Powerwave Technologies, Inc.

TEST REPORT FOR

Multi-carrier RF Power Amplifier, G3L-850-180

Tested To The Following Standards:
FCC Part 22 H
and
RSS-131 Issue 2

Report No.: 92273-8

Date of issue: October 14, 2011

ACCREDITED
Testing Certificates:
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.

Testing the Future
CKC LABORATORIES, INC.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

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

REPRESENTATIVE: Charlotte Yu
Customer Reference Number: 144808

REPORT PREPARED BY:

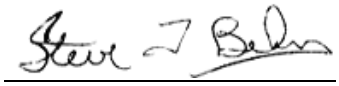
Joyce Walker
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 92273

DATE OF EQUIPMENT RECEIPT: September 23, 2011
DATE(S) OF TESTING: September 23 - October 3, 2011

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	CB #	JAPAN	CANADA	FCC
Brea A	US0060	R-2945, C-3248 & T-1572	3082D-1	90473

SUMMARY OF RESULTS

Standard / Specification: FCC Part 22 H and RSS-131 Issue 2

Description	Test Procedure/Method	Results
RF Power Output	FCC 2.1033(c)(14)/2.1046/22.913(a)	Pass
Modulation Characteristics – Audio Frequency Response	FCC 2.1033(c)(14)/2.1047(a)	NA
Modulation Characteristics – Modulation Limiting Response	FCC 2.1033(c)(14)/2.1047(b)	NA
Occupied Bandwidth	FCC 2.1033(c)(14)/2.1049	Pass
Spurious Emissions at Antenna Terminal	FCC 2.1033(c)(14)/2.1051/22.917(a)	Pass
Field Strength of Spurious Radiation	FCC 2.1033(c)(14)/2.1053/22.917(a)	Pass
Frequency Stability	FCC 2.1033(c)(14)/2.1055/22.355	NA
Block Edge	FCC 22.917(b)	Pass
Intermodulation	EIA/TIA 603	Pass
Out of Band Rejection	RSS-131 §4.2	Pass
Passband Gain & Bandwidth	RSS-131 §4.2/RSP-100	Pass
RF Power Output	RSS-131 §4.3.1	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
During Spurious Emissions at Antenna Terminal testing an equivalent delay filter from second equipment vendor installed. (Manufacturer: Ace Technologies). Not to be confused with Output RF Filter. Delay Filter response plot of ACE Technology and HiGain are included in the report for comparison purposes.

EQUIPMENT UNDER TEST (EUT)

EQUIPMENT UNDER TEST

Multi-carrier RF Power Amplifier
Manuf: Powerwave Technologies, Inc.
Model: G3L-850-180
Serial: 11IU08000012

PERIPHERAL DEVICES

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

Signal Generator
Manuf: Aeroflex
Model: IFR3416
Serial: 341006/496

ESG
Manuf: Agilent
Model: 4433B
Serial: US40052191

Power Supply
Manuf: HP
Model: 6032A
Serial: 3542P123027

ESG
Manuf: Agilent
Model: 4433B
Serial: US40052146

FCC PART 22 H

PUBLIC MOBILE SERVICES - Subpart H—Cellular Radiotelephone Service

FCC 2.1033(c)(14)/2.1046/22.913(a) - RF Power Output

Test Conditions / Setup

The RF power of the EUT was measured at the antenna port. The measurement satisfies the requirement by demonstrating the measured power is below 500 watts.

Engineer Name: E. Wong

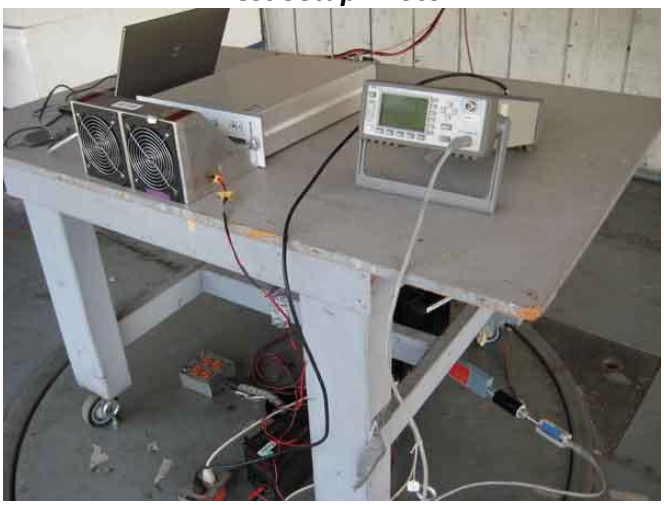
Test Equipment

Asset/Serial #	Description	Model	Manufacturer	Cal Date	Cal Due
02778	RF Power meter	EPM-441A	HP	012610	012612
03072	Power Sensor	E4412A	HP	012610	012612

Test Results Table

Modulation	Power (dBm)	Power (watt)
GSM	53.2	210
EDGE	53.2	210
CDMA2000	53.2	210
WCDMA	53.2	210
LTE	53.2	210

Test Setup Photo



FCC 2.1033(c)(14)/2.1047(a) - Modulation Characteristics - Audio Frequency Response

NA = Not applicable because §22.915 for modulation requirements was deleted by Docket No. 01-108

FCC 2.1033(c)(14)/2.1047(b) - Modulation Characteristics - Modulation Limiting Response

NA = Not applicable because §22.915 for modulation requirements was deleted by Docket No. 01-108

FCC 2.1033(c)(14)/2.1049- Occupied Bandwidth

Test Data

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

Customer:	**Powerwave Technologies, Inc.**		
Specification:	2.1029 Occupied BW, Input vs. Output port		
Work Order #:	**92273**	Date:	9/26/2011
Test Type:	**Conducted Emissions**	Time:	16:26:21
Equipment:	**Multi-carrier RF Power Amplifier**	Sequence#:	2
Manufacturer:	Powerwave Technologies, Inc.	Tested By:	E. Wong
Model:	G3L-850-180		28V DC
S/N:	11IU08000012		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	8/9/2010	8/9/2012
T2	AN03239	Cable	32022-2-29094K-24TC	8/30/2011	8/30/2013

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

Function	Manufacturer	Model #	S/N
Multi-carrier RF Power Amplifier*	Powerwave Technologies, Inc.	G3L-850-180	11IU08000012

Support Devices:

Function	Manufacturer	Model #	S/N
Signal generator	Aeroflex	IFR3416	341006/496
Power Supply	HP	6032A	3542P123027
ESG	Agilent	4433B	US40052191
ESG	Agilent	4433B	US40052146

Test Conditions / Notes:

The EUT is placed on the wooden table. RF output port is connected to a spectrum analyzer. RF input port is connected to a remote ESG. The RF input signal is adjusted to maintain the rated output power. In addition, the input signal is captured with a spectrum analyzer.

Frequency range: 869-894MHz
Modulation: GSM, EDGE, WCDMA, CDMA2000, LTE
Power=210W (53.2dBm)

GSM: 869.5MHz, 881.5MHz, 893.6MHz

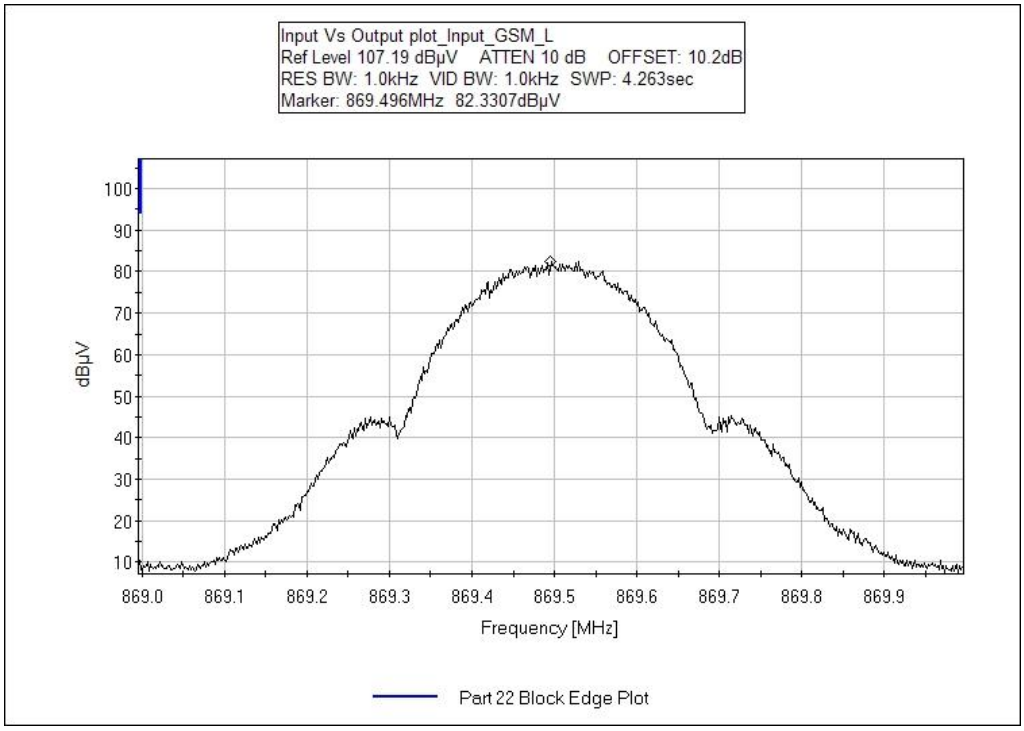
EDGE: 869.5MHz, 881.5MHz, 893.6MHz

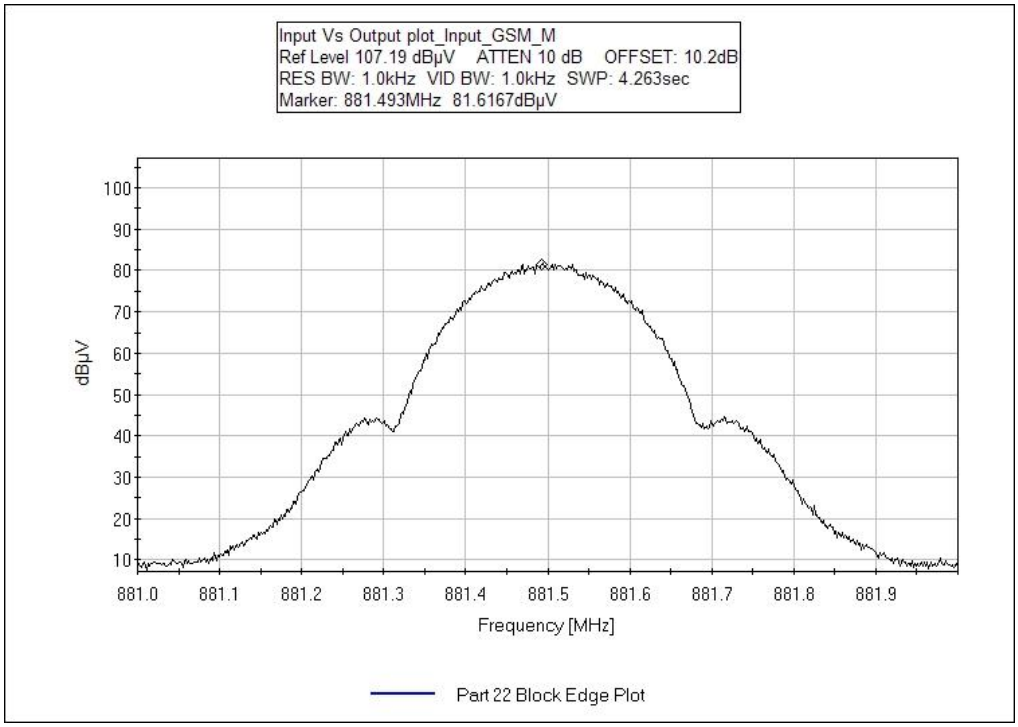
WCDMA: 871.5MHz, 881.5MHz, 891.5MHz

CDMA2000: 871.3MHz, 881.5MHz, 891.7MHz

LTE: 872.5MHz, 881.5MHz,890.5MHz

23°C, 67% relative humidity


Input Vs Output plot_Input_GSM_L
Ref Level 107.19 dBµV ATTEN 10 dB OFFSET: 10.2dB
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 4.263sec
Marker: 869.496MHz 82.3307dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
869.0
869.1
869.2
869.3
869.4
869.5
869.6
869.7
869.8
869.9
Frequency [MHz]
Part 22 Block Edge Plot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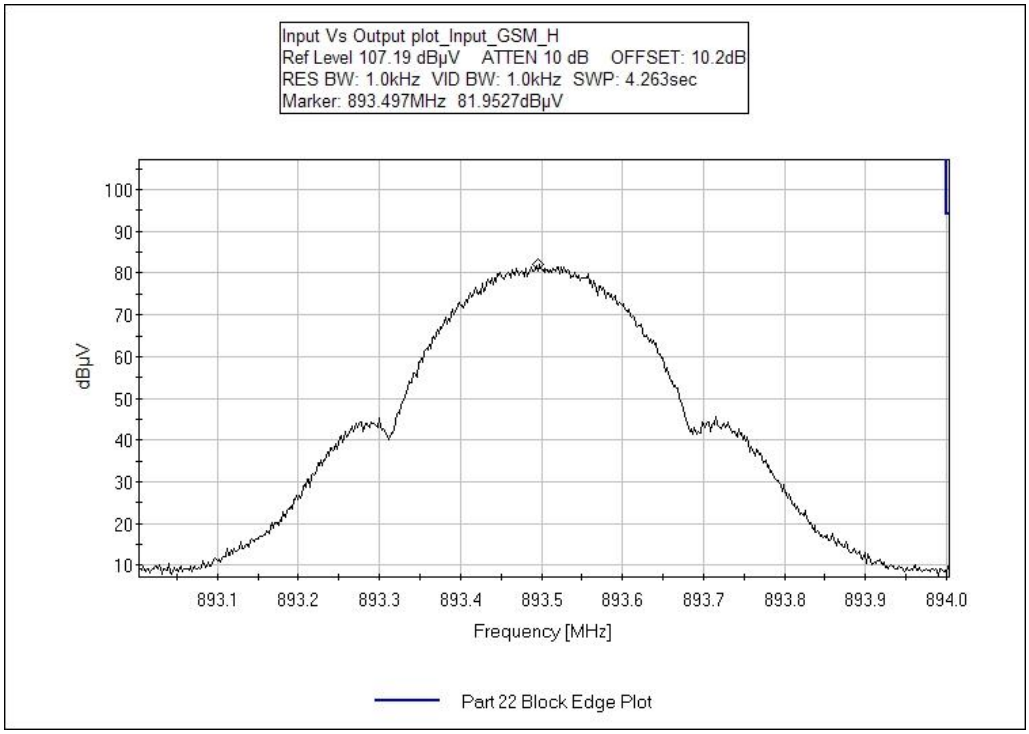
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 4.263sec
Marker: 881.493MHz 81.6167dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
881.0
881.1
881.2
881.3
881.4
881.5
881.6
881.7
881.8
881.9
Frequency [MHz]
Part 22 Block Edge Plot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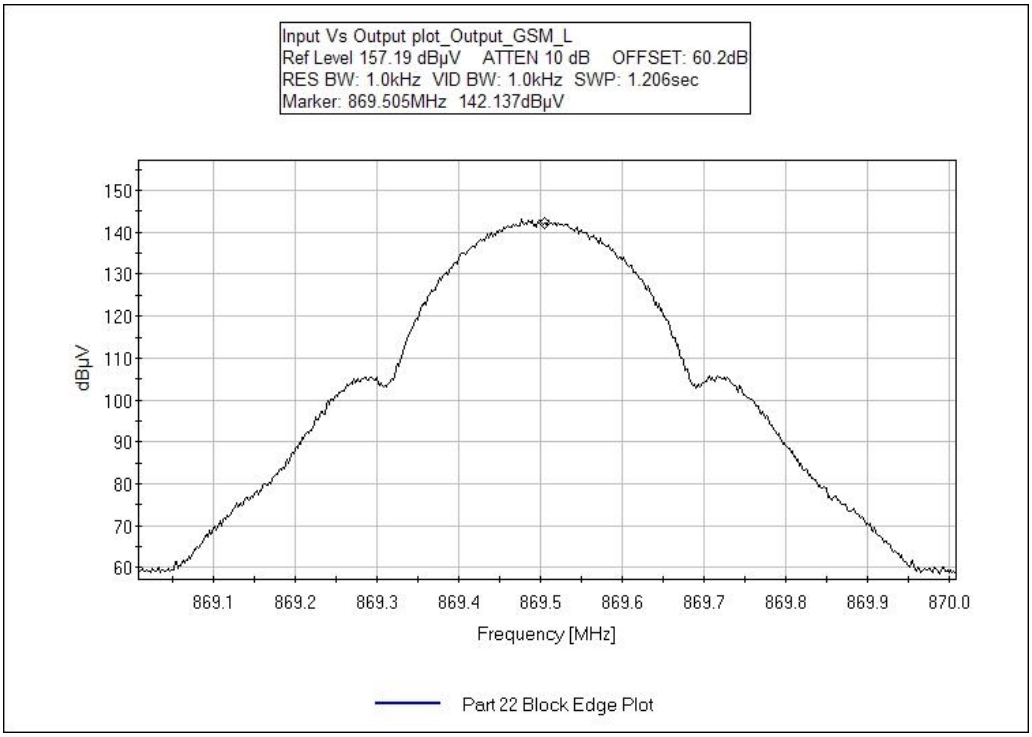
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 4.263sec
Marker: 893.497MHz 81.9527dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
893.1
893.2
893.3
893.4
893.5
893.6
893.7
893.8
893.9
894.0
Frequency [MHz]
Part 22 Block Edge Plot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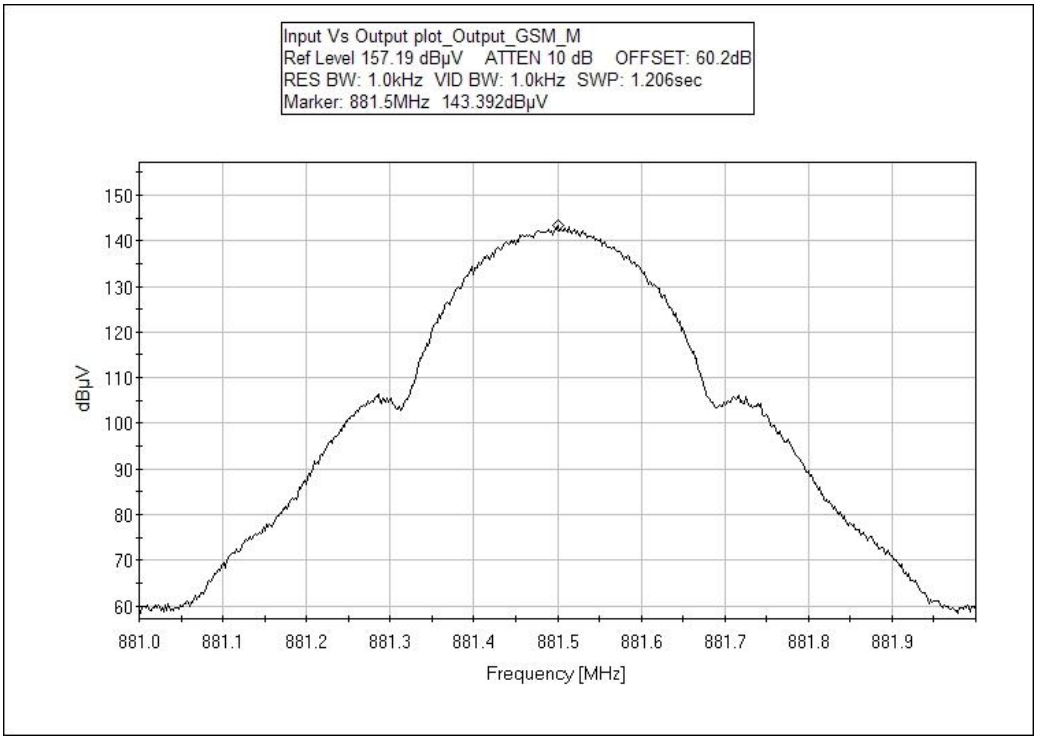
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 1.206sec
Marker: 869.505MHz 142.137dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
869.1
869.2
869.3
869.4
869.5
869.6
869.7
869.8
869.9
870.0
Frequency [MHz]
Part 22 Block Edge Plot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RES BW: 1.0kHz VID BW: 1.0kHz SWP: 1.206sec
Marker: 881.5MHz 143.392dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
881.0
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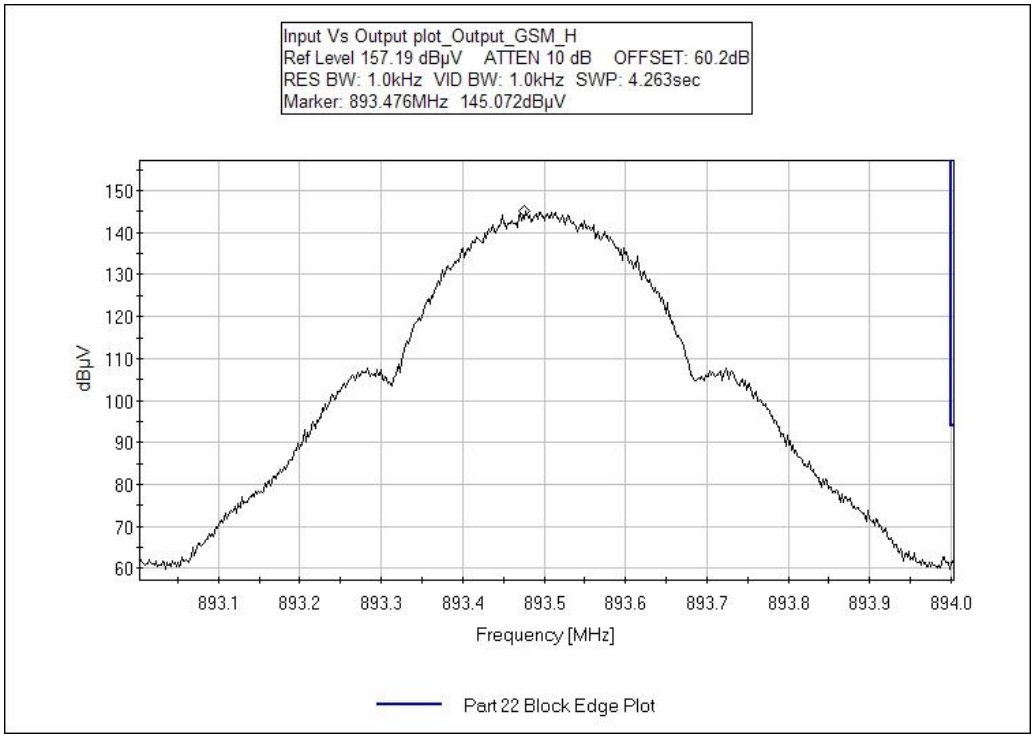
881.6
881.7
881.8
881.9
Frequency [MHz]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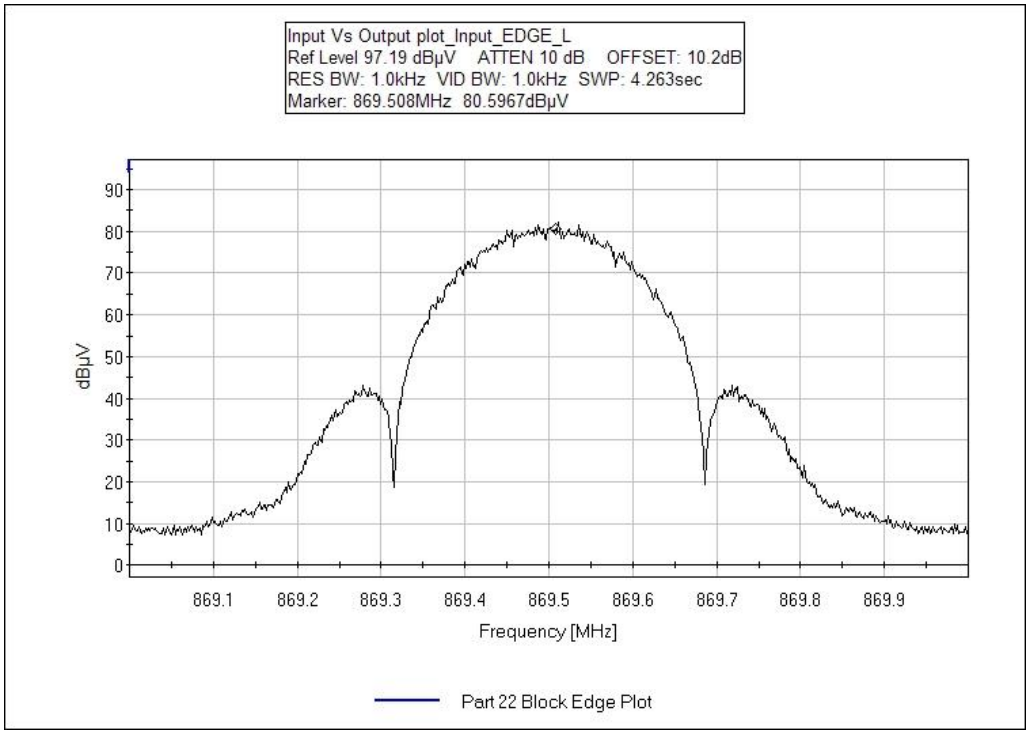
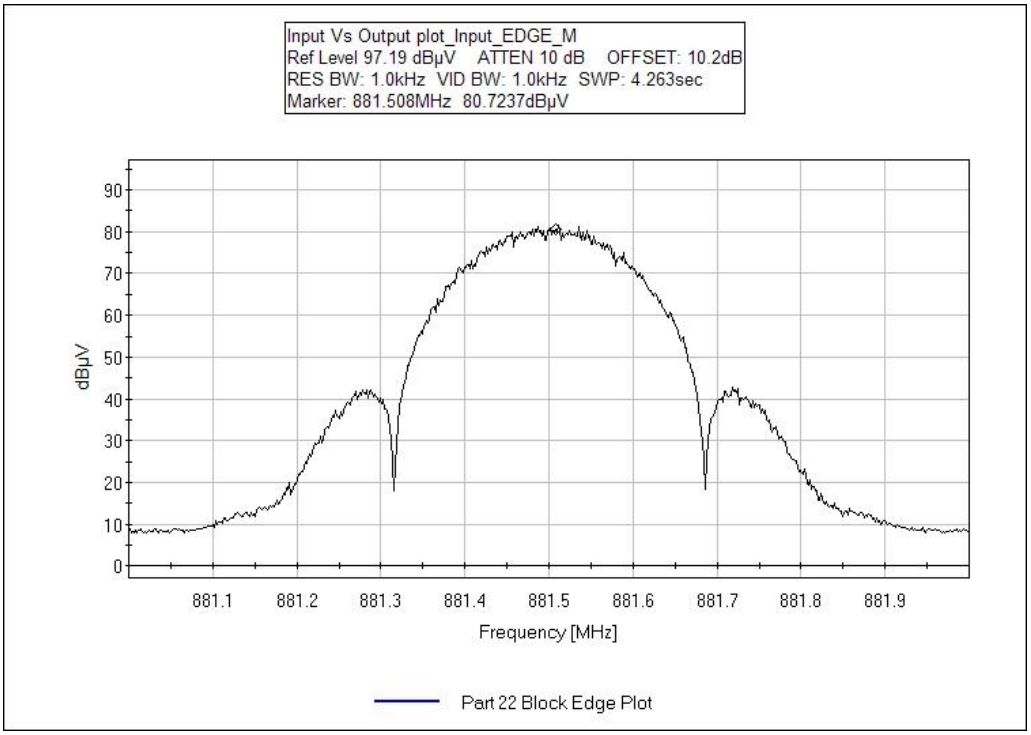
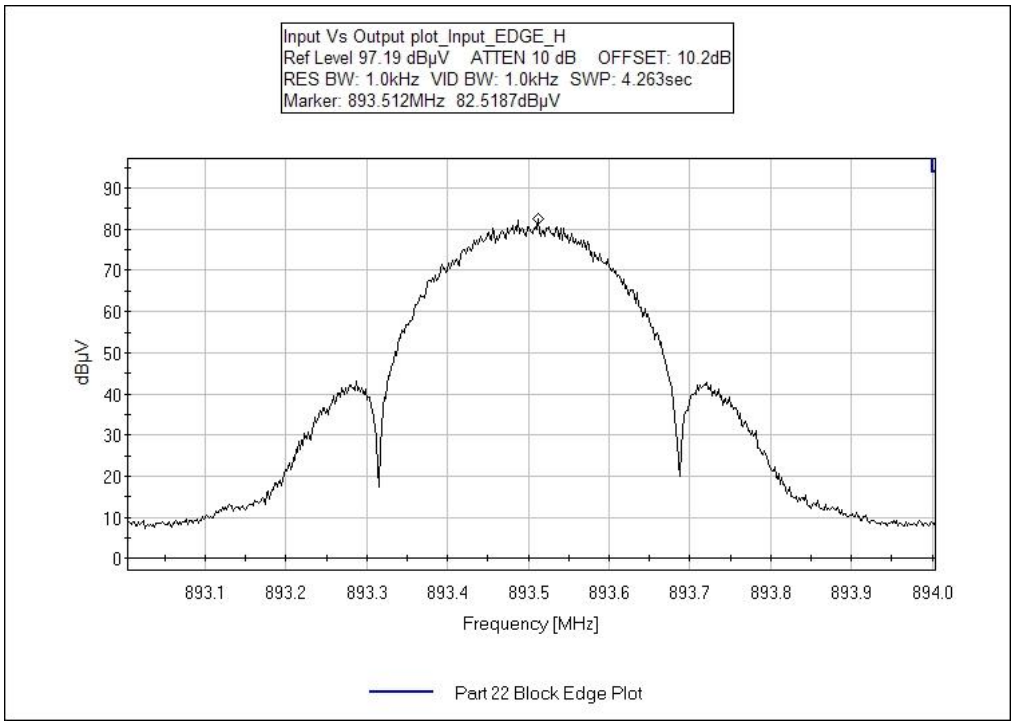
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 4.263sec
Marker: 893.476MHz 145.072dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
893.1
893.2
893.3
893.4
893.5
893.6
893.7
893.8
893.9
894.0
Frequency [MHz]
Part 22 Block Edge Plot


Input Vs Output plot_Input_EDGE_L
Ref Level 97.19 dBµV ATTEN 10 dB OFFSET: 10.2dB
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 4.263sec
Marker: 869.508MHz 80.5967dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
869.1
869.2
869.3
869.4
869.5
869.6
869.7
869.8
869.9
Frequency [MHz]
Part 22 Block Edge Plot


Input Vs Output plot_Input_EDGE_M
Ref Level 97.19 dBµV ATTEN 10 dB OFFSET: 10.2dB
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 4.263sec
Marker: 881.508MHz 80.7237dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
881.1
881.2
881.3
881.4
881.5
881.6
881.7
881.8
881.9
Frequency [MHz]
Part 22 Block Edge Plot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Ref Level 97.19 dBµV ATTEN 10 dB OFFSET: 10.2dB
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 4.263sec
Marker: 893.512MHz 82.5187dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
893.1
893.2
893.3
893.4
893.5
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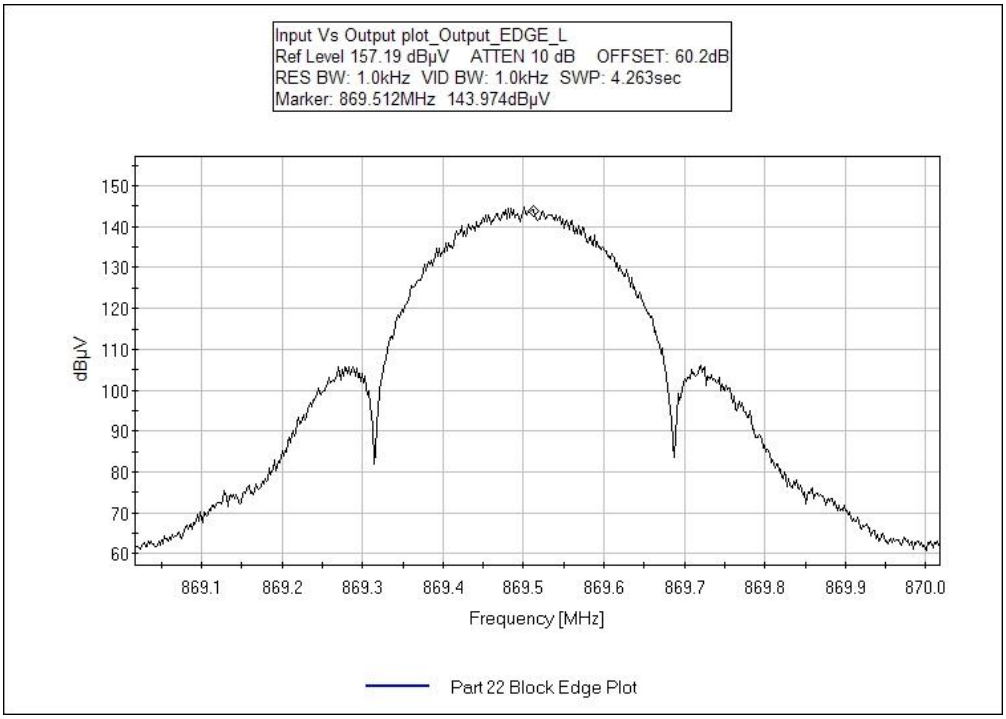
893.8
893.9
894.0
Frequency [MHz]
Part 22 Block Edge Plot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RES BW: 1.0kHz VID BW: 1.0kHz SWP: 4.263sec
Marker: 869.512MHz 143.974dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
869.1
869.2
869.3
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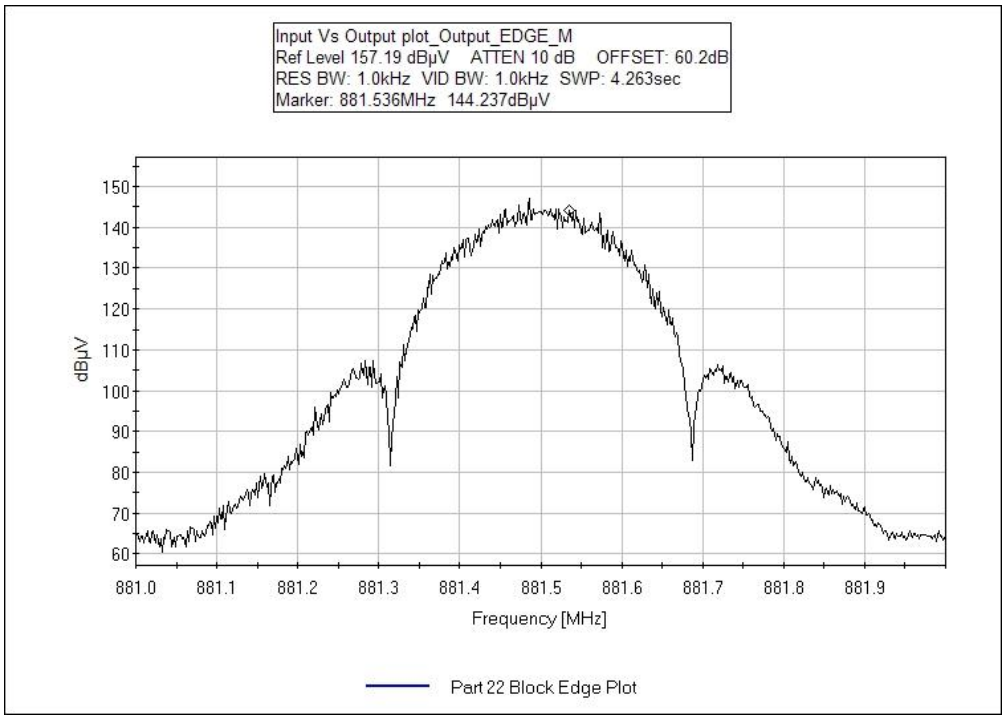
869.7
869.8
869.9
870.0
Frequency [MHz]
Part 22 Block Edge Plot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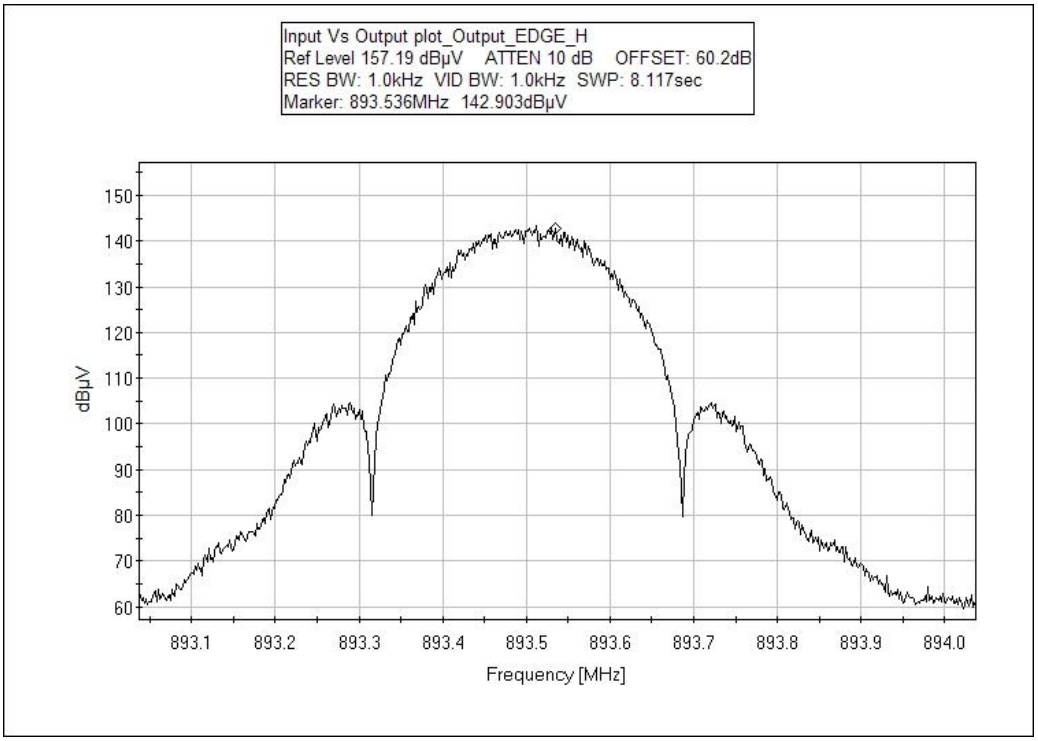
Ref Level 157.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 4.263sec
Marker: 881.536MHz 144.237dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
881.0
881.1
881.2
881.3
881.4
881.5
881.6
881.7
881.8
881.9
Frequency [MHz]
Part 22 Block Edge Plot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Ref Level 157.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 8.117sec
Marker: 893.536MHz 142.903dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
893.1
893.2
893.3
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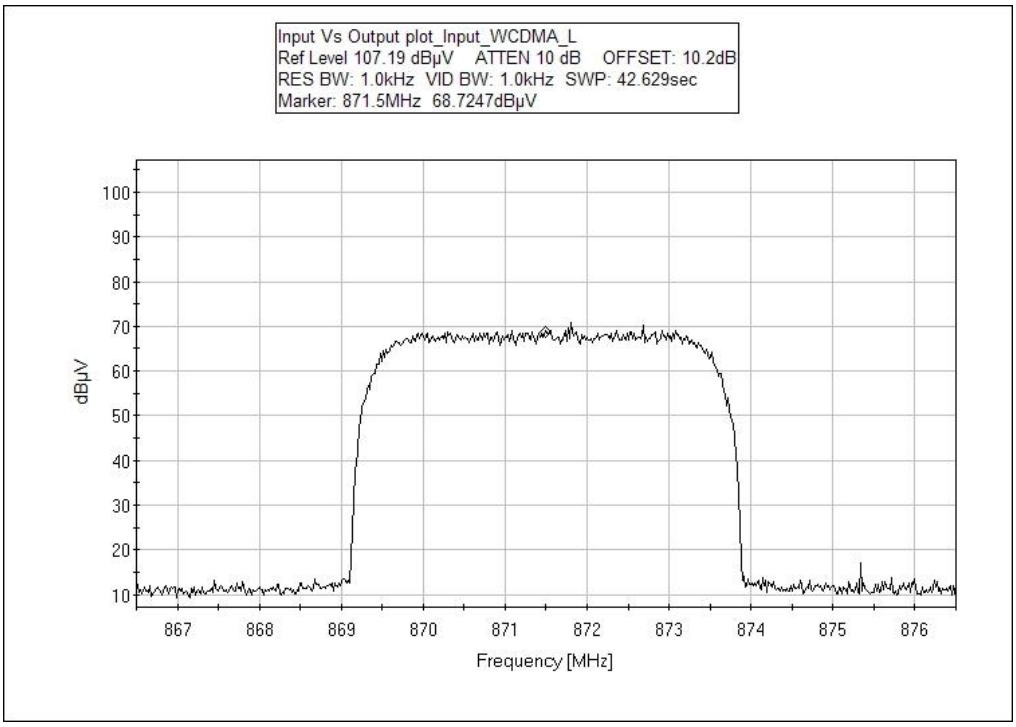
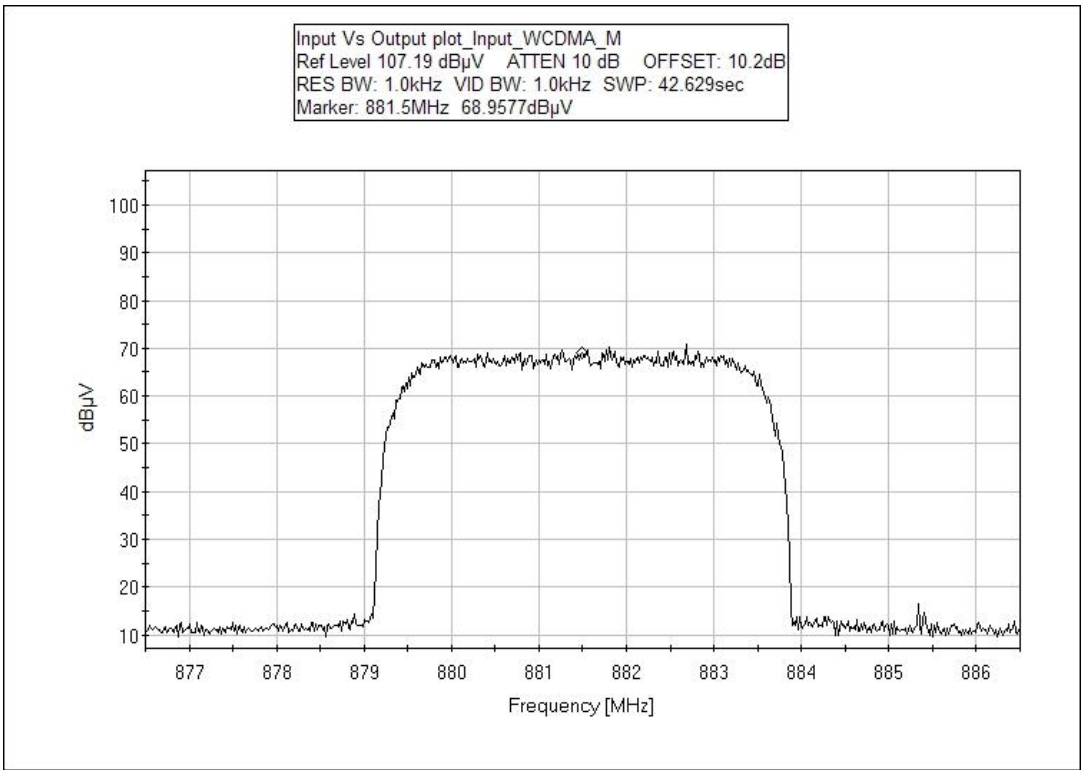
893.7
893.8
893.9
894.0
Frequency [MHz]


Input Vs Output plot_Input_WCDMA_L
Ref Level 107.19 dBµV ATTEN 10 dB OFFSET: 10.2dB
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 42.629sec
Marker: 871.5MHz 68.7247dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
867
868
869
870
871
872
873
874
875
876
Frequency [MHz]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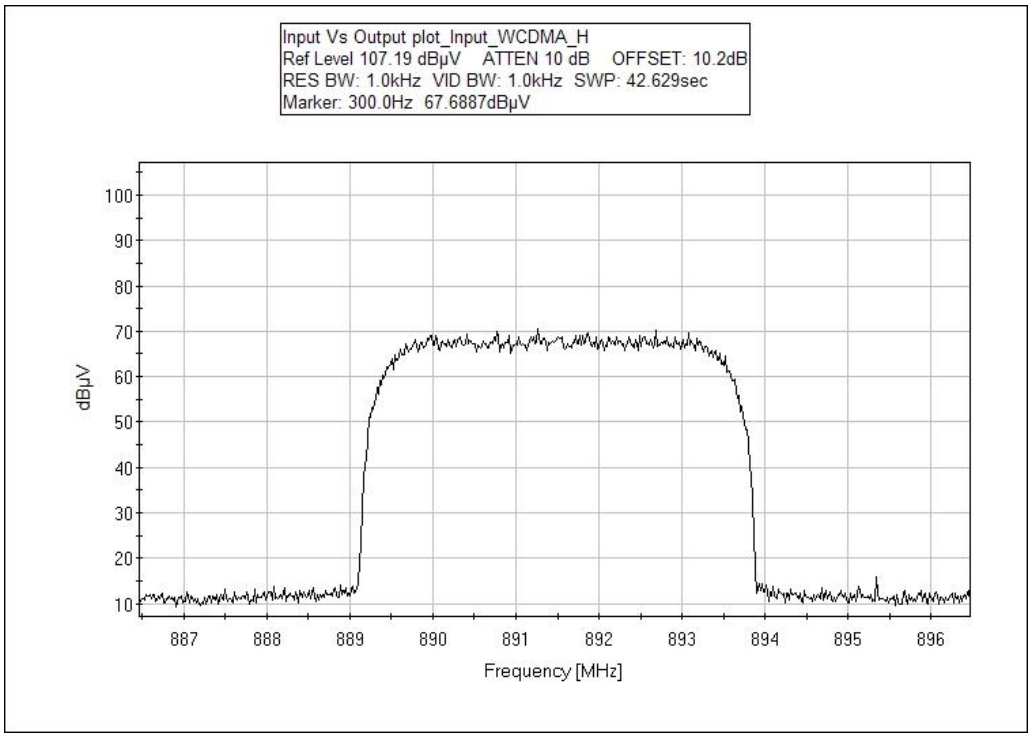
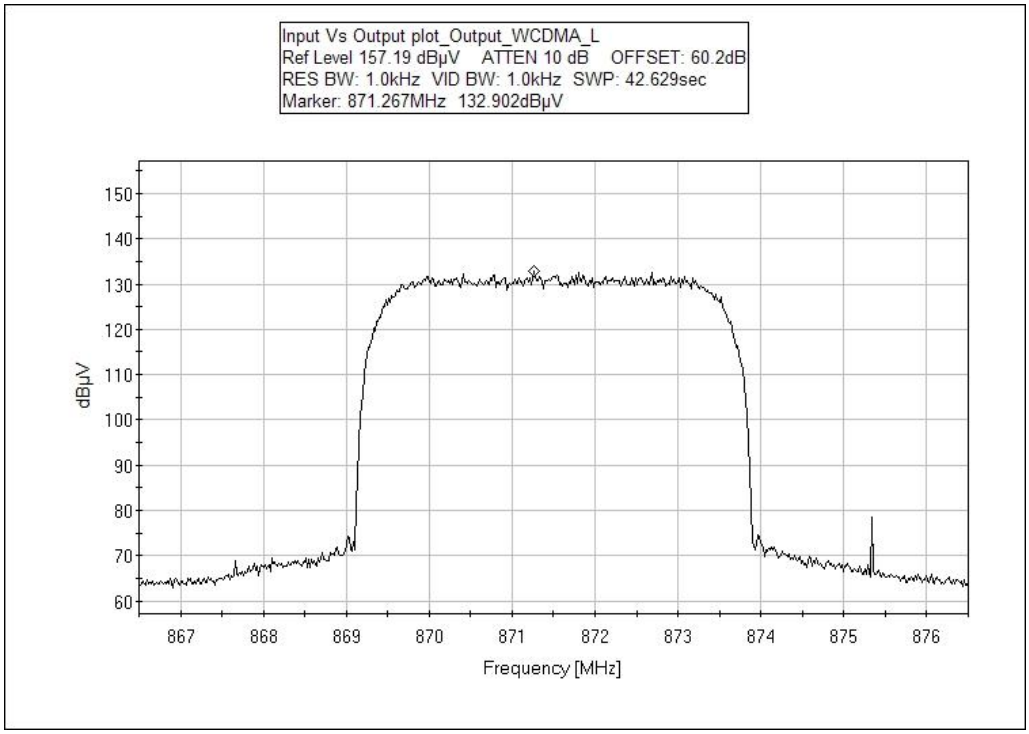
Ref Level 107.19 dBµV ATTEN 10 dB OFFSET: 10.2dB
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 42.629sec
Marker: 881.5MHz 68.9577dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
877
878
879
880
881
882
883
884
885
886
Frequency [MHz]


Input Vs Output plot_Input_WCDMA_H
Ref Level 107.19 dBµV ATTEN 10 dB OFFSET: 10.2dB
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 42.629sec
Marker: 300.0Hz 67.6887dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
887
888
889
890
891
892
893
894
895
896
Frequency [MHz]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RES BW: 1.0kHz VID BW: 1.0kHz SWP: 42.629sec
Marker: 871.267MHz 132.902dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
867
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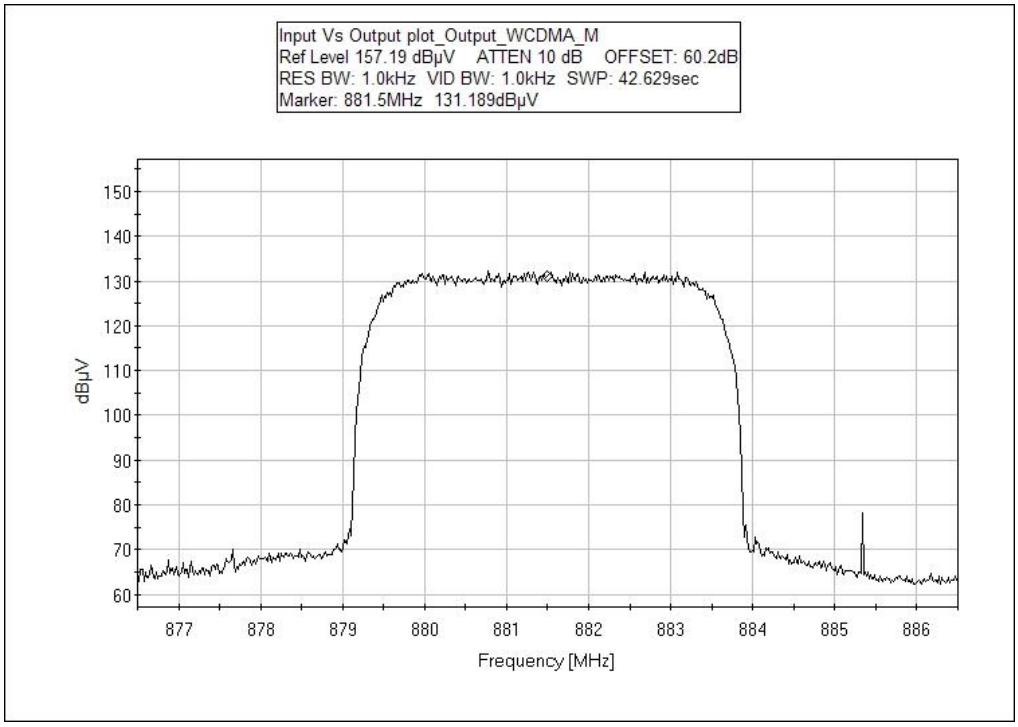
869
870
871
872
873
874
875
876
Frequency [MHz]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RES BW: 1.0kHz VID BW: 1.0kHz SWP: 42.629sec
Marker: 881.5MHz 131.189dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
877
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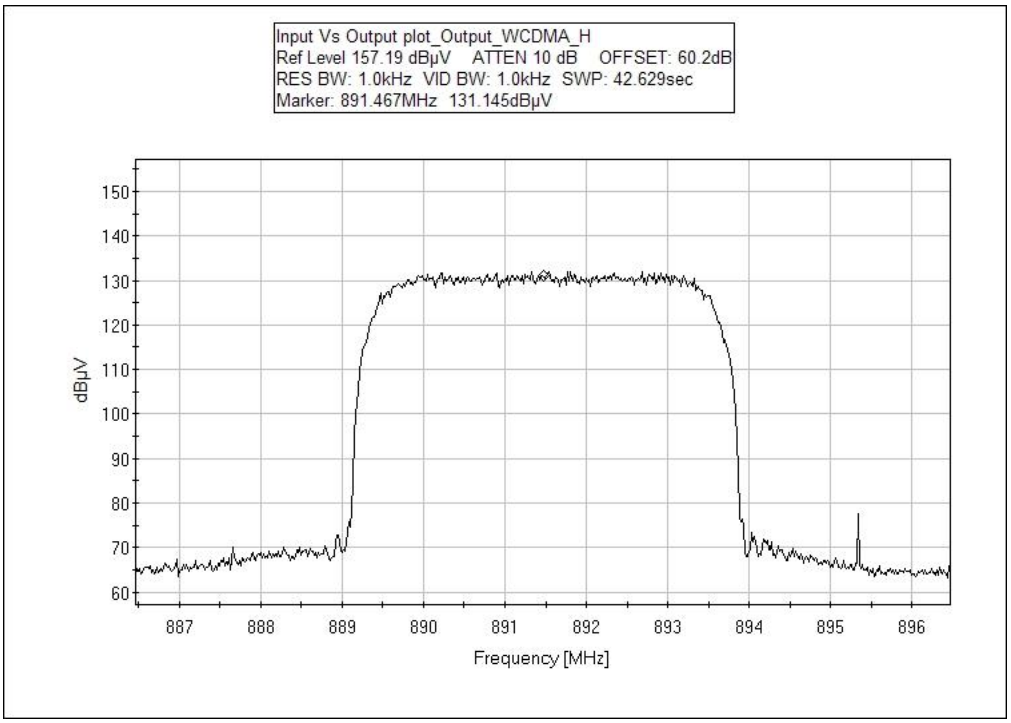
879
880
881
882
883
884
885
886
Frequency [MHz]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RES BW: 1.0kHz VID BW: 1.0kHz SWP: 42.629sec
Marker: 891.467MHz 131.145dBµV
dBµV
150
140
130
120
110
100
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80
70
60
887
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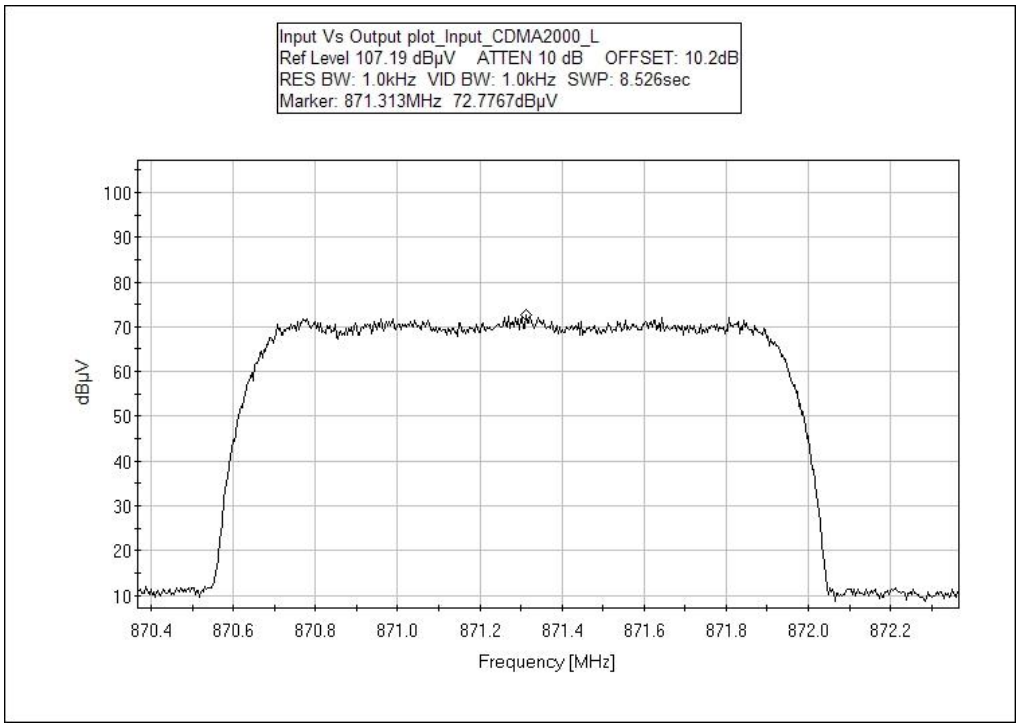
890
891
892
893
894
895
896
Frequency [MHz]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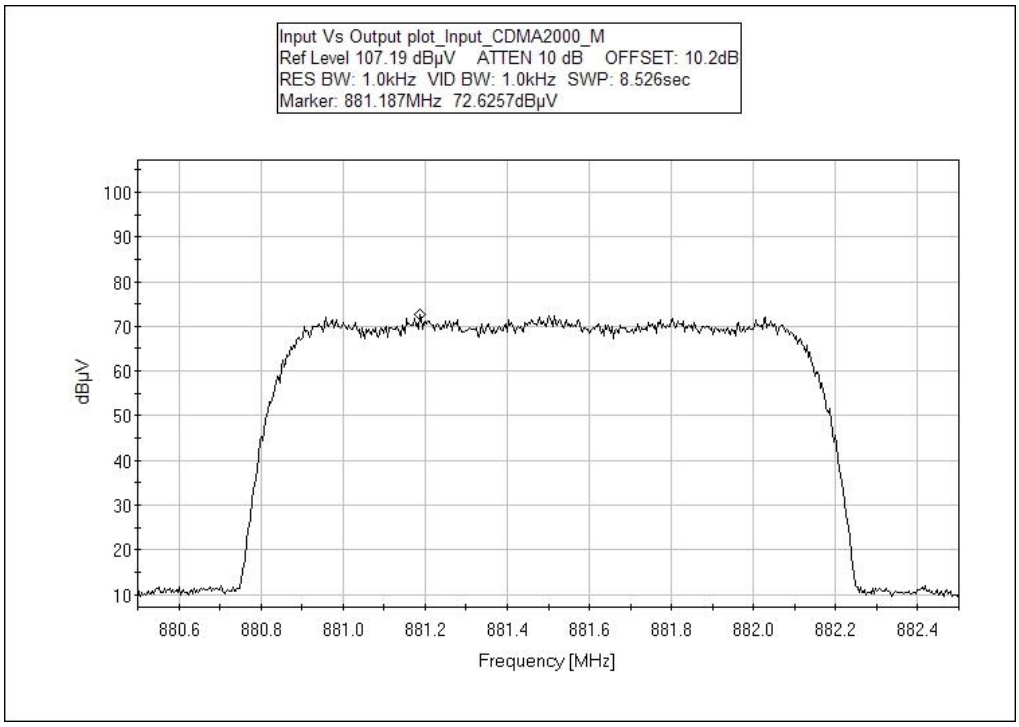
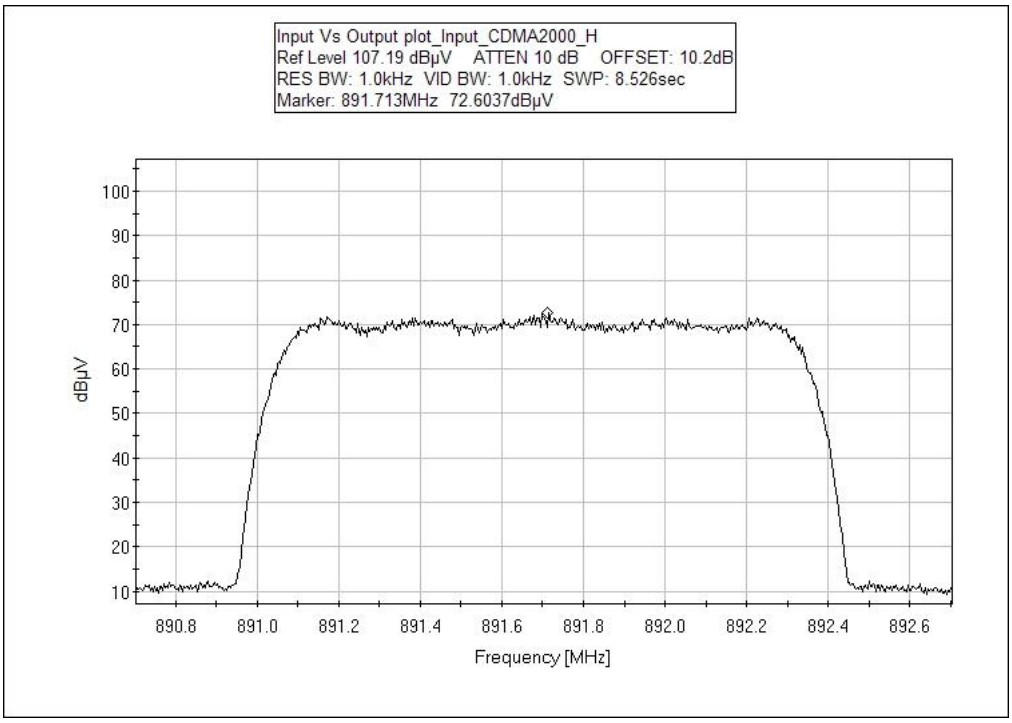
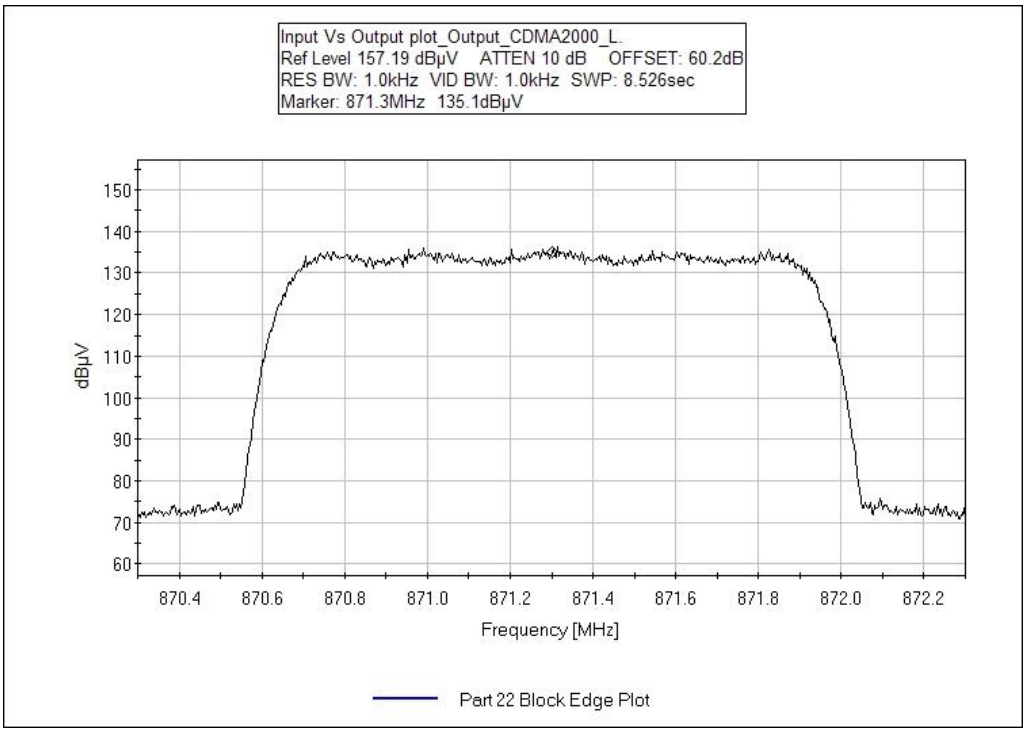
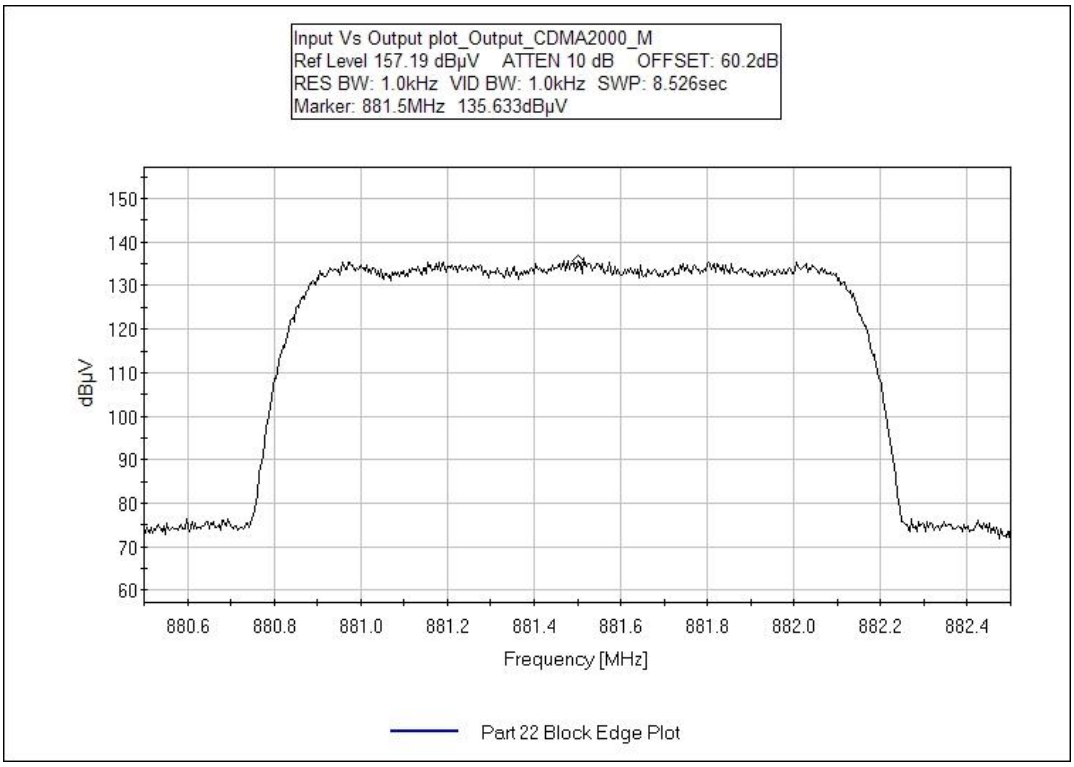
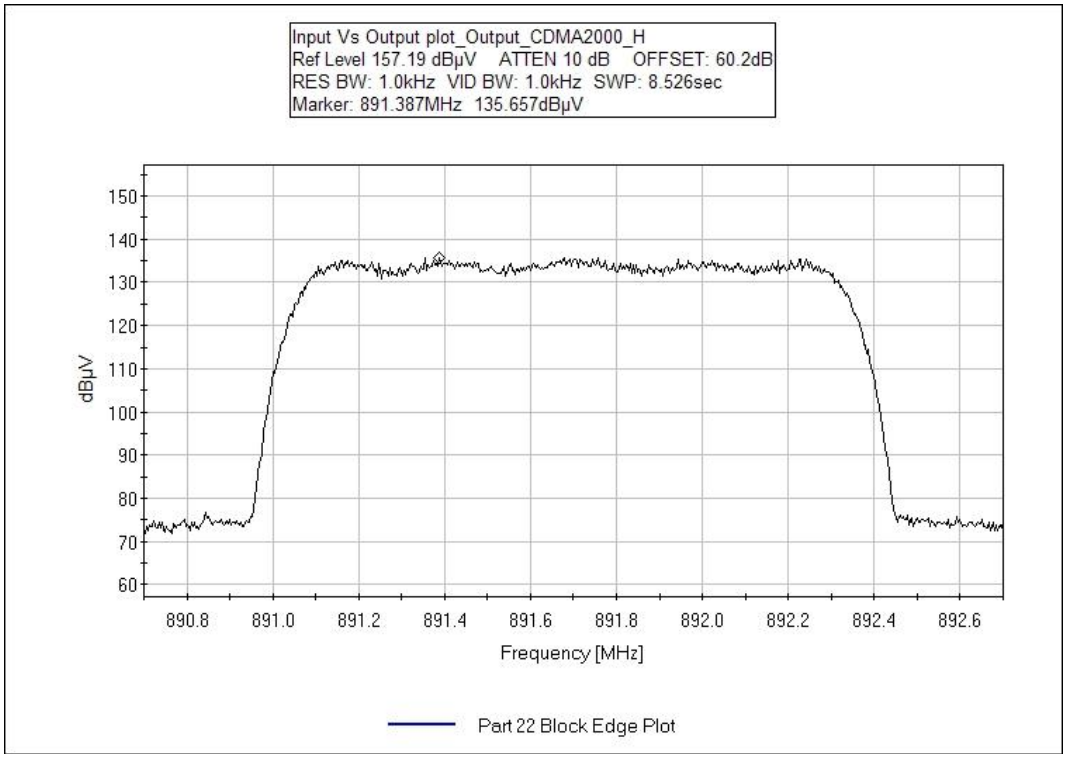
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 8.526sec
Marker: 871.313MHz 72.7767dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
870.4
870.6
870.8
871.0
871.2
871.4
871.6
871.8
872.0
872.2
Frequency [MHz]

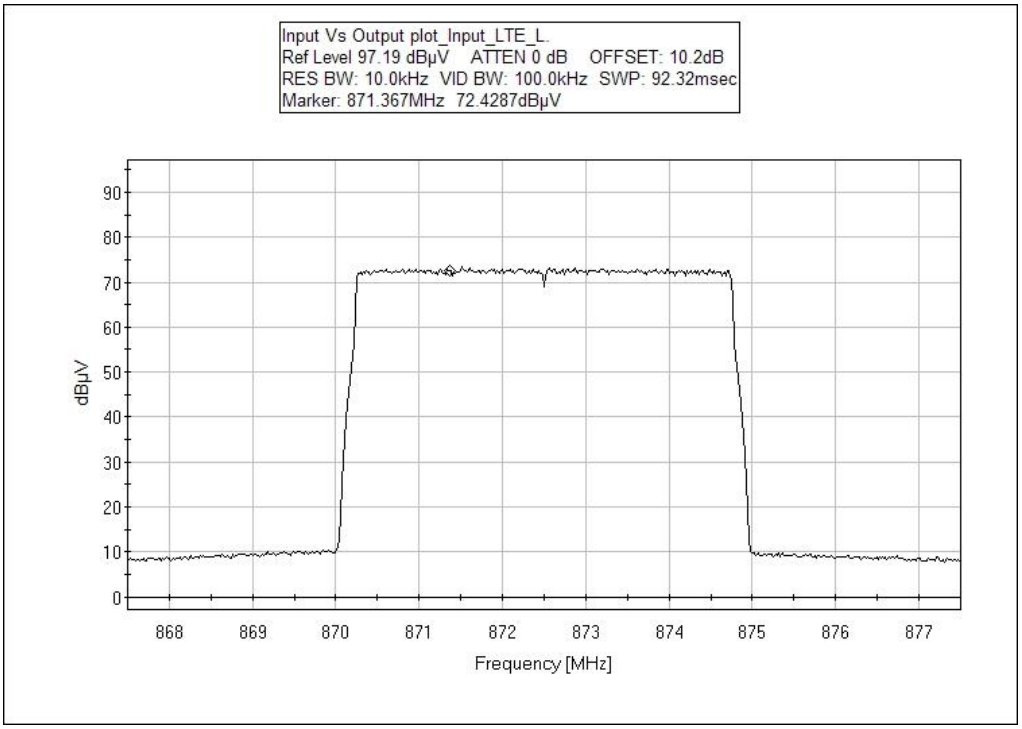

Input Vs Output plot_Input_CDMA2000_M
Ref Level 107.19 dBµV ATTEN 10 dB OFFSET: 10.2dB
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 8.526sec
Marker: 881.187MHz 72.6257dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
880.6
880.8
881.0
881.2
881.4
881.6
881.8
882.0
882.2
882.4
Frequency [MHz]

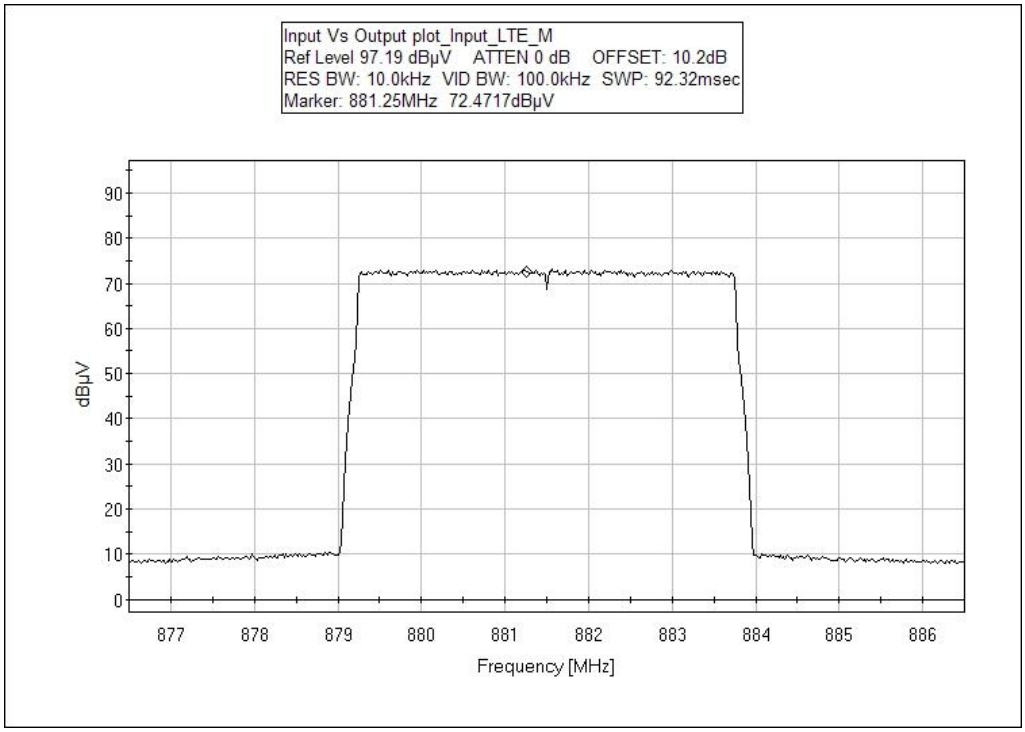

Input Vs Output plot_Input_CDMA2000_H
Ref Level 107.19 dBµV ATTEN 10 dB OFFSET: 10.2dB
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 8.526sec
Marker: 891.713MHz 72.6037dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
890.8
891.0
891.2
891.4
891.6
891.8
892.0
892.2
892.4
892.6
Frequency [MHz]

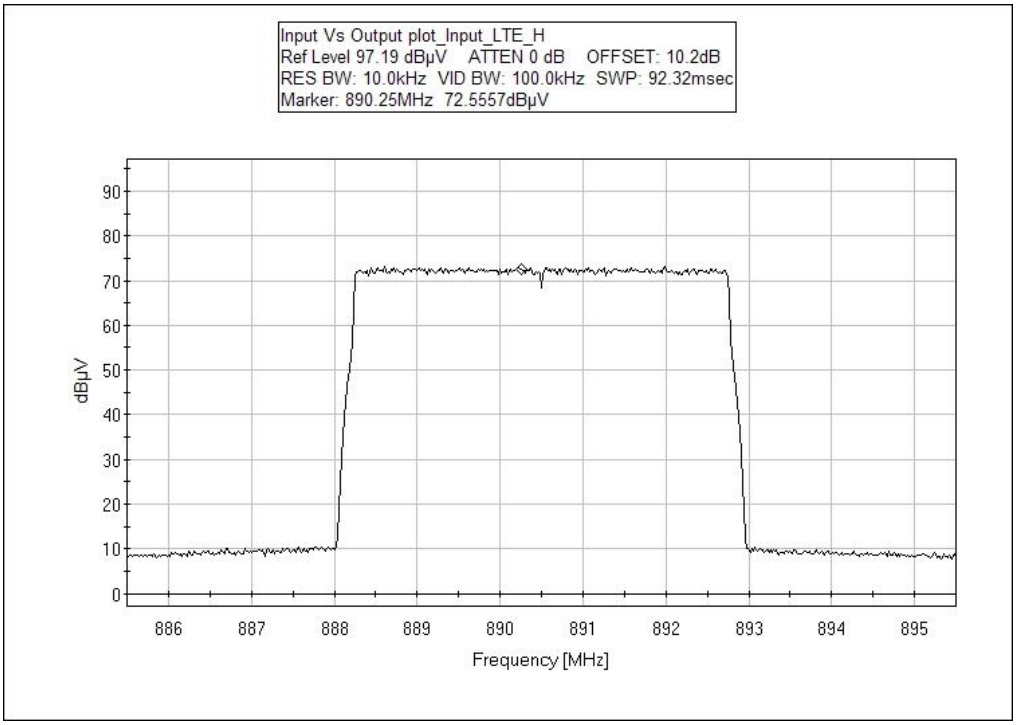

Input Vs Output plot_Output_CDMA2000_L.
Ref Level 157.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 8.526sec
Marker: 871.3MHz 135.1dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
870.4
870.6
870.8
871.0
871.2
871.4
871.6
871.8
872.0
872.2
Frequency [MHz]
Part 22 Block Edge Plot

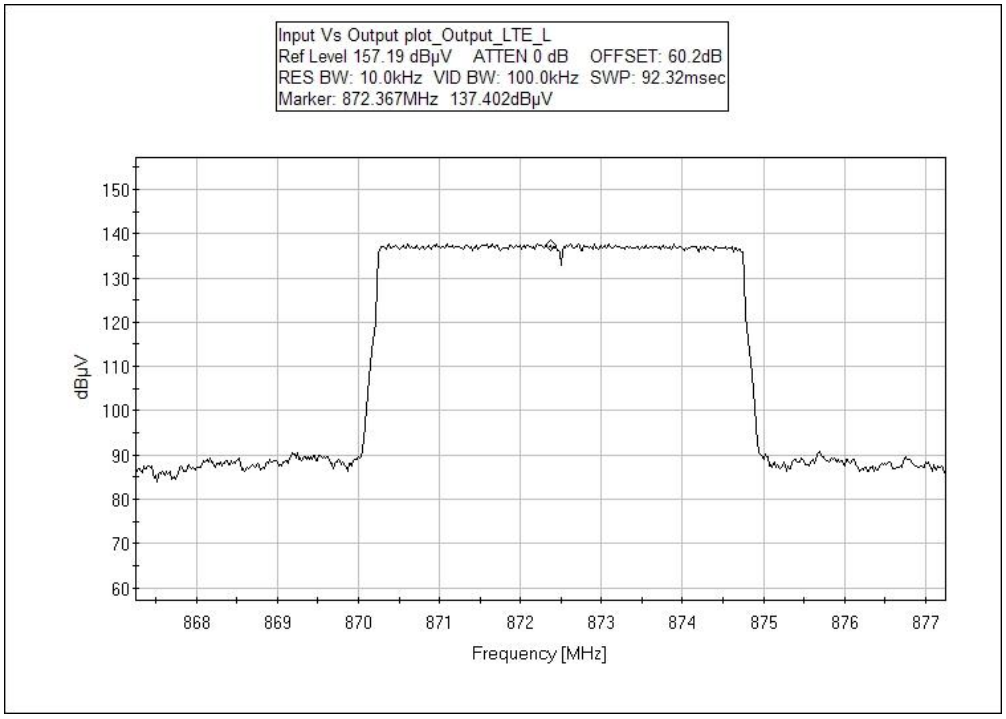

Input Vs Output plot_Output_CDMA2000_M
Ref Level 157.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 8.526sec
Marker: 881.5MHz 135.633dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
880.6
880.8
881.0
881.2
881.4
881.6
881.8
882.0
882.2
882.4
Frequency [MHz]
Part 22 Block Edge Plot

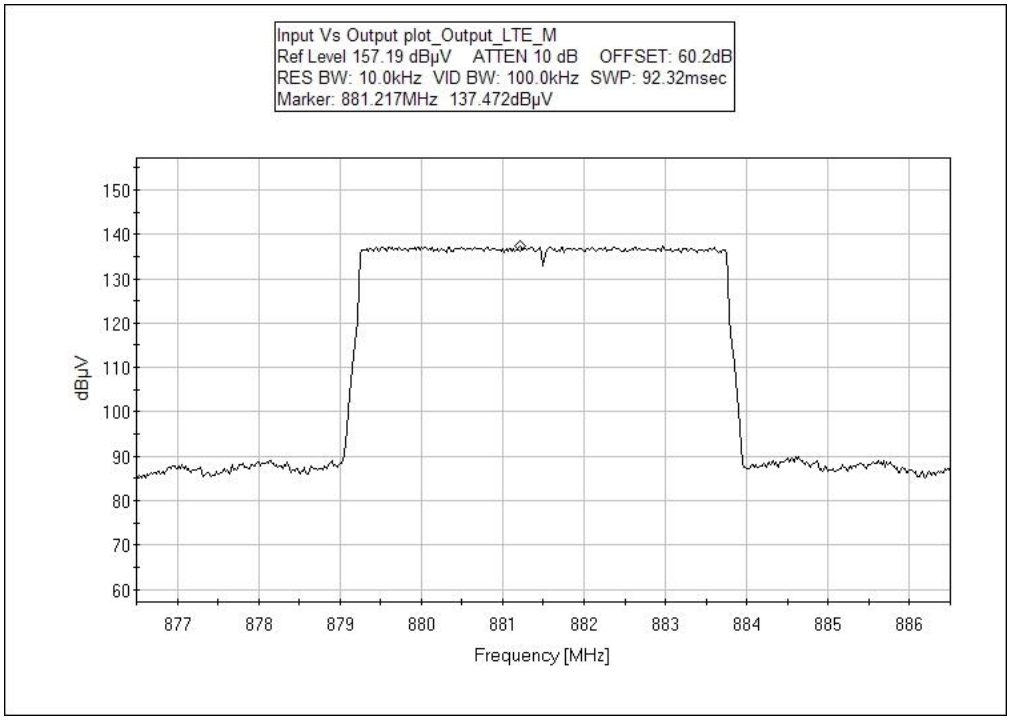

Input Vs Output plot_Output_CDMA2000_H
Ref Level 157.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 1.0kHz VID BW: 1.0kHz SWP: 8.526sec
Marker: 891.387MHz 135.657dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
890.8
891.0
891.2
891.4
891.6
891.8
892.0
892.2
892.4
892.6
Frequency [MHz]
Part 22 Block Edge Plot

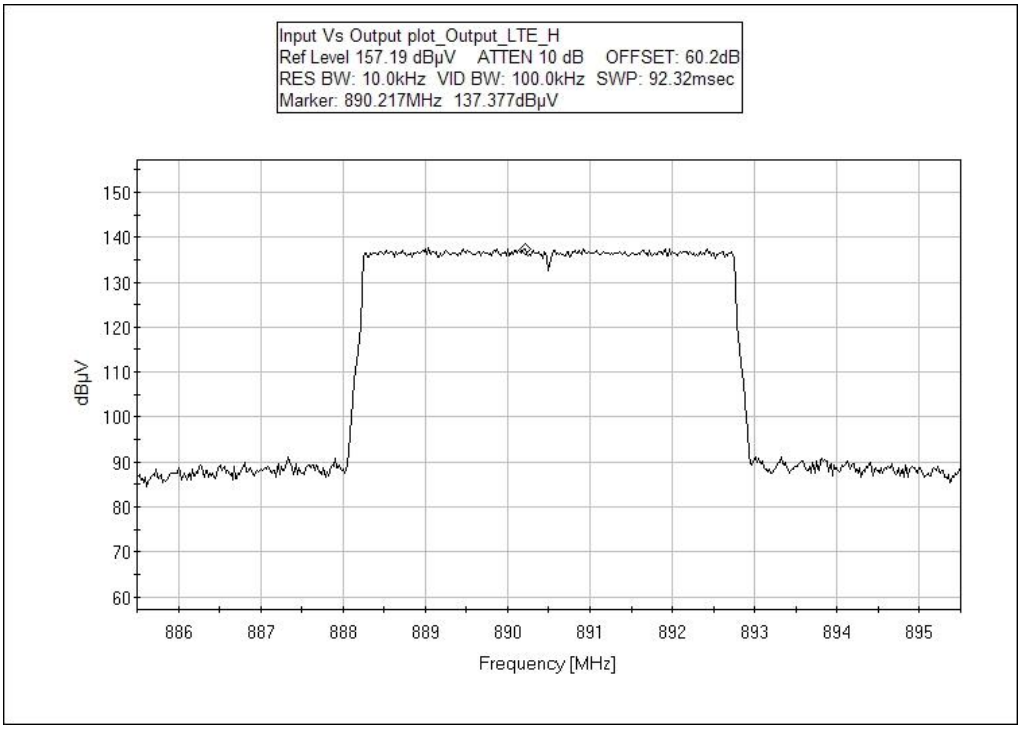

Input Vs Output plot_Input_LTE_L.
Ref Level 97.19 dBµV ATTEN 0 dB OFFSET: 10.2dB
RES BW: 10.0kHz VID BW: 100.0kHz SWP: 92.32msec
Marker: 871.367MHz 72.4287dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
868
869
870
871
872
873
874
875
876
877
Frequency [MHz]


Input Vs Output plot_Input_LTE_M
Ref Level 97.19 dBµV ATTEN 0 dB OFFSET: 10.2dB
RES BW: 10.0kHz VID BW: 100.0kHz SWP: 92.32msec
Marker: 881.25MHz 72.4717dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
877
878
879
880
881
882
883
884
885
886
Frequency [MHz]


Input Vs Output plot_Input_LTE_H
Ref Level 97.19 dBµV ATTEN 0 dB OFFSET: 10.2dB
RES BW: 10.0kHz VID BW: 100.0kHz SWP: 92.32msec
Marker: 890.25MHz 72.5557dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
886
887
888
889
890
891
892
893
894
895
Frequency [MHz]


Input Vs Output plot_Output_LTE_L
Ref Level 157.19 dBµV ATTEN 0 dB OFFSET: 60.2dB
RES BW: 10.0kHz VID BW: 100.0kHz SWP: 92.32msec
Marker: 872.367MHz 137.402dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
868
869
870
871
872
873
874
875
876
877
Frequency [MHz]


Input Vs Output plot_Output_LTE_M
Ref Level 157.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 10.0kHz VID BW: 100.0kHz SWP: 92.32msec
Marker: 881.217MHz 137.472dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
877
878
879
880
881
882
883
884
885
886
Frequency [MHz]


Input Vs Output plot_Output_LTE_H
Ref Level 157.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 10.0kHz VID BW: 100.0kHz SWP: 92.32msec
Marker: 890.217MHz 137.377dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
886
887
888
889
890
891
892
893
894
895
Frequency [MHz]

Test Setup Photos

FCC 2.1033(c)(14)/2.1051/22.917(a) - Spurious Emissions at Antenna Terminal

Limit Line for Spurious Conducted Emission

REQUIRED ATTENUATION = 43+10 LOG P dB

Limit line (dBuV) = V_{dBuv} - Attenuation

$$V_{dBuV} = 20 \text{Log} \frac{V}{1 \text{x} 10^{-6}}$$
$$= 20 (\text{Log } V - \text{Log } 1 \text{x} 10^{-6})$$
$$= 20 \text{Log } V - 20 \text{Log} 1 \text{x} 10^{-6}$$
$$= 20 \text{Log } V - 20 (-6)$$
$$= 20 \text{Log } V + 120$$

$$\text{Attenuation} = 43 + 10 \text{Log } P$$
$$= 43 + 10 \text{Log} \frac{V^2}{R}$$
$$= 43 + 10 (\text{Log } V^2 - \text{Log } R)$$
$$= 43 + 10 (2 \text{Log } V - \text{Log } R)$$
$$= 43 + 20 \text{Log } V - 10 \text{Log } R$$

Limit line = V_{dBuv} - Attenuation
= 20 Log V + 120 – (43 + 20 Log V – 10Log R)
= 20 Log V + 120 – 43 – 20 Log V + 10Log R
= 20 Log V + 120 – 43 – 20 Log V + 10Log R
= 120 – 43 + 10 Log 50 Note: R = 50 Ω
= 120 –43 + 16.897
= 94 dBuV at any power level

Test Data

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

Customer:	**Powerwave Technologies, Inc.**		
Specification:	**47 CFR §22.917 Spurious Emissions**		
Work Order #:	**92273**	Date:	10/3/2011
Test Type:	**Conducted Emissions**	Time:	10:05:58
Equipment:	**Multi-carrier RF Power Amplifier**	Sequence#:	3
Manufacturer:	Powerwave Technologies, Inc.	Tested By:	E. Wong
Model:	G3L-850-180		28V DC
S/N:	11IU08000012		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	8/9/2010	8/9/2012
T2	AN03239	Cable	32022-2-29094K-24TC	8/30/2011	8/30/2013
T3	AN03169	High Pass Filter	HM1155-11SS	9/22/2011	9/22/2013

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

Function	Manufacturer	Model #	S/N
Multi-carrier RF Power Amplifier*	Powerwave Technologies, Inc.	G3L-850-180	11IU08000012

Support Devices:

Function	Manufacturer	Model #	S/N
Signal generator	Aeroflex	IFR3416	341006/496
Power Supply	HP	6032A	3542P123027
ESG	Agilent	4433B	US40052191
ESG	Agilent	4433B	US40052146

Test Conditions / Notes:

The EUT is placed on the wooden table. RF output port is connected to a spectrum analyzer. RF input port is connected to a remote ESG via a pre -amplifier. The RF input signal is adjusted to maintain the rated output power.

Frequency range: 869-894MHz
Modulation: GSM, EDGE, WCDMA,CDMA2000, LTE
Power=210W (53.2dBm)

GSM: 869.5MHz, 881.5MHz, 893.6MHz

EDGE: 869.5MHz, 881.5MHz, 893.6MHz

WCDMA: 871.5MHz, 881.5MHz, 891.5MHz

CDMA2000: 871.3MHz, 881.5MHz, 891.7MHz

LTE: 872.5MHz, 881.5MHz,890.5MHz

Frequency range of measurement = 9 kHz- 9 GHz.
9 kH -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-9000 MHz;RBW=1 MHz,VBW=1 MHz.

23°C, 67% relative humidity
Note: equivalent delay filter from second equipment vendor installed. (Manufacturer: Ace Technologies). Not to be confused with Output RF Filter. Delay Filter response plot of ACE Technology and HiGain are included in the report for comparison purposes.

Ext Attn: 0 dB

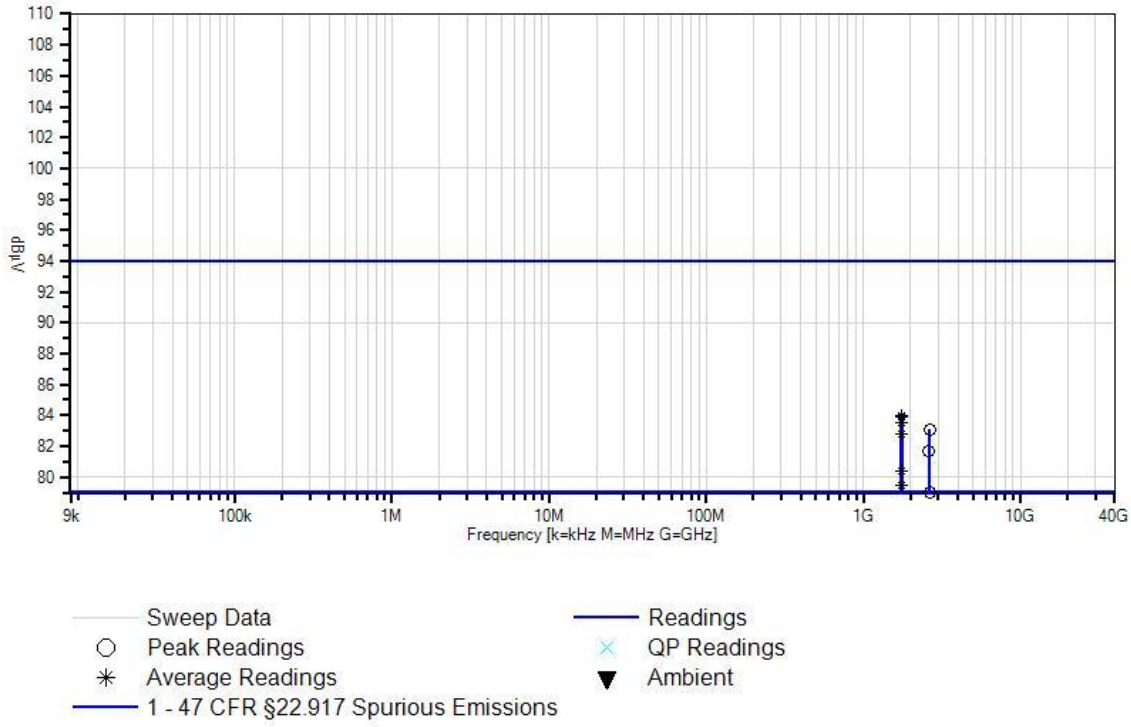
Measurement Data: Reading listed by margin. Test Lead: Antenna port

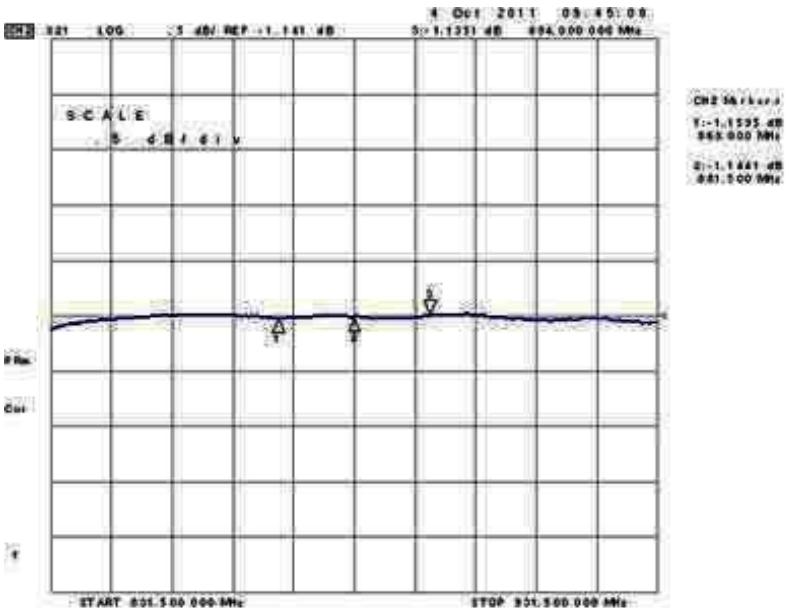
#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	1738.997M Ave	83.3	+0.0	+0.3	+0.4		+0.0	84.0	94.0 GSM: Measured with higher noise floor level	-10.0	Anten
2	1762.943M Ave	83.2	+0.0	+0.3	+0.4		+0.0	83.9	94.0 GSM: Measured with higher noise floor level	-10.1	Anten
3	1763.123M Ave	82.8	+0.0	+0.3	+0.4		+0.0	83.5	94.0 EDGE	-10.5	Anten
4	2644.485M	82.4	+0.0	+0.4	+0.3		+0.0	83.1	94.0 EDGE	-10.9	Anten
5	1738.990M Ave	82.1	+0.0	+0.3	+0.4		+0.0	82.8	94.0 EDGE	-11.2	Anten
^	1738.990M	89.2	+0.0	+0.3	+0.4		+0.0	89.9	94.0 EDGE	-4.1	Anten
^	1738.897M	88.7	+0.0	+0.3	+0.4		+0.0	89.4	94.0 GSM: Measured with higher noise floor level	-4.6	Anten
8	2608.427M	81.0	+0.0	+0.4	+0.3		+0.0	81.7	94.0 EDGE	-12.3	Anten

9	1763.017M Ave	79.7	+0.0	+0.3	+0.4	+0.0	80.4	94.0 CDMA 2000	-13.6	Anten
^	1762.943M	90.1	+0.0	+0.3	+0.4	+0.0	90.8	94.0 GSM: Measured with higher noise floor level	-3.2	Anten
11	1743.000M Ave	78.8	+0.0	+0.3	+0.4	+0.0	79.5	94.0 CDMA 2000	-14.5	Anten
^	1743.000M	94.1	+0.0	+0.3	+0.4	+0.0	94.8	94.0 CDMA 2000	+0.8	Anten
13	2680.382M	78.3	+0.0	+0.4	+0.3	+0.0	79.0	94.0 EDGE	-15.0	Anten
14	2643.130M	78.0	+0.0	+0.4	+0.3	+0.0	78.7	94.0 LTE	-15.3	Anten
15	2615.742M	76.6	+0.0	+0.4	+0.3	+0.0	77.3	94.0 LTE	-16.7	Anten
16	2644.558M	75.6	+0.0	+0.4	+0.3	+0.0	76.3	94.0 WCDMA	-17.7	Anten
17	1762.583M Ave	75.1	+0.0	+0.3	+0.4	+0.0	75.8	94.0 LTE	-18.2	Anten
^	1762.583M	89.0	+0.0	+0.3	+0.4	+0.0	89.7	94.0 LTE	-4.3	Anten
19	1787.003M Ave	75.1	+0.0	+0.3	+0.4	+0.0	75.8	94.0 EDGE	-18.2	Anten
^	1787.003M	83.6	+0.0	+0.3	+0.4	+0.0	84.3	94.0 EDGE	-9.7	Anten
^	1786.957M	79.8	+0.0	+0.3	+0.4	+0.0	80.5	94.0 GSM	-13.5	Anten
22	1763.083M Ave	74.7	+0.0	+0.3	+0.4	+0.0	75.4	94.0 WCDMA	-18.6	Anten
^	1763.017M	95.0	+0.0	+0.3	+0.4	+0.0	95.7	94.0 CDMA 2000	+1.7	Anten
^	1763.123M	90.2	+0.0	+0.3	+0.4	+0.0	90.9	94.0 EDGE	-3.1	Anten
^	1763.083M	85.0	+0.0	+0.3	+0.4	+0.0	85.7	94.0 WCDMA	-8.3	Anten
26	2672.730M	74.5	+0.0	+0.4	+0.3	+0.0	75.2	94.0 WCDMA	-18.8	Anten
27	1783.250M Ave	74.5	+0.0	+0.3	+0.4	+0.0	75.2	94.0 CDMA 2000	-18.8	Anten
^	1783.250M	90.2	+0.0	+0.3	+0.4	+0.0	90.9	94.0 CDMA 2000	-3.1	Anten
29	2615.400M	73.7	+0.0	+0.4	+0.3	+0.0	74.4	94.0 WCDMA	-19.6	Anten
30	1744.050M Ave	73.6	+0.0	+0.3	+0.4	+0.0	74.3	94.0 LTE	-19.7	Anten
^	1744.050M	88.9	+0.0	+0.3	+0.4	+0.0	89.6	94.0 LTE	-4.4	Anten
32	1743.100M Ave	73.6	+0.0	+0.3	+0.4	+0.0	74.3	94.0 WCDMA	-19.7	Anten
^	1743.100M	83.9	+0.0	+0.3	+0.4	+0.0	84.6	94.0 WCDMA	-9.4	Anten

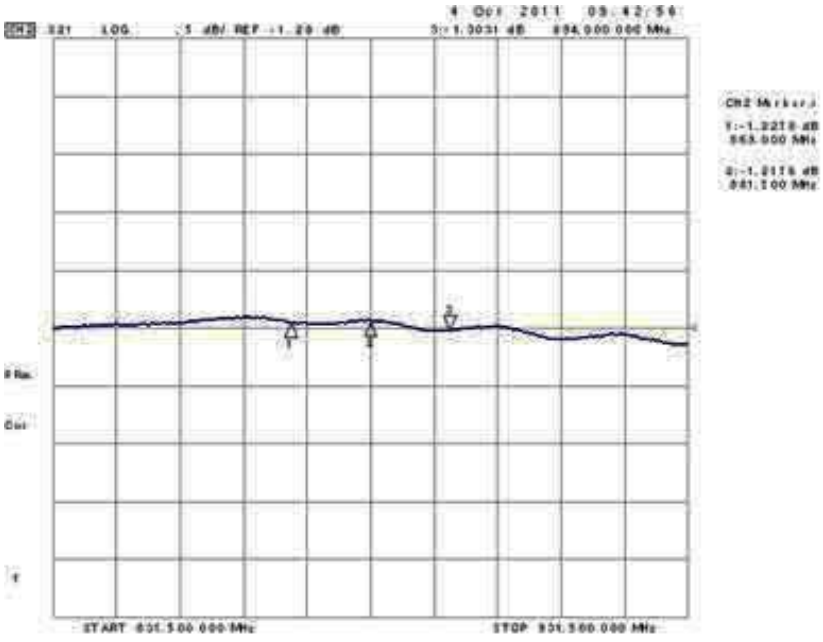
34	1778.583M Ave	71.7	+0.0	+0.3	+0.4	+0.0	72.4	94.0 LTE	-21.6	Anten
^	1778.583M	87.3	+0.0	+0.3	+0.4	+0.0	88.0	94.0 LTE	-6.0	Anten
36	2671.010M	71.6	+0.0	+0.4	+0.3	+0.0	72.3	94.0 LTE	-21.7	Anten
37	1780.883M Ave	70.2	+0.0	+0.3	+0.4	+0.0	70.9	94.0 WCDMA	-23.1	Anten
^	1780.883M	80.6	+0.0	+0.3	+0.4	+0.0	81.3	94.0 WCDMA	-12.7	Anten
39	2644.100M Ave	65.0	+0.0	+0.4	+0.3	+0.0	65.7	94.0 CDMA 2000	-28.3	Anten
^	2644.100M	84.3	+0.0	+0.4	+0.3	+0.0	85.0	94.0 CDMA 2000	-9.0	Anten
41	2614.500M Ave	64.9	+0.0	+0.4	+0.3	+0.0	65.6	94.0 CDMA 2000	-28.4	Anten
^	2614.500M	82.6	+0.0	+0.4	+0.3	+0.0	83.3	94.0 CDMA 2000	-10.7	Anten

CKC Laboratories, Inc. Date: 10/3/2011 Time: 10:05:58 Powerwave Technologies, Inc. WO#: 92273
47 CFR §22.917 Spurious Emissions Test Lead: Antenna port 28V DC Sequence#: 3 Ext ATTN: 0 dB





Delayfilter: ACE Technologies



Delay Filter: HiGain

Test Setup Photos

FCC 2.1033(c)(14)/2.1053/22.917(a) - Field Strength of Spurious Radiation

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 /m^2
Pt = Average Transmit Power
r = Test distance

Field Intensity E (V/m)

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

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

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

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

10 Log P_t = 10 Log E^2 (V/m)+ 10 Log r^2 – 10 Log 30

10 Log P_t = 20 Log E (V/m) + 20 Log r – 10 Log 30

At 3 meter, r = 3 m

10 Log P_t = 20 Log E (V/m) + 20 Log 3 – 10 Log 30

10 Log P_t = 20 Log E (V/m) + 9.54 – 14.77

10 Log P_t = 20 Log E (V/m) - 5.23

*Since 20 Log E (V/m) = 20 Log E (**u**V/m) –120*

10 Log P_t = 20 Log E (uV/m) - 120 - 5.23

10 Log P_t = 20 Log E (uV/m) –125.23

Limit line (dBuV) at 3 meter = E_{dBuv} – Attenuation

= E_{dBuv} - (43+10 Log $P_{t \text{ at 3 meter}}$)

= E_{dBuv} - 43 - 10 Log $P_{t \text{ at 3 meter}}$

= E_{dBuv} - 43 – (20 Log E (uV/m) –125.23)

= E_{dBuv} - 43 - 20 Log E (uV/m) + 125.23

= E_{dBuv} - 20 Log E (uV/m) + 82.23

Since 20 Log E (uV/m) = E in dBuV/m

= ~~E_{dBuv}~~ - ~~E_{dBuv}~~ + 82.23

Radiated Emission limit 3 meter = 82.23 dBuV at any power level measured in dBuV

Test Data

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

Customer: **Powerwave Technologies, Inc.**
Specification: **47 CFR §22.917 Spurious Emissions**
Work Order #: **92273** Date: 9/26/2011
Test Type: **Radiated Scan** Time: 09:23:51
Equipment: **Multi-carrier RF Power Amplifier** Sequence#: 1
Manufacturer: Powerwave Technologies, Inc. Tested By: E. Wong
Model: G3L-850-180
S/N: 11IU08000012

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	8/9/2010	8/9/2012
	AN00309	Preamp	8447D	5/7/2010	5/7/2012
	AN01995	Biconilog Antenna	CBL6111C	3/8/2010	3/8/2012
	ANP05050	Cable	RG223/U	3/21/2011	3/21/2013
	ANP05198	Cable	8268	12/21/2010	12/21/2012
	AN01646	Horn Antenna	3115	8/18/2010	8/18/2012
	AN00786	Preamp	83017A	8/5/2010	8/5/2012
	AN03239	Cable	32022-2-29094K-24TC	8/30/2011	8/30/2013
	ANP05421	Cable	Sucoflex 104A	2/12/2010	2/12/2012
	ANP05563	Cable	ANDL-1-PNMN-48	9/3/2010	9/3/2012
	AN00314	Loop Antenna	6502	6/30/2010	6/30/2012
	AN03169	High Pass Filter	HM1155-11SS	9/22/2011	9/22/2013

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

Function	Manufacturer	Model #	S/N
Multi-carrier RF Power Amplifier*	Powerwave Technologies, Inc.	G3L-850-180	11IU08000012

Support Devices:

Function	Manufacturer	Model #	S/N
Signal generator	Aeroflex	IFR3416	341006/496
Power Supply	HP	6032A	3542P123027
ESG	Agilent	4433B	US40052191
ESG	Agilent	4433B	US40052146

Test Conditions / Notes:

The EUT is placed on the wooden table. RF output port is connected to a remote power meter. RF input port is connected to a remote ESG. The RF input signal is adjusted to maintain the rated output power.

Frequency range: 869-894MHz
Modulation: GSM, EDGE, WCDMA, CDMA2000, LTE
Power=210W (53.2dBm)

EDGE: 869MHz, 881.5MHz, 894MHz

WCDMA: 871.5MHz, 881.5MHz, 891.5MHz

LTE: 872.5MHz, 881.5MHz,890.5MHz

Frequency range of measurement = 9 kHz- 9 GHz.
9 kH -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-9000 MHz;RBW=1 MHz,VBW=1 MHz.

23°C, 67% relative humidity

No emissions within 20 dB were found. Detection was performed with reduced resolution bandwidth or at the aid of High Pass Filter at the required resolution bandwidth.

Test Setup Photos

FCC 2.1033(c)(14)/2.1055/22.355 - Frequency Stability

NA = Not applicable for amplifiers.

FCC 22.917(b) - Block Edge

Test Data

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

Customer:	**Powerwave Technologies, Inc.**		
Specification:	**Bandedge plot**		
Work Order #:	**92273**	Date:	9/26/2011
Test Type:	**Conducted Emissions**	Time:	16:26:21
Equipment:	**Multi-carrier RF Power Amplifier**	Sequence#:	2
Manufacturer:	Powerwave Technologies, Inc.	Tested By:	E. Wong
Model:	G3L-850-180		28V DC
S/N:	11IU08000012		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	8/9/2010	8/9/2012
T2	AN03239	Cable	32022-2-29094K-24TC	8/30/2011	8/30/2013

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

Function	Manufacturer	Model #	S/N
Multi-carrier RF Power Amplifier*	Powerwave Technologies, Inc.	G3L-850-180	11IU08000012

Support Devices:

Function	Manufacturer	Model #	S/N
Signal generator	Aeroflex	IFR3416	341006/496
Power Supply	HP	6032A	3542P123027
ESG	Agilent	4433B	US40052191
ESG	Agilent	4433B	US40052146

Test Conditions / Notes:

The EUT is placed on the wooden table. RF output port is connected to a spectrum analyzer. RF input port is connected to a remote ESG. The RF input signal is adjusted to maintain the rated output power.
Frequency range: 869-894MHz
Modulation: GSM, EDGE, WCDMA, CDMA2000, LTE
Power=210W (53.2dBm)

GSM: 869.5MHz, 881.5MHz, 893.6MHz

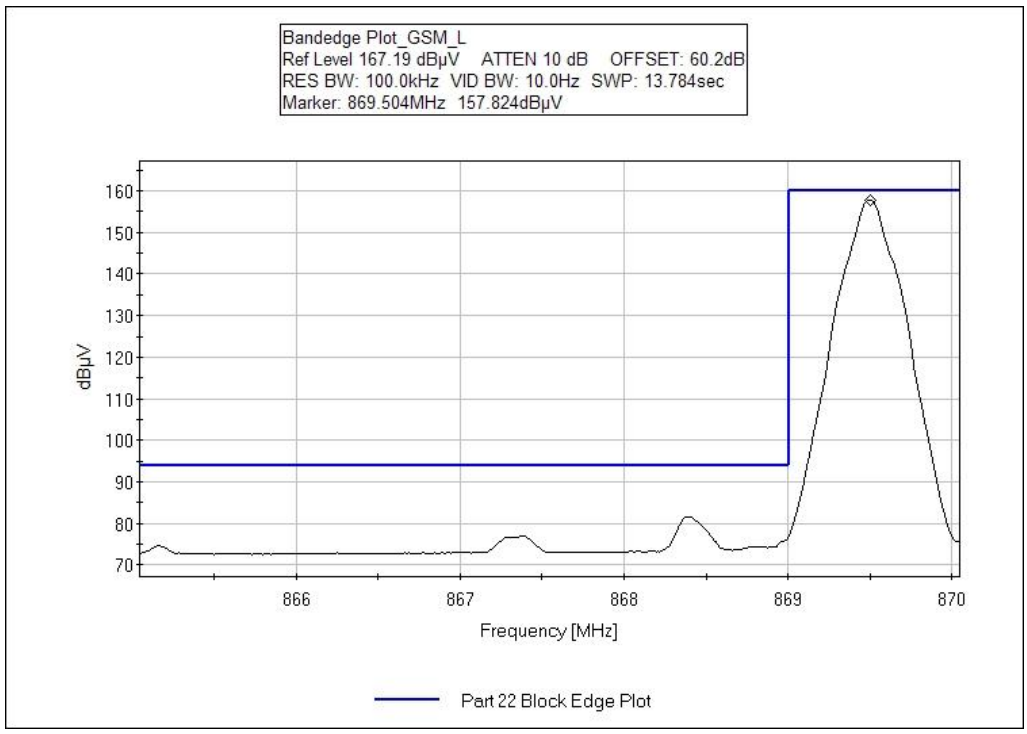
EDGE: 869.5MHz, 881.5MHz, 893.6MHz

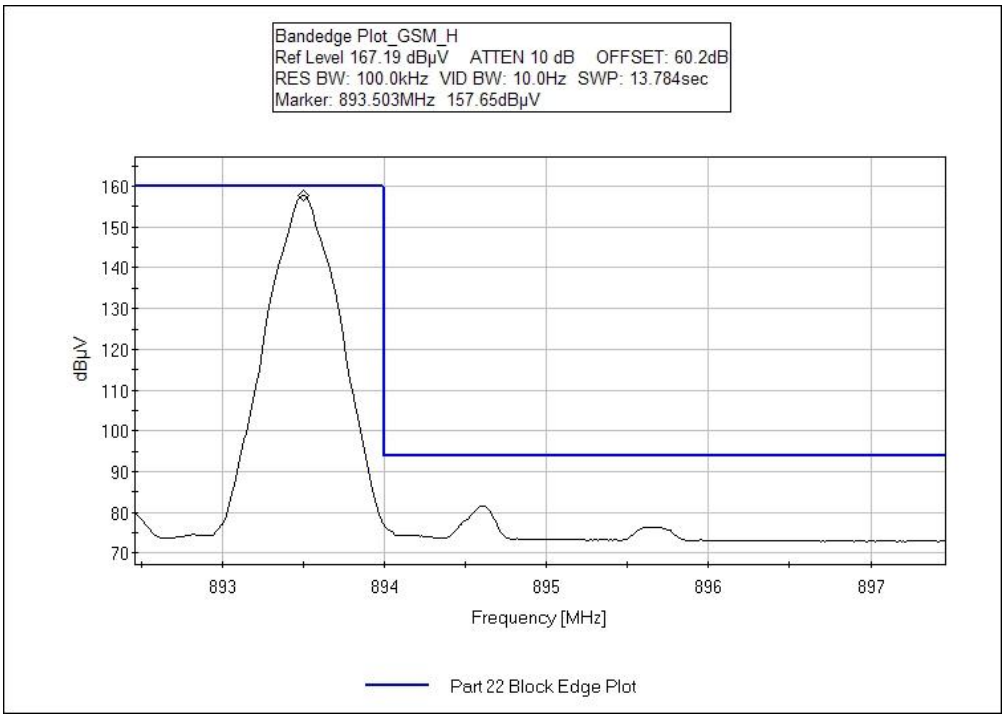
WCDMA: 871.5MHz, 881.5MHz, 891.5MHz

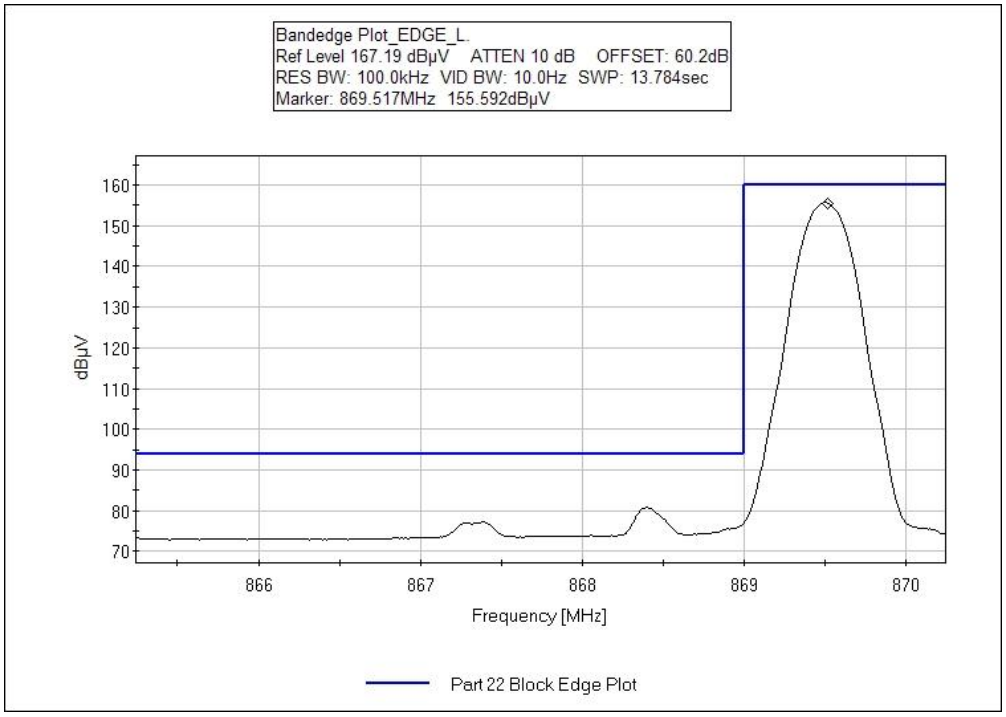
CDMA2000: 871.3MHz, 881.5MHz, 891.7MHz

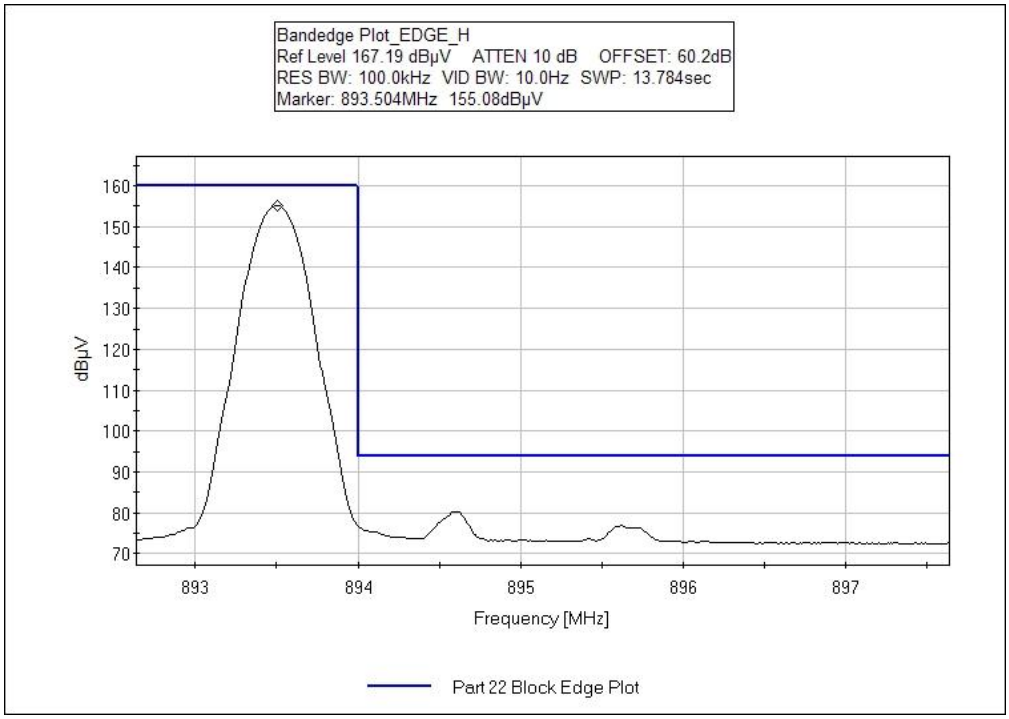
LTE: 872.5MHz, 881.5MHz,890.5MHz

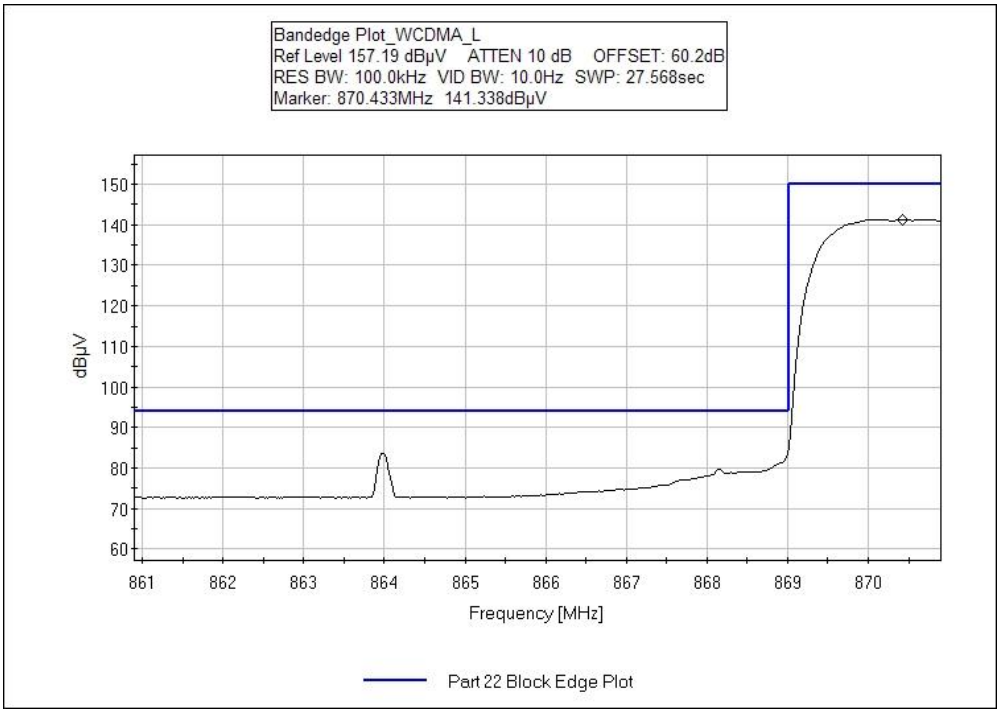
23°C, 67% relative humidity

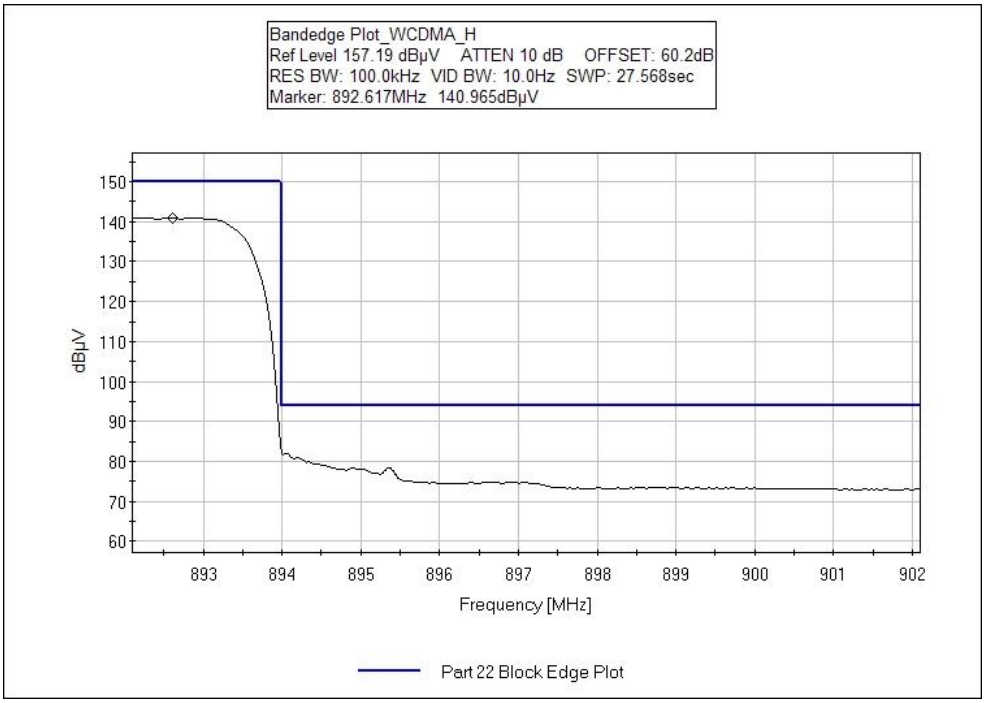

Bandedge Plot_GSM_L
Ref Level 167.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 10.0Hz SWP: 13.784sec
Marker: 869.504MHz 157.824dBµV
dBµV
160
150
140
130
120
110
100
90
80
70
866
867
868
869
870
Frequency [MHz]
Part 22 Block Edge Plot

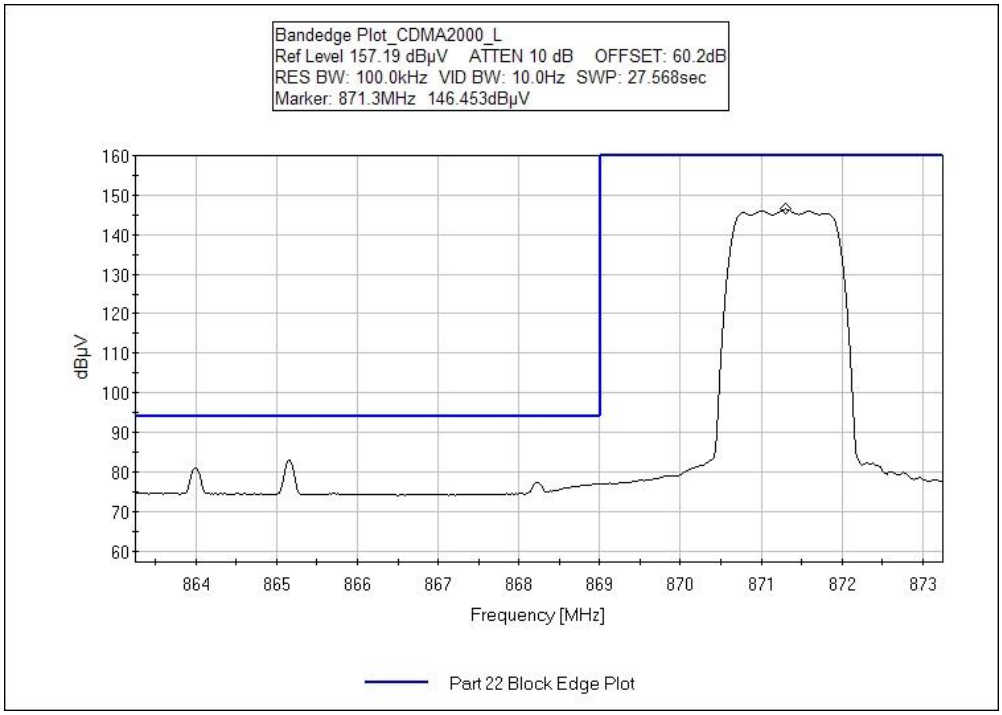

Bandedge Plot_GSM_H
Ref Level 167.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 10.0Hz SWP: 13.784sec
Marker: 893.503MHz 157.65dBµV
dBµV
160
150
140
130
120
110
100
90
80
70
893
894
895
896
897
Frequency [MHz]
Part 22 Block Edge Plot

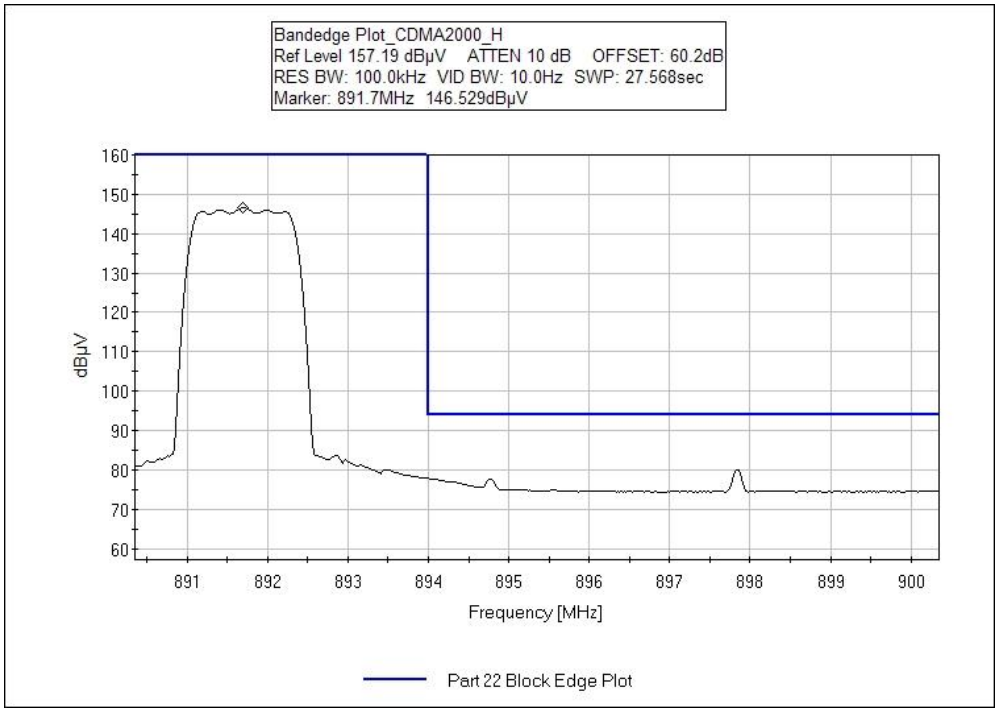

Bandedge Plot_EDGE_L.
Ref Level 167.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 10.0Hz SWP: 13.784sec
Marker: 869.517MHz 155.592dBµV
dBµV
160
150
140
130
120
110
100
90
80
70
866
867
868
869
870
Frequency [MHz]
Part 22 Block Edge Plot

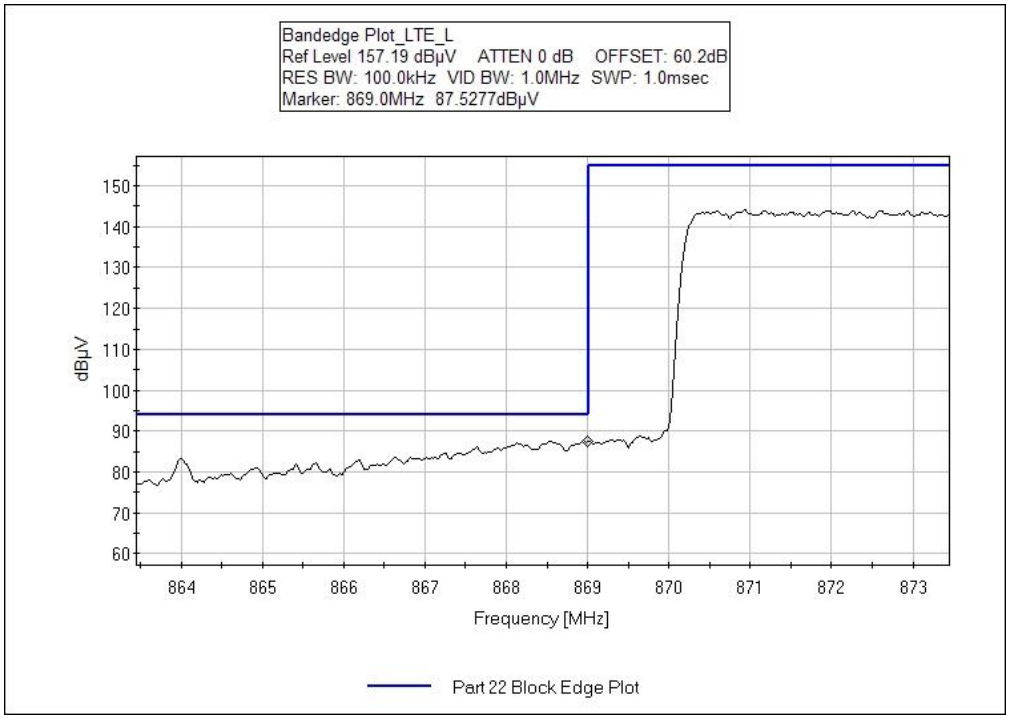

Bandedge Plot_EDGE_H
Ref Level 167.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 10.0Hz SWP: 13.784sec
Marker: 893.504MHz 155.08dBµV
dBµV
160
150
140
130
120
110
100
90
80
70
893
894
895
896
897
Frequency [MHz]
Part 22 Block Edge Plot

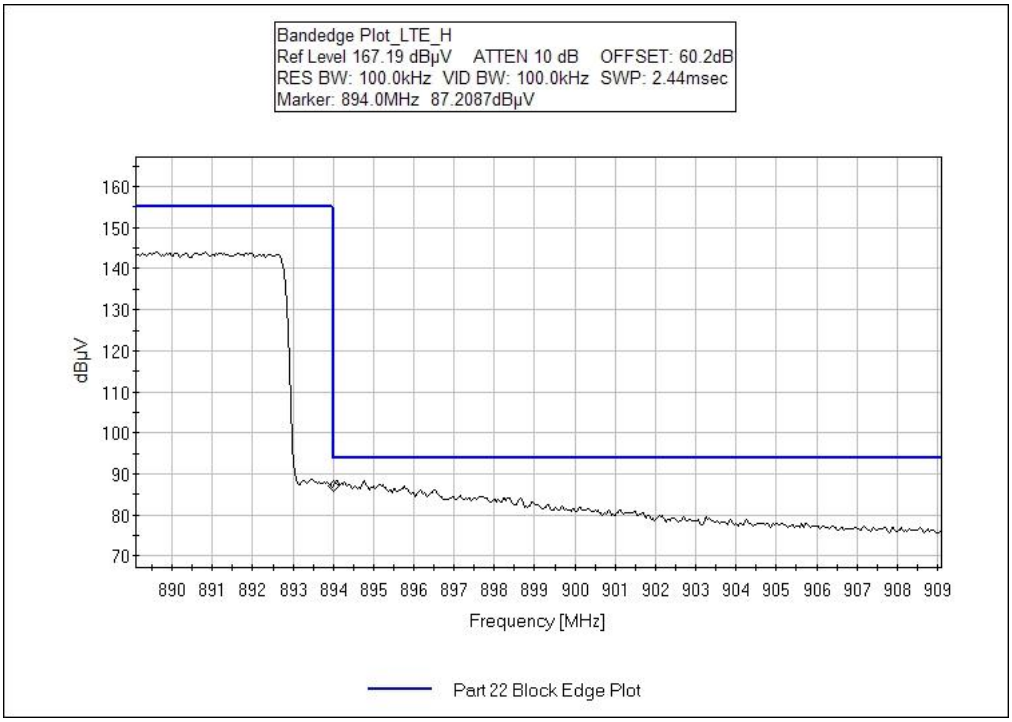

Bandedge Plot_WCDMA_L
Ref Level 157.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 10.0Hz SWP: 27.568sec
Marker: 870.433MHz 141.338dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
861
862
863
864
865
866
867
868
869
870
Frequency [MHz]
Part 22 Block Edge Plot


Bandedge Plot_WCDMA_H
Ref Level 157.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 10.0Hz SWP: 27.568sec
Marker: 892.617MHz 140.965dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
893
894
895
896
897
898
899
900
901
902
Frequency [MHz]
Part 22 Block Edge Plot


Bandedge Plot_CDMA2000_L
Ref Level 157.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 10.0Hz SWP: 27.568sec
Marker: 871.3MHz 146.453dBµV
dBµV
160
150
140
130
120
110
100
90
80
70
60
864
865
866
867
868
869
870
871
872
873
Frequency [MHz]
Part 22 Block Edge Plot


Bandedge Plot_CDMA2000_H
Ref Level 157.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 10.0Hz SWP: 27.568sec
Marker: 891.7MHz 146.529dBµV
dBµV
160
150
140
130
120
110
100
90
80
70
60
891
892
893
894
895
896
897
898
899
900
Frequency [MHz]
Part 22 Block Edge Plot


Bandedge Plot_LTE_L
Ref Level 157.19 dBµV ATTEN 0 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 1.0MHz SWP: 1.0msec
Marker: 869.0MHz 87.5277dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
864
865
866
867
868
869
870
871
872
873
Frequency [MHz]
Part 22 Block Edge Plot


Bandedge Plot_LTE_H
Ref Level 167.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 2.44msec
Marker: 894.0MHz 87.2087dBµV
dBµV
160
150
140
130
120
110
100
90
80
70
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
Frequency [MHz]
Part 22 Block Edge Plot

Test Setup Photos

EIA/TIA 603 - Intermodulation

Test Data

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112		
Customer:	**Powerwave Technologies, Inc.**		
Specification:	**Intermodulation**		
Work Order #:	**92273**	Date:	9/26/2011
Test Type:	**Conducted Emissions**	Time:	16:26:21
Equipment:	**Multi-carrier RF Power Amplifier**	Sequence#:	2
Manufacturer:	Powerwave Technologies, Inc.	Tested By:	E. Wong
Model:	G3L-850-180		28V DC
S/N:	11IU08000012		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	8/9/2010	8/9/2012
T2	AN03239	Cable	32022-2-29094K-24TC	8/30/2011	8/30/2013

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

Function	Manufacturer	Model #	S/N
Multi-carrier RF Power Amplifier*	Powerwave Technologies, Inc.	G3L-850-180	11IU08000012

Support Devices:

Function	Manufacturer	Model #	S/N
Signal generator	Aeroflex	IFR3416	341006/496
Power Supply	HP	6032A	3542P123027
ESG	Agilent	4433B	US40052191
ESG	Agilent	4433B	US40052146

Test Conditions / Notes:

The EUT is placed on the wooden table. RF output port is connected to a spectrum analyzer. RF input port is connected to two remote ESG. The RF input signal is adjusted to maintain the rated output power.
Two modulated signals separated in approximately one channel apart are injected into the device at the lower band and the upper band.

Frequency range: 869-894MHz
Modulation: GSM, EDGE, WCDMA, CDMA2000, LTE
Power=210W (53.2dBm)

GSM: 869.5MHz, 881.5MHz, 893.6MHz

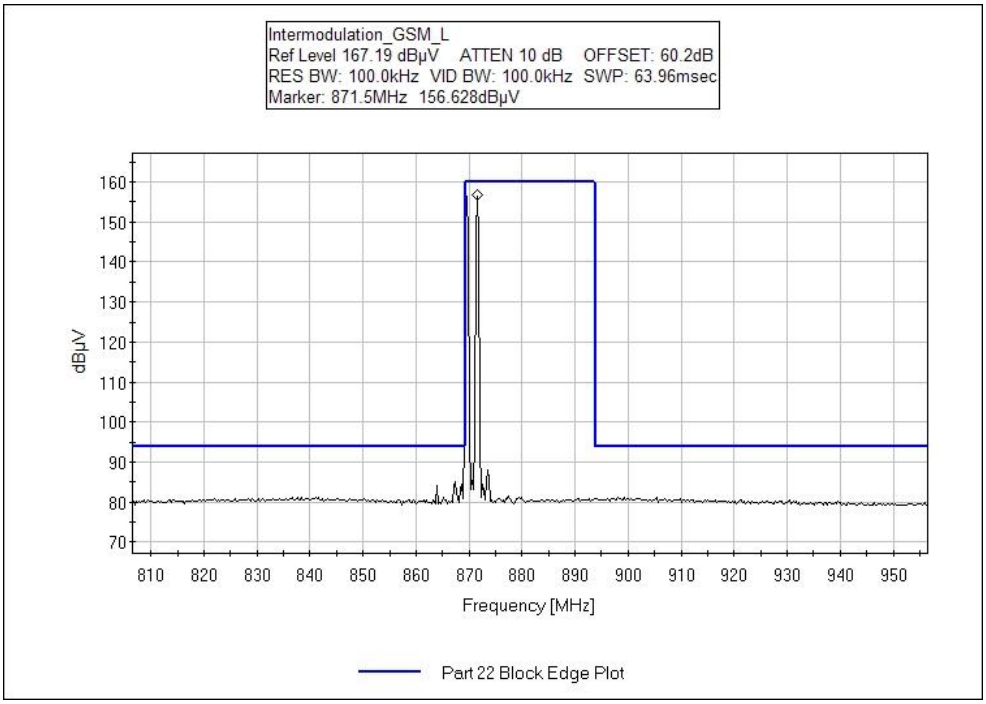
EDGE: 869.5MHz, 881.5MHz, 893.6MHz

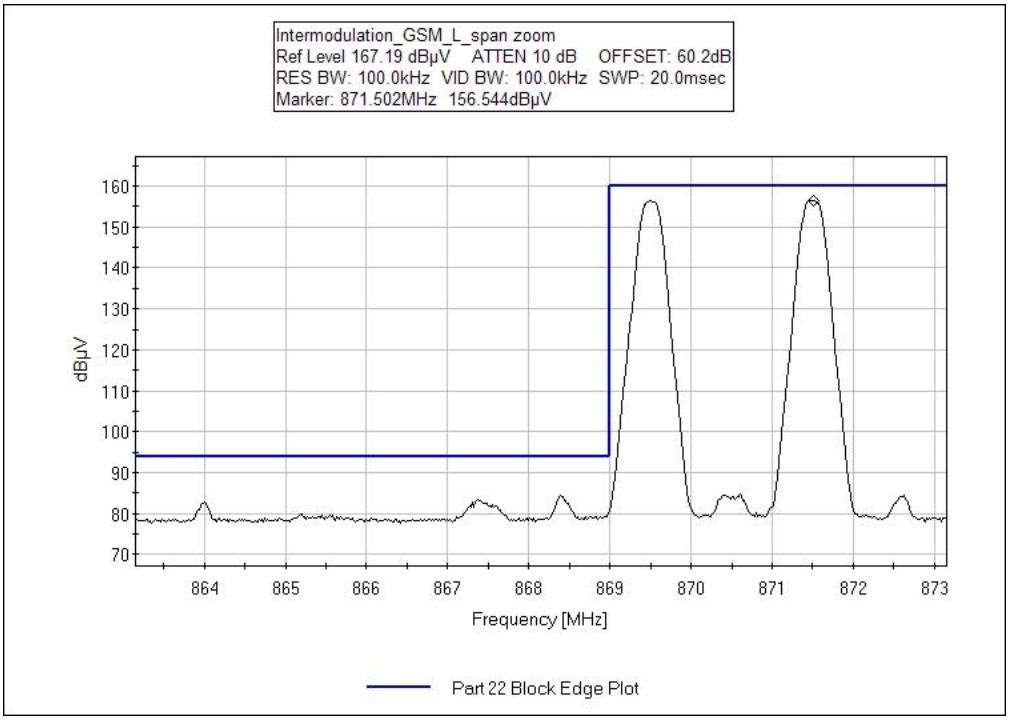
WCDMA: 871.5MHz, 881.5MHz, 891.5MHz

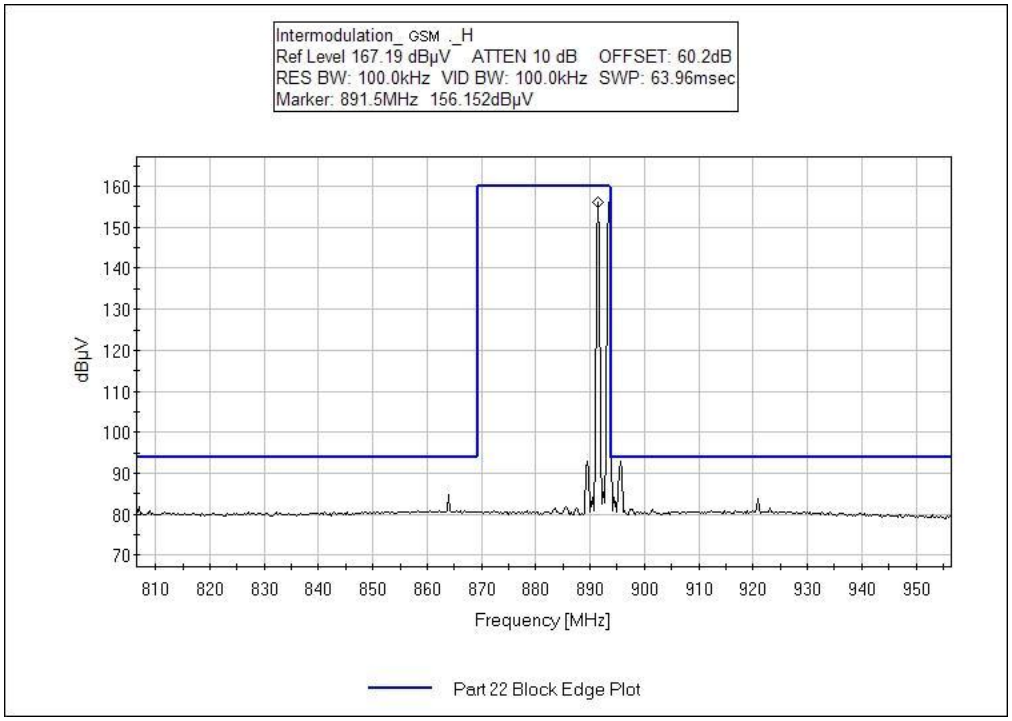
CDMA2000: 871.3MHz, 881.5MHz, 891.7MHz

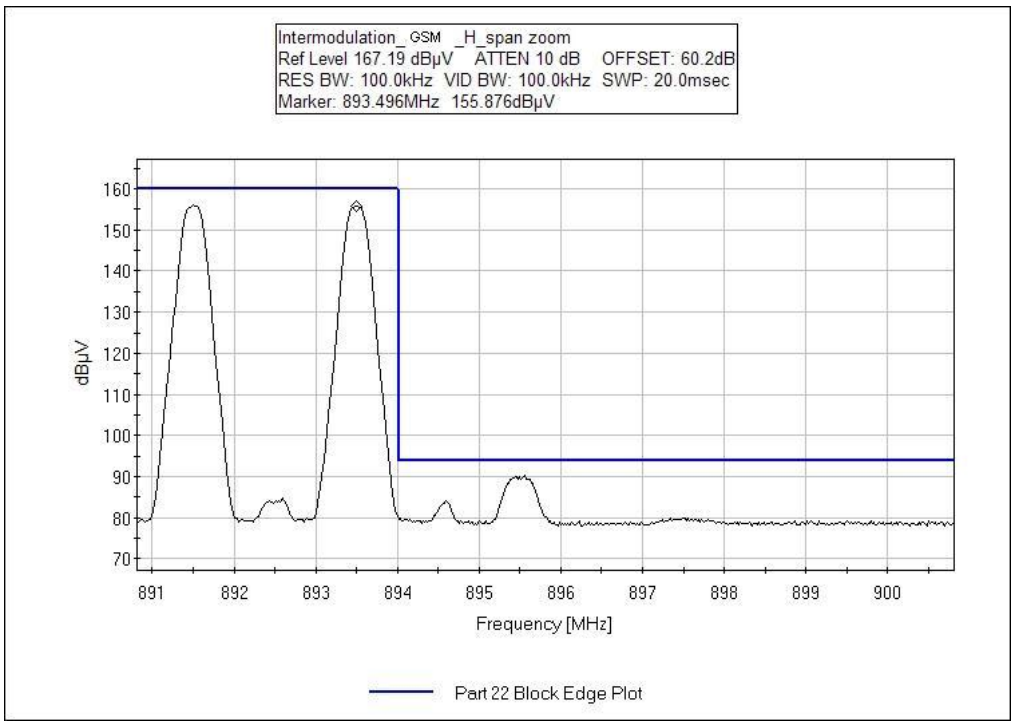
LTE: 872.5MHz, 881.5MHz,890.5MHz

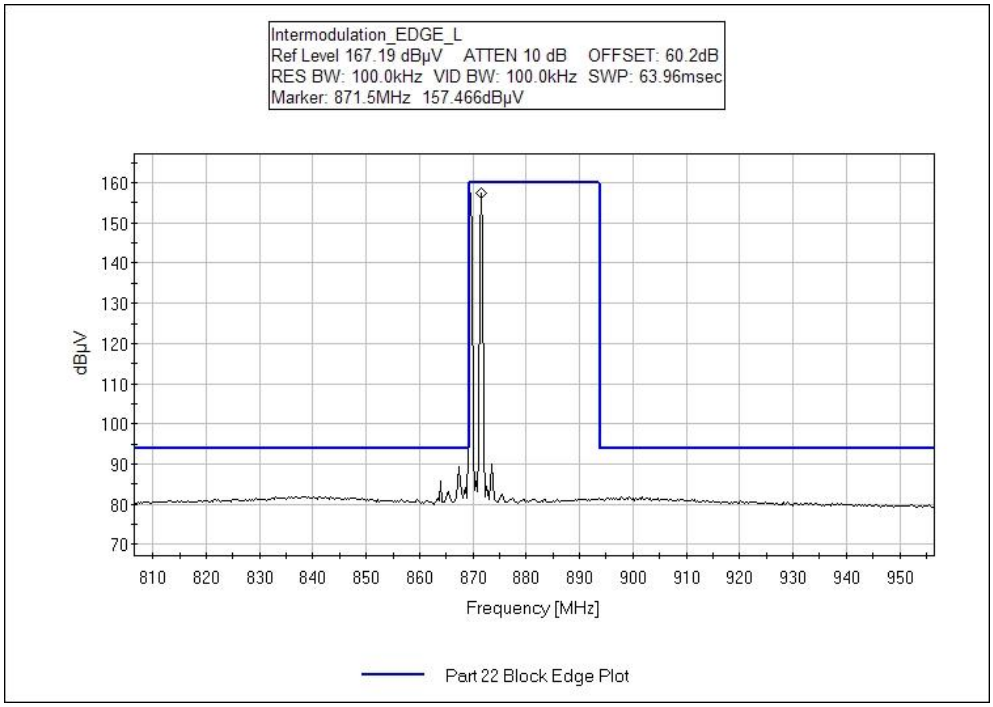
23°C, 67% relative humidity

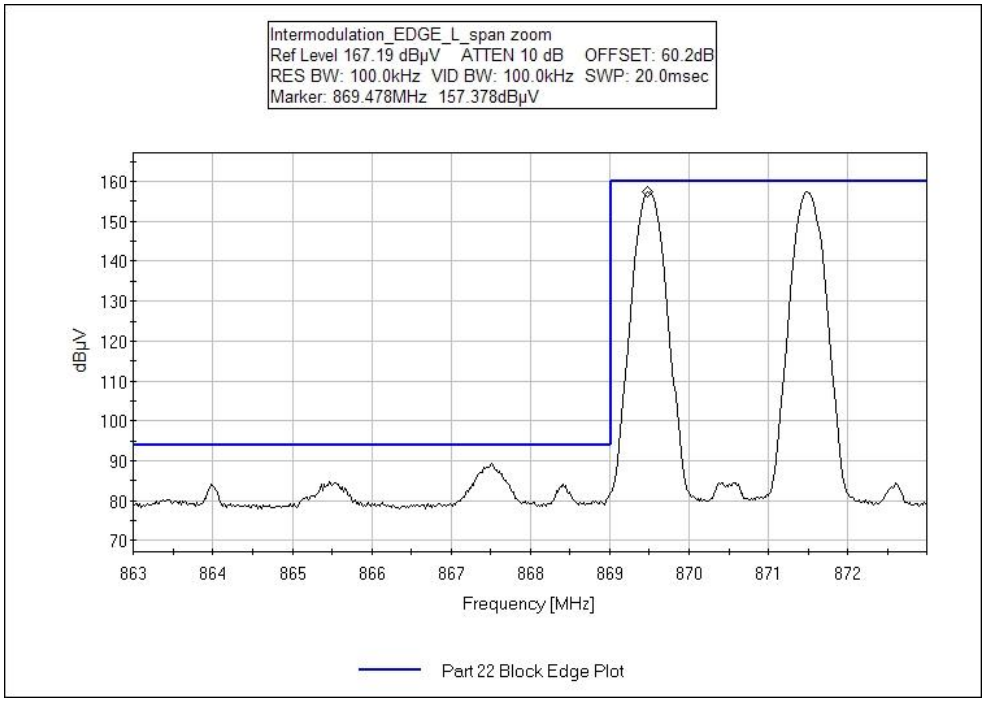

Intermodulation_GSM_L
Ref Level 167.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 63.96msec
Marker: 871.5MHz 156.628dBµV
dBµV
160
150
140
130
120
110
100
90
80
70
810 820 830 840 850 860 870 880 890 900 910 920 930 940 950
Frequency [MHz]
Part 22 Block Edge Plot

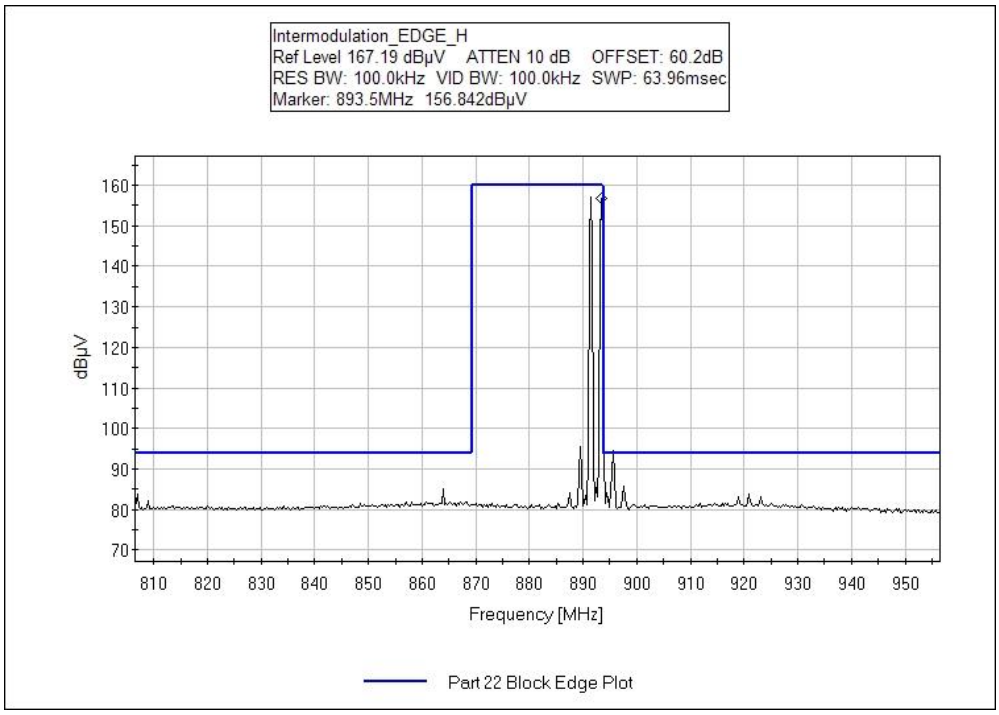

Intermodulation_GSM_L_span zoom
Ref Level 167.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 20.0msec
Marker: 871.502MHz 156.544dBµV
dBµV
160
150
140
130
120
110
100
90
80
70
864 865 866 867 868 869 870 871 872 873
Frequency [MHz]
Part 22 Block Edge Plot

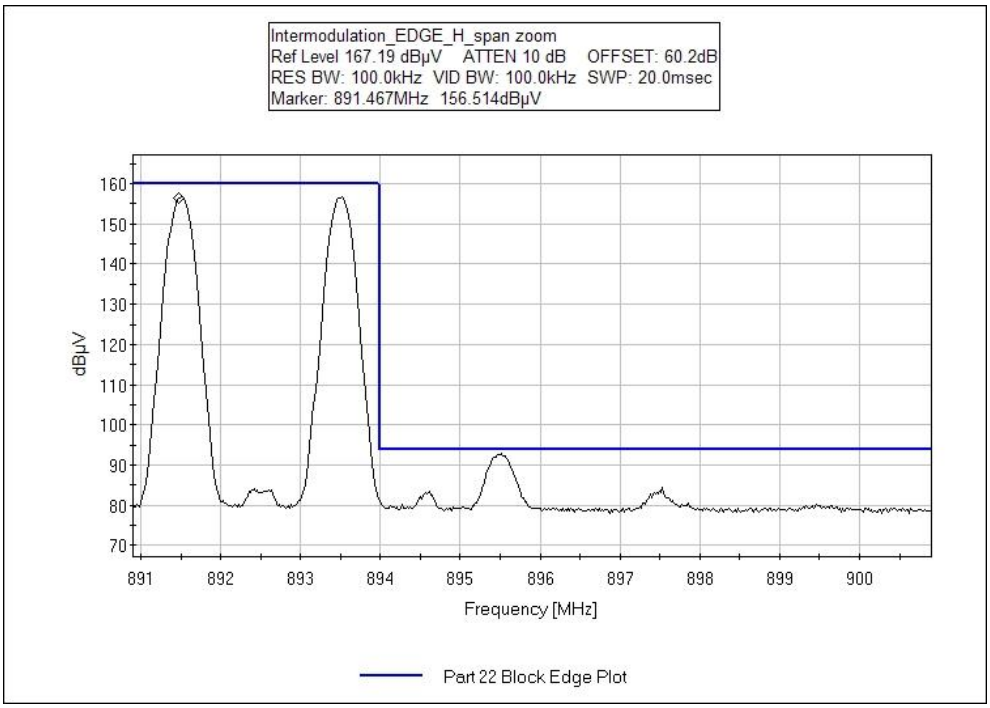

Intermodulation_ GSM _H
Ref Level 167.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 63.96msec
Marker: 891.5MHz 156.152dBµV
dBµV
160
150
140
130
120
110
100
90
80
70
810 820 830 840 850 860 870 880 890 900 910 920 930 940 950
Frequency [MHz]
Part 22 Block Edge Plot

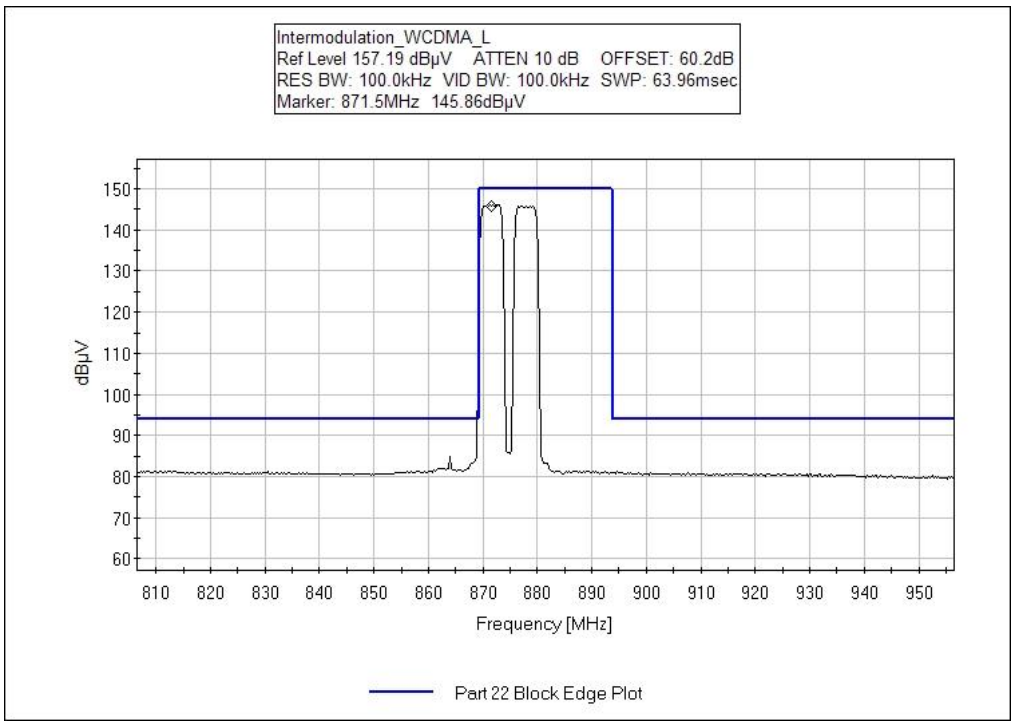

Intermodulation_ GSM _H_span zoom
Ref Level 167.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 20.0msec
Marker: 893.496MHz 155.876dBµV
dBµV
160
150
140
130
120
110
100
90
80
70
891 892 893 894 895 896 897 898 899 900
Frequency [MHz]
Part 22 Block Edge Plot

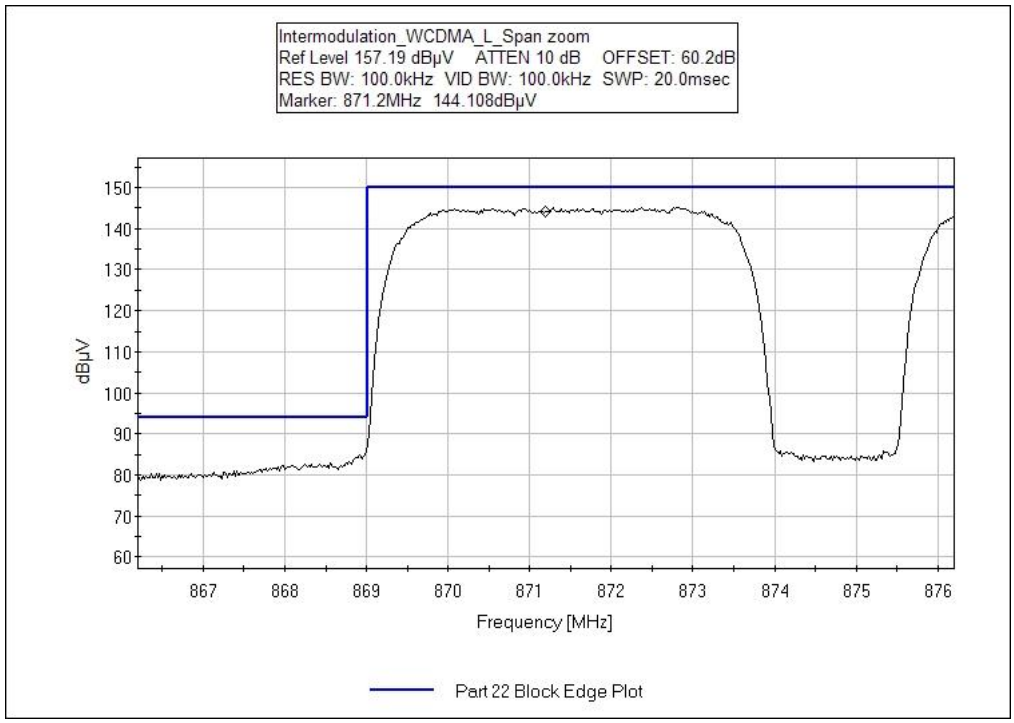

Intermodulation_EDGE_L
Ref Level 167.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 63.96msec
Marker: 871.5MHz 157.466dBµV
dBµV
160
150
140
130
120
110
100
90
80
70
810 820 830 840 850 860 870 880 890 900 910 920 930 940 950
Frequency [MHz]
Part 22 Block Edge Plot

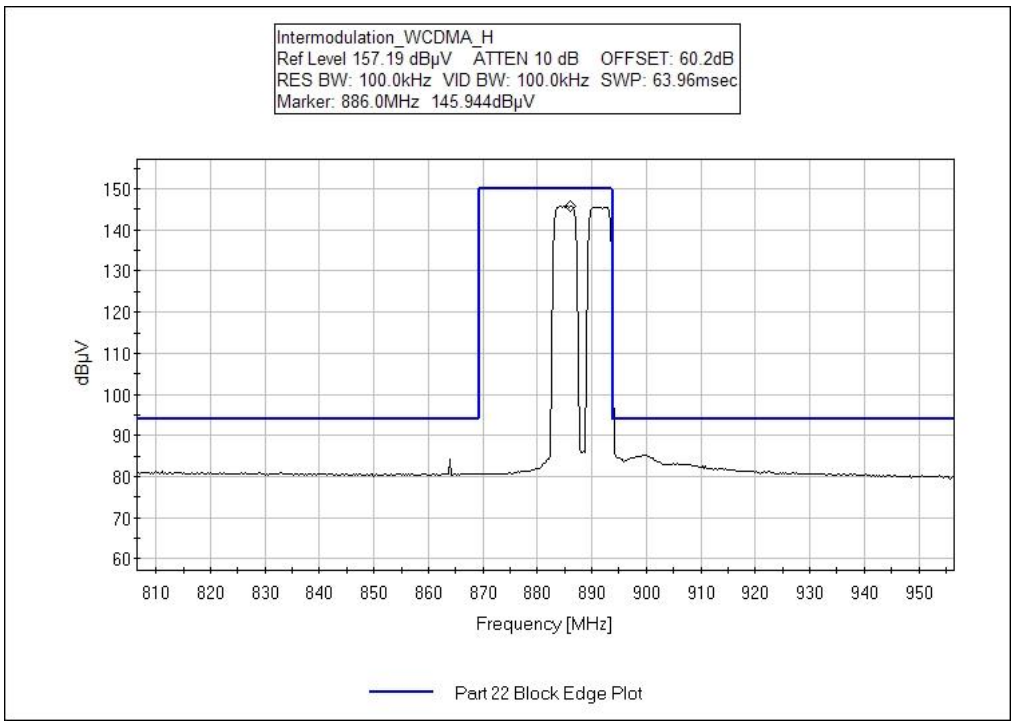

Intermodulation_EDGE_L_span zoom
Ref Level 167.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 20.0msec
Marker: 869.478MHz 157.378dBµV
dBµV
160
150
140
130
120
110
100
90
80
70
863 864 865 866 867 868 869 870 871 872
Frequency [MHz]
Part 22 Block Edge Plot

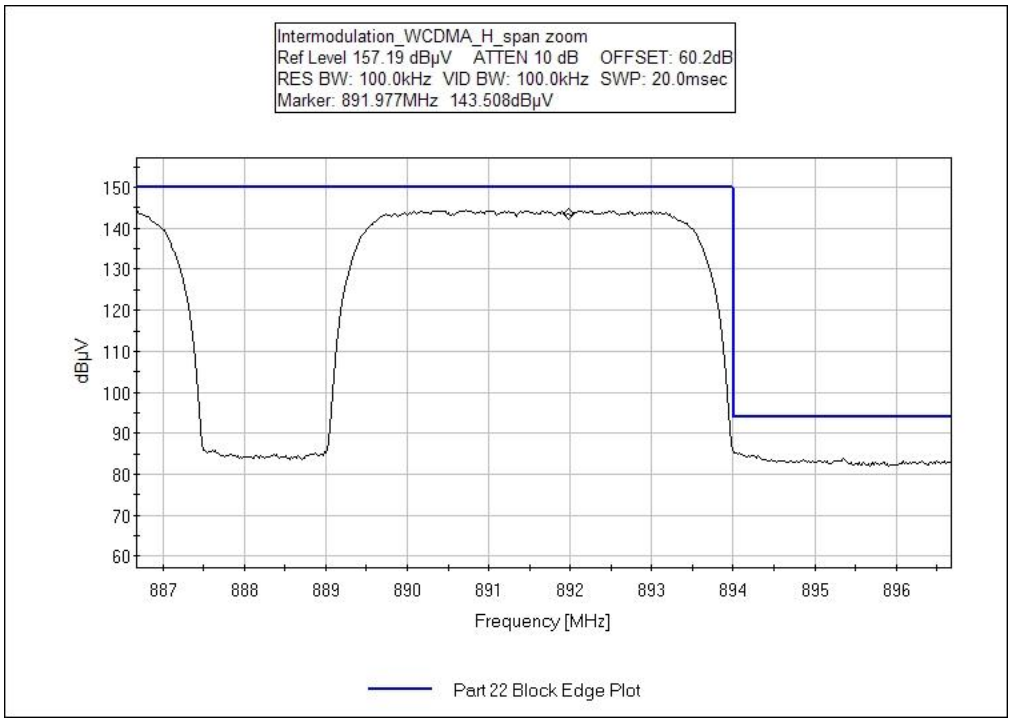

Intermodulation_EDGE_H
Ref Level 167.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 63.96msec
Marker: 893.5MHz 156.842dBµV
dBµV
160
150
140
130
120
110
100
90
80
70
810 820 830 840 850 860 870 880 890 900 910 920 930 940 950
Frequency [MHz]
Part 22 Block Edge Plot

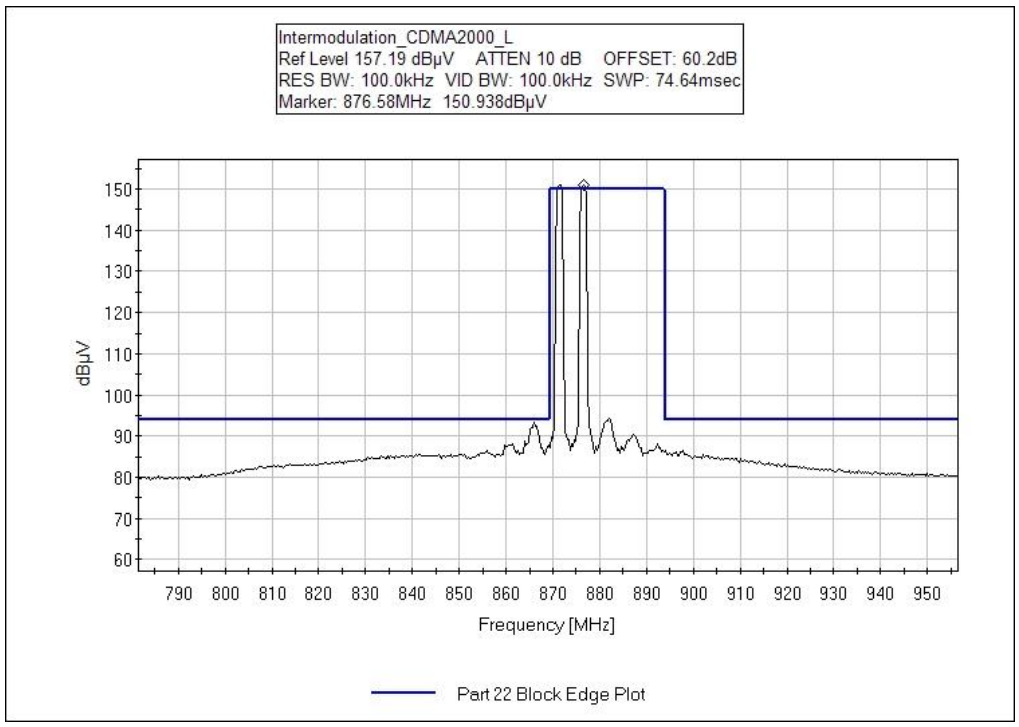

Intermodulation_EDGE_H_span zoom
Ref Level 167.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 20.0msec
Marker: 891.467MHz 156.514dBµV
dBµV
160
150
140
130
120
110
100
90
80
70
891 892 893 894 895 896 897 898 899 900
Frequency [MHz]
Part 22 Block Edge Plot

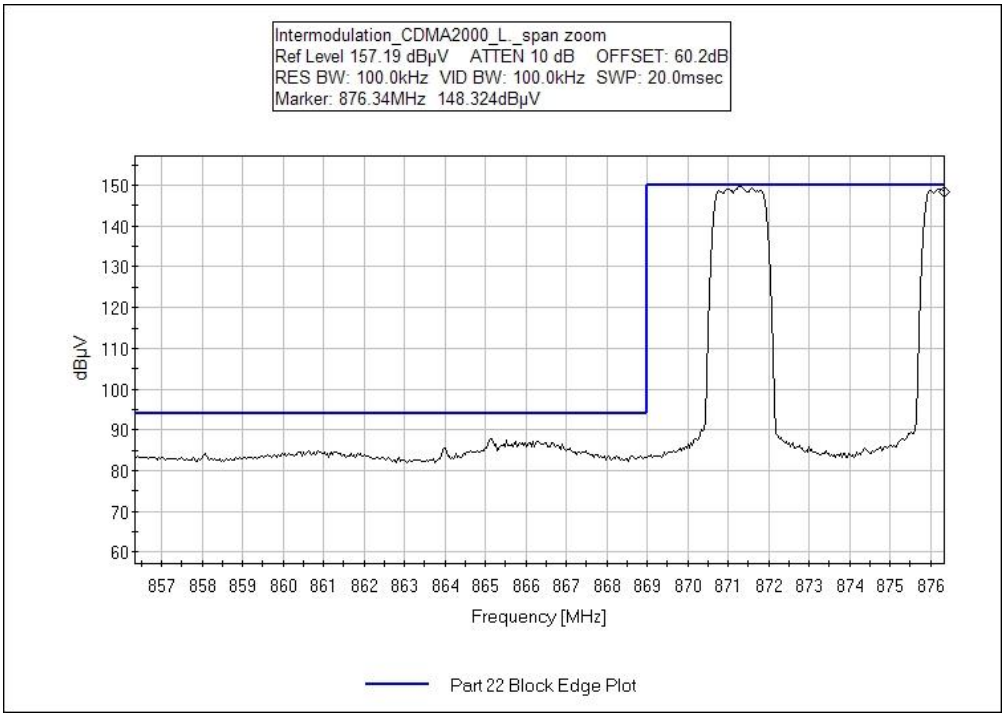

Intermodulation_WCDMA_L
Ref Level 157.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 63.96msec
Marker: 871.5MHz 145.86dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
810 820 830 840 850 860 870 880 890 900 910 920 930 940 950
Frequency [MHz]
Part 22 Block Edge Plot

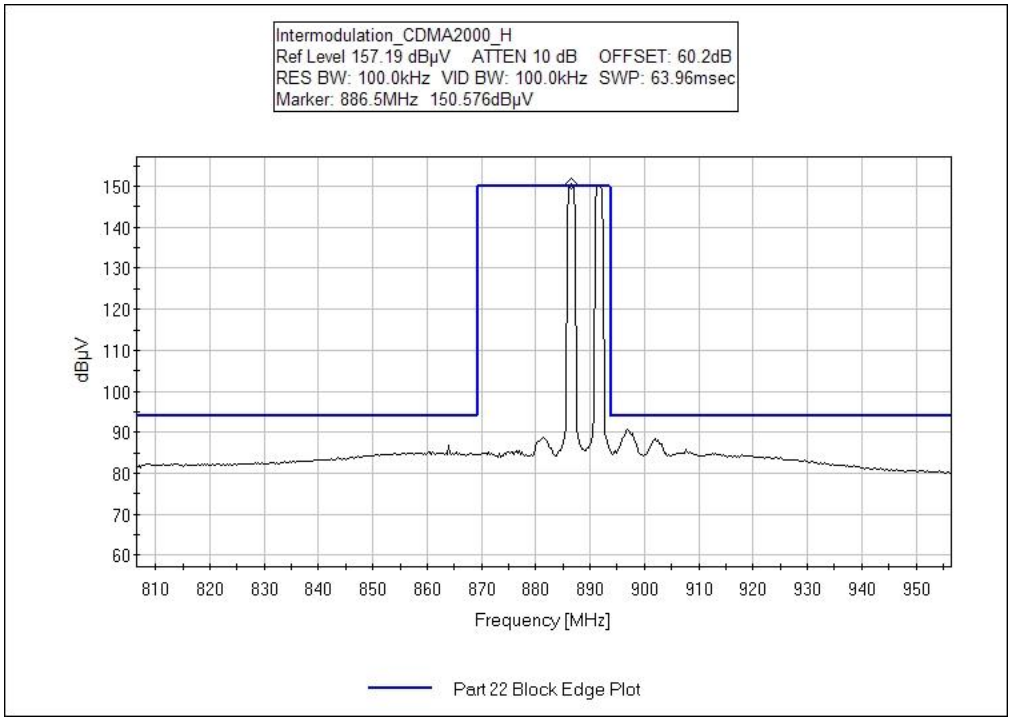

Intermodulation_WCDMA_L_Span zoom
Ref Level 157.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 20.0msec
Marker: 871.2MHz 144.108dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
867 868 869 870 871 872 873 874 875 876
Frequency [MHz]
Part 22 Block Edge Plot

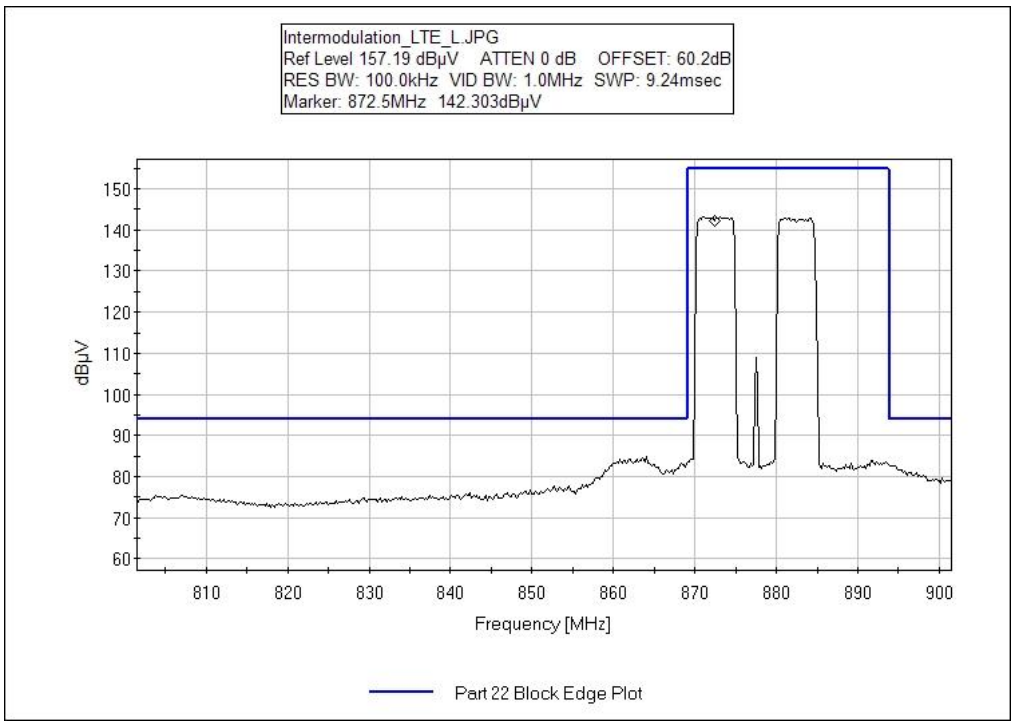

Intermodulation_WCDMA_H
Ref Level 157.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 63.96msec
Marker: 886.0MHz 145.944dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
810 820 830 840 850 860 870 880 890 900 910 920 930 940 950
Frequency [MHz]
Part 22 Block Edge Plot

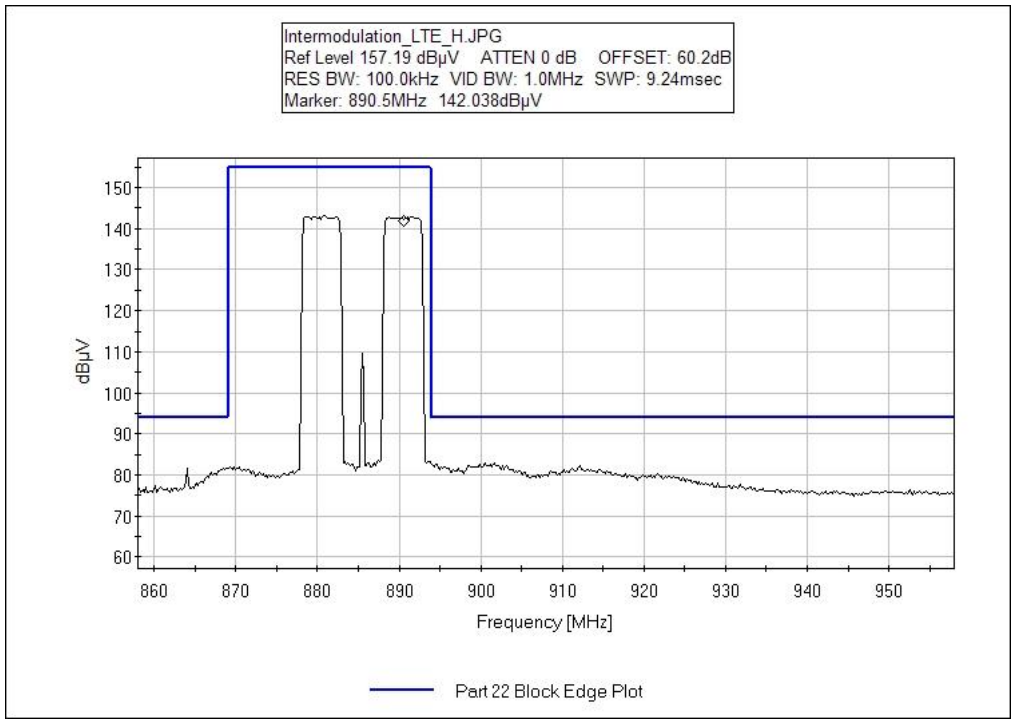

Intermodulation_WCDMA_H_span zoom
Ref Level 157.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 20.0msec
Marker: 891.977MHz 143.508dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
887 888 889 890 891 892 893 894 895 896
Frequency [MHz]
Part 22 Block Edge Plot


Intermodulation_CDMA2000_L
Ref Level 157.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 74.64msec
Marker: 876.58MHz 150.938dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
790 800 810 820 830 840 850 860 870 880 890 900 910 920 930 940 950
Frequency [MHz]
Part 22 Block Edge Plot


Intermodulation_CDMA2000_L_span zoom
Ref Level 157.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 20.0msec
Marker: 876.34MHz 148.324dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876
Frequency [MHz]
Part 22 Block Edge Plot


Intermodulation_CDMA2000_H
Ref Level 157.19 dBµV ATTEN 10 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 100.0kHz SWP: 63.96msec
Marker: 886.5MHz 150.576dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
810 820 830 840 850 860 870 880 890 900 910 920 930 940 950
Frequency [MHz]
Part 22 Block Edge Plot


Intermodulation_LTE_L.JPG
Ref Level 157.19 dBµV ATTEN 0 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 1.0MHz SWP: 9.24msec
Marker: 872.5MHz 142.303dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
810
820
830
840
850
860
870
880
890
900
Frequency [MHz]
Part 22 Block Edge Plot


Intermodulation_LTE_H.JPG
Ref Level 157.19 dBµV ATTEN 0 dB OFFSET: 60.2dB
RES BW: 100.0kHz VID BW: 1.0MHz SWP: 9.24msec
Marker: 890.5MHz 142.038dBµV
dBµV
150
140
130
120
110
100
90
80
70
60
860
870
880
890
900
910
920
930
940
950
Frequency [MHz]
Part 22 Block Edge Plot

Test Setup Photos

RSS-131 §4.2 - Out of Band Rejection

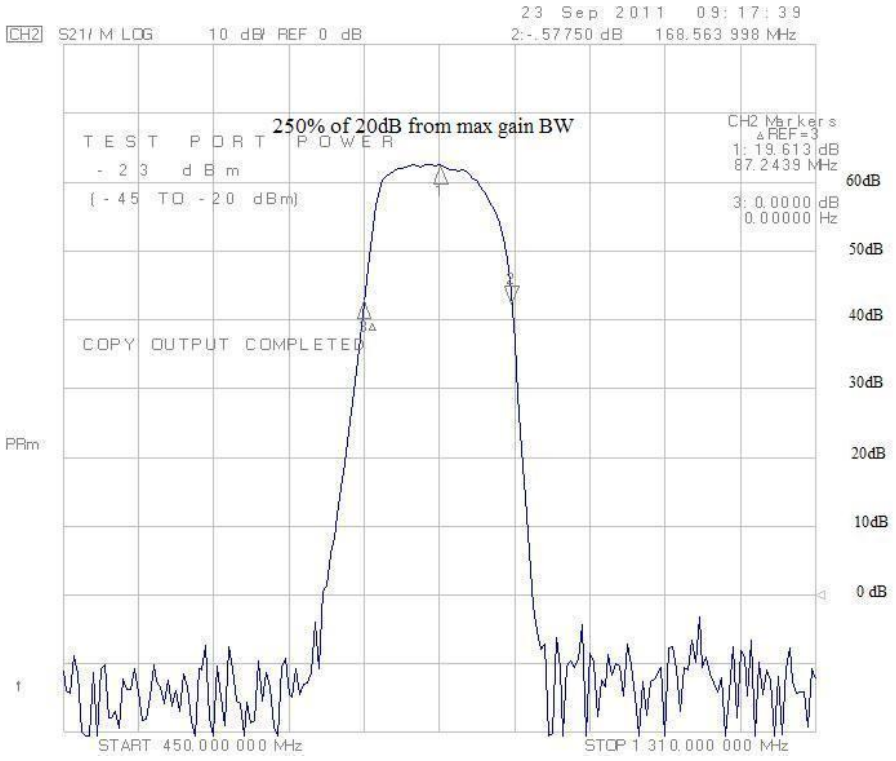
Test Conditions / Setup

RF in and RF output of the device is connected to Port 1 and Port 2 of a network analyzer. All cables and attenuator are normalized prior to system gain measurement.

Engineer Name: E. Wong

Test Equipment					
Asset/Serial #	**Description**	**Model**	**Manufacturer**	**Cal Date**	**Cal Due**
C00054	Network Analyzer	8753ES	HP	9/20/11	9/20/13

Test Data



Test Setup Photos

RSS-131

Zone Enhancers for the Land Mobile Service

RSS-131 §4.2/RSP-100 - Passband Gain & Bandwidth

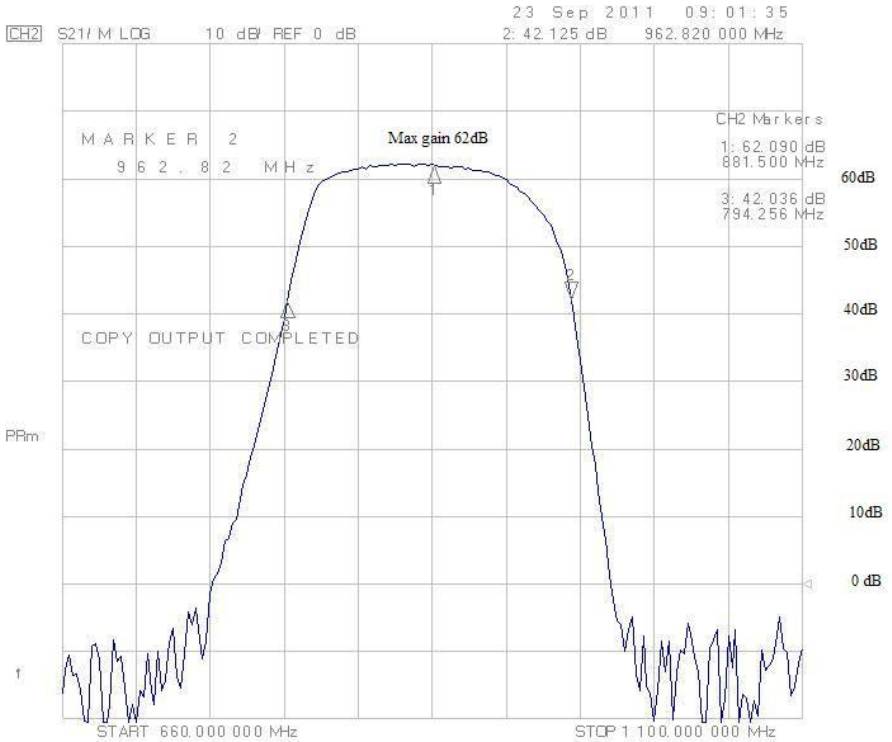
Test Conditions / Setup for Passband Gain

RF in and RF output of the device is connected to Port 1 and Port 2 of a network analyzer. All cables and attenuator are normalized prior to system gain measurement.

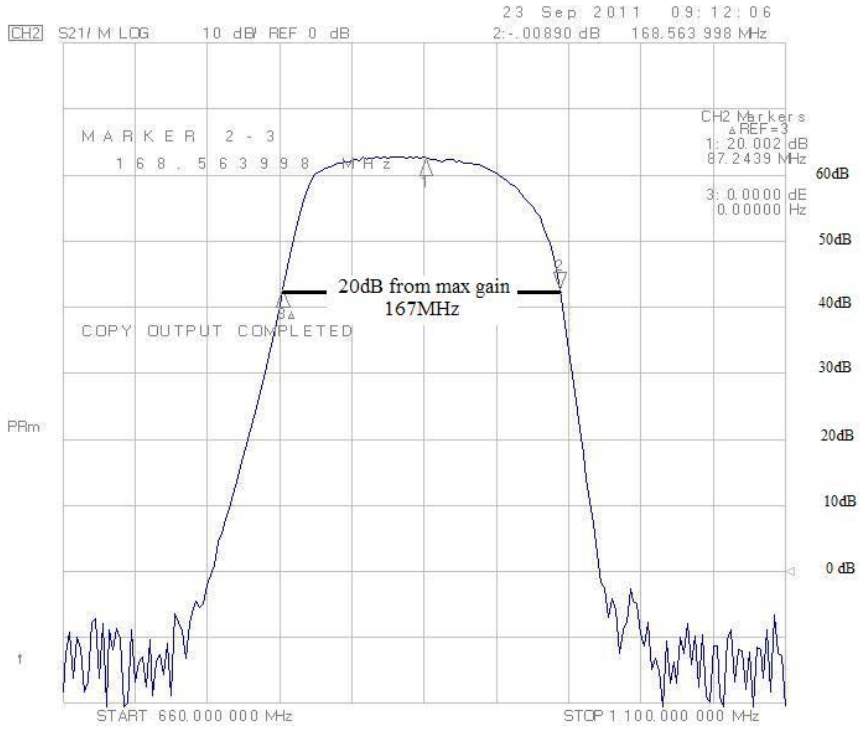
Engineer Name: E. Wong

Test Equipment					
Asset/Serial #	**Description**	**Model**	**Manufacturer**	**Cal Date**	**Cal Due**
C00054	Network Analyzer	8753ES	HP	9/20/11	9/20/13

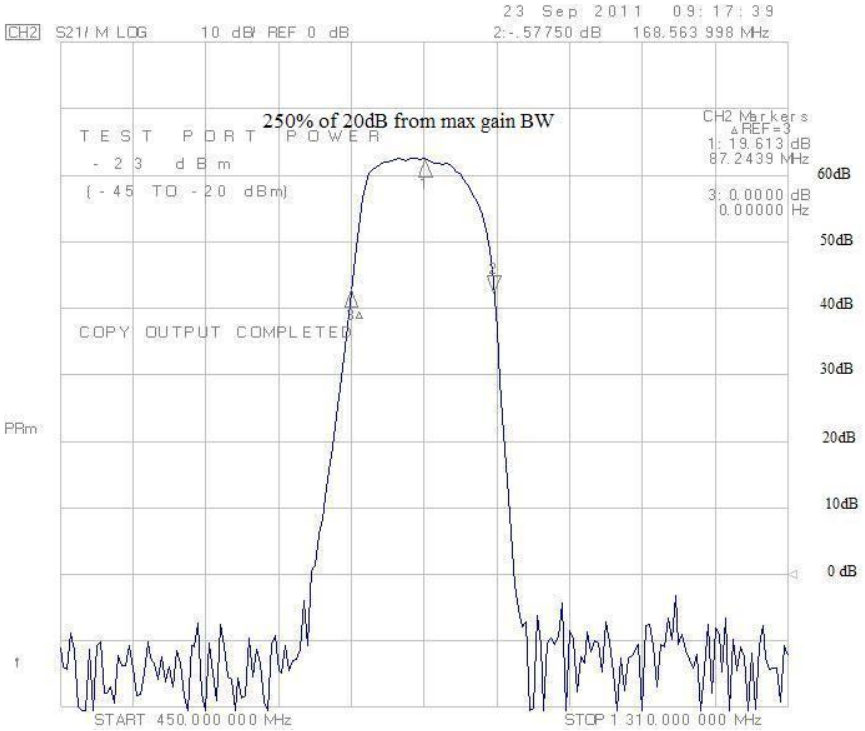
Test Data for Passband Gain



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 gain 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.

Test Data for Bandwidth

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

Customer:	**Powerwave Technologies, Inc.**		
Specification:	**RSS131 99% Bandwidth plot**		
Work Order #:	**92273**	Date:	9/26/2011
Test Type:	**Conducted Emissions**	Time:	16:26:21
Equipment:	**Multi-carrier RF Power Amplifier**	Sequence#:	2
Manufacturer:	Powerwave Technologies, Inc.	Tested By:	E. Wong
Model:	G3L-850-180		28V DC
S/N:	11IU08000012		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	8/9/2010	8/9/2012
T2	AN03239	Cable	32022-2-29094K-24TC	8/30/2011	8/30/2013

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

Function	*Manufacturer*	*Model #*	*S/N*
Multi-carrier RF Power Amplifier*	Powerwave Technologies, Inc.	G3L-850-180	11IU08000012

Support Devices:

Function	*Manufacturer*	*Model #*	*S/N*
Signal generator	Aeroflex	IFR3416	341006/496
Power Supply	HP	6032A	3542P123027
ESG	Agilent	4433B	US40052191
ESG	Agilent	4433B	US40052146

Test Conditions / Notes:

The EUT is placed on the wooden table. RF output port is connected to a spectrum analyzer. RF input port is connected to a remote ESG. The RF input signal is adjusted to maintain the rated output power. Automated 99% bandwidth of the spectrum analyzer was utilized.
Frequency range: 869-894MHz
Modulation: GSM, EDGE, WCDMA, CDMA2000, LTE
Power=210W (53.2dBm)

GSM: 869.5MHz, 881.5MHz, 893.6MHz

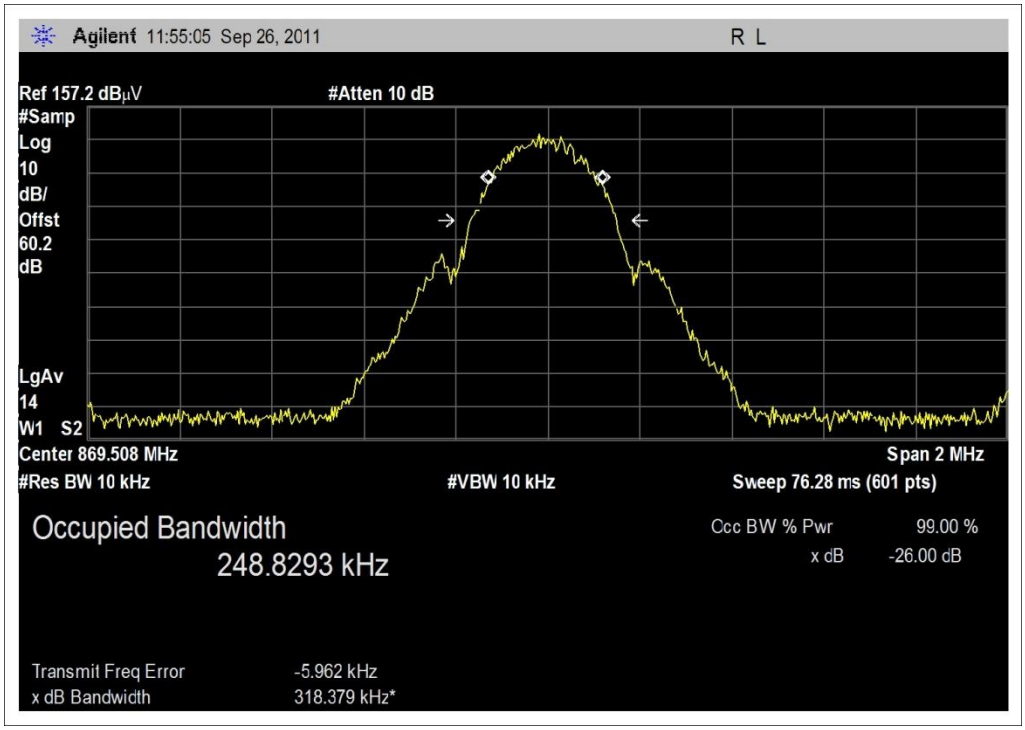
EDGE: 869.5MHz, 881.5MHz, 893.6MHz

WCDMA: 871.5MHz, 881.5MHz, 891.5MHz

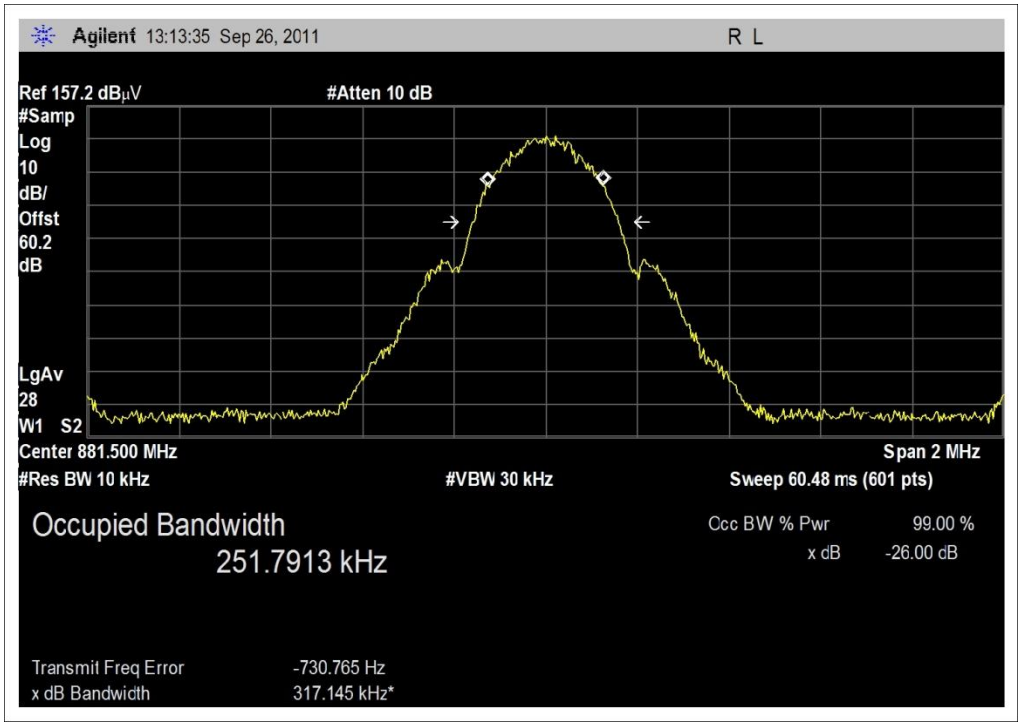
CDMA2000: 871.3MHz, 881.5MHz, 891.7MHz

LTE: 872.5MHz, 881.5MHz,890.5MHz

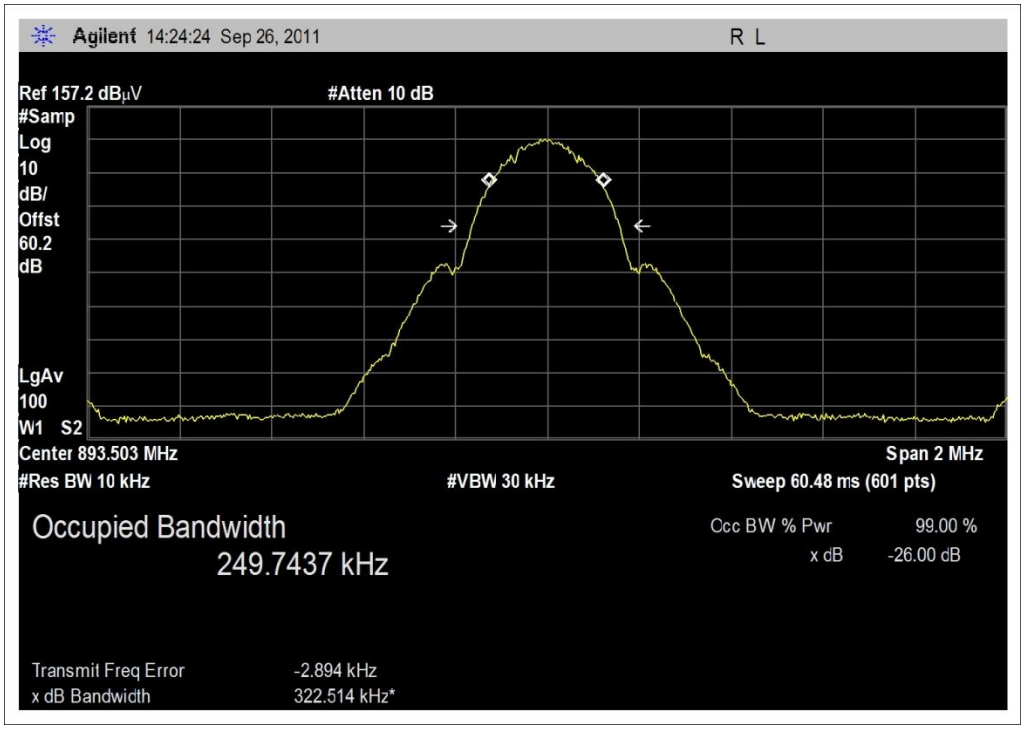
23°C, 67% relative humidity



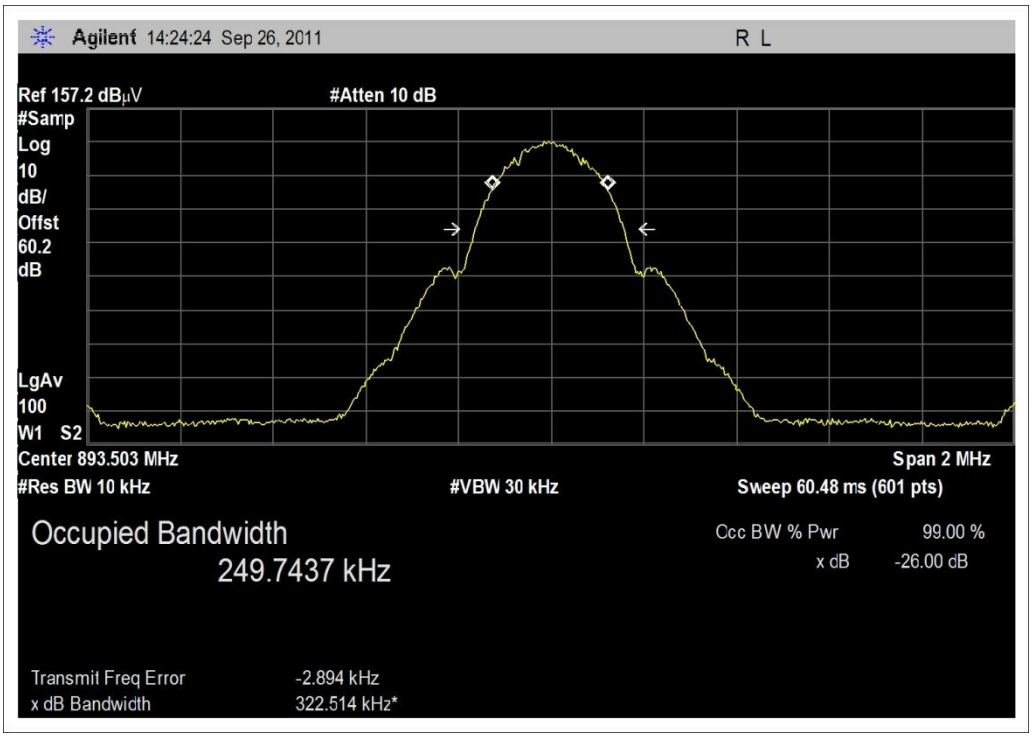
GSM – Low Channel



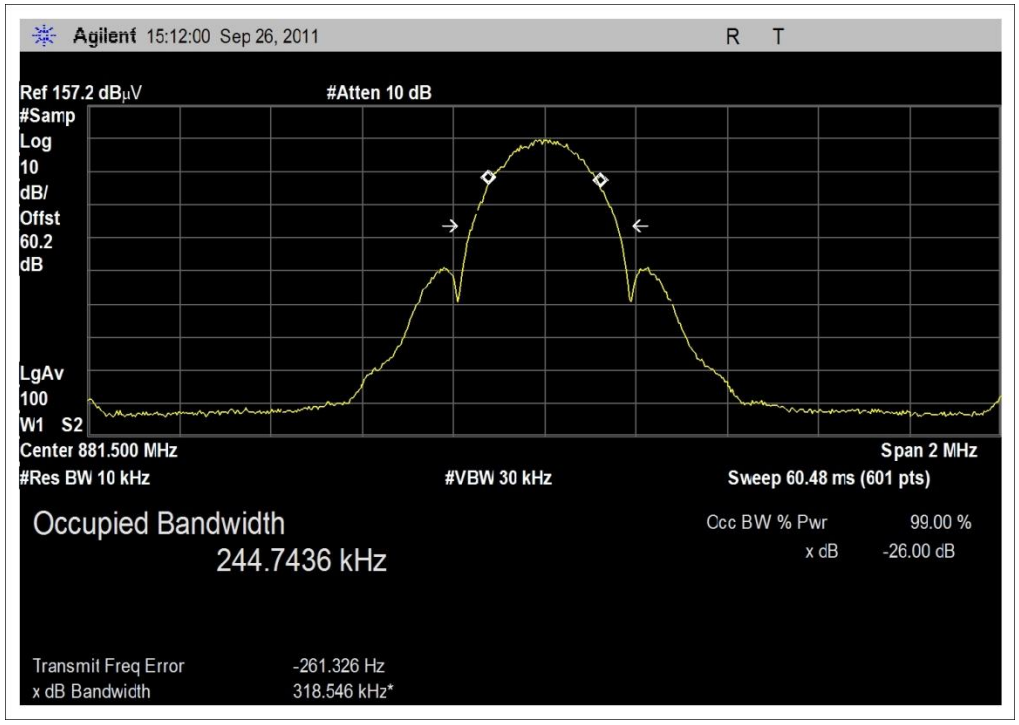
GSM – Middle Channel



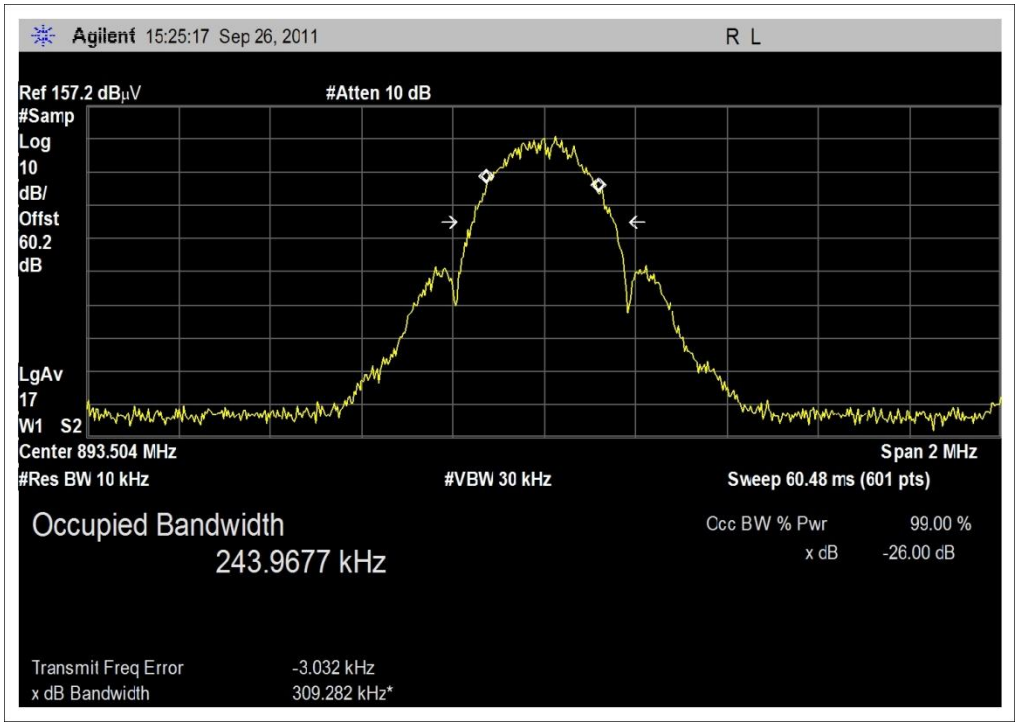
GSM – High Channel



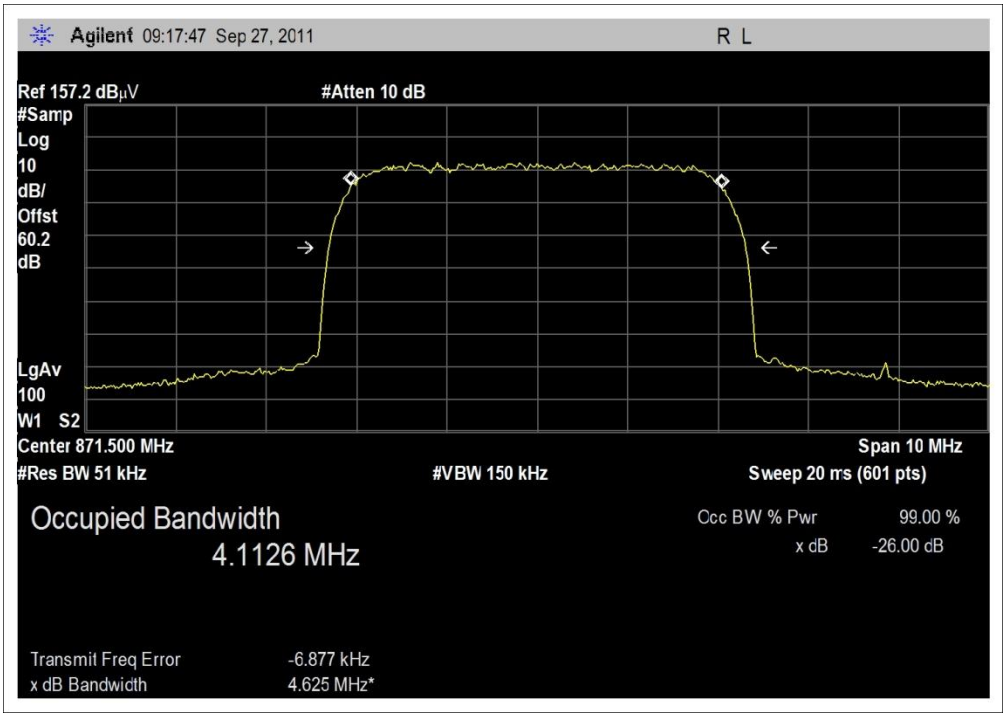
EDGE – Low Channel



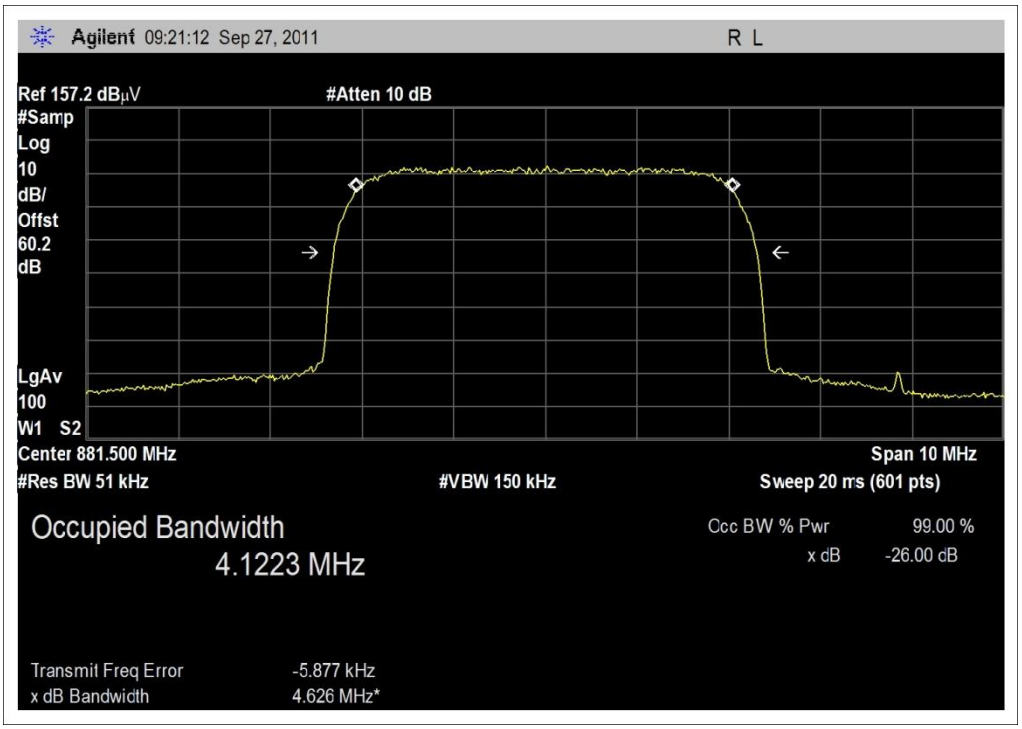
EDGE – Middle Channel



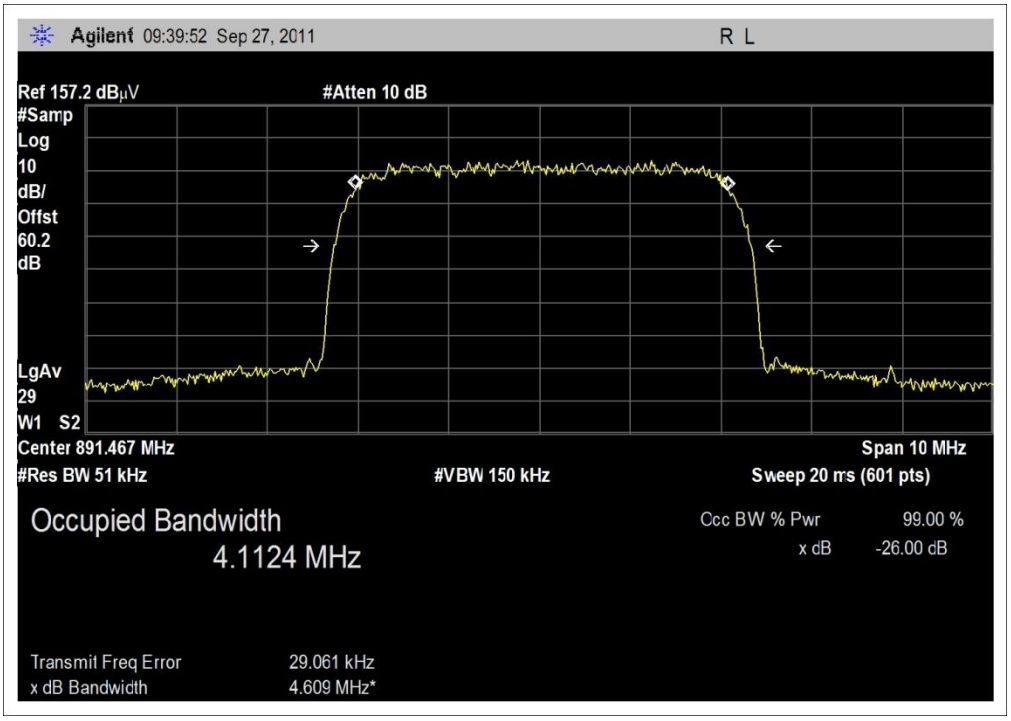
EDGE – High Channel



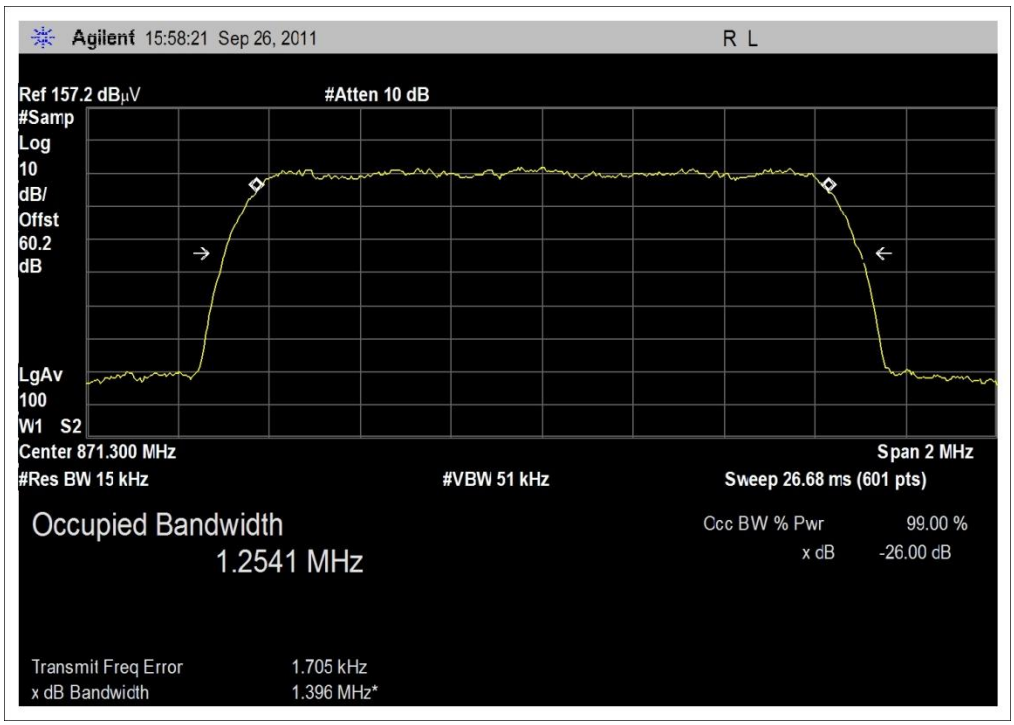
WCDMA – Low Channel



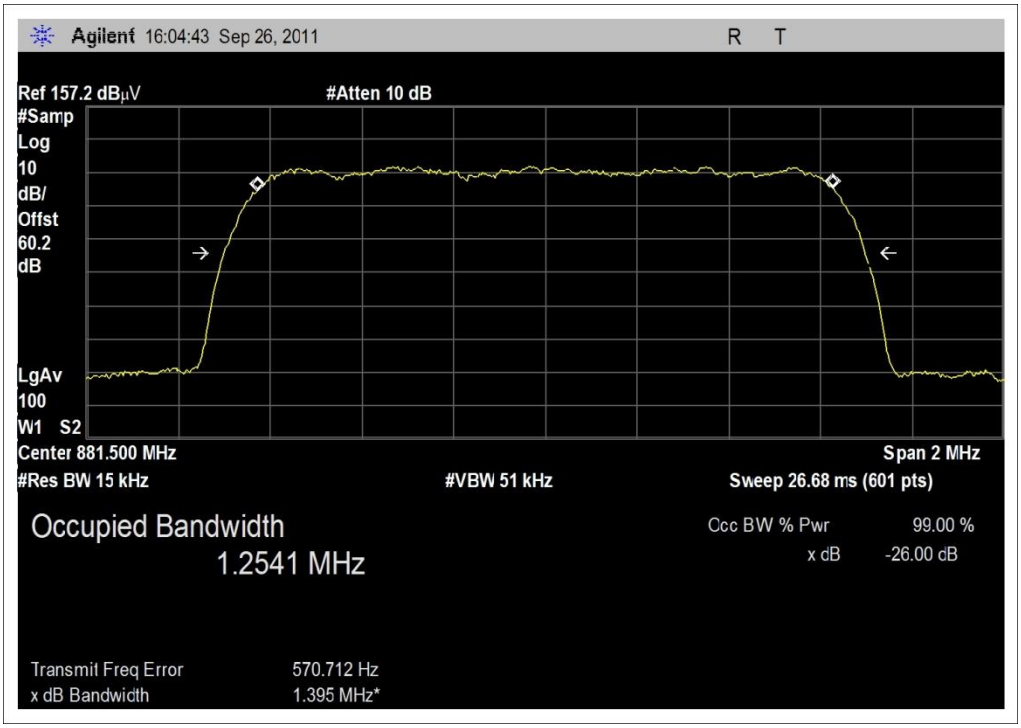
WCDMA – Middle Channel



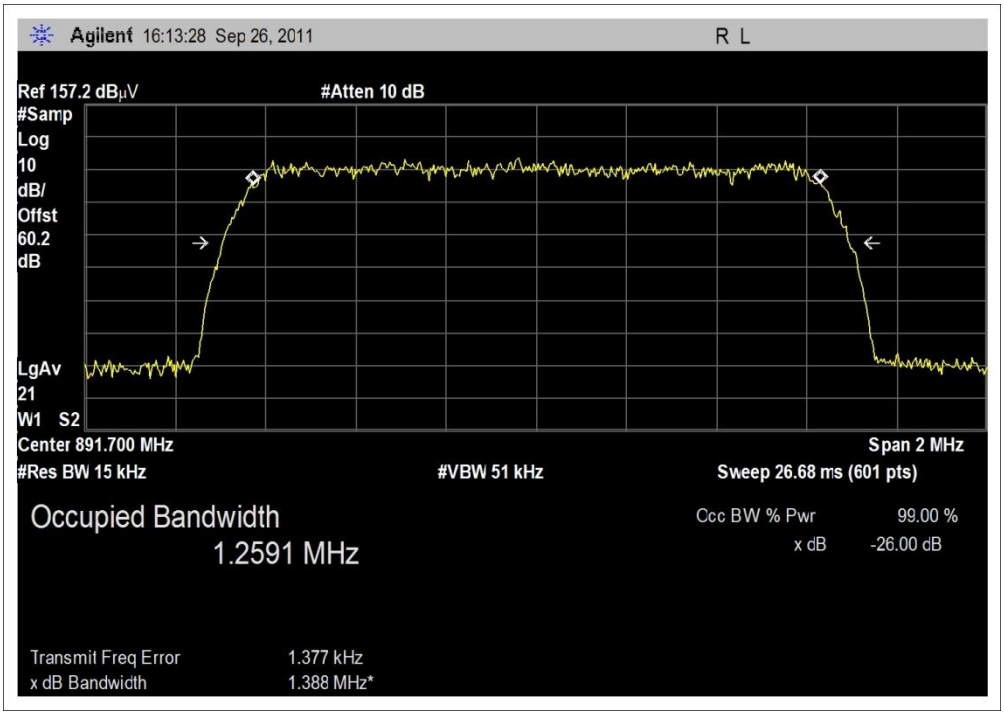
WCDMA – High Channel



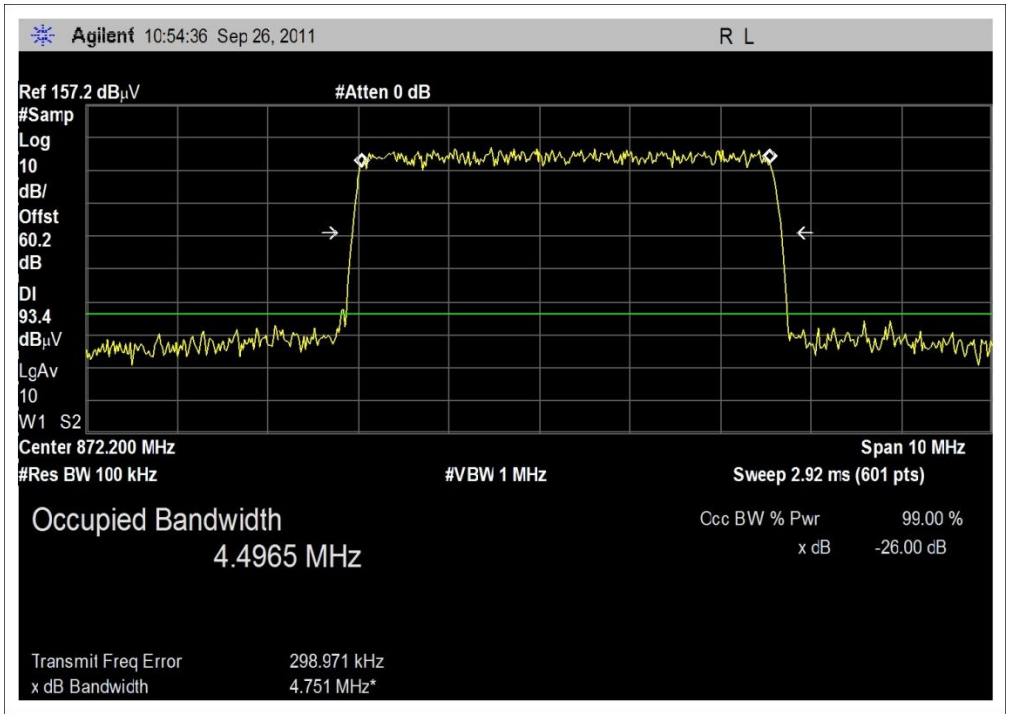
CDMA2000 – Low Channel



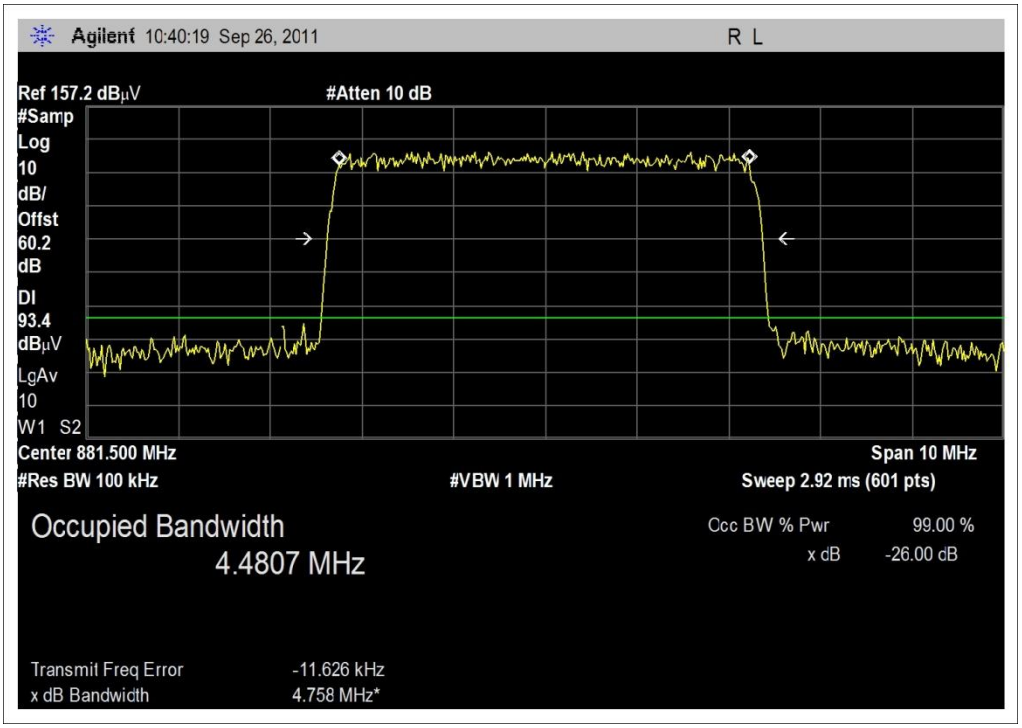
CDMA2000 – Middle Channel



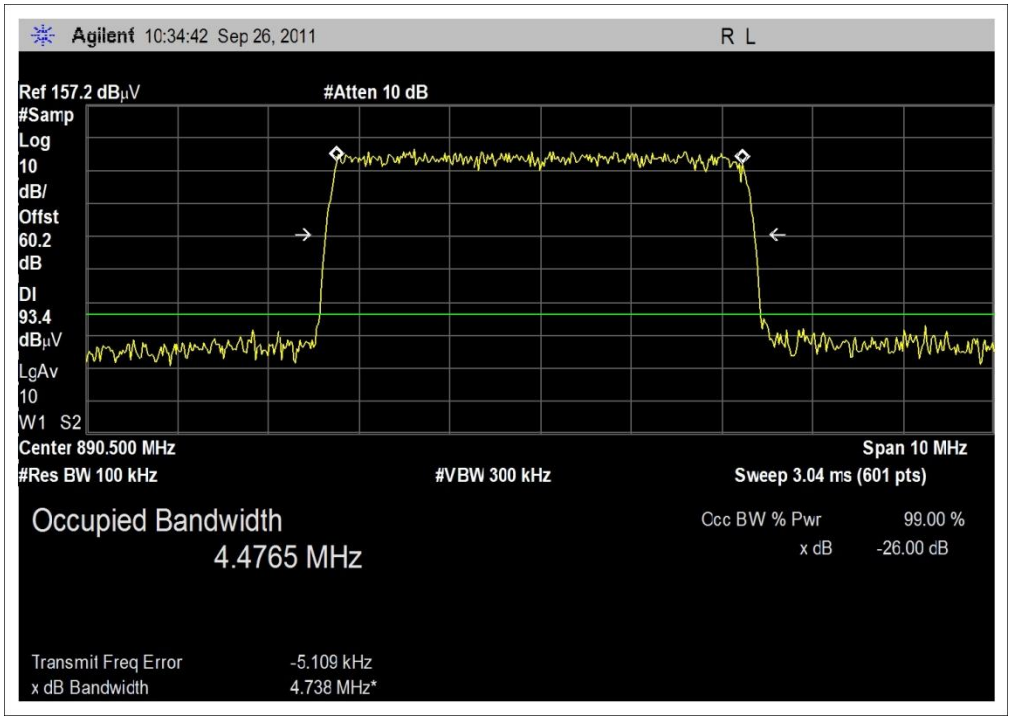
CDMA2000 – High Channel



LTE – Low Channel



LTE – Middle Channel



LTE – High Channel

Test Setup Photos

Passband Gain

Bandwidth

RSS-131 §4.3.1 - RF Power Output

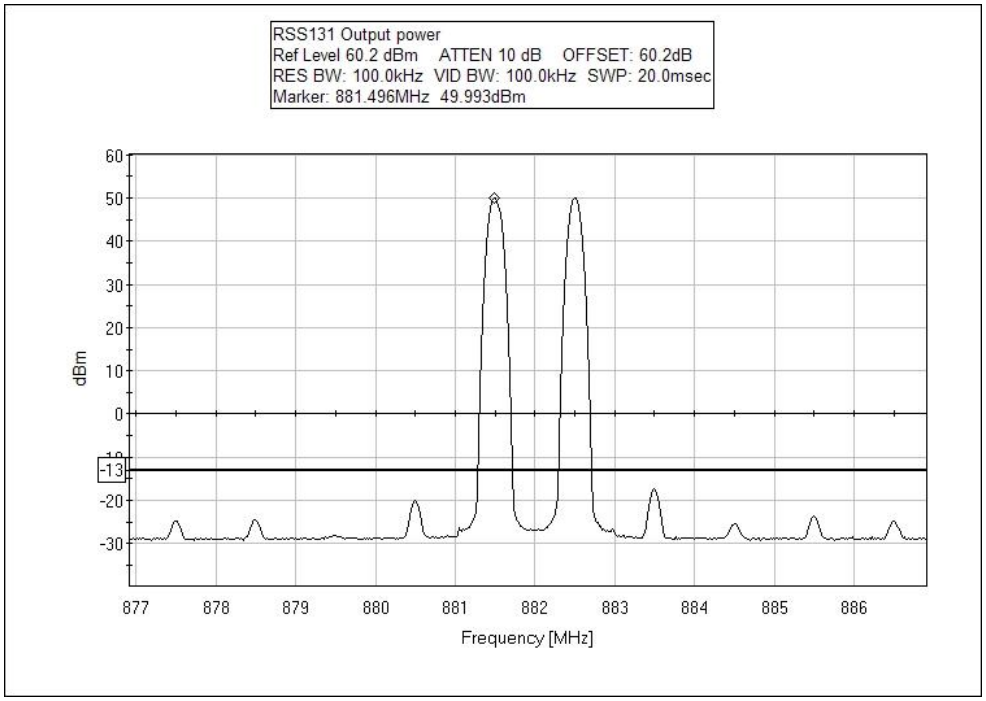
Test Conditions / Setup

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 in accordance with RSS-131 § 4.3.1 requirement.
Measured Po1 =+ 50. dBm
P mean = Po1 + 3 dB = **50 + 3 dBm = 53 dBm = 200 W**
Internal control prevented the device from generating inter modulation at rated power level.

Engineer Name: E. Wong

Test Equipment					
Asset/Serial #	**Description**	**Model**	**Manufacturer**	**Cal Date**	**Cal Due**
AN02672	Spectrum Analyzer	E4446A	Agilent	8/9/2010	8/9/2012
AN03239	Cable	32022-2-29094K-24TC	Goodwill	8/30/2011	8/30/2013

Test Data



Test Setup Photos

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

Unless otherwise indicated, the following configuration parameters are used for equipment setup: 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	(dBµV)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/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. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

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 "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or carrot ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. 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 or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent 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

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. 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.