



Test Report Summary

FCC CFR 47, Part 22

Subpart H Cellular Radiotelephone Service

Manufacturer: ADC Telecommunications

Name of Equipment: FlexWave™ Prism – Cellular 40 Watt

Model Number(s): FWP-B810100MOD

Manufacturer's Address: P.O. Box 1101
Minneapolis, MN 55440-1101

Test Report Number: MN111411 Cellular 40 Watt

Test Date(s): 7 November, 2011 (Intertek)
9, 10, 11 November (ADC)

According to testing performed at Intertek, the above-mentioned unit is in accordance with the applicable electromagnetic compatibility (EMC) portions of the requirements defined in FCC Part 22.

It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.


All testing was done in accordance with the Federal Communications Commission's CFR 47 Part 22 and the EUT fulfills the requirements of the Federal Communications Commission's CFR 47 Part 22.

Date: 14 November, 2011

Location: Intertek Testing Services (INTERTEK)
7250 Hudson Blvd., Suite 100
Oakdale, MN 55128
Phone: (651) 730-1188
Fax: (651) 730-1282

ADC Telecommunications
1187 Park Place
Shakopee, MN 55379
Phone: (952) 403-8340

Testing Conducted by (ADC):
And Report Written by:



Joshua J. Wittman
Compliance Engineer



EMC Emission – T E S T R E P O R T

Test Report File Number: MN111411 Cellular 40 Watt

Date of Issue: 14 November, 2011

Model Number(s): FWP-B810100MOD

Product Name: FlexWave™ Prism – Cellular 40 Watt

Product Type: Repeater

Applicant: ADC Telecommunications

Manufacturer: ADC Telecommunications

License Holder: ADC Telecommunications

Address: P.O. Box 1101
Minneapolis, MN 55440-1101

Test Result: ☒ **Positive** ☐ Negative

Test Project Number: 100553602MIN-001

Reference(s)

Total pages including Appendices: 81



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2.0 REVISION DESCRIPTION

| Rev | Total Pages | Date | Description |
|-----|-------------|-------------------|------------------|
| A | 81 | 14 November, 2011 | Original Release |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

3.0 DOCUMENTATION

3.1 Test Regulations

| | |
|--------|-----------------------------------|
| 22.355 | Frequency Tolerance |
| 22.913 | Effective Radiated Power Limits |
| 22.917 | Emission Limitations for Cellular |

The emissions tests were performed according to the following regulations:

■ FCC Part 22

- ☐ FCC Part 24
- ☐ FCC Part 90
- ☐ IC RSS-131 Issue 2

Environmental Conditions in the lab:

ADC

Temperature: 24° C
Relative Humidity: 35%
Atmospheric Pressure: 100.2 kPa

INTERTEK

15-35° C
30-60%
86-106 kPa

Power Supply Utilized:

Power Supply System : 120 VAC, Single Phase

3.2 Test Operation Mode

- ▣ Standby
- ▣ Test Program
- ▣ Practice Operation

■ Max composite in and out

3.3 Configuration of the Device Under Test:

Normal Operation – Cellular - 869 to 894 MHz

3.4 Product Options:

None

3.5 EUT Specifications and Requirements:

Length: 10.0"
Width: 12.0"
Height: 40.0"
Weight: 150 pounds

3.6 Cables:

| Cable Type | Length | From | To |
|------------|--------|-----------------|-------------|
| RF | > 3M | Ancillary Equip | EUT |
| RF | < 3M | EUT | 50 Ohm Load |
| Power | < 3M | Power | Input Power |
| Fiber | > 3M | Ancillary Equip | EUT |

3.7 Power Requirements:

Voltage: 120 VAC
Amps: 5.8 A

3.8 Typical Installation and/or Operating Environment:

Outdoor/Indoor. System is typically employed as an outdoor repeater.

3.9 Other Special Requirements:

None

3.10 EUT Software:

Revision Level: Version V.6 or greater
Description: Internet Explorer

3.11 EUT System Components

| Description | Model # | Serial # | FCC ID # |
|-------------------------|-----------------------|----------|----------|
| Prism Chassis | FP3-00000000000000111 | None | |
| Cellular 40 Watt Module | FWP-B810100MOD | None | |
| | | | |

3.12 Support Equipment

| Description | Manufacturer | Model # | FCC ID # |
|------------------|--------------|----------|----------|
| Power Meter | HP | 437B | |
| Signal Generator | Aeroflex | 3413 | |
| Attenuator | Aeroflex | 86-30-12 | |
| | | | |

3.13 Deviations from Standard:

Modifications required to pass:

☐ As indicated on the data sheet(s)

■ **None**

Test Specification Deviations; Additions to or Exclusions from:

☐ As indicated in the Test Plan

■ **None**

3.14 General Remarks:

None.

3.15 Summary:

The requirements according to the technical regulations are

■ **met**

☐ not Met

The equipment under test does

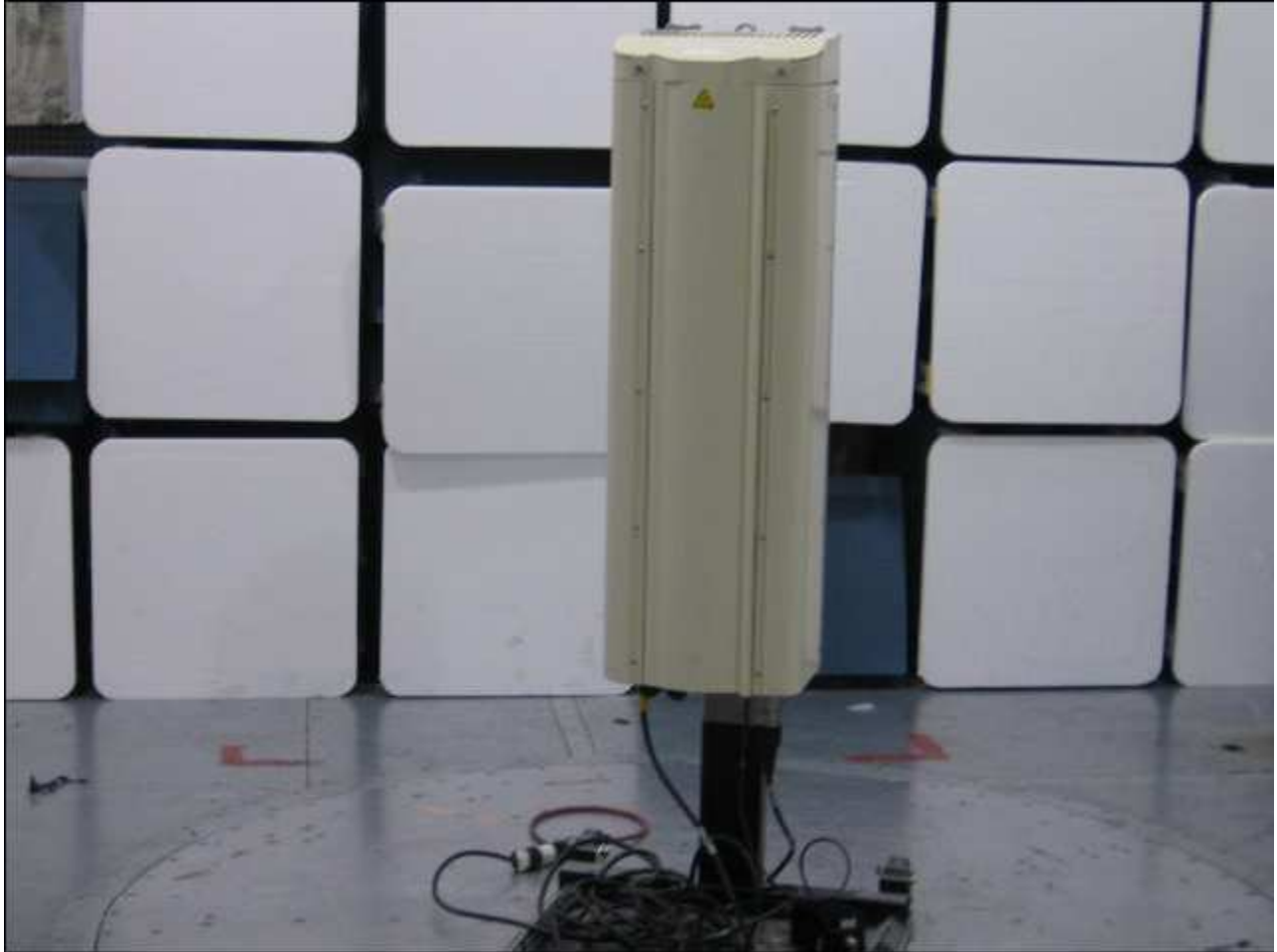
■ **fulfill the general approval requirements mentioned in Section 3.1.**

☐ not fulfill the general approval requirements mentioned in Section 3.1.

4.0 TEST SET-UP DRAWINGS AND PHOTOS

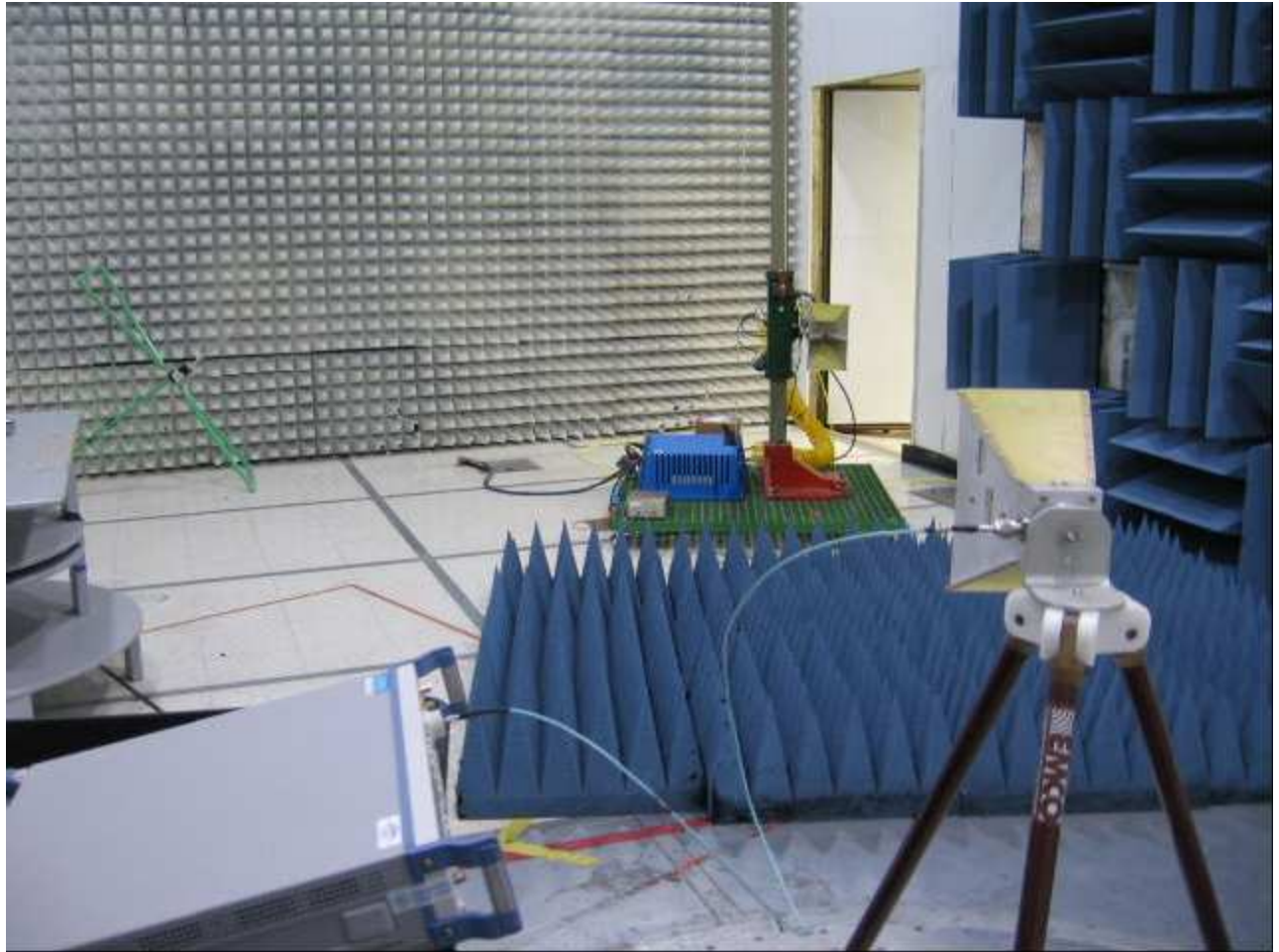
[Table of Contents; Section 1.0](#)

4.1 Test Set-up Photo, Radiated Emissions



4.2 Test Set-up Photo, Radiated Emissions





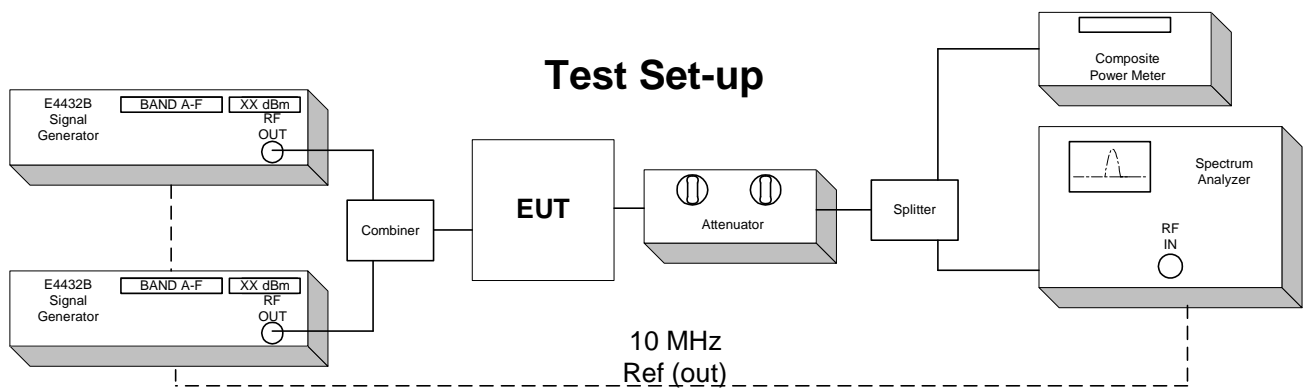
4.3 Test Set-up Drawings

Conducted and Radiated Emission Limits Test

Conducted Output Power Test

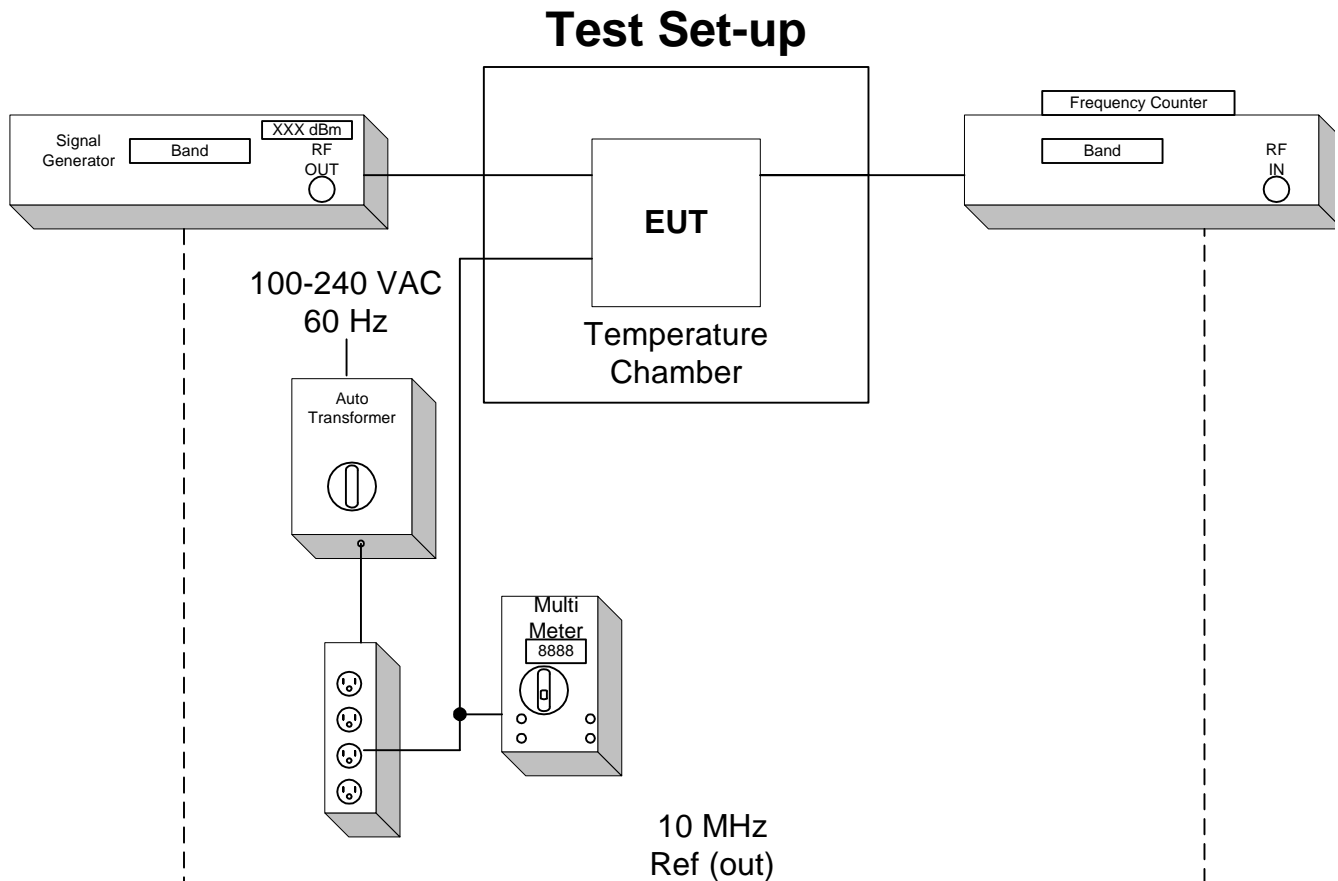
Inter-Modulation Test

Occupied Bandwidth Modulation Test



Frequency Tolerance Test

EUT is specified for outdoor use with temperature range of -30° to $+50^{\circ}$ C, and was tested with its range.



5.0 TEST RESULTS

5.1.1 22.913 Effective Radiated Power Limits

Test Summary:

- The requirements are: ☒ **MET** ☐ NOT MET

Test Location:

☐ INTERTEK (Oakdale, MN)

☒ **ADC facility (Shakopee, MN)**

Test Distance:

☐ 3 Meters

☐ 10 Meters

☒ **Conducted measurement**

Test Equipment (ADC):

1, 2, 6, 7, 11, 12

Test Limit:

500 Watts or 57 dBm Limit

Test Data:

[Conducted Output Power; Section 7.2](#)

[Table of Contents; Section 1.0](#)

Test Engineer: Joshua J. Wittman

Date: 11 November, 2011

5.1.2 22.355 Frequency Tolerance

Test Summary:

- The requirements are: ☒ **MET** ☐ NOT MET
- The fundamental emission stays within the limit.
- Frequency measured over a temperature range of -30 to 50° C and an input voltage range of 100 to 240 VAC.

Test Location:

☐ INTERTEK (Oakdale, MN)

☒ **ADC facility (Shakopee, MN)**

Test Equipment (ADC):

3, 4, 5, 6, 9, 10

Test Limit:

TABLE C-1.—FREQUENCY TOLERANCE FOR
TRANSMITTERS IN THE PUBLIC MOBILE SERVICES

| Frequency range (MHz) | Base, fixed (ppm) | Mobile ≤3 watts (ppm) | Mobile ≤3 watts (ppm) |
|--------------------------|----------------------|-----------------------------|-----------------------------|
| 25 to 50 | 20.0 | 20.0 | 50.0 |
| 50 to 450 | 5.0 | 5.0 | 50.0 |
| 450 to 512 | 2.5 | 5.0 | 5.0 |
| 821 to 896 | 1.5 | 2.5 | 2.5 |
| 928 to 929 | 5.0 | n/a | n/a |
| 929 to 960 | 1.5 | n/a | n/a |
| 2110 to 2220 | 10.0 | n/a | n/a |

Test Data:

[Frequency Stability; Section 7.3](#)

[Table of Contents; Section 1.0](#)

Test Engineer: Joshua J. Wittman

Date: 9 November, 2011

5.1.3 22.917 Emission Limitations Cellular

Test Summary:

- The requirements are: ■ **MET** □ NOT MET
- Out of band emissions were less than -13 dBm.
- Outside the emission bandwidth of the carrier, all emissions are attenuated at least 26 dB below the transmitter power.

Test Location:

□ INTERTEK (Oakdale, MN)

■ ADC facility (Shakopee, MN)

Test Equipment (ADC):

1, 2, 6, 7, 11, 12

Test Limit:

Out of band emissions:

Attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB, or -13 dBm.

Outside of the carrier emissions bandwidth:

26 dB below the transmitter power

Test Data:

[Conducted Emissions; Section 7.1](#)

[Intermodulation; Section 7.4](#)

[Occupied Bandwidth; Section 7.5](#)

Radiated Emissions; ([Appendix B](#))

Test Engineer: Joshua J. Wittman

Date: 11 June, 2011

Date: 11 June, 2011

Date: 11 June, 2011

[Table of Contents; Section 1.0](#)

6.0 TEST EQUIPMENT

[Table of Contents; Section 1.0](#)

| Number | Description | Manufacturer | Model | ADC TELECOMMUNICAT IONS Serial Number | Cal Due | Used |
|--------|---------------------------|-------------------|----------|--|----------|-------------------------------------|
| 1 | Spectrum Analyzer | HP | 8563E | MC27690 | 12-15-11 | <input checked="" type="checkbox"/> |
| 2 | Power Meter | HP | 437B | MC27541 | 6-30-12 | <input checked="" type="checkbox"/> |
| 3 | Multimeter | Fluke | 79 | MC18758 | 6-30-13 | <input checked="" type="checkbox"/> |
| 4 | Frequency Counter | HP | 5347A | MC27548 | 7-27-12 | <input checked="" type="checkbox"/> |
| 5 | Temperature Chamber | ESPEC | PSL-4G | MC10075 | 9-8-12 | <input checked="" type="checkbox"/> |
| 6 | Signal Generator | Aeroflex | 3413 | MC57343 | 11-9-12 | <input checked="" type="checkbox"/> |
| 7 | Signal Generator | Aeroflex | 3413 | MC57947 | 4-15-12 | <input checked="" type="checkbox"/> |
| 8 | Variable Auto Transformer | Staco | 1520CT | MC44655 | CNR | <input checked="" type="checkbox"/> |
| 9 | Digital Barometer | Fisher Scientific | 02-403 | MC50719 | 1-20-12 | <input checked="" type="checkbox"/> |
| 10 | Attenuator | Aeroflex | 49-30-33 | N/A | CNR | <input checked="" type="checkbox"/> |
| 11 | Attenuator | Aeroflex | 86-30-12 | N/A | CNR | <input checked="" type="checkbox"/> |
| 12 | RF Power Sensor | HP | 8482A | MC27649 | 6-30-12 | <input checked="" type="checkbox"/> |

Equipment with a Calibration Not Required (CNR) listing is verified and compensated for with NIST traceable calibrated equipment

Conducted Emissions Test Data

[Table of Contents; Section 1.0](#)**Test Engineer:** Joshua J. Wittman

7.1 Conducted Emission Limits Test

[Table of Contents; Section 1.0](#)

[Back to Emission Limits; Section 5.1.3](#)

The out of band emissions were measured directly from the EUT antenna output with a spectrum analyzer from 30 MHz to the 10th harmonic of the highest carrier frequency. Test signals used are GSM, EDGE, CDMA, W-CDMA, LTE 3MHz BW, LTE 5 MHz BW, & LTE 10MHz BW. The different signals were input one at a time to the EUT. In all cases, the out of band emissions were less than -13 dBm from the equation

$$(19\text{dBm} - [43 + 10\log(0.08\text{W})])$$

Band edge compliance is also demonstrated using a GSM, EDGE, CDMA, W-CDMA, LTE 3MHz BW, LTE 5 MHz BW, & LTE 10MHz BW signal at the upper and lower limits of the band.

The Host unit connects directly to the BTS via coax. The Host unit does not connect to an antenna or amplifier, thus it is a Part 15 device and has been tested and is compliant as such. No FCC ID is necessary.

Industry practice has generally set the input signal power level. Test signal used was \approx -25 dBm input to DHU. Industry practice has generally set the output signal power level.

Prism Remote:

Range: 100 - 240 VAC

Tested @: 120 VAC

Tested @: 5.8 A

Digital Host Unit (DHU):

Range: 21-60 VDC

Tested @: 48 VDC

Tested @: 3.5 A

Application details for 2.1033(c)(8), 2.1033(c)(10), and 2.1033(c)(13):

RF amplifier output stage has three devices with 27.5 VDC voltage applied. Current for device #1 is 3.5A max. Devices #2 and #3 have 1.5A max.

The input to the host unit has a digital attenuation chip (ALC) to provide protection from overdrive with 5-10 millisecond attack time / 100 millisecond decay time and 31 dB of head room, such that single channel operation, or multi-channel operation will not exceed nominal gain of the system.

The frequency stability is derived by the BTS, base transceiver station. This product uses internal frequency stability to keep the signal inside our filter bandwidths. This means that the frequency can change, but the frequency that transmits is still at the original frequency. The remote system uses the data over the fiber optic path to phase/frequency lock to the host. The purpose is to frequency lock the up- and down-conversion local oscillators, and thereby eliminate any end-to-end frequency shift.

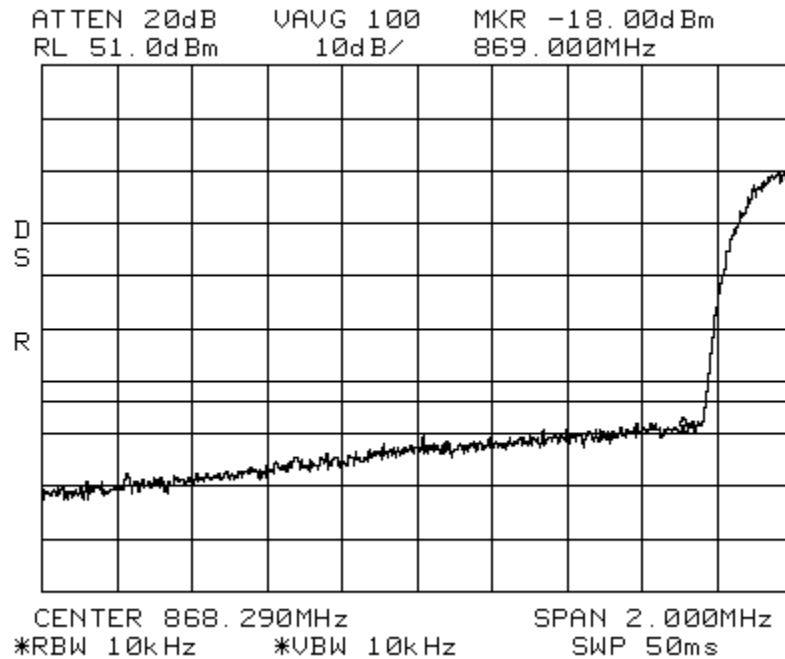
The spurious limitation is completed with the duplexer. The ALC also suppresses in-band spurious by preventing PA overdrive, while the duplexer suppresses out-of-band spurious. Internal to the electronics, the use of SAW filters provides for higher Q roll-off at band edges.

This equipment does not modulate the RF, so there is no modulation limiter. This equipment does not change the modulation of the RF or the occupied bandwidth of any channel. It transports the signal, as is, over an optical link. The RF input is not changed in the RF output.

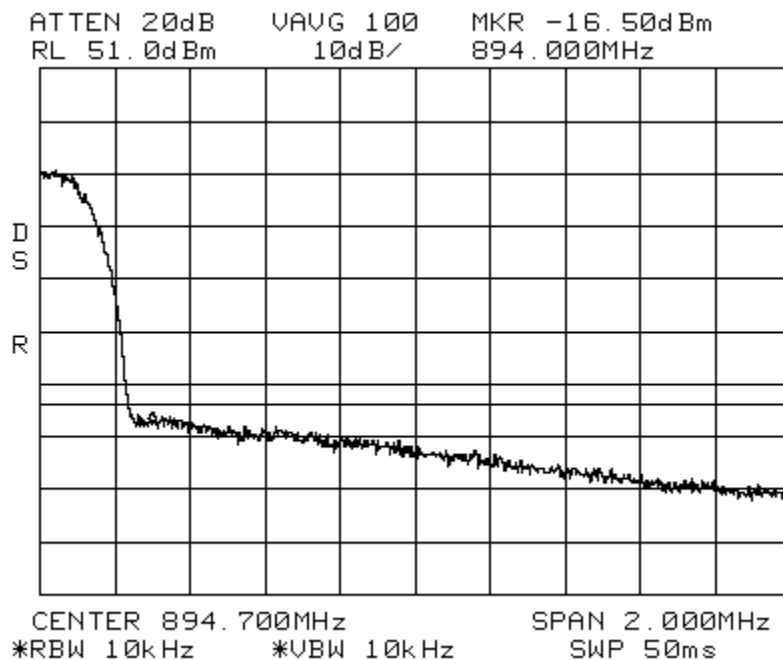
This is a constant gain device, so the setup controls the output. There is an overdrive and overpower limit control that prevents excess power.

Results:
Pass (See plots)

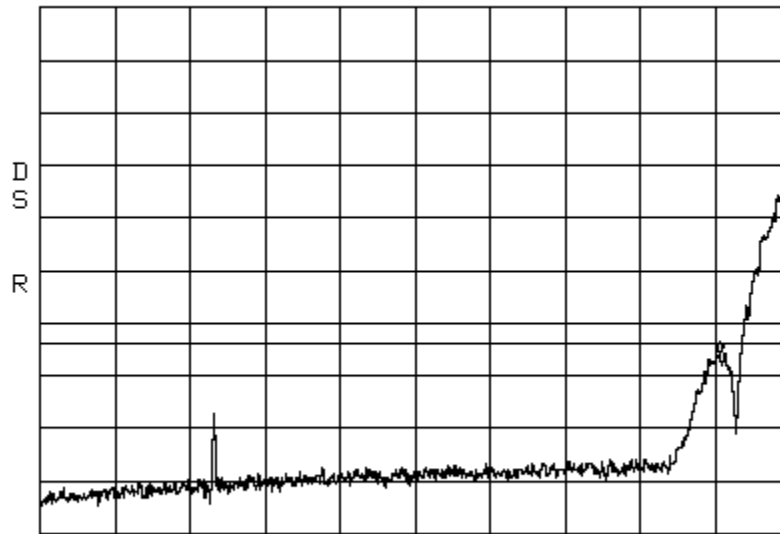
Band_Edge CDMA CELL 40W
Center: 868.29 MHz Span: 2 MHz RBW: 10 kHz VBW: 10 kHz



Band_Edge CDMA CELL 40W
Center: 894.7 MHz Span: 2 MHz RBW: 10 kHz VBW: 10 kHz

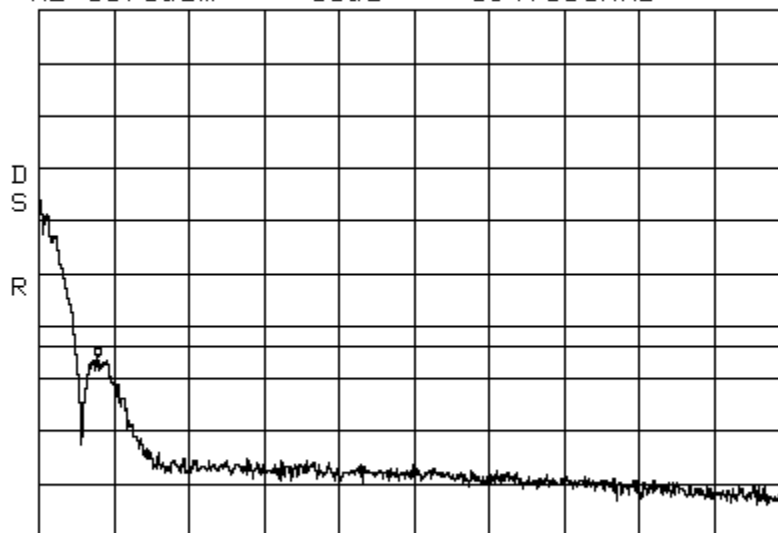


Band_Edge EDGE CELL 40W
Center: 868.370 MHz Span: 1.5 MHz RBW: 3 kHz VBW: 10 kHz
ATTEN 20dB VAVG 100 MKR -14.50dBm
RL 51.0dBm 10dB/ 868.980MHz



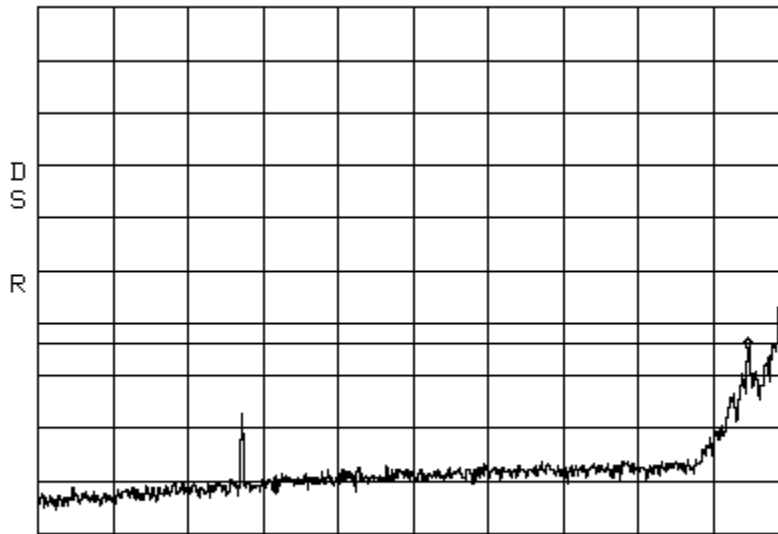
CENTER 868.370MHz SPAN 1.500MHz
*RBW 3.0kHz *VBW 10kHz SWP 420ms

Band_Edge EDGE CELL 40W
Center: 894.650 MHz Span: 1.5 MHz RBW: 3 kHz VBW: 10 kHz
ATTEN 20dB VAVG 100 MKR -14.83dBm
RL 51.0dBm 10dB/ 894.018MHz



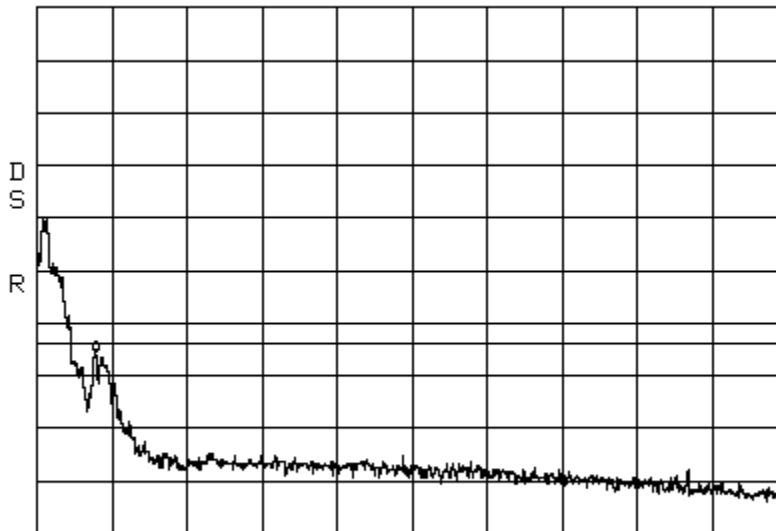
CENTER 894.650MHz SPAN 1.500MHz
*RBW 3.0kHz *VBW 10kHz SWP 420ms

Band_Edge GSM CELL 40W
Center: 868.310 MHz Span: 1.5 MHz RBW: 3 kHz VBW: 10 kHz
ATTEN 20dB VAVG 100 MKR -13.83dBm
RL 51.0dBm 10dB/ 868.980MHz



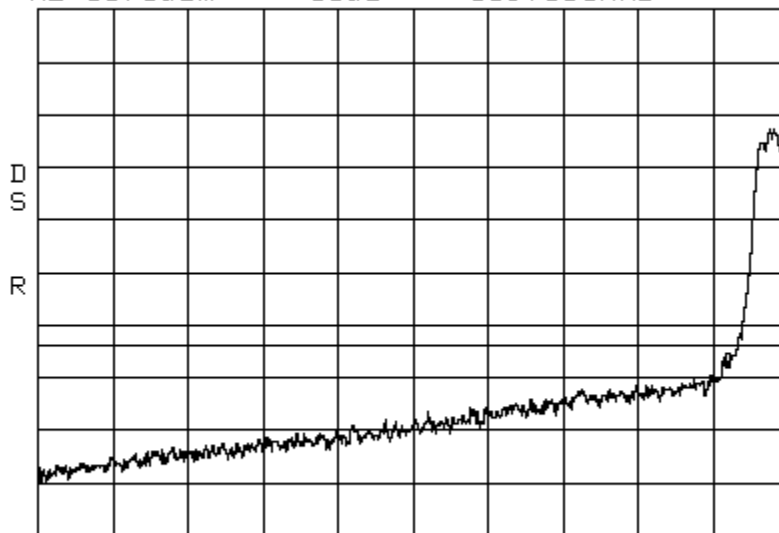
CENTER 868.310MHz SPAN 1.500MHz
*RBW 3.0kHz *VBW 10kHz SWP 420ms

Band_Edge GSM CELL 40W
Center: 894.650 MHz Span: 1.5 MHz RBW: 3 kHz VBW: 10 kHz
ATTEN 20dB VAVG 100 MKR -14.50dBm
RL 51.0dBm 10dB/ 894.018MHz



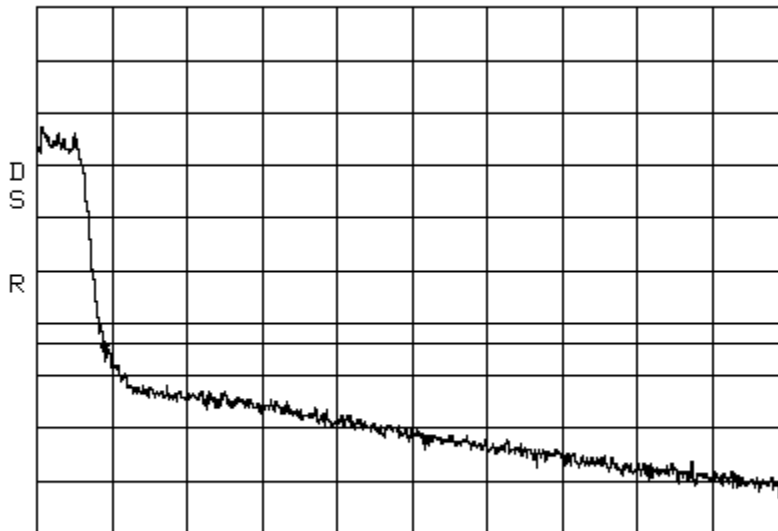
CENTER 894.650MHz SPAN 1.500MHz
*RBW 3.0kHz *VBW 10kHz SWP 420ms

Band_Edge LTE 3 MHz Channel Bandwidth CELL 40W
Center: 866.9MHz Span: 5 MHz RBW: 30 kHz VBW: 100 kHz
ATTEN 20dB VAVG 100 MKR -16.33dBm
RL 51.0dBm 10dB/ 869.000MHz



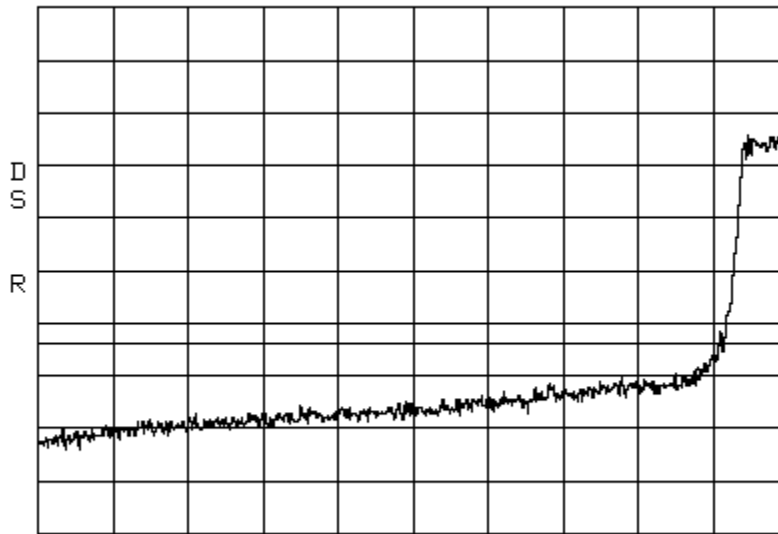
CENTER 866.900MHz SPAN 5.000MHz
*RBW 30kHz *VBW 100kHz SWP 50ms

Band_Edge LTE 3 MHz Channel Bandwidth CELL 40W
Center: 896.050MHz Span: 5 MHz RBW: 30 kHz VBW: 100 kHz
ATTEN 20dB VAVG 100 MKR -14.33dBm
RL 51.0dBm 10dB/ 894.000MHz



CENTER 896.050MHz SPAN 5.000MHz
*RBW 30kHz *VBW 100kHz SWP 50ms

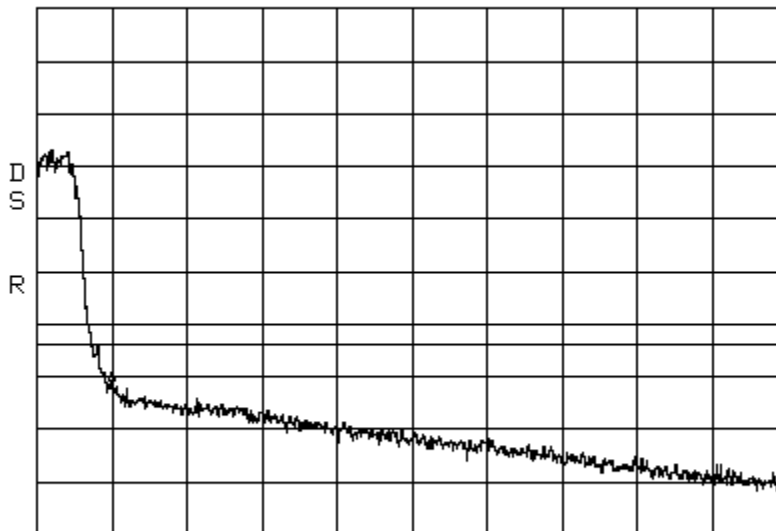
Band_Edge LTE 5 MHz Channel Bandwidth CELL 40W
Center: 867.100 MHz Span: 5 MHz RBW: 30 kHz VBW: 100 kHz
ATTEN 20dB VAVG 100 MKR -19.50dBm
RL 51.0dBm 10dB/ 869.000MHz



CENTER 867.100MHz SPAN 5.000MHz
*RBW 30kHz *VBW 100kHz SWP 50ms

Correction Factor $10\log(\text{RBW Needed} / \text{RBW Used})$ $10\log(50\text{kHz} / 30\text{kHz}) = 2.2$
Actual = -17.30dBm

Band_Edge LTE 5 MHz Channel Bandwidth CELL 40W
Center: 896.0 MHz Span: 5 MHz RBW: 30 kHz VBW: 100 kHz
ATTEN 20dB VAVG 100 MKR -20.33dBm
RL 51.0dBm 10dB/ 894.000MHz

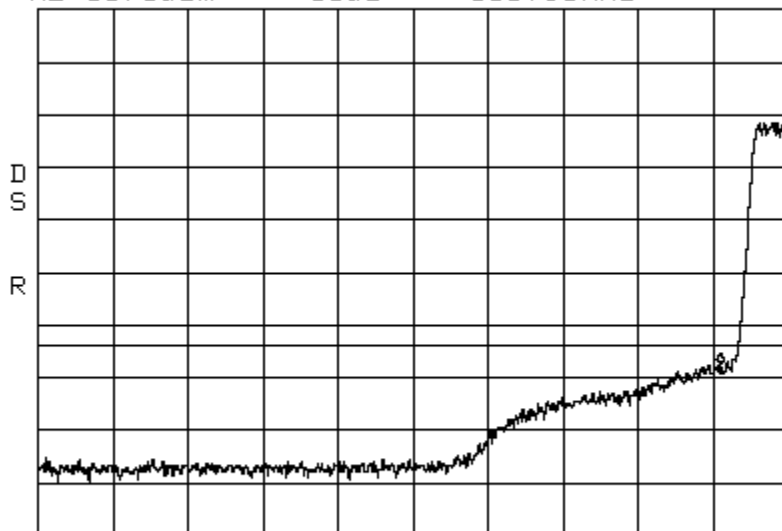


CENTER 896.000MHz SPAN 5.000MHz
*RBW 30kHz *VBW 100kHz SWP 50ms

Correction Factor $10\log(\text{RBW Needed} / \text{RBW Used})$ $10\log(50\text{kHz} / 30\text{kHz}) = 2.2$
Actual = -18.13dBm

Band_Edge LTE 10 MHz Channel Bandwidth
Center: 862.83 MHz Span: 15 MHz RBW: 100 kHz
ATTEN 20dB VAVG 100 MKR -16.50dBm
RL 51.0dBm 10dB/ 868.98MHz

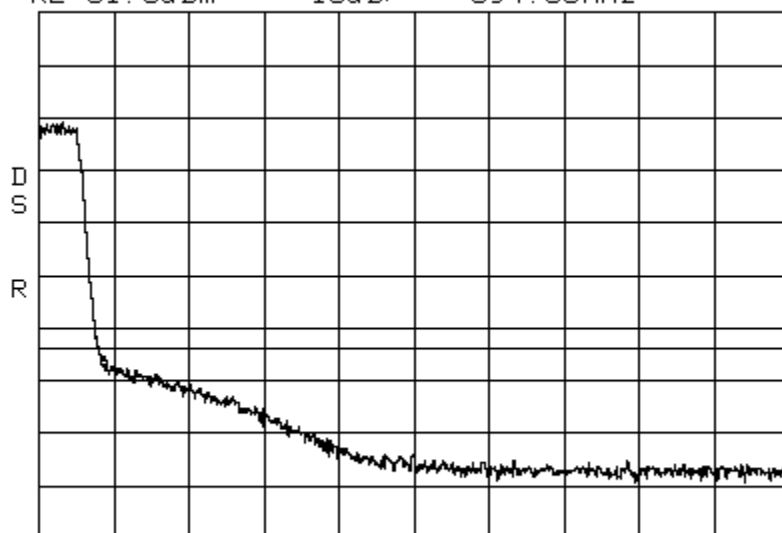
CELL 40W
VBW: 100 kHz



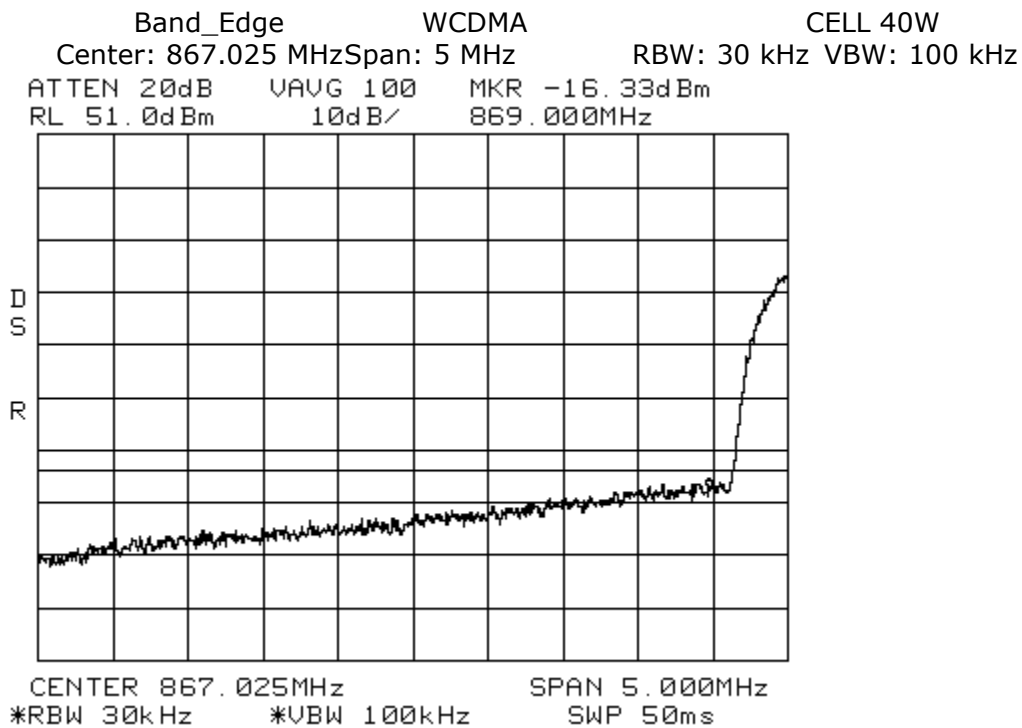
CENTER 862.83MHz SPAN 15.00MHz
*RBW 100kHz *VBW 100kHz SWP 50ms

Band_Edge LTE 10 MHz Channel Bandwidth
Center: 900.20 MHz Span: 15 MHz RBW: 100 kHz
ATTEN 20dB VAVG 100 MKR -16.50dBm
RL 51.0dBm 10dB/ 894.00MHz

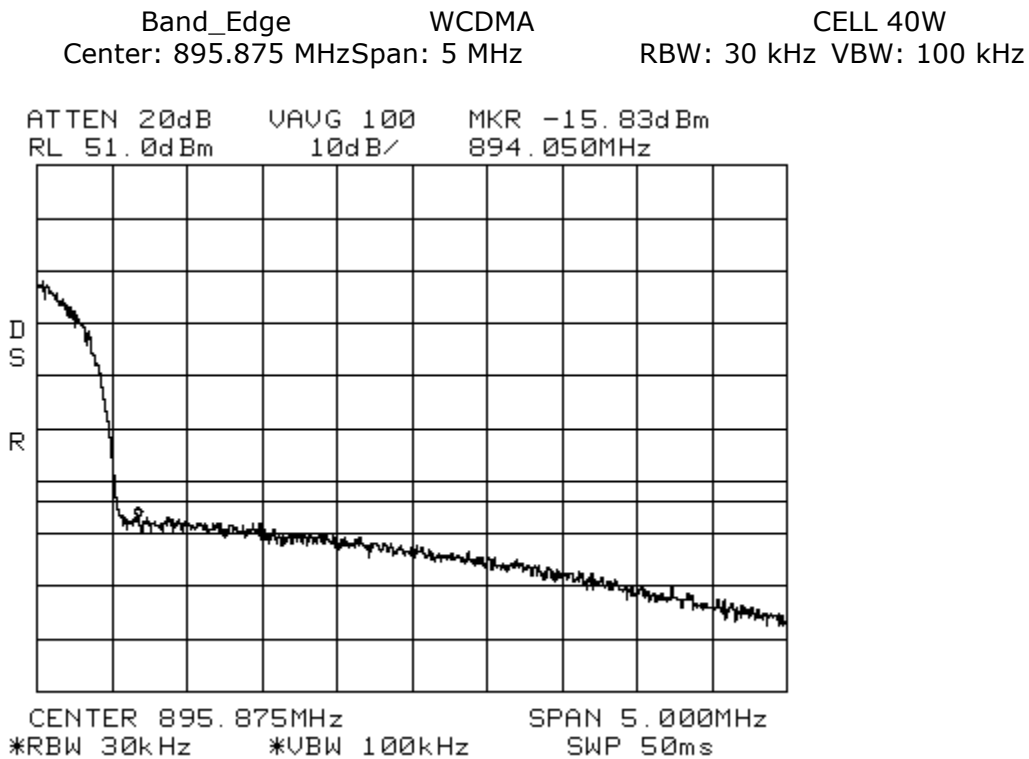
CELL 40W
VBW: 100 kHz



CENTER 900.20MHz SPAN 15.00MHz
*RBW 100kHz *VBW 100kHz SWP 50ms



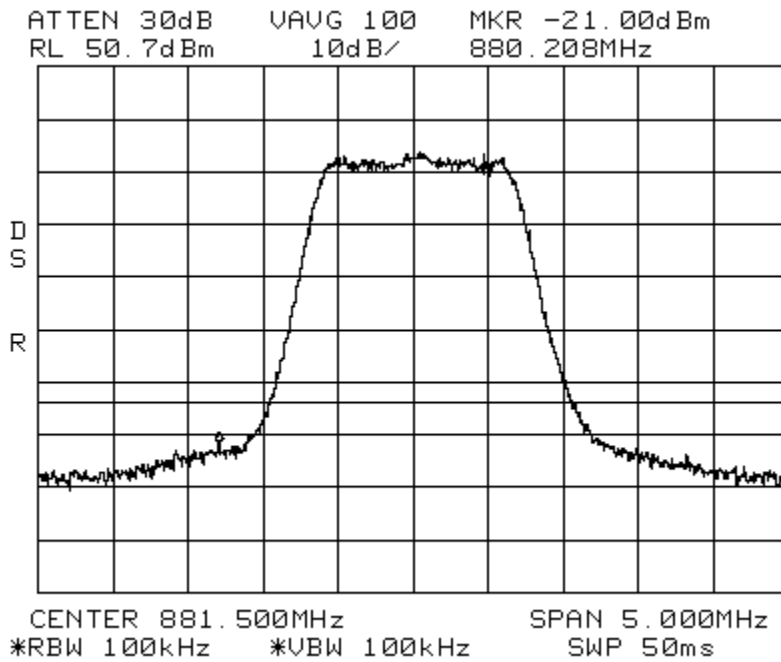
Correction Factor $10\log(\text{RBW Needed} / \text{RBW Used})$ $10\log(50\text{kHz} / 30\text{kHz}) = 2.2$
Actual = -14.13dBm



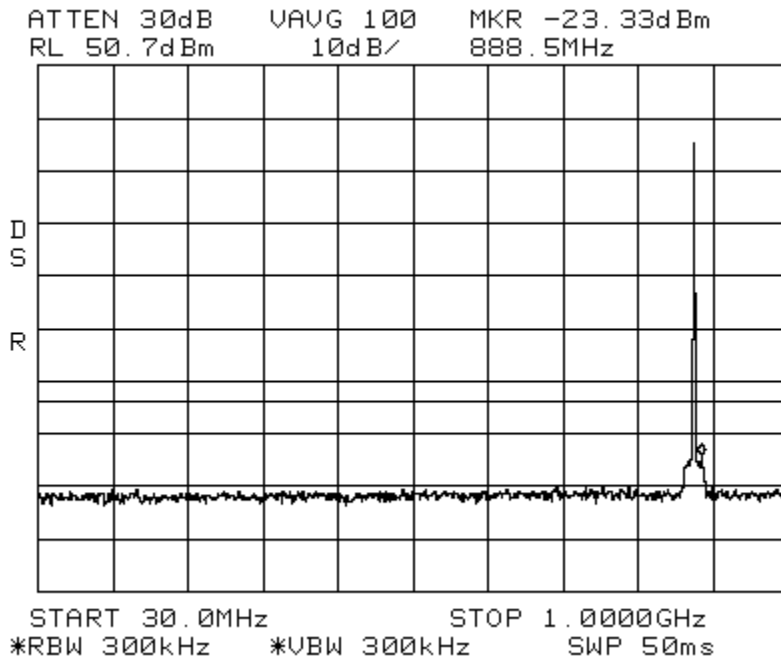
Correction Factor $10\log(\text{RBW Needed} / \text{RBW Used})$ $10\log(50\text{kHz} / 30\text{kHz}) = 2.2$
Actual = -13.63dBm

Conducted Emissions CDMA
Center: 881.5 MHz Span: 5 MHz

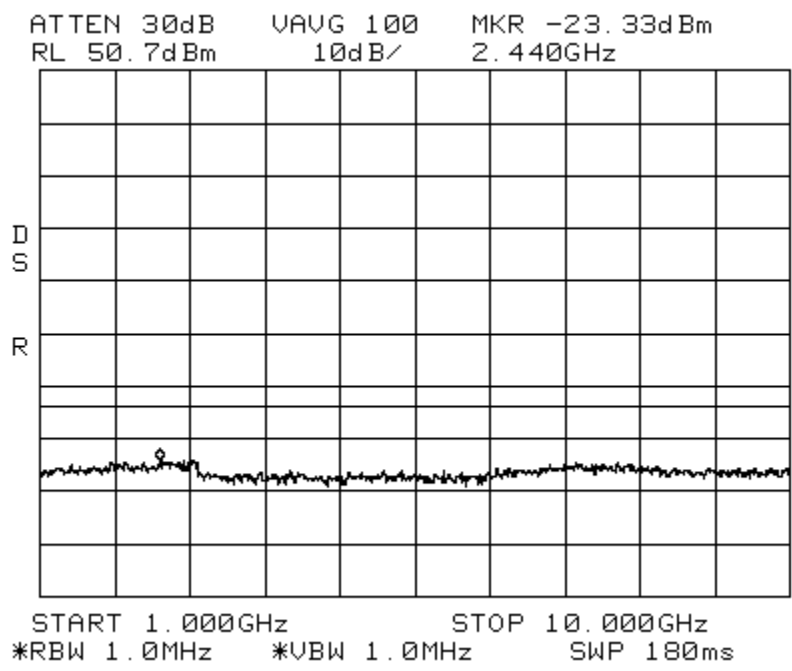
CELLULAR 40 W
RBW/VBW: 100 kHz



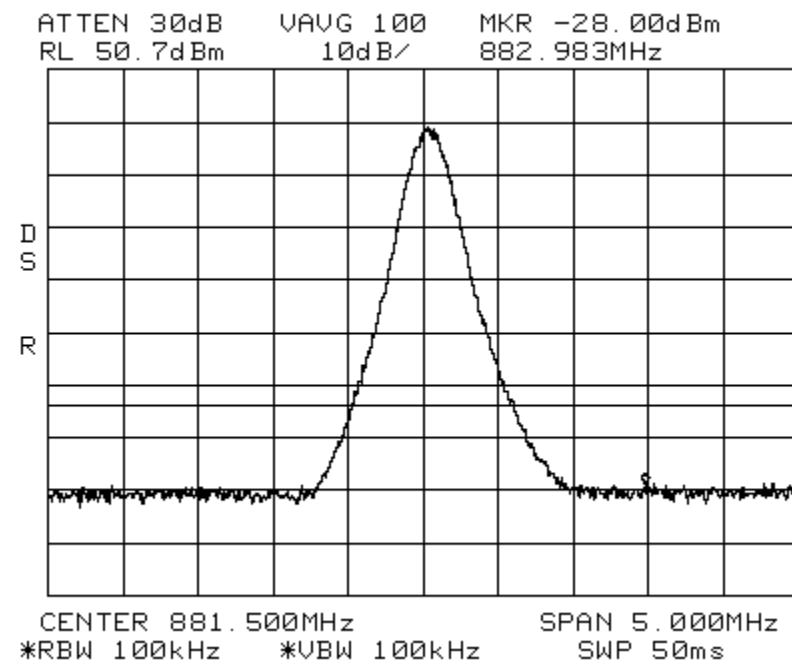
Conducted Emissions CDMA CELLULAR 40 W
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



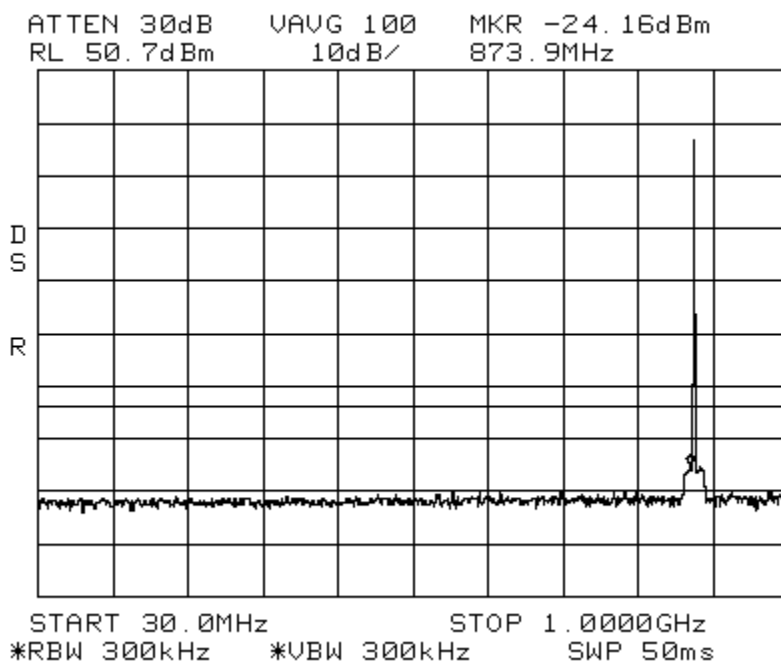
Conducted Emissions CDMA CELLULAR 40 W
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



Conducted Emissions EDGE CELLULAR 40 W
 Center: 881.5 MHz Span: 5 MHz RBW/VBW: 100 kHz



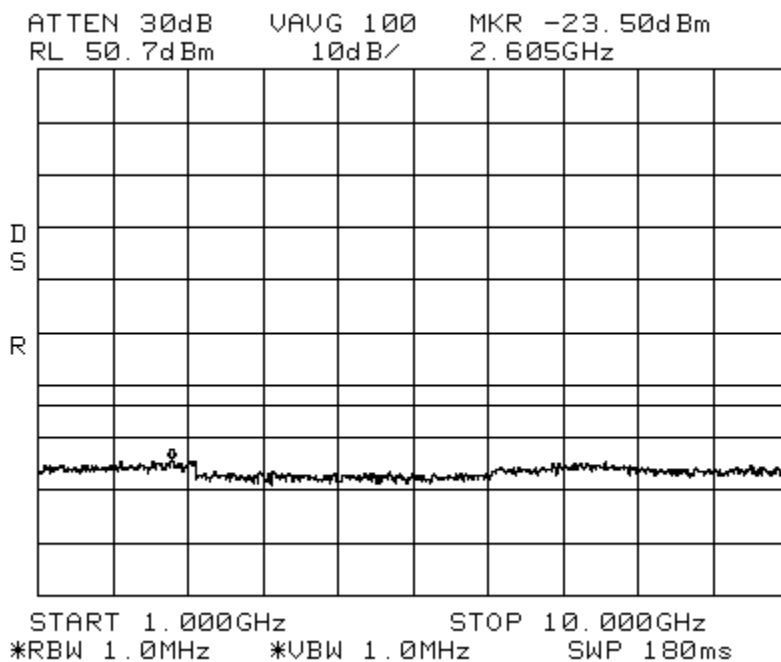
Conducted Emissions EDGE CELLULAR 40 W
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



Conducted Emissions
 Span: 1 GHz to 10 GHz

EDGE

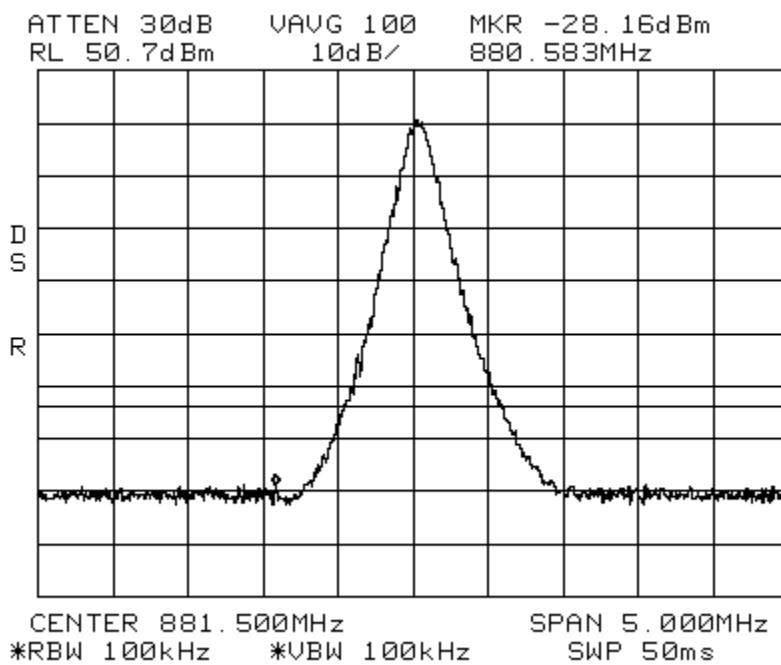
CELLULAR 40 W
 RBW/VBW: 1 MHz



Conducted Emissions
 Center: 881.5 MHz

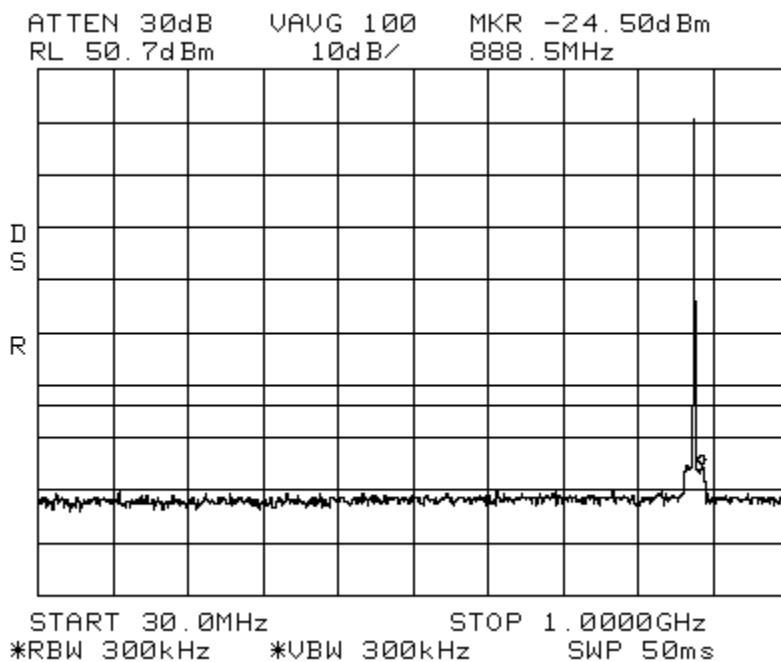
GSM
 Span: 5 MHz

CELLULAR 40W
 RBW/VBW: 100 kHz



Conducted Emissions
Span: 30 MHz to 1 GHz

GSM CELLULAR 40W
RBW/VBW: 300 kHz

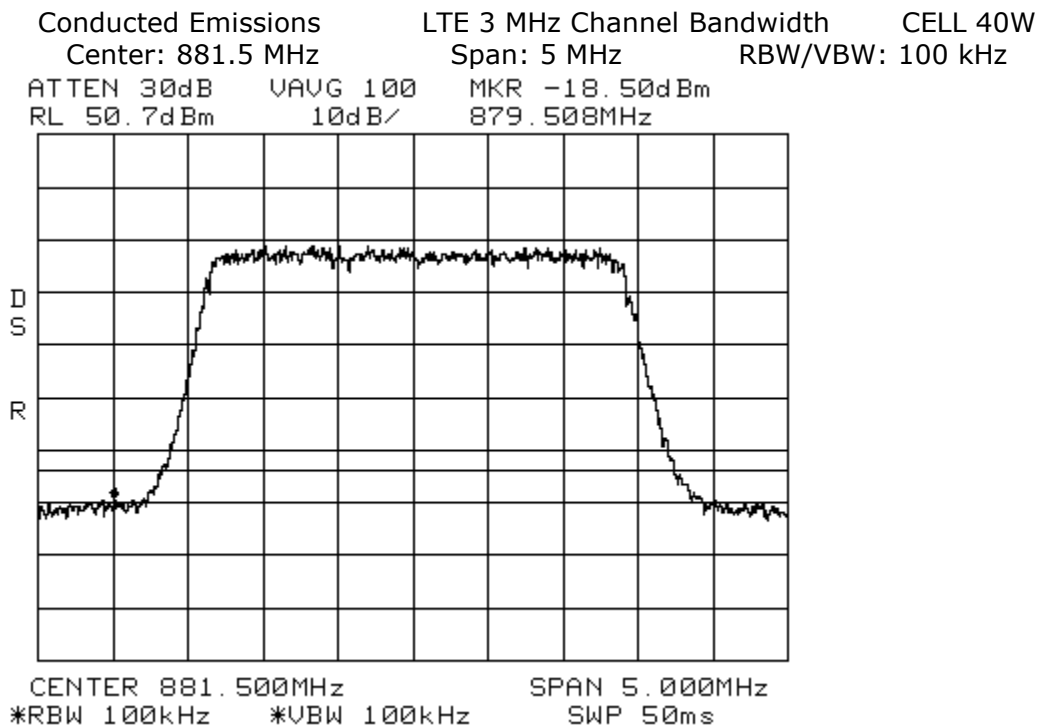
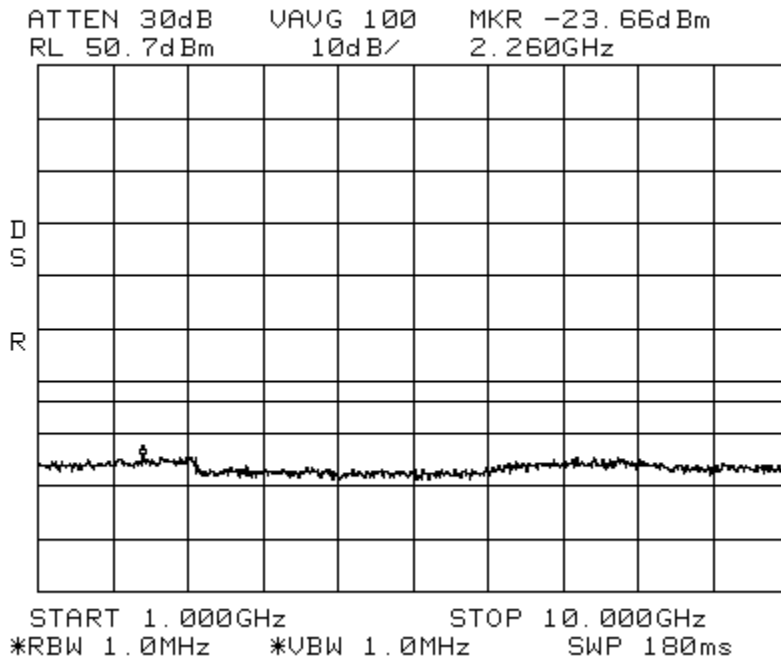


Conducted Emissions

GSM CELLULAR 40W

Span: 1 GHz to 10 GHz

RBW/VBW: 1 MHz



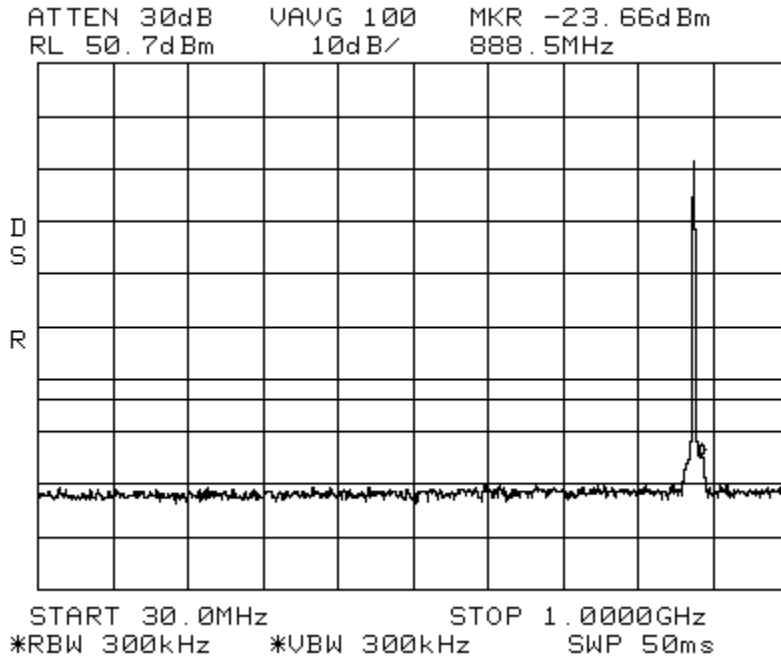
Conducted Emissions

LTE 3 MHz Channel Bandwidth

CELL 40W

Span: 30 MHz to 1 GHz

RBW/VBW: 300 kHz



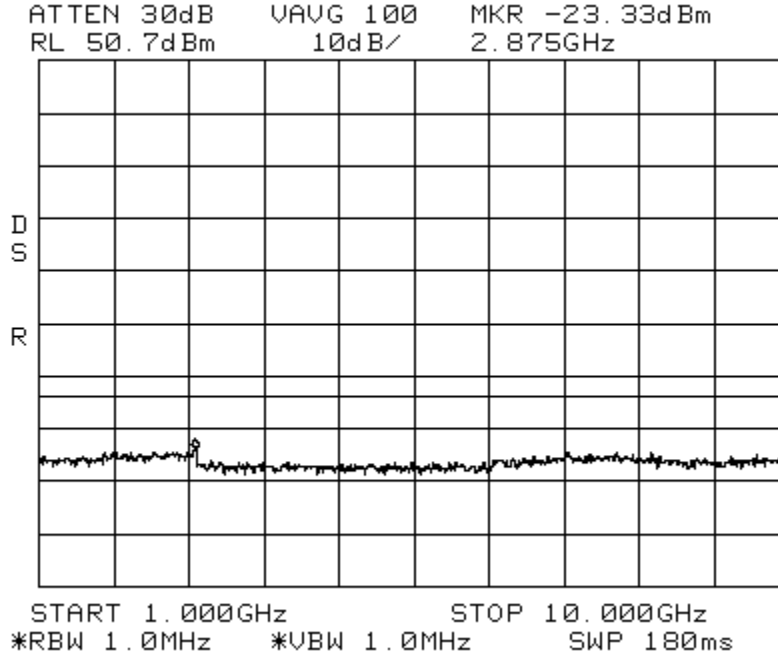
Conducted Emissions

LTE 3 MHz Channel Bandwidth

CELL 40W

Span: 1 GHz to 10 GHz

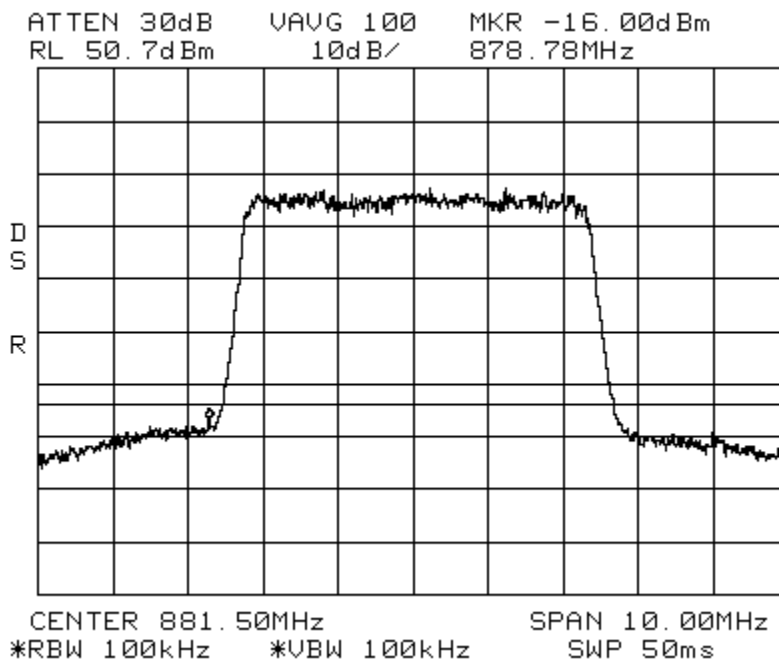
RBW/VBW: 1 MHz



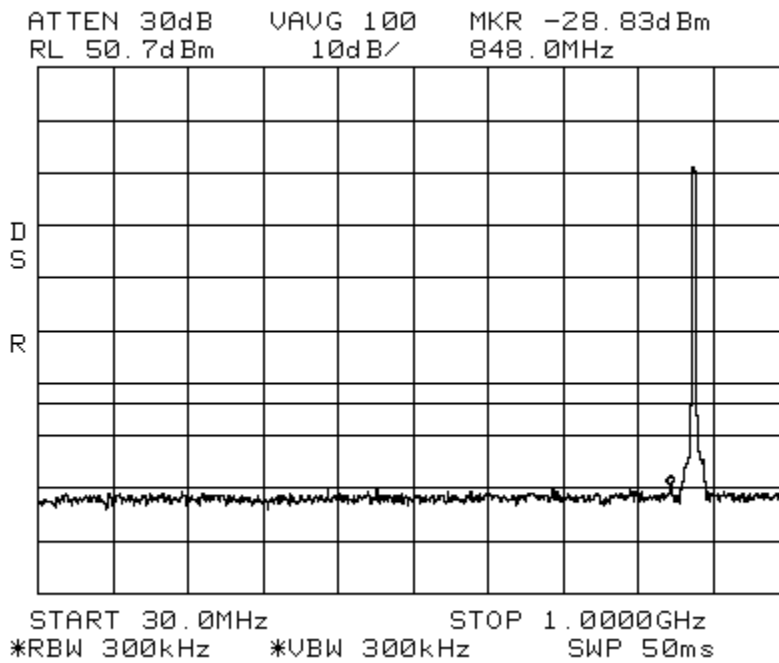
Conducted Emissions
Center: 881.5 MHz

LTE 5 MHz Channel Bandwidth
Span: 10 MHz

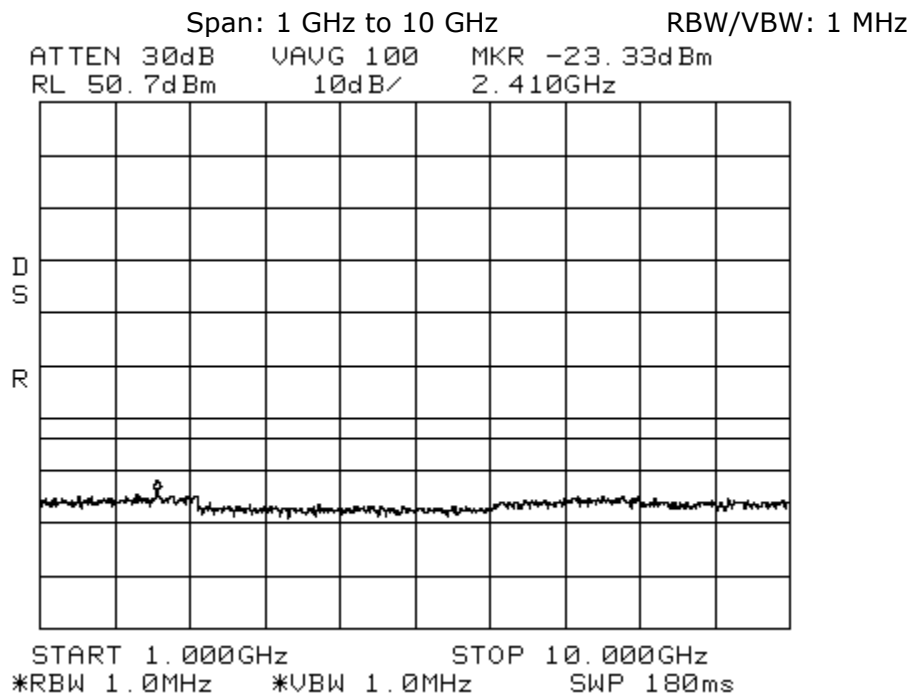
CELL 40W
RBW/VBW: 100 kHz



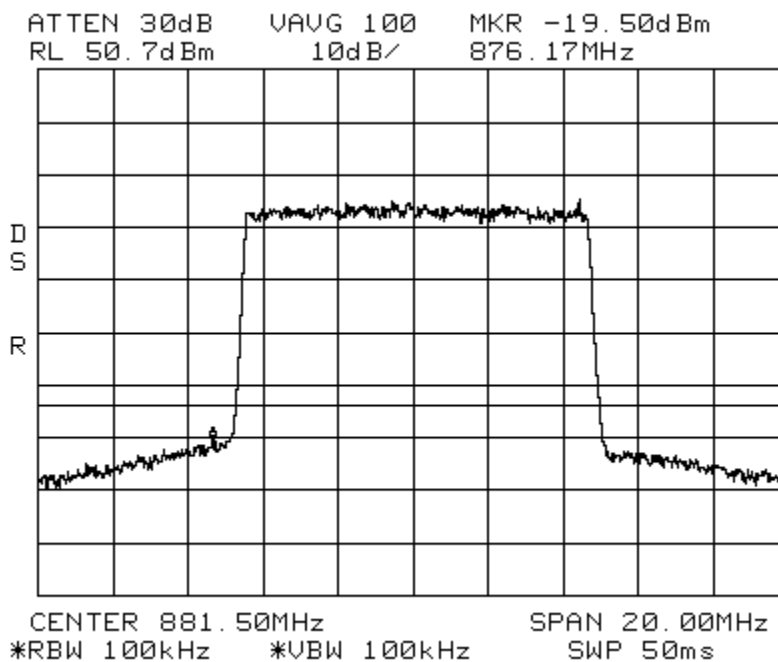
Conducted Emissions LTE 5 MHz Channel Bandwidth CELL 40W
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



Conducted Emissions LTE 5 MHz Channel Bandwidth CELL 40W



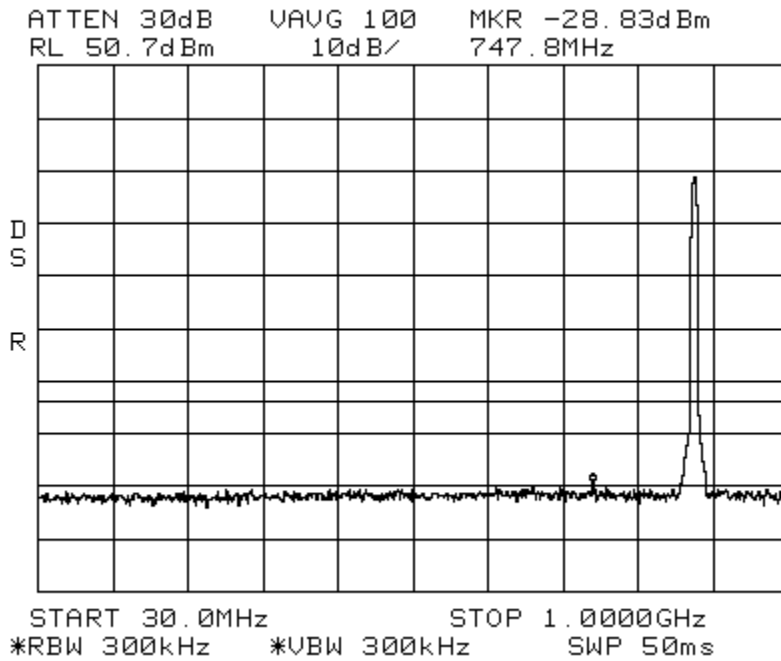
Conducted Emissions LTE 10 MHz Channel Bandwidth CELL 40W
Center: 881.5 MHz Span: 20MHz RBW/VBW: 100 kHz



Conducted Emissions LTE 10 MHz Channel Bandwidth CELL 40W

Span: 30 MHz to 1 GHz

RBW/VBW: 300 kHz



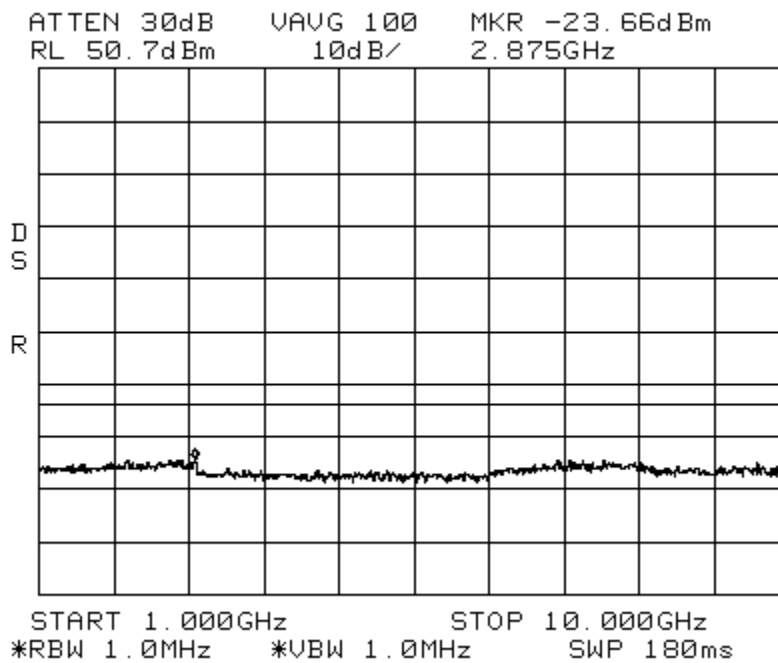
Conducted Emissions

LTE 10 MHz Channel Bandwidth

CELL 40W

Span: 1 GHz to 10 GHz

RBW/VBW: 1 MHz

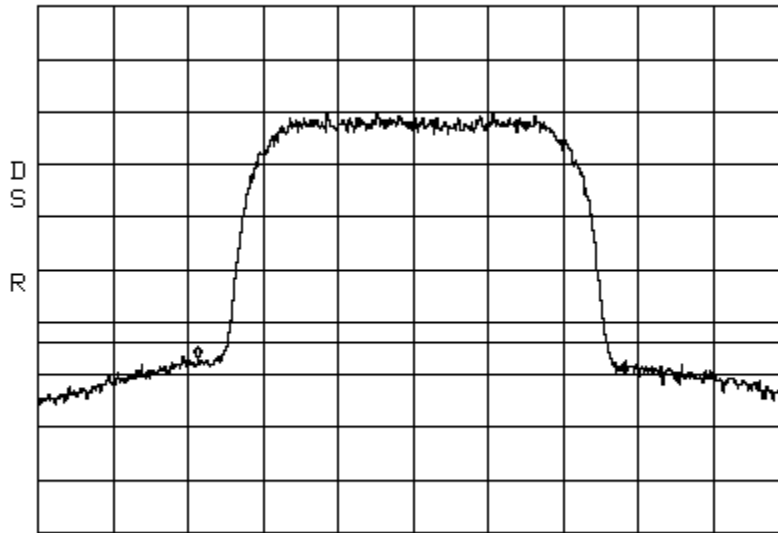


Conducted Emissions

WCDMA

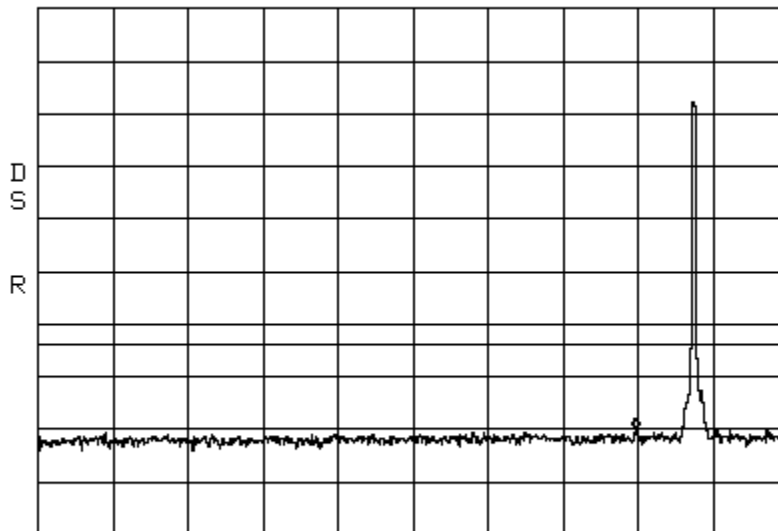
CELLULAR 40W

Center: 881.5 MHz Span: 10 MHz RBW/VBW: 100 kHz
 ATTN 30dB VAVG 100 MKR -16.00dBm
 RL 50.7dBm 10dB/ 878.63MHz



CENTER 881.50MHz SPAN 10.00MHz
 *RBW 100kHz *VBW 100kHz SWP 50ms

Conducted Emissions WCDMA CELLULAR 40W
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz
 ATTN 30dB VAVG 100 MKR -29.33dBm
 RL 50.7dBm 10dB/ 802.8MHz

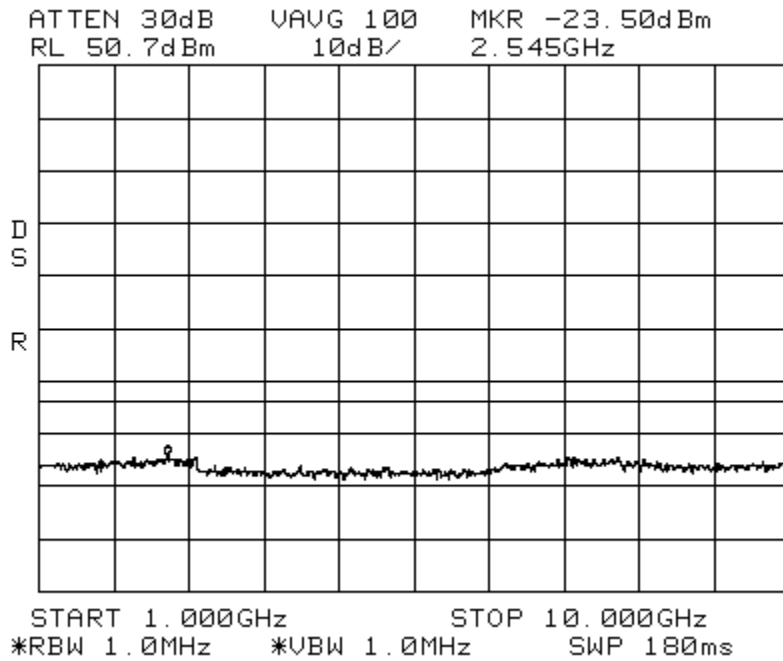


START 30.0MHz STOP 1.0000GHz
 *RBW 300kHz *VBW 300kHz SWP 50ms

Conducted Emissions WCDMA CELLULAR 40W

Span: 1 GHz to 10 GHz

RBW/VBW: 1 MHz



7.2 Conducted Output Power Test

*Note: The EUT is a fixed repeater and not a base station.

This measurement was made as a direct conducted emission measurement. The output from the EUT antenna connector was connected to the power meter. The carrier output, below, was conducted using a single GSM, EDGE, CDMA, W-CDMA, LTE 3MHz BW, LTE 5 MHz BW, & LTE 10MHz BW signal.

A signal was used at the low, mid and high parts of the selected band. The power meter level was offset by 30.5 dB to compensate for cable loss and attenuator between the EUT and the power meter.

| | |
|-------------------|--------------------|
| <u>GSM</u> | <u>46.98 Watts</u> |
| Carrier Frequency | Carrier Output |
| 869.2 MHz | 46.20 dBm |
| 881.5 MHz | 46.72 dBm |
| 893.8 MHz | 46.30 dBm |

| | |
|-------------------|--------------------|
| <u>EDGE</u> | <u>45.81 Watts</u> |
| Carrier Frequency | Carrier Output |
| 869.2 MHz | 46.25 dBm |
| 881.5 MHz | 46.61 dBm |
| 893.8 MHz | 46.26 dBm |

| | |
|-------------------|--------------------|
| <u>CDMA</u> | <u>45.81 Watts</u> |
| Carrier Frequency | Carrier Output |
| 869.8 MHz | 46.39 dBm |
| 881.5 MHz | 46.61 dBm |
| 893.2 MHz | 46.37 dBm |

| | |
|-------------------|--------------------|
| <u>W-CDMA</u> | <u>46.34 Watts</u> |
| Carrier Frequency | Carrier Output |
| 871.6 MHz | 46.40 dBm |
| 881.5 MHz | 46.66 dBm |
| 891.4 MHz | 46.50 dBm |

| | |
|-------------------|--------------------|
| <u>3 LTE</u> | <u>45.91 Watts</u> |
| Carrier Frequency | Carrier Output |
| 870.5 MHz | 46.42 dBm |
| 881.5 MHz | 46.62 dBm |
| 892.5 MHz | 46.31 dBm |

| | |
|-------------------|--------------------|
| <u>5 LTE</u> | <u>43.55 Watts</u> |
| Carrier Frequency | Carrier Output |
| 871.5 MHz | 46.09 dBm |
| 881.5MHz | 46.39 dBm |
| 891.5 MHz | 46.24 dBm |

| | |
|-------------------|--------------------|
| <u>10LTE</u> | <u>44.15 Watts</u> |
| Carrier Frequency | Carrier Output |
| 874 MHz | 46.25 dBm |
| 881.5 MHz | 46.35 dBm |
| 889 MHz | 46.45 dBm |

7.3 Frequency Stability Test

[Table of Contents; Section 1.0](#)

[Back to Frequency Stability; Section 5.1.1](#)

| HOST | REMOTE | | | |
|---------------|---------------|-------------------|--------------------|---------------------|
| Input Voltage | Input Voltage | Carrier Frequency | Measured Frequency | Meets Requirements? |
| 21 VDC | 100 VAC | 869.200 MHz | 869.200 MHz | Yes |
| 48 VDC | 170 VAC | 869.200 MHz | 869.200 MHz | Yes |
| 60 VDC | 240 VAC | 869.200 MHz | 869.200 MHz | Yes |
| 21 VDC | 100 VAC | 881.500 MHz | 881.500 MHz | Yes |
| 48 VDC | 170 VAC | 881.500 MHz | 881.500 MHz | Yes |
| 60 VDC | 240 VAC | 881.500 MHz | 881.500 MHz | Yes |
| 21 VDC | 100 VAC | 893.800 MHz | 893.800 MHz | Yes |
| 48 VDC | 170 VAC | 893.800 MHz | 893.800 MHz | Yes |
| 60 VDC | 240 VAC | 893.800 MHz | 893.800 MHz | Yes |
| Temperature | | Carrier Frequency | Measured Frequency | Meets Requirements? |
| | | | | |
| -30 Deg. C | | 869.200 MHz | 869.200 MHz | Yes |
| -20 Deg. C | | 869.200 MHz | 869.200 MHz | Yes |
| -10 Deg. C | | 869.200 MHz | 869.200 MHz | Yes |
| 0 Deg. C | | 869.200 MHz | 869.200 MHz | Yes |
| 10 Deg. C | | 869.200 MHz | 869.200 MHz | Yes |
| 20 Deg. C | | 869.200 MHz | 869.200 MHz | Yes |
| 30 Deg. C | | 869.200 MHz | 869.200 MHz | Yes |
| 40 Deg. C | | 869.200 MHz | 869.200 MHz | Yes |
| 50 Deg. C | | 869.200 MHz | 869.200 MHz | Yes |
| | | | | |
| -30 Deg. C | | 881.500 MHz | 881.500 MHz | Yes |
| -20 Deg. C | | 881.500 MHz | 881.500 MHz | Yes |
| -10 Deg. C | | 881.500 MHz | 881.500 MHz | Yes |
| 0 Deg. C | | 881.500 MHz | 881.500 MHz | Yes |
| 10 Deg. C | | 881.500 MHz | 881.500 MHz | Yes |
| 20 Deg. C | | 881.500 MHz | 881.500 MHz | Yes |
| 30 Deg. C | | 881.500 MHz | 881.500 MHz | Yes |
| 40 Deg. C | | 881.500 MHz | 881.500 MHz | Yes |
| 50 Deg. C | | 881.500 MHz | 881.500 MHz | Yes |
| | | | | |
| -30 Deg. C | | 893.800 MHz | 893.800 MHz | Yes |
| -20 Deg. C | | 893.800 MHz | 893.800 MHz | Yes |
| -10 Deg. C | | 893.800 MHz | 893.800 MHz | Yes |
| 0 Deg. C | | 893.800 MHz | 893.800 MHz | Yes |
| 10 Deg. C | | 893.800 MHz | 893.800 MHz | Yes |
| 20 Deg. C | | 893.800 MHz | 893.800 MHz | Yes |
| 30 Deg. C | | 893.800 MHz | 893.800 MHz | Yes |
| 40 Deg. C | | 893.800 MHz | 893.800 MHz | Yes |
| 50 Deg. C | | 893.800 MHz | 893.800 MHz | Yes |

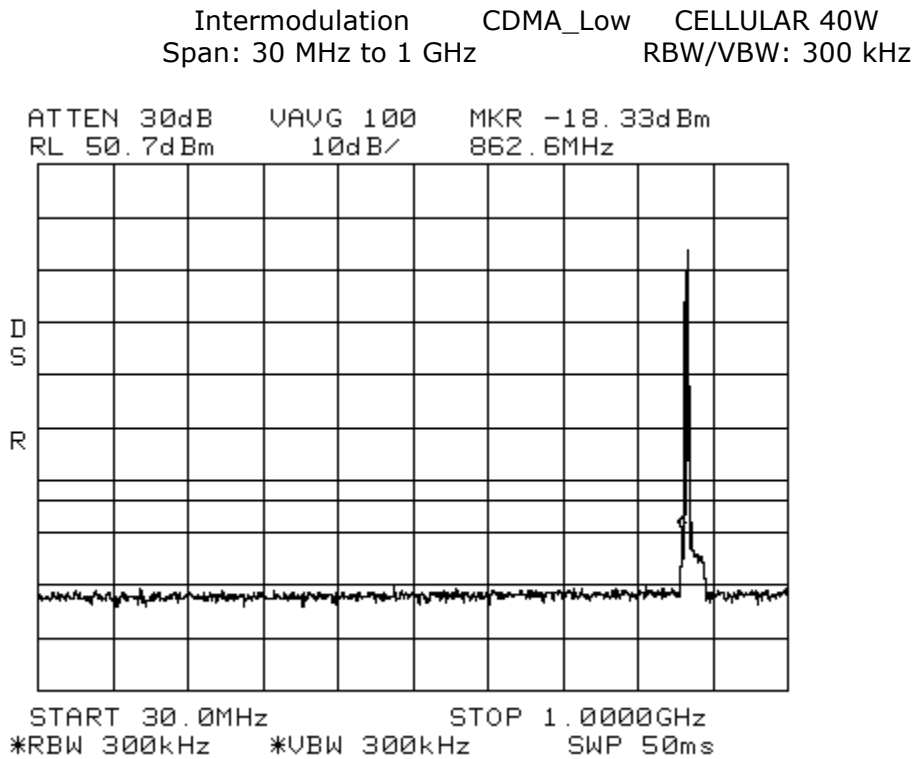
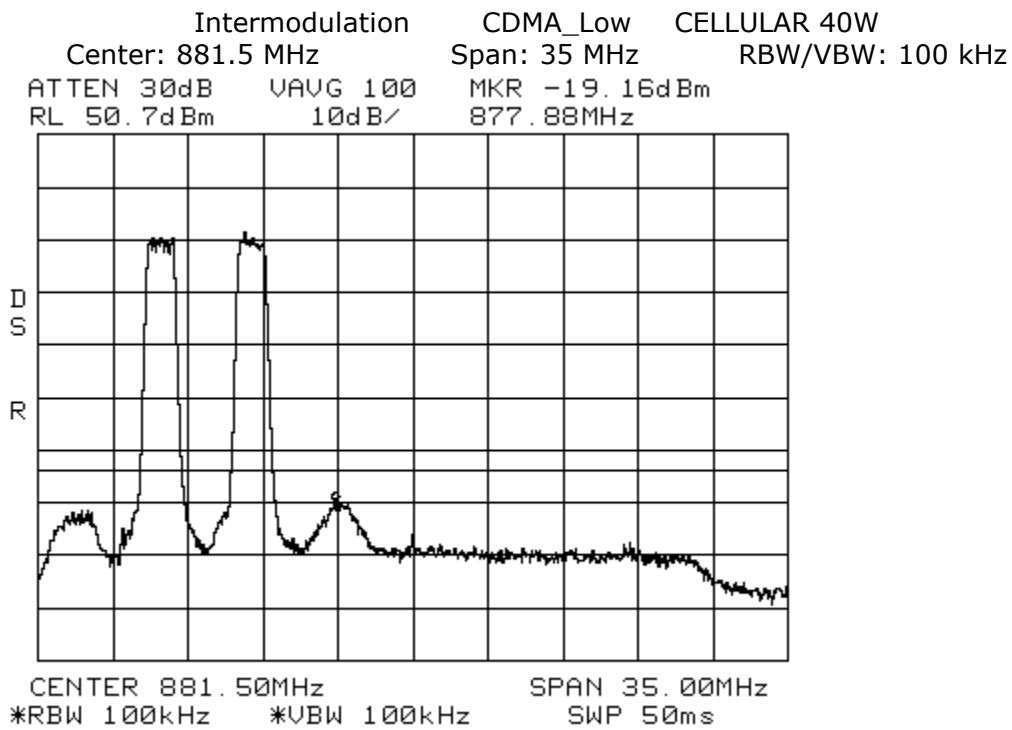
7.4 Intermodulation Test

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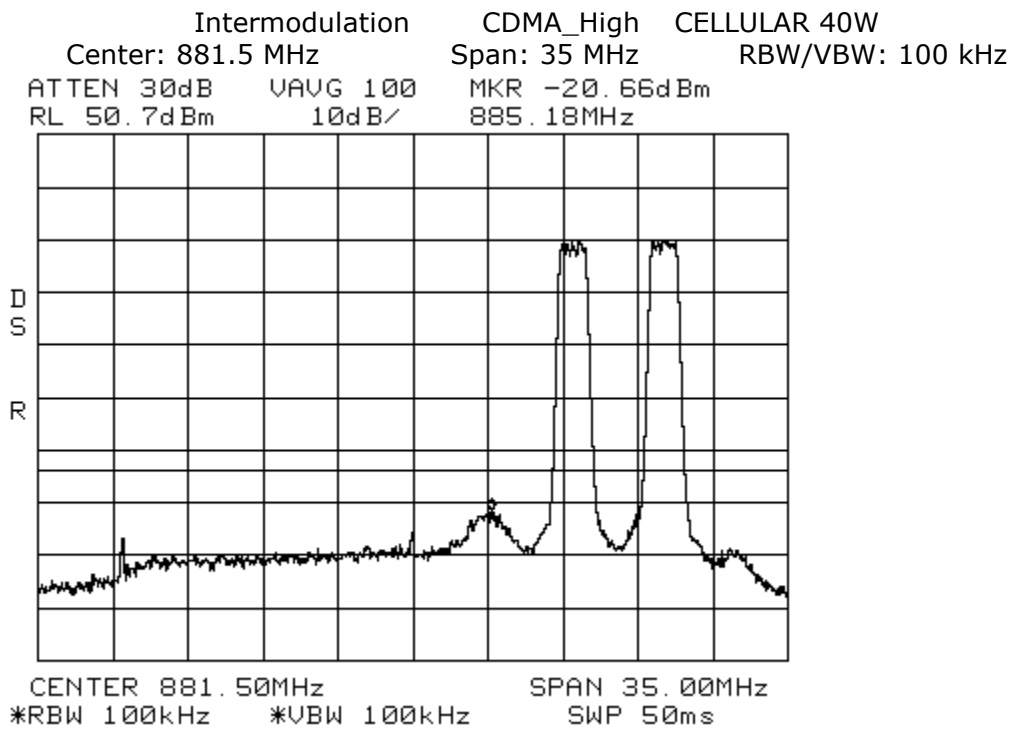
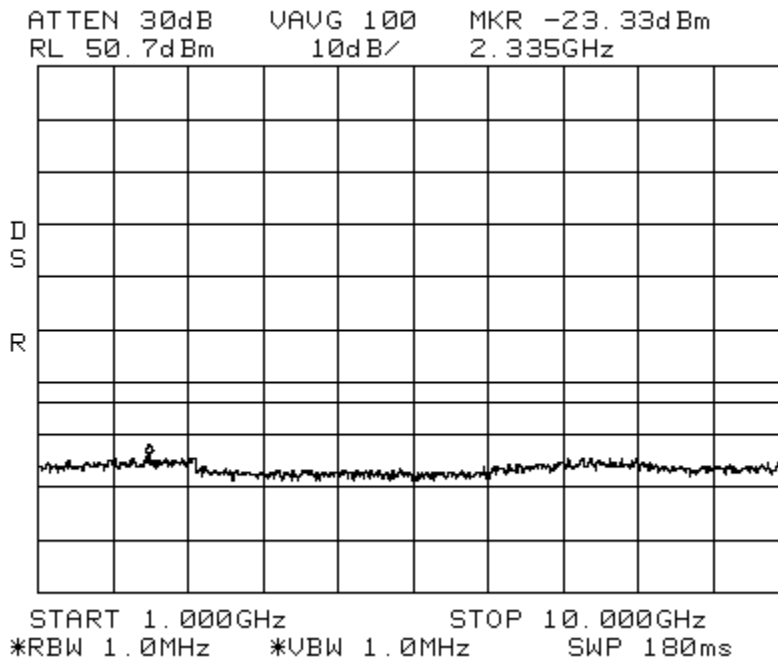
[Back to Emission Limits; Section 5.1.3](#)

The inter-modulation products test was performed for the EUT. One test was performed with the modulation type. 2 signals input to the EUT at lower end channels, and 1 signal input to the EUT at upper end channel. The modulation types tested were GSM, EDGE, CDMA, W-CDMA, LTE 3MHz BW, LTE 5 MHz BW, and LTE 10MHz BW. An investigation was made from 30 MHz to the 10th Harmonic of the highest fundamental frequency (~ 10 GHz). The following plots show the results.

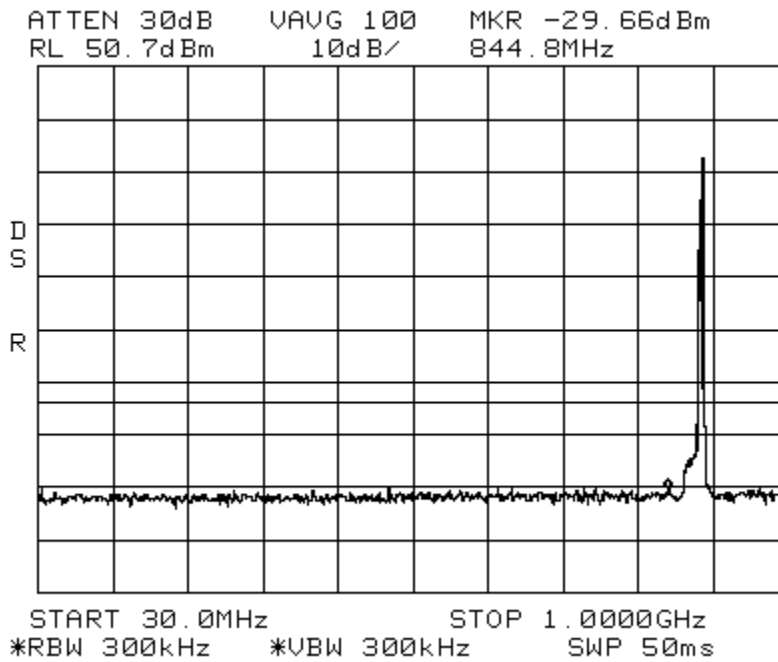
Results:
(See Plots)



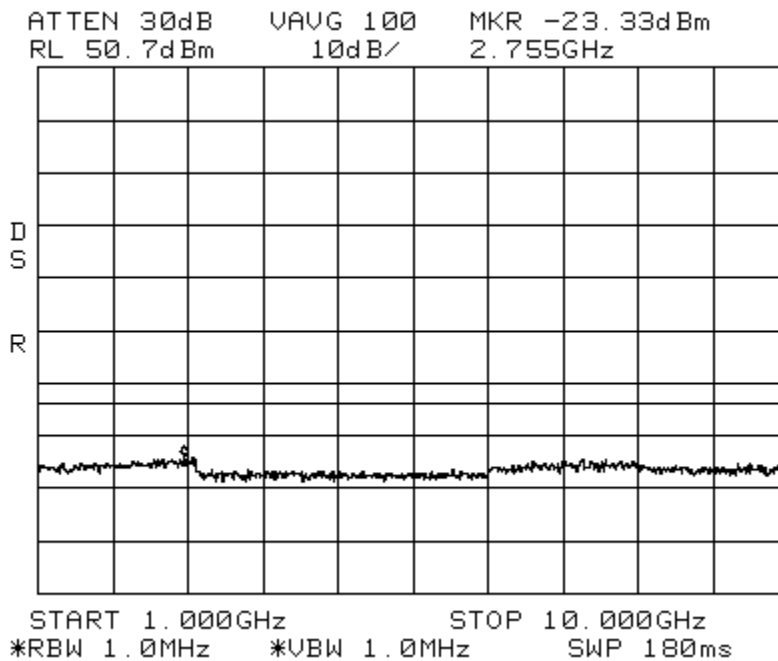
Intermodulation CDMA_Low CELLULAR 40W
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz

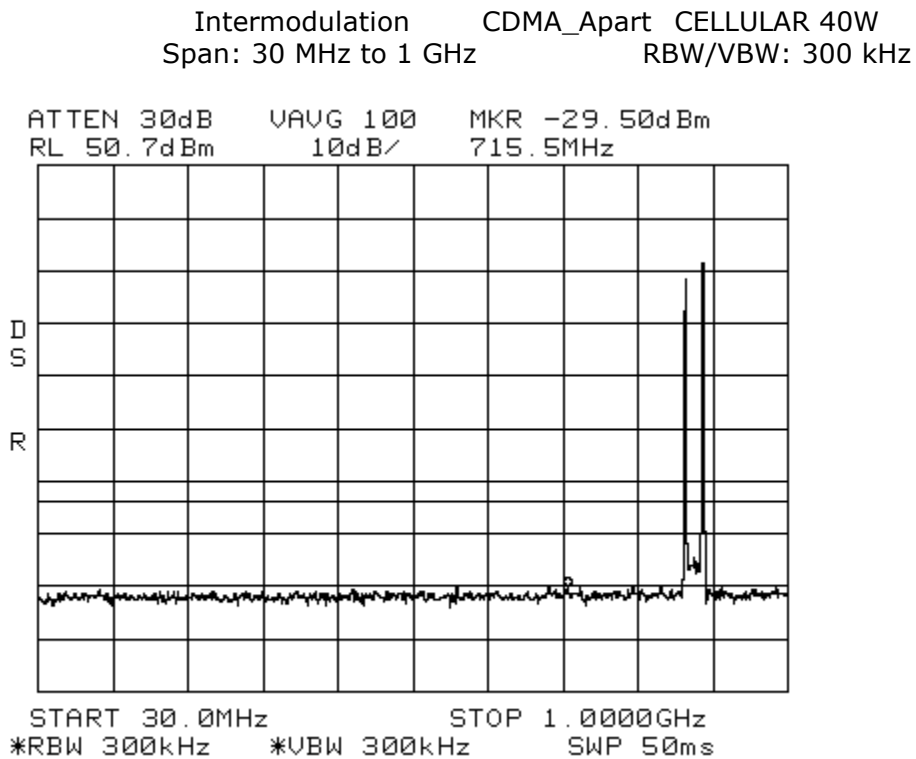
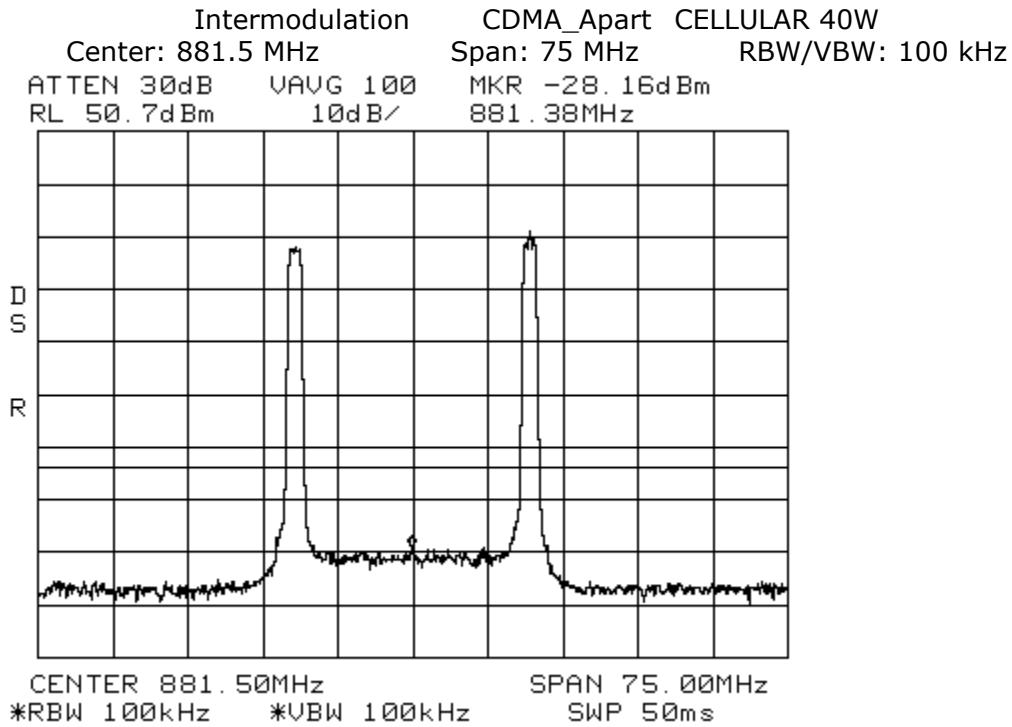


Intermodulation CDMA_High CELLULAR 40W
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz

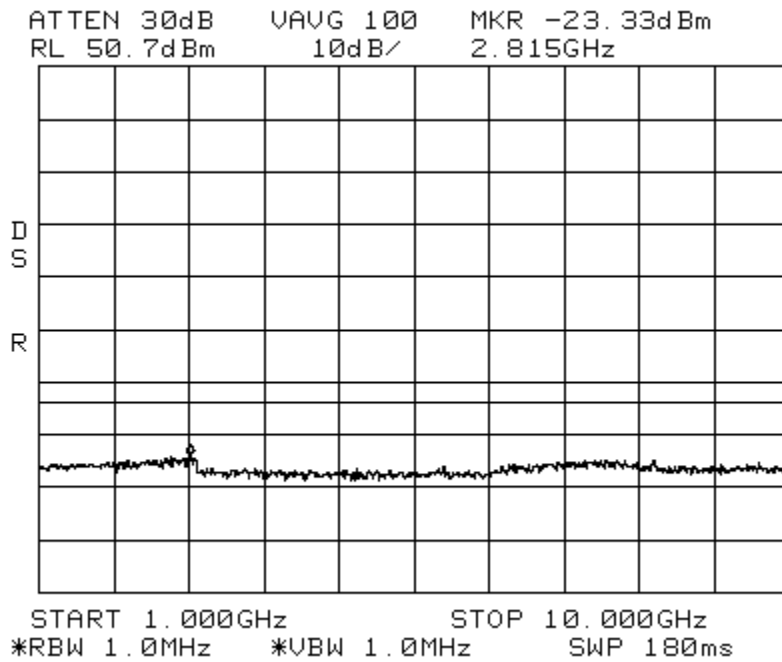


Intermodulation CDMA_High CELLULAR 40W
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz

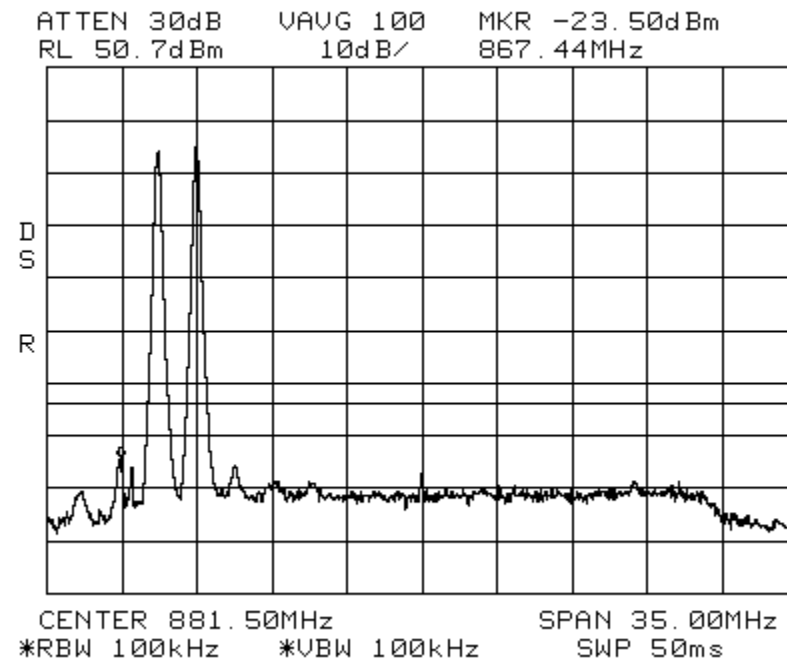




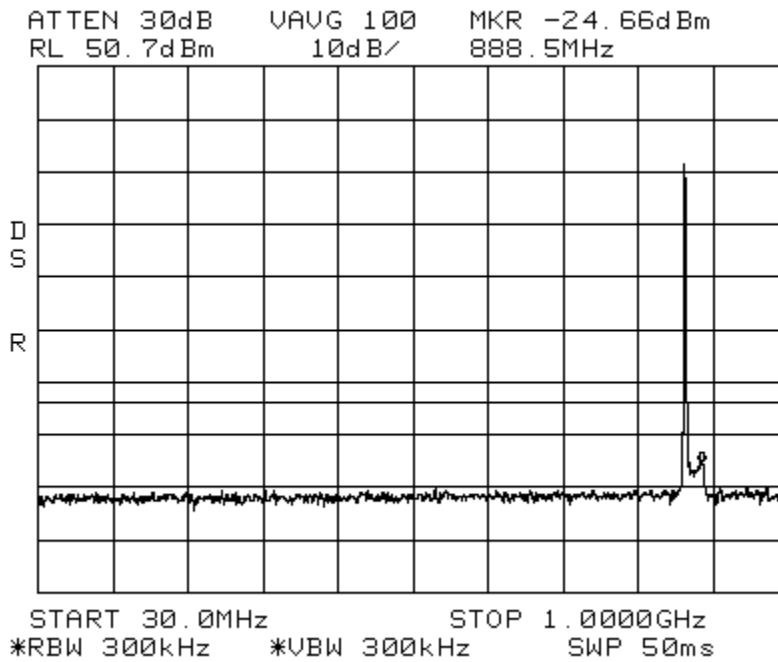
Intermodulation CDMA_Apart CELLULAR 40W
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



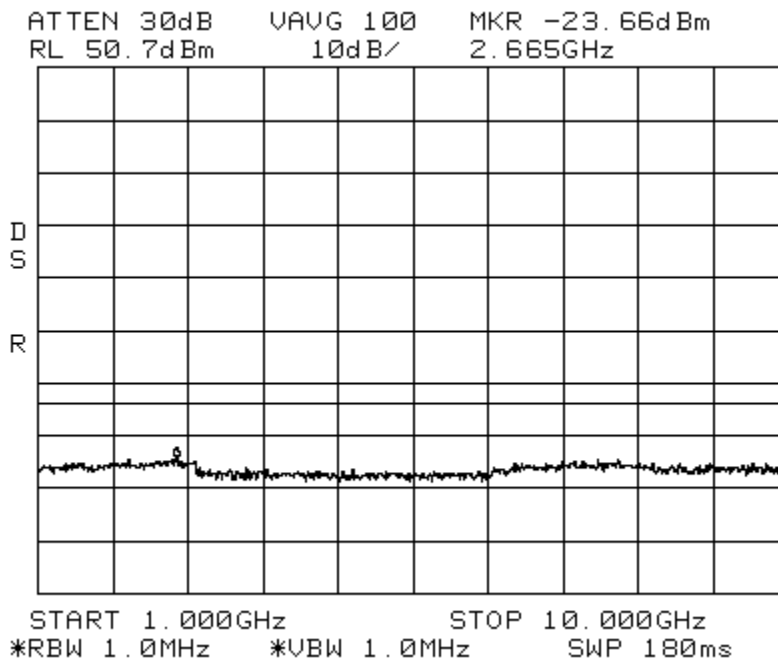
Intermodulation EDGE_Low CELLULAR 40 W
Center: 881.5 MHz Span: 35 MHz RBW/VBW: 100 kHz



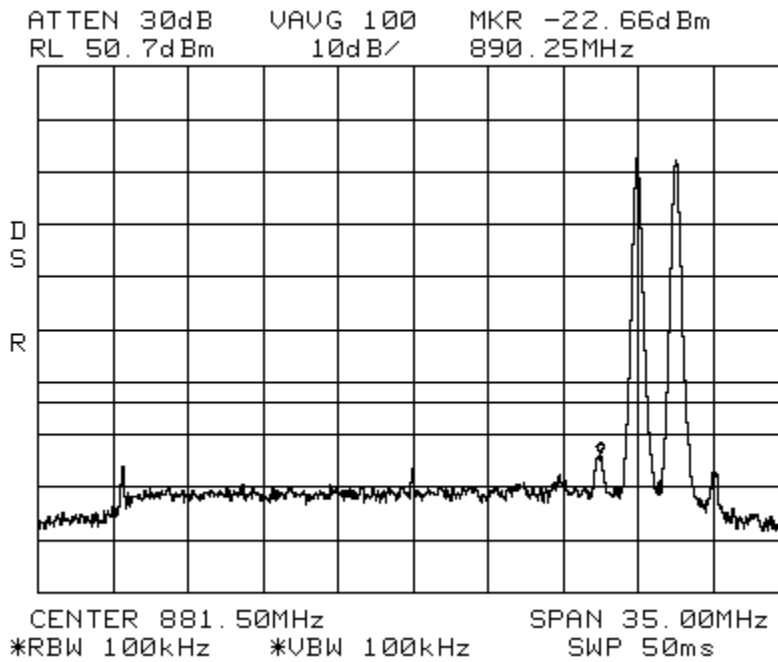
Intermodulation EDGE_Low CELLULAR 40 W
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



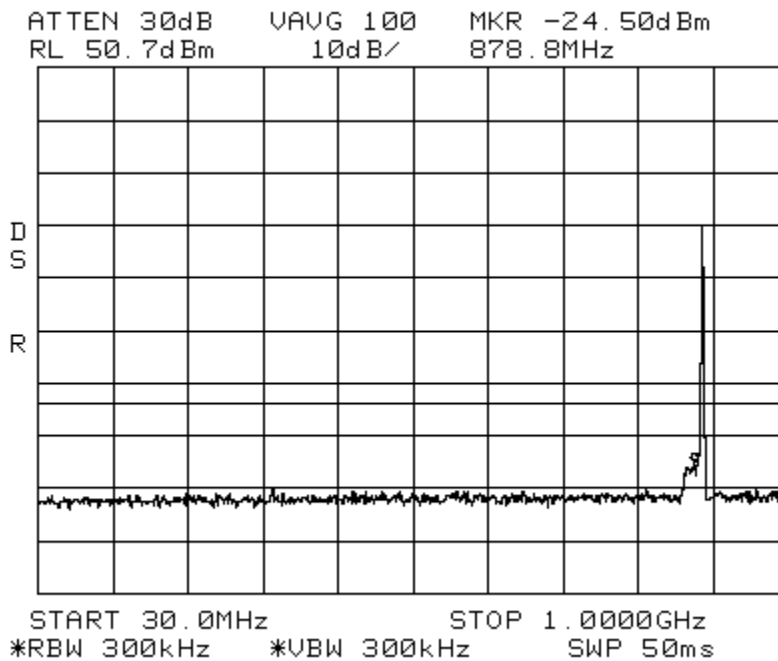
Intermodulation EDGE_Low CELLULAR 40 W
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



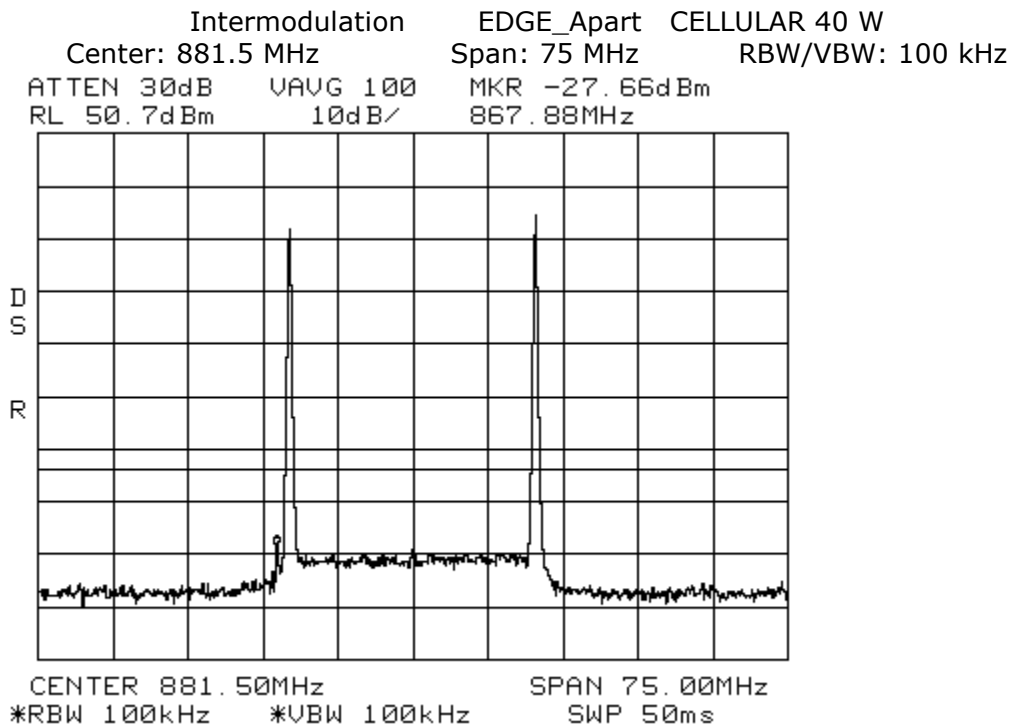
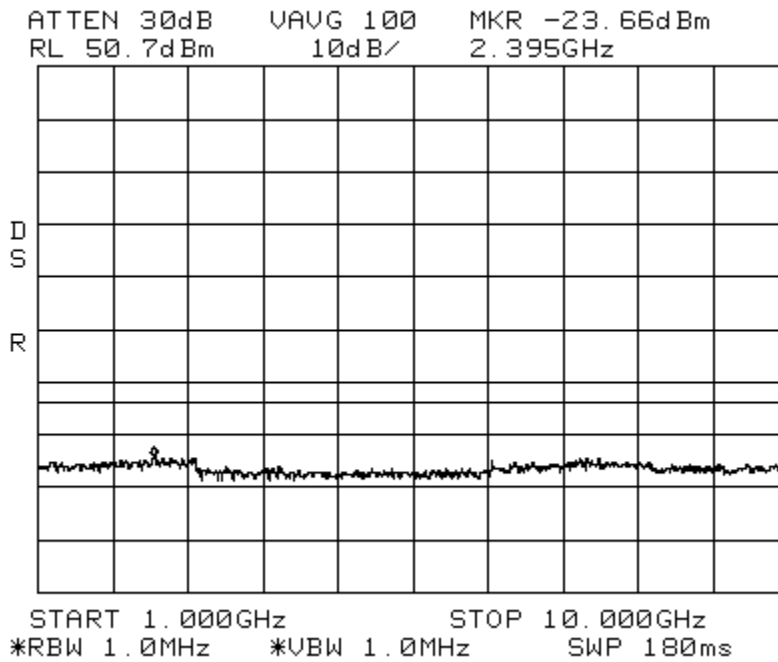
Intermodulation EDGE_High CELLULAR 40 W
Center: 881.5 MHz Span: 35 MHz RBW/VBW: 100 kHz



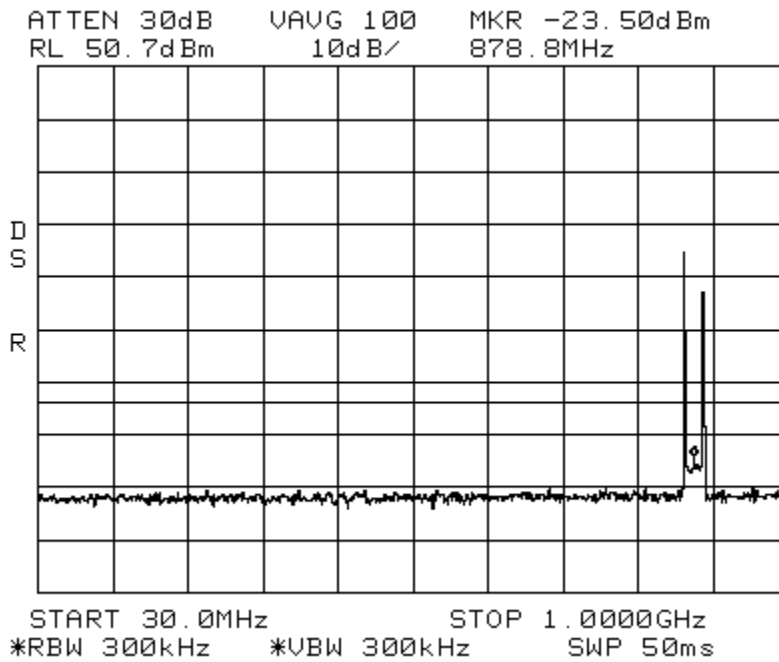
Intermodulation EDGE_High CELLULAR 40 W
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



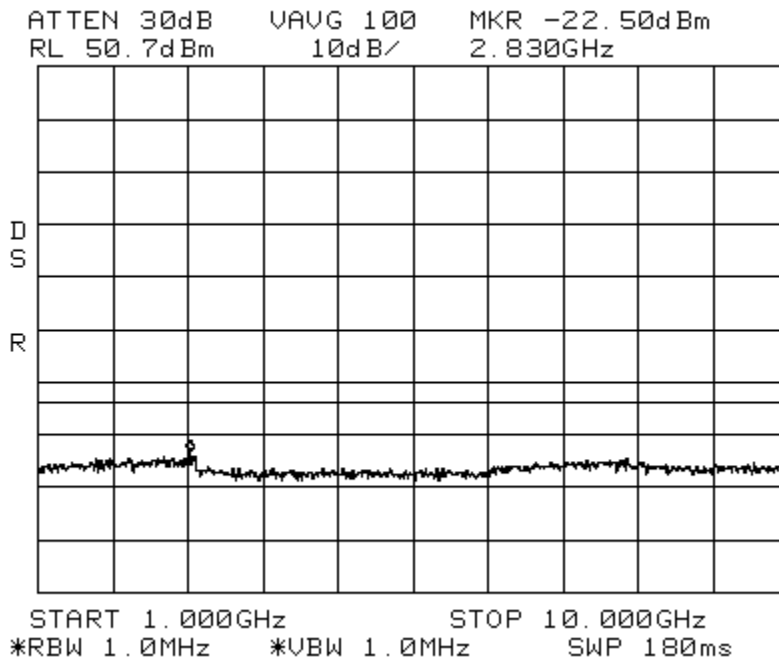
Intermodulation EDGE_High CELLULAR 40 W
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz

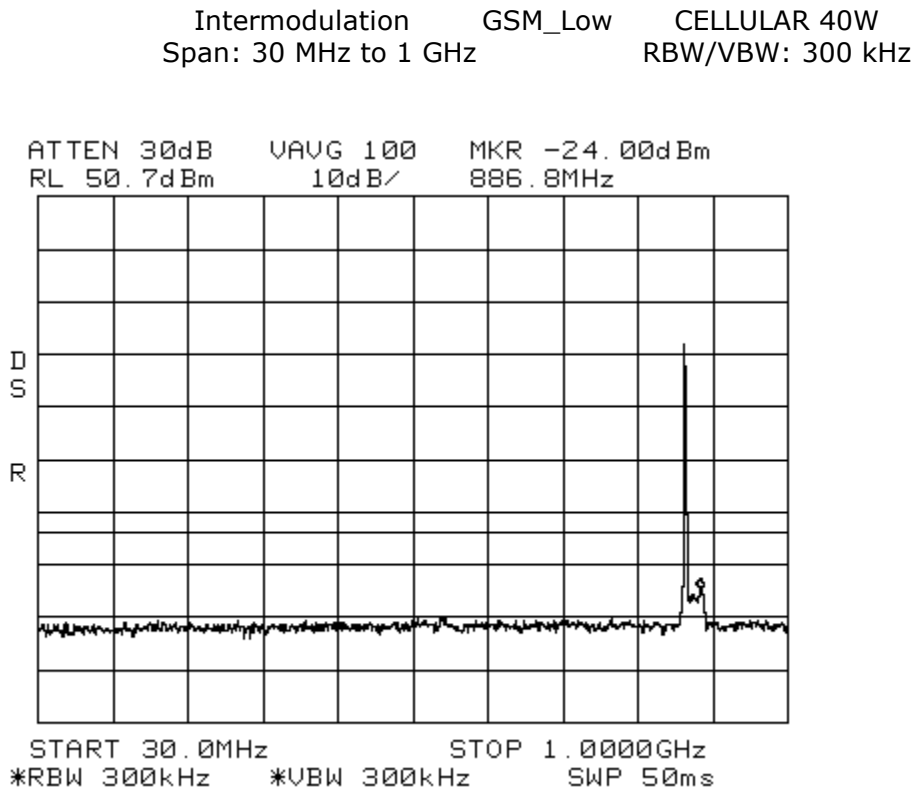
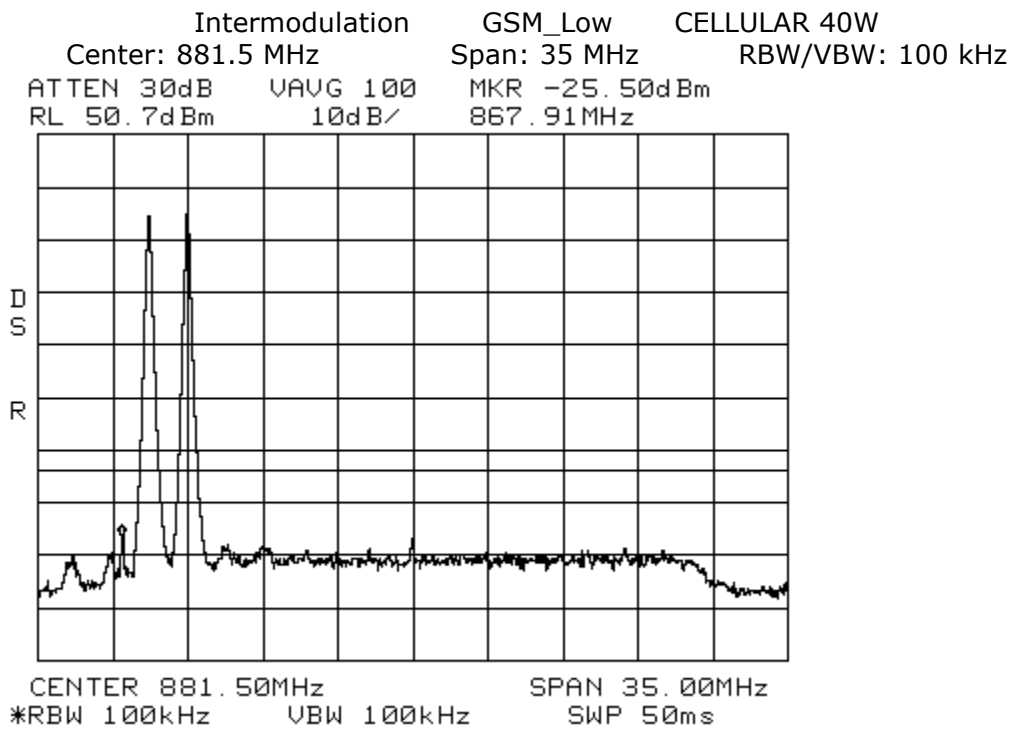


Intermodulation EDGE_Apart CELLULAR 40 W
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz

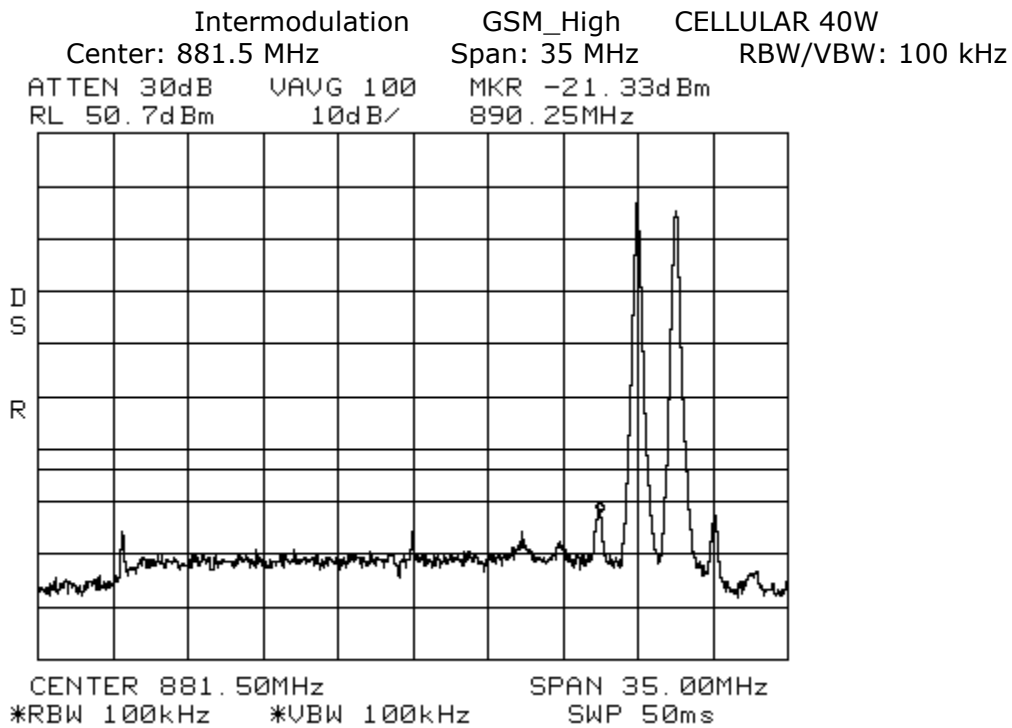
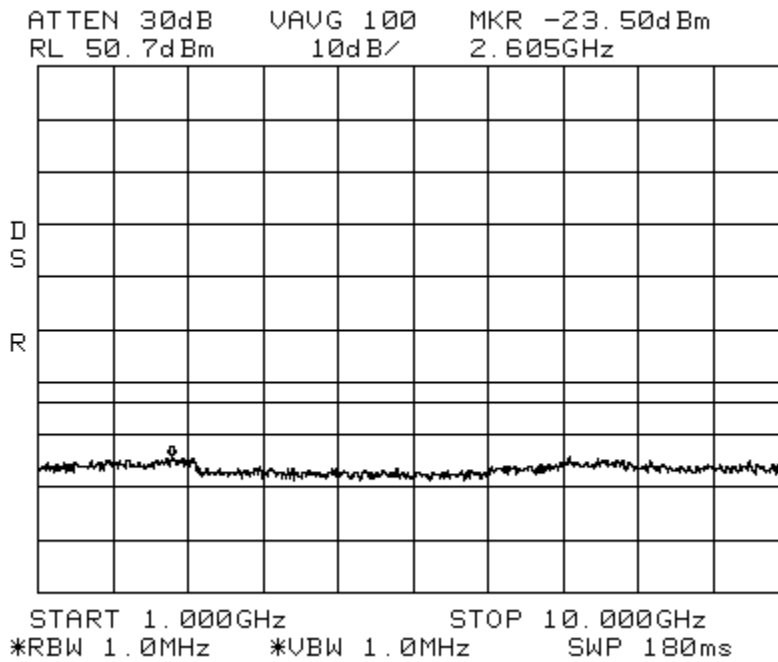


Intermodulation EDGE_Apart CELLULAR 40 W
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz

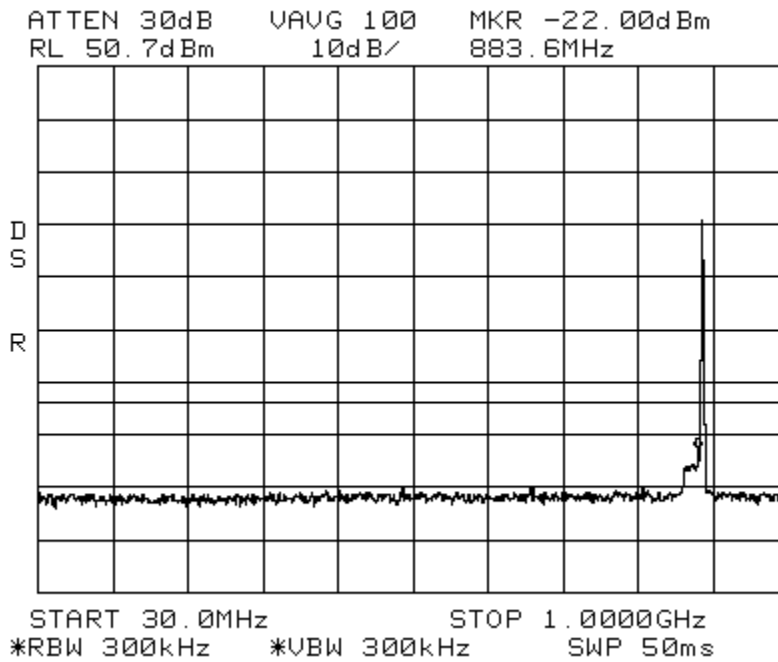




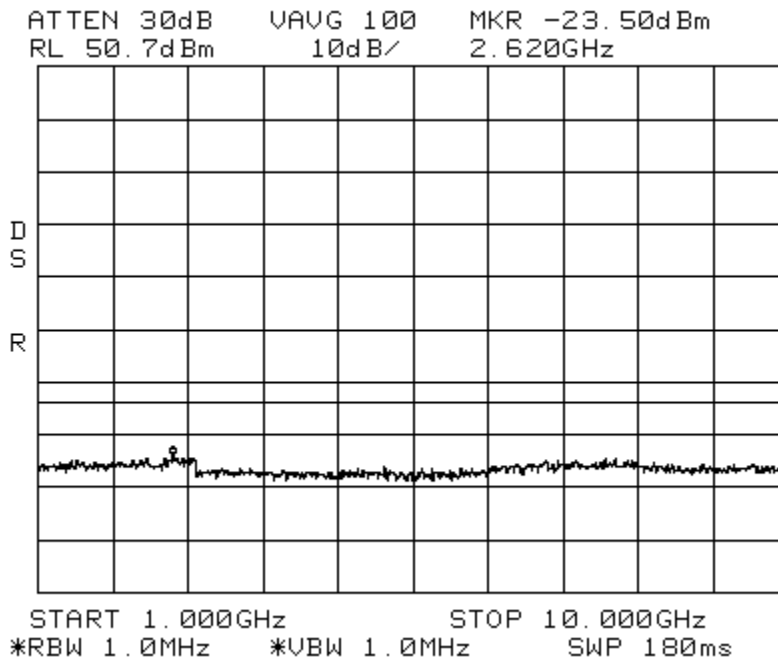
Intermodulation GSM_Low CELLULAR 40W
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz

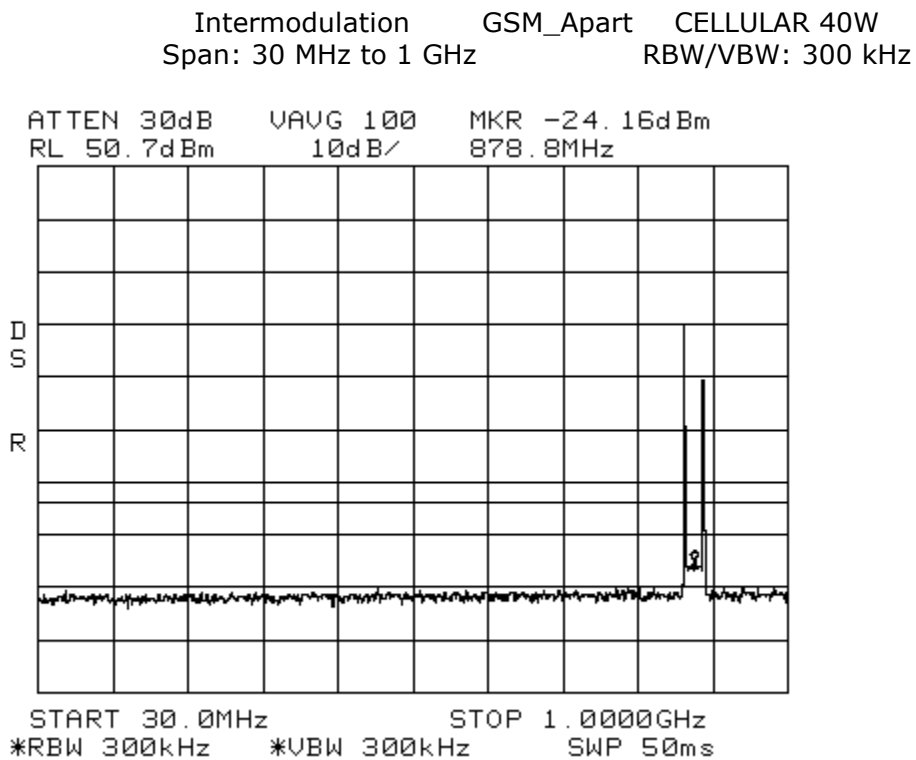
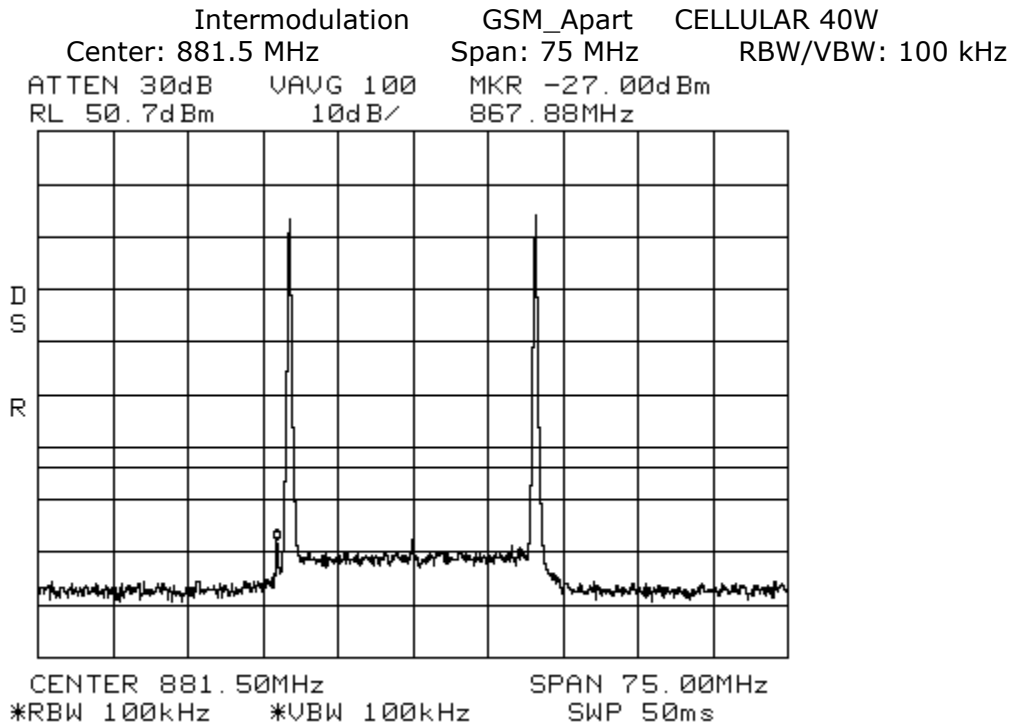


Intermodulation GSM_High CELLULAR 40W
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz

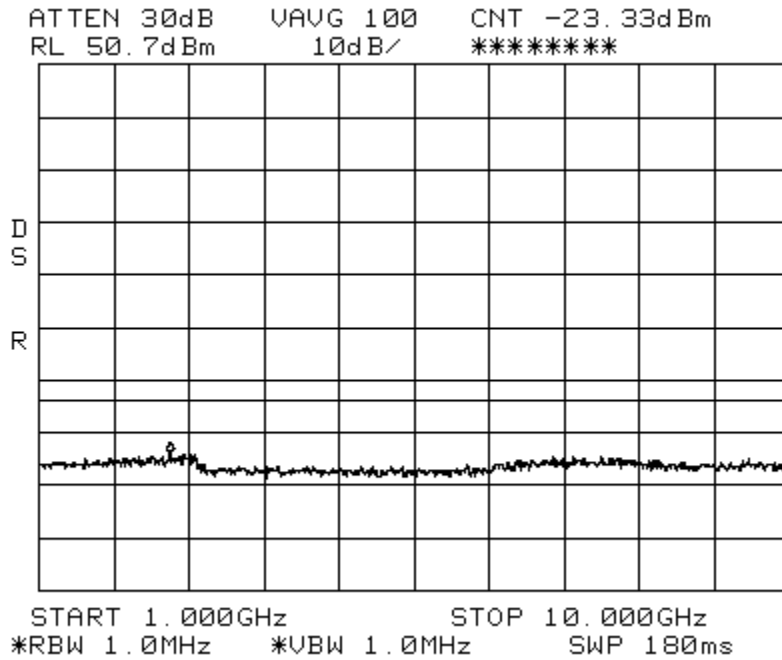


Intermodulation GSM_High CELLULAR 40W
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz

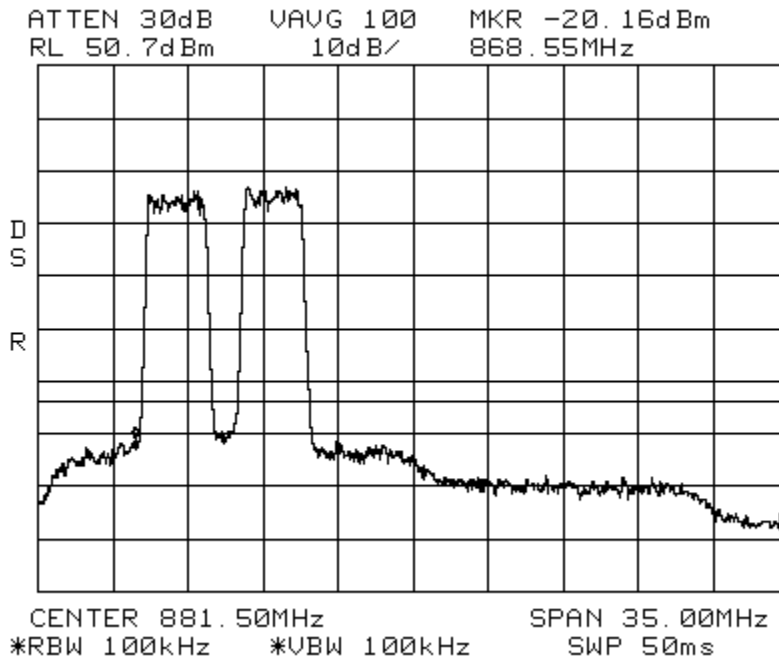




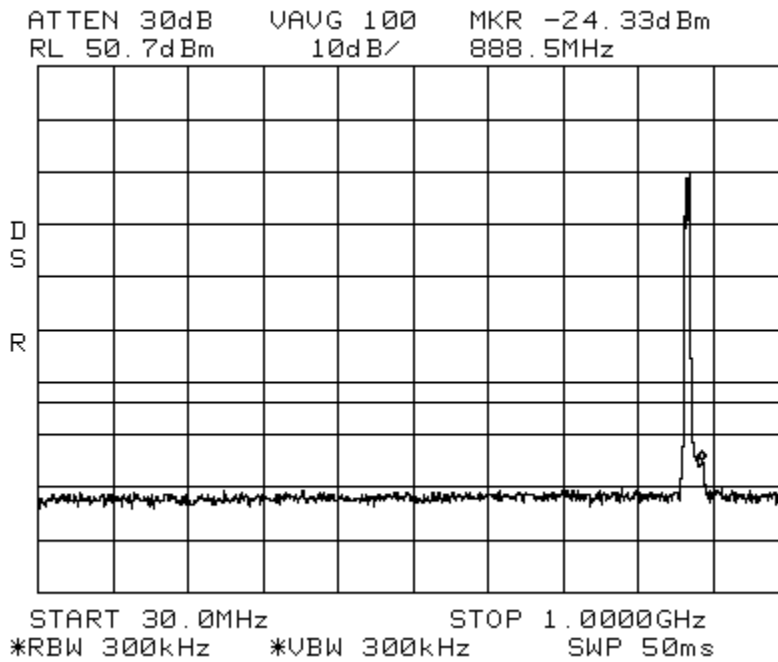
Intermodulation GSM_Apart CELLULAR 40W
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



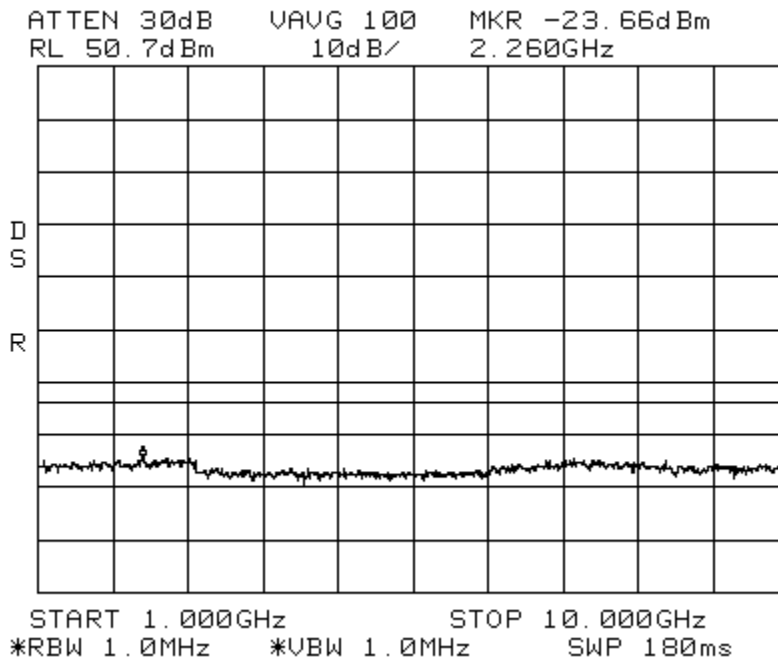
Intermodulation LTE 3 MHz Channel Bandwidth_Low CELL 40W
Center: 881.5 MHz Span: 35 MHz RBW/VBW: 100 kHz



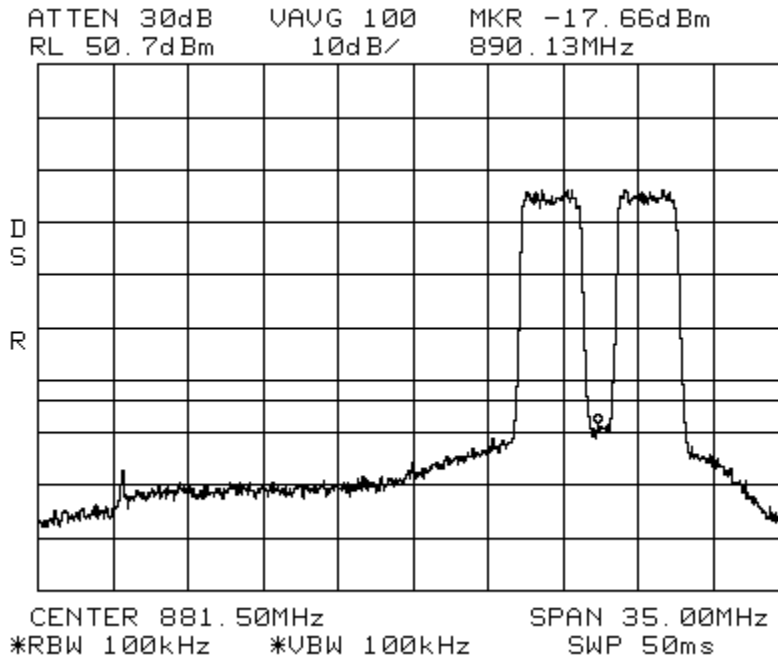
Intermodulation LTE 3MHz Channel Bandwidth _Low CELL 40W
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



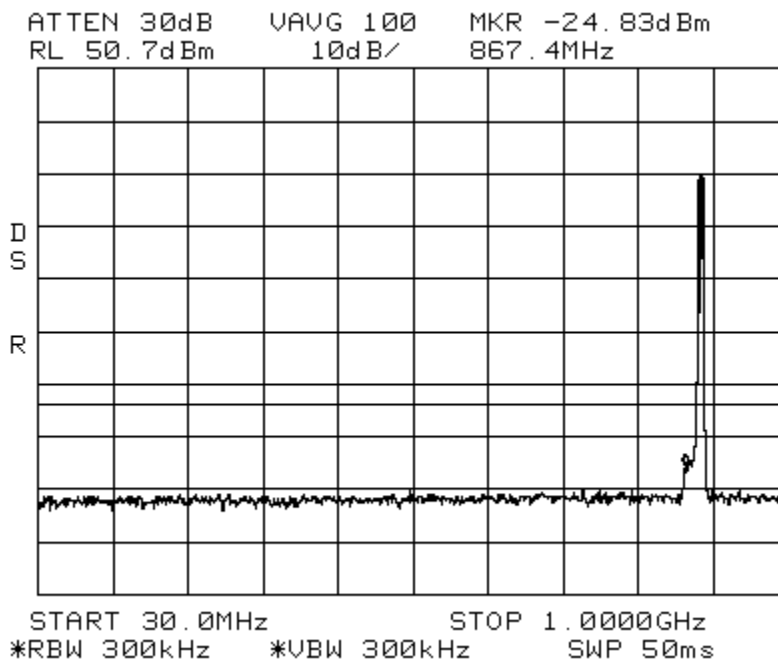
Intermodulation LTE 3 MHz Channel Bandwidth _Low CELL 40W
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



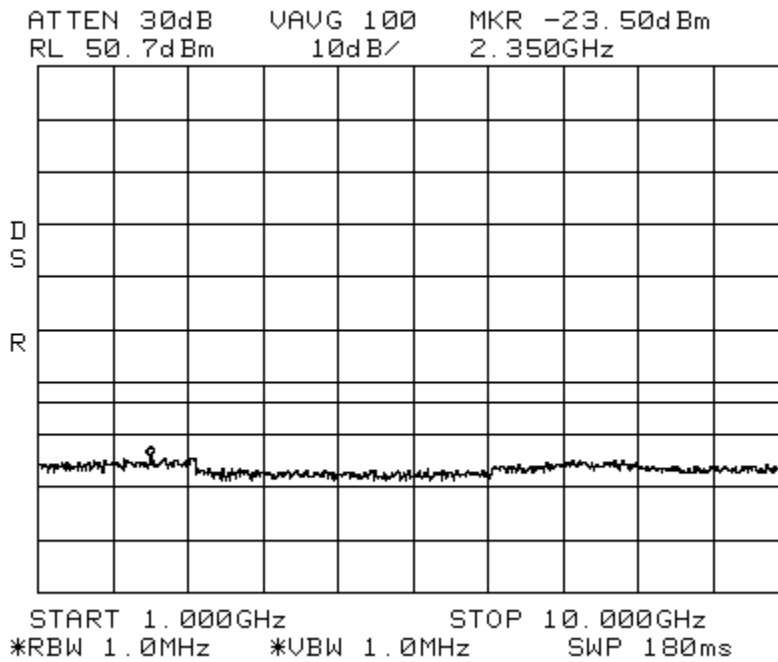
Intermodulation LTE 3 MHz Channel Bandwidth _High CELL 40W
Center: 881.5 MHz Span: 35 MHz RBW/VBW: 100 kHz



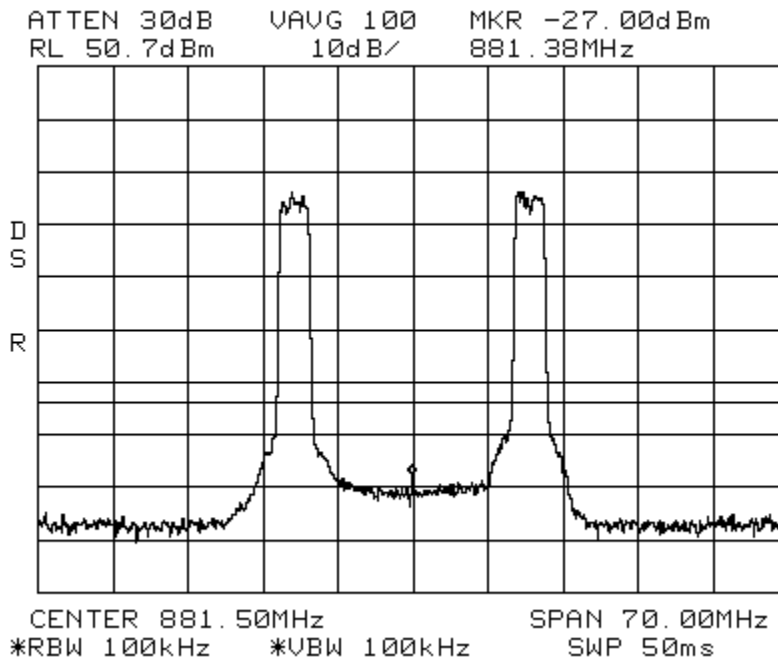
Intermodulation LTE 3 MHz Channel Bandwidth _High CELL 40W
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



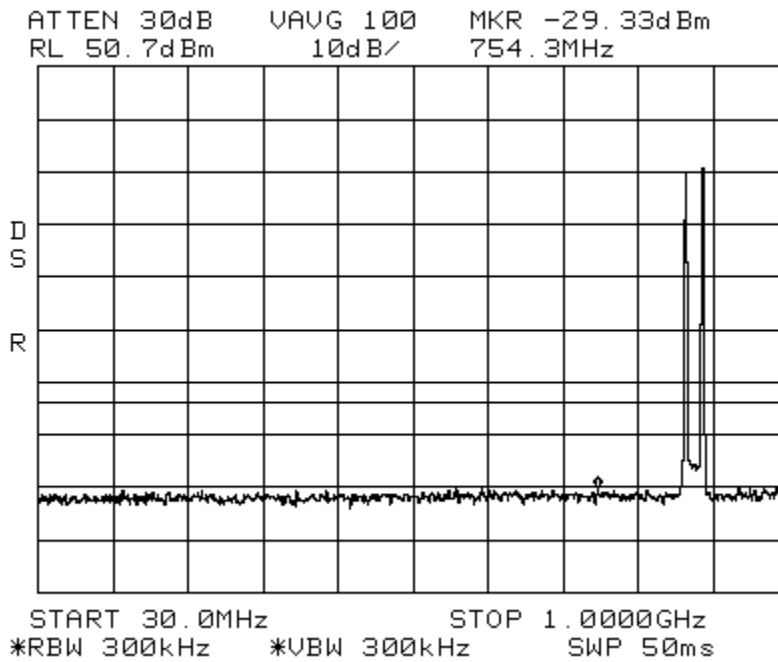
Intermodulation LTE 3 MHz Channel Bandwidth _High CELL 40W
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



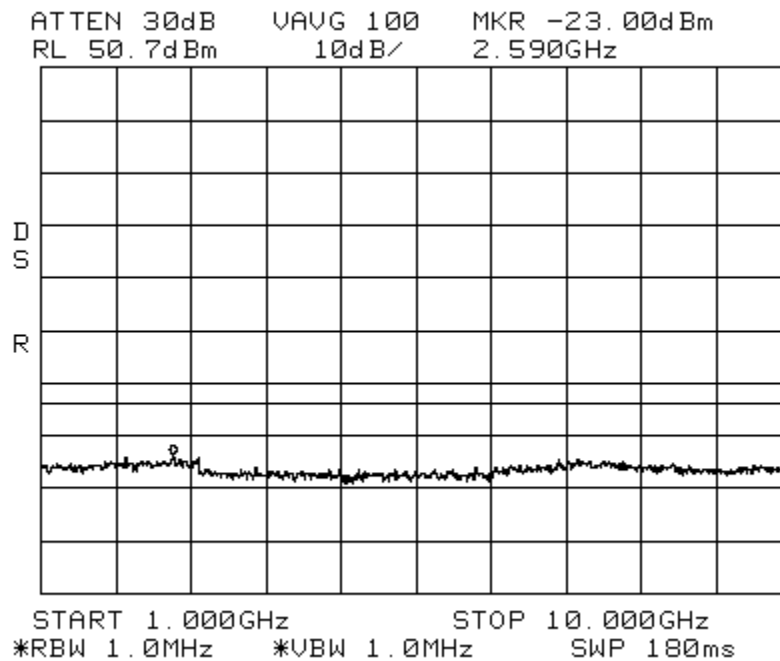
Intermodulation LTE 3 MHz Channel Bandwidth _Apart CELL 40W
Center: 881.5 MHz Span: 70 MHz RBW/VBW: 100 kHz



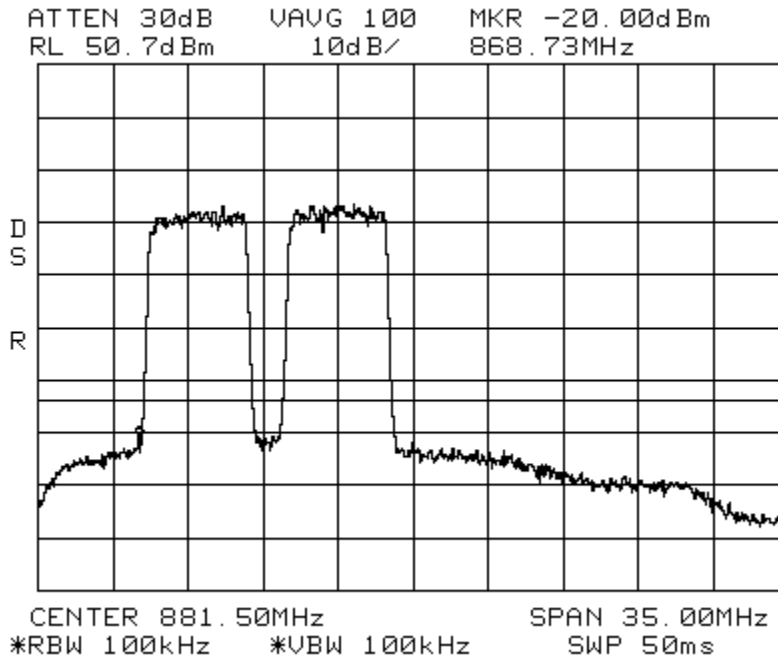
Intermodulation LTE 3 MHz Channel Bandwidth _Apart CELL 40W
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



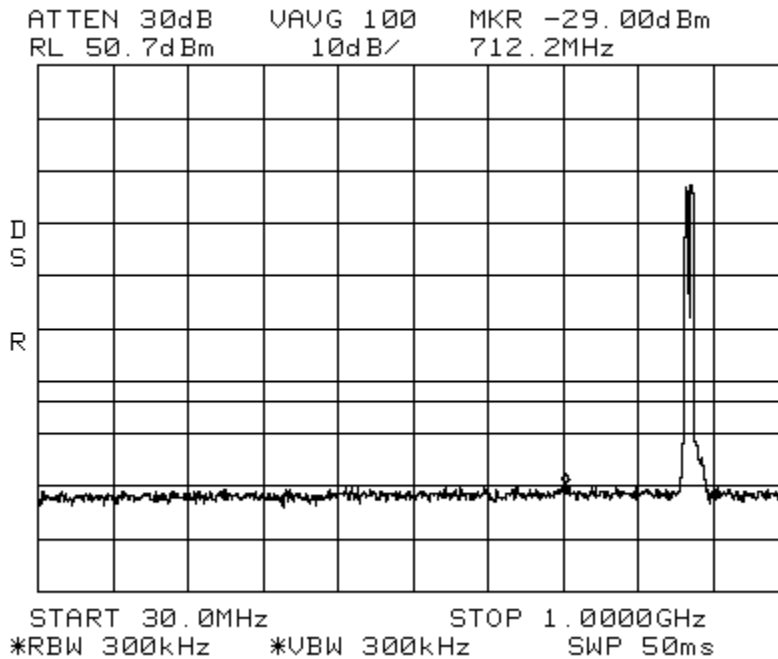
Intermodulation LTE 3 MHz Channel Bandwidth _Apart CELL 40W
 Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



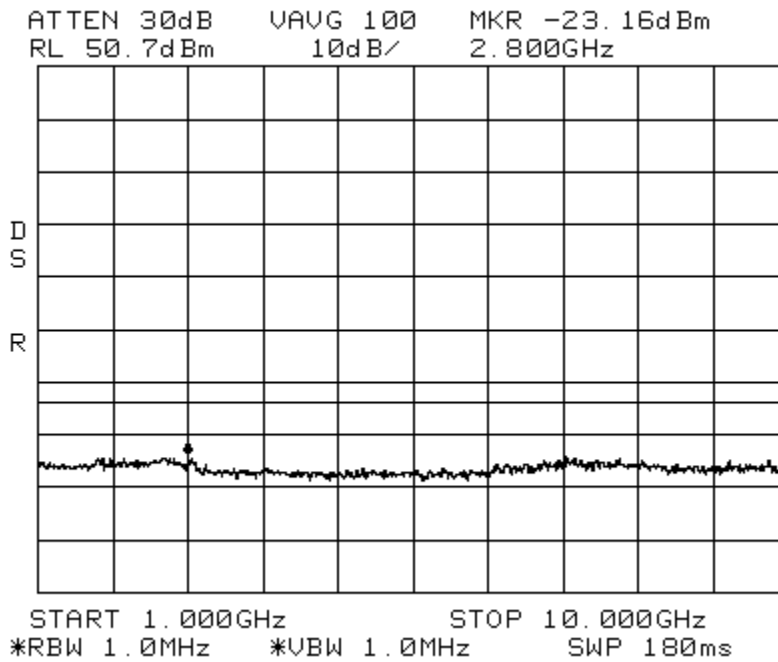
Intermodulation LTE 5 MHz Channel Bandwidth **_Low** CELL 40W
Center: 881.5 MHz Span: 35 MHz RBW/VBW: 100 kHz



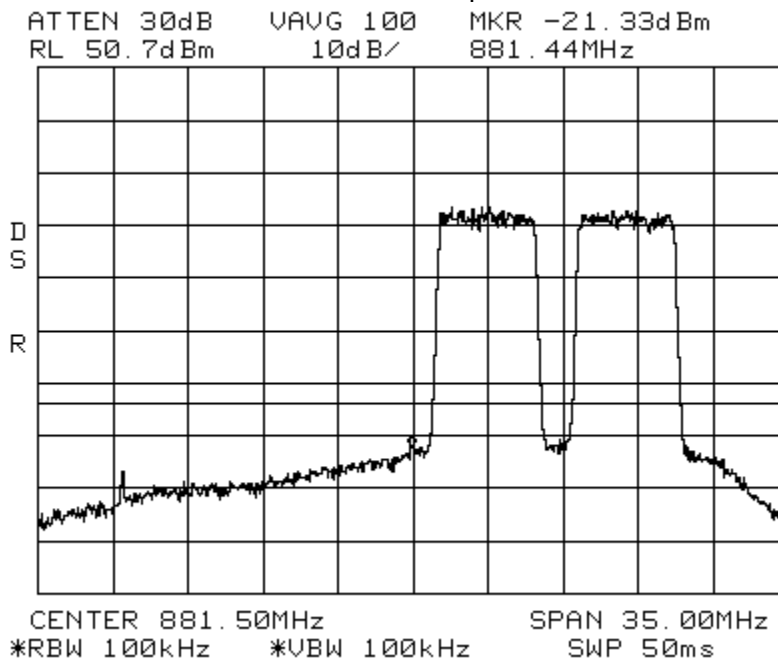
Intermodulation LTE 5 MHz Channel Bandwidth **_Low** CELL 40W
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



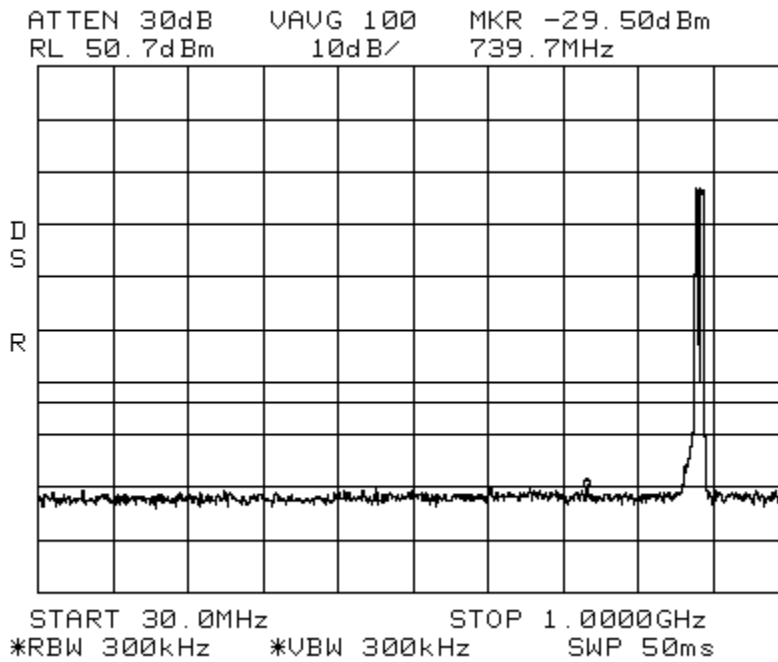
Intermodulation LTE 5 MHz Channel Bandwidth _Low CELL 40W
 Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



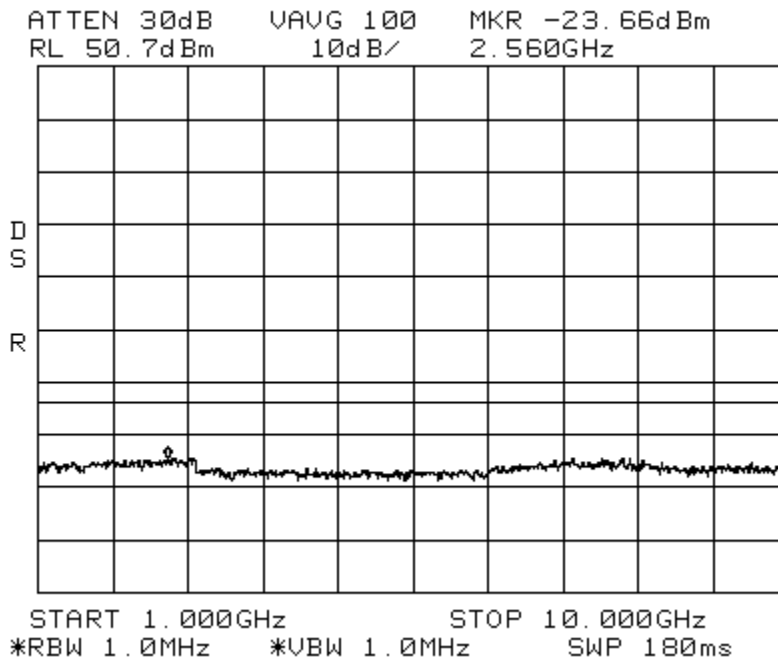
Intermodulation LTE 5 MHz Channel Bandwidth _High CELL 40W
 Center: 881.5 MHz Span: 35 MHz RBW/VBW: 100 kHz



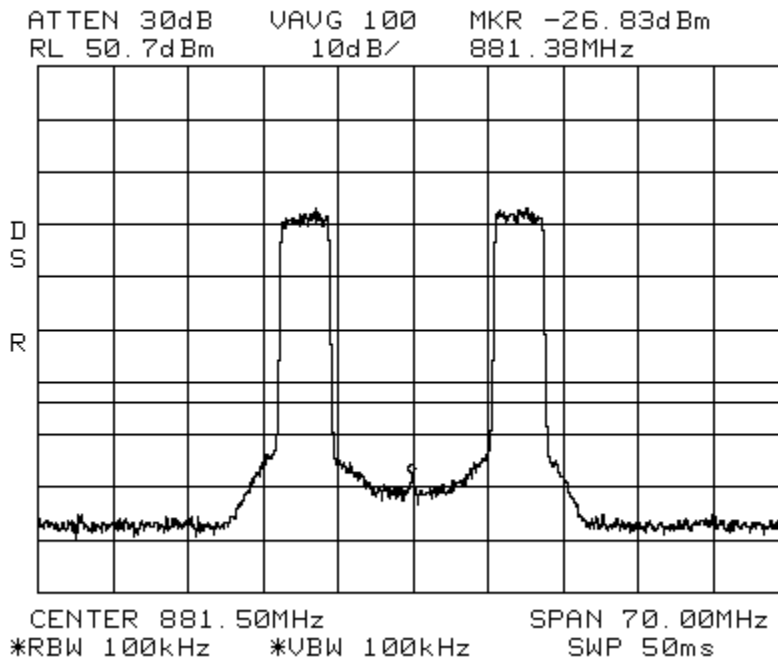
Intermodulation LTE 5 MHz Channel Bandwidth _High CELL 40W
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



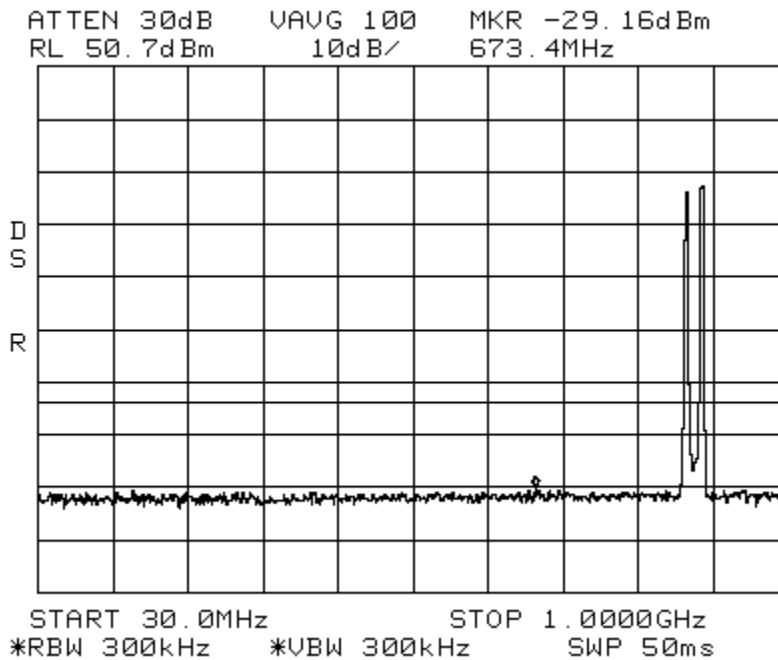
Intermodulation LTE 5 MHz Channel Bandwidth _High CELL 40W
 Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



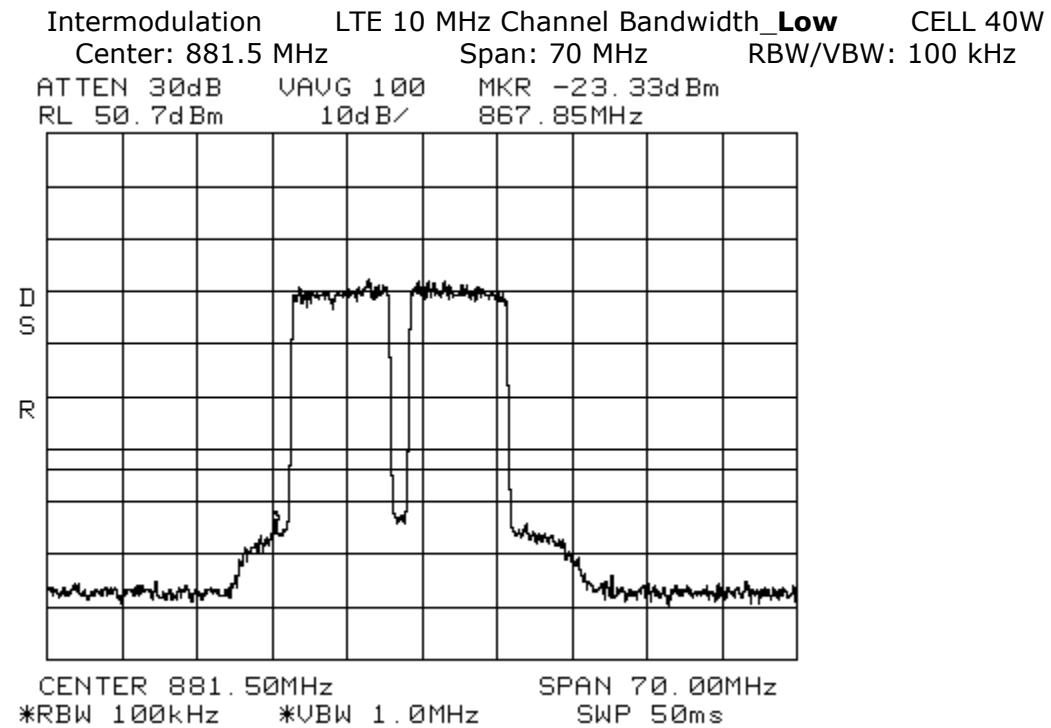
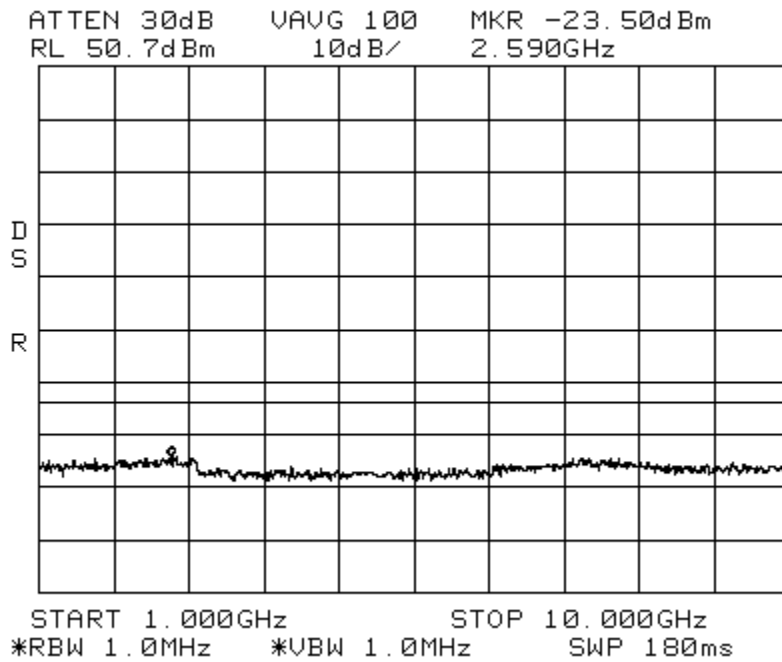
Intermodulation LTE 5 MHz Channel Bandwidth _Apart CELL 40W
Center: 881.5 MHz Span: 70 MHz RBW/VBW: 100 kHz



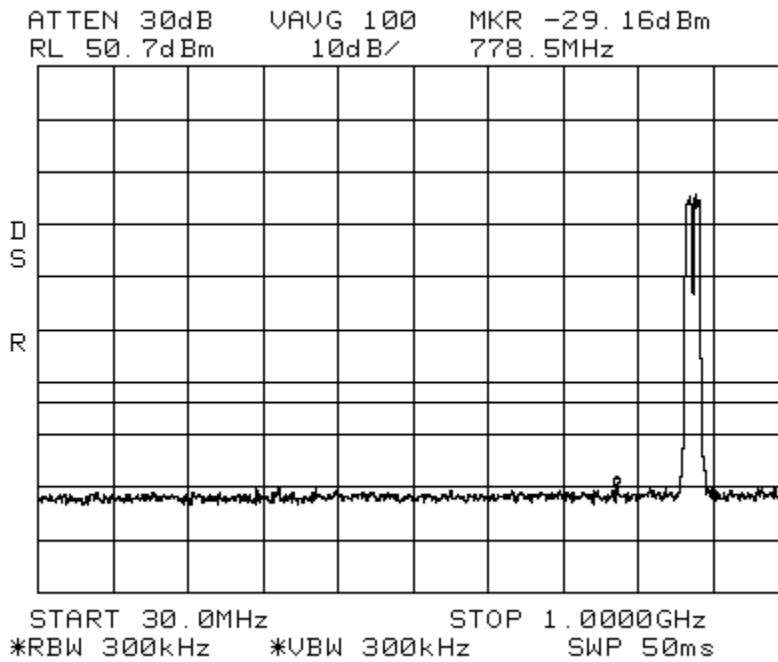
Intermodulation LTE 5 MHz Channel Bandwidth _Apart CELL 40W
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



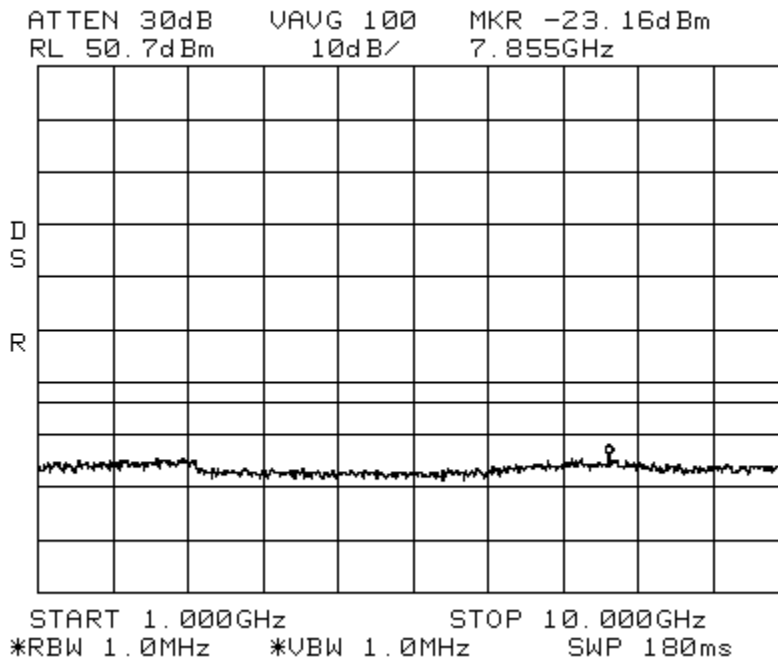
Intermodulation LTE 5 MHz Channel Bandwidth _Apart CELL 40W
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



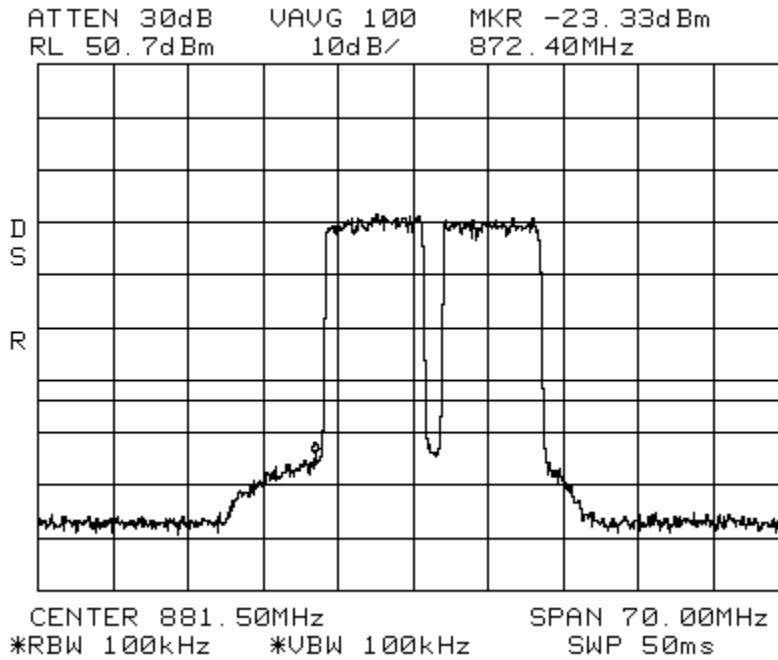
Intermodulation LTE 10 MHz Channel Bandwidth _Low CELL 40W
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



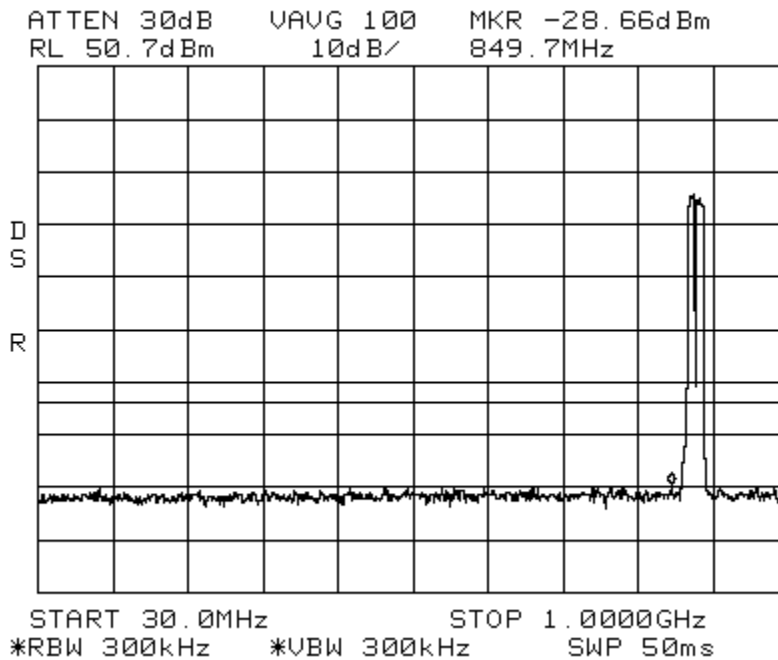
Intermodulation LTE 10 MHz Channel Bandwidth _Low CELL 40W
 Span: 1 GHz to 10GHz RBW/VBW: 1 MHz



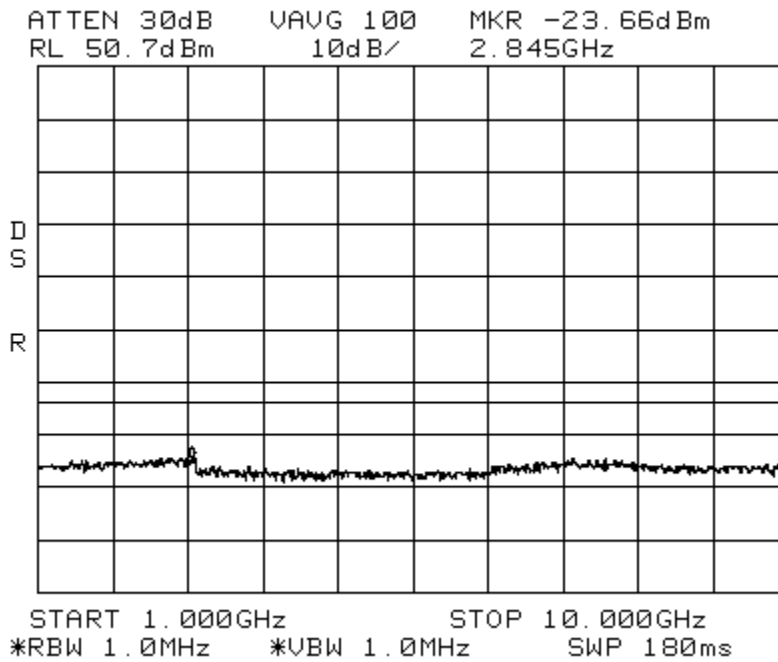
Intermodulation LTE 10 MHz Channel Bandwidth _High CELL 40W
Center: 881.5 MHz Span: 70 MHz RBW/VBW: 100 kHz



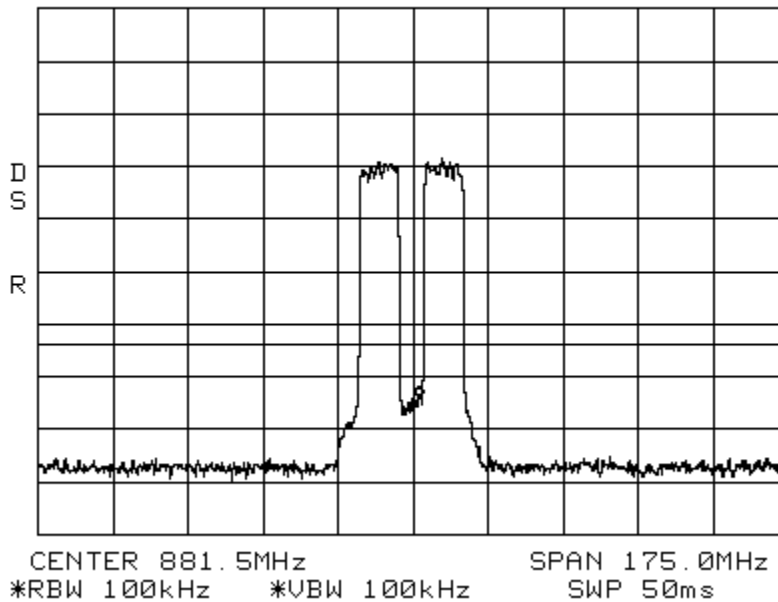
Intermodulation LTE 10 MHz Channel Bandwidth _High CELL 40W
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



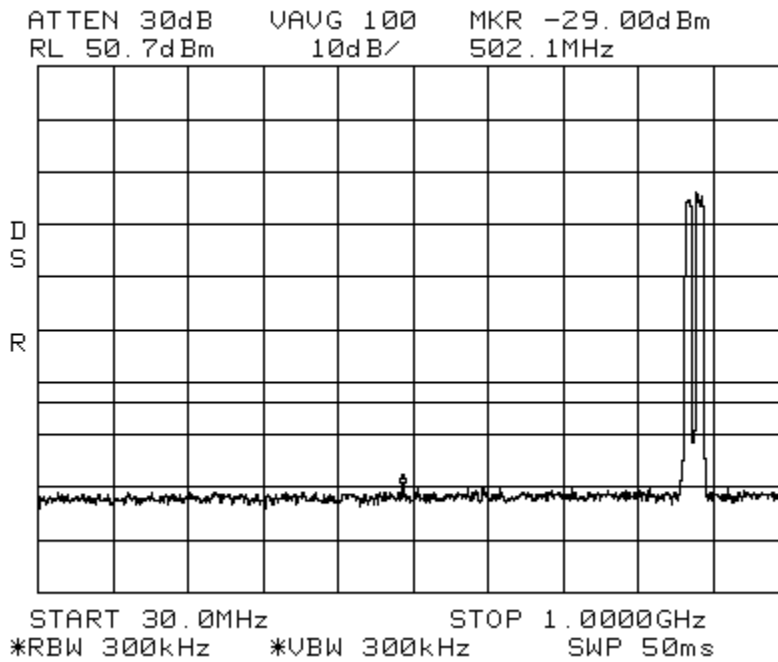
Intermodulation LTE 10 MHz Channel Bandwidth _High CELL 40W
 Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



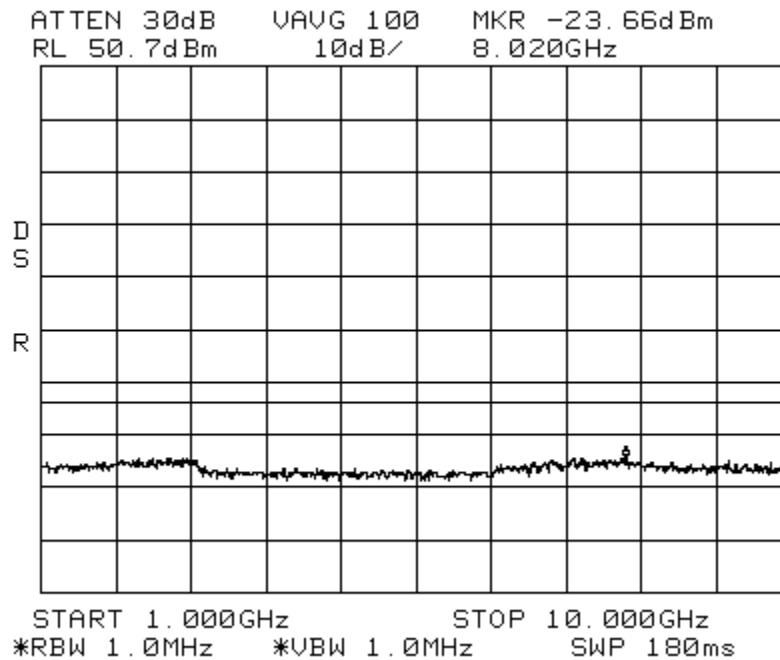
Intermodulation LTE 10 MHz Channel Bandwidth _Apart CELL 40W
 Center: 881.5 MHz Span: 175 MHz RBW/VBW: 100 kHz
 ATTEN 30dB VAVG 100 MKR -23.16dBm
 RL 50.7dBm 10dB/ 883.0MHz

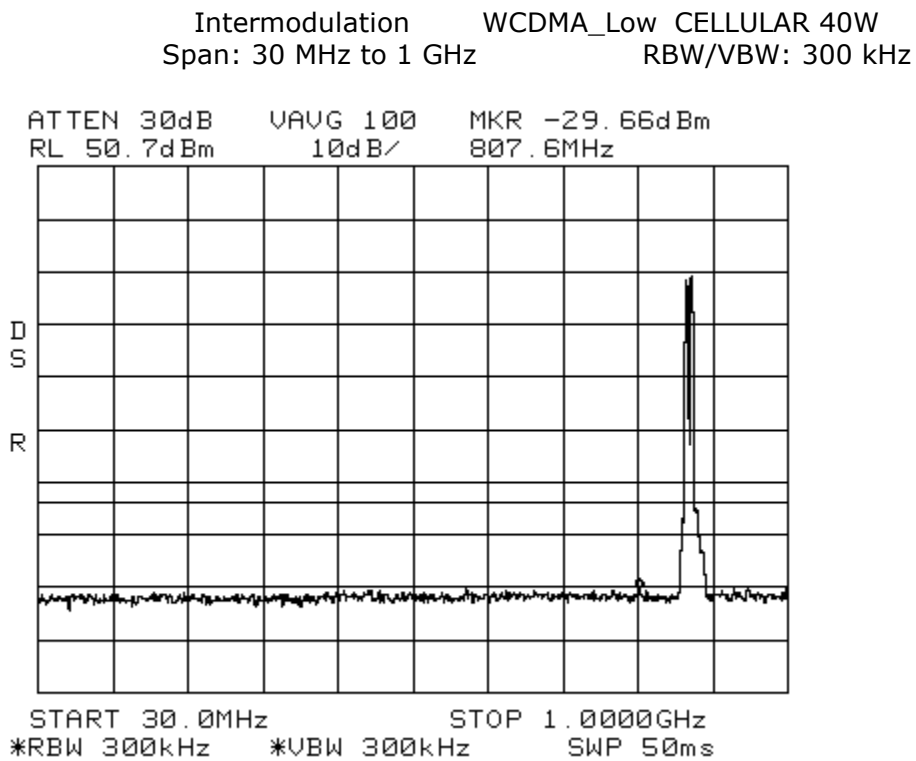
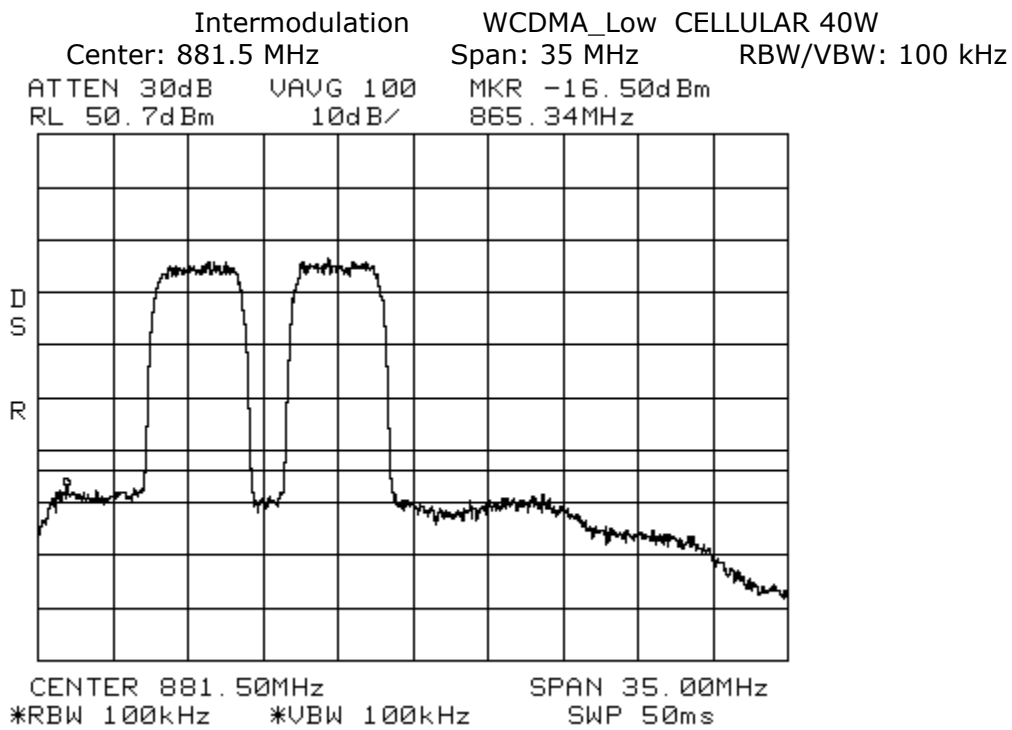


Intermodulation LTE 10 MHz Channel Bandwidth _Apart CELL 40W
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz

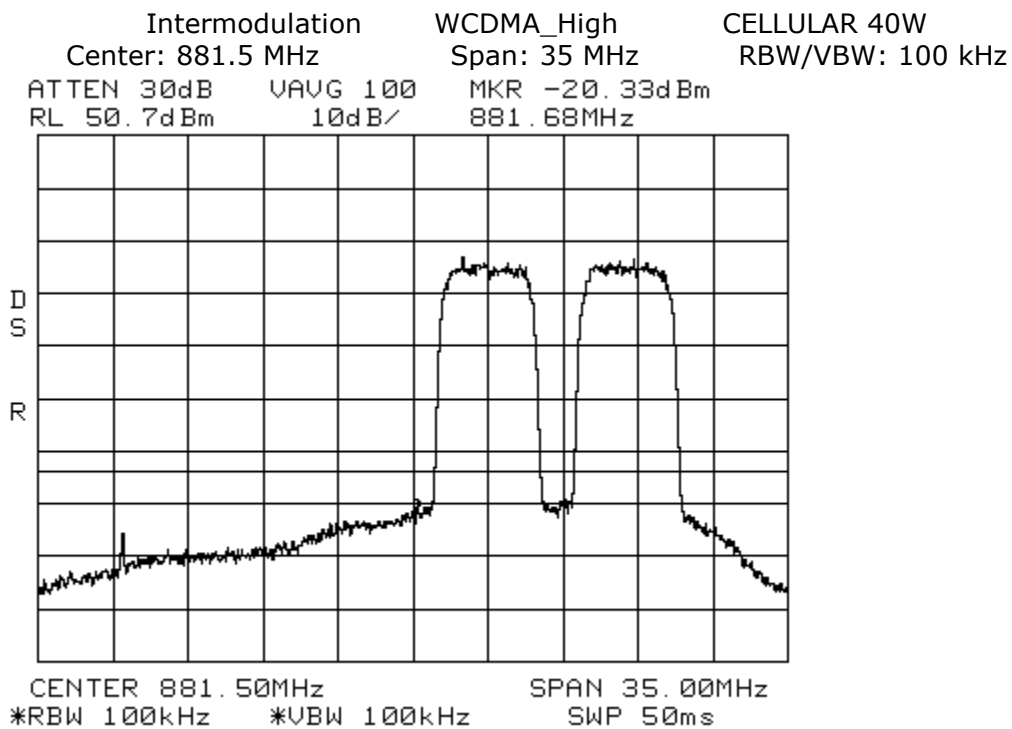
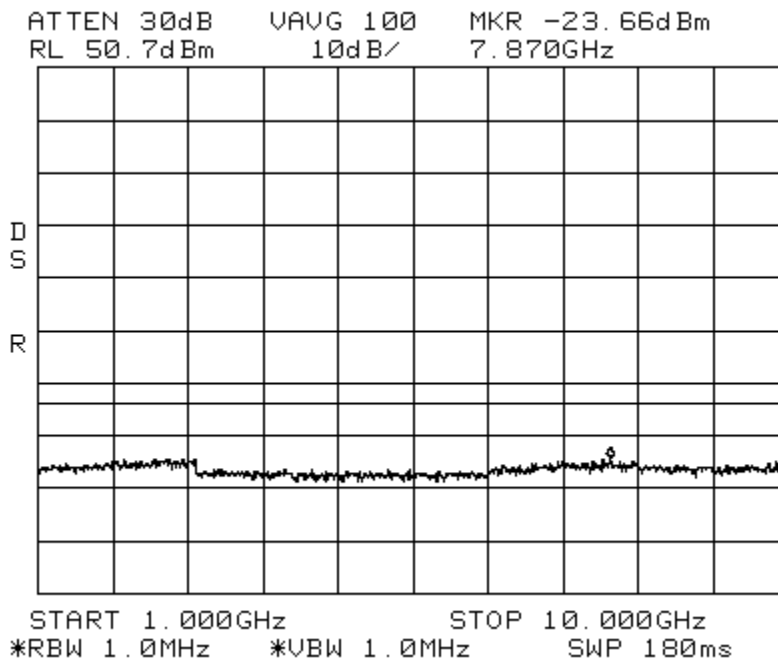


Intermodulation LTE 10 MHz Channel Bandwidth _Apart CELL 40W
 Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz

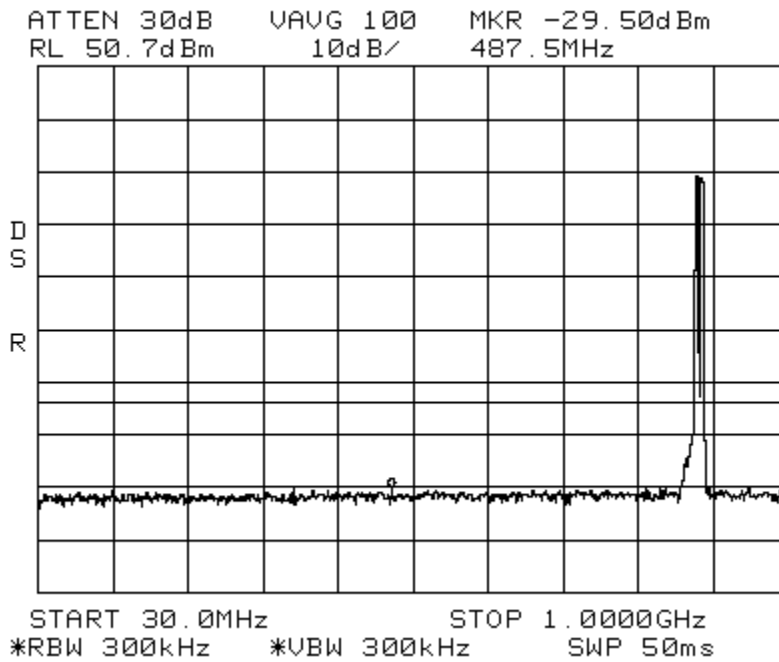




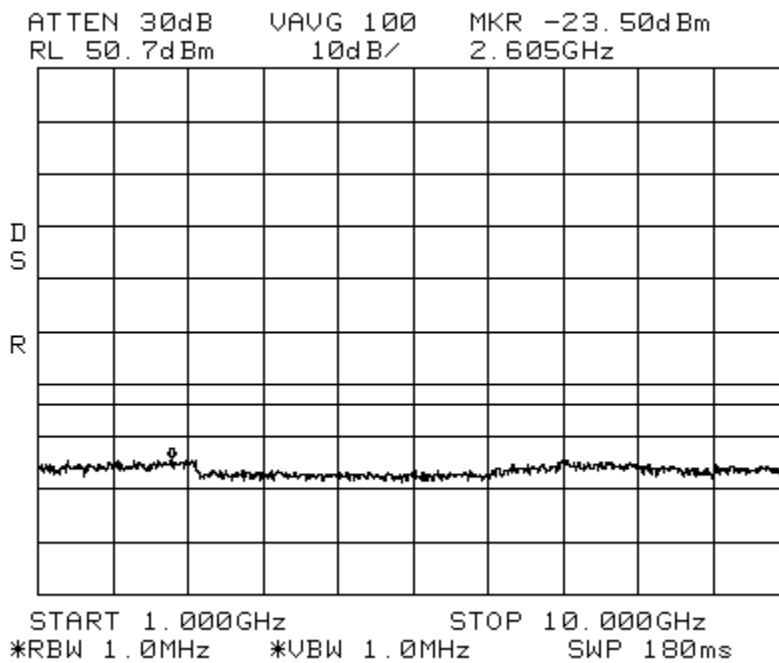
Intermodulation WCDMA_Low CELLULAR 40W
 Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz

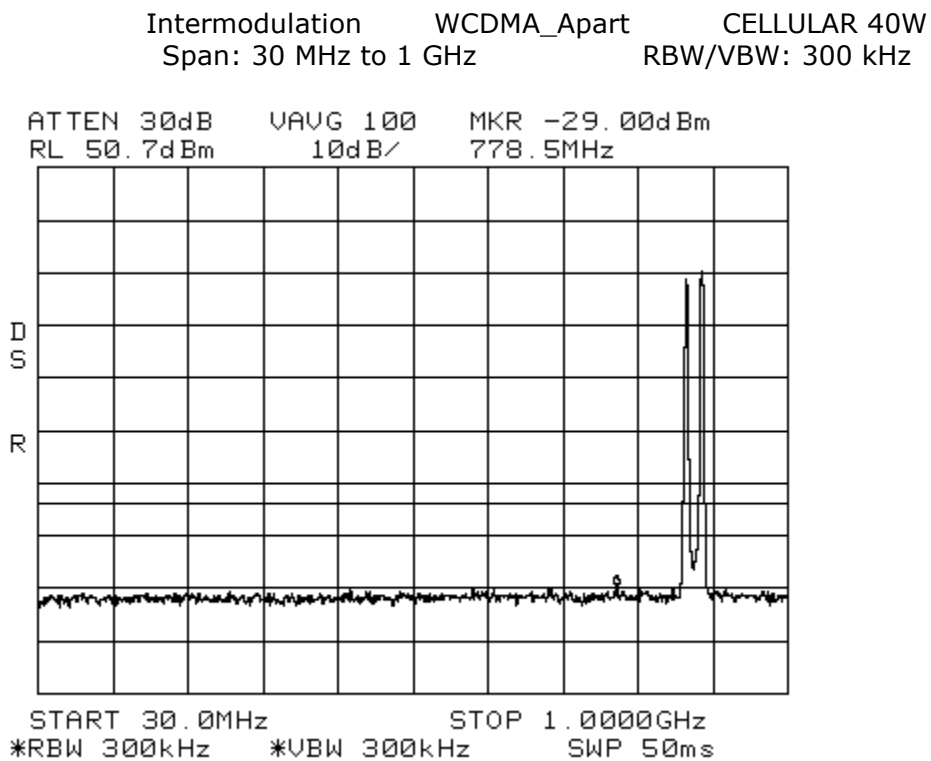
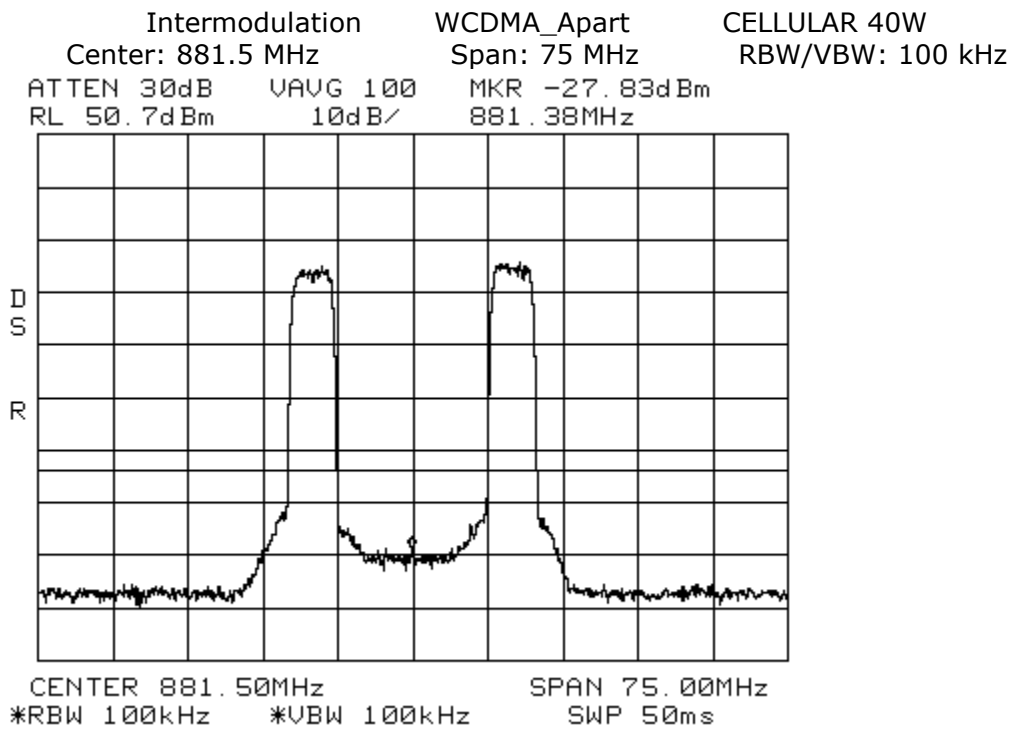


Intermodulation WCDMA_High CELLULAR 40W
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz

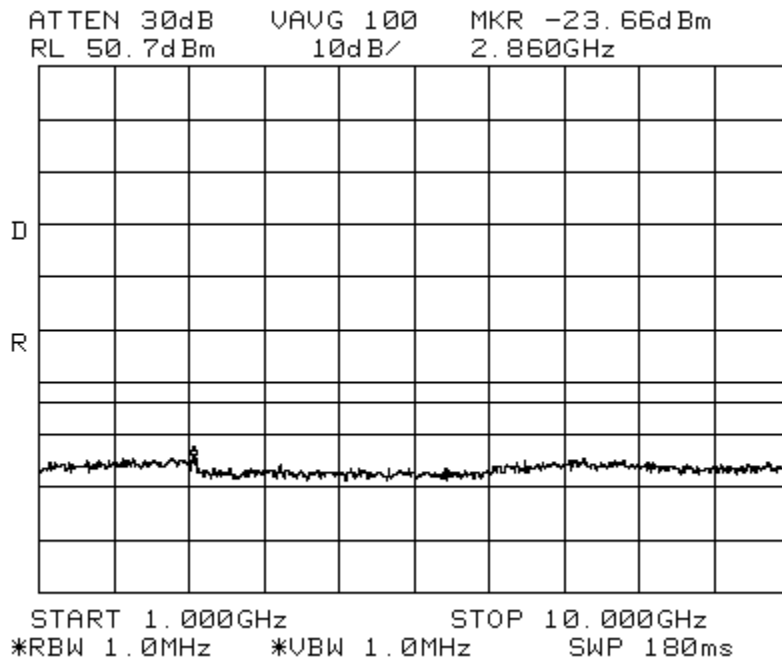


Intermodulation WCDMA_High CELLULAR 40W
 Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz





Intermodulation WCDMA_Apart CELLULAR 40W
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



7.5 Occupied Bandwidth Modulation Test

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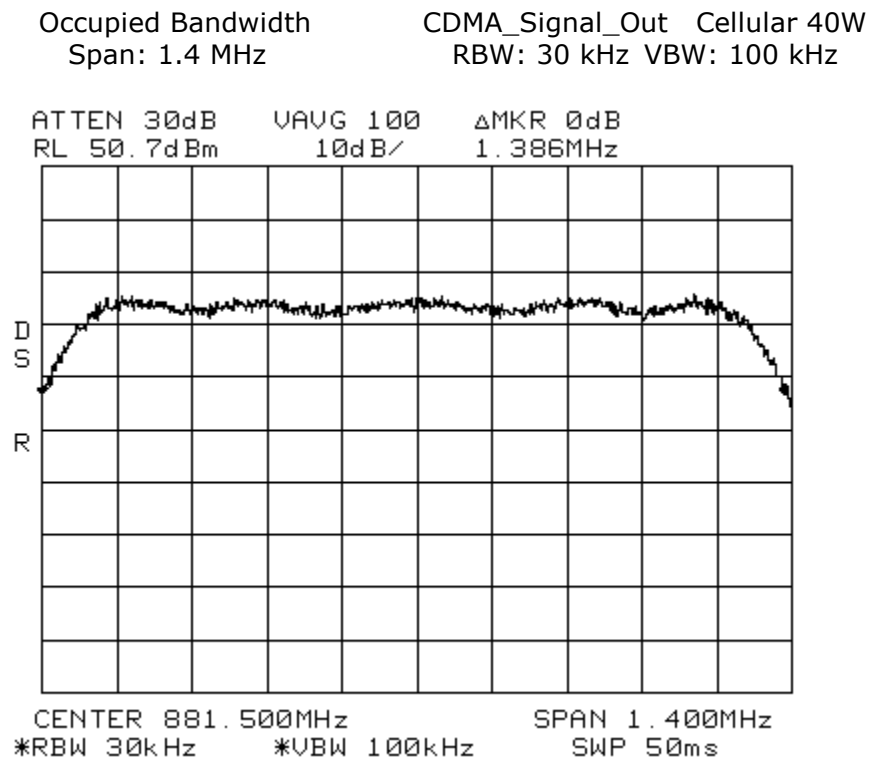
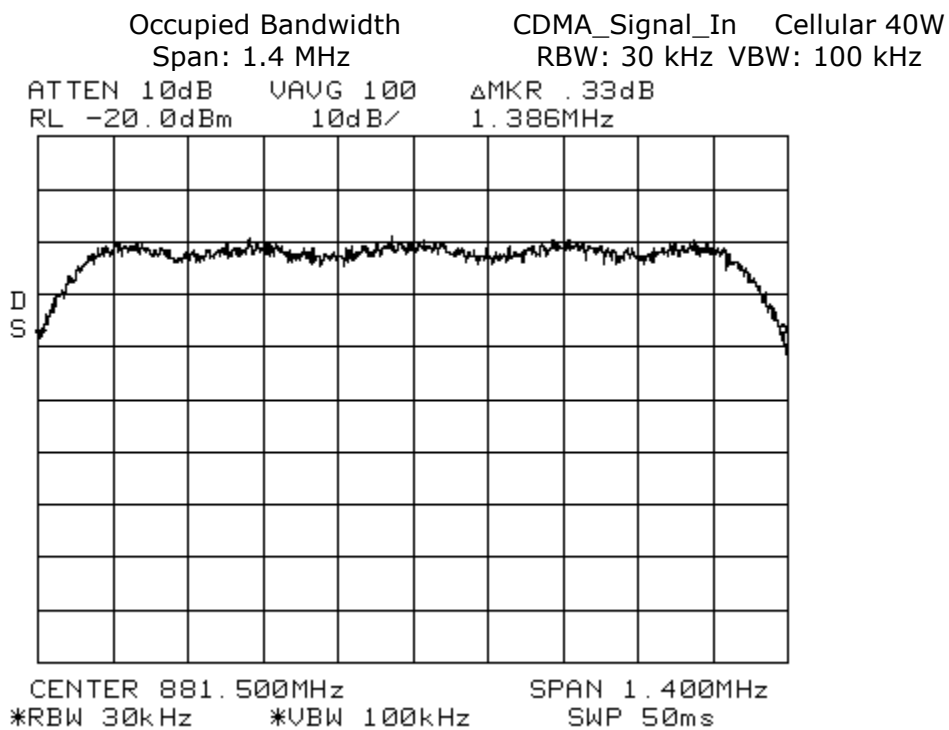
[Back to Emission Limits; Section 5.1.3](#)

An output Occupied Bandwidth test was done with modulation types: GSM, EDGE, CDMA, W-CDMA, LTE 3MHz BW, LTE 5 MHz BW, & LTE 10MHz BW. The purpose was to determine the amount of occupied bandwidth for the different types of modulation schemes produced by the EUT. The following plots show output signals.

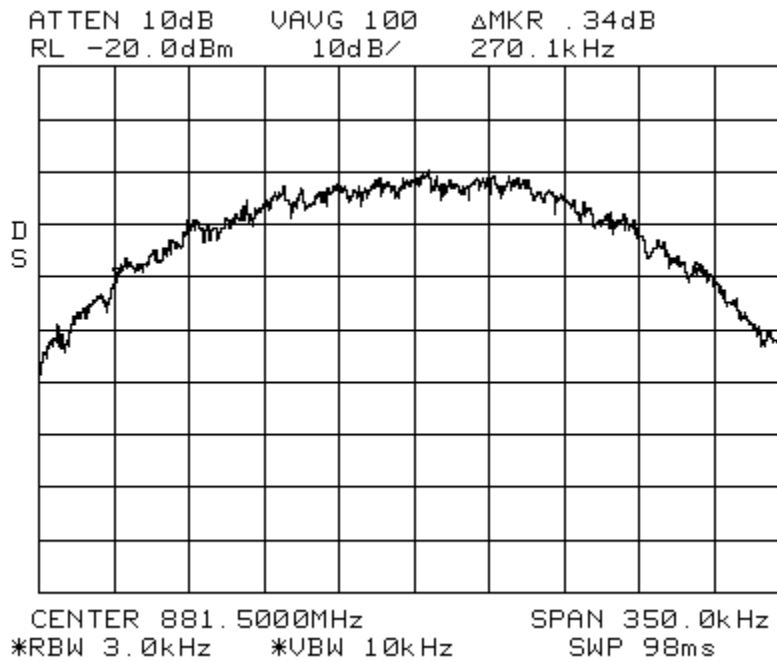
The resolution bandwidth is reduced to 1% of the estimated emission bandwidth and the video bandwidth is set to 3 times the resolution bandwidth. The markers are moved to the -20 dB points (from the previously established center frequency level) on either side of center frequency.

Results:

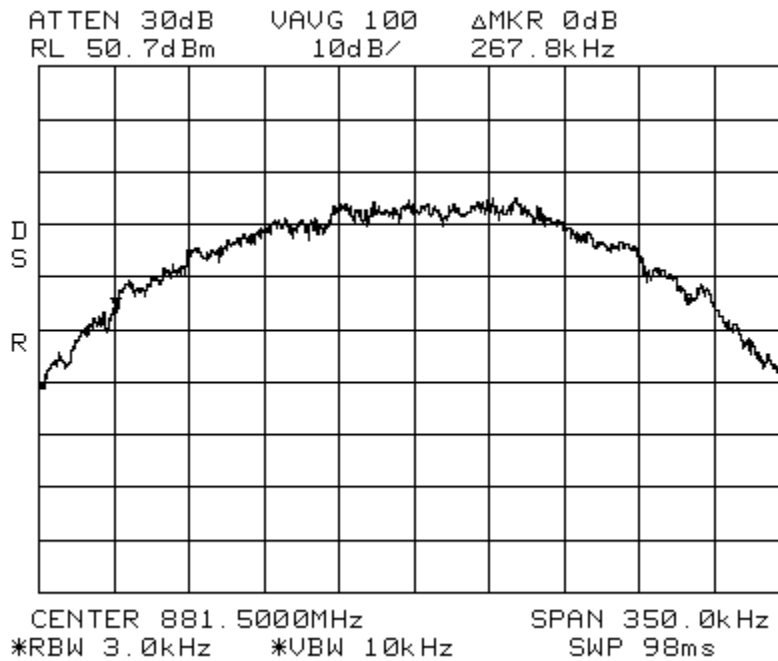
Pass (see plots)



Occupied Bandwidth EDGE_Signal_In CELL 40W
Span: 350 kHz RBW: 3 kHz VBW: 10 kHz



Occupied Bandwidth EDGE_Signal_Out CELL 40W
Span: 350 kHz RBW: 3 kHz VBW: 10 kHz

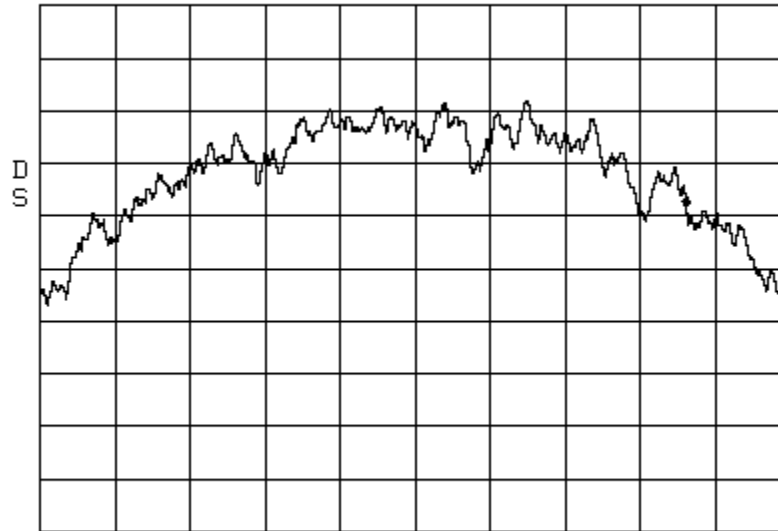


Occupied Bandwidth
Span: 350 kHz

GSM_Signal_In
RBW: 3 kHz VBW: 10 kHz

CELL 40W

ATTEN 10dB VAUG 100 ΔMKR -.33dB
RL -20.0dBm 10dB/ 254.9kHz



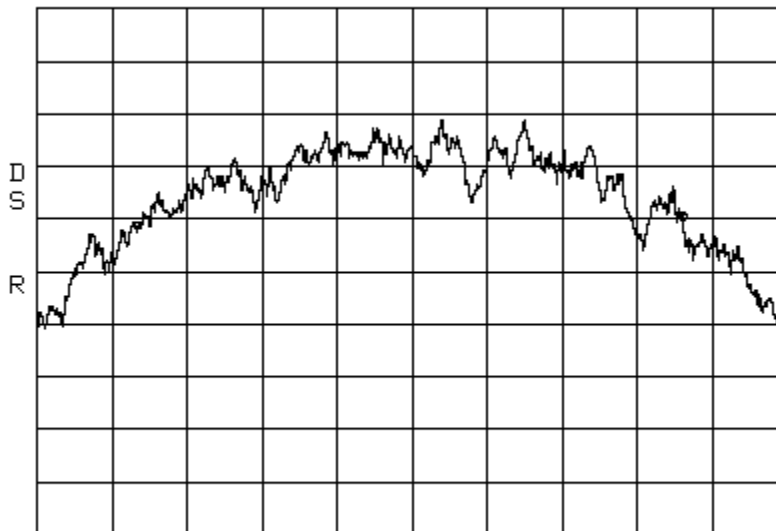
CENTER 881.5000MHz SPAN 350.0kHz
*RBW 3.0kHz *VBW 10kHz SWP 98ms

Occupied Bandwidth
Span: 350 kHz

GSM_Signal_Out
RBW: 3 kHz VBW: 10 kHz

CELL 40W

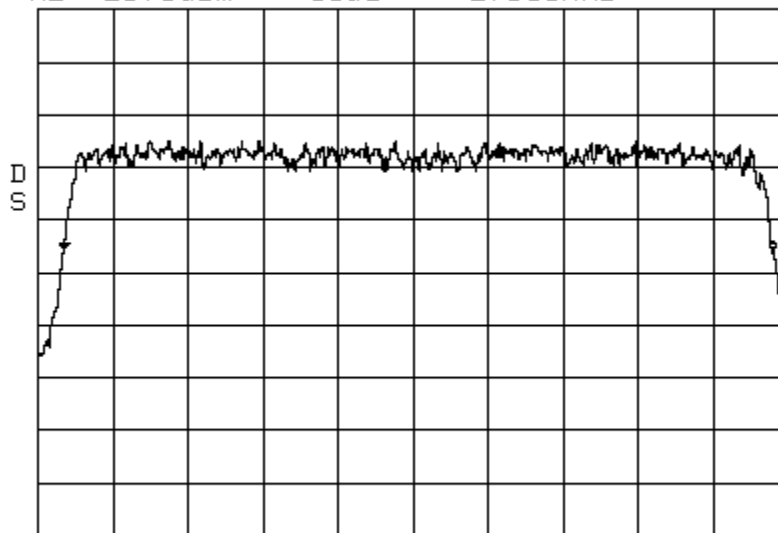
ATTEN 30dB VAUG 100 ΔMKR 1.33dB
RL 50.7dBm 10dB/ 254.3kHz



CENTER 881.5000MHz SPAN 350.0kHz
*RBW 3.0kHz *VBW 10kHz SWP 98ms

Occupied Bandwidth LTE 3 MHz Channel Bandwidth_Signal_In
Span: 3 MHz RBW: 30kHz VBW: 100 kHz
ATTEN 10dB VAVG 100 ΔMKR -.33dB
RL -20.0dBm 10dB/ 2.835MHz

CELL 40W

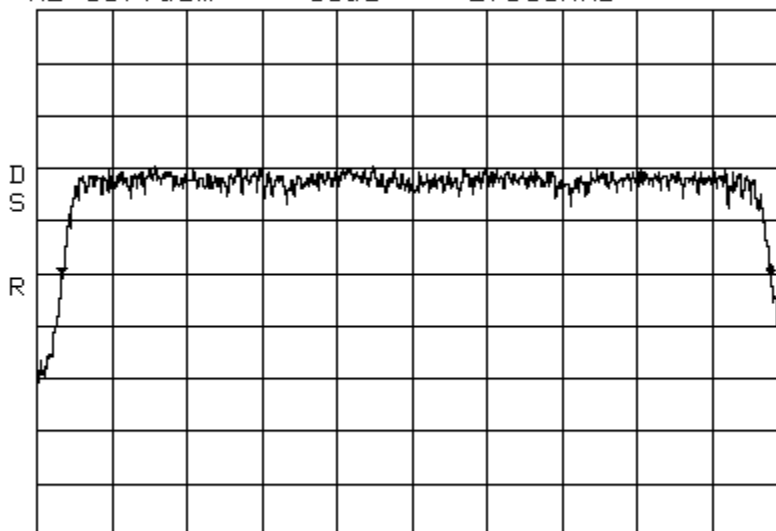


CENTER 881.500MHz SPAN 3.000MHz
*RBW 30kHz *VBW 100kHz SWP 50ms

Occupied Bandwidth LTE 3 MHz Channel Bandwidth_Signal_Out
Span: 3 MHz RBW: 30 kHz VBW: 100 kHz

CELL 40W

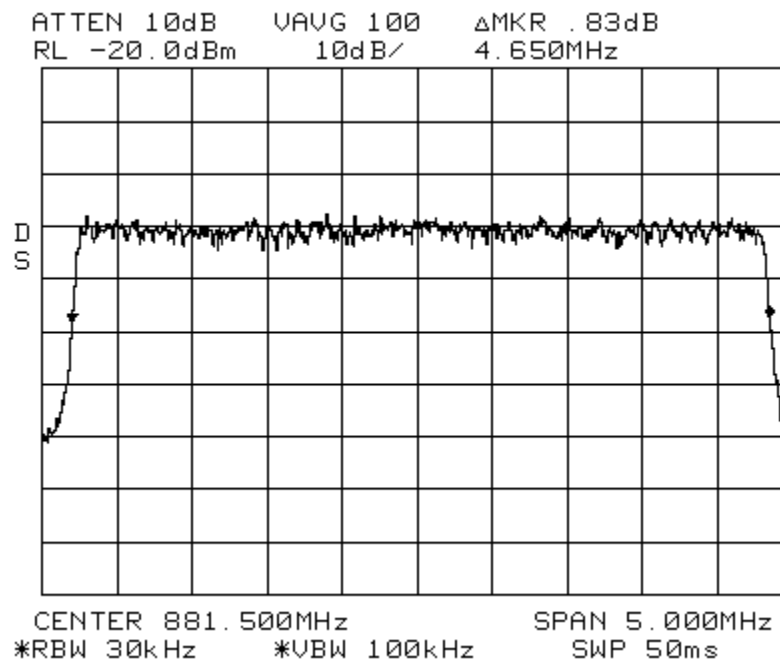
ATTEN 30dB VAVG 100 ΔMKR -.16dB
RL 50.7dBm 10dB/ 2.835MHz



CENTER 881.500MHz SPAN 3.000MHz
*RBW 30kHz *VBW 100kHz SWP 50ms

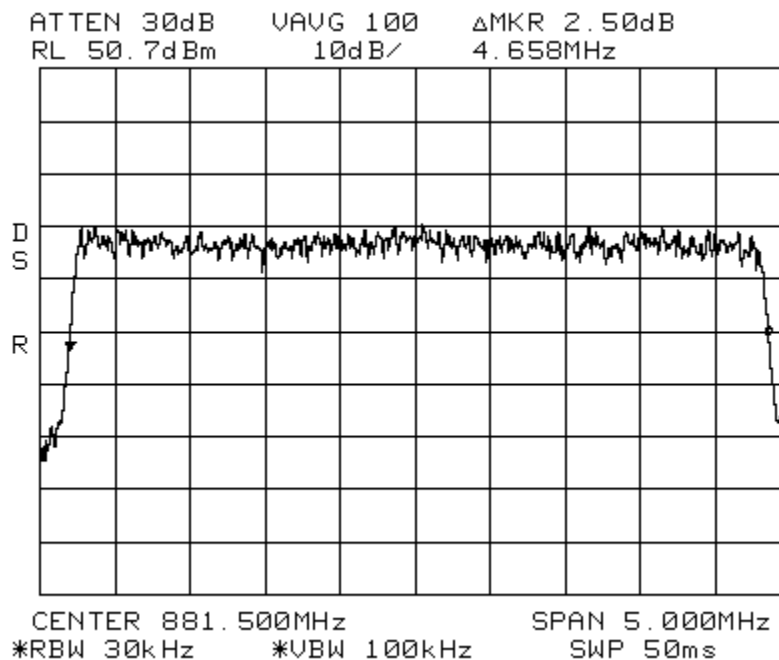
Occupied Bandwidth LTE 5 MHz Channel Bandwidth_Signal_In
Span: 5 MHz RBW: 30 kHz VBW: 100 kHz

CELL 40W



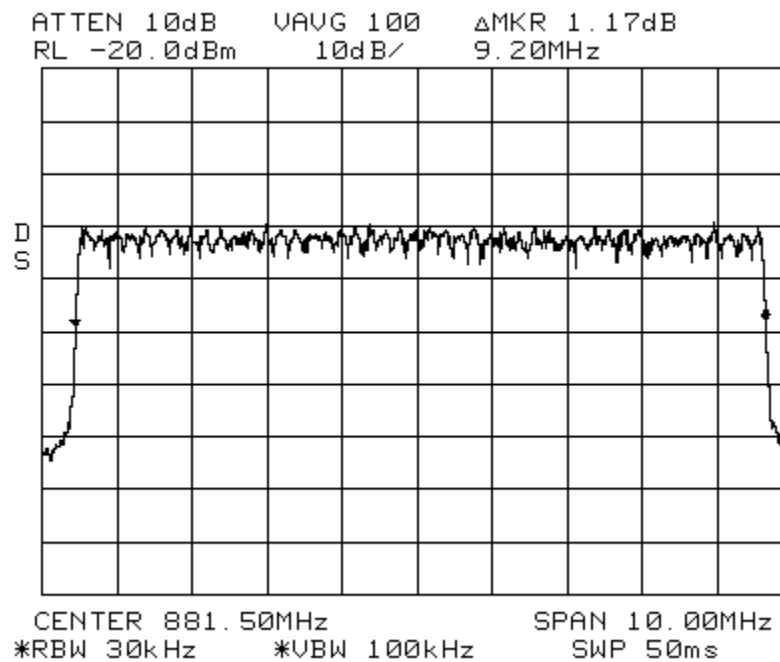
Occupied Bandwidth LTE 5 MHz Channel Bandwidth_Signal_Out
Span: 5 MHz RBW: 30 kHz VBW: 100 kHz

CELL 40W



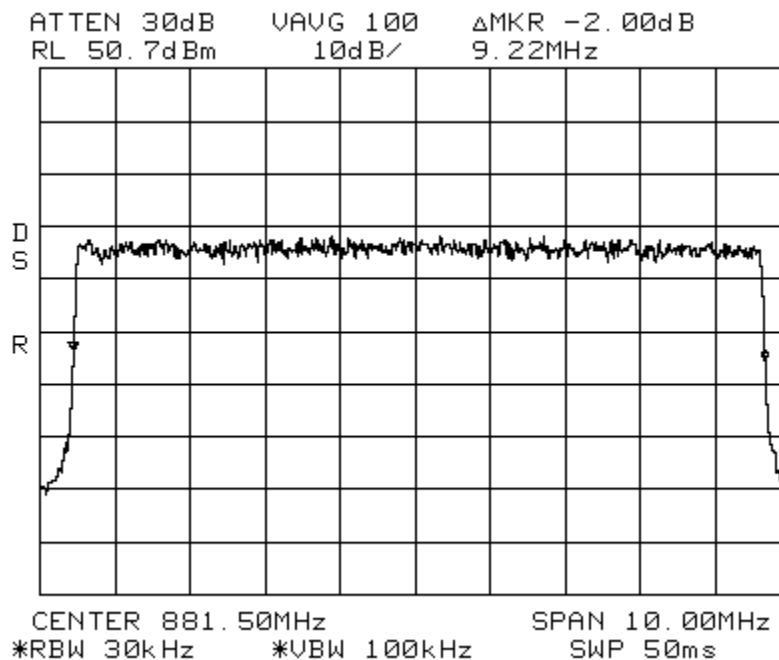
Occupied Bandwidth LTE 10 MHz Channel Bandwidth_Signal_In
Span: 10 MHz RBW: 30 kHz VBW: 100 kHz

CELL 40W



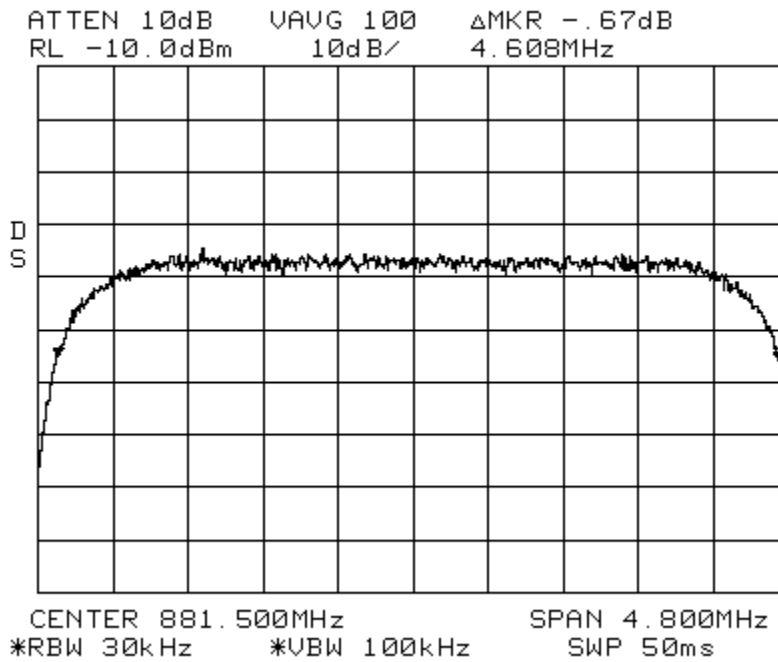
Occupied Bandwidth LTE 10 MHz Channel Bandwidth_Signal_Out
Span: 10 MHz RBW: 30 kHz VBW: 100 kHz

CELL 40W



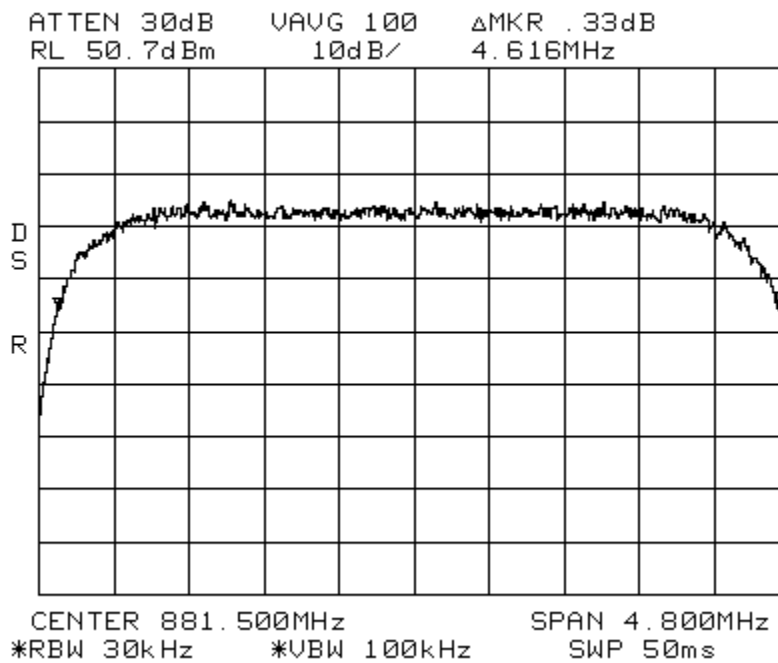
Occupied Bandwidth
Span: 4.8 MHz

WCDMA_Signal_In CELLULAR 40W
RBW: 30 kHz VBW: 100 kHz



Occupied Bandwidth
Span: 4.8 MHz

WCDMA_Signal_Out CELLULAR 40W
RBW: 30 kHz VBW: 100 kHz



Measurement Protocol

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Measurement Protocol

Environmental conditions of the lab, (ADC)

Temperature: 24° C

Relative Humidity: 35 %

Atmospheric Pressure: 100.2 kPa

Test Methodology:

Emission testing is performed according to the procedures in ANSI C63.4-2003.

Measurement Uncertainty

The test system for conducted emissions is defined as the signal generator(s), the power meter, the spectrum analyzer and the coaxial cable. The equipment comprising the test systems is calibrated prior to testing the EUT.

Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into its characteristic impedance or left un-terminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

Radiated Emissions

The final level, in dBuV/m, equals the reading from the spectrum analyzer (Level dBuV), adding the antenna correction factor and cable loss factor (Factor dB) to it, and subtracting the preamp gain (and duty cycle correction factor, if applicable). This result then has the limit subtracted from it to provide the Delta, which gives the tabular data as shown in the data sheets in Appendix B.

Example:

| FREQ (MHz) | LEVEL (dBuV) | CABLE/ANT/PREAMP (dB) (dB/m) (dB) | FINAL (dBuV/m) | POL/HGT/AZ (m) (deg) | DELTA1 |
|---------------|-----------------|--------------------------------------|-------------------|-------------------------|--------|
| 60.80 | 42.5Qp + | 1.2 + 10.9 - 25.5 = | 29.1 | V 1.0 0.0 | -10.9 |

Substitution Method

A cabinet (or enclosure) radiated emission scan was also made, at Intertek, with the EUT's antenna replaced with a termination to demonstrate case radiation compliance to the -13 dBm requirement. Radiated emissions from the EUT are measured in the frequency range of 30 to 20,000 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees. The field strength levels were measured per ANSI C63.4. The EUT is then replaced with a tuned dipole antenna (below 1GHz) or horn antenna (above 1 GHz). The substitute antenna was placed in the same polarization as the test antenna. A signal generator was used to generate a signal level that matched the highest level measured from the EUT. The signal generator level minus the cable loss from the signal generator to the substitute antenna plus the substitute antenna gain equals the spurious power level.

Test Equipment

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated according to internal procedure.

Radiated Emissions Test Data

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Document Name: 100553602MIN-001.pdf

Test Engineer: Uri Spector**Date:** 8 November, 2011**Test Procedure:**

Test measurements were made in accordance with ANSI C63.4-2003, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

Test Site Location:

The test site is a 3 meter Semi-Anechoic Chamber, constructed by Panashield™ Inc. and located inside the building at 7250 Hudson Blvd. Suite 100, Oakdale, MN 55128.

Test Site Description:

The 3 meter Semi-Anechoic Chamber is constructed of Panabolt™ modular RF shielding and self-supported with structural steel designed for the local seismic zone rating. The chamber has the nominal size of 20' wide x 29' long x 18' high. All walls and ceiling of the chamber are treated with FFG-1000 Ferrite Grid absorber which was developed specifically to meet international requirements for EMC anechoic chambers for emissions and immunity measurements. To meet high frequency testing white HY-35 hybrid absorber is mounted on the ferrites in specular regions of the chamber.

The chamber has a 2 meter diameter ANSI test volume area and meets the requirements of ANSI C63.4 (1992), EN55022, and FCC Part 15 standards for testing at a 3 meter path length.

FCC Registration Number: 0007355381

IC Registration Number: 4359A