



**ADDENDUM TO POWERWAVE TECHNOLOGIES, INC.
TEST REPORT FC07-001A**

FOR THE

**REPEATERS, RH300020/211 & RH300020/100
FCC PART 24 AND RSS-131**

COMPLIANCE

DATE OF ISSUE: MARCH 19, 2007

PREPARED FOR:

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

P.O. No.: 110144
W.O. No.: 86002/85775

PREPARED BY:

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

Date of test: October 5, 2006 –
March 19, 2007

Report No.: FC07-001B

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ADMINISTRATIVE INFORMATION

DATE OF TEST: October 5, 2006 – March 19, 2007

DATE OF RECEIPT: October 5, 2006

FREQUENCY RANGE TESTED: 9 kHz-20 GHz

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

REPRESENTATIVE: Greg Butler

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

TEST METHOD: FCC Part 24, RSS-131 and RSS GEN

PURPOSE OF TEST: **Original Report:** To demonstrate the compliance of the Repeater, RH300020/110 with the requirements for FCC Part 24 and RSS-131 devices.
Addendum A: To change the model number to RH300020/211 with no new testing.
Addendum B: To add data for testing of the RH300020/100 with the requirements for FCC Part 24 and RSS-131.

FCC TO CANADA STANDARD CORRELATION MATRIX

Canadian Standard	Canadian Section	FCC Standard	FCC Section	Test Description
RSS 131	5.4	N/A	N/A	External Controls
RSS 131	5.5	47 CFR	1.1307	RF Exposure
RSS 131	6.1	N/A	N/A	Passband Gain and Bandwidth
RSS 131	6.2	N/A	N/A	RF Power Output
N/A	N/A	47 CFR	24.232	RF Power Output
RSS 131	6.3	TIA/EIA	603	Non-Linearity (Intermodulation Attenuation)
RSS 131	6.4	47 CFR	24.238	Spurious Emissions Limitations
RSS 131	6.5	N/A	N/A	Frequency Stability (Band Translators)
	3172-A		90473	Site File No.

CONDITIONS FOR COMPLIANCE

No modifications to the EUT were necessary to comply.

APPROVALS

Steve Behm, Director of Engineering Services

QUALITY ASSURANCE:

TEST PERSONNEL:




Joyce Walker, Quality Assurance Administrative Manager

Eddie Wong, EMC Engineer



EQUIPMENT UNDER TEST (EUT) DESCRIPTION

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

The following models were tested by CKC Laboratories: **RH300020/110 & RH300020/100**

Since the time of testing the manufacturer has chosen to use the following model name in place of RH300020/110. Any differences between the names does not affect their EMC characteristics and therefore complies to the level of testing equivalent to the tested model name shown on the data sheets: **RH300020/211**

EQUIPMENT UNDER TEST

Repeater

Manuf: Powerwave Technologies, Inc.
Model: RH300020/211
Serial: NA
FCC ID: E675JS0090

Repeater

Manuf: Powerwave Technologies, Inc.
Model: RH300020/100
Serial: NA
FCC ID: E675JS0090

PERIPHERAL DEVICES

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

Optical Converter

Manuf: Powerwave Technologies, Inc.
Model: NA
Serial: 42473

Spectrum Analyzer

Manuf: HP
Model: 8563E
Serial: NA

Power Meter

Manuf: Agilent
Model: E4419B
Serial: MY40510694

ESG

Manuf: Agilent
Model: E4433B
Serial: US40051840

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

G7W, GXW and F9W

FCC 2.1033 (c)(5) FREQUENCY RANGE

1930 MHz – 1990 MHz.

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

EDGE, GSM, CDMA and WCDMA



FCC 2.1033(c)(14)/2.1046/24.232(a) - RF POWER OUTPUT - RH300020/211

§24.232 Power and antenna height limits.

*(a) Base stations are limited to 1640 watts peak equivalent isotropically radiated power (e.i.r.p.) with an antenna height up to 300 meters HAAT. See 24.53 for HAAT calculation method. Base station antenna heights may exceed 300 meters with a corresponding reduction in power; see Table 1 of this section. **In no case may the peak output power of a base station transmitter exceed 100 watts.** The service area boundary limit and microwave protection criteria specified in §§24.236 and 24.237 apply.*

Table 1: Reduced Power for Base Station Antenna Heights Over 300 Meters

<i>HAAT in meters</i>	<i>Maximum E.I.R.P. (watts)</i>
<i>6300</i>	<i>1640</i>
<i>6500</i>	<i>1070</i>
<i>61000</i>	<i>490</i>
<i>61500</i>	<i>270</i>
<i>62000</i>	<i>160</i>

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 24.238 (a).

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 100 watts.

Test setup: The EUT was placed on the wooden table. The RF Output port was connected to a remote power meter. Optical in port was connected to a support Optical converter. Support optical converter received RF signal and converted the signal to optic and sent it to the EUT. The EUT decoded the optical signal, and generated a RF signal.

Modulation : EDGE and W-CDMA

Frequency	Measured Power
1930 MHz	20W
1960 MHz	20W
1990 MHz	20W

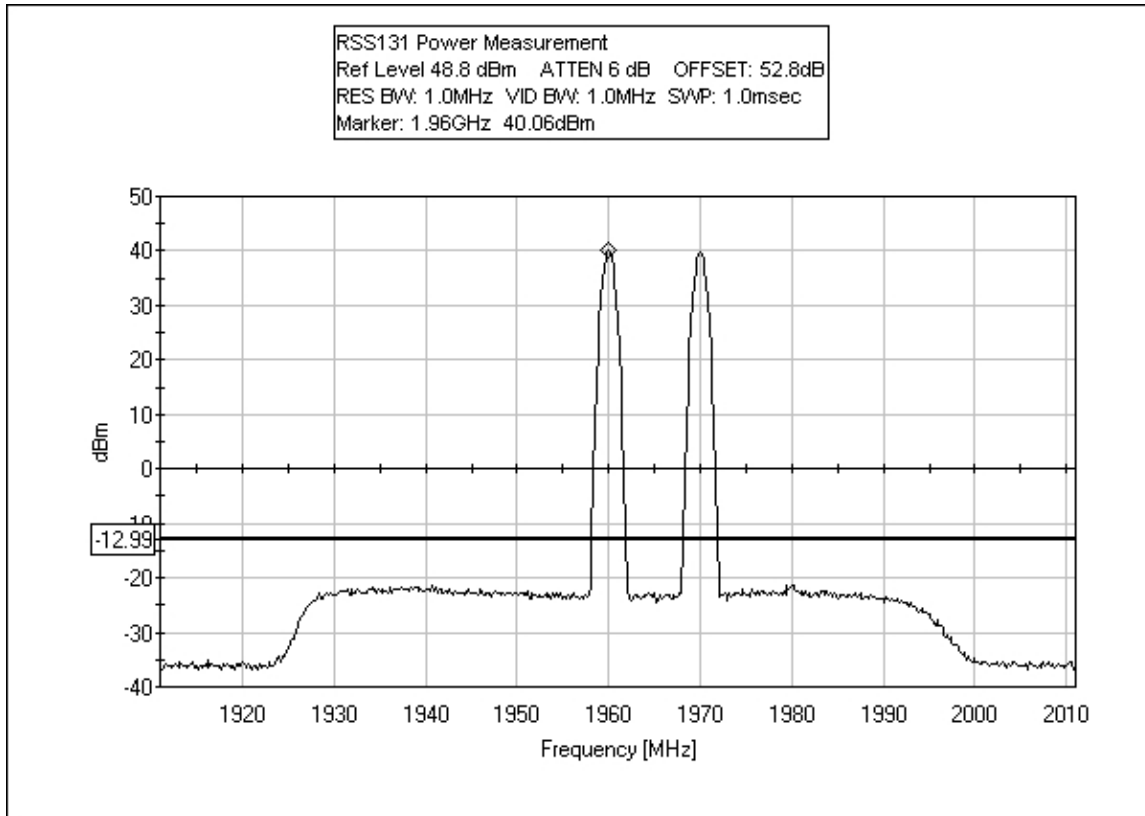
Test Equipment

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

PHOTOGRAPH SHOWING RF POWER



CANADA POWER



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 =+ 40. dBm

$$P_{\text{mean}} = P_{o1} + 3 \text{ dB} = 40 + 3 \text{ dBm} = 43 \text{ dBm} = 20 \text{ W}$$

Note: With protection circuits, the EUT did not enter inter-modulation mode at designated power level.

FCC 2.1033(c)(14)/2.1046/24.232(a) - RF POWER OUTPUT - RH300020/100

§24.232 Power and antenna height limits.

(a) Base stations are limited to 1640 watts peak equivalent isotropically radiated power (e.i.r.p.) with an antenna height up to 300 meters HAAT. See 24.53 for HAAT calculation method. Base station antenna heights may exceed 300 meters with a corresponding reduction in power; see Table 1 of this section. **In no case may the peak output power of a base station transmitter exceed 100 watts.** The service area boundary limit and microwave protection criteria specified in §§24.236 and 24.237 apply.

Table 1: Reduced Power for Base Station Antenna Heights Over 300 Meters

<i>HAAT in meters</i>	<i>Maximum E.I.R.P. (watts)</i>
6300	1640
6500	1070
61000	490
61500	270
62000	160

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 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 FCC24.23a (a).

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 100 watts.

Test setup : The EUT with an optical input and a RF output is placed on the wooden table. The RF Output is connected to a RF load and a directional coupler. The RF power of the EUT is monitored at the output of the directional coupler and the RF input signal injected to a support RF to optical converter is adjusted to maintain the output power. RF Power = 20 watts, Modulation: GSM.

Frequency	Measured Power
1931 MHz	20W
1960 MHz	20W
1990 MHz	20W

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

RH300020/100 PHOTOGRAPH SHOWING RF OUTPUT POWER



**FCC 2.1033(c)(14)/2.1051/24.238(a) - SPURIOUS EMISSIONS AT ANTENNA
TERMINAL - RH300020/211**

Test Conditions: The EUT is placed on the wooden table. The RF Output port is connected to a remote power meter . 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 evaluated at the antenna port. Power = 20 watts. Frequency = 1930 MHz, 1960 MHz, 1990MHz. Modulation: EDGE, WCDMA. 21°C, 58% relative humidity. Frequency range of measurement = 9 kHz - 20 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 - 20,000 MHz RBW=1 MHz, VBW=1 MHz. **No emissions were found.**

Test Equipment for Blockedge plot, input output plot, antenna conducted spurious emissions, 99% BW, intermodulation, and RSS-131 RF output power

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02672	Agilent	E4446A	US44300438	011405	011407

RH300020/211 PHOTOGRAPH SHOWING DIRECT CONNECT TEST SETUP



FCC 2.1033(c)(14)/2.1051/24.238(a) - SPURIOUS EMISSIONS AT ANTENNA TERMINAL - RH300020/100

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: **FCC 24.238 (a) Conducted Spurious Emission**
 Work Order #: **85775** Date: 11/17/2006
 Test Type: **Conducted Emissions** Time: 11:11:28
 Equipment: **Repeater** Sequence#: 23
 Manufacturer: Powerwave Technologies, Inc. Tested By: E. Wong
 Model: RH300020/100 110V 60Hz
 S/N: NA

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Repeater*	Powerwave Technologies, Inc.	RH300020/100	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Optical Converter	Powerwave Technologies, Inc.	NA	42473
Spectrum Analyzer	HP	8563E	NA
Power Meter	Agilent	E4419B	MY40510694
ESG	Agilent	E4433B	US40051840

Test Conditions / Notes:

The EUT is placed on the wooden table. The RF Output port is connected to a remote power meter . Optical in port is connected to an Optical converter. Support optical converter receives the signal, converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates a RF signal. Power = 20 watts, Frequency = 1930 MHz, Modulation: GSM. 21°C, 58% relative humidity. Frequency range of measurement = 9 kHz - 20 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 - 20,000 MHz RBW=1 MHz, VBW=1 MHz.

Transducer Legend:

T1=1-40 GHz Cable 020807	T2=Filter 3GHz HPF AN02744
--------------------------	----------------------------

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

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	Dist dB	Table dB	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	3859.930M	69.9	+1.3	+0.3		+0.0	71.5	94.0	-22.5	Anten



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

Customer: **Powerwave Technologies, Inc.**
 Specification: **FCC 24.238 (a) Conducted Spurious Emission**
 Work Order #: **85775** Date: 11/16/2006
 Test Type: **Conducted Emissions** Time: 14:58:43
 Equipment: **Repeater** Sequence#: 24
 Manufacturer: Powerwave Technologies, Inc. Tested By: E. Wong
 Model: RH300020/100 110V 60Hz
 S/N: NA

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Repeater*	Powerwave Technologies, Inc.	RH300020/100	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Optical Converter	Powerwave Technologies, Inc.	NA	42473
Spectrum Analyzer	HP	8563E	NA
Power Meter	Agilent	E4419B	MY40510694
ESG	Agilent	E4433B	US40051840

Test Conditions / Notes:

The EUT is placed on the wooden table. The RF Output port is connected to a remote power meter . Optical in port is connected to an Optical converter. Support optical converter receives the signal, converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates a RF signal. Power = 20 watts, Frequency = 1960 MHz, Modulation: GSM. 21°C, 58% relative humidity. Frequency range of measurement = 9 kHz - 20 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 - 20,000 MHz RBW=1 MHz, VBW=1 MHz.

Transducer Legend:

T1=1-40 GHz Cable 020807	T2=Filter 3GHz HPF AN02744
--------------------------	----------------------------

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

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	Dist dB	Table dB	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	3919.992M	68.8	+1.3	+0.3	+0.0	70.4	94.0	-23.6	Anten	
2	5880.000M	61.8	+1.6	+0.3	+0.0	63.7	94.0	-30.3	Anten	



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

Customer: **Powerwave Technologies, Inc.**
 Specification: **FCC 24.238 (a) Conducted Spurious Emission**
 Work Order #: **85775** Date: 11/16/2006
 Test Type: **Conducted Emissions** Time: 15:14:43
 Equipment: **Repeater** Sequence#: 25
 Manufacturer: Powerwave Technologies, Inc. Tested By: E. Wong
 Model: RH300020/100 110V 60Hz
 S/N: NA

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Repeater*	Powerwave Technologies, Inc.	RH300020/100	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Optical Converter	Powerwave Technologies, Inc.	NA	42473
Spectrum Analyzer	HP	8563E	NA
Power Meter	Agilent	E4419B	MY40510694
ESG	Agilent	E4433B	US40051840

Test Conditions / Notes:

The EUT is placed on the wooden table. The RF Output port is connected to a remote power meter . Optical in port is connected to an Optical converter. Support optical converter receives the signal, converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates a RF signal. Power = 20 watts, Frequency = 1990 MHz, Modulation: GSM. 21°C, 58% relative humidity. Frequency range of measurement = 9 kHz - 20 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 - 20,000 MHz RBW=1 MHz, VBW=1 MHz.

Transducer Legend:

T1=1-40 GHz Cable 020807	T2=Filter 3GHz HPF AN02744
--------------------------	----------------------------

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

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	Dist dB	Table dB	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	5970.030M	62.7	+1.6	+0.4	+0.0	64.7	94.0	-29.3	Anten	
2	3980.000M	59.3	+1.3	+0.3	+0.0	60.9	94.0	-33.1	Anten	
3	1989.992M	114.9	+0.9	+0.0	+0.0	115.8	154.0	-38.2	Anten	

Test Equipment for Blockedge plot, input output plot, antenna conducted spurious emissions, 99% BW, intermodulation, and RSS-131 RF output power

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02672	Agilent	E4446A	US44300438	011405	011407

RH300020/100 PHOTOGRAPH SHOWING DIRECT CONNECT TEST SETUP





FCC 2.1033(c)(14)/2.1053/24.238(a) - FIELD STRENGTH OF SPURIOUS RADIATION - RH300020/211

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

Customer: **Powerwave Technologies, Inc.**
 Specification: **FCC 24.238 Radiated Spurious Emission**
 Work Order #: **86002** Date: 12/14/2006
 Test Type: **Radiated Scan** Time: 10:10:09
 Equipment: **Repeater** Sequence#: 3
 Manufacturer: Powerwave Technologies, Inc. Tested By: E. Wong
 Model: RH300020/110
 S/N: NA

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Repeater*	Powerwave Technologies, Inc.	RH300020/110	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Optical Converter	Powerwave Technologies, Inc.	NA	42473
Spectrum Analyzer	HP	8563E	NA
Power Meter	Agilent	E4419B	MY40510694
ESG	Agilent	E4433B	US40051840

Test Conditions / Notes:

The EUT is placed on the wooden table. The RF Output port is connected to a remote power meter. Optical in port is connected to a support Optical converter. 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. Power = 20 watts. Frequency = 1930 MHz, 1960 MHz and 1988 MHz, Modulation: EDGE and 1930 MHz, 1960 MHz and 1990 MHz, Modulation: WCDMA. 21°C, 58% relative humidity Frequency range of measurement = 9 kHz - 20 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 - 20,000 MHz RBW=1 MHz, VBW=1 MHz.

Operating Frequency: 1930 MHz -1990 MHz
 Channels: Low, Mid and High
 Highest Measured Output Power: 43.01 EIRP(dBm)= 20 EIRP(Watts)
 Distance: 3 meters
 Limit: $43+10\text{Log}(P)$ 56.01 dBc

Freq. (MHz)	Reference Level (dBm)	Antenna Polarity (H/V)	dBc
3,865.95	-51.8	Horiz	94.81
5,798.95	-44.8	Horiz	87.81
7,731.95	-47.4	Horiz	90.41
3,865.95	-50.6	Vert	93.61
5,798.95	-49.6	Vert	92.61
7,731.95	-49.6	Vert	92.61
5,879.95	-42.7	Horiz	85.71
5,880.00	-45.9	Vert	88.91
7,839.95	-47	Horiz	90.01
7,839.95	-48	Vert	91.01
3,919.95	-51.7	Horiz	94.71
3,973.90	-53.9	Vert	96.91
5,960.85	-48.6	Vert	91.61
7,947.80	-48.1	Vert	91.11
3,973.95	-53.4	Horiz	96.41
5,960.90	-48	Horiz	91.01
3,866.00	-49.3	Horiz	92.31
5,799.00	-50.6	Horiz	93.61
3,862.00	-53.6	Vert	96.61
7,840.00	-49.1	Vert	92.11
5,880.00	-49.2	Horiz	92.21
5,882.40	-52.5	Vert	95.51
5,880.00	-52.6	Vert	95.61
3,920.00	-54.1	Horiz	97.11
5,960.25	-52.9	Vert	95.91
3,973.50	-55.1	Vert	98.11
3,973.50	-55.6	Horiz	98.61

Test Equipment

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02672	Agilent	E4446A	US44300438	011405	011407
9kHz-30MHz						
Loop Antenna	00314	EMCO	6502	2014	061406	061408
30 MHz -1 GHz						
Bilog Antenna	01995	Chase	CBL6111C	2451	020206	020208
Pre-amp	00309	HP	8447D	1937A02548	060106	060108
Antenna cable	P05198	Belden	8268 (RG-214)	Cable#15	010305	010307
Pre-amp to SA cable	P05050	Pasternack	RG223/U	Cable#10	051605	051607
1-20 GHz						
Horn Antenna	00849	EMCO	3115	6246	062906	062908
Microwave Pre-amp	00786	HP	83017A	3123A00281	071906	071908
Heliast Antenna cable	P05565	Andrew	LDF1-50	P5565	091806	091808
24" SMA Cable (White)	P05204	Pasterneck	35591-48	1-40GHz_white	020805	020807
18-26 GHz	01413	HP	RA42-k-F- 4B-C	942126_003	102505	102507
3.0 GHz HPF	02744	K&L	11SH10- 3000	1	030806	030808

PHOTOGRAPH SHOWING RADIATED EMISSIONS



Radiated Emissions - Front View

PHOTOGRAPH SHOWING RADIATED EMISSIONS



Radiated Emissions - Back View



FCC 2.1033(c)(14)/2.1053/24.238(a) - FIELD STRENGTH OF SPURIOUS RADIATION - RH300020/100

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

Customer: **Powerwave Technologies, Inc.**
 Specification: **FCC 24.238 Radiated Spurious Emission**
 Work Order #: **85775** Date: 11/16/2006
 Test Type: **Radiated Scan** Time: 10:05:55
 Equipment: **Repeater** Sequence#: 20
 Manufacturer: Powerwave Technologies, Inc. Tested By: E. Wong
 Model: RH300020/100
 S/N: NA

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Repeater*	Powerwave Technologies, Inc.	RH300020/100	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Optical Converter	Powerwave Technologies, Inc.	NA	42473
Spectrum Analyzer	HP	8563E	NA
Power Meter	Agilent	E4419B	MY40510694
ESG	Agilent	E4433B	US40051840

Test Conditions / Notes:

The EUT is placed on the wooden table. The RF Output port is connected to a remote power meter . Optical in port is connected to an Optical converter. Support optical converter receives the signal, converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates a RF signal. Power = 20 watts, Frequency = 1930 MHz, 1960 MHz and 1990 MHz, Modulation: GSM. 21°C, 58% relative humidity. Frequency range of measurement = 9 kHz - 20 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 - 20,000 MHz RBW=1 MHz, VBW=1 MHz.

Operating Frequency: 930 MHz - 990 MHz
 Channels: Low, Mid and High
 Highest Measured Output Power: 43.01 EIRP(dBm)= 20 EIRP(Watts)
 Distance: 3 meters
 Limit: $43+10\text{Log}(P)$ 56.01 dBc

Freq. (MHz)	Reference Level (dBm)	Antenna Polarity (H/V)	dBc
5,789.80	-29.5	Horiz	72.51
5,789.80	-31.8	Vert	74.81
3,860.17	-35.5	Horiz	78.51
3,860.00	-38.1	Vert	81.11
5,779.60	-43.3	Horiz	86.31
5,880.02	-32.2	Horiz	75.21
5,880.00	-33.9	Vert	76.91
3,919.93	-36.1	Horiz	79.11
3,920.00	-43.9	Vert	86.91
5,970.00	-38.5	Horiz	81.51
5,970.00	-39.5	Vert	82.51
3,980.00	-42.9	Horiz	85.91
3,980.00	-47.4	Vert	90.41

Test Equipment

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02672	Agilent	E4446A	US44300438	011405	011407
9kHz-30MHz						
Loop Antenna	00314	EMCO	6502	2014	061406	061408
30 MHz -1 GHz						
Bilog Antenna	01995	Chase	CBL6111C	2451	020206	020208
Pre-amp	00309	HP	8447D	1937A02548	060106	060108
Antenna cable	P05198	Belden	8268 (RG-214)	Cable#15	010305	010307
Pre-amp to SA cable	P05050	Pasternack	RG223/U	Cable#10	051605	051607
Horn Antenna	00849	EMCO	3115	6246	062906	062908
Microwave Pre-amp	00786	HP	83017A	3123A00281	071906	071908
1-20 GHz						
Heliac Antenna cable	P05565	Andrew	LDF1-50	P5565	091806	091808
24" SMA Cable (White)	P05204	Pasterneck	35591-48	1-40GHz_white	020805	020807
18-26 GHz	01413	HP	RA42-k-F-4B-C	942126_003	102505	102507
3.0 GHz HPF	02744	K&L	11SH10-3000	1	030806	030808

RH300020/100 PHOTOGRAPH SHOWING RADIATED EMISSIONS



Radiated Emissions - Front View

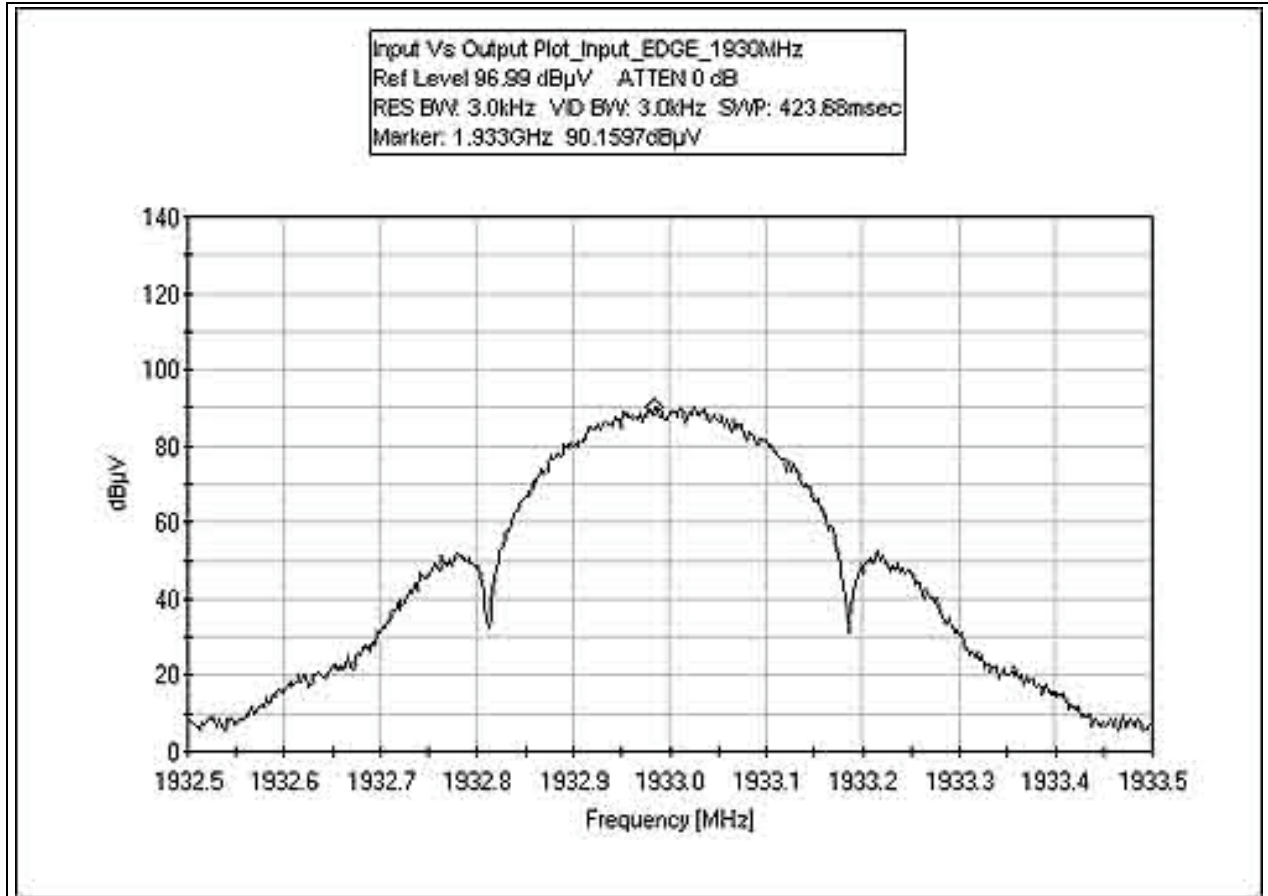
RH300020/100 PHOTOGRAPH SHOWING RADIATED EMISSIONS



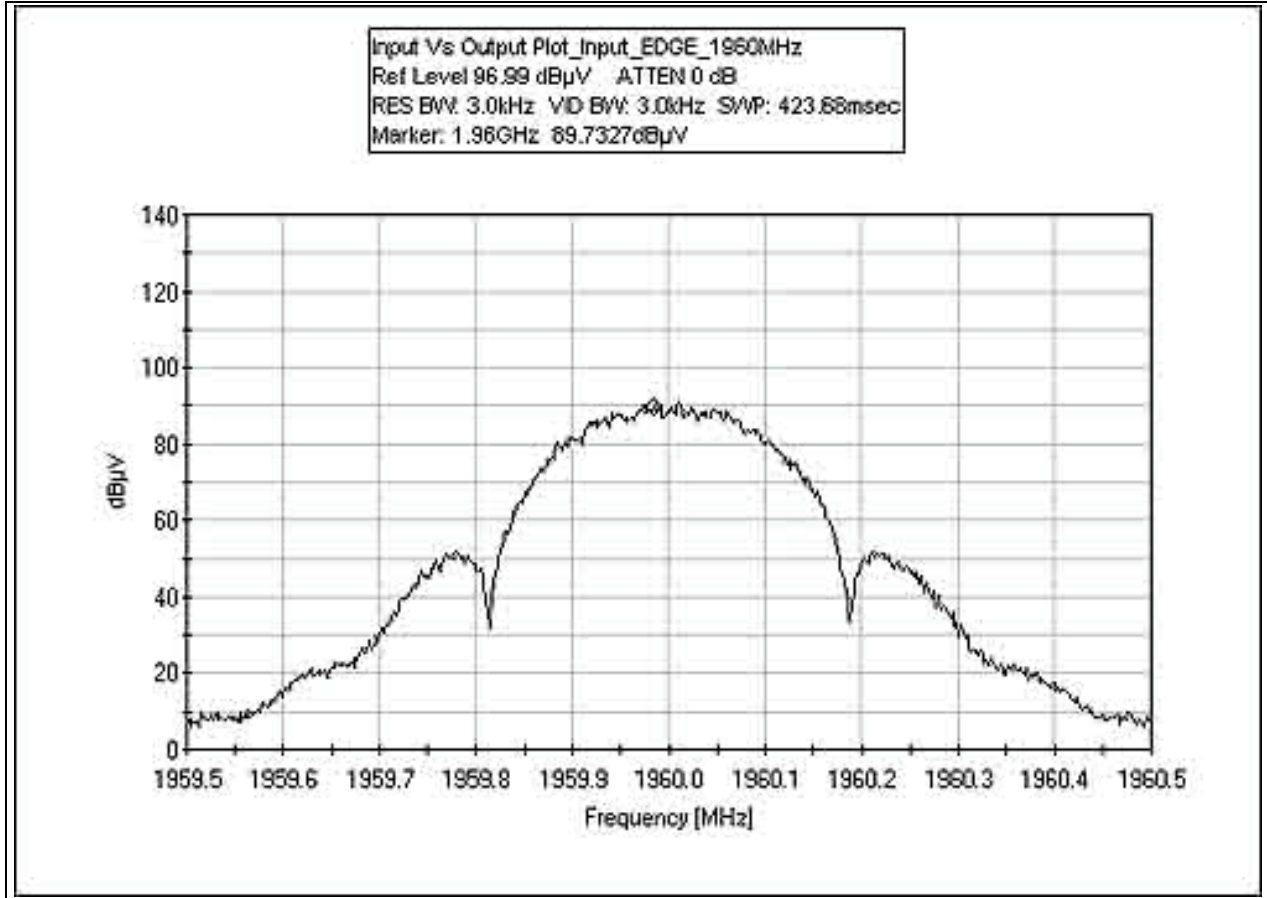
Radiated Emissions - Back View

RH300020/211 INPUT PLOT - EDGE 1930 MHz

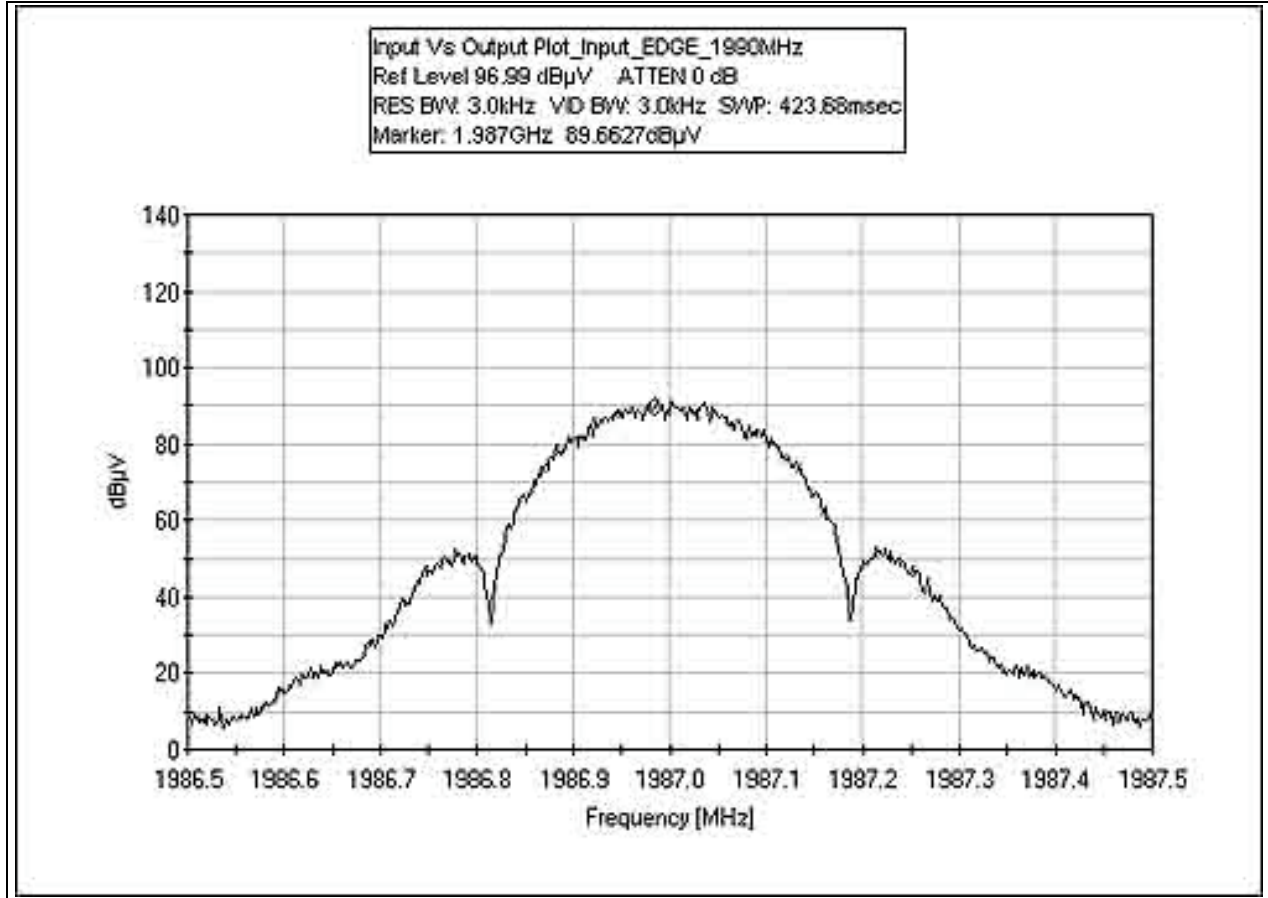
Test Setup: Input signal is measured at the RF input port of the support RF to Optical converter.



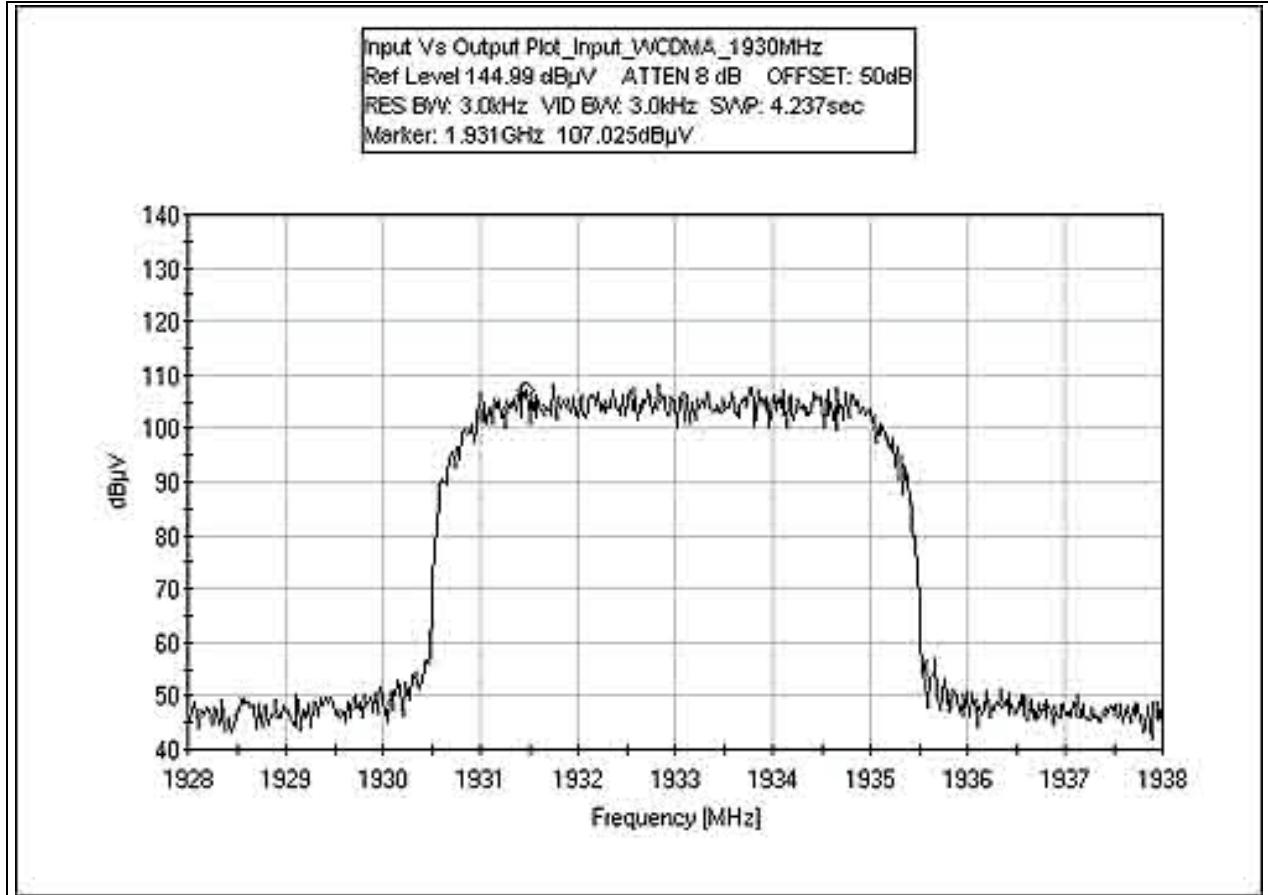
RH300020/211 INPUT PLOT - EDGE 1960 MHz



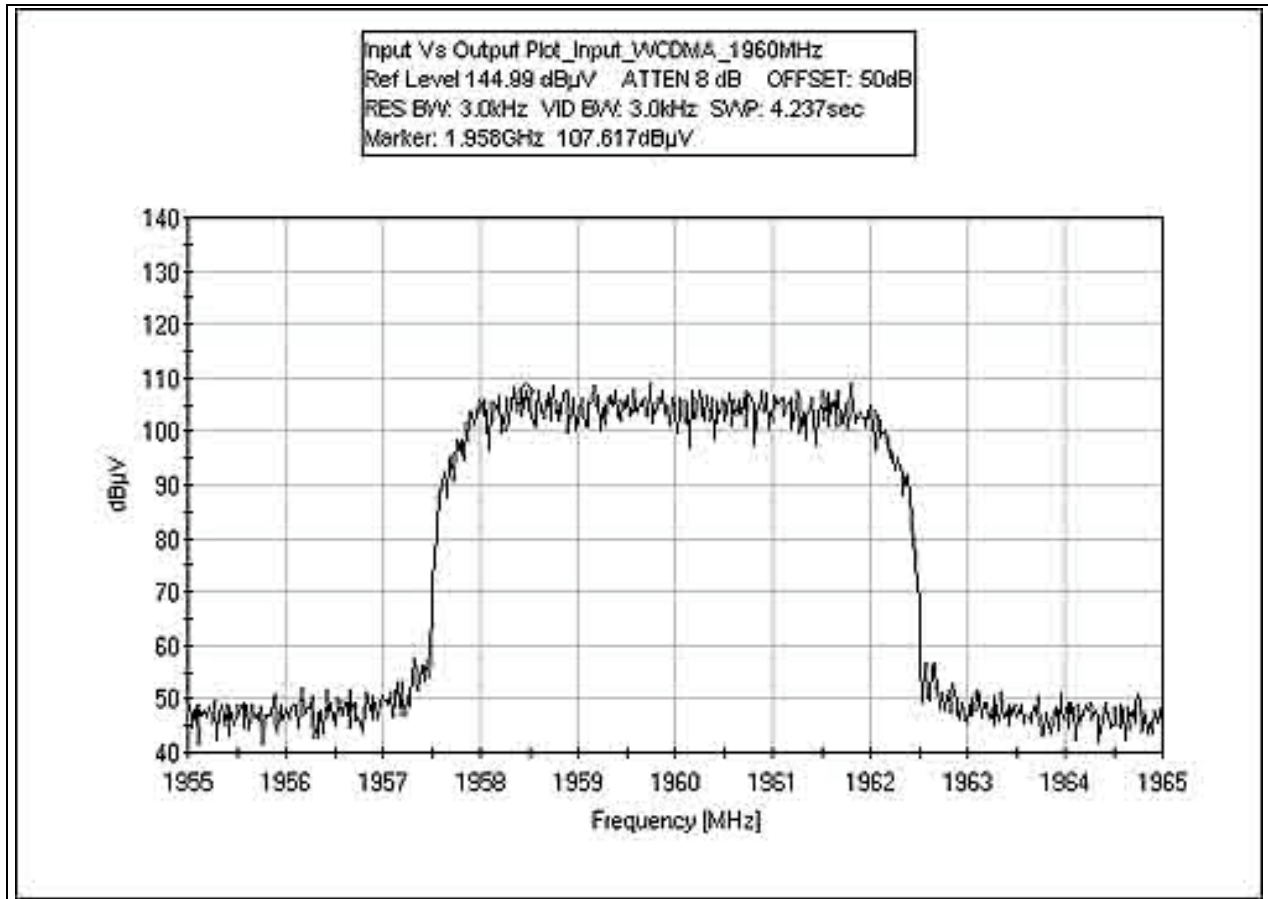
RH300020/211 INPUT PLOT - EDGE 1990 MHz



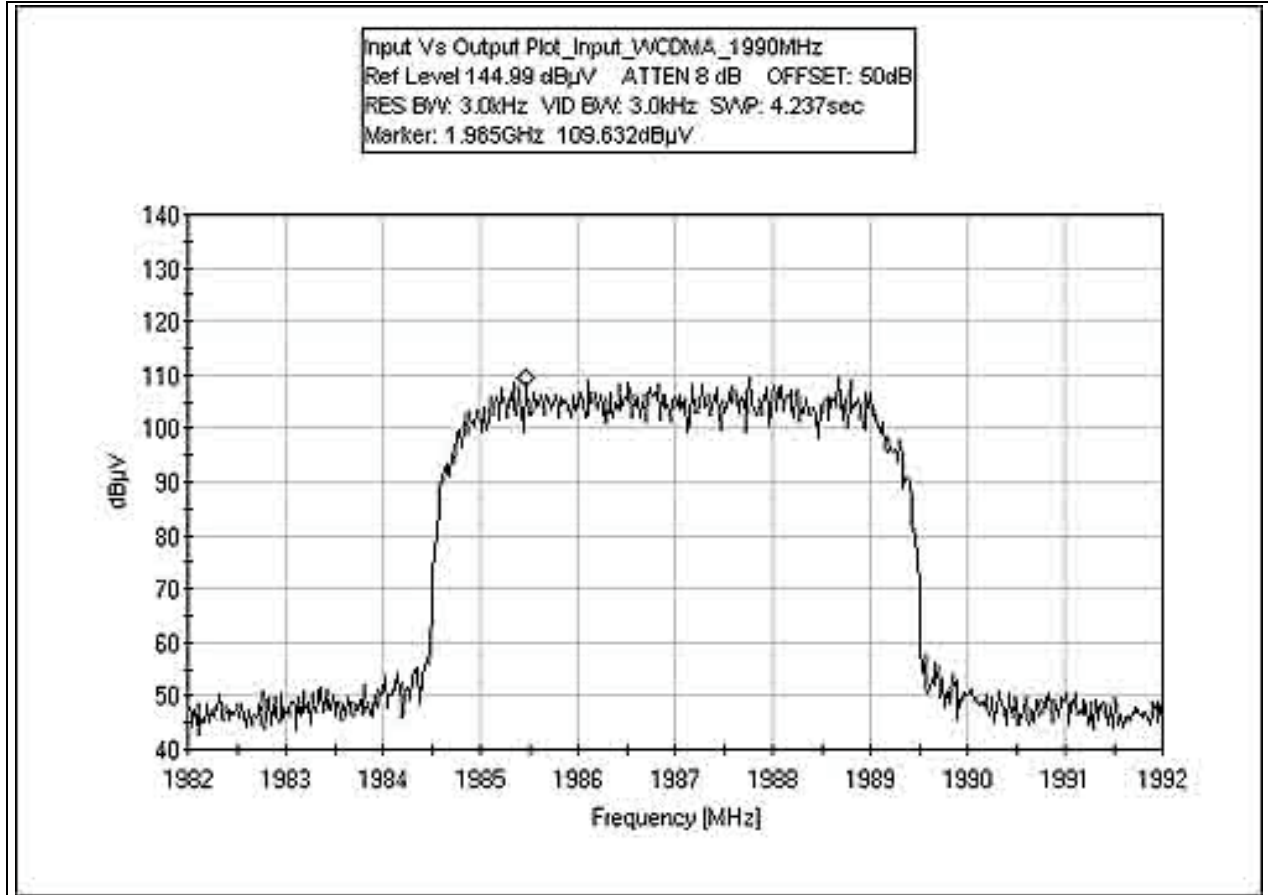
RH300020/211 INPUT PLOT - WCDMA 1930 MHz



RH300020/211 INPUT PLOT - WCDMA 1960 MHz

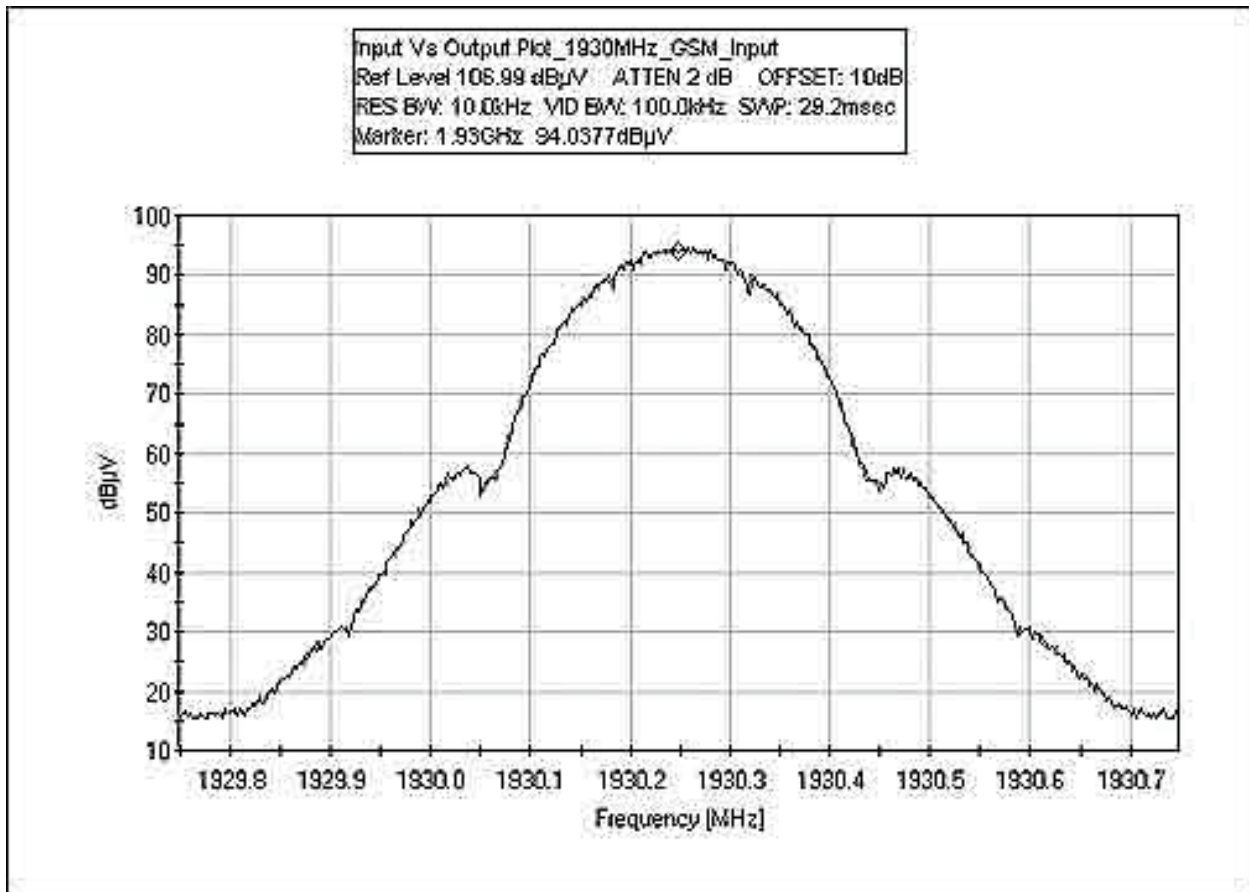


RH300020/211 INPUT PLOT - WCDMA 1990 MHz

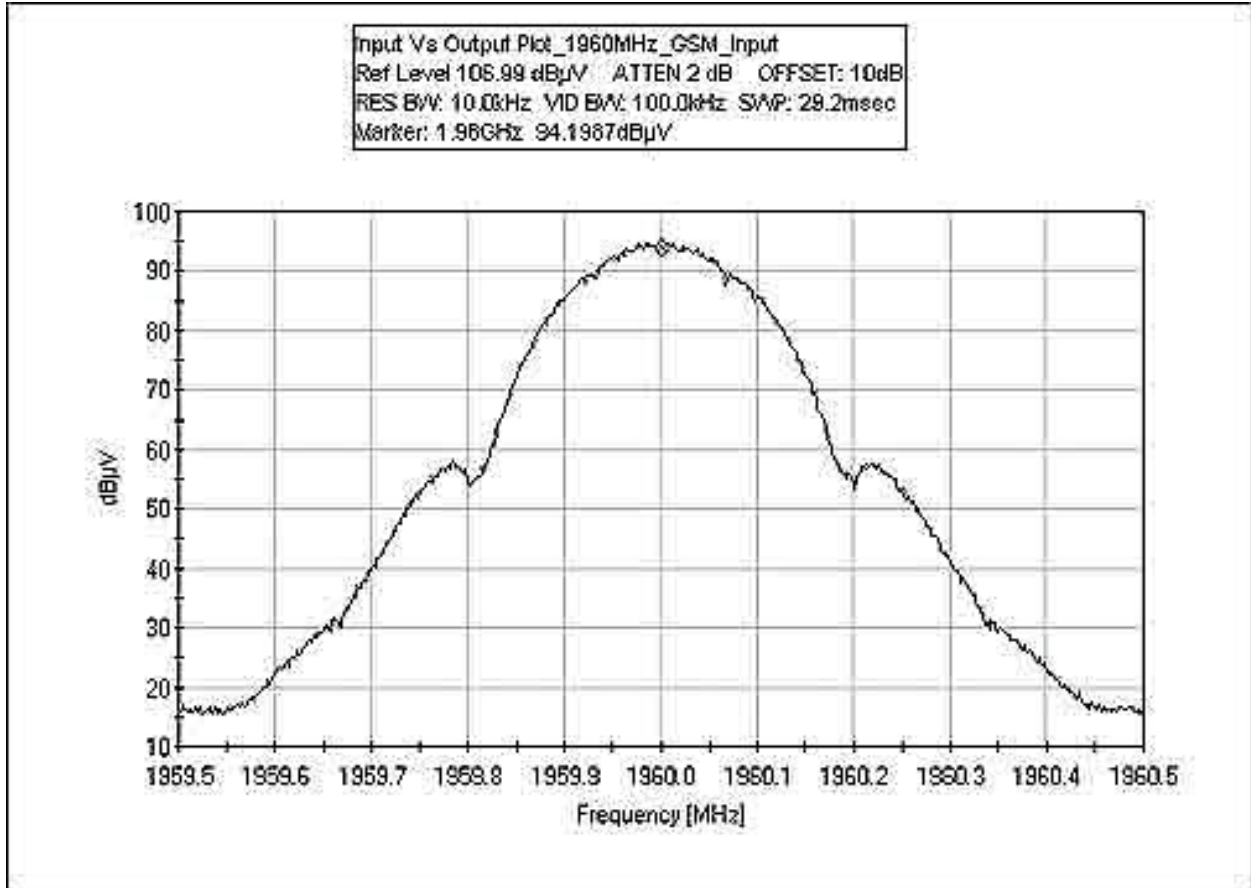


RH300020/100 INPUT PLOT 1930 MHz GSM

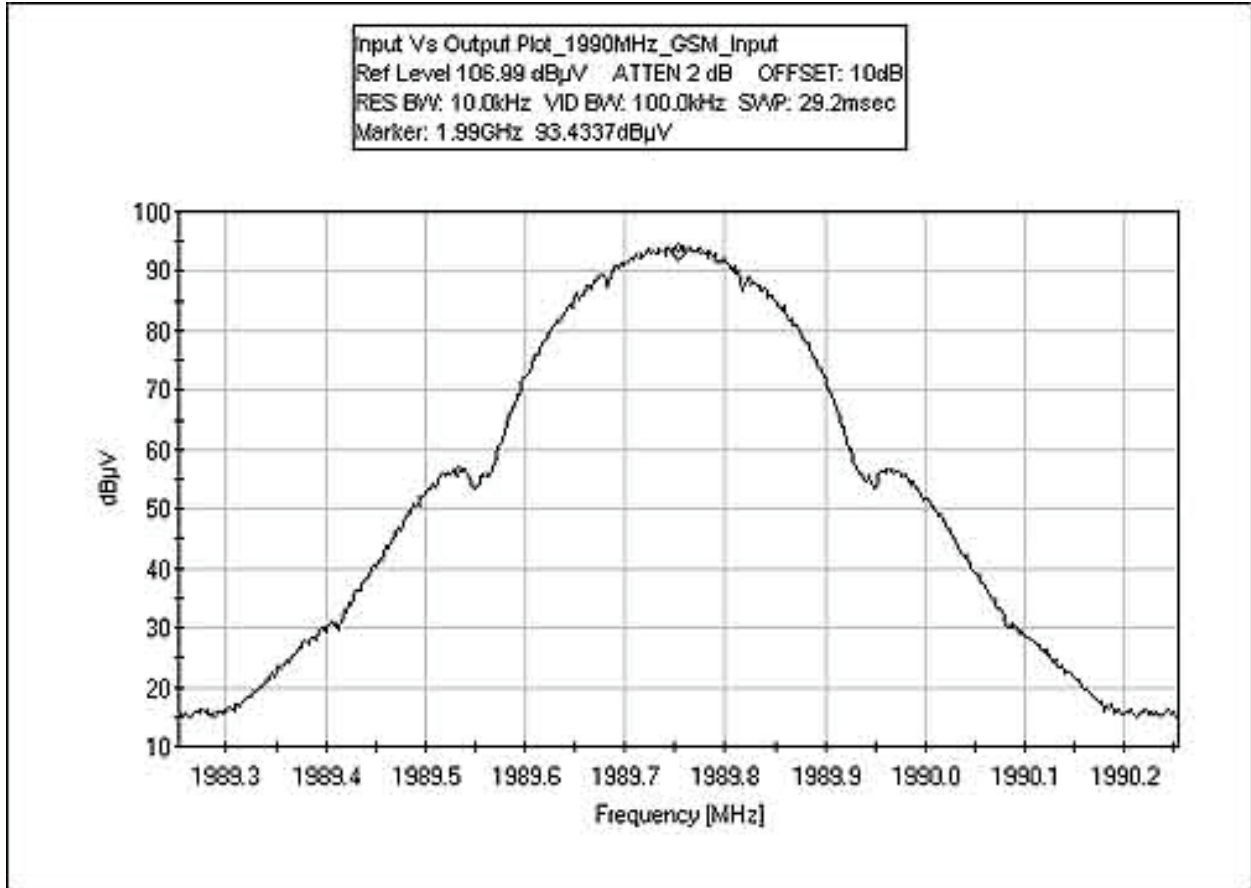
Test Setup: The EUT is placed on the wooden table. The RF Output port is connected to a spectrum analyzer . Optical in port is connected to an Optical converter. Support optical converter receives the signal and converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates a RF signal. The emission signature is evaluated at the antenna port.



RH300020/100 INPUT PLOT 1960 MHz GSM

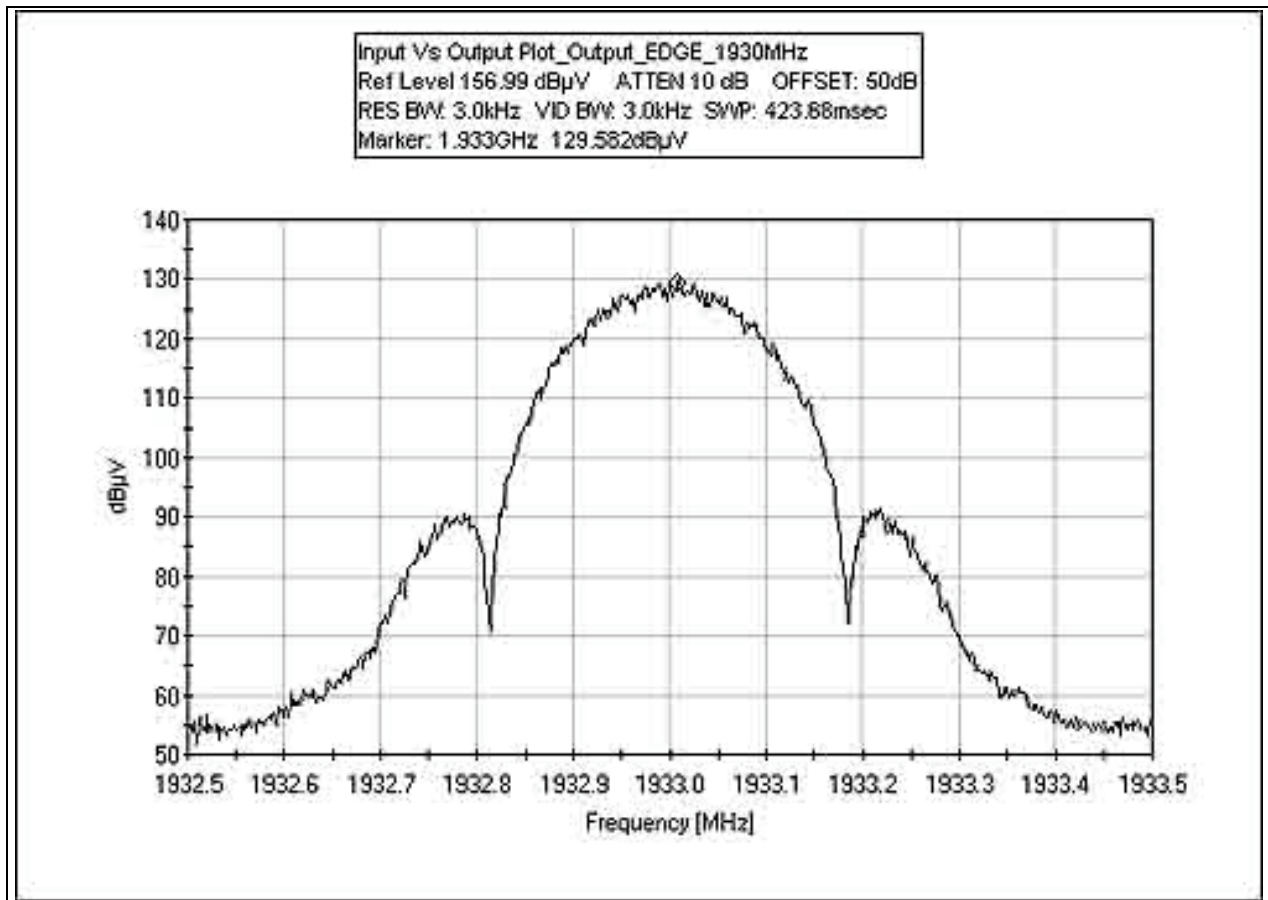


RH300020/100 INPUT PLOT 1990 MHz GSM

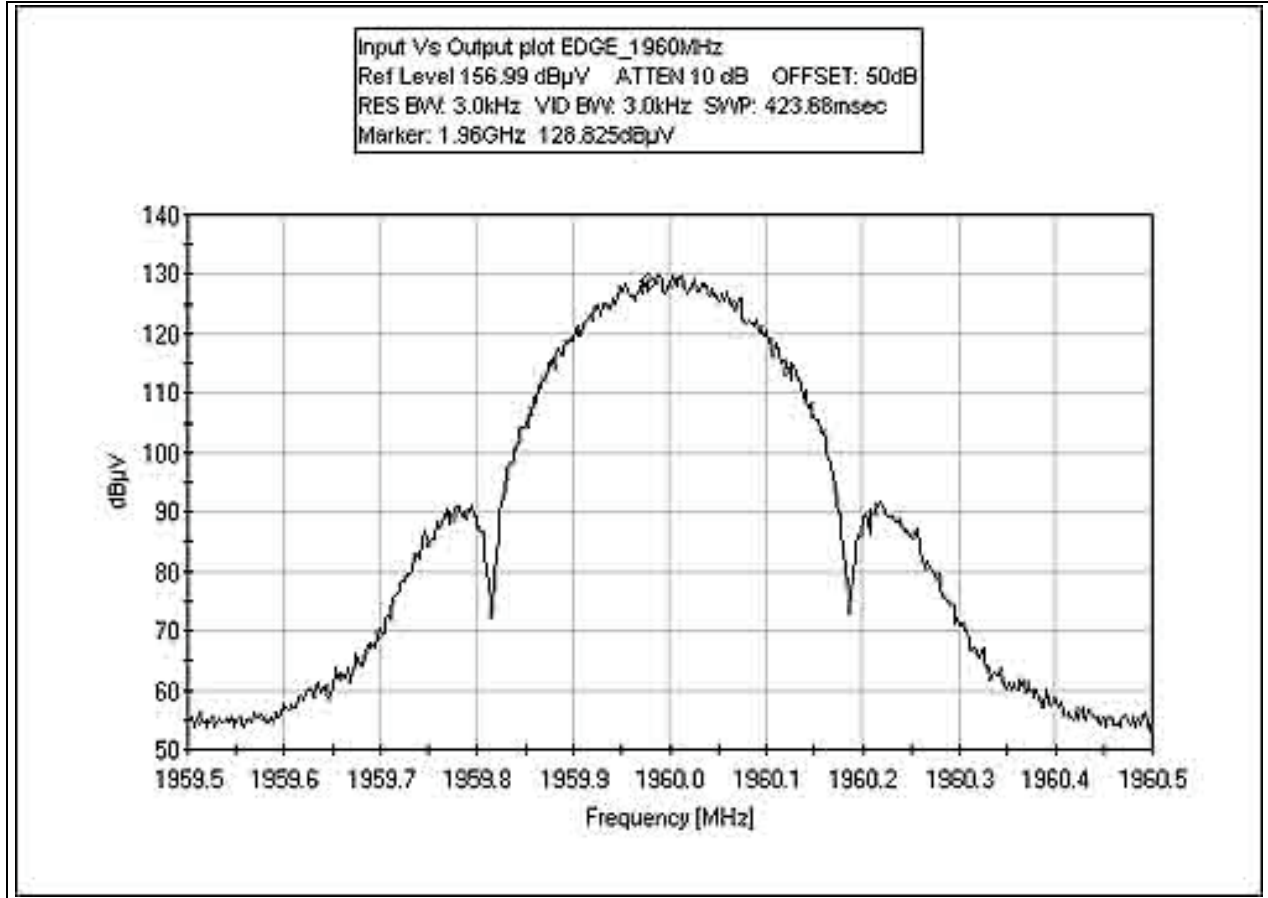


RH300020/211 OUTPUT PLOT - EDGE 1930 MHz

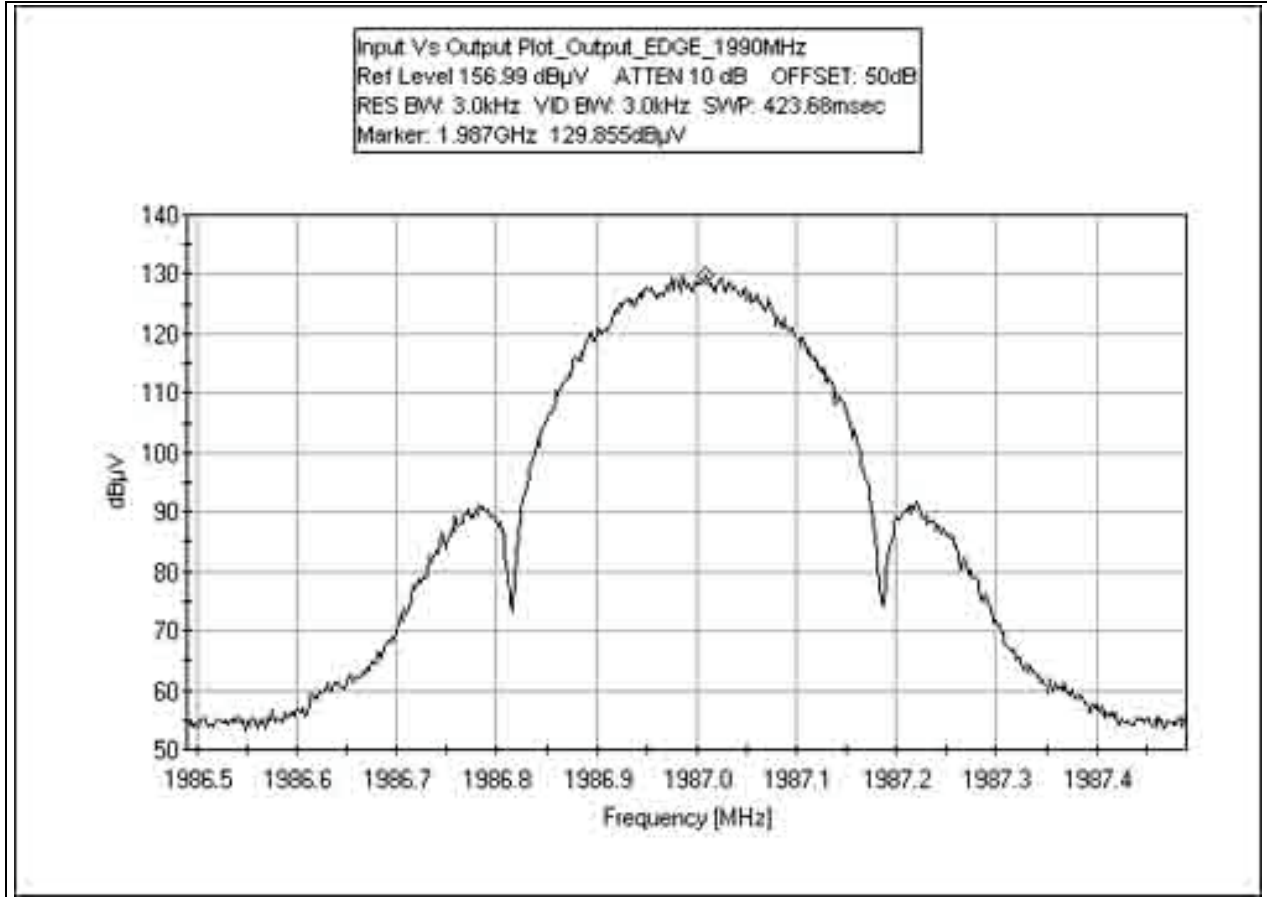
Test Setup: The EUT is placed on the wooden table. The RF Output port is connected to a remote power meter . Optical in port is connected to a support Optical converter. Support optical converter receives RF signal, converts the signal to optic and send it to the EUT. The EUT decodes the optical signal, and generates a RF signal. Output wave form evaluated at the antenna port. Power = 20 watts. Frequency = 1930 MHz, 1960 MHz, 1990MHz. Modulation: EDGE, WCDMA.



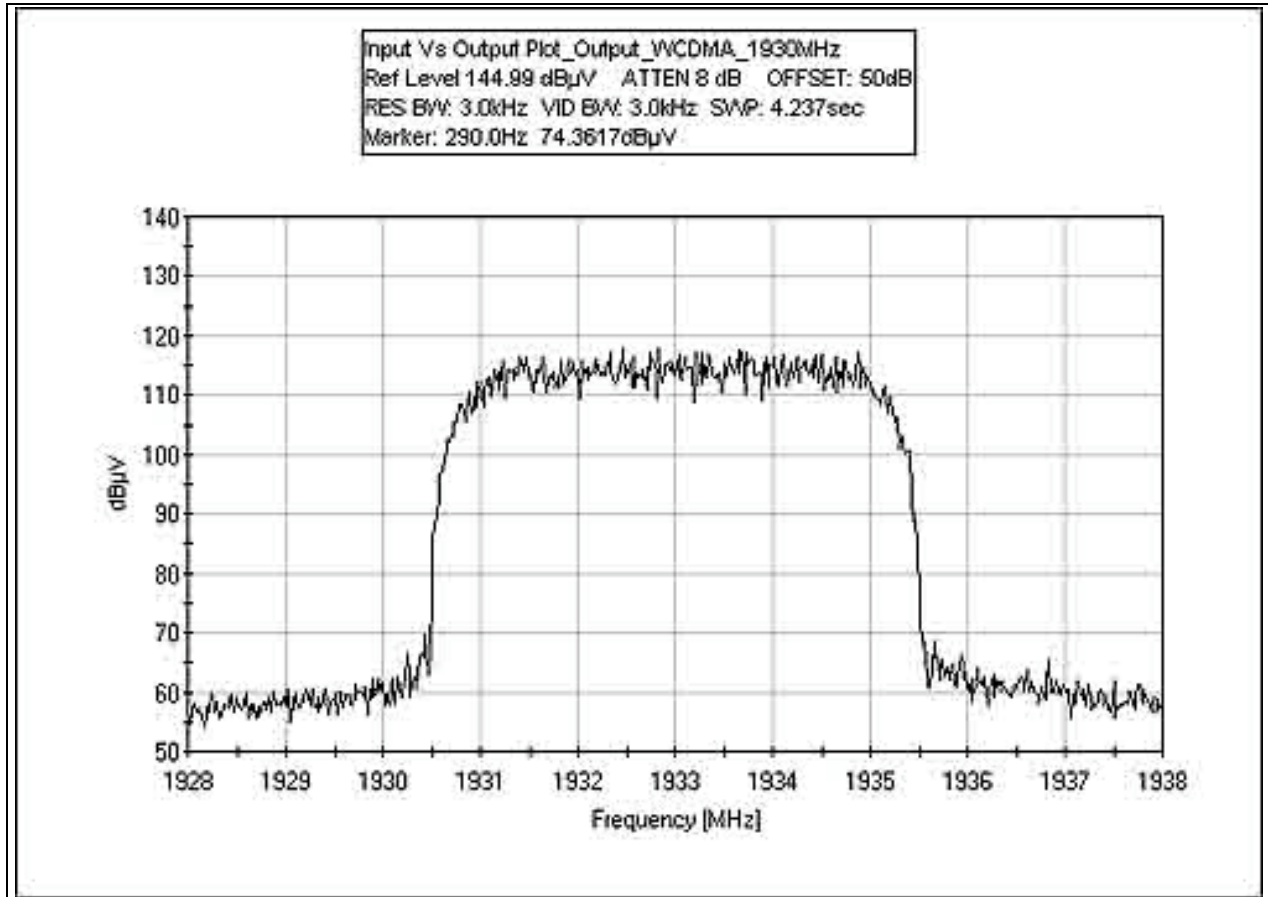
RH300020/211 OUTPUT PLOT - EDGE 1960 MHz



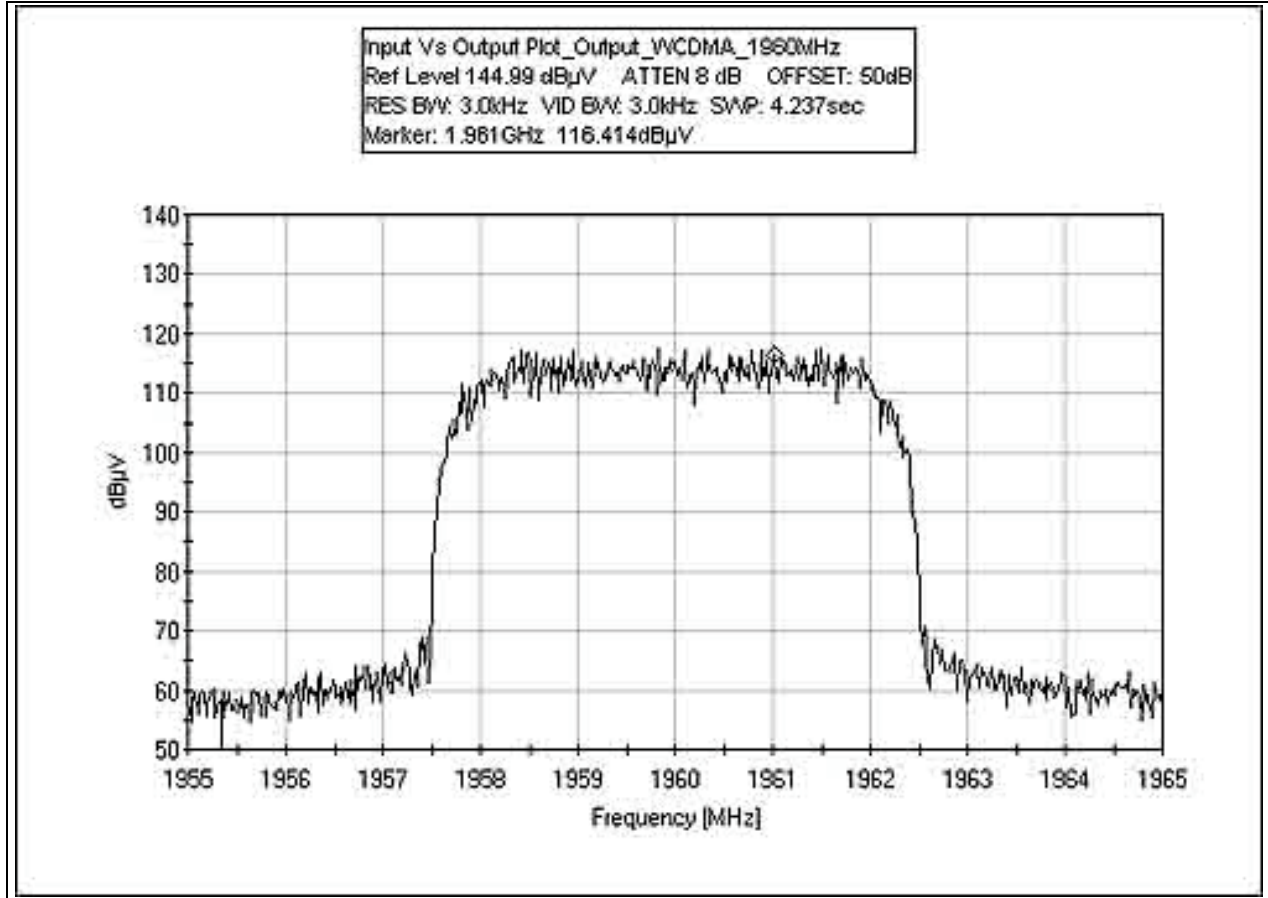
RH300020/211 OUTPUT PLOT - EDGE 1990 MHz



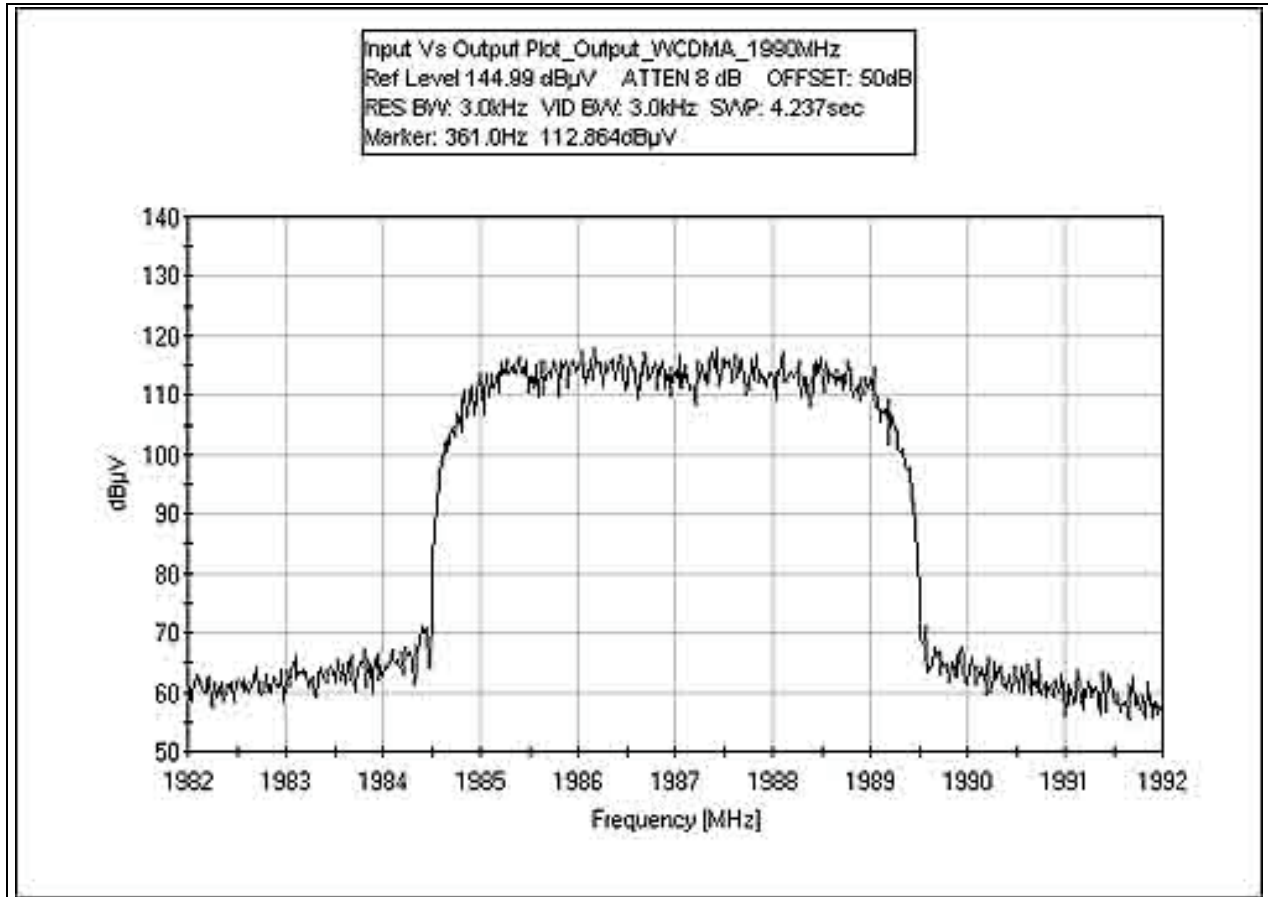
RH300020/211 OUTPUT PLOT - WCDMA 1930 MHz



RH300020/211 OUTPUT PLOT - WCDMA 1960 MHz

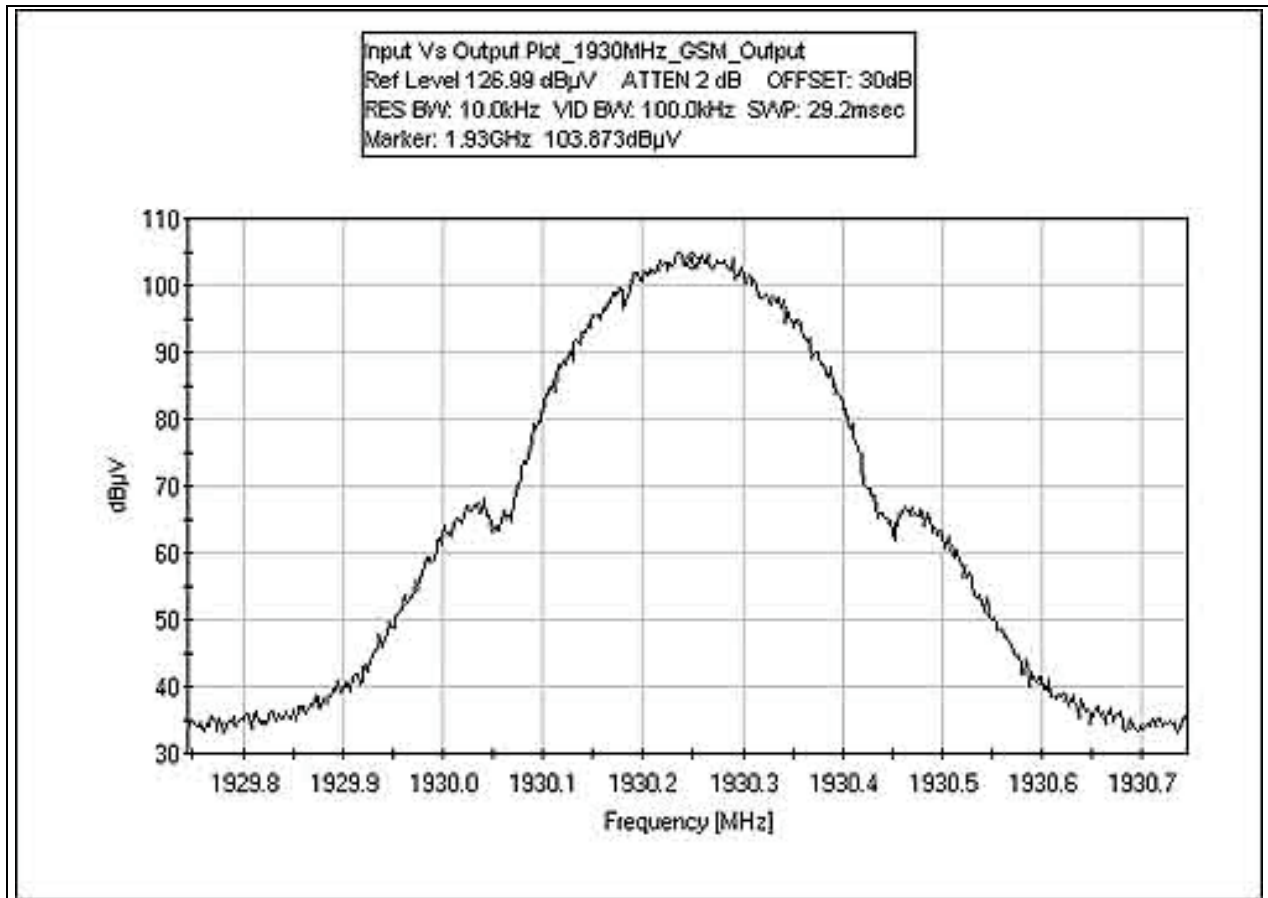


RH300020/211 OUTPUT PLOT - WCDMA 1990 MHz

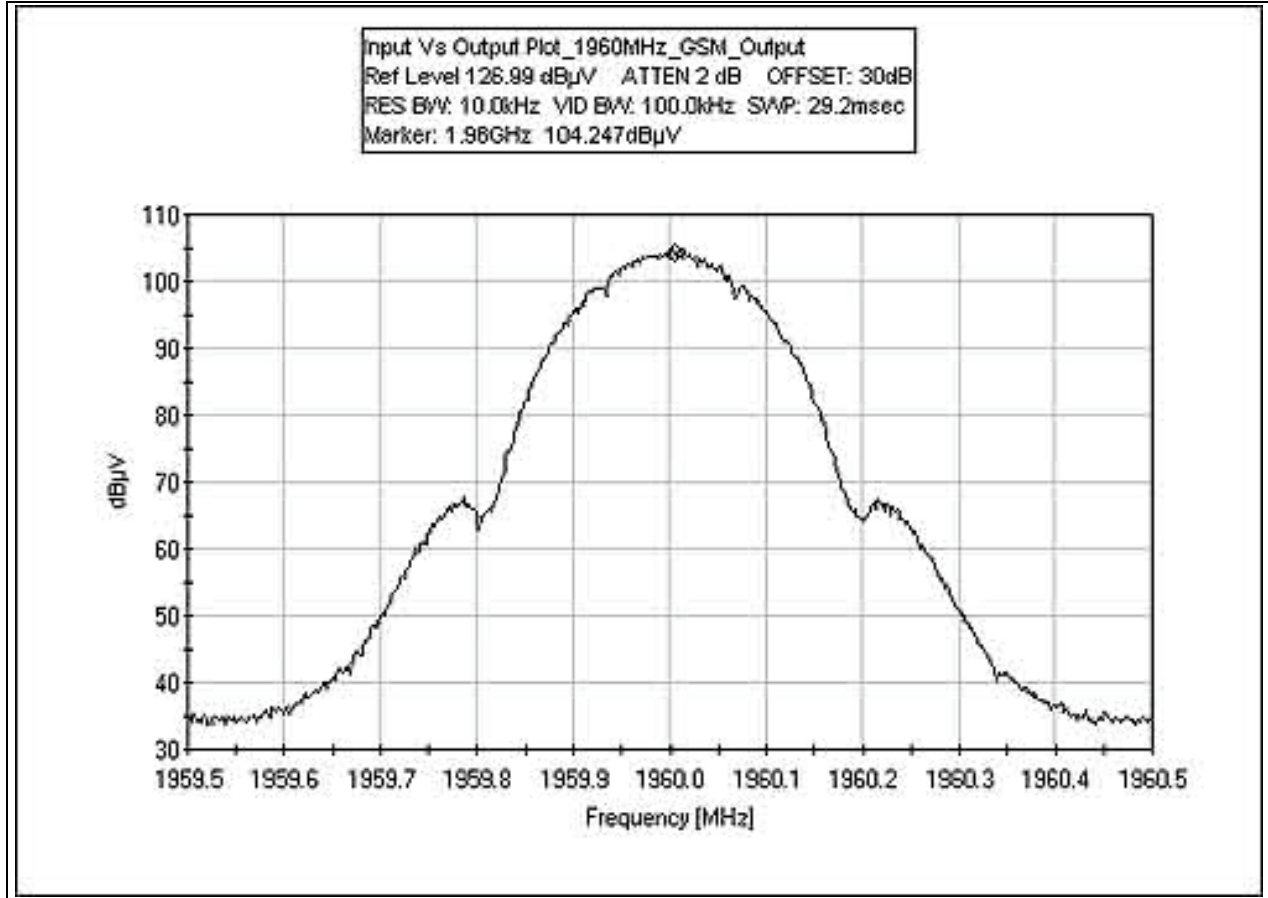


RH300020/100 OUTPUT PLOT 1930 MHz GSM

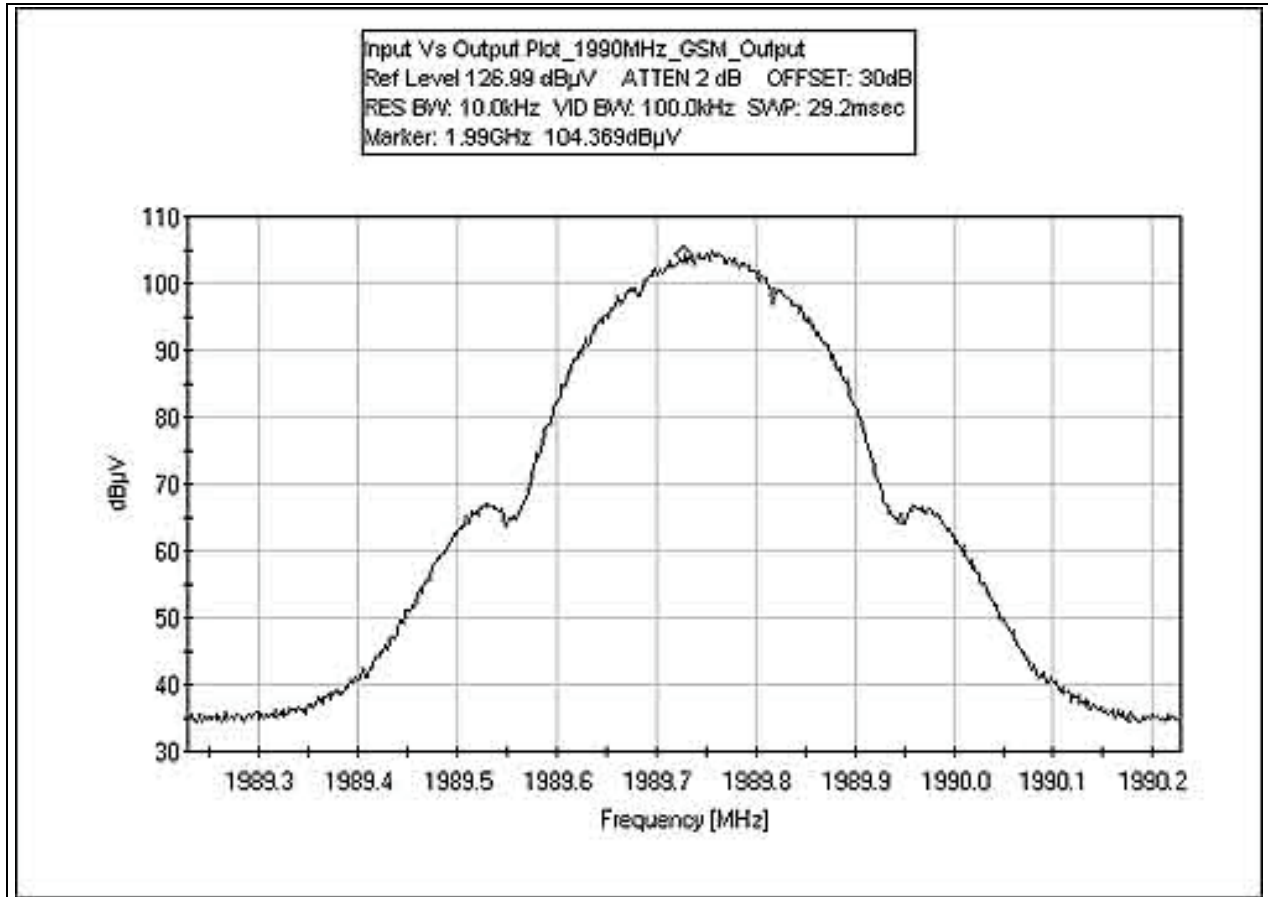
Test Setup: The EUT is placed on the wooden table. The RF Output port is connected to a spectrum analyzer . Optical in port is connected to an Optical converter. Support optical converter receives the signal and converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates a RF signal. The emission signature is evaluated at the antenna port.



RH300020/100 OUTPUT PLOT 1960 MHz GSM

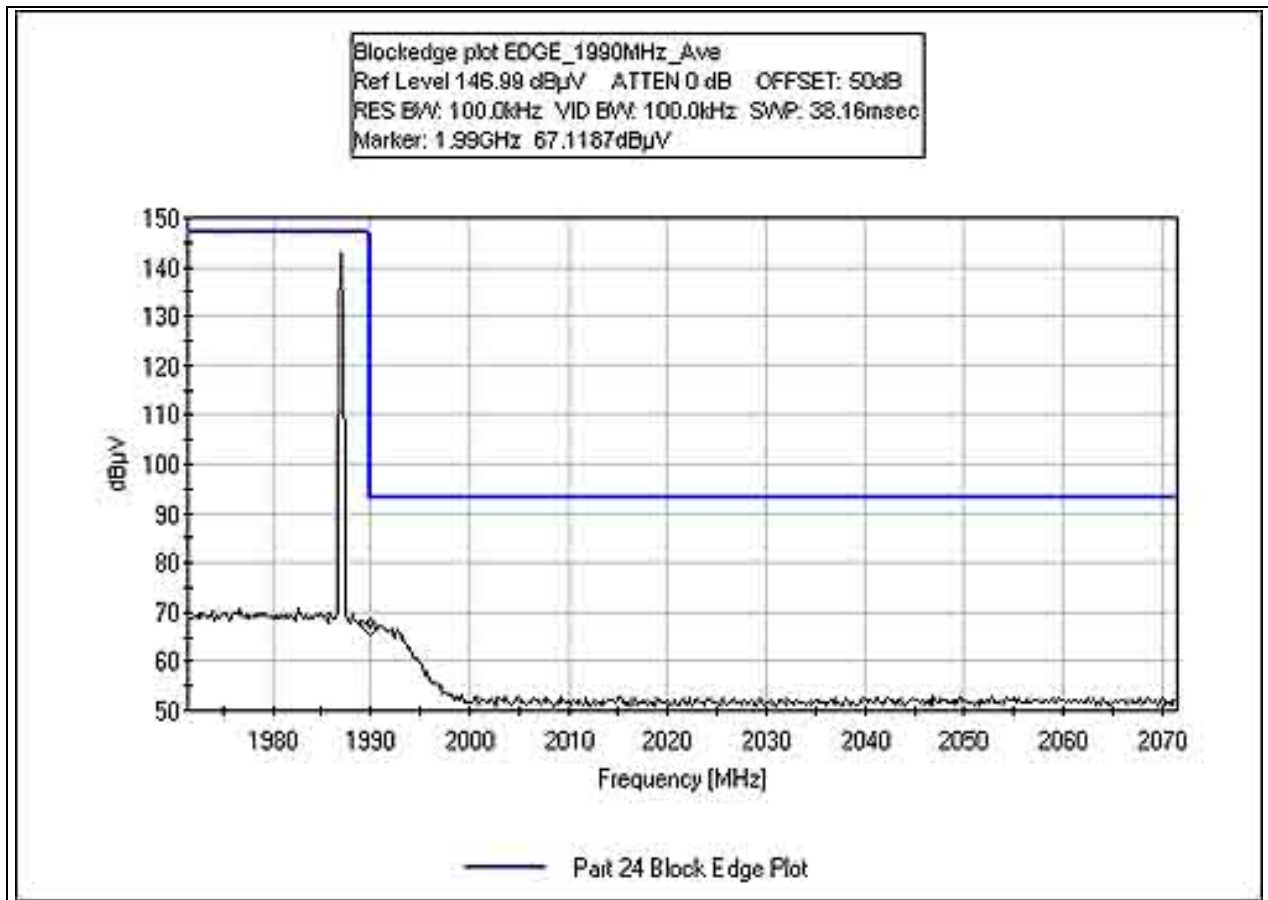


RH300020/100 OUTPUT PLOT 1990 MHz GSM

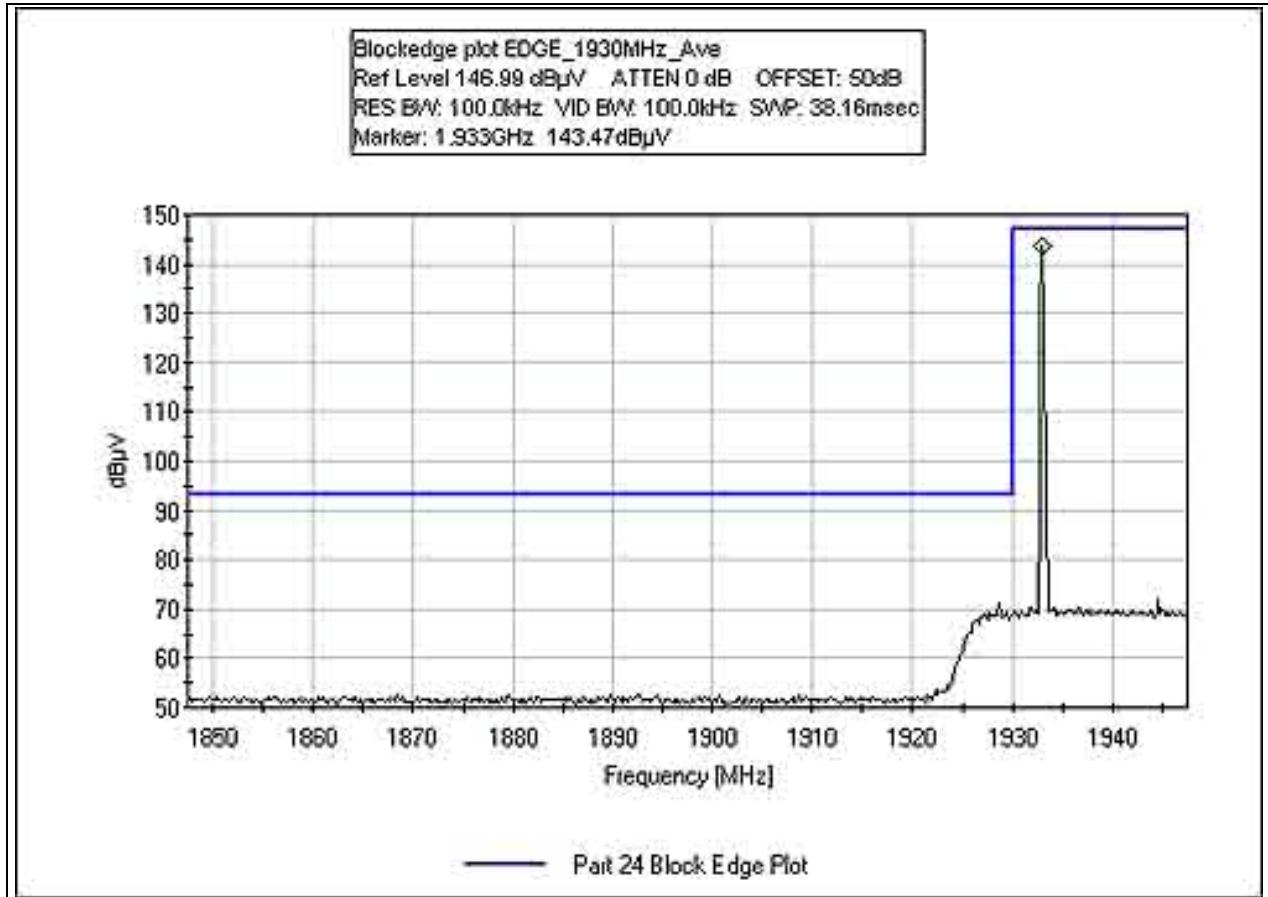


RH300020/211 BLOCKEDGE - EDGE 1990 MHz

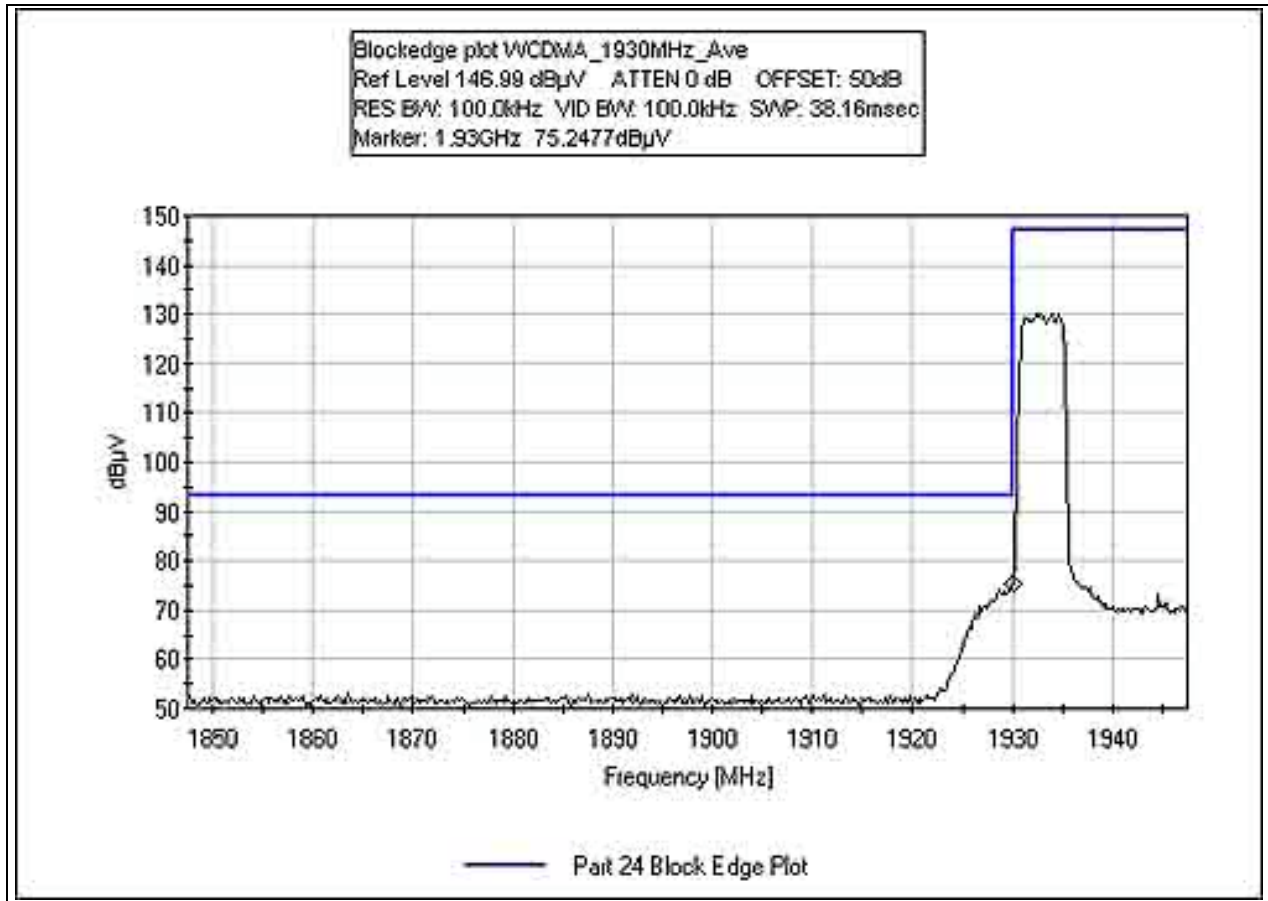
Test Setup: The EUT is placed on the wooden table. The RF Output port is connected to a remote power meter . Optical in port is connected to a support Optical converter. Support optical converter receives the RF signal, converts the signal to optic and sends it to the EUT. The EUT decode the optical signal, and generates a RF signal. Blockedge evaluated at the antenna port. Power = 20 watts, Frequency = 1930 MHz, 1960 MHz, 1990MHz. Modulation: EDGE, WCDMA.



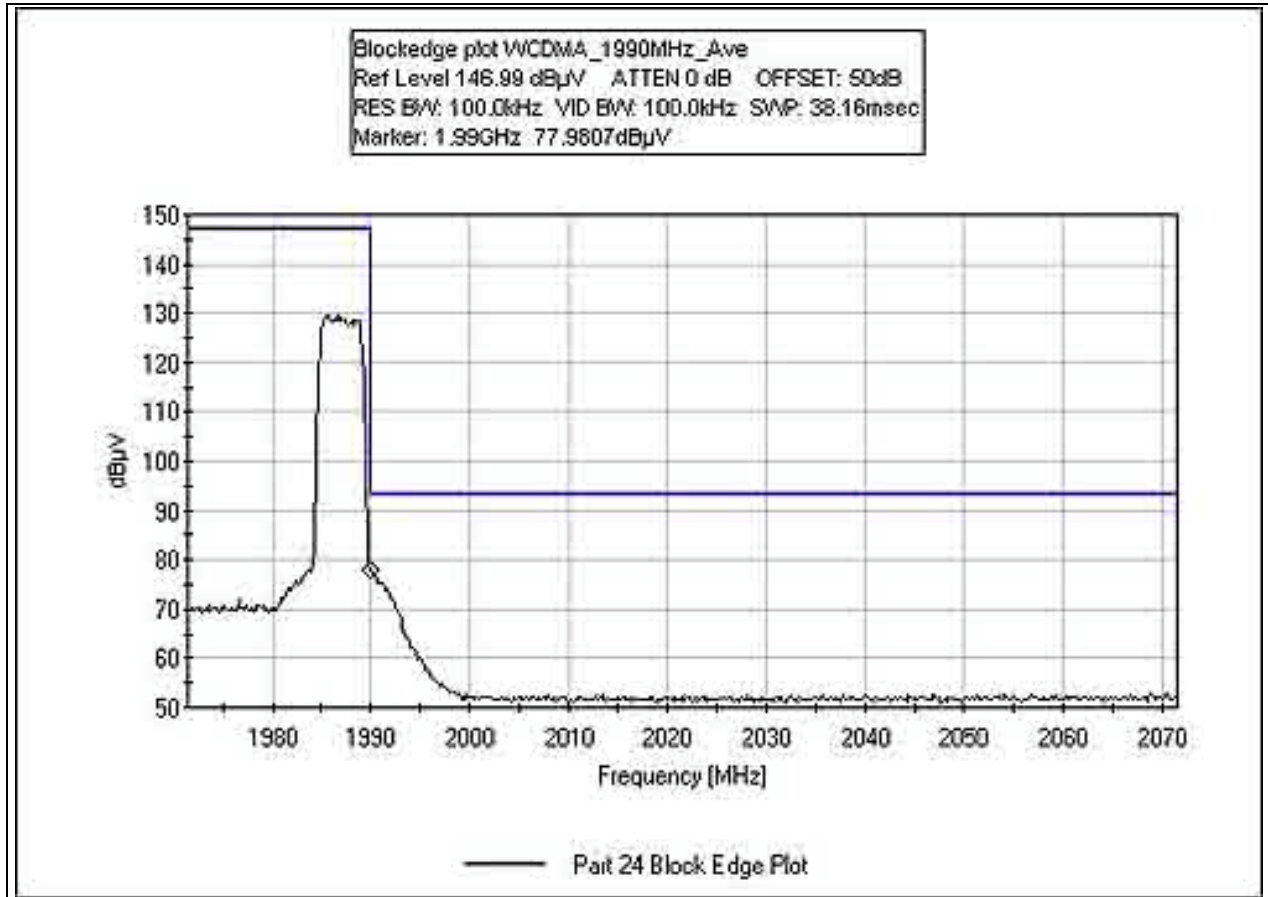
RH300020/211 BLOCKEDGE - EDGE 1930 MHz



RH300020/211 BLOCKEDGE - WCDMA 1930 MHz

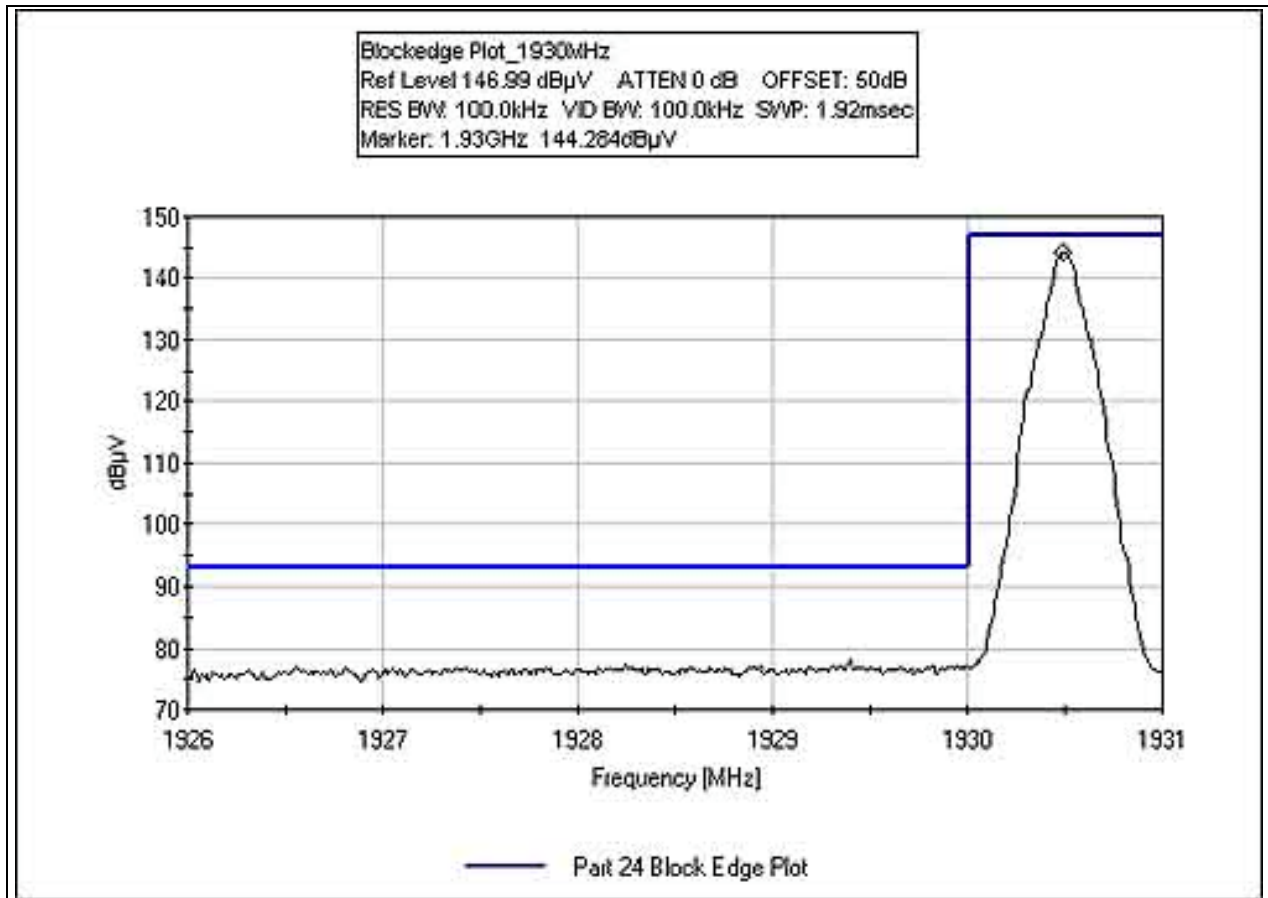


RH300020/211 BLOCKEDGE - WCDMA 1990 MHz

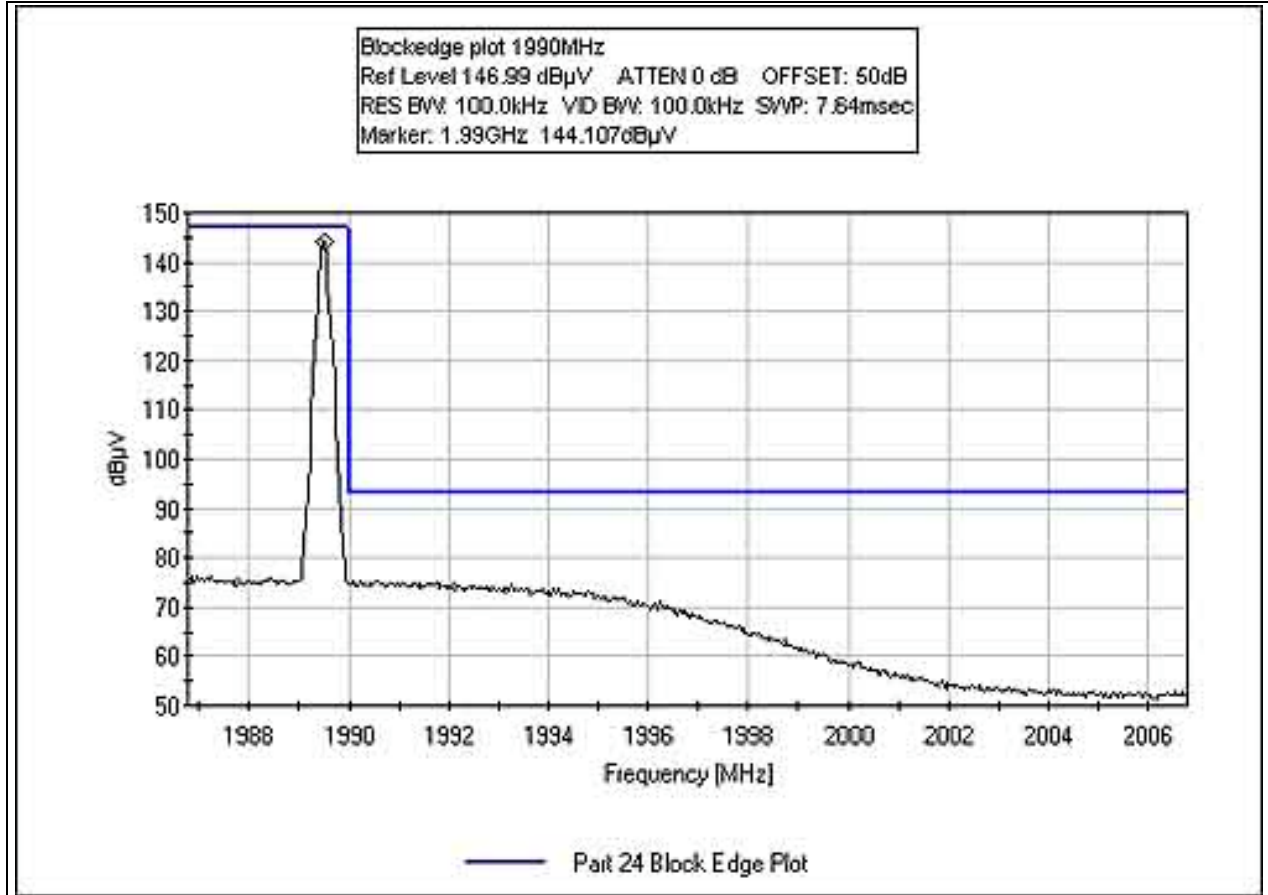


RH300020/100 BLOCKEDGE 1930 MHz

Test Setup: The EUT is placed on the wooden table. The RF Output port is connected to a spectrum analyzer . Optical in port is connected to an Optical converter. Support optical converter receives the signal and converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates a RF signal. The emission signature is evaluated at the antenna port.

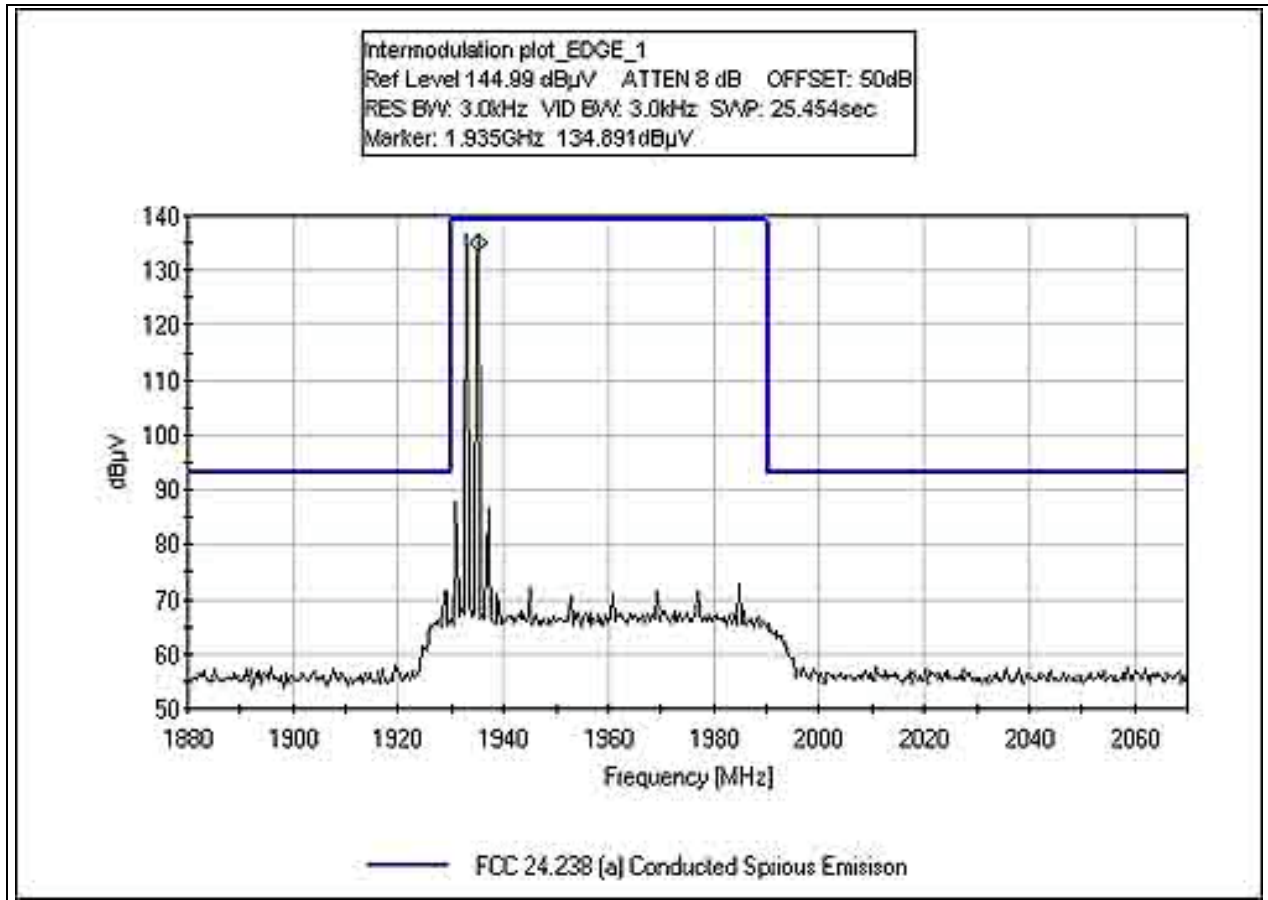


RH300020/100 BLOCKEDGE 1990 MHz

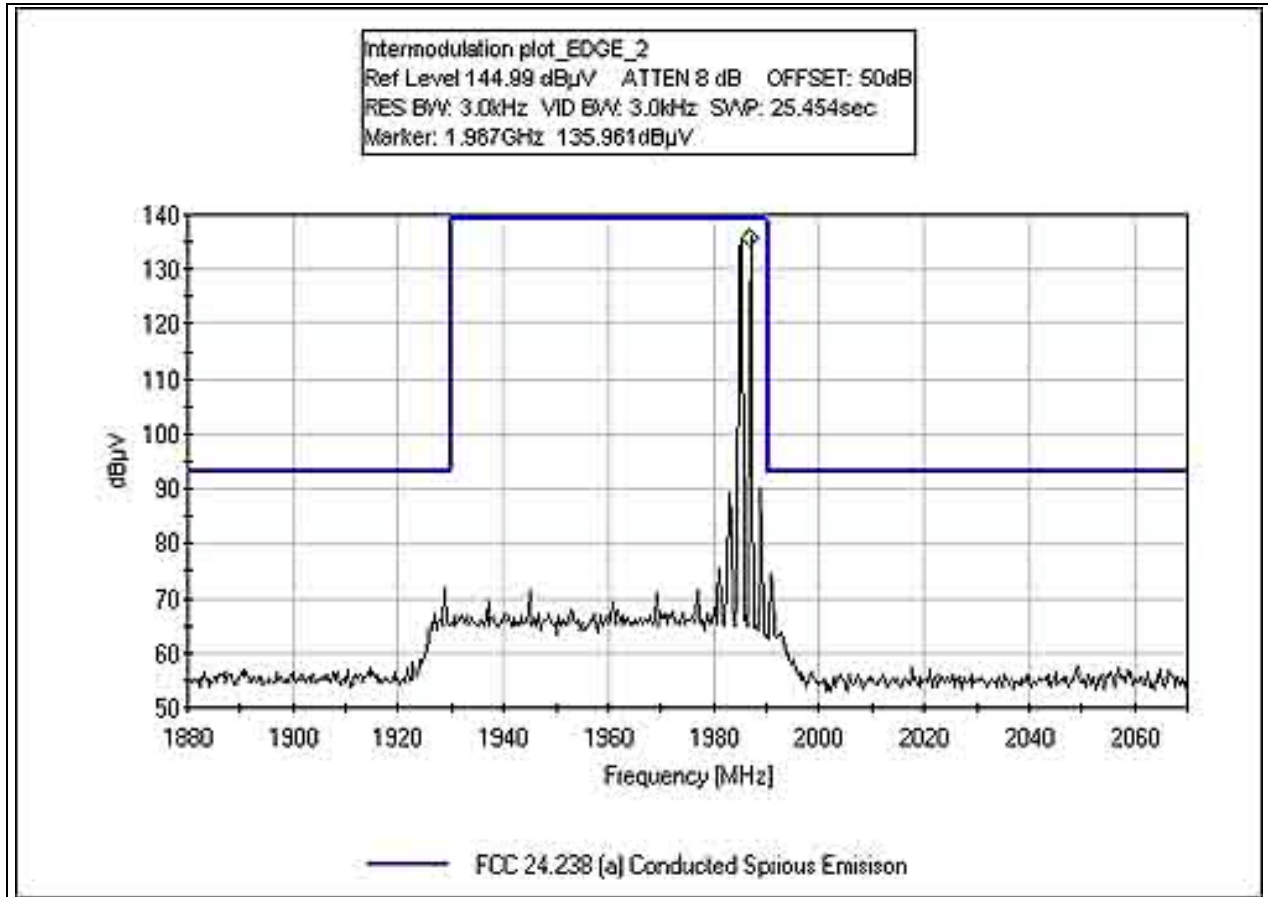


RH300020/211 INTERMODULATION - EDGE 1

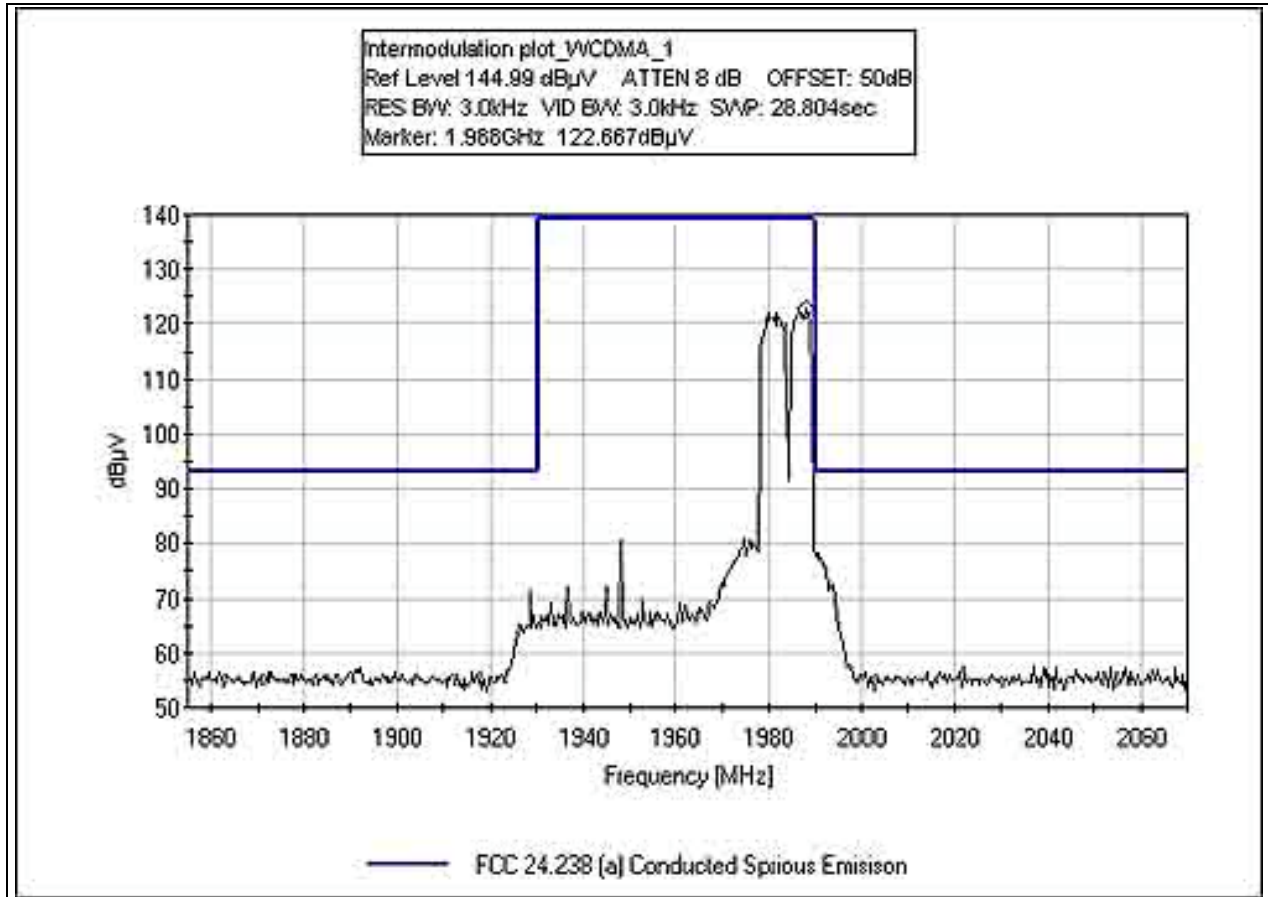
Test Setup: The EUT is placed on the wooden table. The RF Output port is connected to a remote power meter . Optical in port is connected to a support Optical converter. Support optical converter receiving two RF signals, converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates a RF signal. Intermodulation evaluated at the antenna port.



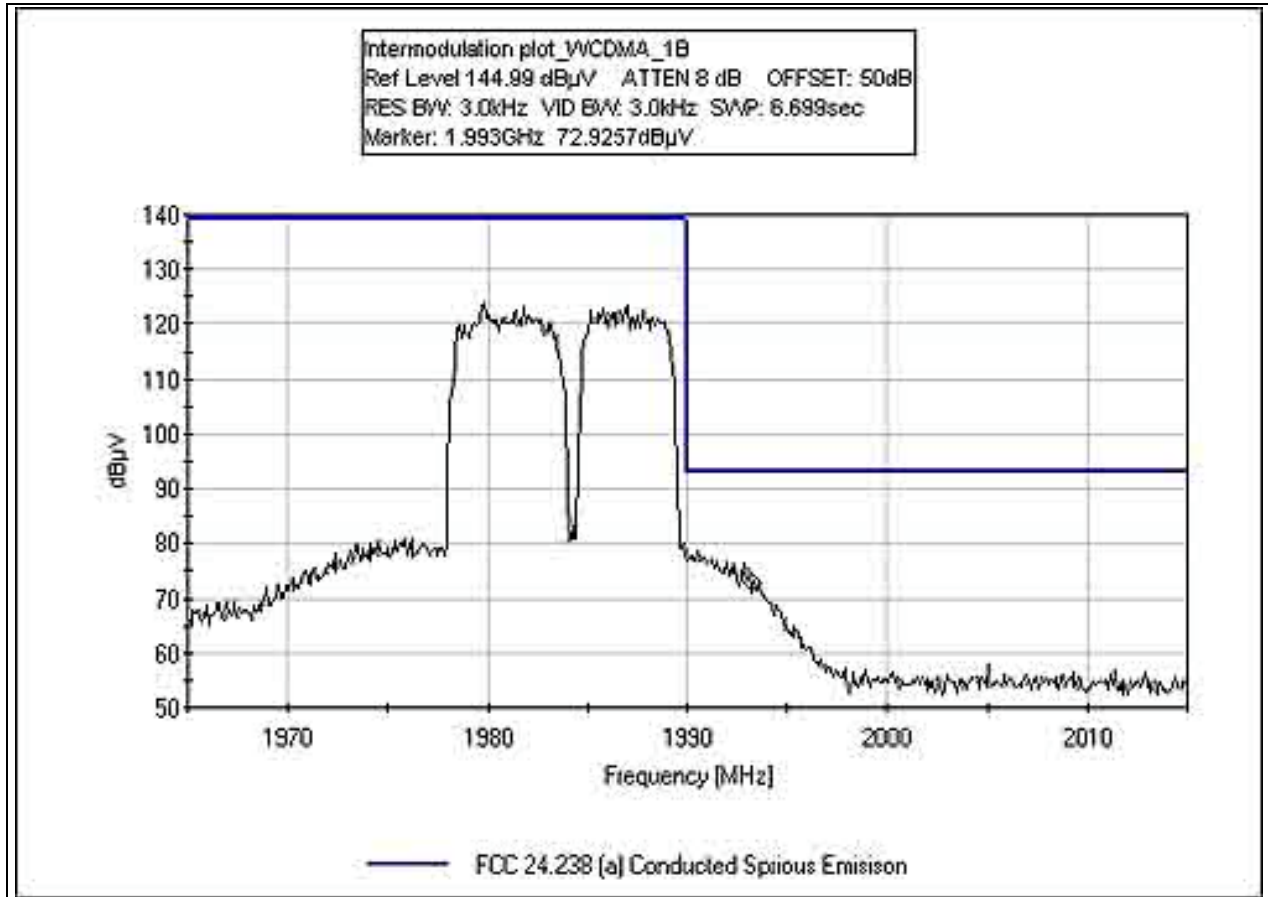
RH300020/211 INTERMODULATION - EDGE 2



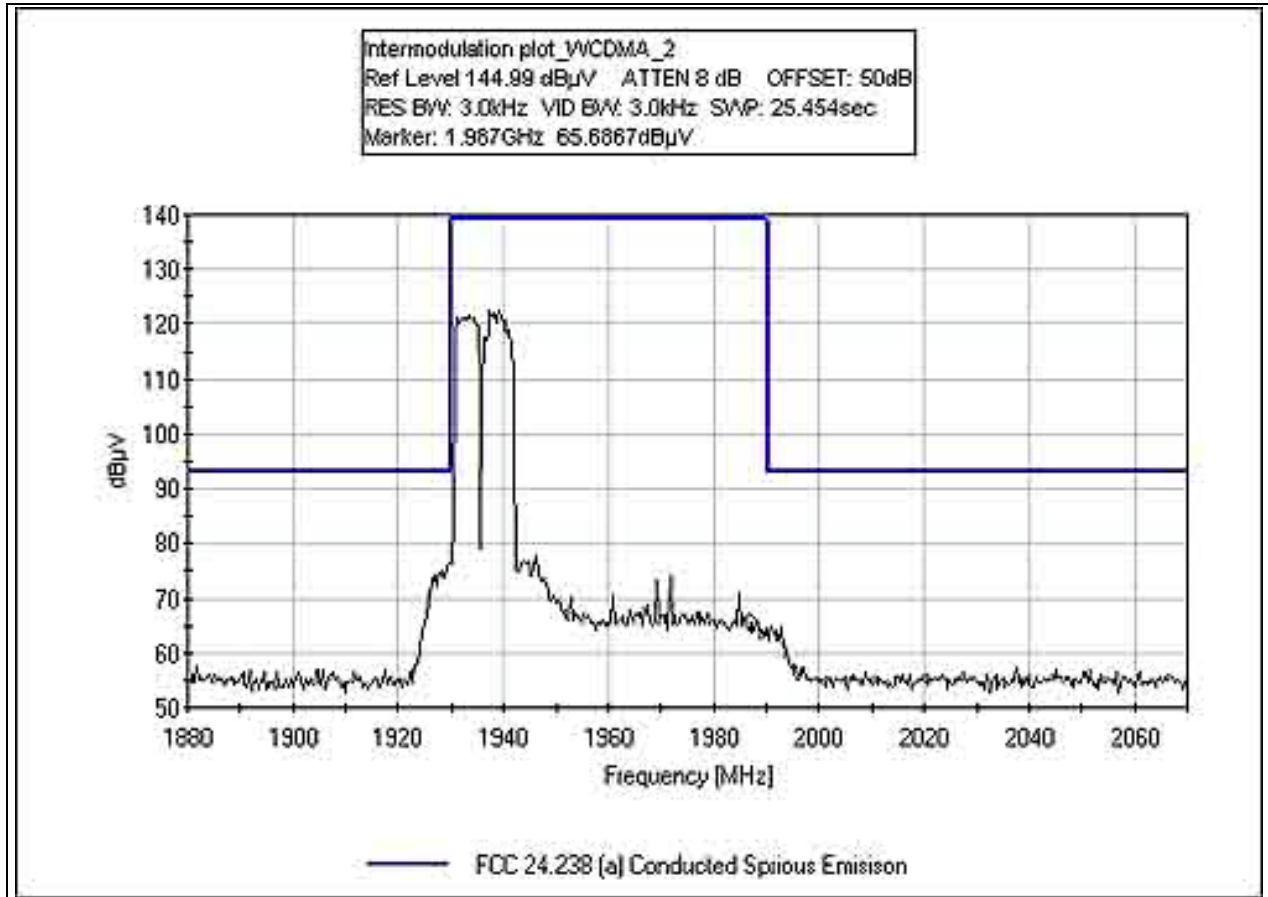
RH300020/211 INTERMODULATION - WCDMA 1



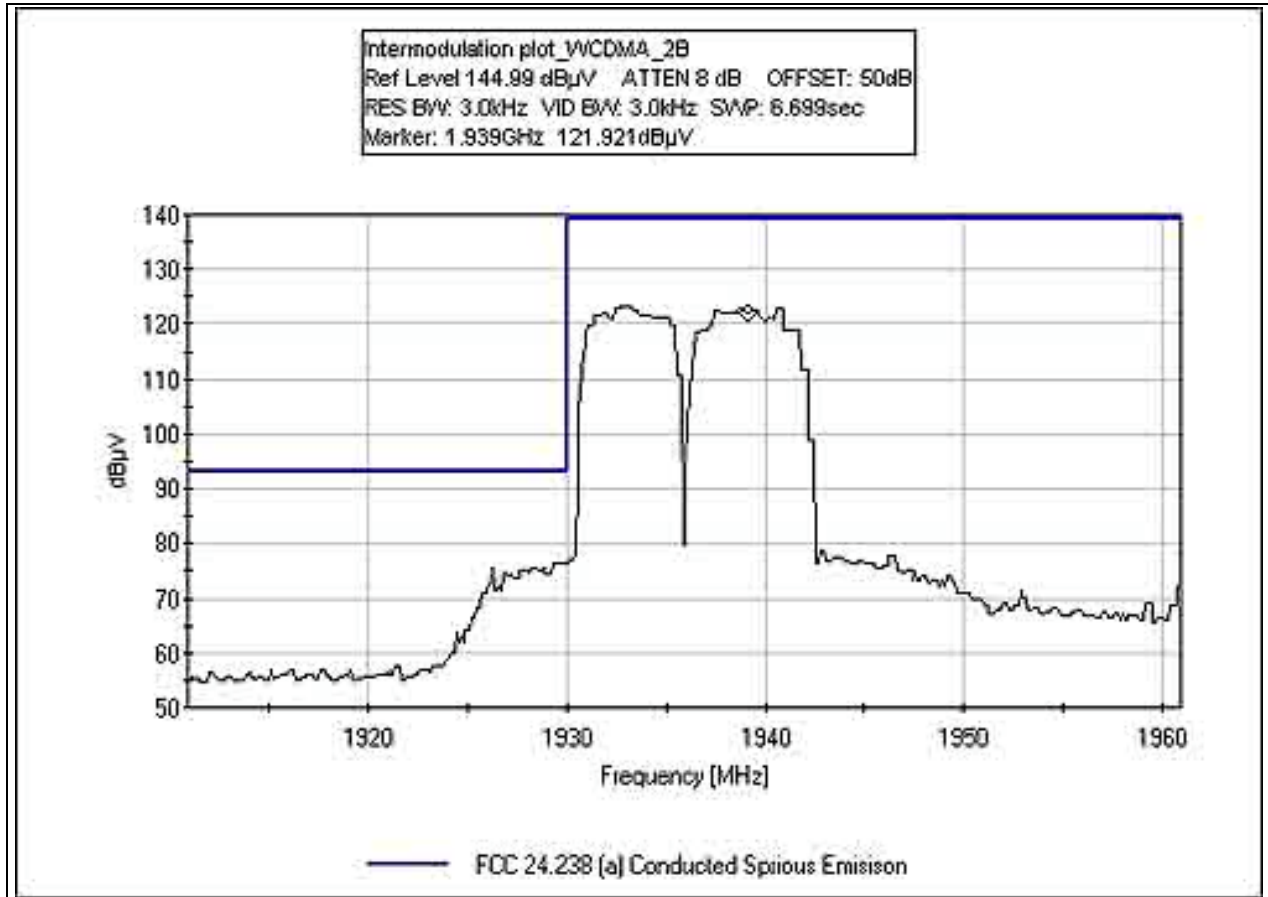
RH300020/211 INTERMODULATION - WCDMA 1B



RH300020/211 INTERMODULATION - WCDMA 2

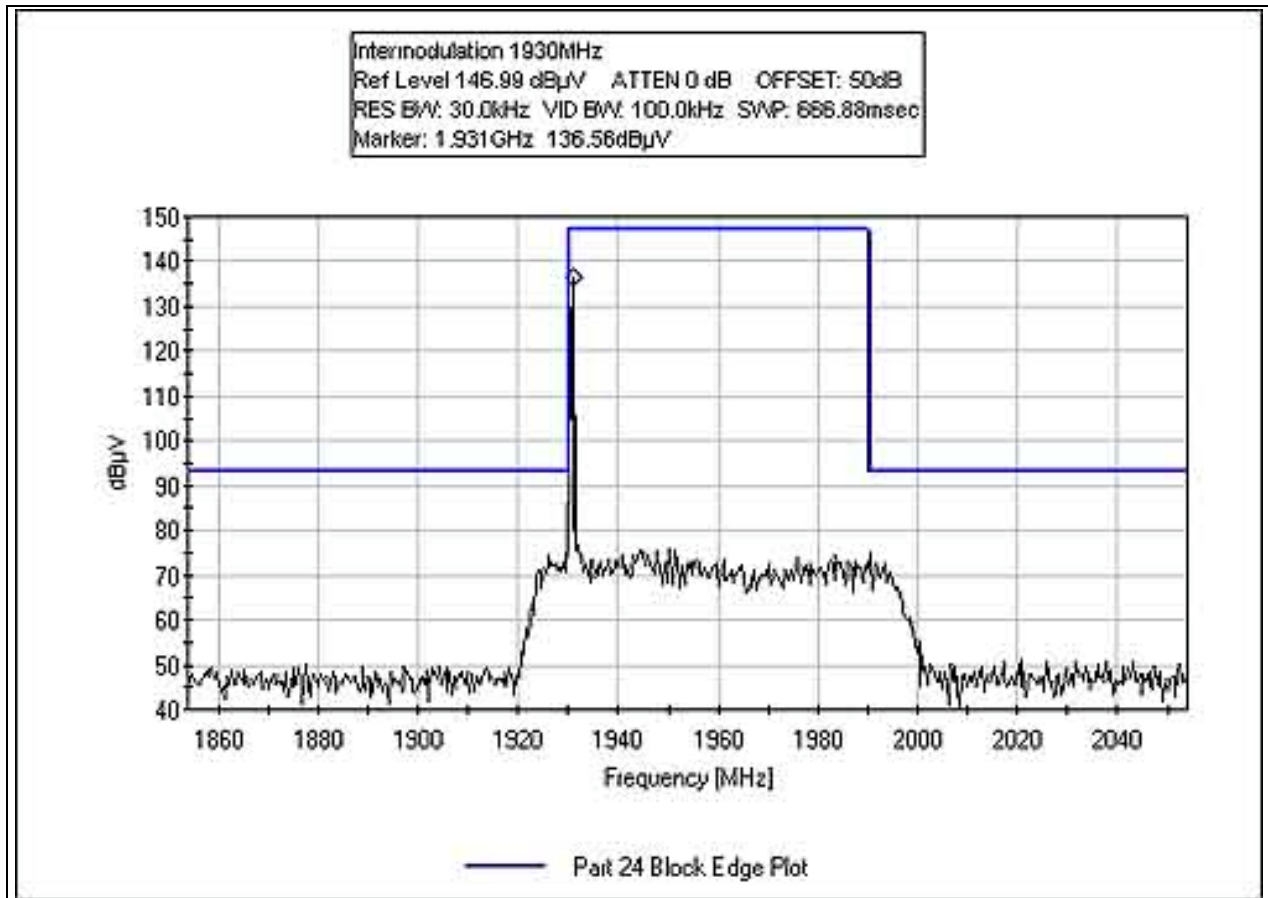


RH300020/211 INTERMODULATION - WCDMA 2B

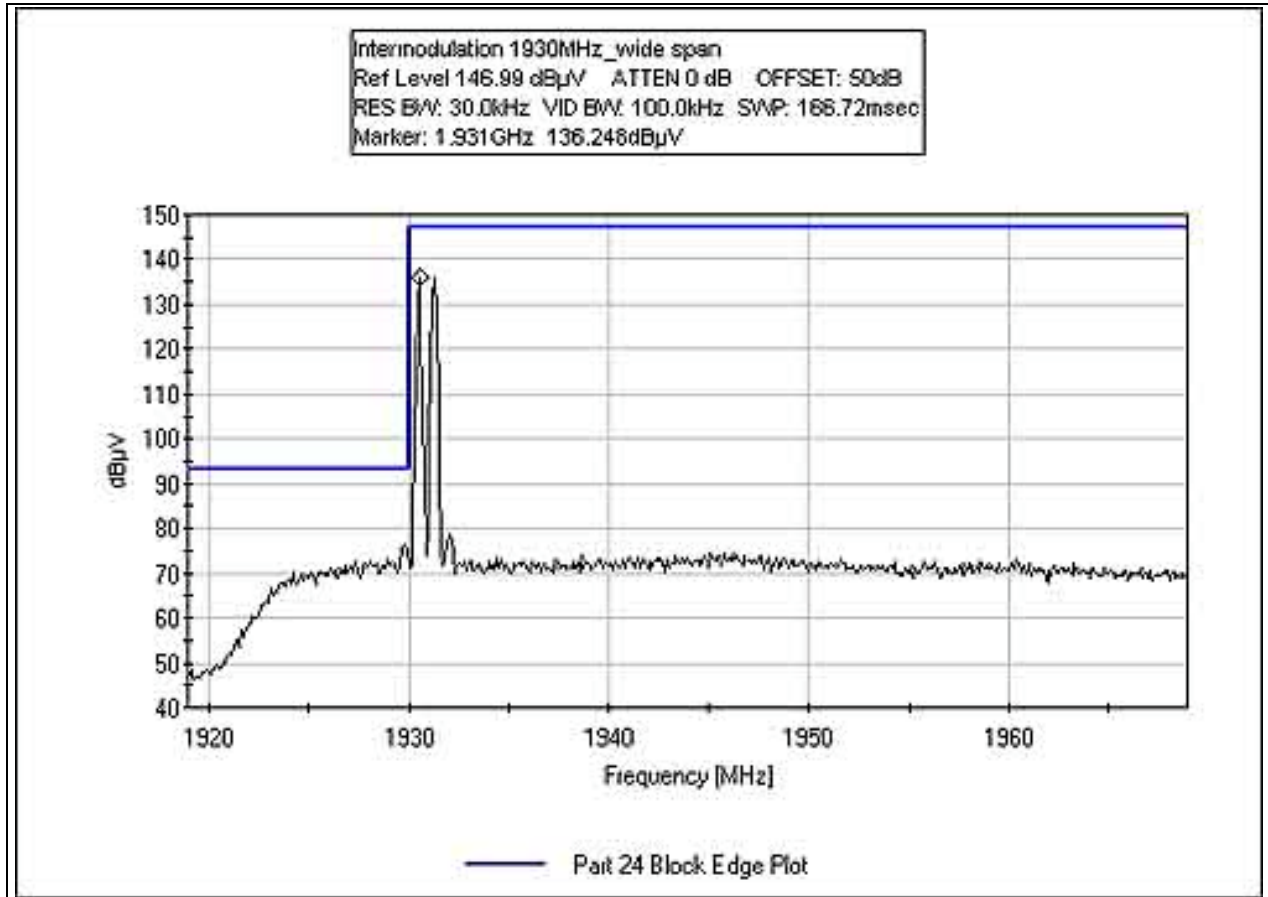


RH300020/100 INTERMODULATION 1930 MHz

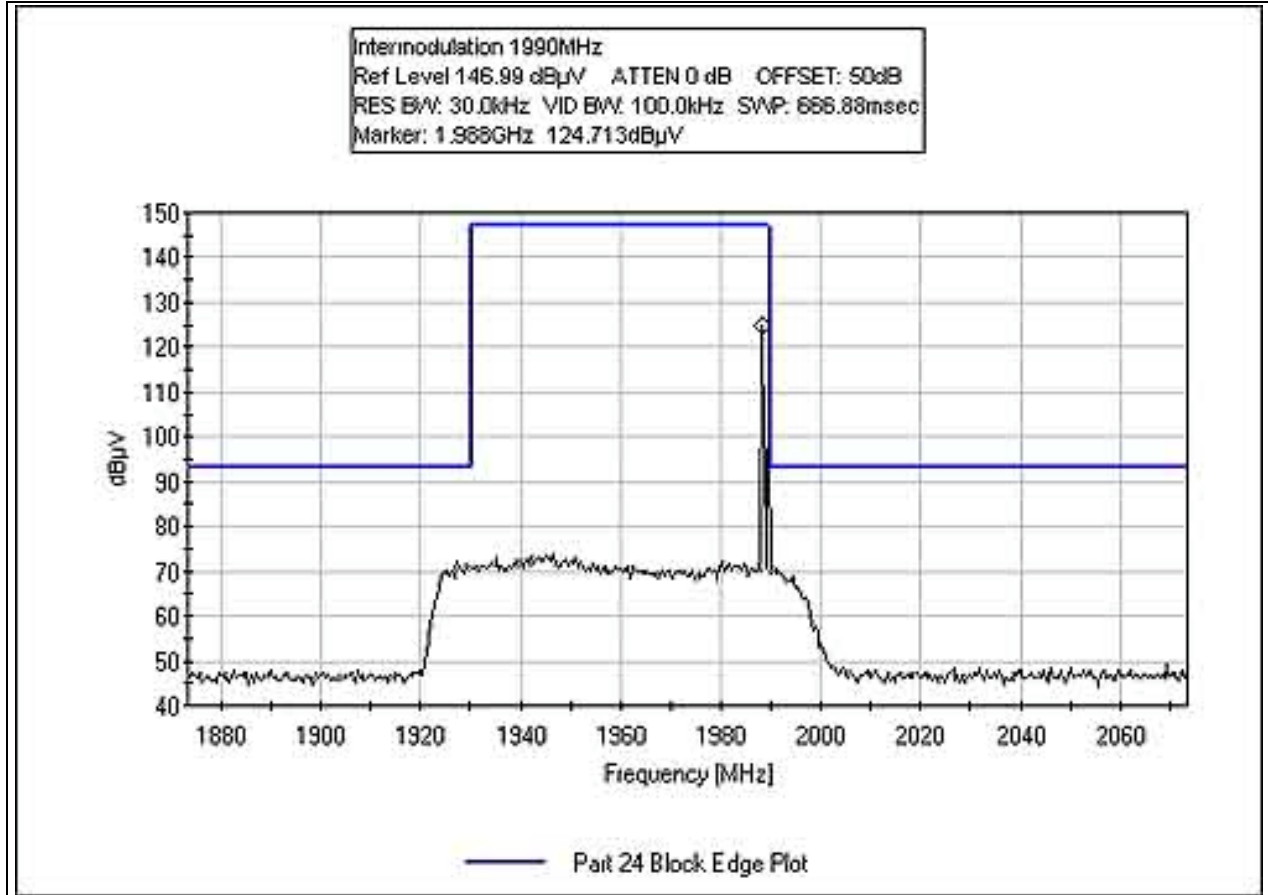
Test Setup: The EUT is placed on the wooden table. The RF Output port is connected to a spectrum analyzer . Optical in port is connected to an Optical converter. Support optical converter receives the signal and converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates a RF signal. The emission signature is evaluated at the antenna port.



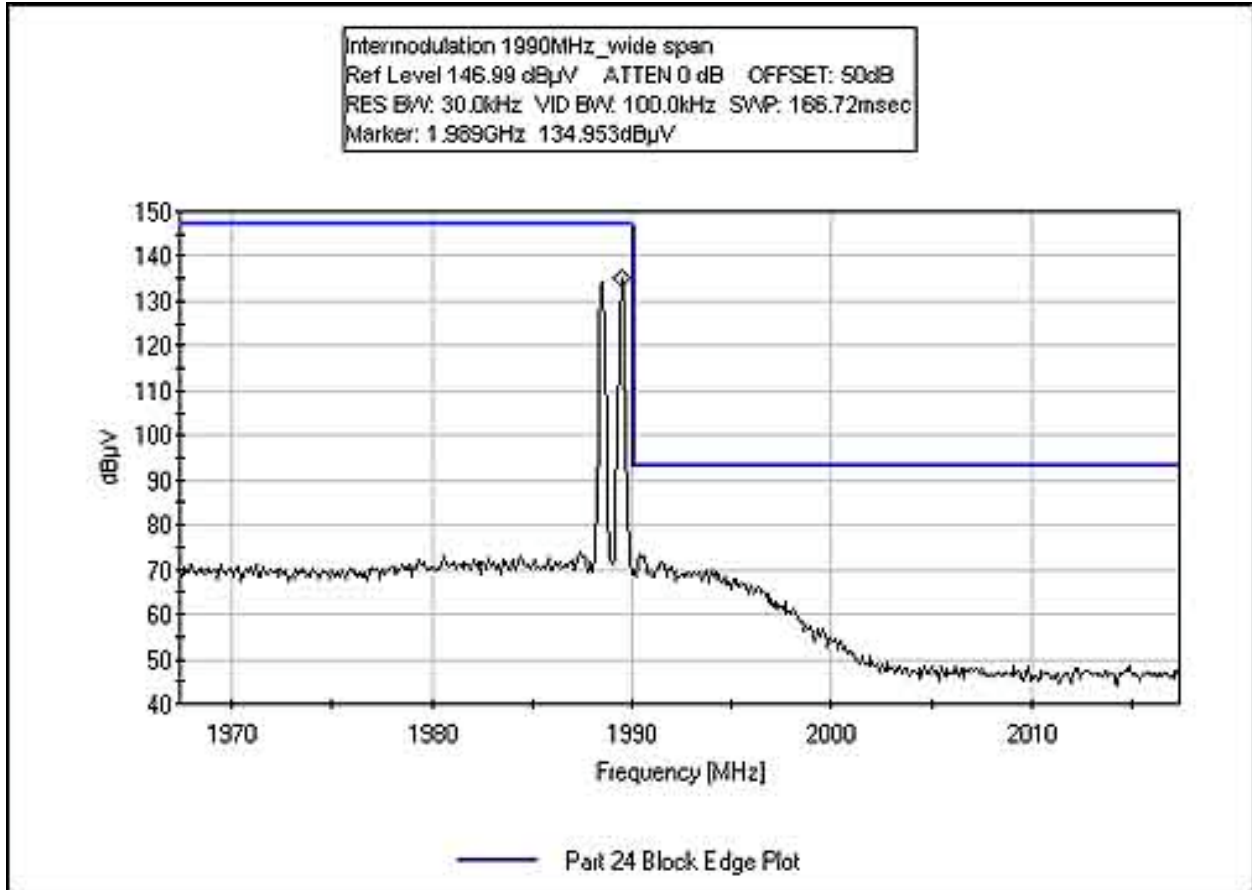
RH300020/100 INTERMODULATION 1930 MHz WIDE SPAN



RH300020/100 INTERMODULATION 1990 MHz

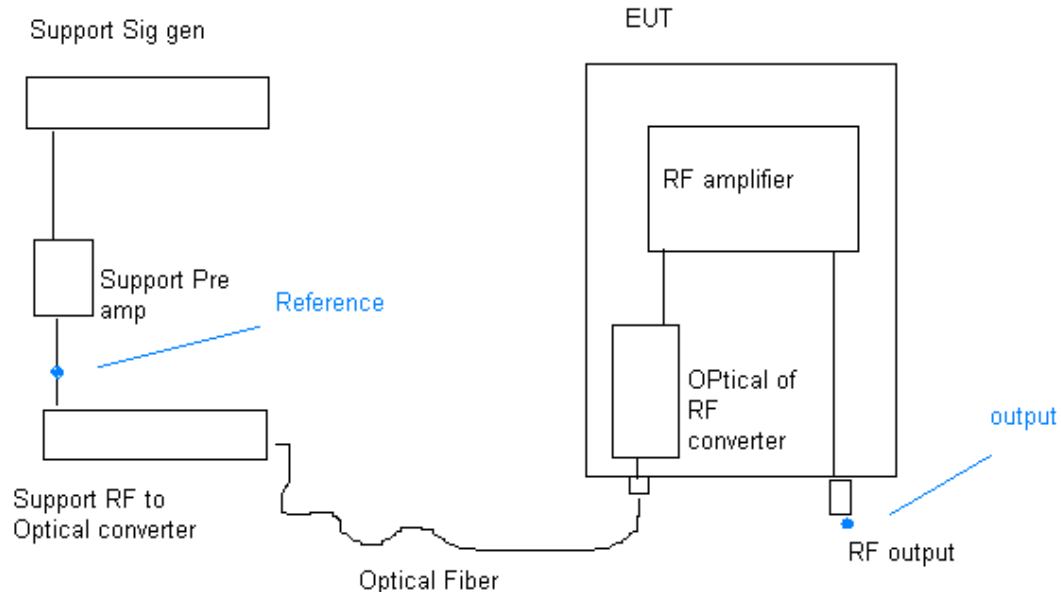


RH300020/100 INTERMODULATION 1990 MHz WIDE SPAN



RH300020/211 RSS 131 AMPLIFIER GAIN

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.

Manufacture stated gain = 45- 70 dB

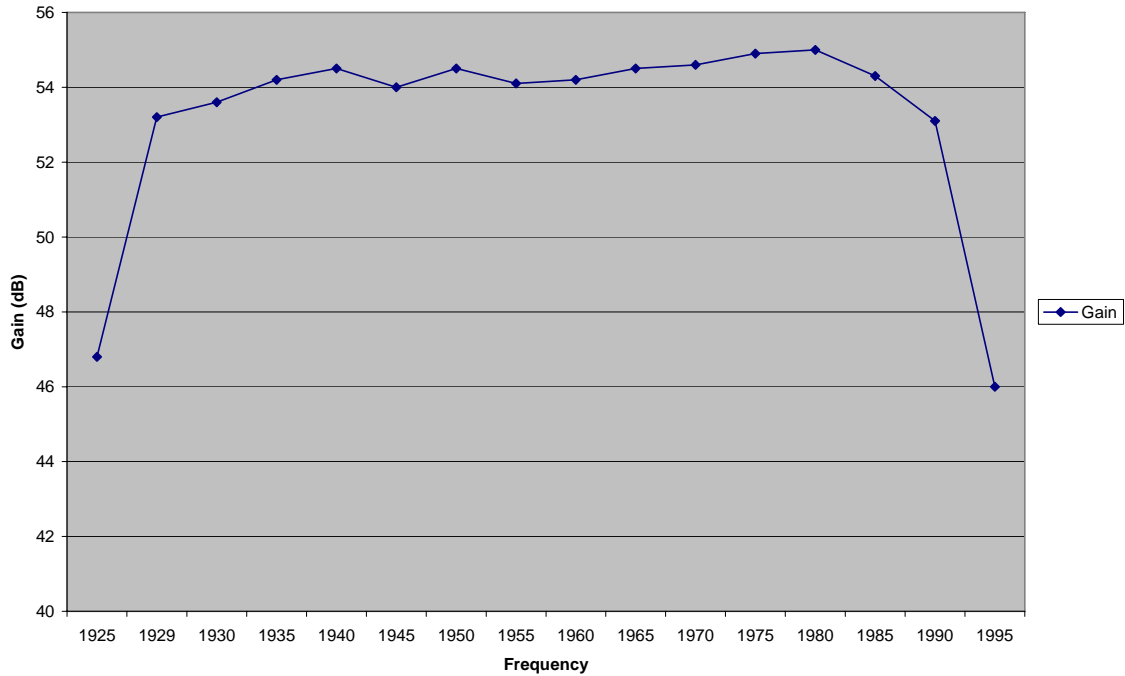
A support signal generator is connected to CKC's test computer via GPIB. CKC's test software capable of setting the output frequency and amplitude of the support signal generator is used to control the signal generator.

The software which is also capable of collecting data when used with a spectrum analyzer, measures the frequency and amplitude of the RF signal.

A base line RF level at the Reference point was measured. Then the EUT was activated and RF level at the RF output port was measured. The gain is computed as the difference between the signal level at the RF output and the baseline measurement.

Support Signal generator: Agilent E4433B, SN US40051840

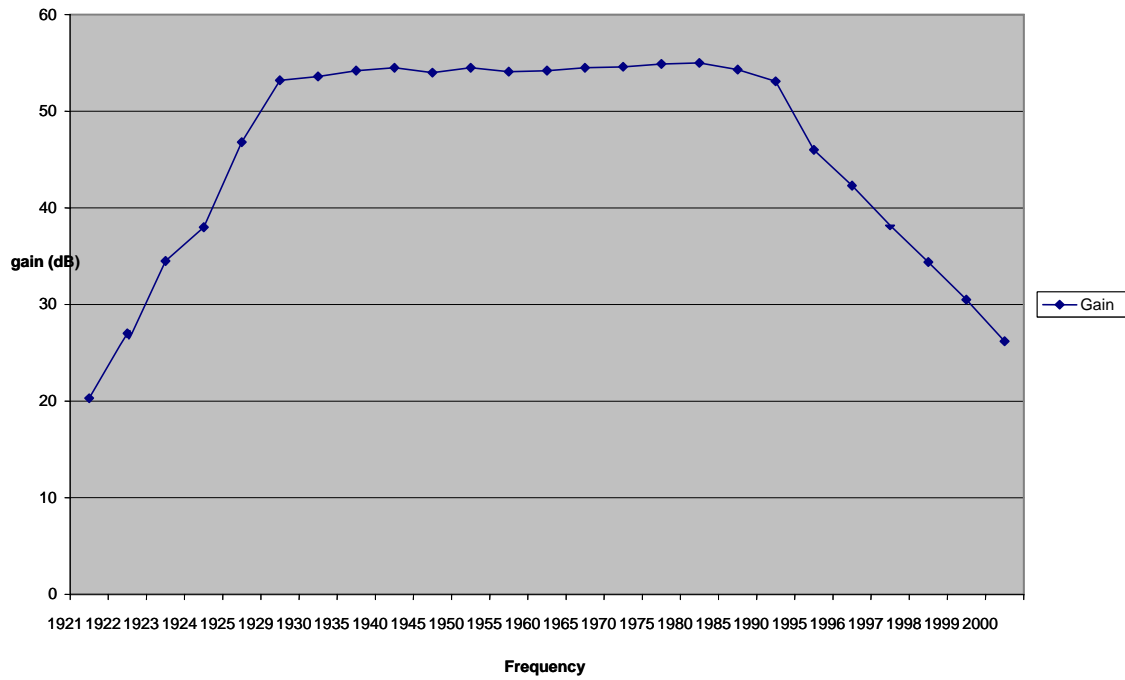
Gain Linearity Plot: Max gain = 55 dB



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

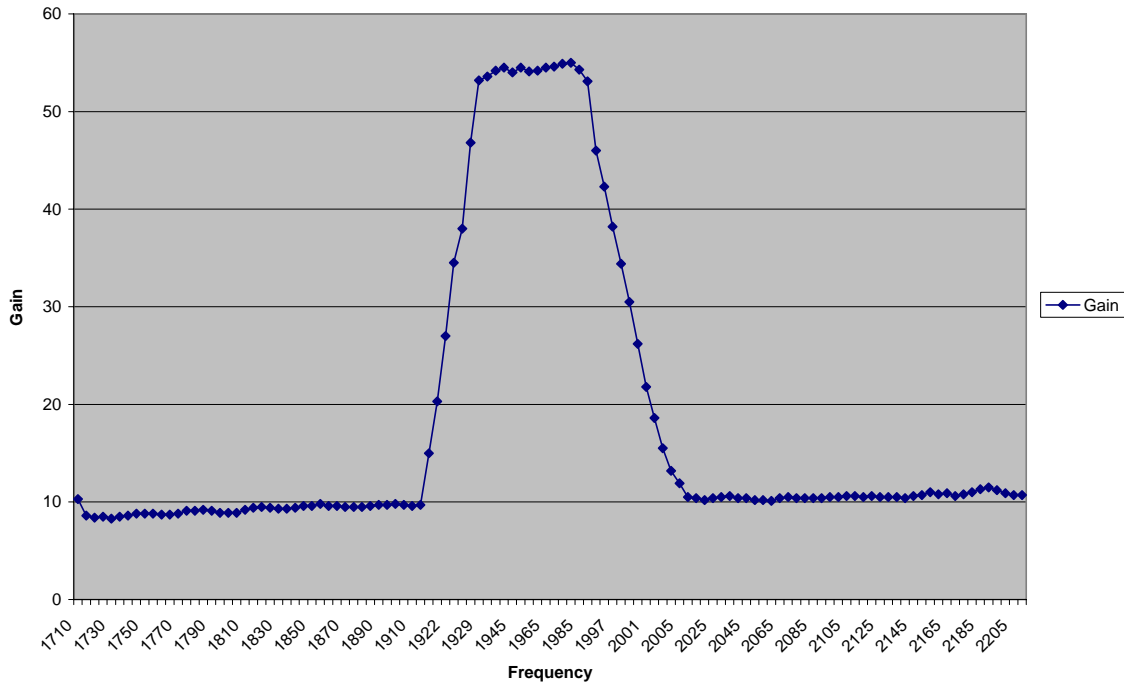
Maximum measured gain = 55dB, which does not exceed the manufacturer declared maximum gain of 70 dB.

Gain Linearity Plot: -20dB BW = 75MHz



Measured -20 dB Bandwidth is 75 MHz. (Between 1923 MHz and 1998 MHz)

Gain Linearity Plot + - 250% of -20 dB BW



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 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.

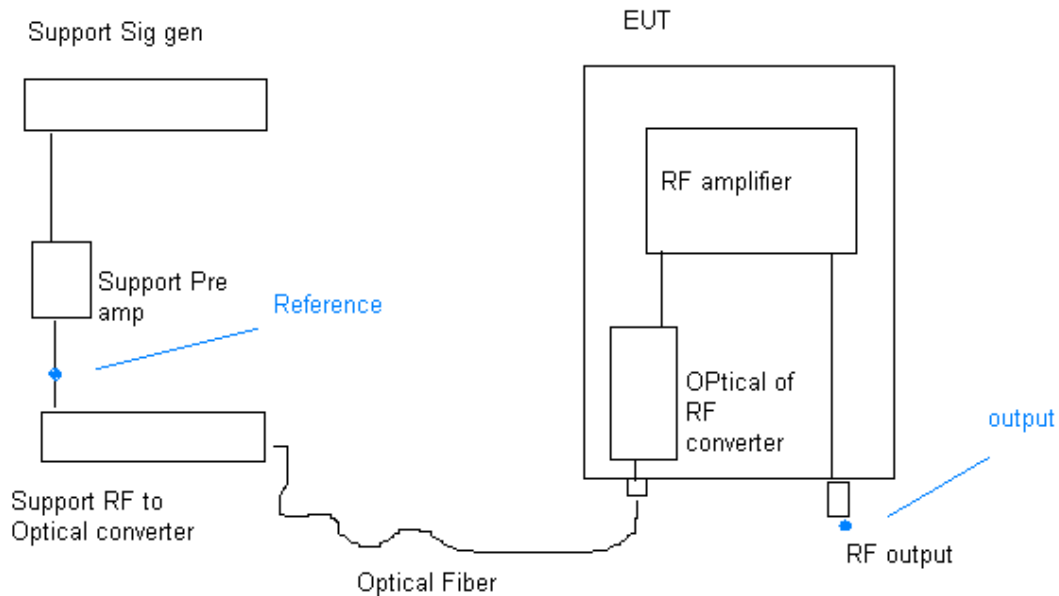
Outside of the 20dB bandwidth the gain shall not exceed that at the 20dB point.

Test Equipment

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02467	Agilent	E7405A	US40240225	032205	032207

RH300020/100 RSS 131 AMPLIFIER GAIN AND BANDWIDTH:

Setup



Measured gain = Output – Reference (dB)

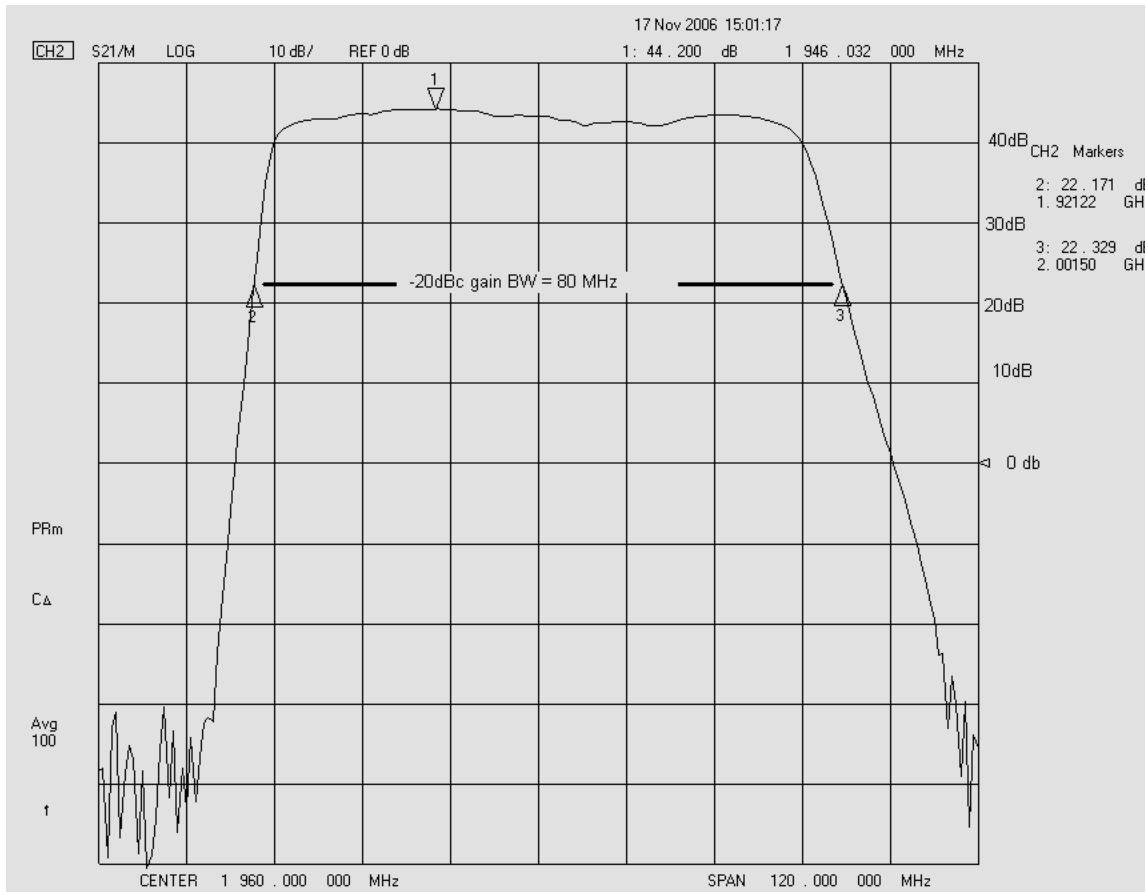
The nominal bandwidth and nominal pass band gain (dB) of the RF enhancer or translator shall be stated by the manufacturer or equipment certification applicant and indicated in the test report.

Manufacturer stated gain = 45 to 70 dB

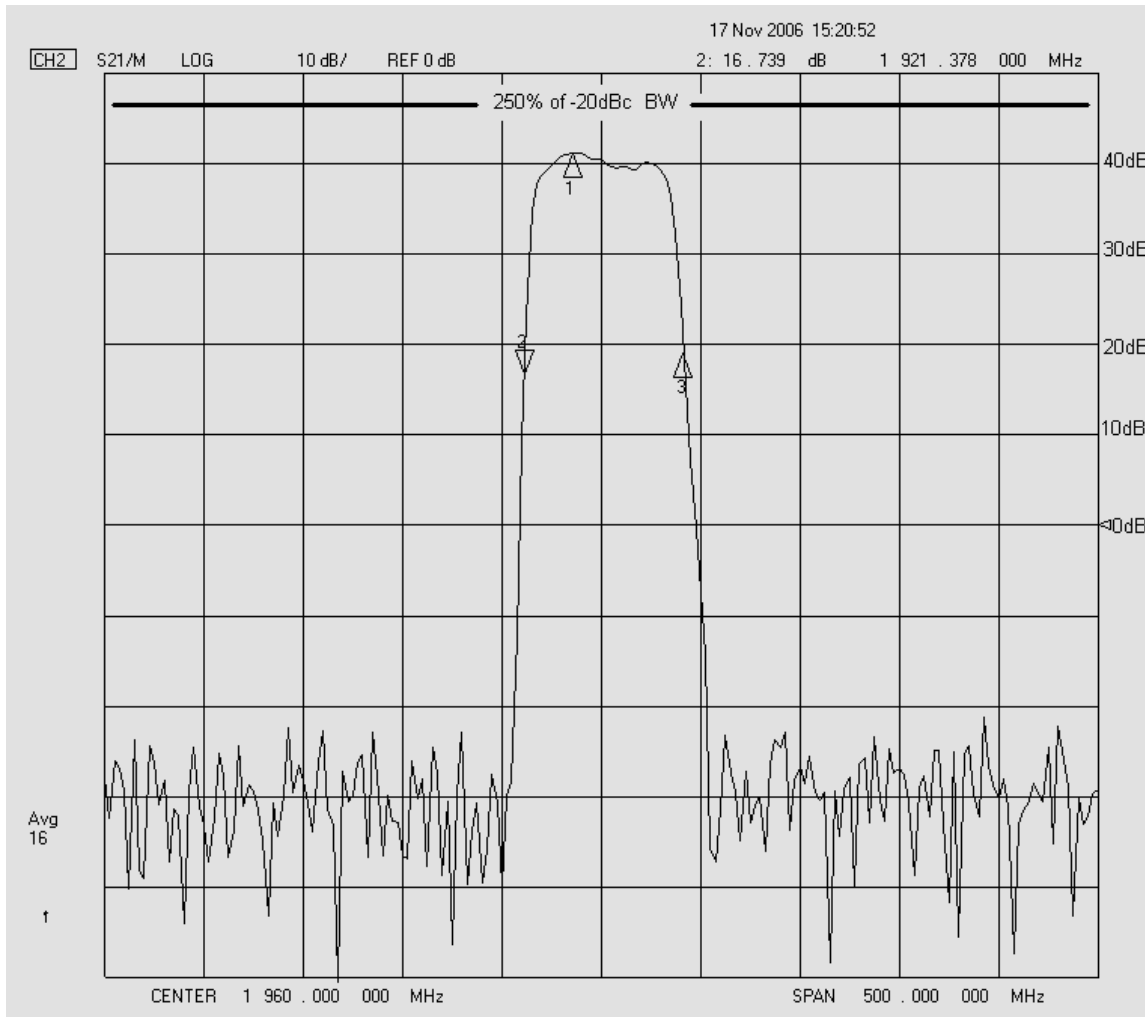


The internal control is adjusted to the nominal gain for which equipment certification is sought.

Maximum measured gain = 44.2 dB



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_0 of the pass band up to at least $f_0 \pm 250\%$ 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.

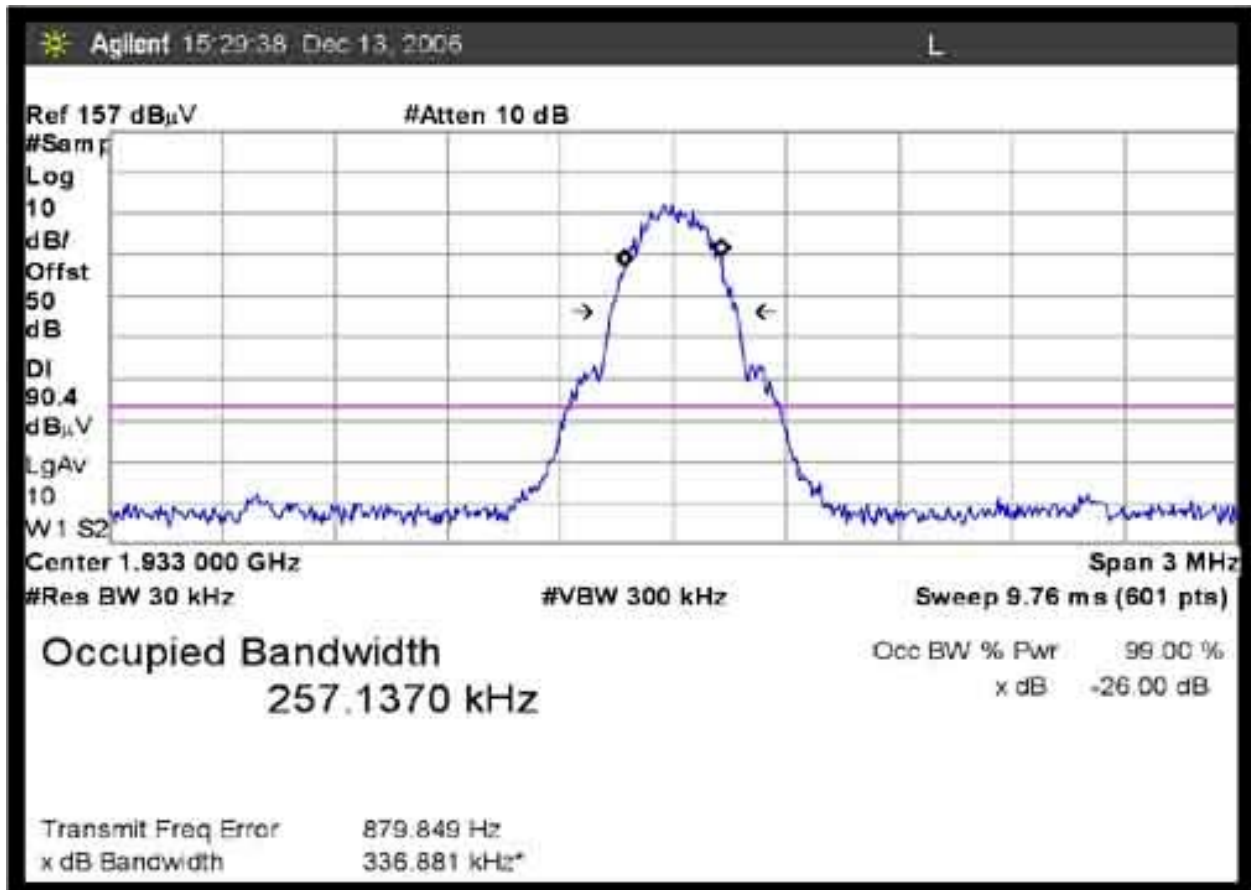
Test Equipment

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Network analyzer	PWAV	HP	8753E	Us38432770	072204	072206

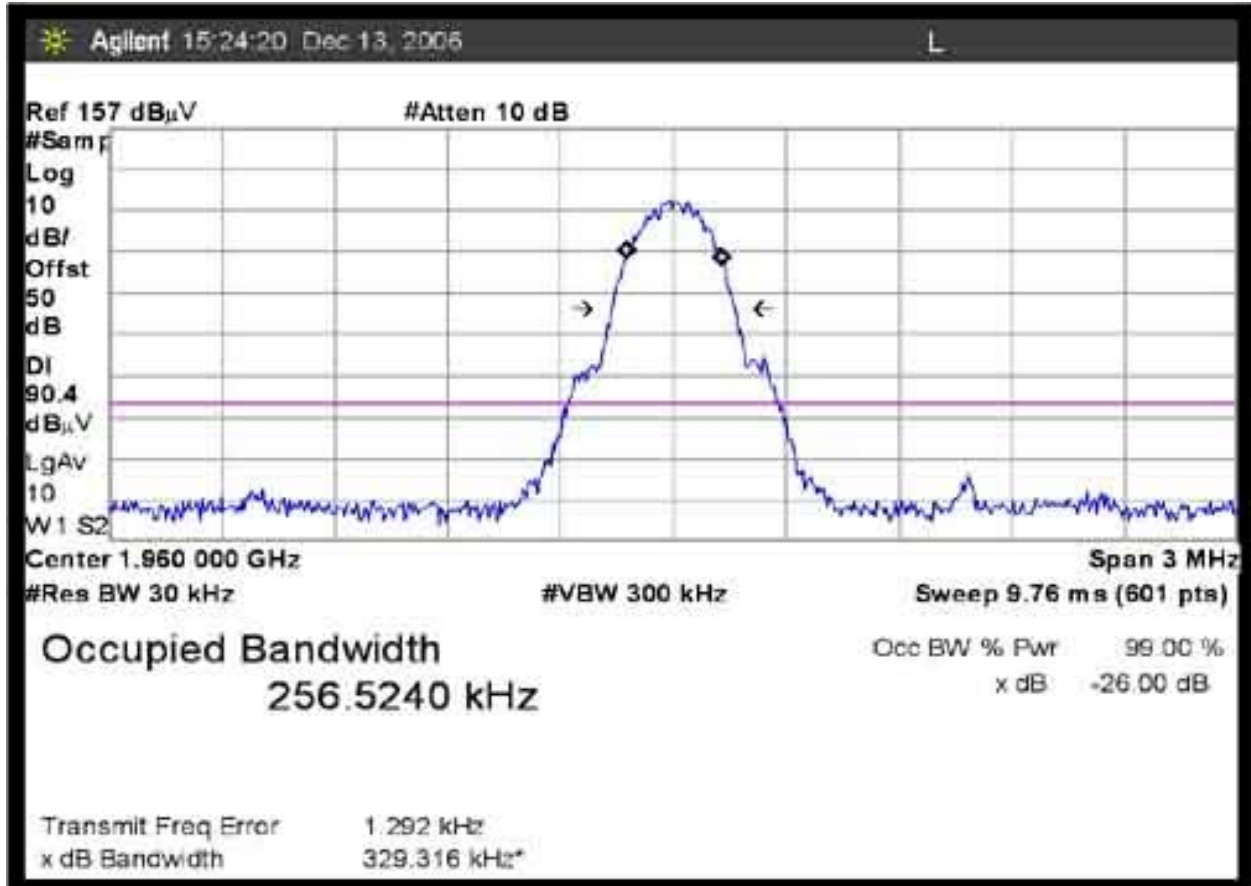


RH300020/211 RSS 131 99% BANDWIDTH EDGE 1930 MHz

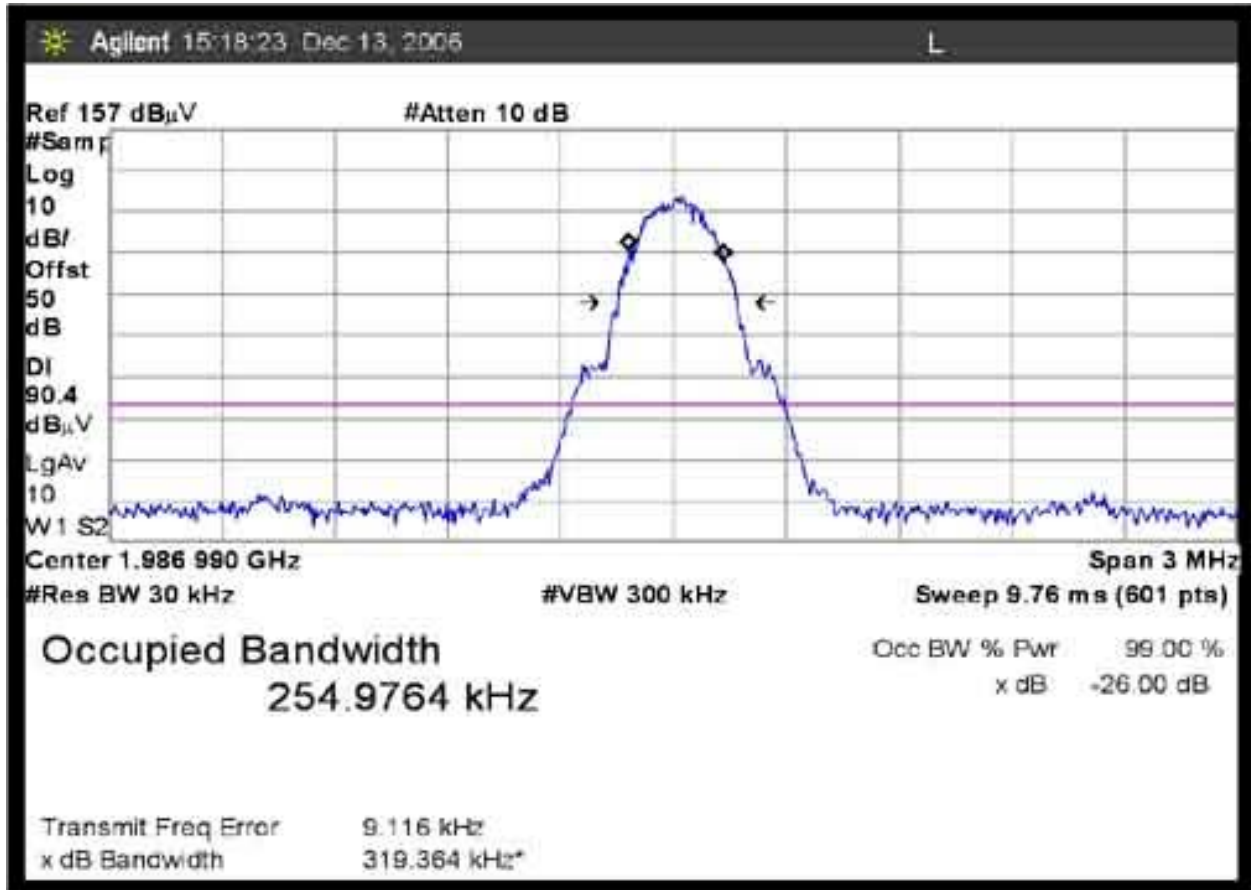
Setup: The EUT is placed on the wooden table. The RF Output port is connected to a remote power meter . Optical in port is connected to a support Optical converter. Support optical converter receives RF signal converts the signal to optic and send to the EUT. The EUT decode the optical signal, and generates a RF signal. 99% BW evaluated at the antenna port. Power = 20 watts, Frequency = 1930 MHz, 1960 MHz, 1990MHz, Modulation: EDGE, WCDMA.



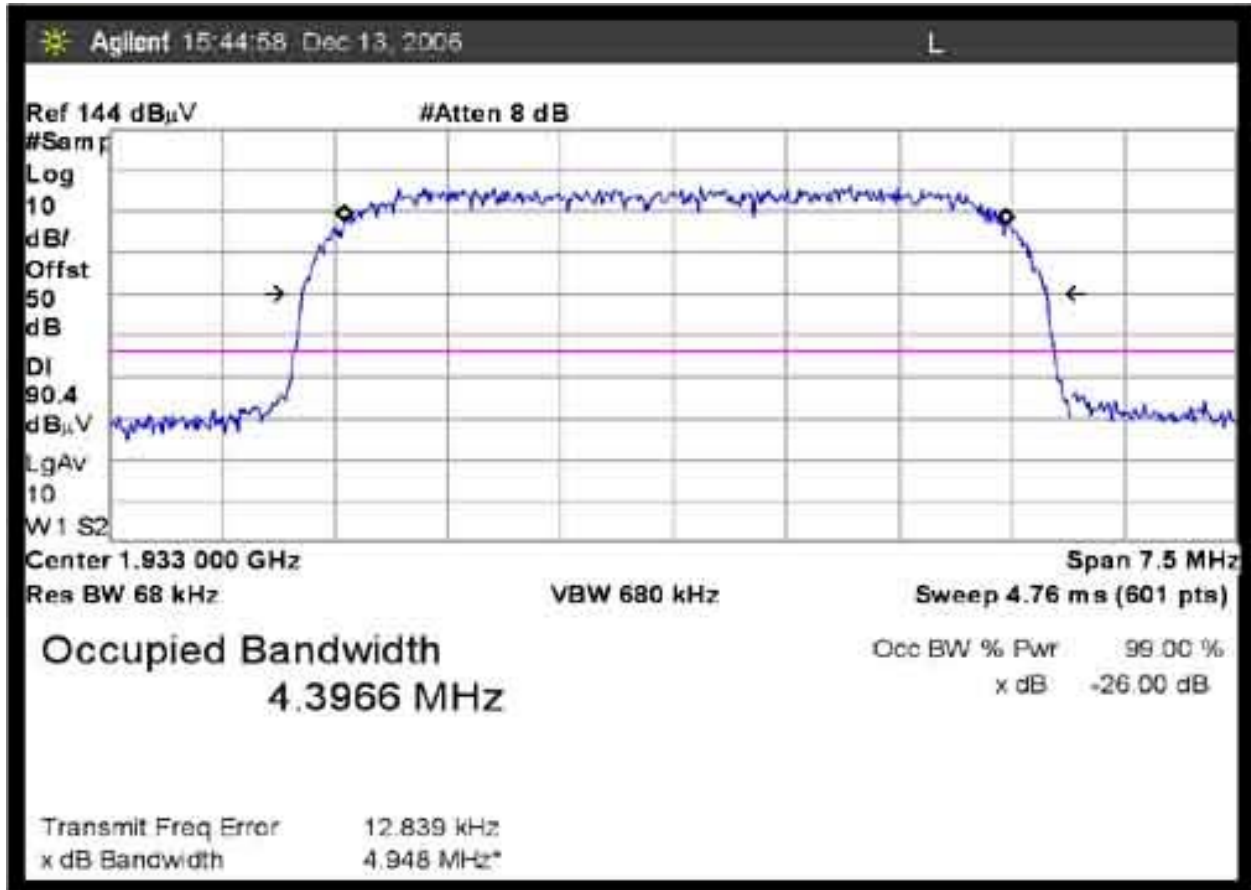
RH300020/211 RSS 131 99% BANDWIDTH EDGE 1960 MHz



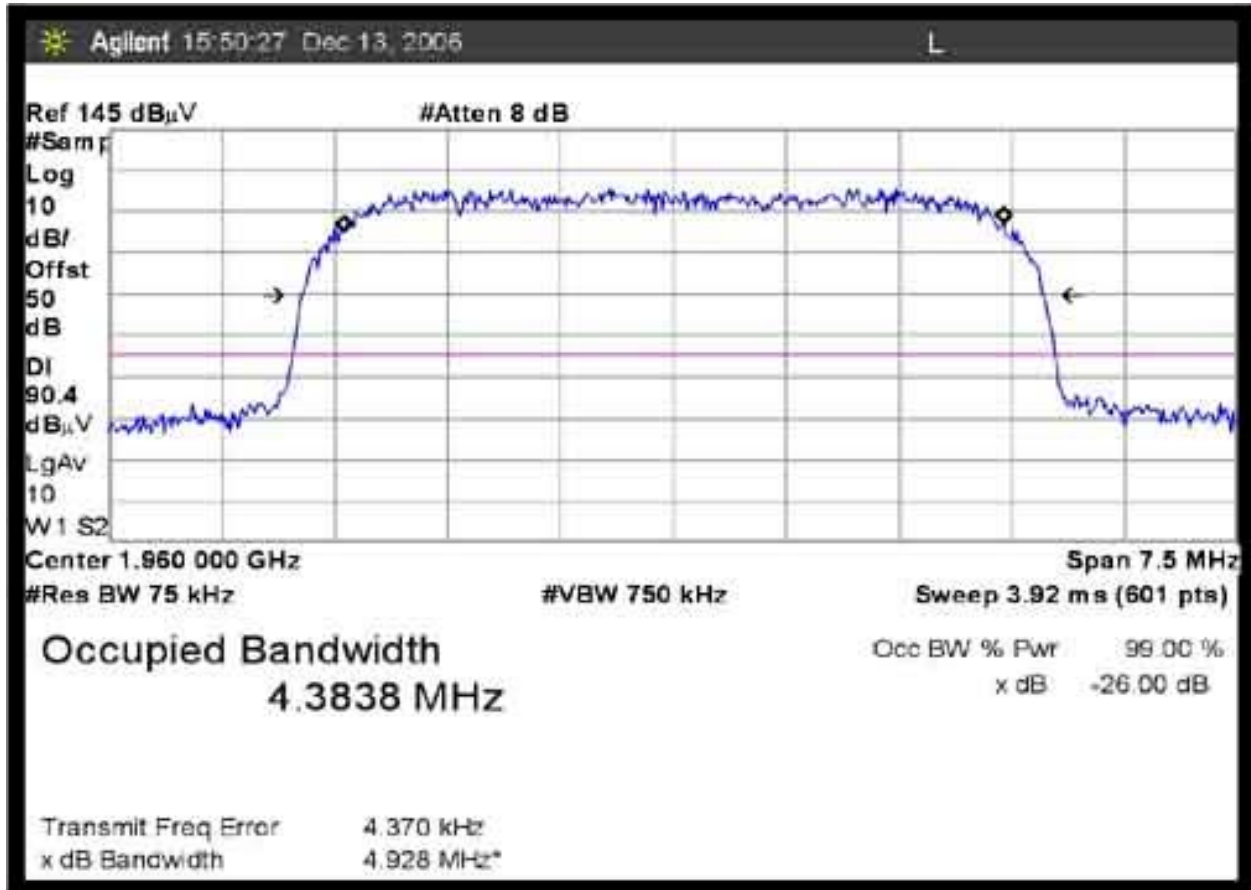
RH300020/211 RSS 131 99% BANDWIDTH EDGE 1990 MHz



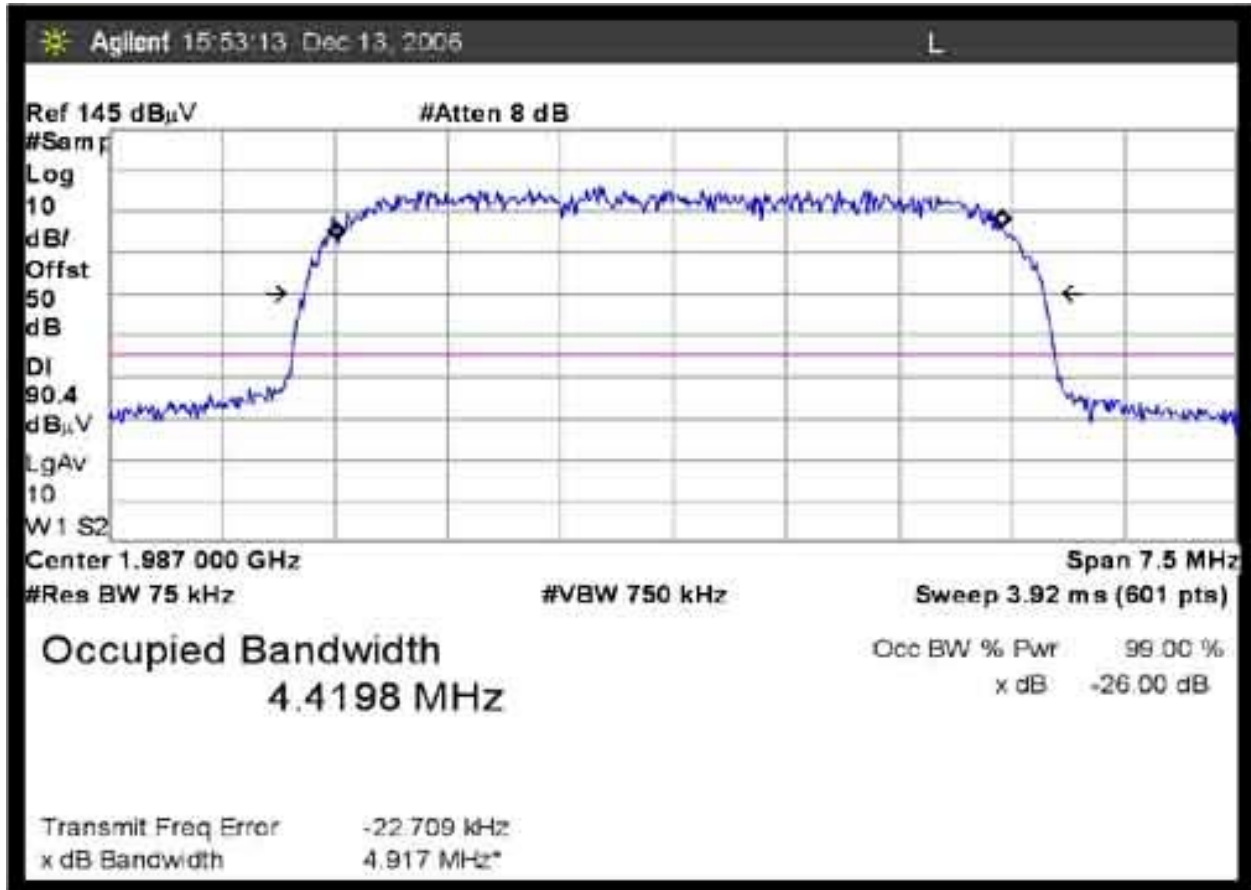
RH300020/211 RSS 131 99% BANDWIDTH WCDMA 1930 MHz



RH300020/211 RSS 131 99% BANDWIDTH WCDMA 1960 MHz

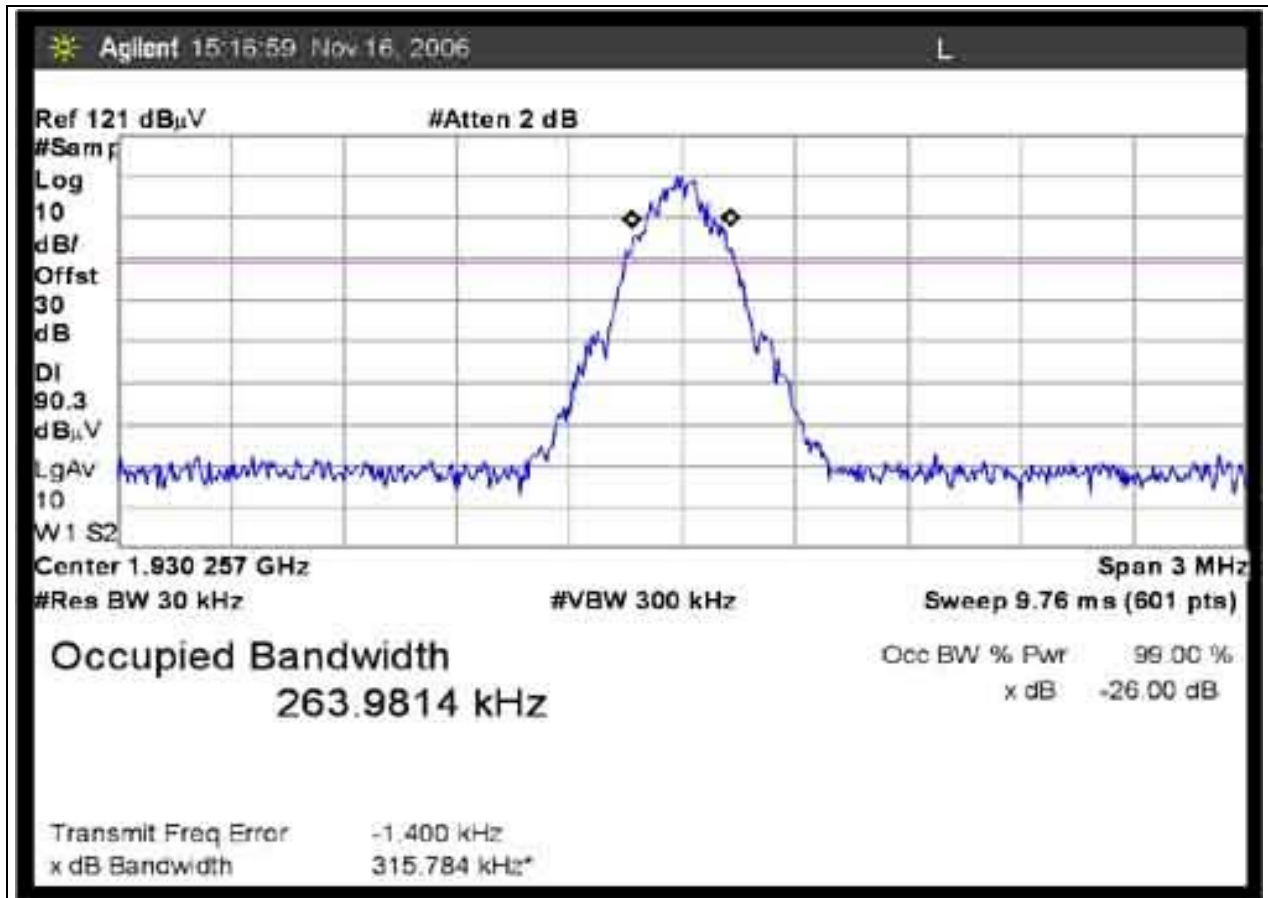


RH300020/211 RSS 131 99% BANDWIDTH WCDMA 1990 MHz

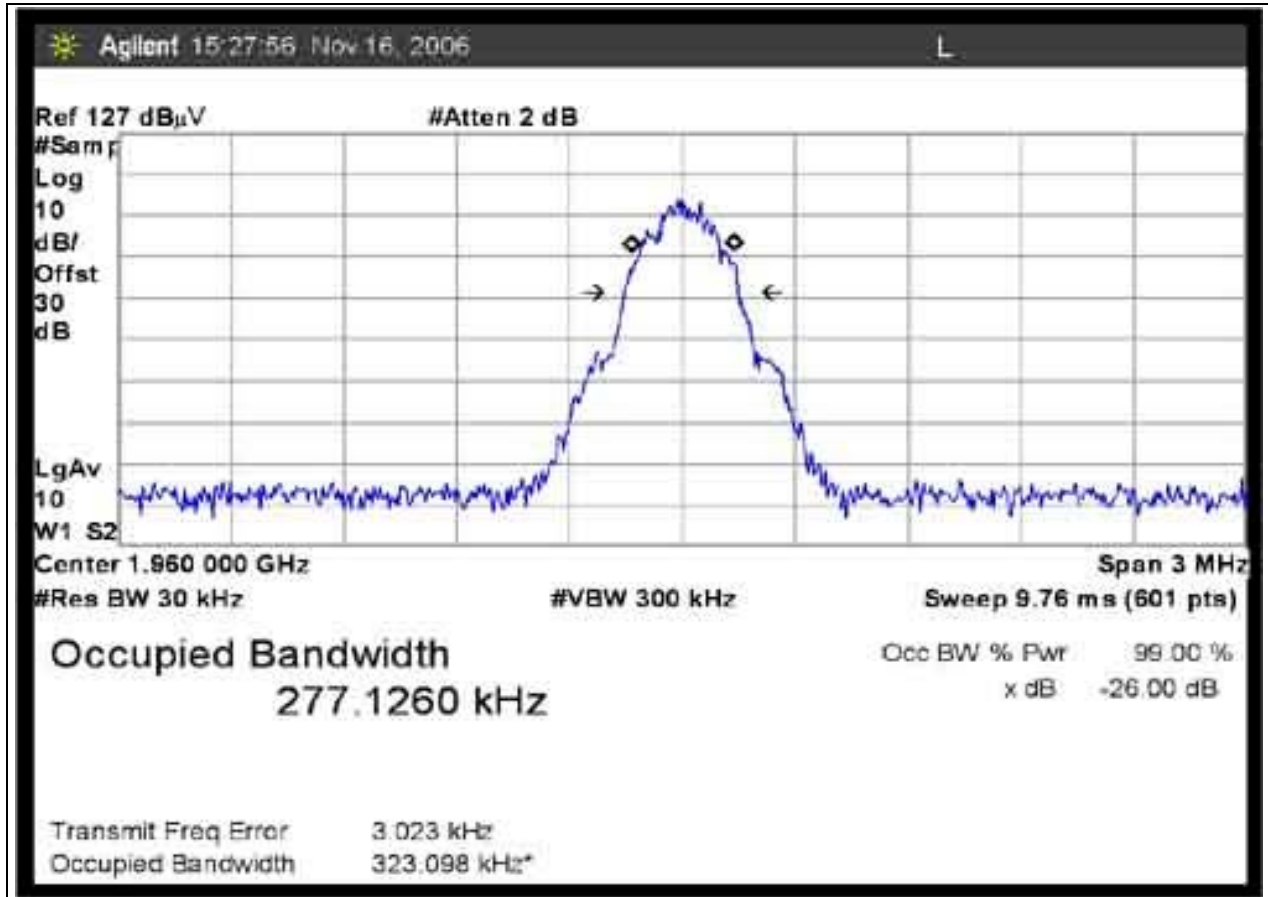


RH300020/100 RSS 131 99% BANDWIDTH 1930 MHz GSM

Test Setup: The EUT is placed on the wooden table. The RF Output port is connected to a spectrum analyzer . Optical in port is connected to an Optical converter. Support optical converter receives the signal and converts the signal to optic and sends it to the EUT. The EUT decodes the optical signal, and generates a RF signal. The emission signature is evaluated at the antenna port.



RH300020/100 RSS 131 99% BANDWIDTH 1960 MHz GSM



RH300020/100 RSS 131 99% BANDWIDTH 1990 MHz GSM

