CKC LABORATORIES, INC. Testing the Future

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Certicate Numbers
803.01, 803.02, 803.05, 803.06
EMC

POWERWAVE TECHNOLOGIES, INC. TEST REPORT

FOR THE

WIDEBAND RADIO HEAD, RH900020/101

FCC PART 27

TESTING

DATE OF ISSUE: AUGUST 24, 2007

PREPARED FOR:

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

P.O. No.: 114703
W.O. No.: 86910

PREPARED BY:

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

Date of test: August 16-17, 2007

Report No.: FC07-066

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ADMINISTRATIVE INFORMATION

DATE OF TEST: August 16-17, 2007

DATE OF RECEIPT: August 16, 2007

REPRESENTATIVE: Charlotte Yu

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

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

FREQUENCY RANGE TESTED: 10 kHz-10 GHz

TEST METHOD: FCC Part 27

PURPOSE OF TEST: To perform the testing of the Wideband Radio Head, RH900020/101 with the requirements for FCC Part 27 devices.

APPROVALS

Steve Behm, Director of Engineering Services

QUALITY ASSURANCE:

Joyce Walker, Quality Assurance Administrative Manager

TEST PERSONNEL:

Eddie Wong, EMC Engineer

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. Operational parameters, such as gain, channel number and power levels are set using a PC running Powerwave OM-Online software which can communicate with the WRHs either locally or remotely via modem.

The following model has been tested by CKC Laboratories: **RH900020/101**

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: **RH900020/211; RH009002/000; RH009002/001; RH009002/011; RH900020/102; RH900020/212; RH009002/002; RH009002/012**

EQUIPMENT UNDER TEST

Broadband Radiohead

Manuf: Powerwave Technologies
Model: RH900020/101
Serial: NA
FCC ID: E675JS0094 (pending)

PERIPHERAL DEVICES

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

Power Meter
Manuf: Agilent
Model: E4419B
Serial: GB40201912

Signal Generator
Manuf: Agilent
Model: E4433B
Serial: US40052191

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

Optical Converter
Manuf: Powerwave Technologies
Model: NA
Serial: 42473

DC Power Supply
Manuf: HP
Model: 3616A
Serial: NA

DC Power Supply
Manuf: HP
Model: 6032A
Serial: 3542A12327

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
F9W

FCC 2.1033 (c)(5) FREQUENCY RANGE
2110 MHz – 2155 MHz

FCC 2.1033 (c)(6) OPERATING POWER
20 watts

FCC 2.1033 (c)(7) MAXIMUM POWER RATING
1640 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.

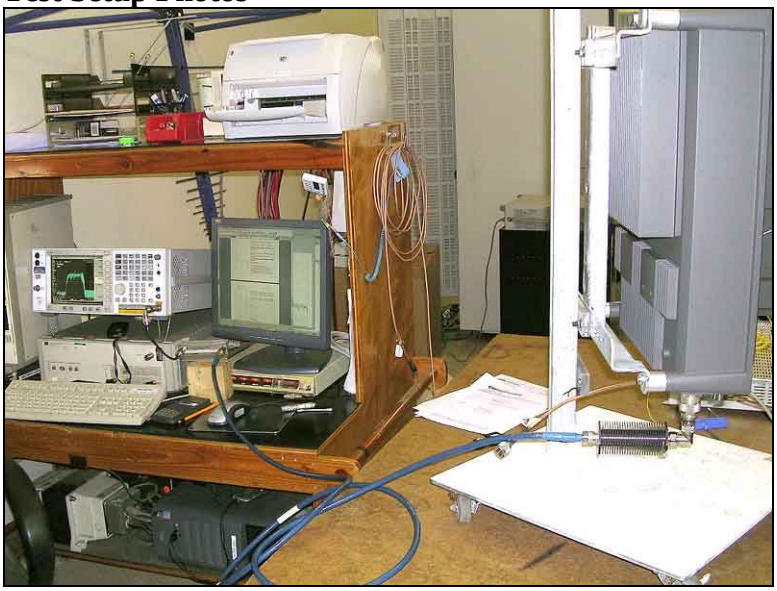
FCC 2.1033 (c)(13) MODULATION INFORMATION
CMA2000 & WDCMA_UMTS

FCC 2.1033(c)(14)/2.1046/27.50(d)(1) - 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



Test Data Sheets

27.50(d)
(1) The power of each fixed or base station transmitting in the 2110-2155 MHz band and located in any county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, is limited to a peak equivalent isotropically radiated power (EIRP) of 3280 watts. The power of each fixed or base station transmitting in the 2110-2155 MHz band from any other location is limited to a peak EIRP of **1640 watts.** A licensee operating a base or fixed station utilizing a power of more than 1640 watts EIRP must coordinate such operations in advance with all Government and non-Government satellite entities in the 2025-2110 MHz band. Operations above 1640 watts EIRP must also be coordinated in advance with the following licensees within 120 kilometers (75 miles) of the base or fixed station: all Broadband Radio Service (BRS) licensees authorized under Part 27 in the 2155-2160 MHz band and all AWS licensees in the 2110-2155 MHz band.

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.

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 500 watts.

Test setup: The EUT is placed on the wooden table. The RF Output port is connected to a power meter . Optical in port is connected to a support Optical converter. The support optical converter receives RF signal converts the signal to optic and send to the EUT. The EUT decodes the optical signal, and generates a RF signal.

RF signal measured at the antenna port
CDMA2000, WCDMA-UMTS,

2110 MHz, 2132.5 MHz, 2155MHz

CMA2000	dBm	Watts
2110 MHz,	43	20
2132.5 MHz	43	20
2155MHz	43	20

WCDMA- UMTS		
2110 MHz,	43	20
2132.5 MHz	43	20
2155MHz	43	20

Conclusion: Each single channel does not exceed the 1640 Watt peak power limit.

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

Test Equipment

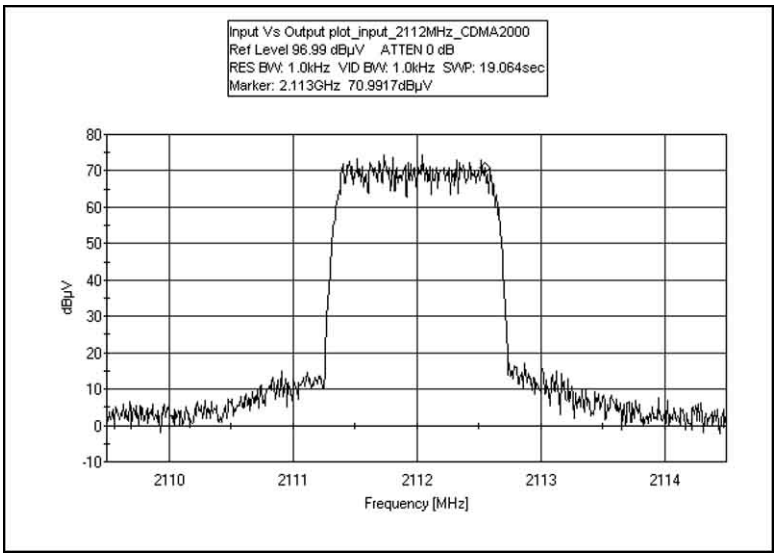
Equipment	Asset #	Manufacturer	Model	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02672	Agilent	E4446A	US44300438	010307	010309
High Freq Cable (big blue)	05421	Huber Suhner	NA	12237/4A	112805	112807

Test Conditions: The EUT is placed on the wooden table. RF out is connected to remote loadstring and power meter. RF in receives RF signal via remote ESGs and a preamp. The RF level is adjusted to maintain the transmit power. Input waveform form evaluation performed at the RF input port.

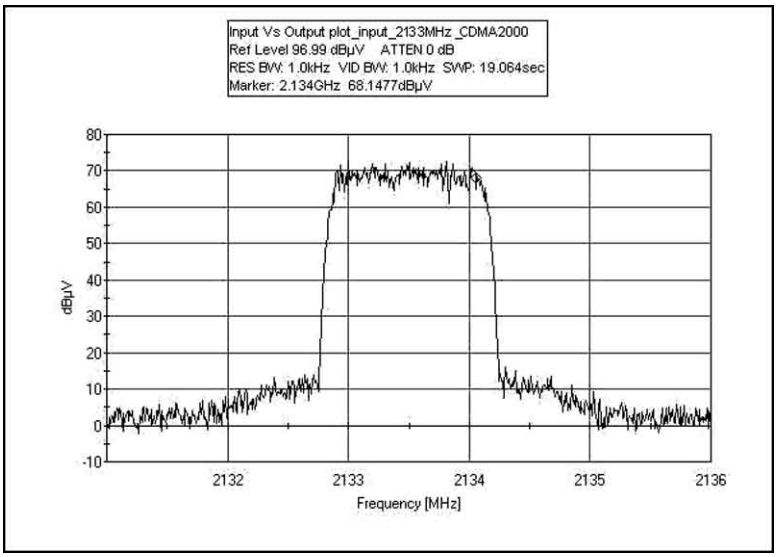
Test Setup Photos

Test Plots

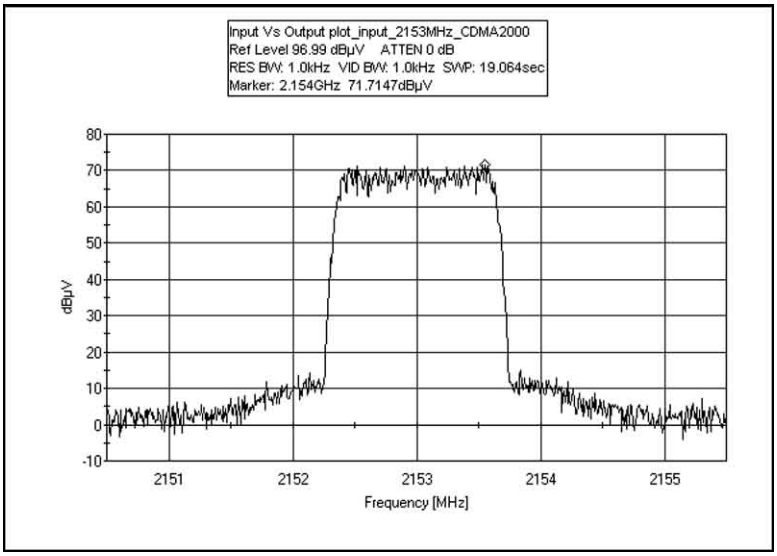
INPUT PLOT - CDMA2000 2112MHz



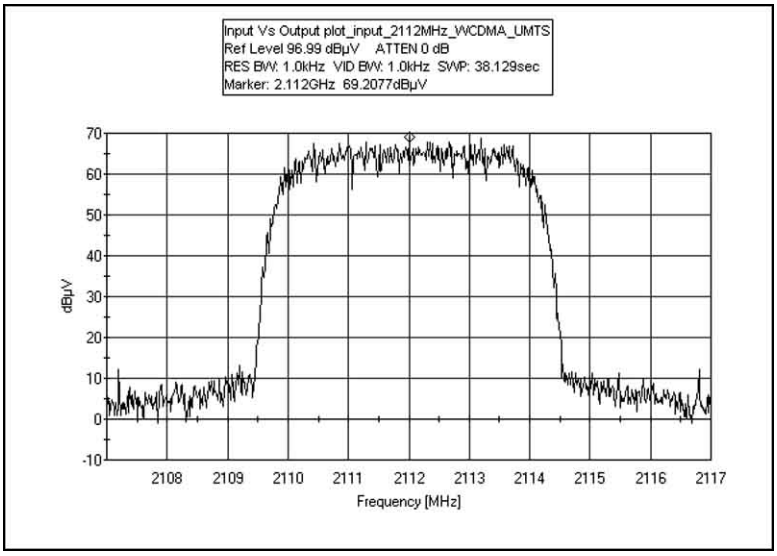
INPUT PLOT - CDMA2000 2133MHz



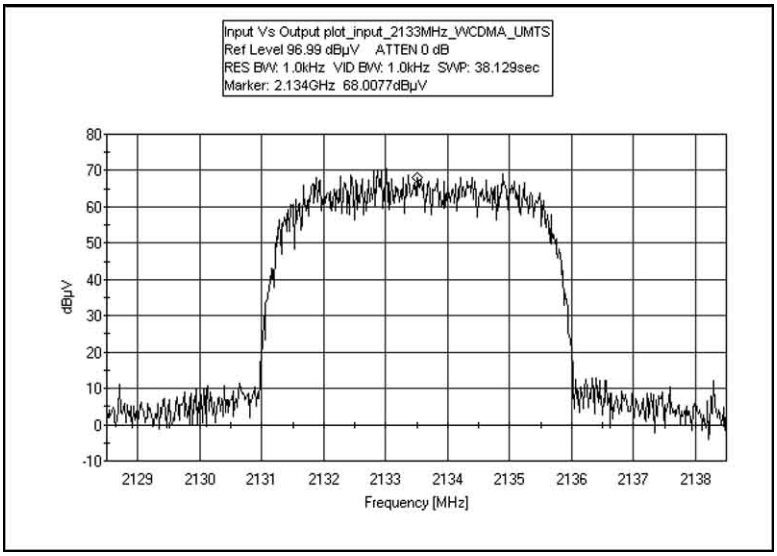
INPUT PLOT - CDMA2000 2153MHz



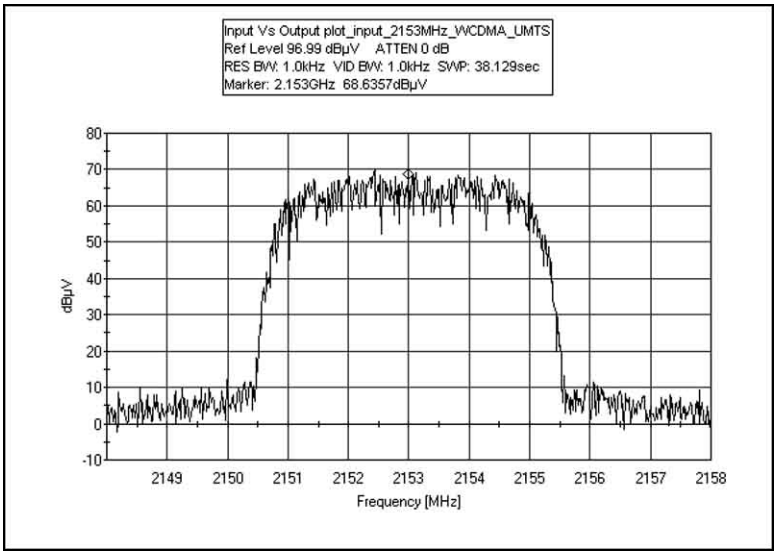
INPUT PLOT - WCDMA_UMTS 2112MHz



INPUT PLOT - WCDMA_UMTS 2133MHz



INPUT PLOT - WCDMA_UMTS 2153MHz



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

Test Equipment

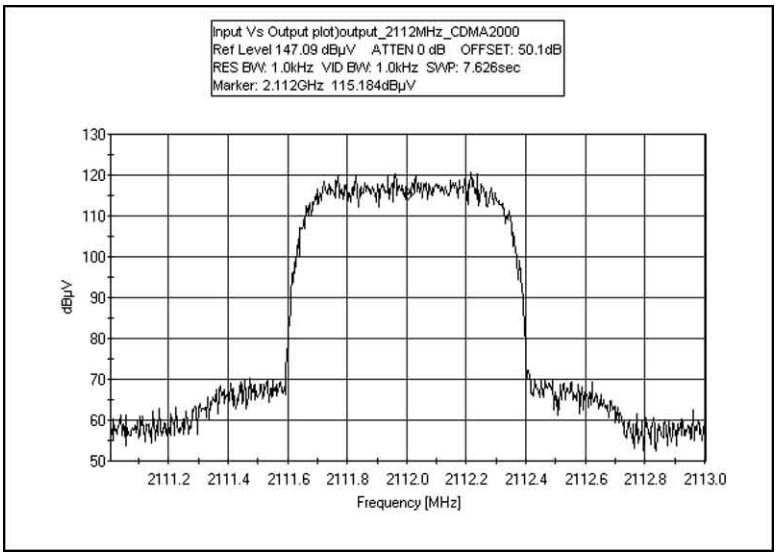
Equipment	Asset #	Manufacturer	Model	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02672	Agilent	E4446A	US44300438	010307	010309
High Freq Cable (big blue)	05421	Huber Suhner	NA	12237/4A	112805	112807

Test Conditions: The EUT is placed on the wooden table. RF out is connected to remote loadstring and power meter. RF in receives RF signal via remote ESGs and a preamp. The RF level is adjusted to maintain the transmit power. Output wave form evaluation performed at the antenna port.

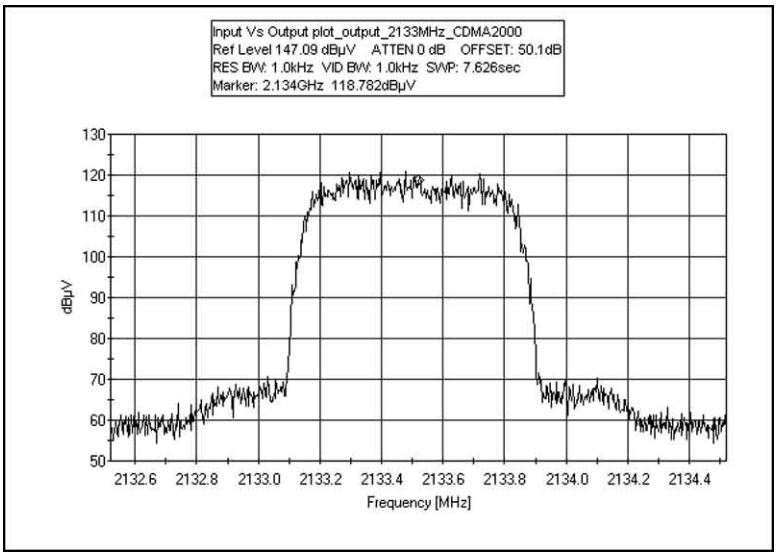
Test Setup Photos

Test Plots

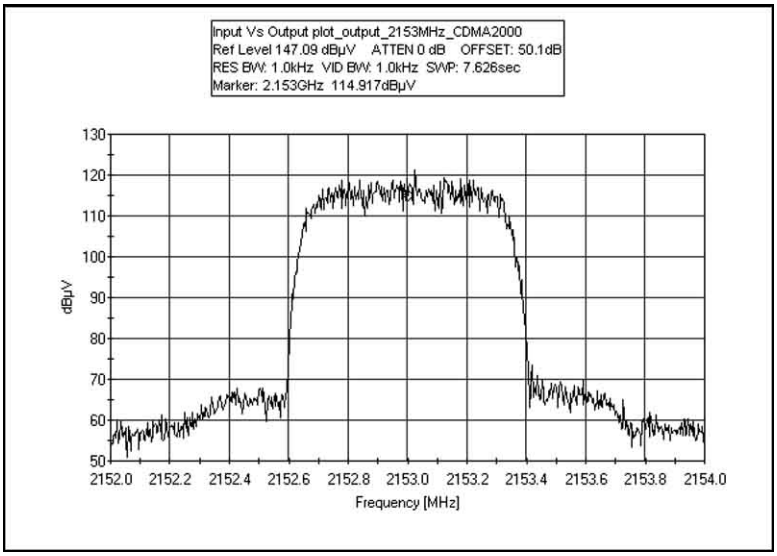
INPUT PLOT - CDMA2000 2112MHz



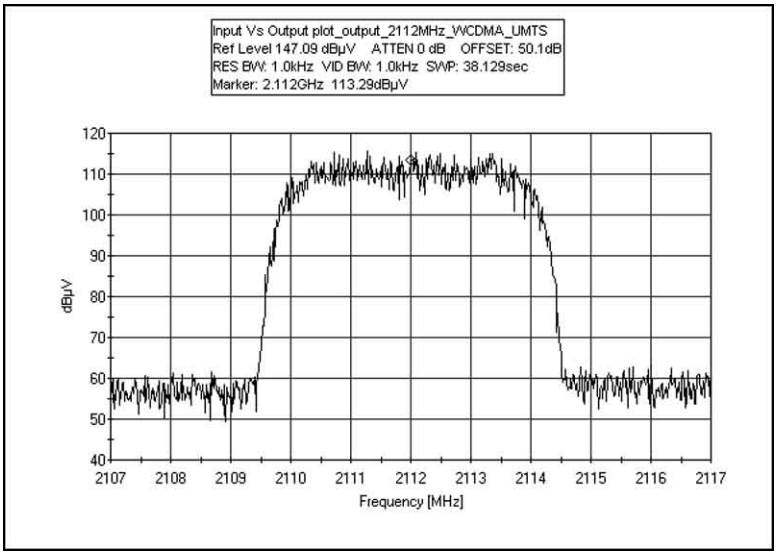
OUTPUT PLOT - CDMA2000 2133MHz



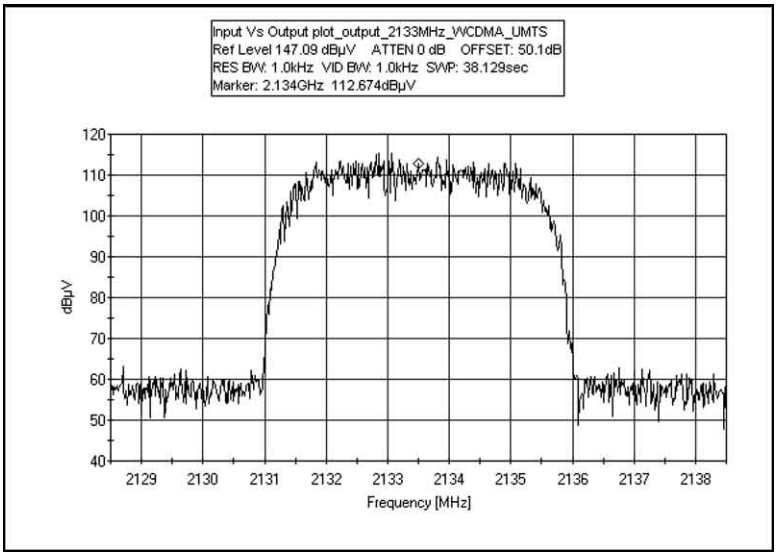
OUTPUT PLOT - CDMA2000 2153MHz



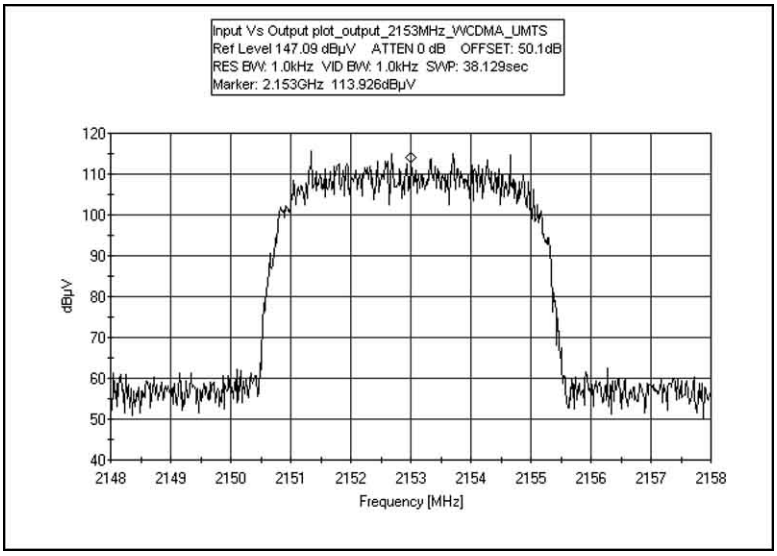
OUTPUT PLOT - WCDMA_UMTS 2112MHz



OUTPUT PLOT - WCDMA_UMTS 2133MHz



OUTPUT PLOT - WCDMA_UMTS 2153MHz



FCC 2.1033(c)(14)/2.1051/27.53(g) - SPURIOUS EMISSIONS AT ANTENNA TERMINAL

Test Setup Photos

Test Data Sheets

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

Customer:	**Powerwave Technologies, Inc.**		
Specification:	**FCC Part 27.53(g)Conducted Spurious Emissions**		
Work Order #:	**86910**	Date:	8/17/2007
Test Type:	**Conducted Emissions**	Time:	10:23:08
Equipment:	**Broadband Radiohead**	Sequence#:	6
Manufacturer:	Powerwave Technologies	Tested By:	E. Wong
Model:	RH900020/101		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
3.0 GHz HPF	1	03/08/2006	03/08/2008	02744
Cable Big Blue	12237/4A	11/28/2005	11/28/2007	P05421

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

Function	Manufacturer	Model #	S/N
Broadband Radiohead*	Powerwave Technologies	RH900020/101	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Power Meter	Agilent	E4419B	GB40201912
Signal Generator	Agilent	E4433B	US40052191
Pre Amp	Mini Circuit	ZHL-4240	D040405
Optical converter	Powerwave Technologies	NA	42473
DC Power Supply	HP	3616A	NA
DC Power Supply	HP	6032A	3542A12327

Test Conditions / Notes:

The EUT is placed on the wooden table. RF out is connected to remote loadstring and power meter. RF in receives RF signal via remote ESGs and a preamp. The RF level is adjusted to maintain the transmit power. Modulation: CDMA 2000. Frequency = 2110 MHz, 2132.5 MHz, 2155 MHz. Power = 20 watts. 23°C, 44% relative humidity. Frequency range of measurement = 9 kHz - 22 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 - 22,000 MHz RBW=1 MHz, VBW=1 MHz.

Transducer Legend:

T1=CABLE_bigblue_ ANP5421 112807	T2=Filter 3GHz HPF AN02744

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

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	6336.000M	57.6	+2.3	+0.7			+0.0	60.6	94.0 2112MHz	-33.4	Anten
2	4224.000M	57.1	+1.8	+0.3			+0.0	59.2	94.0 2112MHz	-34.8	Anten
3	6397.500M	53.9	+2.3	+0.7			+0.0	56.9	94.0 2132MHz	-37.1	Anten

4	4265.000M	53.6	+1.8	+0.3		+0.0	55.7	94.0 2132MHz	-38.3	Anten
5	6458.850M	52.7	+2.3	+0.7		+0.0	55.7	94.0	-38.3	Anten
6	4305.900M	52.4	+1.8	+0.3		+0.0	54.5	94.0	-39.5	Anten

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

Customer:	**Powerwave Technologies, Inc.**		
Specification:	**FCC Part 27.53(g)Conducted Spurious Emissions**		
Work Order #:	**86910**	Date:	8/17/2007
Test Type:	**Conducted Emissions**	Time:	10:43:26
Equipment:	**Broadband Radiohead**	Sequence#:	7
Manufacturer:	Powerwave Technologies	Tested By:	E. Wong
Model:	RH900020/101		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
3.0 GHz HPF	1	03/08/2006	03/08/2008	02744
Cable Big Blue	12237/4A	11/28/2005	11/28/2007	P05421

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

Function	Manufacturer	Model #	S/N
Broadband Radiohead*	Powerwave Technologies	RH900020/101	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Power Meter	Agilent	E4419B	GB40201912
Signal Generator	Agilent	E4433B	US40052191
Pre Amp	Mini Circuit	ZHL-4240	D040405
Optical converter	Powerwave Technologies	NA	42473
DC Power Supply	HP	3616A	NA
DC Power Supply	HP	6032A	3542A12327

Test Conditions / Notes:

The EUT is placed on the wooden table. RF out is connected to remote loadstring and power meter. RF in receives RF signal via remote ESGs and a preamp. The RF level is adjusted to maintain the transmit power. Modulation: WCDMA UMTS Frequency = 2110 MHz, 2132.5 MHz, 2155 MHz. Power = 20 watts. 23°C, 44% relative humidity. Frequency range of measurement = 9 kHz - 22 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 - 22,000 MHz RBW=1 MHz, VBW=1 MHz.

Transducer Legend:

T1=CABLE_bigblue_ ANP5421 112807	T2=Filter 3GHz HPF AN02744

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

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	8534.250M	65.4	+2.6	+0.1			+0.0	68.1	94.0 2132MHz	-25.9	Anten
2	6458.870M	54.5	+2.3	+0.7			+0.0	57.5	94.0 2153MHz	-36.5	Anten
3	6400.500M	54.3	+2.3	+0.7			+0.0	57.3	94.0 2132MHz	-36.7	Anten

4	4267.000M	53.4	+1.8	+0.3		+0.0	55.5	94.0 2132MHz	-38.5	Anten
5	4305.910M	52.3	+1.8	+0.3		+0.0	54.4	94.0 2153MHz	-39.6	Anten
6	4223.647M	50.2	+1.8	+0.3		+0.0	52.3	94.0 2112MHz	-41.7	Anten

FCC 2.1033(c)(14)/2.1053/27.53(g) - FIELD STRENGTH OF SPURIOUS RADIATION

Test Setup Photos

Test Data Sheets

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

Customer: **Powerwave Technologies, Inc.**
Specification: **FCC 27.53 (g) Radiated Spurious Emission**
Work Order #: **86910** Date: 8/16/2007
Test Type: **Radiated Scan** Time: 15:01:41
Equipment: **Broadband Radiohead** Sequence#: 4
Manufacturer: Powerwave Technologies Tested By: E. Wong
Model: RH900020/101
S/N: NA

***Test Equipment*:**

Function	S/N	Calibration Date	Cal Due Date	Asset #
Spectrum Analyzer	US44300438	01/03/2007	01/03/2009	02672
Loop Antenna	2014	06/14/2006	06/14/2008	00314
Bilog Antenna	2451	02/02/2006	02/02/2008	01995
Pre amp to SA Cable	Cable #10	05/16/2007	05/16/2009	P05050
Cable	Cable15	01/05/2007	01/05/2009	P05198
Pre Amp	1937A02548	06/01/2006	06/01/2008	00309
Horn Antenna	6246	06/29/2006	06/29/2008	00849
24" SMA Cable	1-26GHz_white	01/11/2007	01/11/2009	P05205
Microwave Pre-amp	3123A00281	07/19/2006	07/19/2008	00786
Heliax Antenna Cable	P5565	09/18/2006	09/18/2008	P05565
18-26.5 GHz Horn Antenna	3643A00027	11/27/2006	11/27/2008	02112
3.0 GHz HPF	1	03/08/2006	03/08/2008	02744

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

Function	Manufacturer	Model #	S/N
Broadband Radiohead*	Powerwave Technologies	RH900020/101	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Power Meter	Agilent	E4419B	GB40201912
Signal Generator	Agilent	E4433B	US40052191
Pre Amp	Mini Circuit	ZHL-4240	D040405
Optical converter	Powerwave Technologies	NA	42473
DC Power Supply	HP	3616A	NA
DC Power Supply	HP	6032A	3542A12327

Test Conditions / Notes:

The EUT is placed on the wooden table. RF out is connected to remote loadstring and power meter. RF in receives RF signal via remote ESGs and a preamp. The RF level is adjusted to maintain the transmit power. Modulation: CDMA 2000 and WCDMA-UMTS. Frequency = 2110 MHz, 2132.5 MHz, 2155 MHz. Power = 20 watts. 23°C, 44% relative humidity. Frequency range of measurement = 9 kHz - 22 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 - 22,000 MHz RBW=1 MHz, VBW=1 MHz.

Operating Frequency: 2110 MHz - 2155 MHz
Channels: Low, Mid and High
Highest Measured Output Power: 43.01 EIRP(dBm)= 20 EIRP(Watts)
Distance: 3 meters
Limit: 43+10Log(P) 56.01 dBc

Freq. (MHz)	Reference Level (dBm)	Antenna Polarity (H/V)	dBc
6,400.48	-45.3	Vert	88.31
6,459.13	-46.8	Vert	89.81
6,459.13	-47.3	Horiz	90.31
8,440.67	-47.5	Vert	90.51
6,400.35	-48.1	Horiz	91.11
8,533.80	-48.6	Horiz	91.61
4,306.13	-51.9	Vert	94.91
4,306.13	-52.1	Horiz	95.11
4,220.17	-53.5	Horiz	96.51
4,266.90	-54.4	Horiz	97.41
4,220.33	-55.8	Vert	98.81
4,267.03	-56.5	Vert	99.51
6,400.43	-42.3	Horiz	85.31
6,458.83	-43.4	Vert	86.41
6,336.17	-44.3	Vert	87.31
6,336.17	-44.4	Horiz	87.41
8,611.92	-46.8	Horiz	89.81
6,400.67	-47	Vert	90.01
8,611.83	-47.5	Vert	90.51
6,458.92	-49.4	Horiz	92.41
4,267.93	-52.9	Horiz	95.91
4,305.92	-53.3	Horiz	96.31
4,305.87	-53.8	Vert	96.81
4,265.17	-53.9	Vert	96.91
4,224.13	-54.4	Horiz	97.41
4,224.17	-54.9	Vert	97.91

BLOCKEDGE PLOTS

Test Equipment

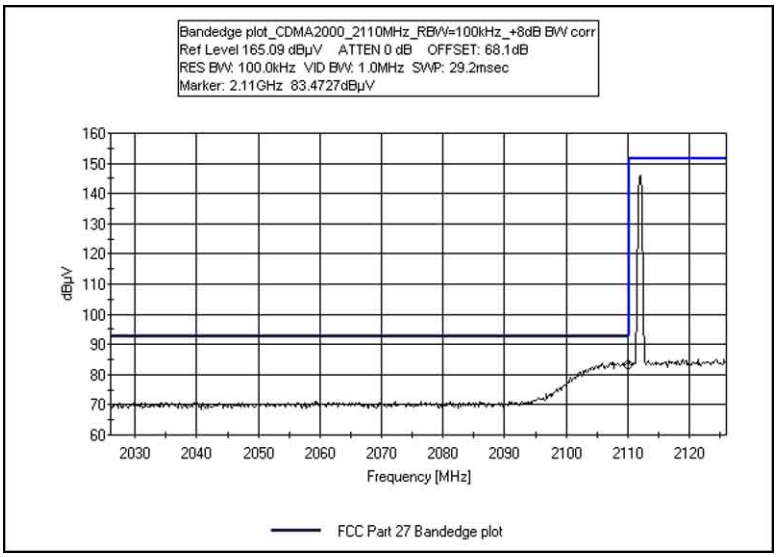
Equipment	Asset #	Manufacturer	Model	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02672	Agilent	E4446A	US44300438	010307	010309
High Freq Cable (big blue)	05421	Huber Suhner	NA	12237/4A	112805	112807

Test Conditions: The EUT is placed on the wooden table. RF out is connected to remote loadstring and power meter. RF in receives RF signal via remote ESGs and a preamp. The RF level is adjusted to maintain the transmit power. Evaluation performed at the antenna port.

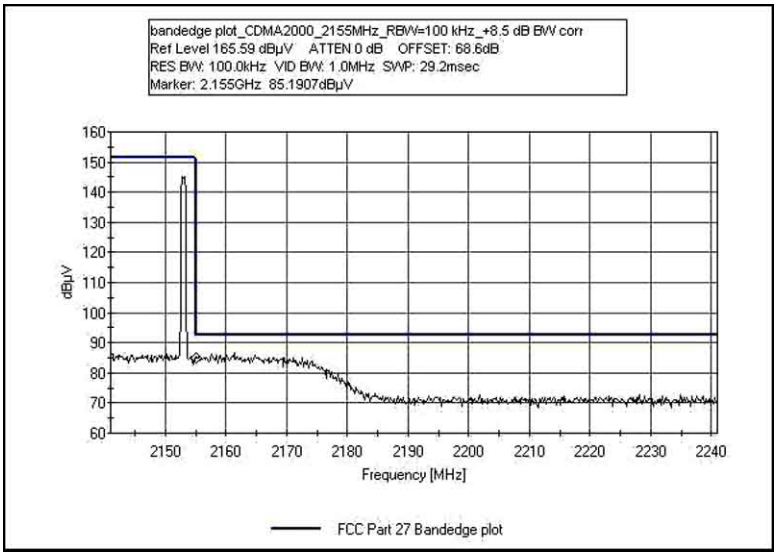
Test Setup Photos

Test Plots

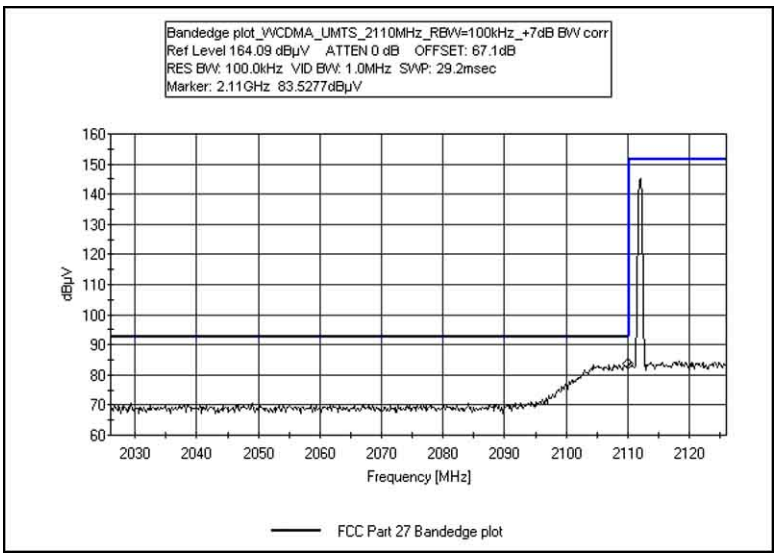
BANDEDGE - CDMA2000 2110MHz



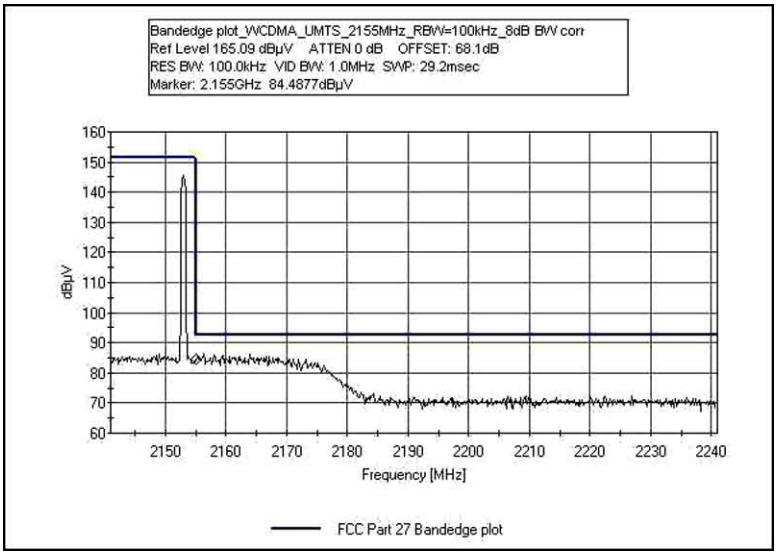
BANDEDGE - CDMA2000 2155MHz



BANDEDGE - WCDMA_UMTS 2110MHz



BANDEDGE - WCDMA_UMTS 2155MHz



INTERMODULATION

Test Equipment

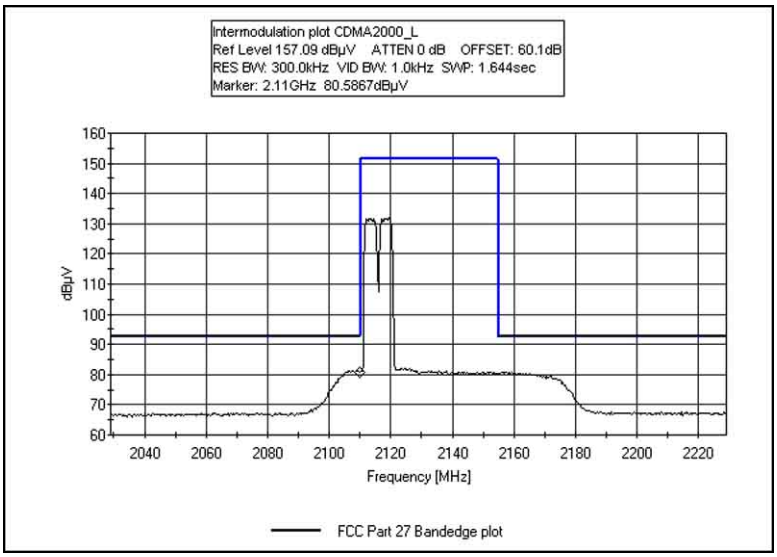
Equipment	Asset #	Manufacturer	Model	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02672	Agilent	E4446A	US44300438	010307	010309
High Freq Cable (big blue)	05421	Huber Suhner	NA	12237/4A	112805	112807

Test Conditions: The EUT is placed on the wooden table, RF out is connected to remote loadstring and power meter. RF in receives 3 RF signal, 2 signal near the lower edge of the pas band, and one signal at the upper edge of the pass band via remote ESGs and a preamp. The RF level is adjusted to maintain the transmit power. Output wave form evaluation performed at the antenna port. Input waveform form evaluation performed at the RF input port.

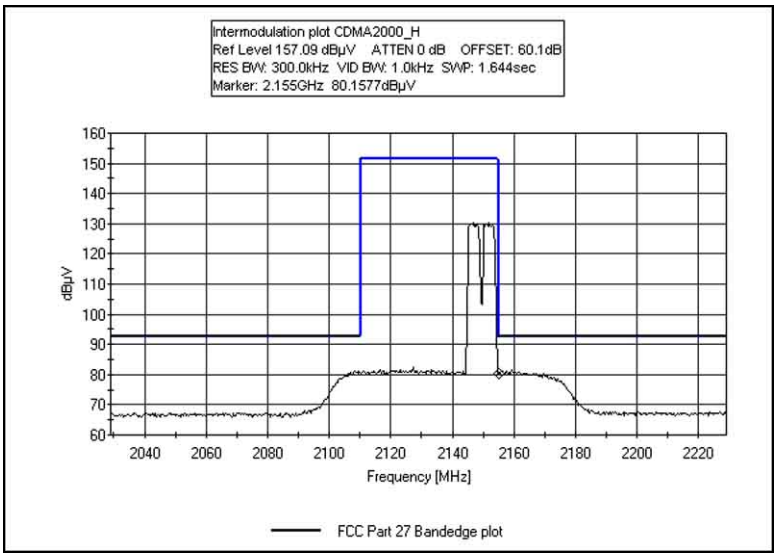
Test Setup Photos

Test Plots

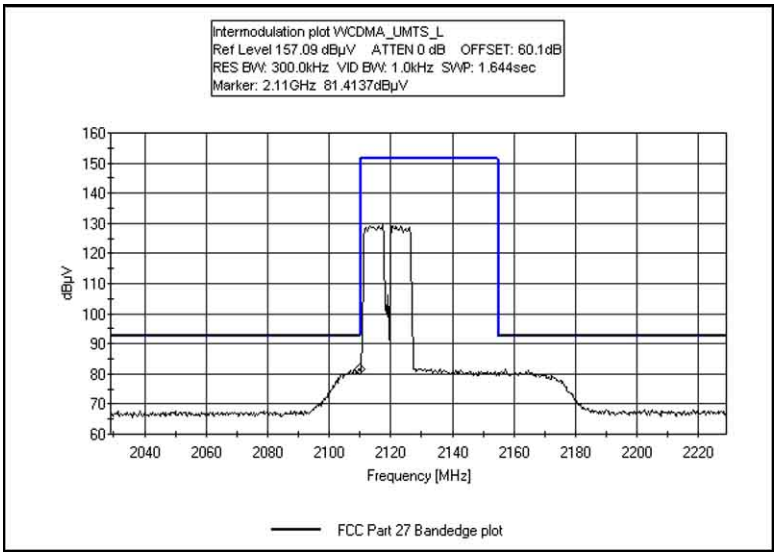
INTERMODULATION - CDMA2000 LOW



INTERMODULATION - CDMA2000 HIGH



INTERMODULATION - WCDMA_UMTS LOW



INTERMODULATION - WCDMA_UMTS HIGH