

Powerwave Technologies, Inc.

TEST REPORT FOR

Nexus Dual Band Repeater, RH905022/13B

Tested To The Following Standards:

FCC Part 90 and RSS 131

Report No.: 91026-6

Date of issue: July 29, 2010



TESTING
CERT #803.01, 803.02,
803.05, 803.06

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

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

Representative: Sean Doan
Customer Reference Number: 137301

DATE OF EQUIPMENT RECEIPT:

DATE(S) OF TESTING:

REPORT PREPARED BY:

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

Project Number: 91026

July 26, 2010

July 26, 2010

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
110 Olinda Place
Brea, CA 92823

Site Registration & Accreditation Information

Location	Japan	Canada	FCC
Brea D	R-1256, C-1319 & T-1660	3082D-2	100638

SUMMARY OF RESULTS

Standard / Specification: FCC Part 90

Description	Test Procedure/Method	Results
RF Output Power	FCC Part 90/2.1046	Pass
Occupied Bandwidth Input / Output	FCC Part 90/2.1049(l)	Pass
Spurious Emissions at Antenna Terminal	FCC Part 90/2.1051/47 CFR §90.210(g)(h)	Pass
Field Strength of Spurious Radiation	FCC Part 90/2.1053/90.210(g)(h)	Pass
FCC_Bandedge	FCC Part 90	Pass
FCC_Intermodulation	FCC Part 90	Pass
FCC_Out of Band Rejection	FCC Part 90	Pass

Standard / Specification: RSS - 131

Description	Test Procedure/Method	Results
99% Bandwidth	RSS-131	Pass
RF Output Power	RSS-131	Pass
Amplifier Gain and Bandwidth:	RSS-131	Pass

Conditions During Testing

This list is a summary of the conditions noted for or modifications made to the equipment during testing.

Summary of Conditions
None

EQUIPMENT UNDER TEST (EUT)

The following model has been tested by CKC Laboratories: **Nexus Dual Band Repeater, RH905022/13B**

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. **Nexus Dual Band Repeater, RH305022/13B**

EQUIPMENT UNDER TEST

The EUT is a Dual Band Transceiver.

Nexus Dual Band Repeater

Manuf: Powerwave Technologies, Inc.

Model: RH905022/13B

Serial: NA

PERIPHERAL DEVICES

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

Pre Amp

Manuf: Minicircuit

Model: ZHL4240_SAM

Serial: D092397-19

Optical Converter Module

Manuf: Powerwave Technologies, Inc

Model: NA

Serial: NA

Signal Generator

Manuf: Aeroflex

Model: IFR343B3

Serial: 3410051078

Spectrum Analyzer

Manuf: Agilent

Model: 8561EC

Serial: 3946A00167

FCC PART 90

This report contains EMC emissions test results under United States Federal Communications Commission (FCC) requirements for licensed devices.

TEMPERATURE AND HUMIDITY DURING TESTING

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

2.1046 - RF Power Output

Test Set up

The EUT is placed on the wooden table. The RF Output port is connected to a load string. The Optical in port is connected to a support Optical converter. The Support optical converter receives the RF signal and converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates an RF signal. The insertion loss of the RF attenuator was measured and entered as a measurement offset of the power meter. RF output port Service 2. Operating range: 851-869MHz.

Engineer Name: E. Wong

Test Equipment				
Equipment	Serial	Cal Date	Cal Due	Asset
RF Power meter	GB37170458	01/26/10	01/26/12	02778
Power Sensor	MY41502826	01/26/10	01/26/12	03072

Test Data

Modulation: iDEN

Frequency	Measured Power (W)
851.025	20
860.000	20
868.975	20

Note: The RF power of the EUT was measured at the antenna port. The measurement satisfies the above requirement by demonstrating the measured power is below 65 watts.

Sec. 90.635 Limitations on power and antenna height.

(a) The effective radiated power and antenna height for base stations may not exceed 1 kilowatt (30 dBw) and 304 m. (1,000 ft.) above average terrain (AAT), respectively, or the equivalent thereof as determined from the Table. These are maximum values, and applicants will be required to justify power levels and antenna heights requested.

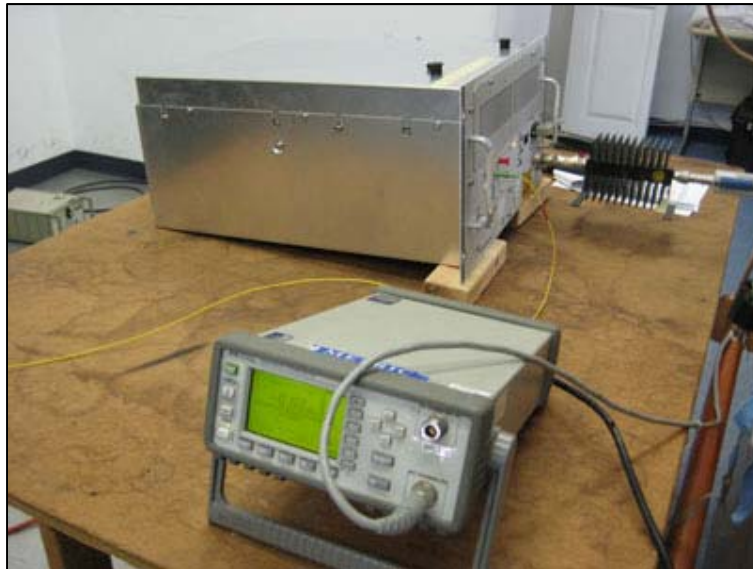
(b) The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw).

Table--Equivalent Power and Antenna Heights for Base Stations in the 851-869 MHz and 935-940 MHz Bands Which Have a Requirement for a 32 km (20 mi) Service Area Radius

Antenna height (ATT) meters (feet)	Effective Radiated Power (watts)
\1,2,4\	
Above 1,372 (4,500).....	65
Above 1,220 (4,000) to 1,372 (4,500).....	70
Above 1,067 (3,500) to 1,220 (4,000).....	75
Above 915 (3,000) to 1,067 (3,500).....	100
Above 763 (2,500) to 915 (3,000).....	140
Above 610 (2,000) to 763 (2,500).....	200
Above 458 (1,500) to 610 (2,000).....	350
Above 305 (1,000) to 458 (1,500).....	600
Up to 305 (1,000).....	\3\ 1,000

Note: The EUT is a RF amplifier/repeater. 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 judgment to select the appropriate antenna to comply with the EIRP limitation set forth by FCC90.635(a).

Test Setup Photos



RF POWER OUTPUT TEST SET UP

2.1049(I) - Occupied Bandwidth Input / Output

Test Set Up

The EUT is placed on the wooden table. The RF Output port is connected to a load string. The Optical in port is connected to a support Optical converter. The Support optical converter receives the RF signal and converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates an RF signal.

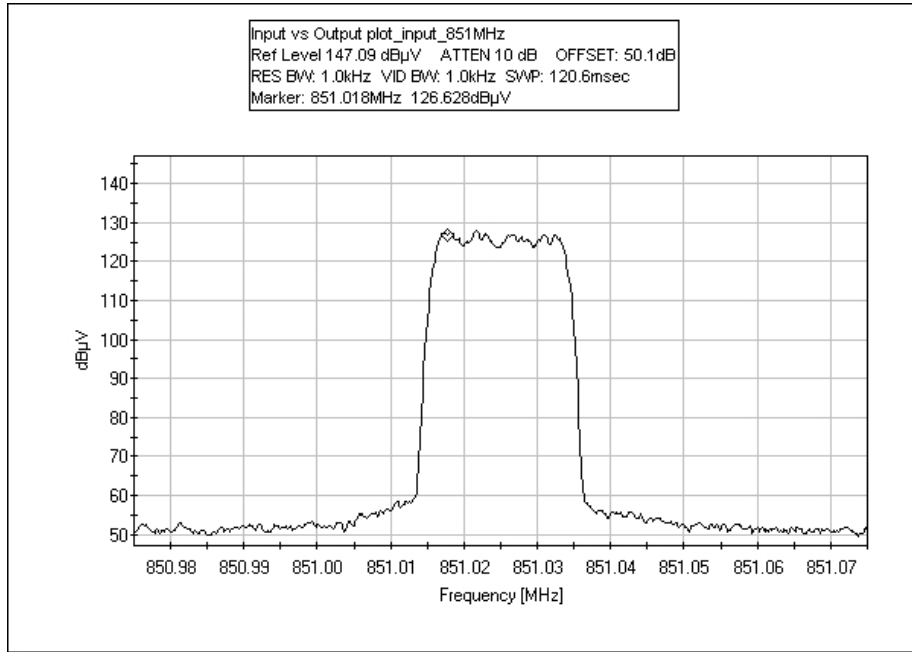
Power = 43dBm=20 watt
 RF output port Service 2
 Operating range: 851-869MHz.
 Modulation: iDEN
 Freq = 851.025MHz, 860.000MHz, 868.975 MHz

The Output waveform is recorded with a spectrum analyzer at the Antenna port of the device.
 The Input waveform is recorded with a spectrum analyzer at the RF out of the support ESG.

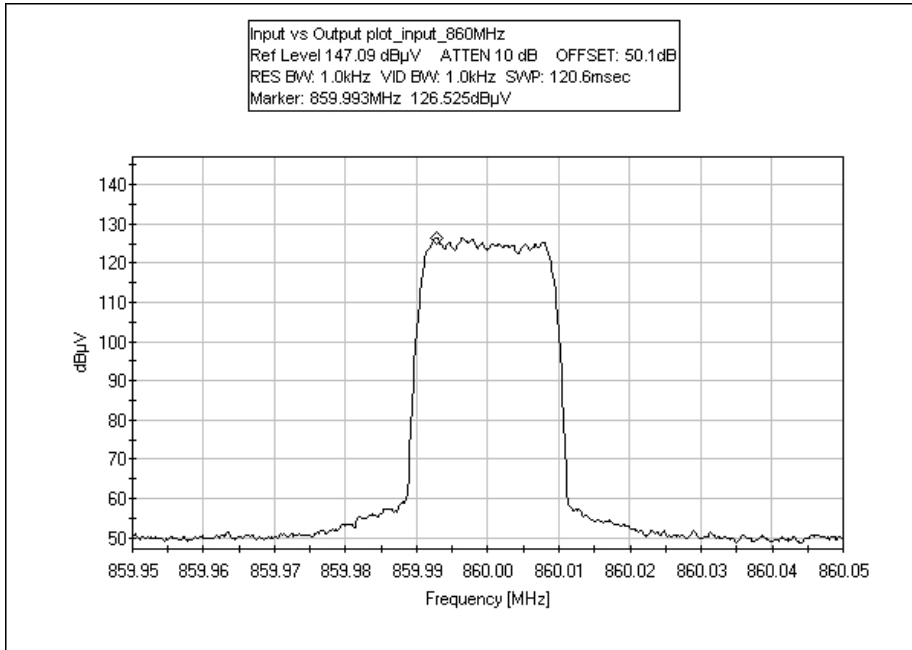
Engineer Name: E. Wong

Test Equipment				
Equipment	Serial	Cal Date	Cal Due	Asset
Spectrum Analyzer	MY46186290	2/21/2009	2/21/2011	AN02869
Cable	32022/2904K36TC	10/28/2009	10/28/2011	AN03174

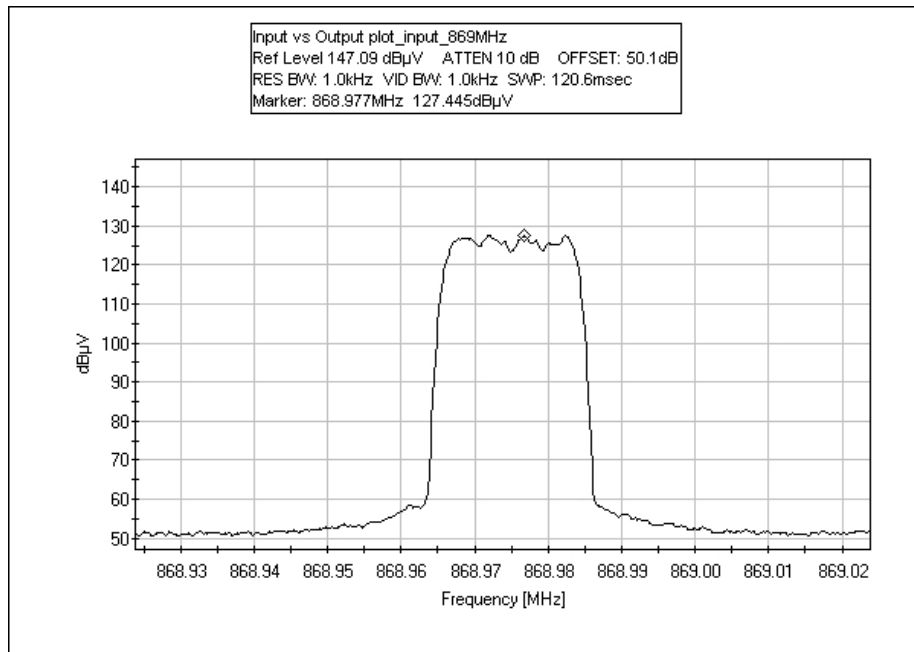
Test Data



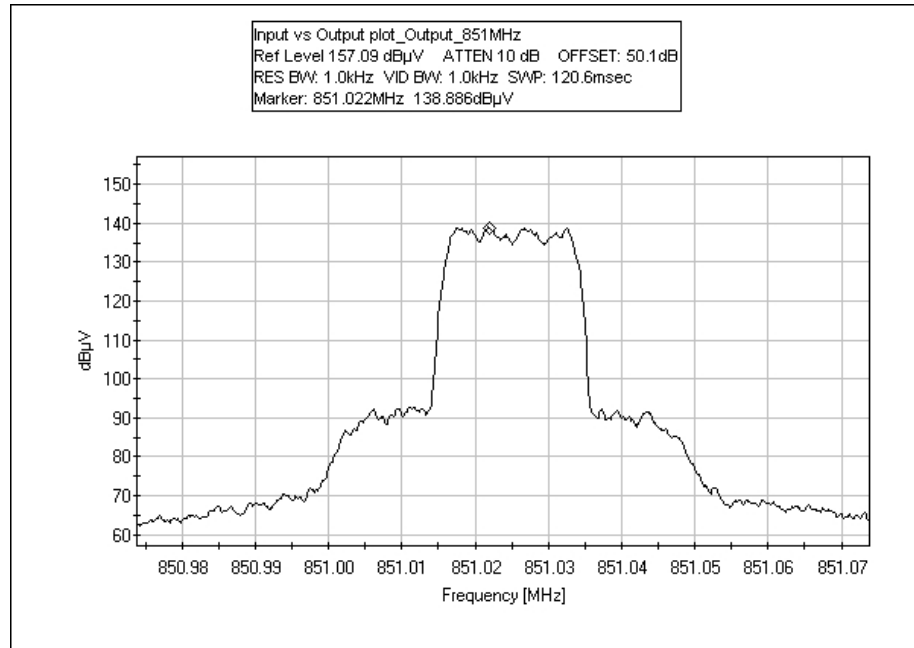
Input_851MHz



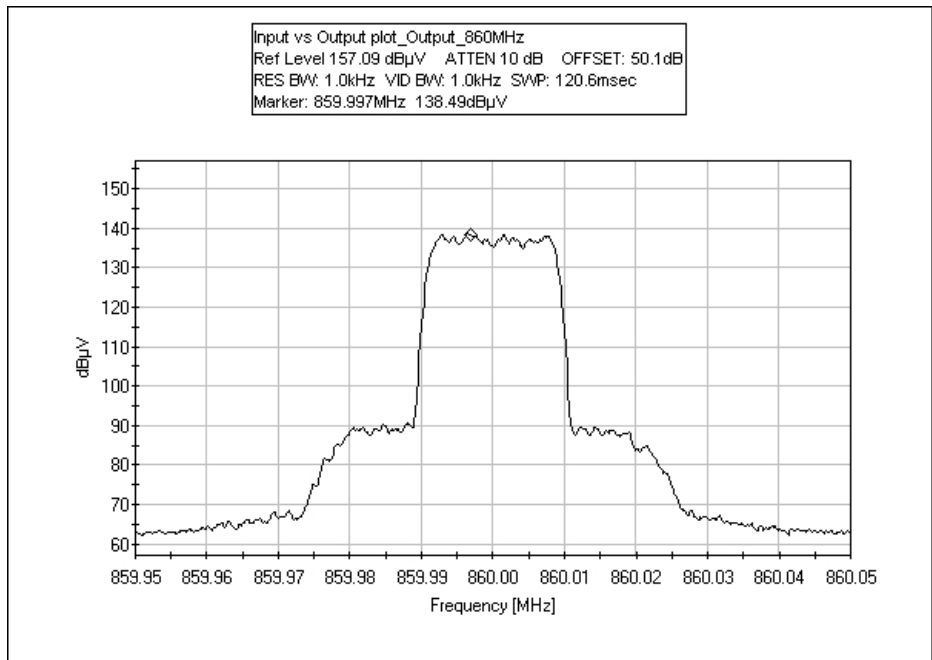
Input_860MHz



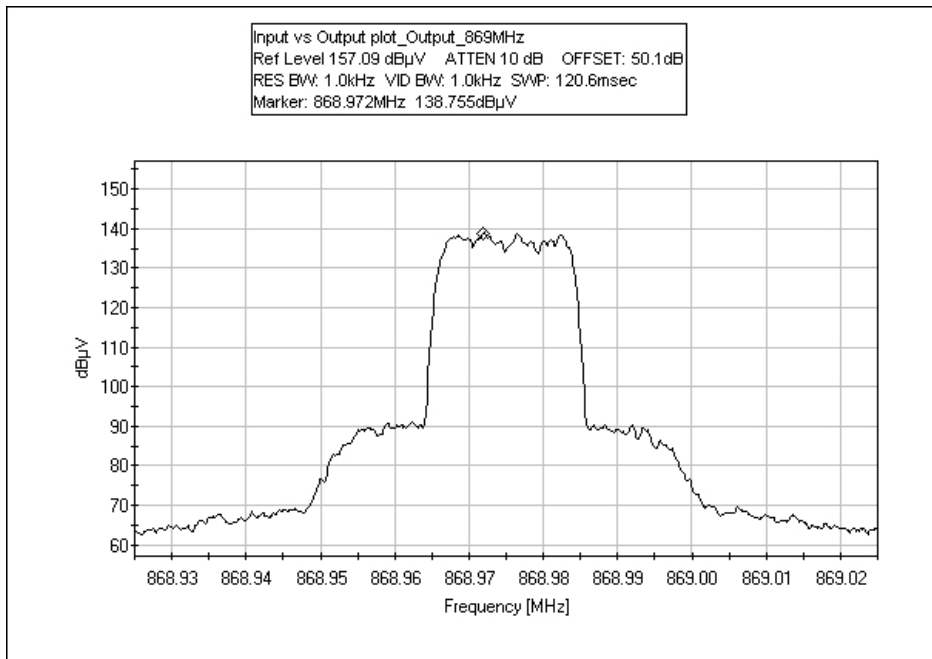
Input_869MHz



Output_851MHz



Output_860MHz



Output_869MHz

Test Setup Photos



2.1049 (I) INPUT / OUTPUT TEST SET UP

2.1051 - Spurious Emissions at Antenna Terminal

Test Data

Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer:	Powerwave Technologies		
Specification:	47 CFR §90.210(g) Spurious Emissions	Date:	7/26/2010
Work Order #:	88274	Time:	10:24:25
Test Type:	Conducted Emissions	Sequence#:	3
Equipment:	Nexus Dual Band Repeater	Tested By:	E. Wong
Manufacturer:	Powerwave Technologies, Inc.		110V 60Hz
Model:	RH905022/13B		
S/N:	NA		

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	2/21/2009	2/21/2011
	AN03174	Cable	16301	10/28/2009	10/28/2011
	AN03169	High Pass Filter	HM1155-11SS	9/14/2009	9/14/2011
	ANdBuV	Unit Conversion		4/12/2010	4/12/2012

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Nexus Dual Band Repeater*	Powerwave Technologies, Inc.	RH905022/13B	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Pre Amp	Minicircuit	ZHL4240_SAM	D092397-19
Optical Converter Module	Powerwave Technologies, Inc	NA	NA
Signal Generator	Aeroflex	IFR343B3	3410051078
Spectrum Analyzer	Agilent	8561EC	3946A00167

Test Conditions / Notes:

The EUT is placed on the wooden table. The RF Output port is connected to a load string. The Optical in port is connected to a support Optical converter. The Support optical converter receives the RF signal and converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates an RF signal.

Power = 43dBm=20 watt
 RF output port Service 2
 Operating range: 851-869MHz.
 Modulation: iDEN
 Freq = 851.025MHz, 860.000MHz, 868.975 MHz
 The insertion loss of the RF attenuator was measured and compensated as measurement offset of the spectrum analyzer.
 29 °C, 39% Relative Humidity
 Frequency range of measurement = 9 kHz- 9 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-9,000 MHz RBW=1 MHz, VBW=1 MHz.
 Detection was performed with the aid of High Pass Filter at the required resolution bandwidth.
No Emission found.

Ext Attn: 0 dB

Measurement Data:

Reading listed by margin.

Test Lead: Antenna port

#	Freq MHz	Rdng dB μ V	Reading listed by margin.				Dist Table	Corr dBm	Spec dBm	Margin dB	Polar Ant
---	-------------	--------------------	---------------------------	--	--	--	---------------	-------------	-------------	--------------	--------------



Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Powerwave Technologies**
 Specification: **47 CFR §90.210(h) Spurious Emissions**
 Work Order #: **88274** Date: 7/26/2010
 Test Type: **Conducted Emissions** Time: 10:24:25
 Equipment: **Nexus Dual Band Repeater** Sequence#: 3
 Manufacturer: Powerwave Technologies, Inc. Tested By: E. Wong
 Model: RH905022/13B 110V 60Hz
 S/N: NA

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	2/21/2009	2/21/2011
	AN03174	Cable	16301	10/28/2009	10/28/2011
	AN03169	High Pass Filter	HM1155-11SS	9/14/2009	9/14/2011
	ANdBuV	Unit Conversion		4/12/2010	4/12/2012

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Nexus Dual Band Repeater*	Powerwave Technologies, Inc.	RH905022/13B	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Pre Amp	Minicircuit	ZHL4240_SAM	D092397-19
Optical Converter Module	Powerwave Technologies, Inc	NA	NA
Signal Generator	Aeroflex	IFR343B3	3410051078
Spectrum Analyzer	Agilent	8561EC	3946A00167

Test Conditions / Notes:

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Power = 43dBm=20 watt
 RF output port Service 2
 Operating range: 851-869MHz.
 Modulation: iDEN
 Freq = 851.025MHz, 860.000MHz, 868.975 MHz
 The insertion loss of the RF attenuator was measured and compensated as measurement offset of the spectrum analyzer.
 29°C, 39% Relative Humidity
 Frequency range of measurement = 9 kHz- 9 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-9,000 MHz RBW=1 MHz, VBW=1 MHz.
 Detection was performed with the aid of High Pass Filter at the required resolution bandwidth.
No Emission found.

Ext Attn: 0 dB

Measurement Data:

Reading listed by margin.

Test Lead: Antenna port

#	Freq MHz	Rdng dB μ V	Reading listed by margin.				Dist Table	Corr dBm	Spec dBm	Margin dB	Polar Ant
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Test Setup Photos



2.1051 CONDUCTED SPURIOUS EMISSIONS TEST SET UP

2.1053 - Field Strength of Spurious Radiation

Test Data

Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Powerwave Technologies**
 Specification: **FCC 90.210(G) Radiated Spurious Emission**
 Work Order #: **88274** Date: 7/26/2010
 Test Type: **Radiated Scan** Time: 15:38:46
 Equipment: **Nexus Dual Band Repeater** Sequence#: 4
 Manufacturer: Powerwave Technologies, Inc. Tested By: E. Wong
 Model: RH905022/13B
 S/N: NA

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	2/21/2009	2/21/2011
	ANdBuV	Unit Conversion		4/12/2010	4/12/2012
	AN01995	Biconilog Antenna	CBL6111C	3/8/2010	3/8/2012
	AN00309	Preamp	8447D	5/7/2010	5/7/2012
	ANP05050	Cable	RG223/U	4/16/2009	4/16/2011
	ANP05198	Cable	8268	1/5/2009	1/5/2011
T1	AN00849	Horn Antenna	3115	4/23/2010	4/23/2012
T2	AN00786	Preamp	83017A	7/28/2008	7/28/2010
T3	AN02948	Cable	32022-2-2909K-24TC	9/21/2009	9/21/2011
T4	ANP05565	Cable	ANDL-1-PNMN-54	9/4/2008	9/4/2010
T5	AN03169	High Pass Filter	HM1155-11SS	9/14/2009	9/14/2011
	AN00314	Loop Antenna	6502	6/30/2010	6/30/2012

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Nexus Dual Band Repeater*	Powerwave Technologies, Inc.	RH905022/13B	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Pre Amp	Minicircuit	ZHL4240_SAM	D092397-19
Optical Converter Module	Powerwave Technologies, Inc	Na	NA
Signal Generator	Aeroflex	IFR343B3	3410051078
Spectrum Analyzer	Agilent	8561EC	3946A00167

Test Conditions / Notes:

The EUT is placed on the wooden table. The RF Output port is connected to a load string. The Optical in port is connected to a support Optical converter. The Support optical converter receives the RF signal and converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates an RF signal.
 Power = 43dBm=20 watt
 RF output port Service 2
 Operating range: 851-869MHz.
 Modulation: iDEN
 Freq = 851.025MHz, 860.000MHz, 868.975 MHz
 29°C, 39% Relative Humidity
 Frequency range of measurement = 9 kHz- 9 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-9,000 MHz RBW=1 MHz, VBW=1 MHz.

Operating Frequency: 794 MHz - 806 MHz
 Channels: Low, Mid and High
 Highest Measured Output Power: 43.01 ERP(dBm)= 20 ERP(Watts)
 Distance: 3 meters
 Limit: $43+10\log(P)=$ 56.01 dBc

Freq. (MHz)	Reference Level (dBm)	Antenna Polarity (H/V)	dBc
2,606.93	-53.3	Vert	96.31
3,475.90	-48.1	Vert	91.11
2,606.93	-46	Horiz	89.01
3,475.90	-41.6	Horiz	84.61
2,580.00	-46.3	Horiz	89.31
3,440.09	-33.4	Horiz	76.41
6,020.09	-46.6	Horiz	89.61
2,580.09	-53.8	Vert	96.81
3,440.05	-45.6	Vert	88.61
2,553.13	-54.9	Vert	97.91
3,404.15	-47	Vert	90.01
1,702.10	-54.5	Horiz	97.51
2,552.94	-47.6	Horiz	90.61
3,404.03	-40.9	Horiz	83.91

Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Powerwave Technologies**
 Specification: **FCC 90.210(H) Radiated Spurious Emission**
 Work Order #: **88274** Date: 7/26/2010
 Test Type: **Radiated Scan** Time: 15:38:46
 Equipment: **Nexus Dual Band Repeater** Sequence#: 4
 Manufacturer: Powerwave Technologies, Inc. Tested By: E. Wong
 Model: RH905022/13B
 S/N: NA

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	2/21/2009	2/21/2011
	ANdBuV	Unit Conversion		4/12/2010	4/12/2012
	AN01995	Biconilog Antenna	CBL6111C	3/8/2010	3/8/2012
	AN00309	Preamp	8447D	5/7/2010	5/7/2012
	ANP05050	Cable	RG223/U	4/16/2009	4/16/2011
	ANP05198	Cable	8268	1/5/2009	1/5/2011
T1	AN00849	Horn Antenna	3115	4/23/2010	4/23/2012
T2	AN00786	Preamp	83017A	7/28/2008	7/28/2010
T3	AN02948	Cable	32022-2-2909K-24TC	9/21/2009	9/21/2011
T4	ANP05565	Cable	ANDL-1-PNMN-54	9/4/2008	9/4/2010
T5	AN03169	High Pass Filter	HM1155-11SS	9/14/2009	9/14/2011
	AN00314	Loop Antenna	6502	6/30/2010	6/30/2012

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Nexus Dual Band Repeater*	Powerwave Technologies, Inc.	RH905022/13B	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Pre Amp	Minicircuit	ZHL4240_SAM	D092397-19
Optical Converter Module	Powerwave Technologies, Inc	NA	NA
Signal Generator	Aeroflex	IFR343B3	3410051078
Spectrum Analyzer	Agilent	8561EC	3946A00167

Test Conditions / Notes:

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 Operating range: 851-869MHz.
 Modulation: iDEN
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 29°C, 39% Relative Humidity
 Frequency range of measurement = 9 kHz- 9 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-9,000 MHz RBW=1 MHz, VBW=1 MHz.

Operating Frequency: 794 MHz - 806
 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
2,606.93	-53.3	Vert	96.31
3,475.90	-48.1	Vert	91.11
2,606.93	-46	Horiz	89.01
3,475.90	-41.6	Horiz	84.61
2,580.00	-46.3	Horiz	89.31
3,440.09	-33.4	Horiz	76.41
6,020.09	-46.6	Horiz	89.61
2,580.09	-53.8	Vert	96.81
3,440.05	-45.6	Vert	88.61
2,553.13	-54.9	Vert	97.91
3,404.15	-47	Vert	90.01
1,702.10	-54.5	Horiz	97.51
2,552.94	-47.6	Horiz	90.61
3,404.03	-40.9	Horiz	83.91

LIMIT LINE FOR SPURIOUS RADIATED EMISSION

REQUIRED ATTENUATION = 43+10 LOG P (DB)

For radiated spurious emission measured at 3 meter test distance,

Required attenuation = 43+10 Log P_{t at 3 meter} dB
 Limit line (dBuV) = E_{dBuV} - Attenuation

E_{dBuV} = Measured field strength at 3 meter in dBuV/m

Power Density (Isotropic)

$$P_D = \frac{P_t}{4\pi r^2}$$

P_D = Power Density in Watts /m²
 P_t = Average Transmit Power
 r = Test distance

Field Intensity E (V/m)

$$E = \sqrt{P_D \times 377}$$

$$E = \frac{\sqrt{P_t \times 377}}{4\pi r^2}$$

$$E = \sqrt{\frac{P_t \times 30}{r^2}}$$

$$P_t = \left(\frac{E^2 \times r^2}{30} \right)$$

$$10 \text{ Log } P_t = 10 \text{ Log } E^2 \text{ (V/m)} + 10 \text{ Log } r^2 - 10 \text{ Log } 30$$

$$10 \text{ Log } P_t = 20 \text{ Log } E \text{ (V/m)} + 20 \text{ Log } r - 10 \text{ Log } 30$$

At 3 meter, $r = 3 \text{ m}$

$$10 \text{ Log } P_t = 20 \text{ Log } E \text{ (V/m)} + 20 \text{ Log } 3 - 10 \text{ Log } 30$$

$$10 \text{ Log } P_t = 20 \text{ Log } E \text{ (V/m)} + 9.54 - 14.77$$

$$10 \text{ Log } P_t = 20 \text{ Log } E \text{ (V/m)} - 5.23$$

Since $20 \text{ Log } E \text{ (V/m)} = 20 \text{ Log } E \text{ (uV/m)} - 120$

$$10 \text{ Log } P_t = 20 \text{ Log } E \text{ (uV/m)} - 120 - 5.23$$

$$10 \text{ Log } P_t = 20 \text{ Log } E \text{ (uV/m)} - 125.23$$

$$\begin{aligned} \text{Limit line (dBuV) at 3 meter} &= E_{\text{dBuV}} - \text{Attenuation} \\ &= E_{\text{dBuV}} - (43 + 10 \text{ Log } P_{t \text{ at 3 meter}}) \\ &= E_{\text{dBuV}} - 43 - 10 \text{ Log } P_{t \text{ at 3 meter}} \\ &= E_{\text{dBuV}} - 43 - (20 \text{ Log } E \text{ (uV/m)} - 125.23) \\ &= E_{\text{dBuV}} - 43 - 20 \text{ Log } E \text{ (uV/m)} + 125.23 \\ &= E_{\text{dBuV}} - 20 \text{ Log } E \text{ (uV/m)} + 82.23 \end{aligned}$$

Since $20 \text{ Log } E \text{ (uV/m)} = E \text{ in dBuV/m}$

$$= E_{\text{dBuV}} - E_{\text{dBuV}} + 82.23$$

$$\text{Radiated Emission limit 3 meter} = 82.23 \text{ dBuV (-24.8dBm) at any power level measured in dBuV}$$

Test Setup Photos



2.1053 RADIATED SPURIOUS EMISSIONS TEST SET UP



2.1053 RADIATED SPURIOUS EMISSIONS TEST SET UP

FCC_Bandedge

Test Set Up

The EUT is placed on the wooden table. The RF Output port is connected to a load string. The Optical in port is connected to a support Optical converter. The Support optical converter receives the RF signal and converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates an RF signal.

The blockedge plot is recorded with a spectrum analyzer at the Antenna port of the device.
The insertion loss of the RF attenuator was measured and compensated as measurement offset of the spectrum analyzer.

The Adjacent Channel Power function of the spectrum analyzer was employed to show bandedge compliance in accordance with instrument setting requirement of 90.210 (o) *For frequencies more than 50 kHz removed from the edge of the authorized bandwidth a resolution of at least 100 kHz must be used for frequencies below 1000 MHz.*

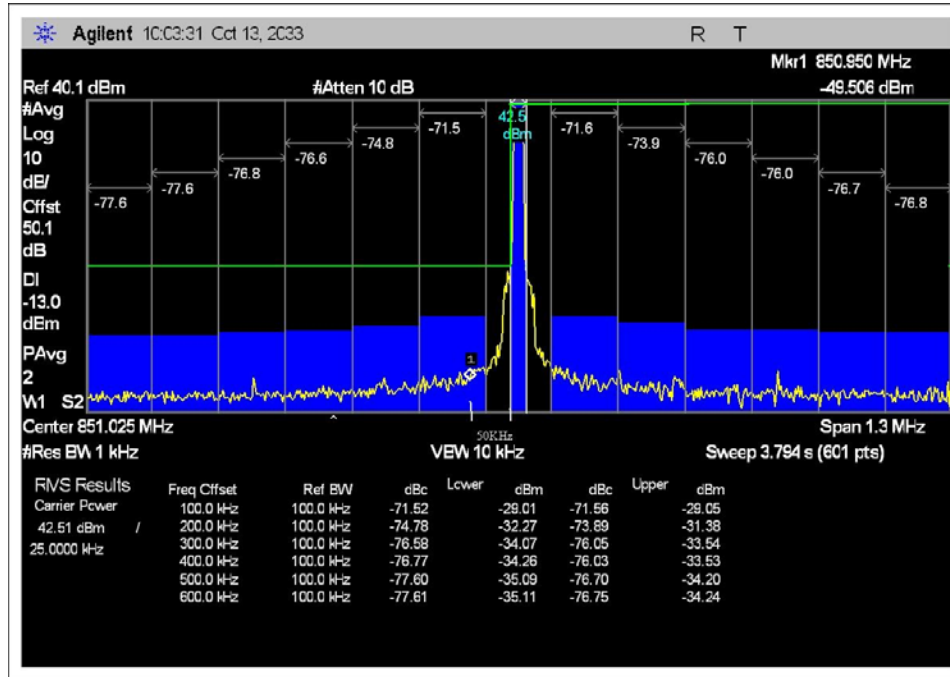
RF output port Service 2
Operating range: 869-894MHz.

Modulation: iDEN
Freq = 851.025MHz, 860.000MHz, 868.975MHz

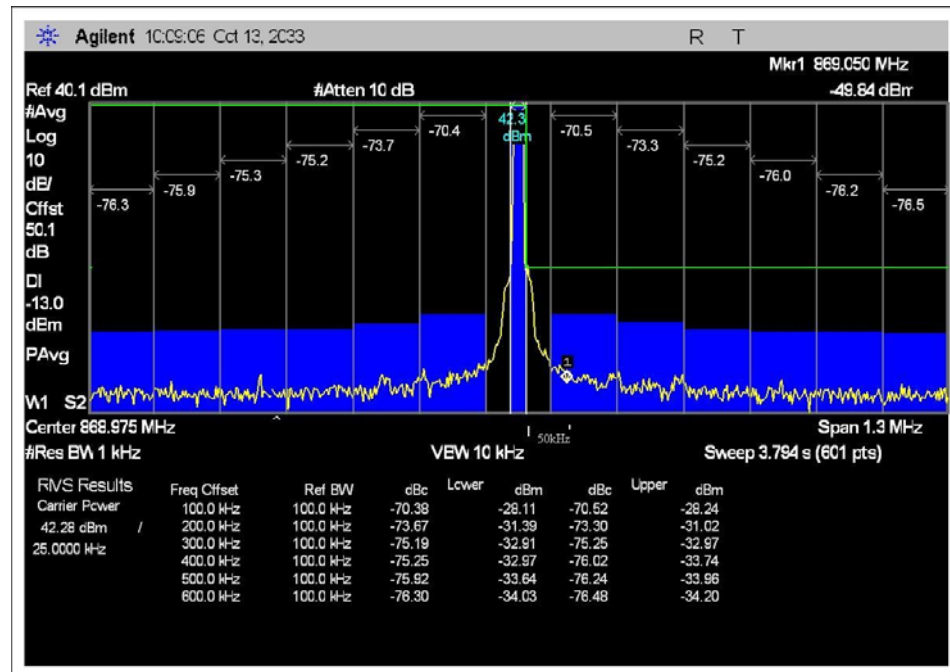
Engineer Name: E. Wong

Test Equipment				
Equipment	Serial	Cal Date	Cal Due	Asset
Spectrum Analyzer	MY46186290	2/21/2009	2/21/2011	AN02869
Cable	32022/2904K36TC	10/28/2009	10/28/2011	AN03174

Test Data



BANDEDGE ADJACENT CHANNEL POWER LOW.



BANDEDGE ADJACENT CHANNEL POWER HIGH

Test Setup Photos



FCC BANDEDGE TEST SET UP

FCC_Intermodulation

Test Set up

The EUT is placed on the wooden table. The RF Output port is connected to a load string. The Optical in port is connected to a support Optical converter. The Support optical converter receives the RF signal and converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates an RF signal.

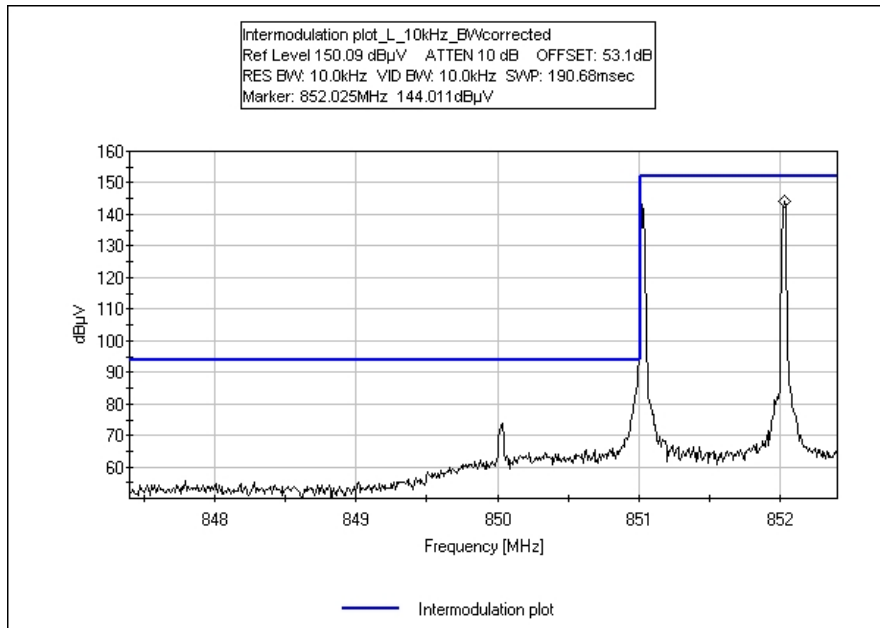
Power = 43dBm=20 watt
 RF output port Service 2
 Operating range: 851-869MHz.
 Modulation: iDEN

Two modulated signal from the support ESG is injected into the device and the intermodulation product is measured at the RF antenna port under investigation. Reduced resolution bandwidth was used, with appropriate bandwidth correction applied.

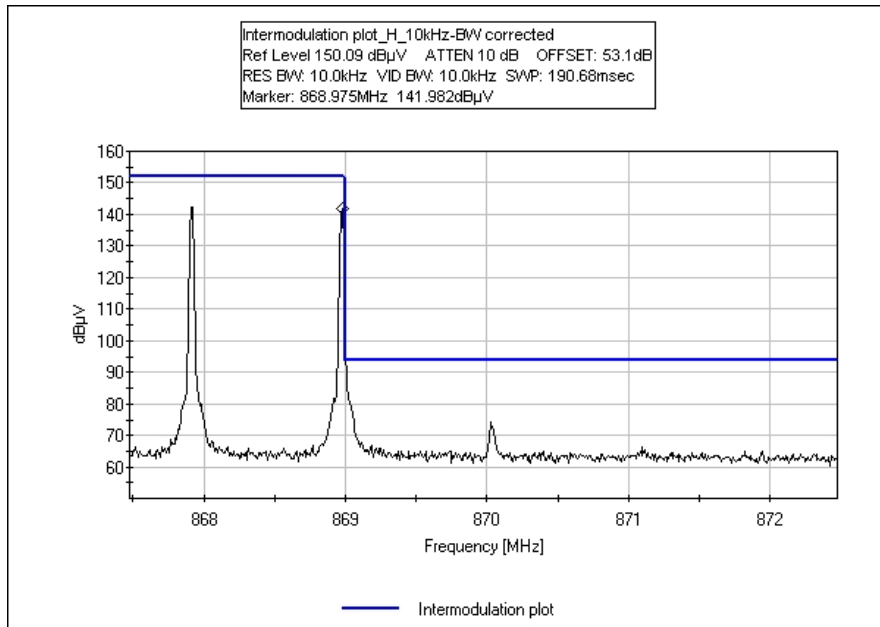
Engineer Name: E. Wong

Test Equipment				
Equipment	Serial	Cal Date	Cal Due	Asset
Spectrum Analyzer	MY46186290	2/21/2009	2/21/2011	AN02869
Cable	32022/2904K36TC	10/28/2009	10/28/2011	AN03174

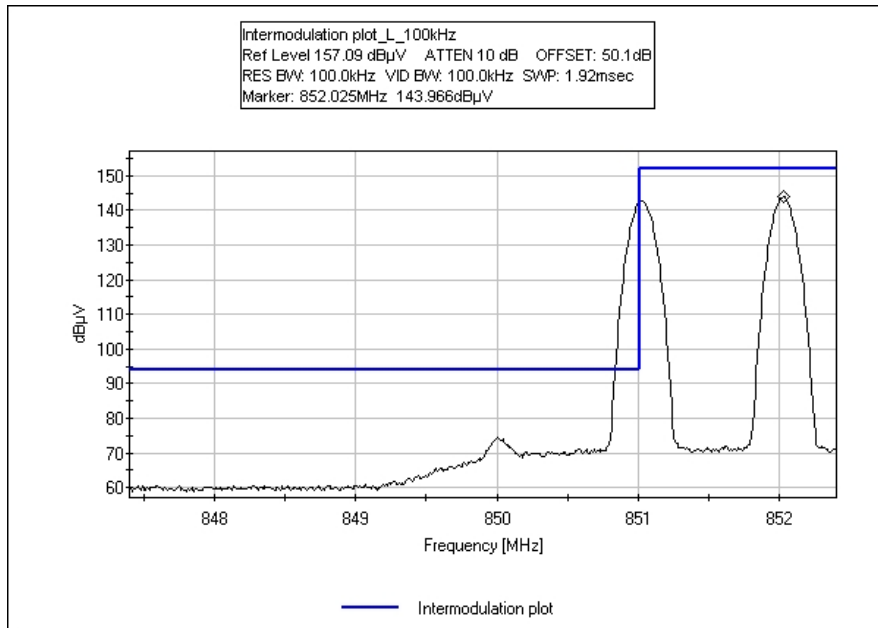
Test Data



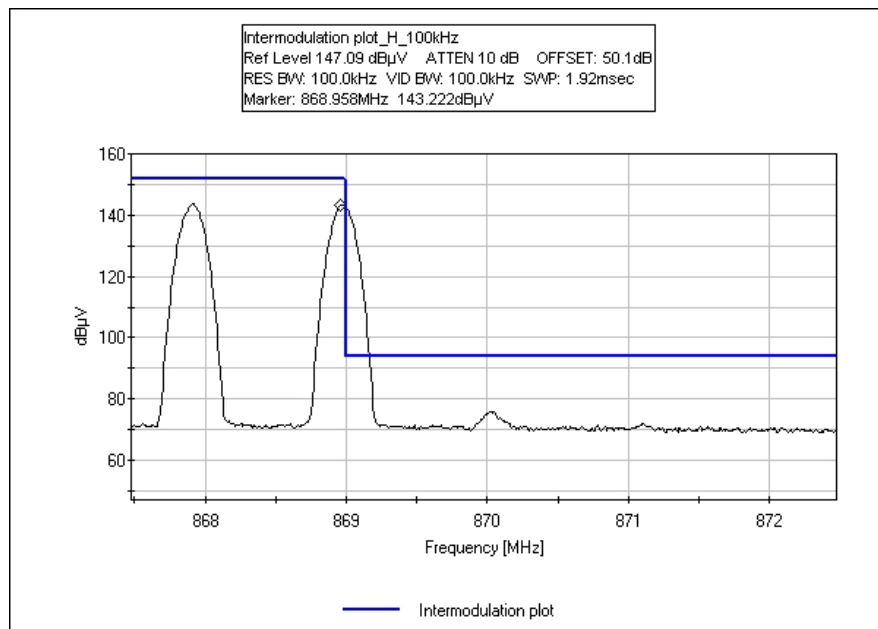
INTERMODULATION_L_10KHZ_BANDWIDTH CORRECTED



INTERMODULATION_H_10KHZ-BANDWIDTH CORRECTED



INTERMODULATION_L_100KHZ



INTERMODULATION_H_100KHZ

Test Setup Photos



INTERMODULATION TEST SET UP

Out of Band Rejection

Test Set up

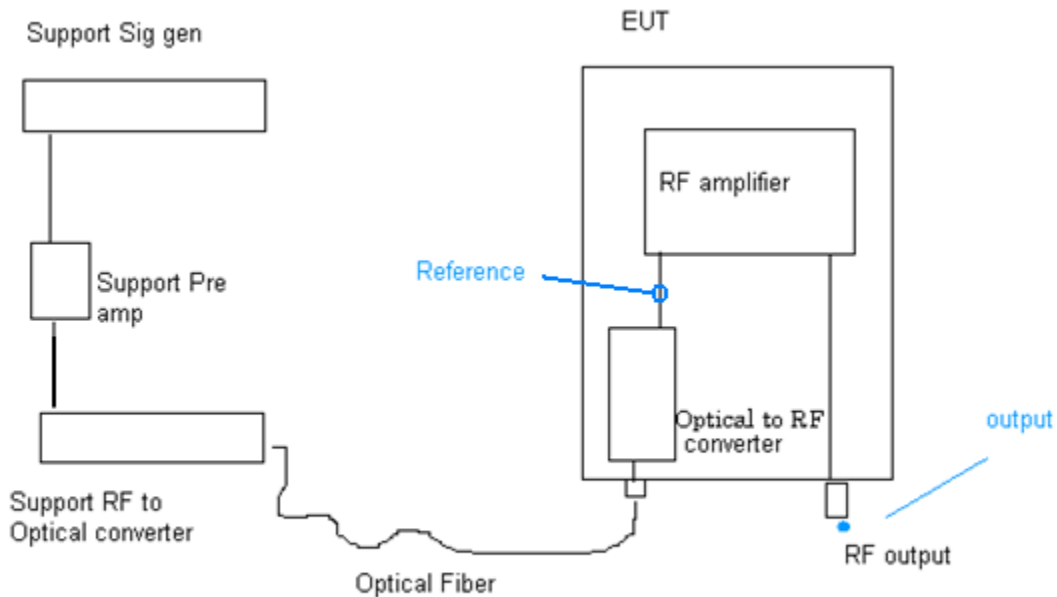
The EUT is placed on the wooden table. The RF Output port is connected to a load string. The Optical port is connected to an Optical Converter. The Support optical converter receives the RF signal, converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal and generates a RF signal.

To measure the System RF gain, the reference was established at the input of the RF amplifier section, by- passing the optical convertor. The Out of band Rejection plot is captured with a Network Analyzer.

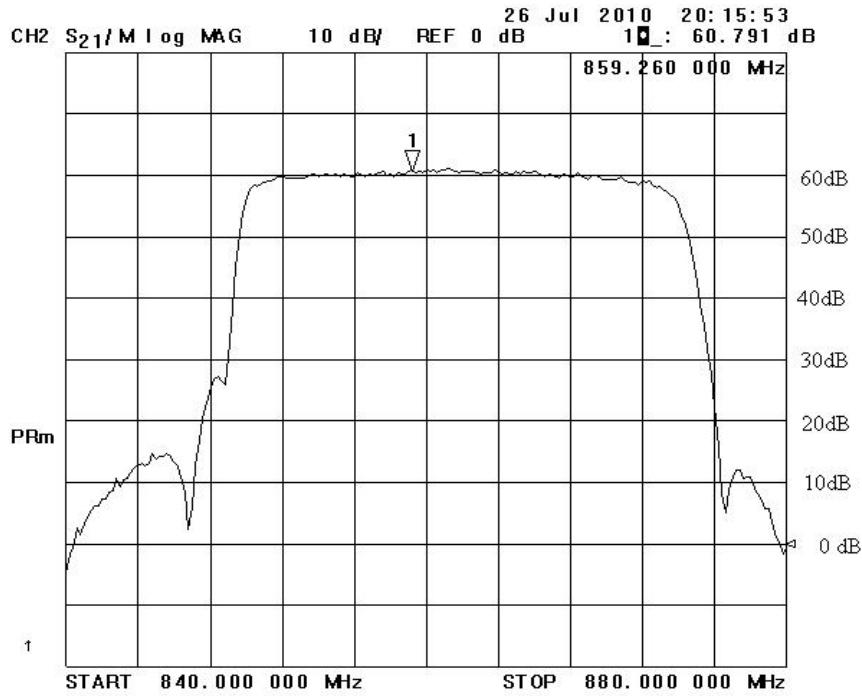
Engineer Name: E. Wong

Test Equipment				
Equipment	Serial	Cal Date	Cal Due	Asset
Network Analyzer	US37309342	07/27/10	07/27/12	C00024

Out of band Rejection



Test Data



Test Setup Photos



OUT OF BAND REJECTION TEST SET UP

RSS - 131

99% Bandwidth

Test Set up

The EUT is placed on the wooden table. The RF Output port is connected to a load string. The Optical in port is connected to a support Optical converter. The Support optical converter receives the RF signal and converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates an RF signal.

99% Bandwidth is recorded with a spectrum analyzer at the Antenna port of the device.

The insertion loss of the RF attenuator was measured and compensated as measurement offset of the spectrum analyzer.

RF output port Service 2

Operating range: 869-894MHz.

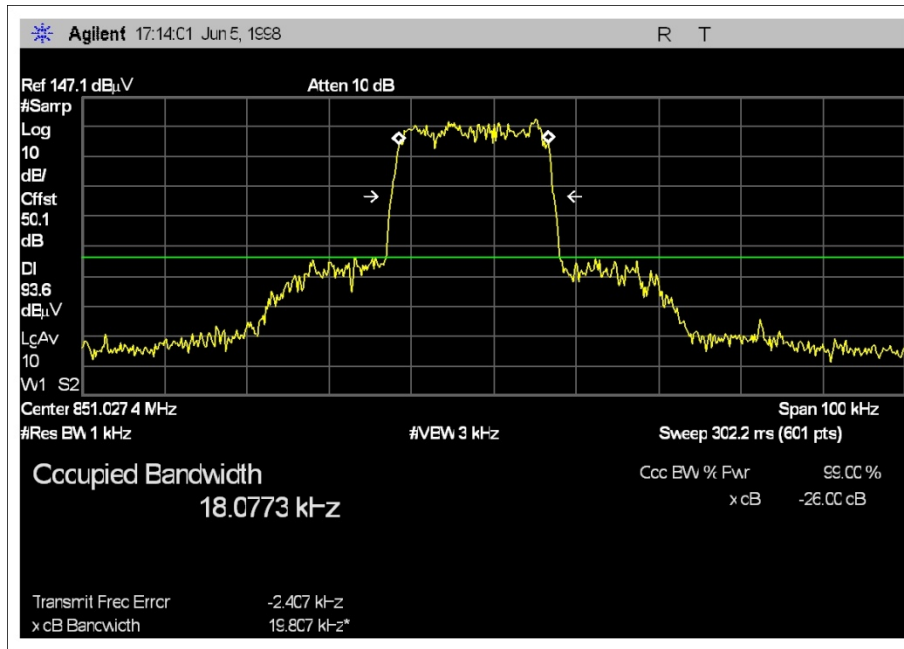
Modulation: iDEN

Freq = 851.025MHz, 860.000MHz, 868.975 MHz

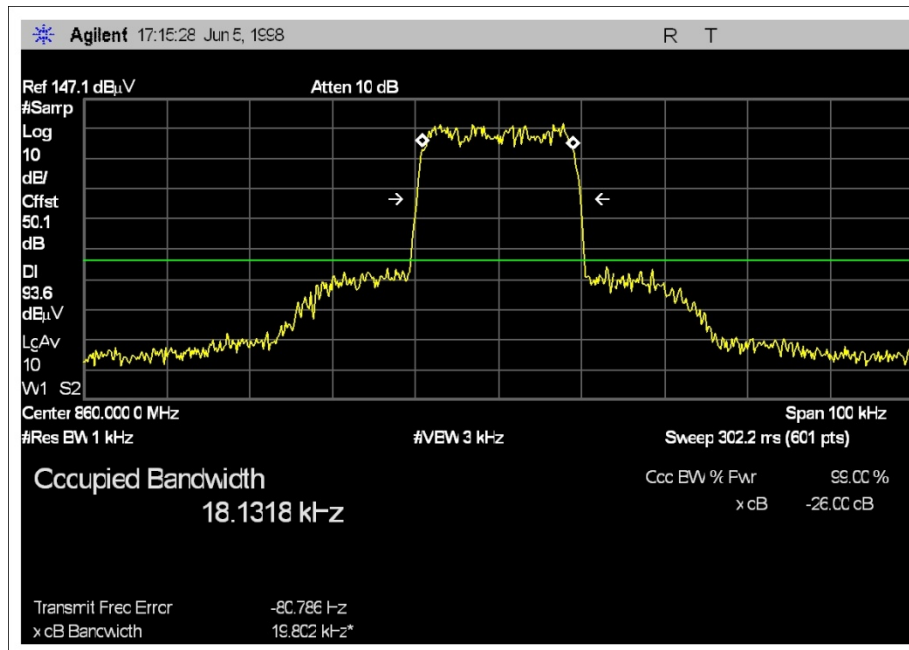
Engineer Name: E. Wong

Test Equipment				
Equipment	Serial	Cal Date	Cal Due	Asset
Spectrum Analyzer	MY46186290	2/21/2009	2/21/2011	AN02869
Cable	32022/2904K36TC	10/28/2009	10/28/2011	AN03174

Test Data



99% BANDWIDTH=18kHz_851MHz



99% BANDWIDTH=18kHz_860MHz



99% BANDWIDTH=18kHz_869MHz.

Test Setup Photos



99% BANDWIDTH TEST SET UP

RF Output Power

Test Set up

The EUT is a RF amplifier. The manufacture 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 IAW **RSS 131, 4.3.1** requirement.

Measured Po1 =+ 43.3 dBm

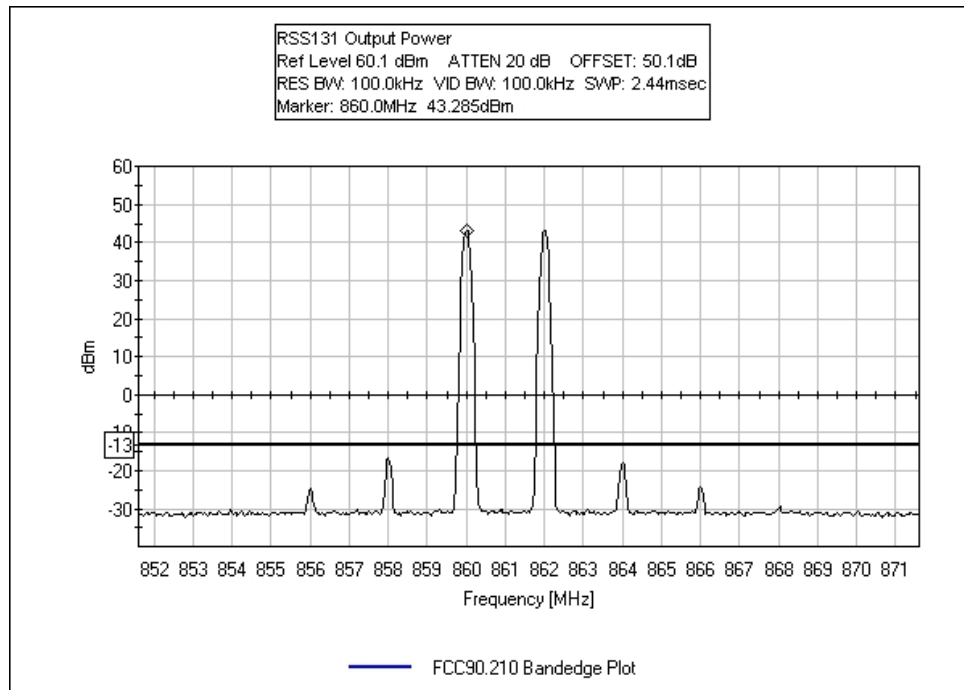
P mean = Po1 + 3 dB = **43.3 + 3 dBm = 46.3 dBm = 42.6 W**

Note: The over power protection circuit of the EUT was activated and shuts off the RF output at Po1 of 43.3dBm before the intermodulation achieved power level of -13dBm

Engineer Name: E. Wong

Test Equipment				
Equipment	Serial	Cal Date	Cal Due	Asset
Spectrum Analyzer	MY46186290	2/21/2009	2/21/2011	AN02869
Cable	32022/2904K36TC	10/28/2009	10/28/2011	AN03174

Test Data



Test Setup Photos



RF OUTPUT POWER TEST SET UP

Amplifier Gain and Bandwidth

Test Set up

The EUT is placed on the wooden table. The RF Output port is connected to a load string. The Optical port is connected to an Optical Converter. The Support optical converter receives the RF signal, converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal and generated a RF signal.

To measure the System RF gain, the reference was established at the input of the RF amplifier section, by- passing the optical convertor. The manufacture declared gain is system RF gain.

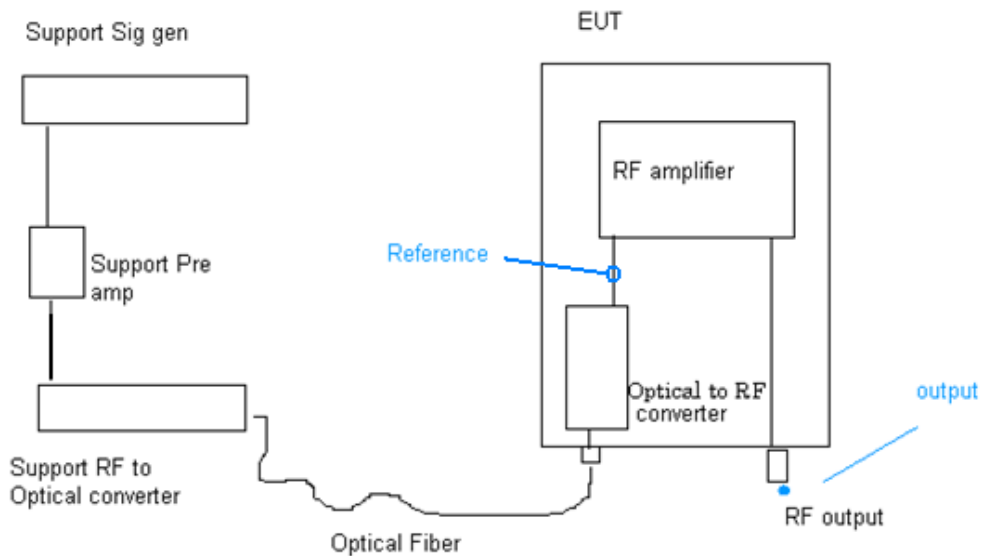
The system RF gain is measured with a Network Analyzer.

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.

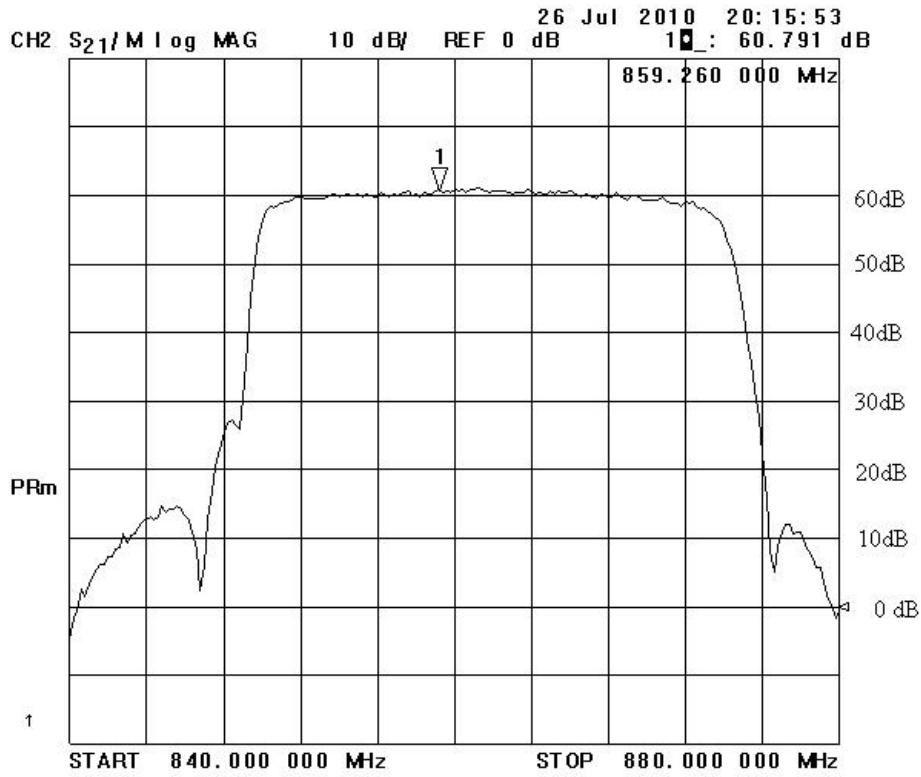
Test Equipment				
Equipment	Serial	Cal Date	Cal Due	Asset
Network analyzer	US37309342	07/27/10	07/27/12	C00024

RSS 131 Amplifier Gain and Bandwidth:

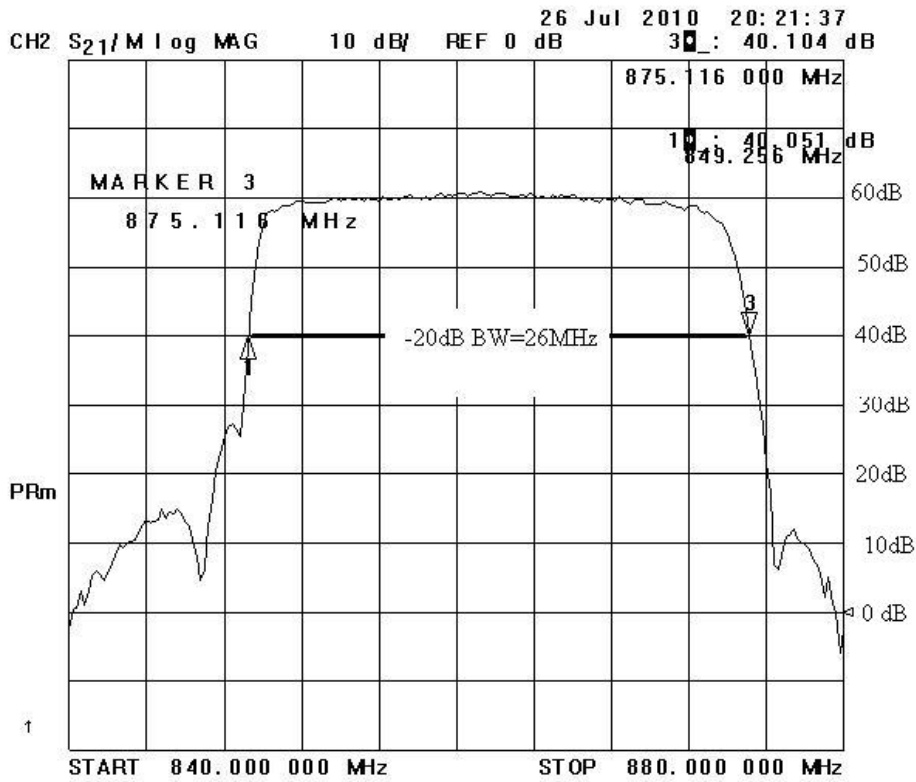
4.2 Passband Gain and Bandwidth



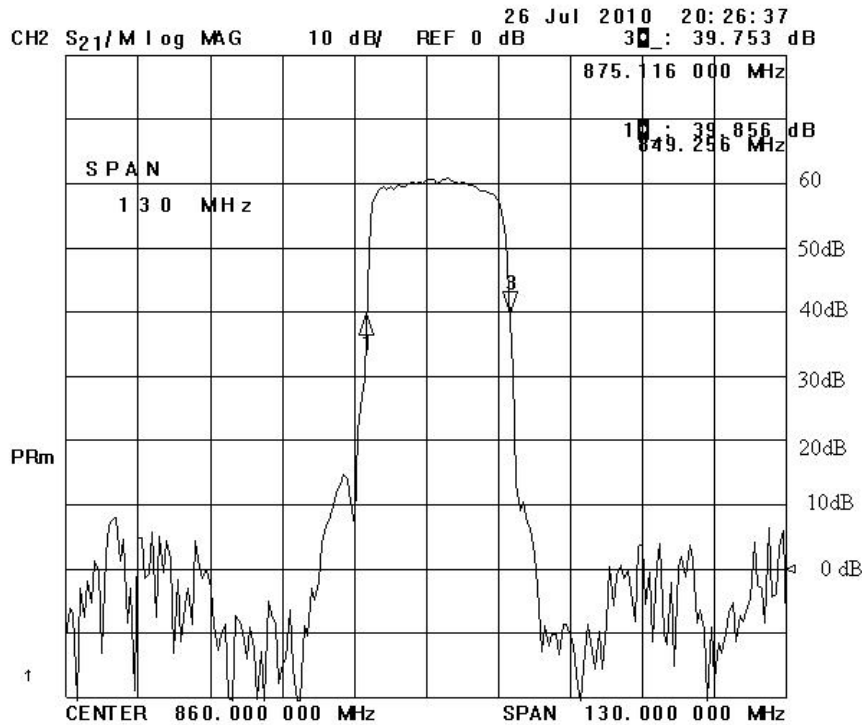
Test Data



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



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



The gain-versus-frequency response of the amplifier from the mid band Fo of the pass band up to at least fo + - 250% of the 220dB 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.

Test Setup Photos



AMPLIFIER GAIN AND BANDWIDTH TEST SET UP

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

The reported measurement uncertainties are calculated based on the worst case of all laboratory environments from CKC Laboratories, Inc. test sites. Only those parameters which require estimation of measurement uncertainty are reported. The reported worst case measurement uncertainty is less than the maximum values derived in CISPR 16-4-2. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit.

SAMPLE CALCULATIONS		
	Meter reading	(dB μ V)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dB μ V/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used. When conducted emissions testing was performed, a 10 dB external attenuator was used with internal offset correction in the analyzer.

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the highest readings, this is indicated as a "QP" or an "Ave" on the appropriate rows of the data sheets. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer/receiver readings recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the measuring device called "peak hold," the measuring device had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the quasi-peak detector.

Average

For certain frequencies, average measurements may be made using the spectrum analyzer/receiver. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.