



POWERWAVE TECHNOLOGIES, INC. TEST REPORT

FOR THE

REPEATER, RH308022/03A

FCC PART 24 SUBPART D

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:

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

Date of test: March 25-27, 2008

Report No.: FC08-036

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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 24 Subpart D

PURPOSE OF TEST: To perform the testing of the Repeater, RH308022/03A with the requirements for FCC Part 24 Subpart D 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

| Test | Specification/Method | Results |
|--|---|----------------|
| RF Power Output | FCC 2.1033(c)(14)/2.1046/24.132(c) | Pass |
| Input and Output Plots | FCC 2.1033(c)(14)/2.1049(i)/Part 24 | Pass |
| Spurious Emissions at Antenna Terminal | FCC 2.1033(c)(14)/2.1051/24.133(a)(2)(ii) | Pass |
| Field Strength of Spurious Radiation | FCC 2.1033(c)(14)/2.1051/24.133(a)(2)(ii) | Pass |
| Block Edge | FCC Part 24.133 | 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

3500 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)/2.1046/24.132(c) - 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

| Modulation: iDEN | Power (dBm) | Power (Watts) |
|------------------|-------------|---------------|
| 935.5MHz | 43 | 20 |
| 937.5MHz | 43 | 20 |
| 939.5 MHz | 43 | 20 |

FCC 2.1033(c)(14)/2.1049(i)/PART 24 - 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

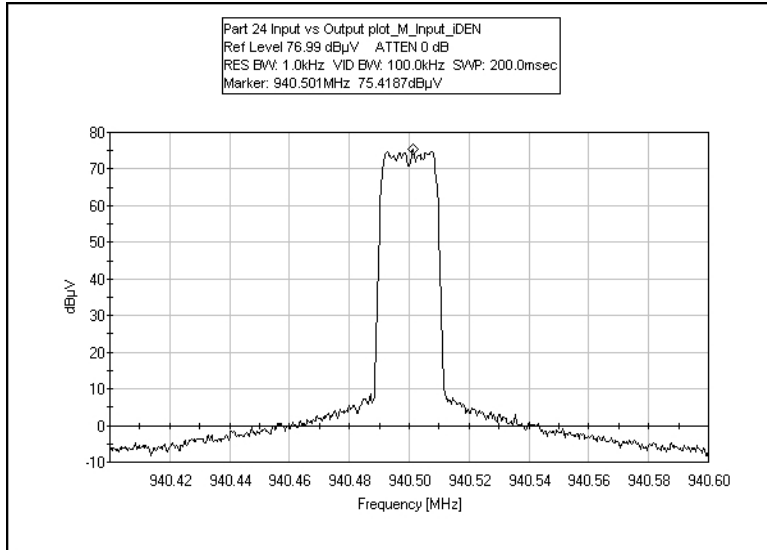
The dual band EUT was placed on the wooden table. Service port Local 1 and Local 2 were left unpopulated, WLI communication (non ethernet, proprietary handshake protocol) port 1 and 2 were connected in loop back manner via UTP. Antenna port Service 1 was terminated to 50 ohm load. Donor 2 out, Donor 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

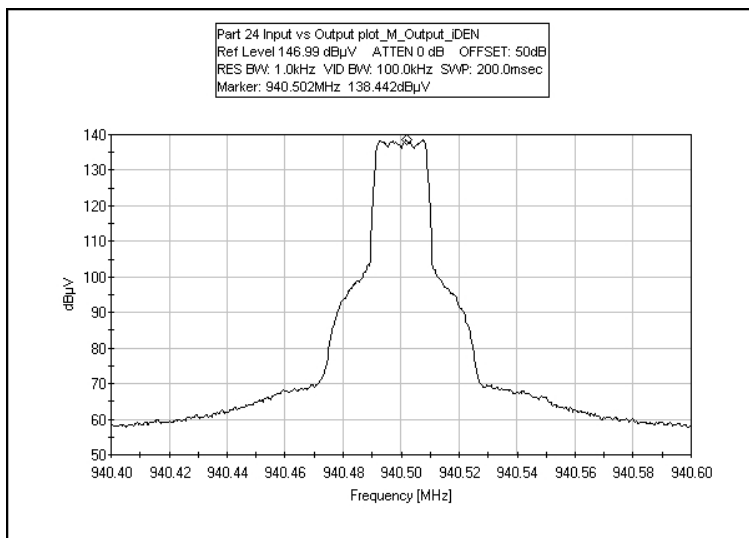


Test Plots

FCC PART 24 INPUT PLOT - MIDDLE CHANNEL iDEN



FCC PART 24 OUTPUT PLOT - MIDDLE CHANNEL iDEN



FCC 2.1033(c)(14)/2.1051/24.133(a)(2)(ii) - 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: **24.133(a)(2)(ii) Conducted Spurious Emissions**
 Work Order #: **87767** Date: 3/26/2008
 Test Type: **Conducted Emissions** Time: 11:40:30
 Equipment: **Dual Band Transceiver** Sequence#: 5
 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 = 940 - 941MHz, Power = 20W. Modulation: iDEN, Frequency: 940.5MHz. 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 | Dist Table | Corr dBμV/m | Spec dBμV/m | Margin dB | Polar Ant |
|---|-----------|-----------|-------|------------|-------------|-------------|-----------|-----------|
| 1 | 1881.000M | 80.1 | +0.5 | +0.0 | 80.6 | 94.0 | -13.4 | Anten |
| | Ave | | | | | | | |
| ^ | 1881.000M | 94.5 | +0.5 | +0.0 | 95.0 | 94.0 | +1.0 | Anten |
| 3 | 3761.983M | 77.1 | +0.7 | +0.0 | 77.8 | 94.0 | -16.2 | Anten |
| 4 | 2821.483M | 72.5 | +0.6 | +0.0 | 73.1 | 94.0 | -20.9 | Anten |
| | Ave | | | | | | | |
| ^ | 2821.483M | 89.9 | +0.6 | +0.0 | 90.5 | 94.0 | -3.5 | Anten |

FCC 2.1033(c)(14)/2.1053/24.133(a)(2)(ii) - FIELD STRENGTH OF SPURIOUS RADIATION

Test Setup Photos



Test Data

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

Customer: **Powerwave Technologies, Inc.**
 Specification: **24.133(a)(2)(ii) Radiated Spurious Emission**
 Work Order #: **87767** Date: 3/25/2008
 Test Type: **Radiated Scan** Time: 15:59:36
 Equipment: **Dual Band Transceiver** Sequence#: 2
 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 = 940 - 941MHz, Power = 20W. Modulation: iDEN, Frequency: 940.5MHz. 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 |
|-------------|-----------------------|------------------------|--------|
| 2,821.55 | -41 | Horiz | 84.01 |
| 2,821.55 | -43.9 | Vert | 86.91 |
| 3,762.03 | -47 | Horiz | 90.01 |
| 3,762.12 | -55.5 | Vert | 98.51 |
| 4,702.60 | -57.8 | Horiz | 100.81 |
| 1,881.13 | -61.7 | Vert | 104.71 |

FCC PART 24.133 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 24 BLOCK EDGE PLOT - iDEN

