



**ADDENDUM TO POWERWAVE TECHNOLOGIES, INC.
TEST REPORT FC08-006**

FOR THE

WIDEBAND RADIO HEAD, RH800020/101

FCC PART 24 AND RSS-131 ISSUE 2, JULY 2003

TESTING

DATE OF ISSUE: FEBRUARY 4, 2008

PREPARED FOR:

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

P.O. No.: 117420
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PREPARED BY:

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Date of test: January 14-21, 2008

Report No.: FC08-006A

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ADMINISTRATIVE INFORMATION

DATE OF TEST: January 14-21, 2008

DATE OF RECEIPT: January 14, 2008

REPRESENTATIVE: Charlotte Yu

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, RSS-131 Issue 2 July 2003 and RSS GEN Issue 2 June 2007

PURPOSE OF TEST:

Original Report: To perform the testing of the Wideband Radio Head, RH800020/101 with the requirements for FCC Part 24 and RSS-131 devices.

Addendum A: To correct the emissions designator on page 6 with no new testing.

APPROVALS

QUALITY ASSURANCE:

Steve Behm, Director of Engineering Services

TEST PERSONNEL:

Eddie Wong, EMC Engineer

SUMMARY OF RESULTS

Test	Specification/Method	Results
RF Power Output	FCC Part 24.132(c)	Pass
RF Power Output	RSS-131 Section 4.3	Pass
Input & Output	FCC 2.1049(I)	Pass
Spurious Emissions at Antenna Terminal	FCC Part 24.133(a)(2)	Pass
Field Strength of Spurious Emissions	FCC Part 24.133(a)(2)	Pass
Block Edge		Pass
Intermodulation		Pass
99% Bandwidth	RSS-131	Pass
Amplifier Gain and Bandwidth	RSS-131	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. Wideband Radio Heads (WRH) work as on-frequency amplifiers used to fill out uncovered areas in wireless mobile systems such as base station fringe areas, tunnels, business, convention centers, airports and industrial buildings. It receives, amplifies and transmits signals to/from a base station to/from mobile stations. The standard WRH is used for analog or digital systems, such as iDEN. It has a fiber optic donor port and a RF port for a service antenna (or RF cable) and is designed to be connected to a BTS via a BMU or OCM.

The following model has been tested by CKC Laboratories: **RH800020/101**

The manufacturer states that the following additional models are identical electrically to the one which was tested, or any differences between them do not affect their EMC characteristics, and therefore they meet the level of testing equivalent to the tested models. **RH800020/102, RH800020/211, RH008002/000, RH008002/011, RH800020/212, RH008002/002, and RH008002/012**

EQUIPMENT UNDER TEST

Wideband Radio Head

Manuf: Powerwave Technologies, Inc.
Model: RH800020/101
Serial: NA
FCC ID: E675JS0099 (pending)

PERIPHERAL DEVICES

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

Power Meter

Manuf: Agilent
Model: E4419B
Serial: GB402019/12

Pre Amp

Manuf: Mini Circuit
Model: ZHL-4240
Serial: D040405

Optical Converter

Manuf: Powerwave
Model: NA
Serial: NA

ESG

Manuf: Aeroflex
Model: IFR 3413
Serial: 341005/078



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

940-941 MHz

FCC 2.1033 (c)(6) OPERATING POWER

20 Watts

FCC 2.1033 (c)(7) MAXIMUM POWER RATING

See CFR 47

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	012706	012708
Power Sensor	02777	HP	E4412A	MY41499662	012706	012708

Test Setup Photos



24.132(c) RF Output Power

(c) Base stations transmitting in the 930–931 MHz and 940–941 MHz bands are limited to 3500 watts e.r.p. per authorized channel and are unlimited in antenna height except as provided in paragraph (d) of this section.

The EUT is a RF amplifier. The manufacturer does not provide an antenna for sale with the product, hence EIRP is not measured nor calculated. The end user of this product is to exercise proper engineering judgement to select the appropriate antenna to comply with the EIRP limitation set forth by FCC 24.132(c).

Test Conditions

The EUT is placed on the wooden table. The RF Output port is connected to a load string . Optical in port is connected to a support Optical converter. Support optical converter receives RF signal converts the signal to optic and sends to the EUT. The EUT decode the optical signal, and generates a RF signal. Emission profile evaluated at the RF antenna port. Modulation: iDEN.

Test Data

Part24

Modulation: iDEN
940.5 MHz

Power (dBm)
43

Power (Watt)
20

RSS-131 - RF POWER OUTPUT

Test Equipment

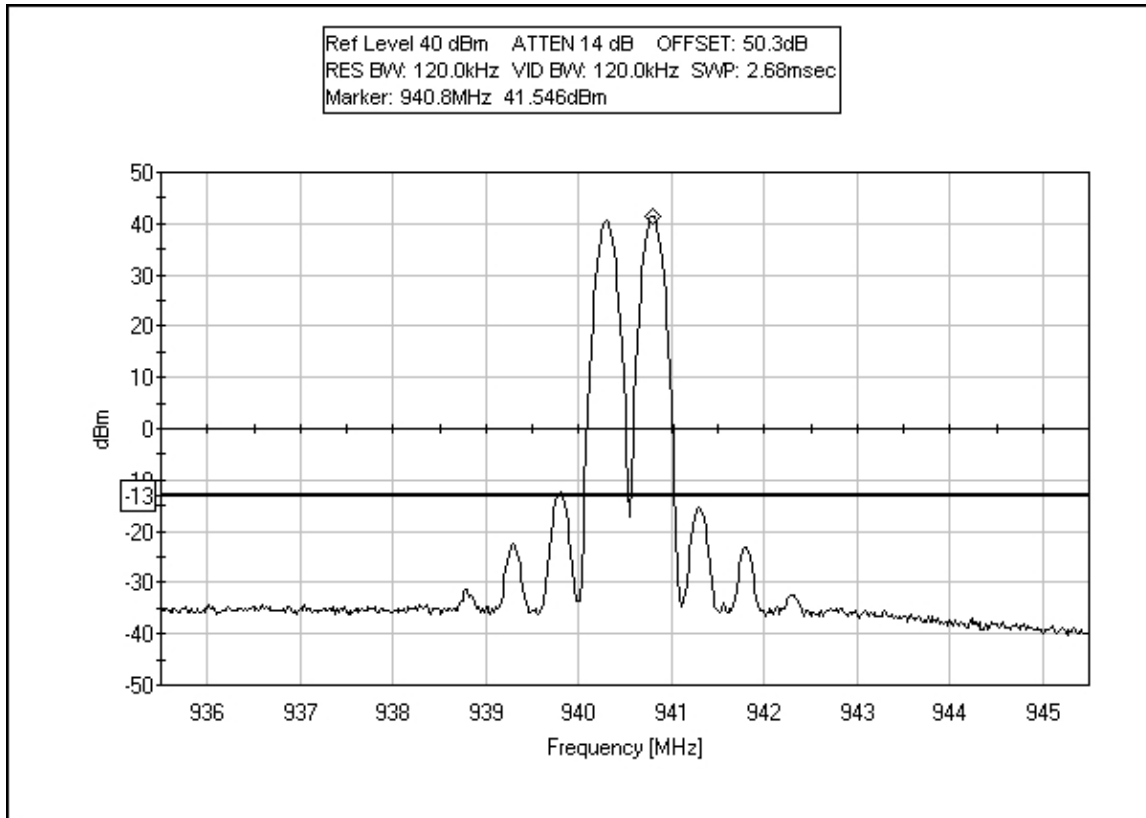
Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02672	Agilent	E4446A	US44300438	010307	010309

Test Setup Photos



Test Data

4.3 Mean Output power.



Test Conditions: The EUT is a RF amplifier. The manufacturer does not provide an antenna for sale with the product, hence EIRP is not measured nor calculated. The RF power of the EUT was measured at the antenna port in accordance with RSS 131, 4.3.1 requirement.

Measured Po1 =+ 41.5 dBm

$$P_{\text{mean}} = P_{o1} + 3 \text{ dB} = 41.5 + 3 \text{ dBm} = 44.5 \text{ dBm} = \mathbf{28W}$$

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

Test Equipment

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

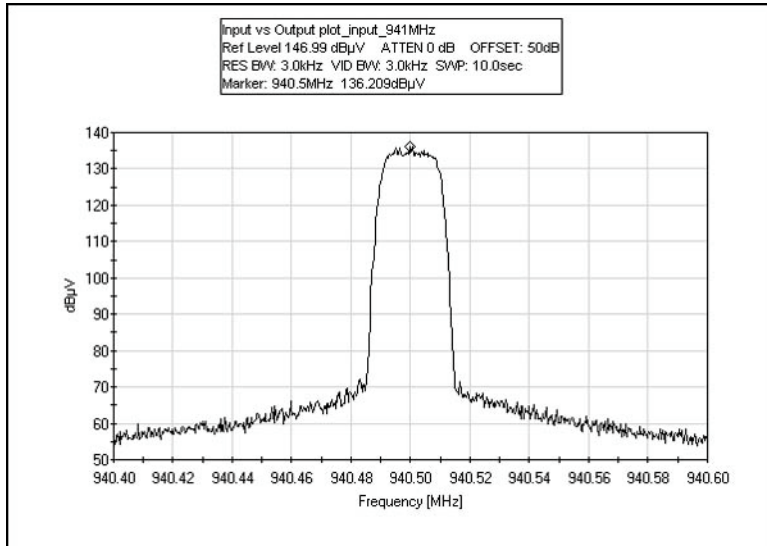
Test Conditions: The EUT is placed on the wooden table. The RF Output port is connected to a load string. Optical in port is connected to a support Optical converter. Support optical converter receives RF signal, converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates a RF signal. Output Emission profile evaluated at the RF antenna port. Modulation: iDEN.

Test Setup Photos

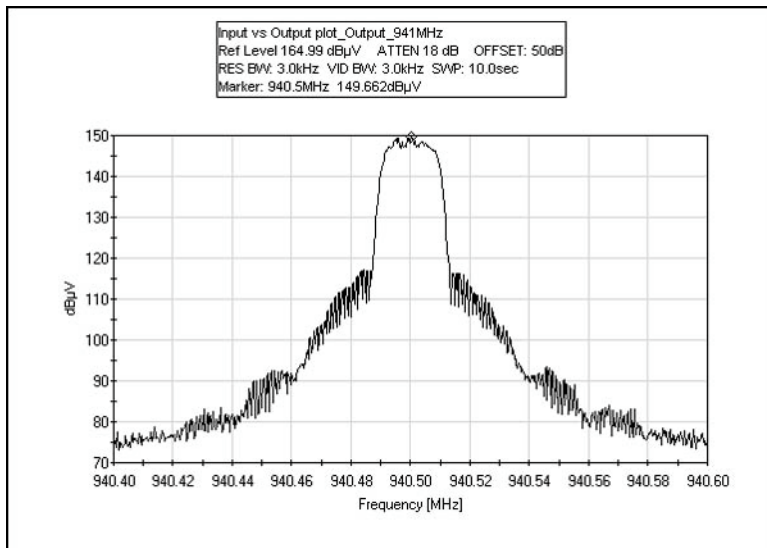


Test Plots

INPUT PLOT 941MHz



OUTPUT PLOT 941MHz



FCC 2.1033(c)(14)/2.1051/24.133(a)(2)(ii) - SPURIOUS EMISSIONS AT ANTENNA TERMINAL

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 Emission**
 Work Order #: **87496** Date: 1/21/2008
 Test Type: **Conducted Emissions** Time: 13:23:13
 Equipment: **Wideband Radio Head** Sequence#: 14
 Manufacturer: Powerwave Technologies, Inc. Tested By: E. Wong
 Model: RH800020/101 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
1.0 GHz HPF	1	03/07/2006	03/07/2008	02749
3'-40GHz cable	NA	09/18/2007	09/18/2009	P02945

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Wideband Radio Head*	Powerwave Technologies, Inc.	RH800020/101	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Power Meter	Agilent	E4419B	GB402019/12
Pre Amp	Mini Circuit	ZHL-4240	D040405
Optical Converter	Powerwave	NA	NA
ESG	Aeroflex	IFR 3413	341005/078

Test Conditions / Notes:

The EUT is placed on the wooden table. The RF Output port is connected to a load string . Optical in port is connected to a support Optical converter. Support optical converter receives RF signal converts the signal to optic and sends to the EUT. The EUT decode the optical signal, and generates a RF signal. RF profile evaluated at the RF antenna port. Operating range: 940-941MHz. Power = 20 watts. Frequency = 940.5MHz. Modulation: iDEN. 21°C, 20% relative humidity. 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	T2=Filter 1GHz HP AN02749
--	---------------------------

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

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	Dist Table dB	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	1880.900M	77.0	+0.5	+0.3	+0.0	77.8	94.0	-16.2	Anten
	Ave								
^	1880.900M	89.5	+0.5	+0.3	+0.0	90.3	94.0	-3.7	Anten
3	2821.567M	71.9	+0.6	+0.4	+0.0	72.9	94.0	-21.1	Anten
	Ave								
^	2821.567M	88.8	+0.6	+0.4	+0.0	89.8	94.0	-4.2	Anten

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

Test Setup Photos





DC



DC

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 #: **87496** Date: 1/18/2008
 Test Type: **Radiated Scan** Time: 11:28:36
 Equipment: **Wideband Radio Head** Sequence#: 4
 Manufacturer: Powerwave Technologies, Inc. Tested By: E. Wong
 Model: RH800020/101
 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	431	07/11/2007	07/11/2009	565
Log Antenna	331	07/17/2007	07/17/2009	300
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
1.0 GHz HPF	1	03/07/2006	03/07/2008	02749
Loop Antenna	2014	06/14/2006	06/14/2008	00314

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Wideband Radio Head*	Powerwave Technologies, Inc.	RH800020/101	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Power Meter	Agilent	E4419B	GB402019/12
Pre Amp	Mini Circuit	ZHL-4240	D040405
Optical Converter	Powerwave	NA	NA
ESG	Aeroflex	IFR 3413	341005/078

Test Conditions / Notes:

The EUT is placed on the wooden table. The RF Output port is connected to a load string . Optical in port is connected to a support Optical converter. Support optical converter receives RF signal converts the signal to optic and sends to the EUT. The EUT decode the optical signal, and generates a RF signal. Operating range: 940-941MHz. Power = 20 watts. Frequency = 940.5 MHz. Modulation: iDEN. 20°C, 20% relative humidity. 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. **No emissions detected.**

BAND EDGE

Test Equipment

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

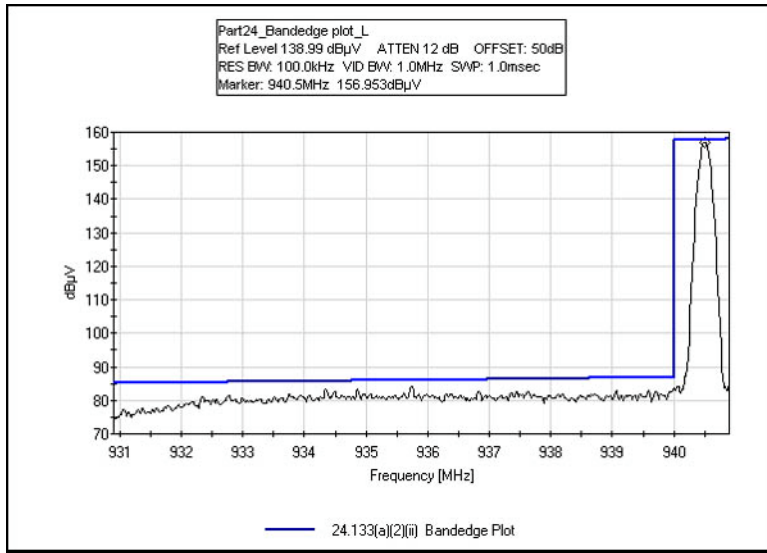
Test Conditions: The EUT is placed on the wooden table. The RF Output port is connected to a load string. Optical in port is connected to a support Optical converter. Support optical converter receives RF signal, converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates a RF signal. Emission profile evaluated at the RF antenna port. Modulation: iDEN.

Test Setup Photos

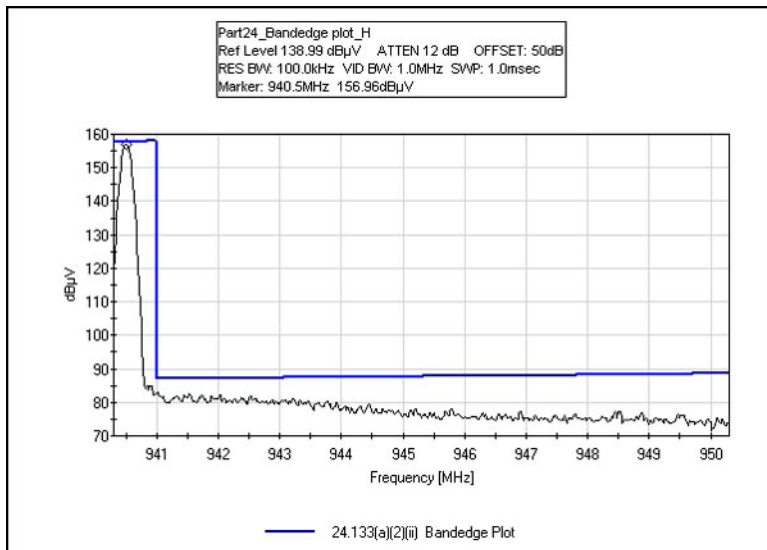


Test Plots

BANDEDGE PLOT L



BANDEDGE PLOT H



INTERMODULATION

Test Equipment

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

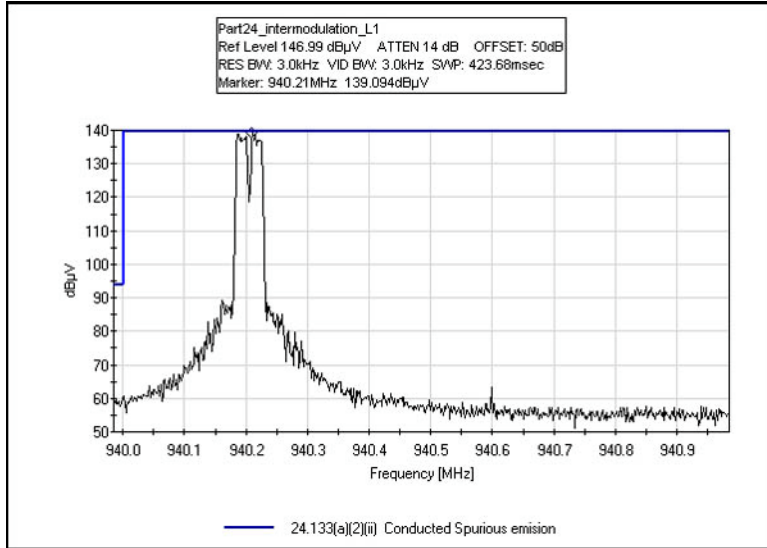
Test Conditions: The EUT is placed on the wooden table. The RF Output port is connected to a load string. Optical in port is connected to a support Optical converter. Support optical converter receives RF signal, converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates a RF signal. Two RF signals spaced a channel apart were injected to the EUT. Emission profile evaluated at the RF antenna port. Modulation: iDEN.

Test Setup Photos

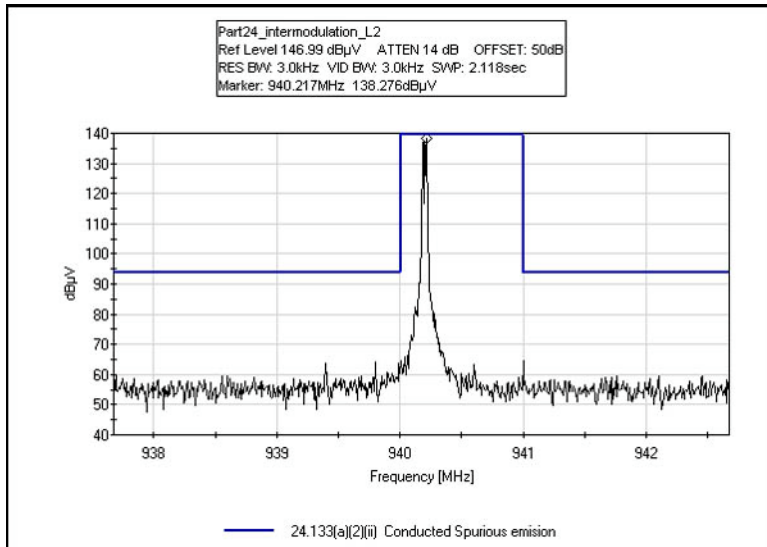


Test Plots

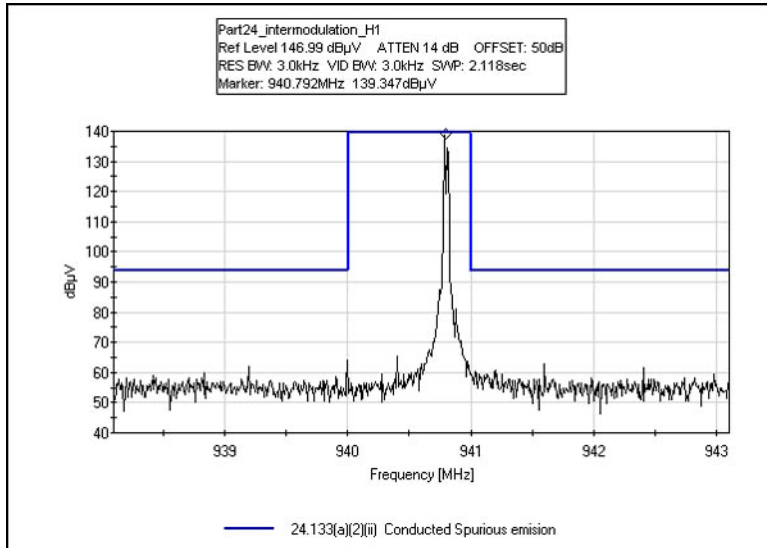
INTERMODULATION L1



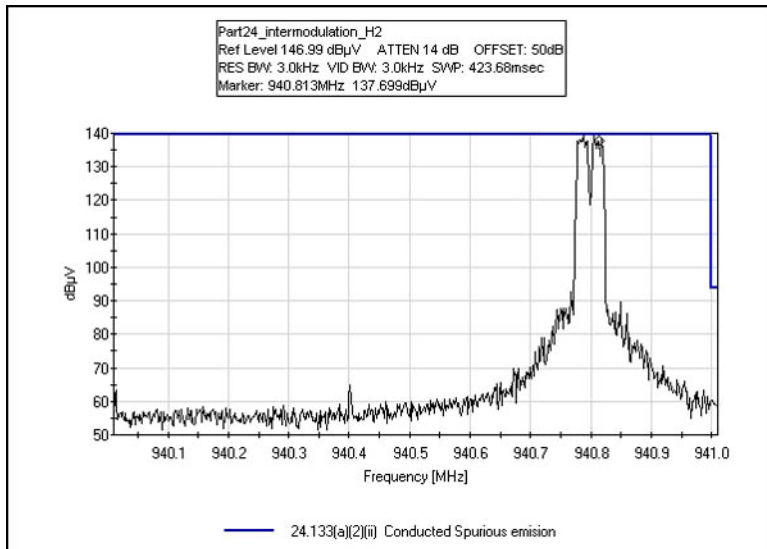
INTERMODULATION L2



INTERMODULATION H1



INTERMODULATION H2



99% BANDWIDTH

Test Equipment

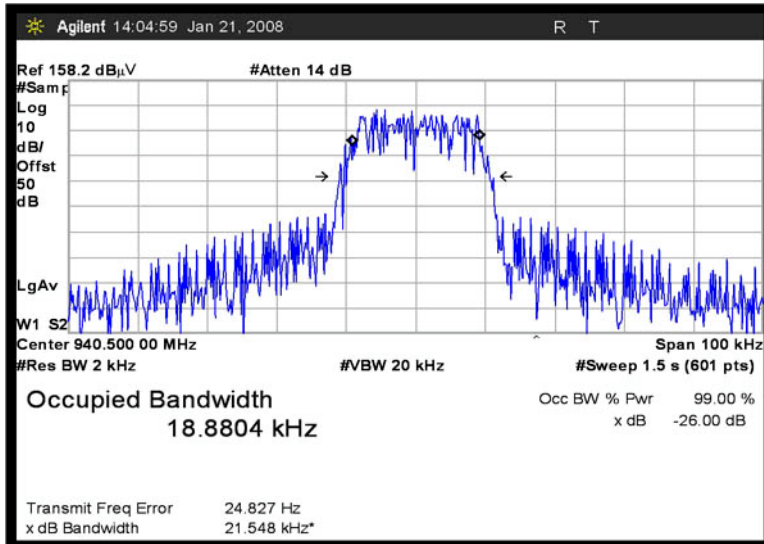
Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02672	Agilent	E4446A	US44300438	010307	010309

Test Conditions: The EUT is placed on the wooden table. The RF Output port is connected to a load string. Optical in port is connected to a support Optical converter. Support optical converter receives RF signal, converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates a RF signal. Emission profile evaluated at the RF antenna port. Modulation: iDEN.

Test Setup Photos



Test Plots



RSS-131 AMPLIFIER GAIN AND BANDWIDTH

Test Equipment

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Network analyzer	C00012	HP	8753E	Us38432770	052006	052008

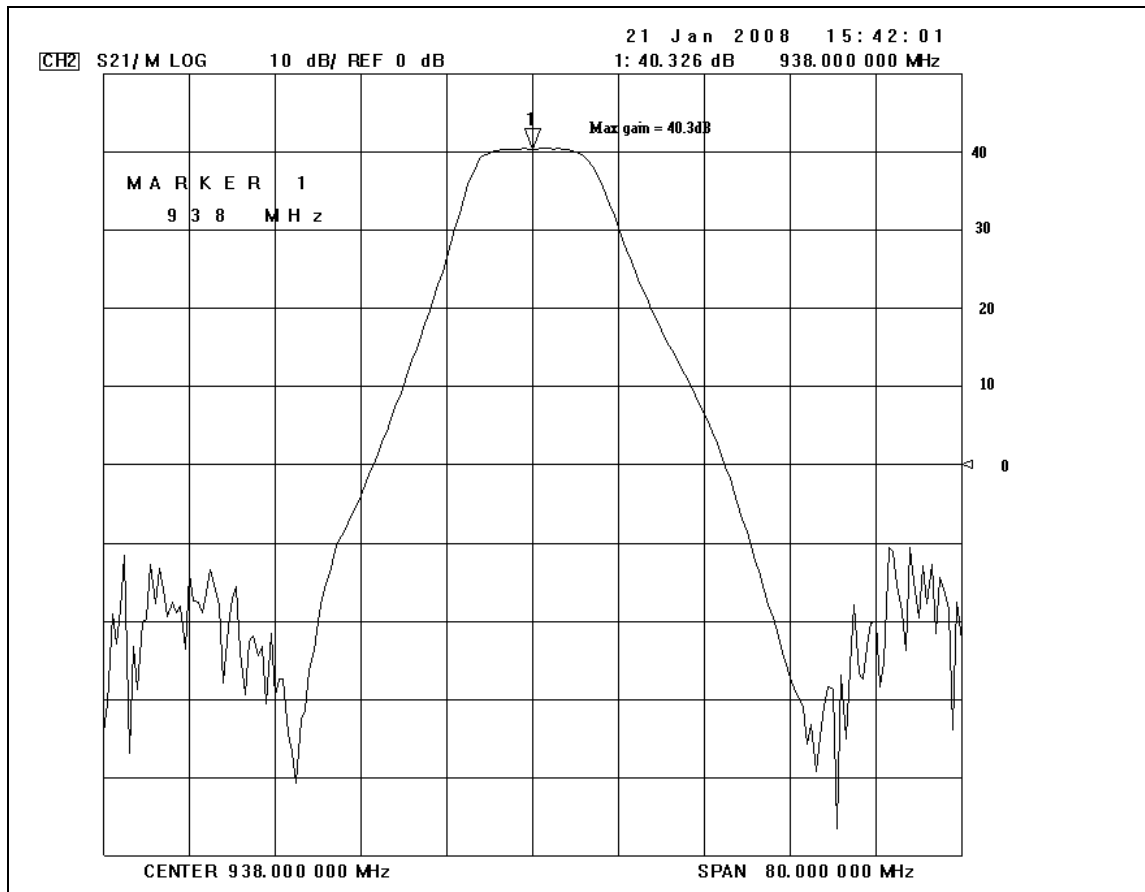
Test Setup Photos



Test Plots

RSS 131 Amplifier gain and Bandwidth:

Setup



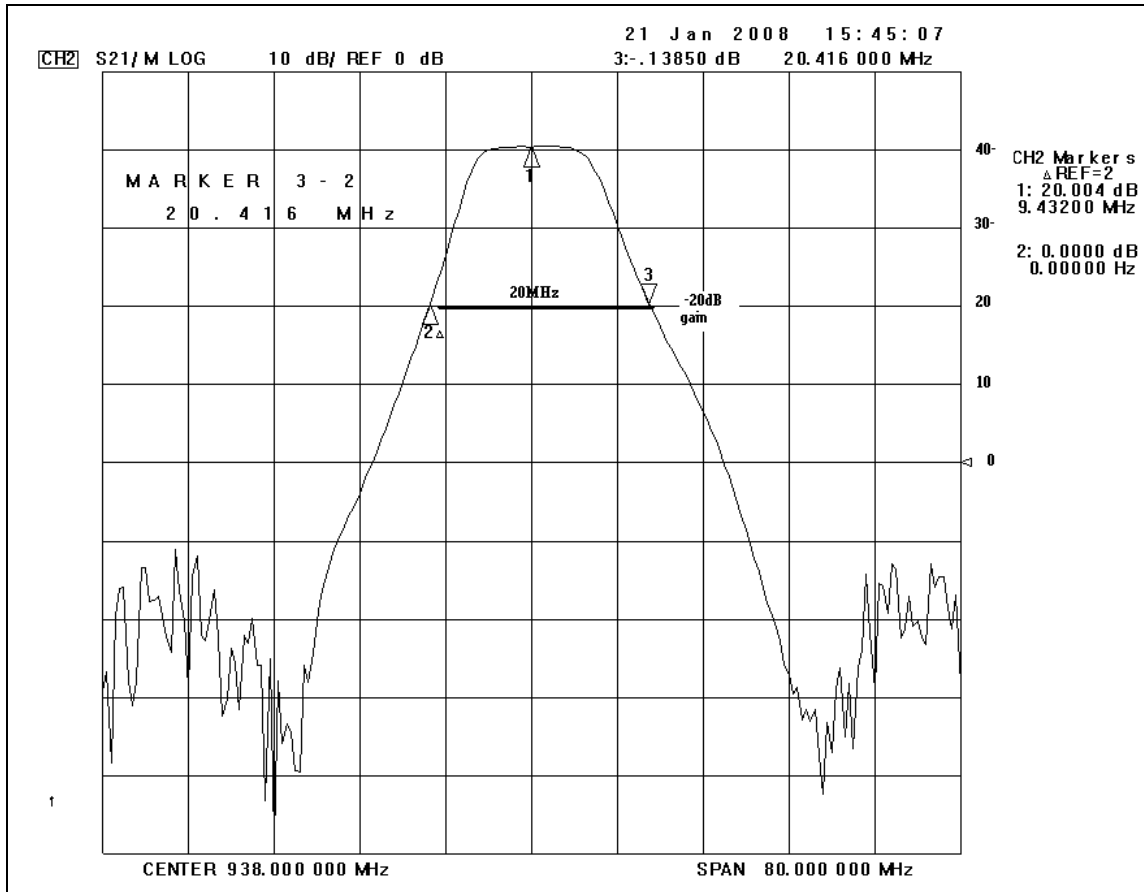
Measured gain = Output – Reference (dB)

The nominal bandwidth and nominal pass band gain (dB) of the RF enhancer or translator shall be stated by the manufacturer or equipment certification applicant and indicated in the test report.

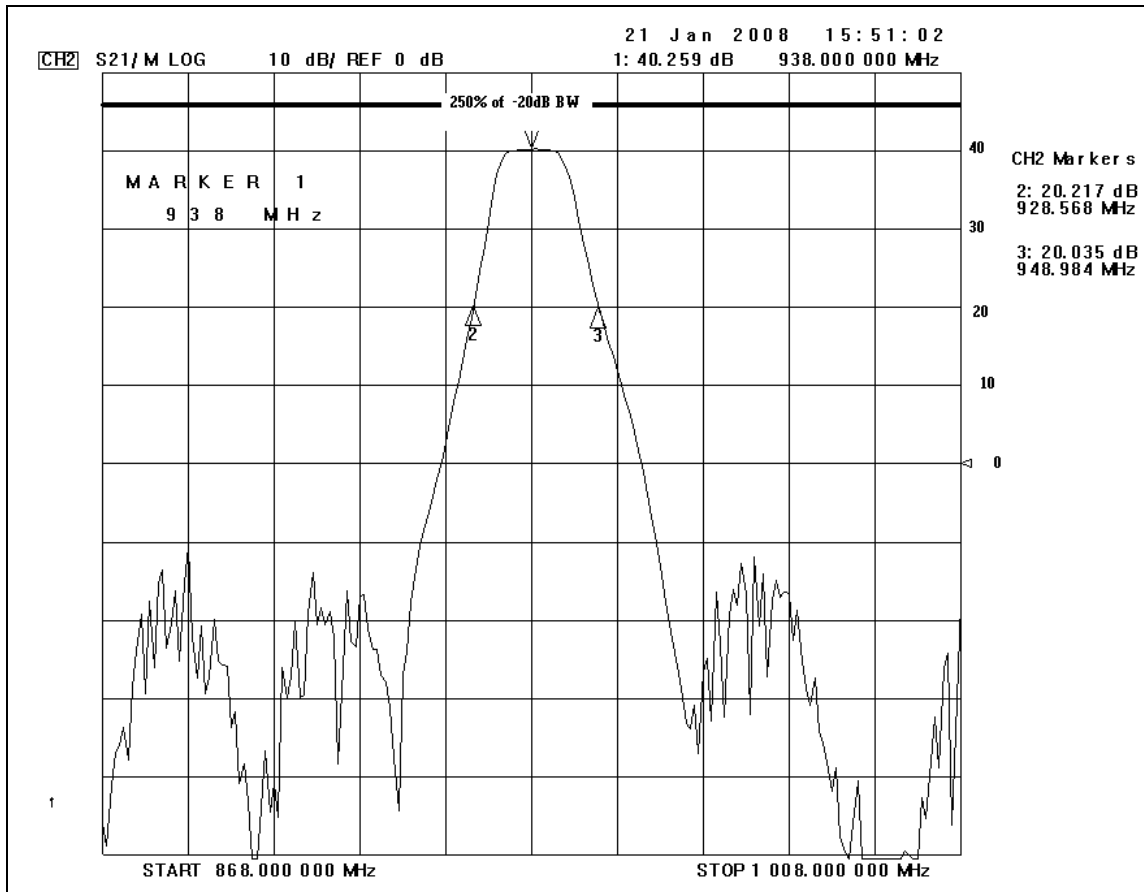
Manufacturer stated gain = 45-70 dB

The internal control is adjusted to the nominal gain for which equipment certification is sought.

Maximum measured gain = 40.3dB



With the aid of a Vector Network analyzer, the 20 dB Bandwidth is measured.



The gain-versus-frequency response of the amplifier from the mid band F_o of the pass band up to at least $f_o \pm 250\%$ of the 20dB Bandwidth.

Minimum standard:

The pass band gain response shall not exceed the nominal gain by more than 1 dB. The 20 dB bandwidth shall not exceed the nominal bandwidth that is stated by the manufacturer.

Outside of the 20dB bandwidth the gain shall not exceed that at the 20dB point.