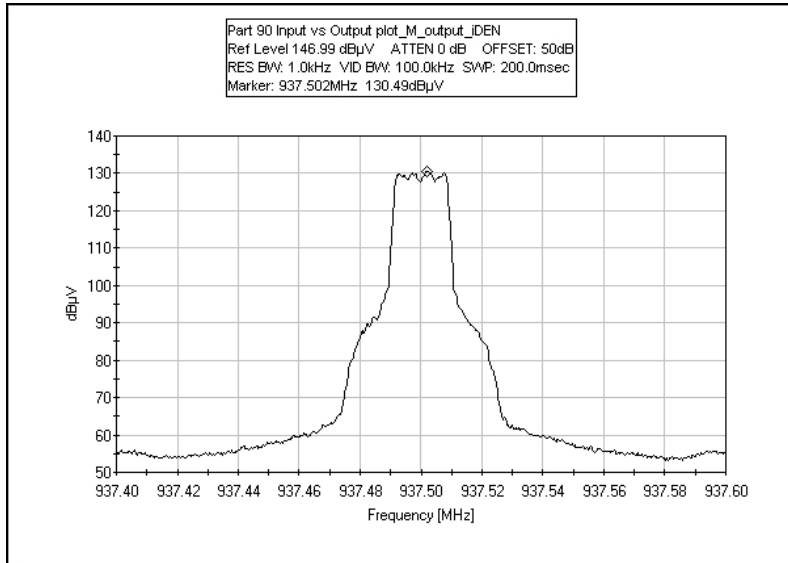
### FCC PART 90 INPUT PLOT - HIGH CHANNEL iDEN



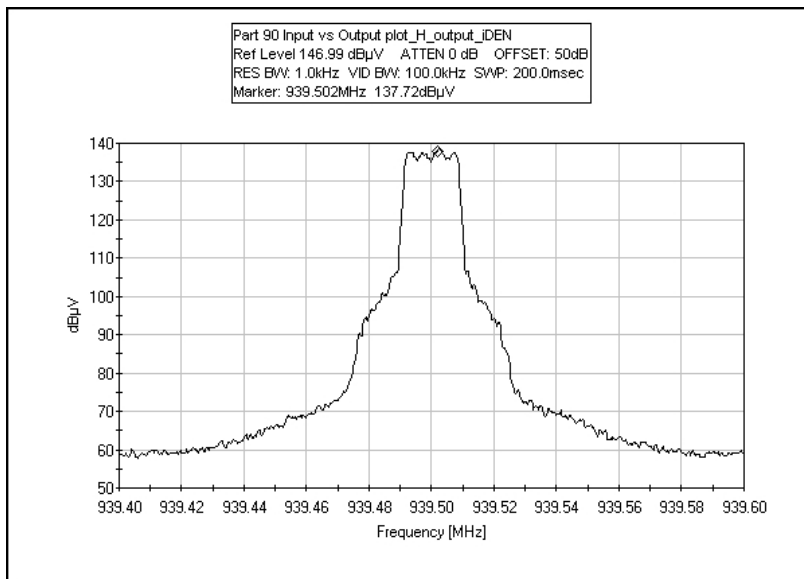
### FCC PART 90 OUTPUT PLOT - LOW CHANNEL iDEN



### FCC PART 90 OUTPUT PLOT - MIDDLE CHANNEL iDEN



### FCC PART 90 OUTPUT PLOTS - HIGH CHANNEL iDEN



**FCC 2.1033(c)(14)/2.1051/90.691(a)(2) - SPURIOUS EMISSIONS AT ANTENNA  
TERMINAL**

**Test Setup Photos**



**Test Data**

**Limit line for Spurious Conducted Emission**

**Required Attenuation** = **43+10 Log P dB**

Limit line (dBuV) =  $V_{dBuV} - \text{Attenuation}$

$$\begin{aligned}
 V_{dBuV} &= 20 \text{ Log } \frac{V}{1 \times 10^{-6}} \\
 &= 20 (\text{Log } V - \text{Log } 1 \times 10^{-6}) \\
 &= 20 \text{ Log } V - 20 \text{ Log } 1 \times 10^{-6} \\
 &= 20 \text{ Log } V - 20 (-6) \\
 &= 20 \text{ Log } V + 120
 \end{aligned}$$

$$\begin{aligned}
 \text{Attenuation} &= 43 + 10 \text{ Log } P \\
 &= 43 + 10 \text{ Log } \frac{V^2}{R} \\
 &= 43 + 10 (\text{Log } V^2 - \text{Log } R) \\
 &= 43 + 10 (2 \text{ Log } V - \text{Log } R) \\
 &= 43 + 20 \text{ Log } V - 10 \text{ Log } R
 \end{aligned}$$

$$\begin{aligned}
 \text{Limit line} &= V_{dBuV} - \text{Attenuation} \\
 &= 20 \text{ Log } V + 120 - (43 + 20 \text{ Log } V - 10 \text{ Log } R) \\
 &= 20 \text{ Log } V + 120 - 43 - 20 \text{ Log } V + 10 \text{ Log } R \\
 &= 20 \text{ Log } V + 120 - 43 - 20 \text{ Log } V + 10 \text{ Log } R \\
 &= 120 - 43 + 10 \text{ Log } 50 \quad \text{Note : } R = 50 \Omega \\
 &= 120 - 43 + 16.897 \\
 &= 94 \text{ dBuV at any power level}
 \end{aligned}$$



Test Location: CKC Laboratories, Inc. • 110. N. Olinda Place. • Brea, CA 92821 • (714) 993-6112

Customer: **Powerwave Technologies, Inc.**  
 Specification: **FCC90.691 Bandedge Plot**  
 Work Order #: **87767** Date: 3/26/2008  
 Test Type: **Conducted Emissions** Time: 10:15:59  
 Equipment: **Dual Band Transceiver** Sequence#: 4  
 Manufacturer: Powerwave Technologies Tested By: E. Wong  
 Model: RH308022/03A 110V 60Hz  
 S/N: NA

**Test Equipment:**

Function	S/N	Calibration Date	Cal Due Date	Asset #
Spectrum Analyzer	US44300438	01/03/2007	01/03/2009	02672
3'-40GHz cable	NA	09/18/2007	09/18/2009	P02945

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Dual Band Transceiver*	Powerwave Technologies	RH308022/03A	NA

**Support Devices:**

Function	Manufacturer	Model #	S/N
Spectrum Analyzer	HP	8563E	3337A01565
Power Meter	Agilent	E4419B	MY0510694
ESG	Aeroflex	IFR3417	341005/018

**Test Conditions / Notes:**

The dual band EUT is placed on the wooden table. Service port Local 1 and Local 2 are left unpopulated, WLI communication (non ethernet, proprietary handshake protocol) port 1 and 2 are connected in loop back manner via UTP. Antenna port Service 1 is terminated to 50 ohm load. Donor 2 out, Donor 1 In and Donor 1 out are connected to 50 ohm loads. Donor 2 In is connected to a remote RF signal source, antenna port Service 2 is connected to a remote power meter. The input RF level is adjusted to maintain a constant output power. Emission profile is evaluated at the antenna port, service 2. Range = 935 - 940MHz, Power = 20W. Modulation: iDEN, Frequency: 935.5 MHz, 937.5MHz, 939.5MHz. Frequency range of measurement = 9 kHz - 10 GHz. Frequency 9 kHz - 150 kHz RBW=200 Hz, VBW=200 Hz; 150 kHz - 30 MHz RBW=9 kHz, VBW=9 kHz; 30 MHz - 1000 MHz RBW=120 kHz, VBW=120 kHz; 1000 MHz - 10,000 MHz RBW=1 MHz, VBW=1 MHz.

**Transducer Legend:**

T1=Hi Freq 40GHz 3ft CAB-ANP02945-091809

**Measurement Data:** Reading listed by margin. Test Lead: Antenna Terminal

#	Freq MHz	Rdng dBμV	T1 dB	dB	dB	dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	1871.058M	69.0	+0.5				+0.0	69.5	94.0	-24.5	Anten
	Ave										
^	1871.058M	84.0	+0.5				+0.0	84.5	94.0	-9.5	Anten
3	1875.000M	68.9	+0.5				+0.0	69.4	94.0	-24.6	Anten
	Ave										
^	1875.000M	83.6	+0.5				+0.0	84.1	94.0	-9.9	Anten

5	3750.000M Ave	68.6	+0.7	+0.0	69.3	94.0	-24.7	Anten
^	3750.000M	83.9	+0.7	+0.0	84.6	94.0	-9.4	Anten
7	1879.167M Ave	68.6	+0.5	+0.0	69.1	94.0	-24.9	Anten
^	1879.167M	83.9	+0.5	+0.0	84.4	94.0	-9.6	Anten
9	3757.733M Ave	67.7	+0.7	+0.0	68.4	94.0	-25.6	Anten
^	3757.733M	81.6	+0.7	+0.0	82.3	94.0	-11.7	Anten
11	3742.292M Ave	66.5	+0.7	+0.0	67.2	94.0	-26.8	Anten
^	3742.292M	80.4	+0.7	+0.0	81.1	94.0	-12.9	Anten

**FCC 2.1033(c)(14)/2.1053/90.691(a)(2) - FIELD STRENGTH OF SPURIOUS RADIATION**

**Test Setup Photos**







**Test Data Sheets**

Test Location: CKC Laboratories, Inc. •110. N. Olinda Place. • Brea, CA 92821 • (714) 993-6112

Customer: **Powerwave Technologies, Inc.**  
 Specification: **90.691(a) Radiated Spurious Emission**  
 Work Order #: **87767** Date: 3/25/2008  
 Test Type: **Radiated Scan** Time: 15:54:57  
 Equipment: **Dual Band Transceiver** Sequence#: 1  
 Manufacturer: Powerwave Technologies Tested By: E. Wong  
 Model: RH308022/03A  
 S/N: NA

**Test Equipment:**

Function	S/N	Calibration Date	Cal Due Date	Asset #
Spectrum Analyzer	US44300438	01/03/2007	01/03/2009	02672
Bilog Antenna	2451	01/21/2008	01/21/2010	01995
Pre amp to SA Cable	Cable #10	05/16/2007	05/16/2009	P05050
Cable	Cable15	01/05/2007	01/05/2009	P05198
Pre Amp	1937A02548	06/01/2006	06/01/2008	00309
Horn Antenna	6246	06/29/2006	06/29/2008	00849
Microwave Pre-amp	3123A00281	07/19/2006	07/19/2008	00786
2'-40GHz cable	NA	09/18/2007	09/18/2009	P2948
Heliac Antenna Cable	P5565	09/18/2006	09/18/2008	P05565
Loop Antenna	2014	06/14/2006	06/14/2008	00314

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Dual Band Transceiver*	Powerwave Technologies	RH308022/03A	NA

**Support Devices:**

Function	Manufacturer	Model #	S/N
Spectrum Analyzer	HP	8563E	3337A01565
Power Meter	Agilent	E4419B	MY0510694
ESG	Aeroflex	IFR3417	341005/018

**Test Conditions / Notes:**

The dual band EUT is placed on the wooden table. Service port Local 1 and Local 2 are left unpopulated, WLI communication (non ethernet, proprietary handshake protocol) port 1 and 2 are connected in loop back manner via UTP. Antenna port Service 1 is terminated to 50 ohm load. Donor 2 out, Donor 1 In and Donor 1 out are connected to 50 ohm loads via a section of shielded RF cable. Donor 2 In is connected to a remote RF signal source, antenna port Service 2 is connected to a remote power meter. The input RF level is adjusted to maintain a constant output power. Range = 935 - 940MHz, Power = 20W. Modulation: iDEN, Frequency: 935.5 MHz, 937.5MHz, 939.5MHz. Frequency range of measurement = 9 kHz - 10 GHz. Frequency 9 kHz - 150 kHz RBW=200 Hz, VBW=200 Hz; 150 kHz- 30 MHz RBW=9 kHz, VBW=9 kHz; 30 MHz - 1000 MHz RBW=120 kHz, VBW=120 kHz; 1000 MHz -10,000 MHz RBW=1 MHz, VBW=1 MHz.

Operating Frequency: 935 MHz - 940 MHz

Channels: Low, Mid and High

Highest Measured Output Power: 43.01 ERP(dBm)= 20 ERP(Watts)

Distance: 3 meters

Limit:  $43+10\text{Log}(P)$  56.01 dBc

Freq. (MHz)	Reference Level (dBm)	Antenna Polarity (H/V)	dBc
2,818.57	-40.7	Horiz	83.71
2,812.50	-46.1	Horiz	89.11
3,750.00	-47.6	Horiz	90.61
2,818.57	-48.2	Horiz	91.21
2,806.25	-50.4	Vert	93.41
3,758.07	-51.5	Horiz	94.51
3,741.83	-51.7	Vert	94.71
3,741.83	-51.8	Horiz	94.81
2,806.75	-56.4	Horiz	99.41
3,758.07	-58.1	Horiz	101.11
1,871.17	-61.1	Horiz	104.11
1,879.07	-61.2	Horiz	104.21
1,870.67	-61.7	Vert	104.71
1,849.00	-62	Vert	105.01
1,875.00	-62.3	Horiz	105.31

**FCC PART 90 BLOCK EDGE**

**Test Equipment**

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02672	Agilent	E4446A	US44300438	010307	010309

**Test Conditions**

The dual band EUT was placed on the wooden table. Service port Local 1 and Local 2 were left unpopulated, WLI communication (non ethernet, proprietary handshake protocol) port 1 and 2 were connected in loop back manner via UTP. Antenna port Service 1 was terminated to 50 ohm load. Donor 2 out, Donor 1 In and Donor 1 out were connected to 50 ohm loads. Donor 2 In was connected to a remote RF signal source, antenna port Service 2 was connected to a remote power meter. The input RF level was adjusted to maintain a constant output power. Emission profile of the output signal was evaluated at the antenna port, service 2 /Service 1. Input signal profile was evaluated at Donor in 1/ Donor in 2.

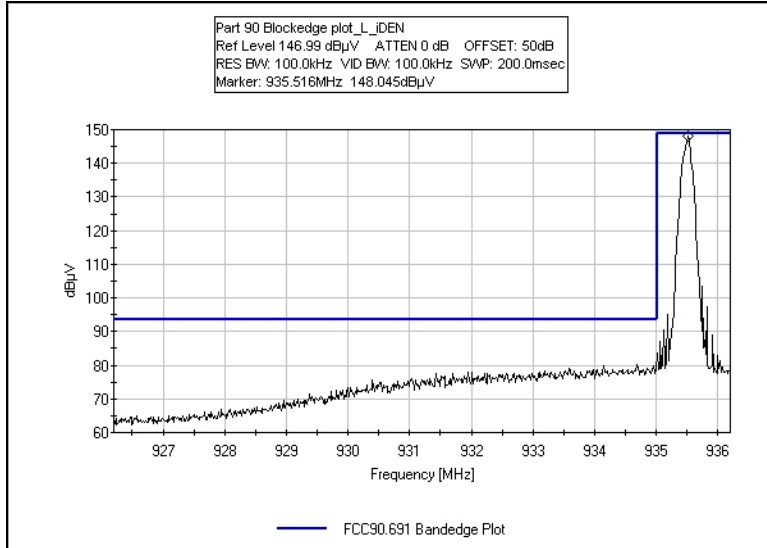
For Bandedge plots, when applicable, a bandwidth correction was applied to compensate for employing resolution bandwidth other than 1 MHz. The signal amplitude was first measured at RBW=1MHz, any loss in amplitude measured with reduced RBW was noted and compensated for.

**Test Setup Photos**



## Test Plots

### FCC PART 90 BLOCKEDGE - LOW CHANNEL iDEN



### FCC PART 90 BLOCKEDGE - HIGH CHANNEL iDEN

