



Test Report Summary

FCC CFR 47, Part 22

Subpart H Cellular Radiotelephone Service

Manufacturer: ADC Telecommunications, Inc

Name of Equipment: FlexWave™ Prism – HDM 850 MIMO

Model Number(s): FWP-B4MT000MOD

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

Test Report Number: MN140711 FCC Prism HDM 850 MIMO
FCC-ID: F8I-PSM0850M

Test Date(s): 9 July, 2014 (Intertek)
25, 30, 31 October & 1, 2, 6, 7, 8 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. The EUT fulfills the requirements of the Federal Communications Commission's CFR 47 Part 22.

Date: 11 July, 2014

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) 403-8322

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



Joshua J. Wittman
Compliance Engineer



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2.0 REVISION DESCRIPTION

Rev	Total Pages	Date	Description
A	77	11 July, 2014	Original Release

3.0 DOCUMENTATION

3.1 Test Regulations

The emissions tests were performed according to the following regulations:

■ FCC Part 22

<u>FCC Section</u>	<u>Test</u>	<u>Results</u>
22.355	Frequency Stability	Pass
22.913	Effective Radiated Power Limits	Pass
22.917	Emissions Limits for Cellular	Pass

3.2 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.

3.3 Test Operation Mode

- ☐ Standby

- ☐ Test Program

- ☐ Practice Operation

- **Max composite in and out**

3.4 Configuration of the Device Under Test:

Normal Operation – Cellular - 869 to 894 MHz

3.5 Product Options:

None

3.6 Chassis Specifications and Requirements:

Length: 10.0"

Width: 12.0"

Height: 40.0"

Weight: 150 pounds

3.7 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

3.8 Power Requirements:

Voltage: 120 VAC

Amps: 5.8 A

Power Supply Utilized:

Power Supply System : 120 VAC, Single Phase

3.9 Typical Installation and/or Operating Environment:

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

3.10 Other Special Requirements:

None

3.11 EUT Software:

Revision Level: Version V.6 or greater

Description: Internet Explorer

3.12 EUT System Components

Description	Model #	Serial #	FCC ID #
Prism Chassis	FP3-00000000000000111	None	
HDM 850 MIMO	FWP-B4MT000MOD	None	

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:

The Prism HDM 850 MHz MIMO module uses identical hardware for both RF outputs. The two RF outputs will have the same rated RF performance. Thus, the report only containing one set of data for one antenna and the FCC Grant listing 2 times the power. See FCC Form 731 for Grant Notes.

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 in Uplink path.

Industry practice has generally set the input signal power level. Test signal used was ≈ -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.

4.0 TEST SET-UP DRAWINGS AND PHOTOS

[Table of Contents; Section 1.0](#)

4.1 Test Set-up Photo, Radiated Emissions

Reference Intertek Report 101716480MIN-001

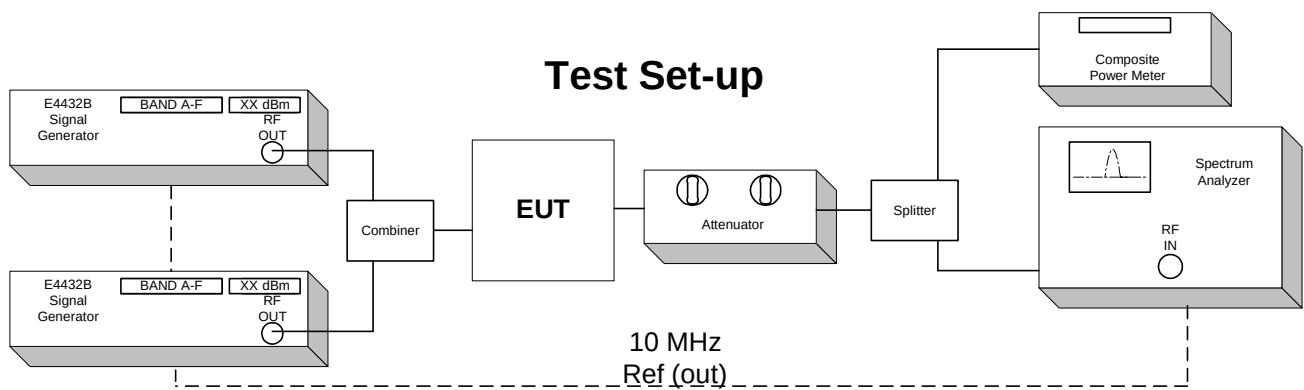
4.2 Test Set-up Drawings

Band Edge Test

Output Power Test

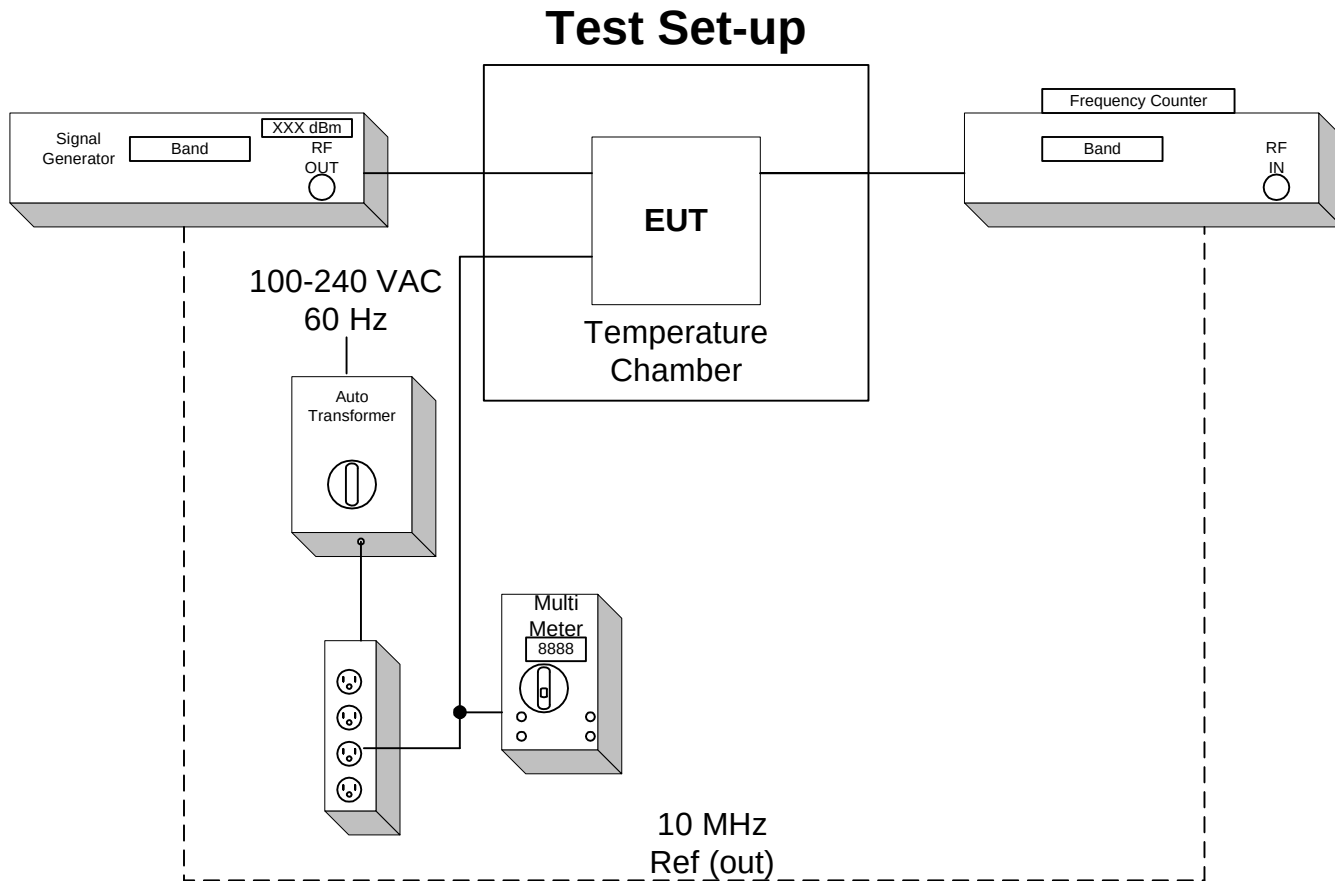
Spurious Emission Test

Occupied Bandwidth 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 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	6-30-13	☒
2	Power Meter	HP	437B	MC27754	6-30-13	☒
3	Multimeter	Fluke	79	MC16178	10-11-13	☒
4	Frequency Counter	HP	5347A	MC27569	6-30-13	☒
5	Temperature Chamber	ESPEC	PSL-4G	MC10075	9-10-13	☒
6	Signal Generator	Aeroflex	3413	MC57343	2-9-13	☒
7	Signal Generator	Aeroflex	3413	MC57947	6-26-14	☒
8	Variable Auto Transformer	Staco	1520CT	MC44655	CNR	☒
9	Digital Barometer	Fisher Scientific	02-403	MC50719	1-25-13	☒
10	Attenuator	Aeroflex	49-30-33	N/A	CNR	☒
11	Attenuator	Aeroflex	86-30-12	N/A	CNR	☒
12	RF Power Sensor	HP	8482A	MC48747	6-30-13	☒

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

6.0 TEST RESULTS

6.1 FCC 22.917 Emissions Limits – Band Edge

Test Summary:

- The requirements are: **• MET** ▫ NOT MET

Test Methods Used:

TIA-603-C 2004, ANSI C63.4-2003, FCC 22.917

Test Procedure:

The RF Output of the transmitter was connected to input of the spectrum analyzer through sufficient attenuation.

Band Edge compliance is demonstrated using a GSM, EDGE, CDMA, WCDMA, LTE 3 MHz, LTE 5MHz, LTE 10MHz, & LTE 15MHz Channel Bandwidths signal at the upper and lower limits of the band.

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.

Test Dates: 11/1/12 & 11/2/12

Tests Conducted By: Joshua J. Wittman

Test Equipment: 1, 2, 6, 9, 12

Number	Description	Manufacturer	Model	ADC TELECOMMUNICAT IONS Serial Number	Cal Due	Used
1	Spectrum Analyzer	HP	8563E	MC27690	6-30-13	☒
2	Power Meter	HP	437B	MC27754	6-30-13	☒
6	Signal Generator	Aeroflex	3413	MC57343	2-9-13	☒
9	Digital Barometer	Fisher Scientific	02-403	MC50719	1-25-13	☒
12	RF Power Sensor	HP	8482A	MC48747	6-30-13	☒

Environmental Conditions in the lab:

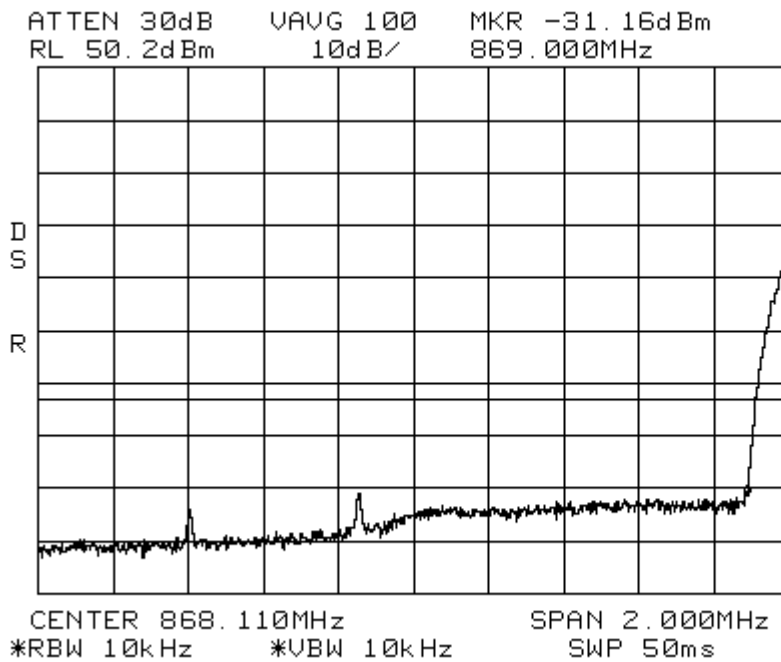
Temperature: 28° C

Relative Humidity: 20%

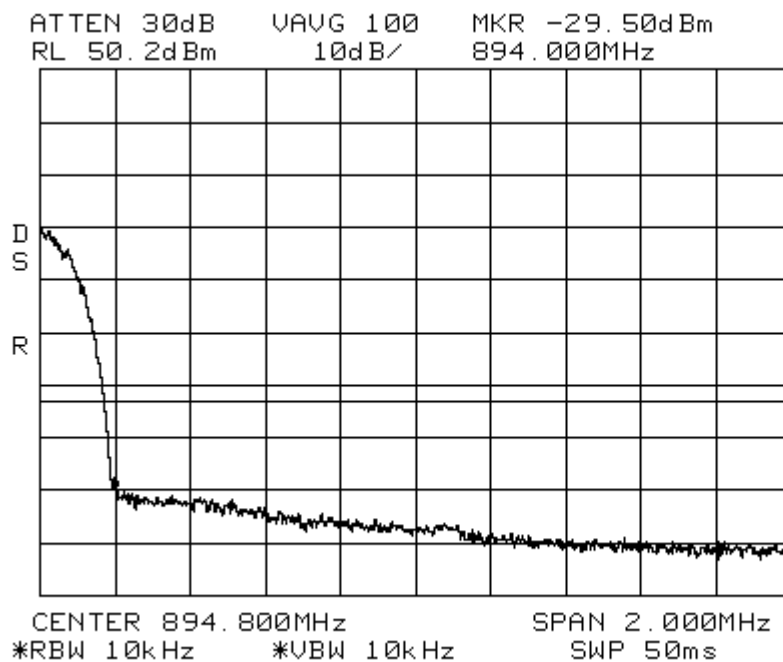
Atmospheric Pressure: 99.0 kPa

Test Results:

Band_Edge CDMA CELL
Center: 869.75 MHz Span: 2 MHz RBW: 10 kHz VBW: 10 kHz



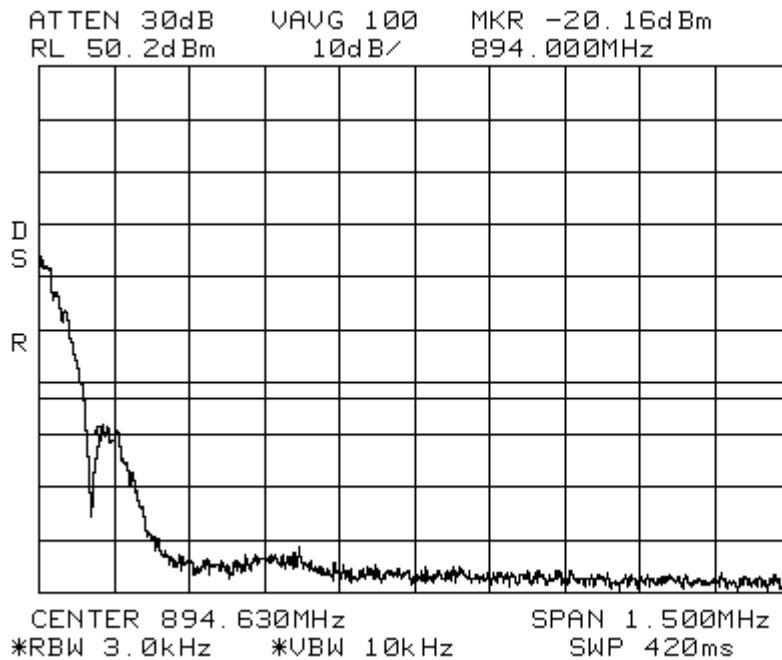
Band_Edge CDMA CELL
Center: 893.25 MHz Span: 2 MHz RBW: 10 kHz VBW: 10 kHz

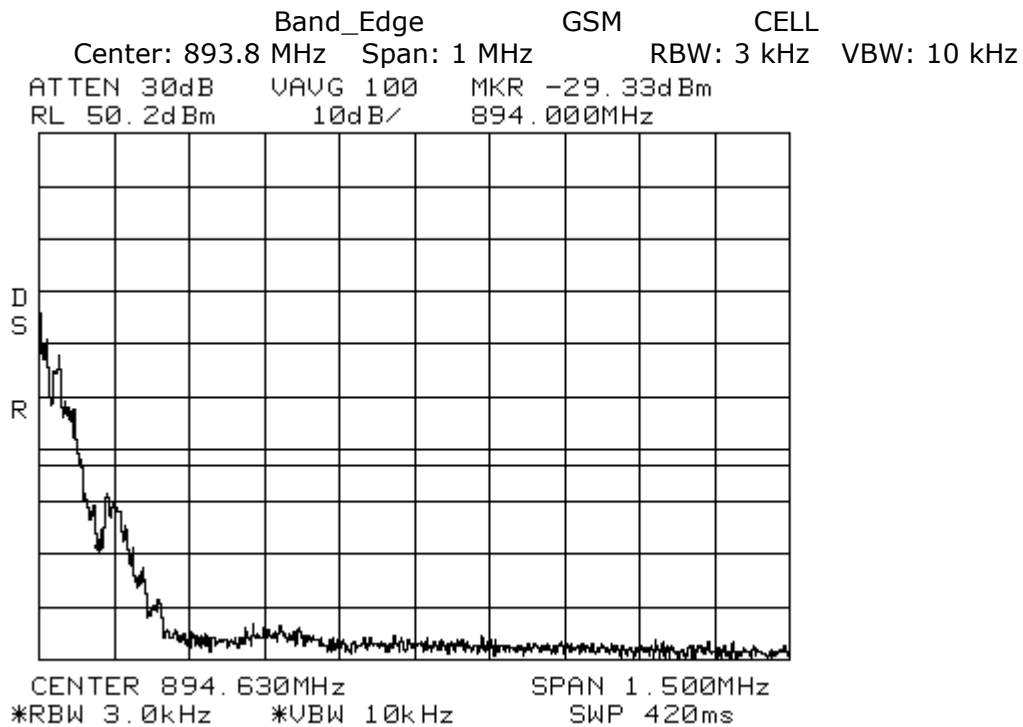
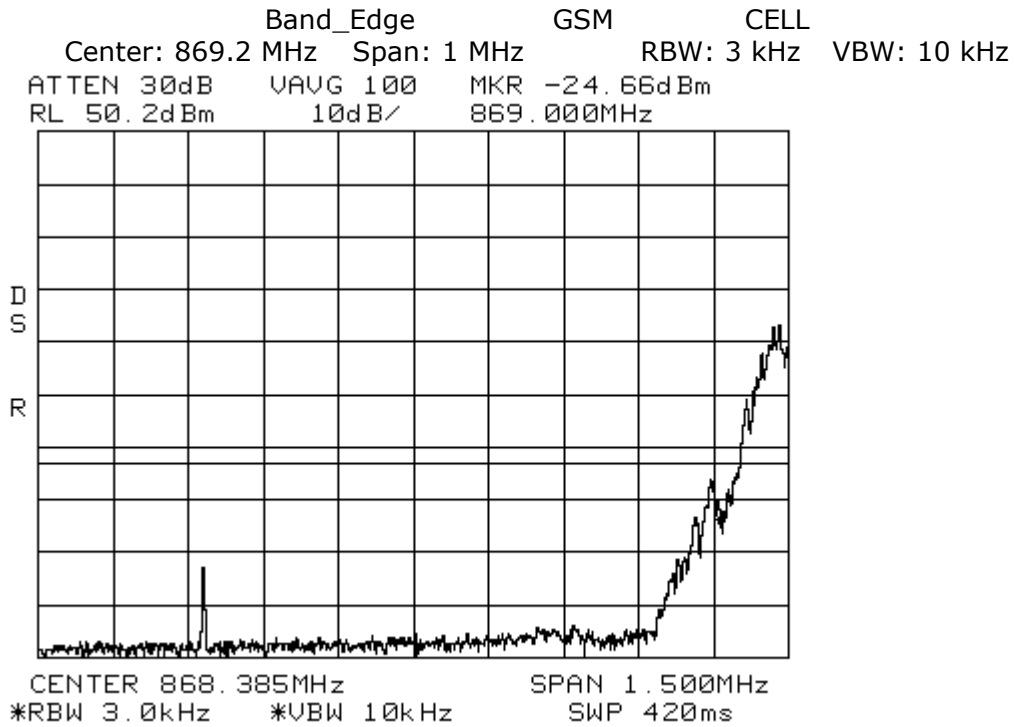


Band_Edge EDGE CELL
Center: 869.2 MHz Span: 1.5 MHz RBW: 3 kHz VBW: 10 kHz

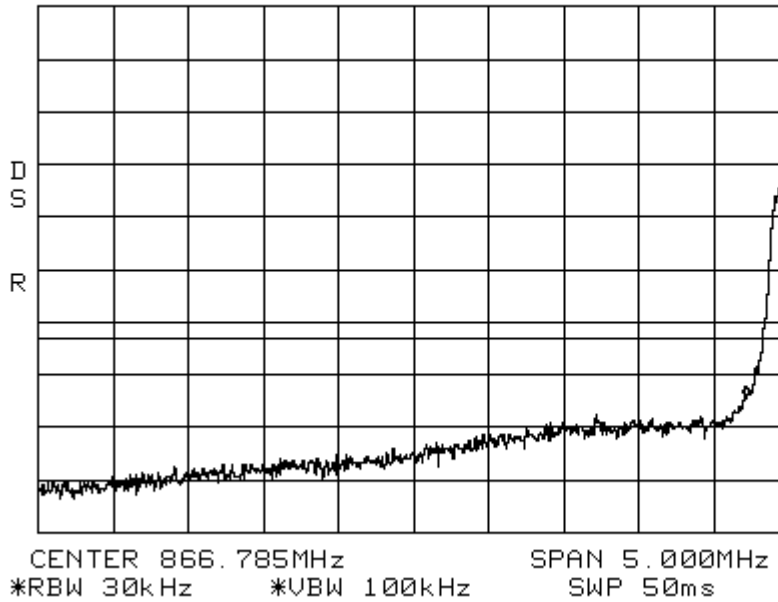


Band_Edge EDGE CELL
Center: 893.8 MHz Span: 1.5 MHz RBW: 3 kHz VBW: 10 kHz

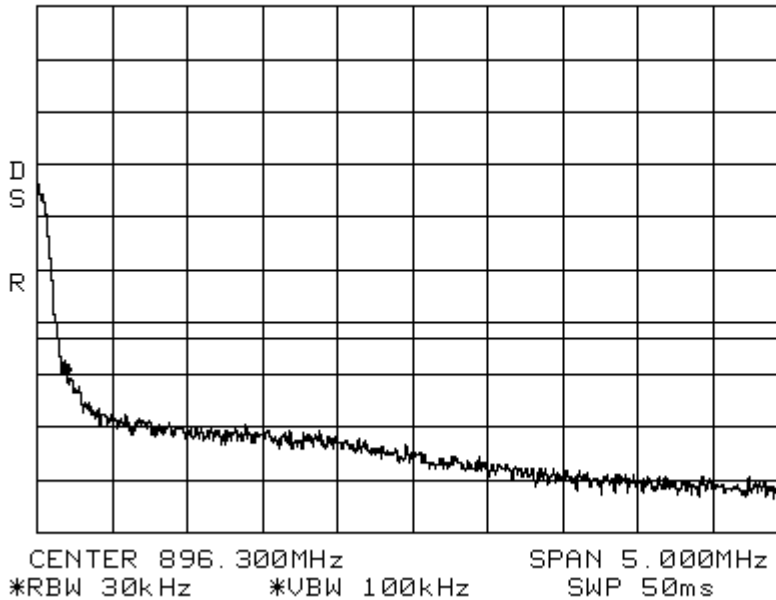




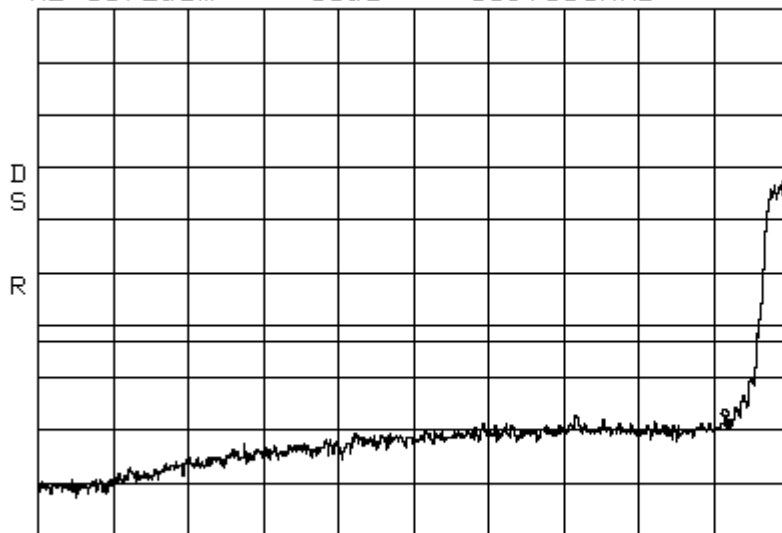
Band_Edge LTE 3 MHz Channel Bandwidth CELL
Center: 870.5 MHz Span: 5 MHz RBW: 30 kHz VBW: 100 kHz
ATTEN 30dB VAVG 100 MKR -24.00dBm
RL 50.2dBm 10dB/ 869.002MHz



Band_Edge LTE 3 MHz Channel Bandwidth CELL
Center: 892.5MHz Span: 5 MHz RBW: 30 kHz VBW: 100 kHz
ATTEN 30dB VAVG 100 MKR -19.83dBm
RL 50.2dBm 10dB/ 894.000MHz



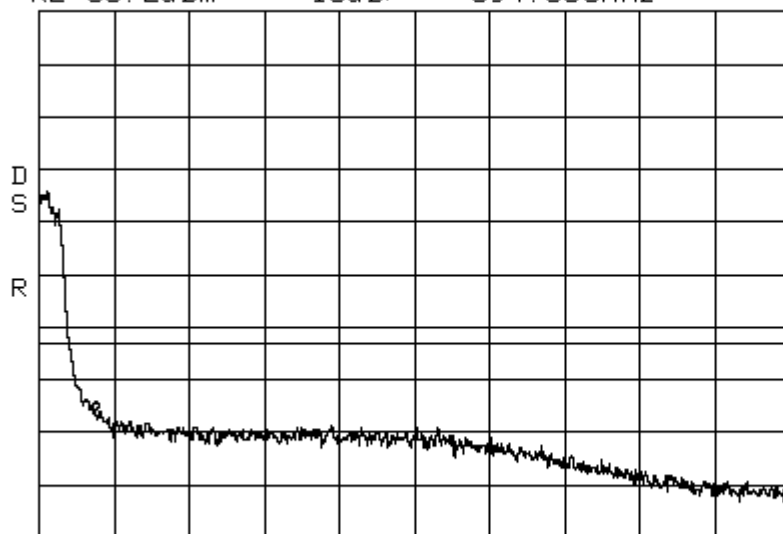
Band_Edge LTE 5 MHz Channel Bandwidth CELL
Center: 871.5MHz Span: 5 MHz RBW: 30 kHz VBW: 100 kHz
ATTEN 30dB VAVG 100 MKR -27.66dBm
RL 50.2dBm 10dB/ 869.000MHz



CENTER 866.925MHz SPAN 5.000MHz
*RBW 30kHz *VBW 100kHz SWP 50ms

Band_Edge LTE 5 MHz Channel Bandwidth CELL
Center: 891.5MHz Span: 5 MHz RBW: 30 kHz VBW: 100 kHz

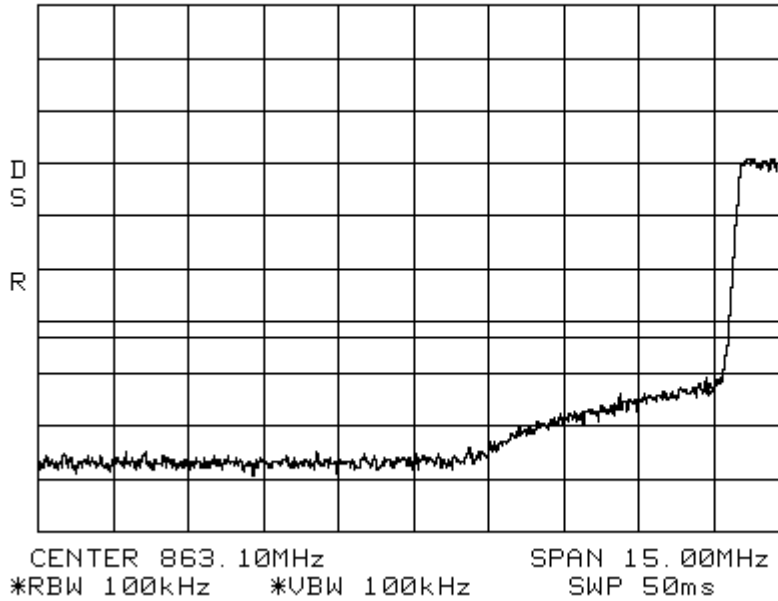
ATTEN 30dB VAVG 100 MKR -25.83dBm
RL 50.2dBm 10dB/ 894.000MHz



CENTER 896.125MHz SPAN 5.000MHz
*RBW 30kHz *VBW 100kHz SWP 50ms

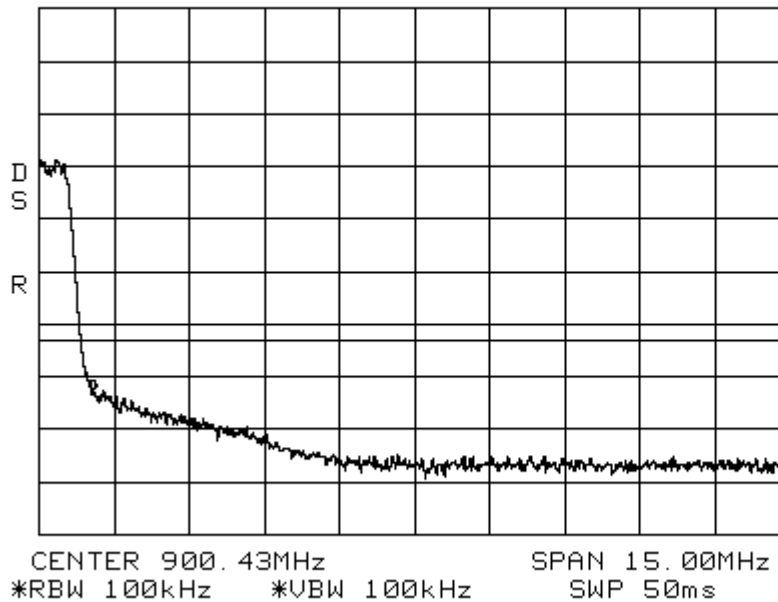
Band_Edge LTE 10 MHz Channel Bandwidth
Center: 874.0MHz Span: 15 MHz RBW: 100 kHz
ATTEN 30dB VAVG 100 MKR -23.83dBm
RL 50.2dBm 10dB/ 869.00MHz

CELL
VBW: 100 kHz

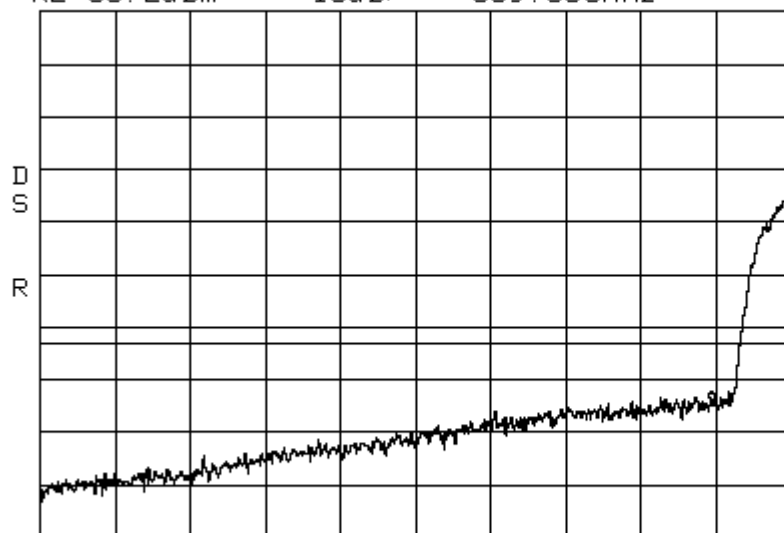


Band_Edge LTE 10 MHz Channel Bandwidth
Center: 889.0MHz Span: 15 MHz RBW: 100 kHz
ATTEN 30dB VAVG 100 MKR -22.50dBm
RL 50.2dBm 10dB/ 894.00MHz

CELL
VBW: 100 kHz

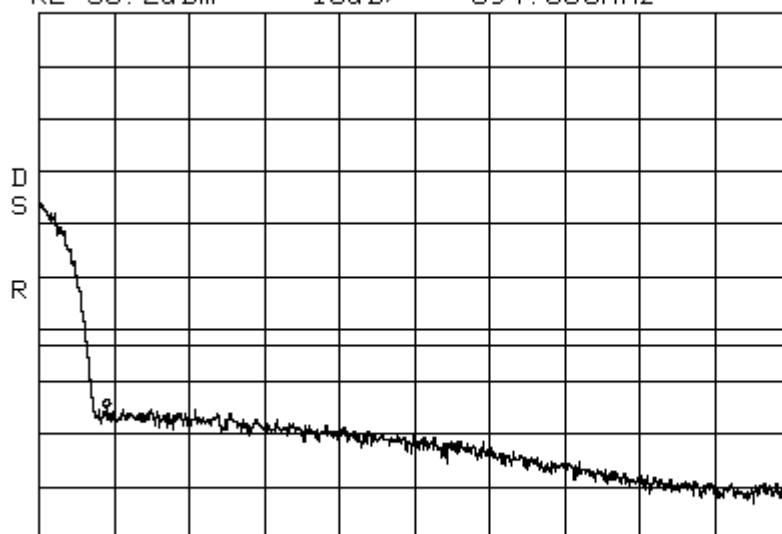


Band_Edge WCDMA CELL
Center: 867.125MHz Span: 5.5 MHz RBW: 30 kHz VBW: 100 kHz
ATTEN 30dB VAVG 100 MKR -24.00dBm
RL 50.2dBm 10dB/ 869.000MHz



CENTER 867.025MHz SPAN 5.000MHz
*RBW 30kHz *VBW 100kHz SWP 50ms

Band_Edge WCDMA CELL
Center: 895.825 MHzSpan: 5.5 MHz RBW: 30 kHz VBW: 100 kHz
ATTEN 30dB VAVG 100 MKR -25.00dBm
RL 50.2dBm 10dB/ 894.000MHz



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

6.2 FCC 2.1049, 22.917 – Occupied Bandwidth

Test Summary:

- The requirements are: **• MET** ◻ NOT MET

Test Methods Used:

TIA-603-C 2004, ANSI C63.4-2003, FCC 2.0149, 22.917

Test Procedure:

The RF Output of the transmitter was connected to input of the spectrum analyzer through sufficient attenuation.

An input/output Occupied Bandwidth test was done with modulation types: GSM, EDGE, CDMA, WCDMA, LTE 3 MHz, LTE 5MHz, LTE 10MHz, & LTE 15MHz Channel Bandwidths. The purpose was to determine the amount of distortion added to different types of modulation schemes by the EUT.

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.

Test Date: 10/30/12

Tests Conducted By: Joshua J. Wittman

Test Equipment: 1, 2, 6, 9, 12

Number	Description	Manufacturer	Model	ADC TELECOMMUNICATIONS Serial Number	Cal Due	Used
1	Spectrum Analyzer	HP	8563E	MC27690	6-30-13	☒
2	Power Meter	HP	437B	MC27754	6-30-13	☒
6	Signal Generator	Aeroflex	3413	MC57343	2-9-13	☒
9	Digital Barometer	Fisher Scientific	02-403	MC50719	1-25-13	☒
12	RF Power Sensor	Agilent	8482A	MC48747	6-30-13	☒

Environmental Conditions in the lab:

Temperature: 28° C

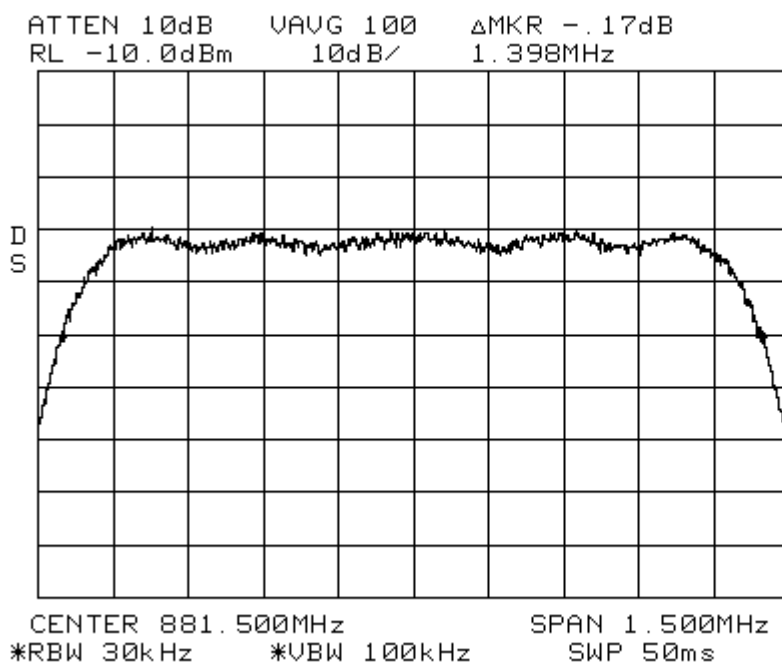
Relative Humidity: 20%

Atmospheric Pressure: 99.0 kPa

Test Results:

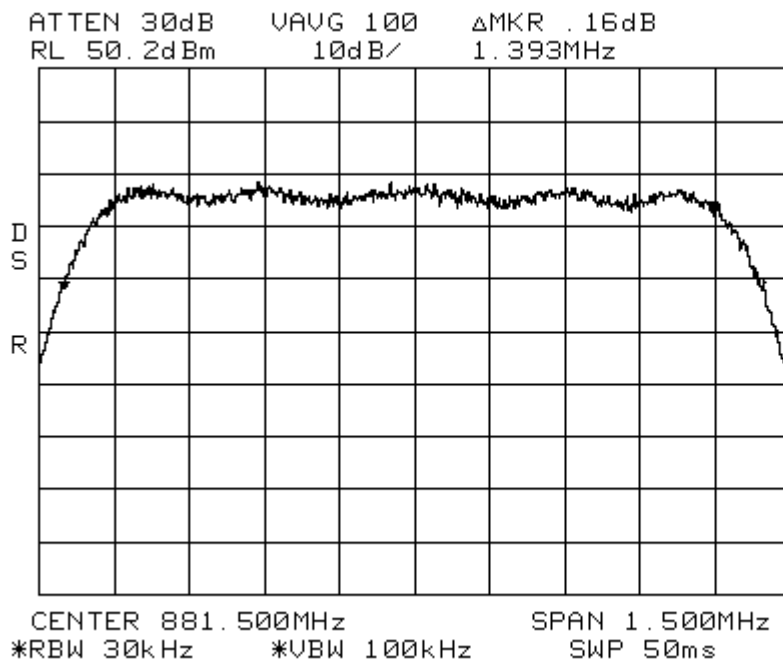
Occupied Bandwidth
Span: 1.5 MHz

CDMA_Signal_In CELL
RBW: 30 kHz VBW: 100 kHz



Occupied Bandwidth
Span: 1.5 MHz

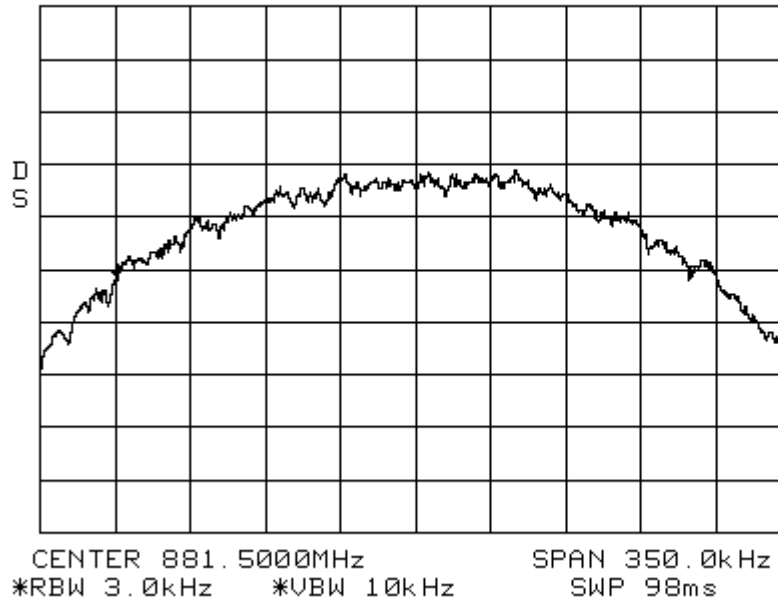
CDMA_Signal_Out CELL
RBW: 30 kHz VBW: 100 kHz



Occupied Bandwidth
Span: 350 kHz

EDGE_Signal_In CELL
RBW: 3 kHz VBW: 10 kHz

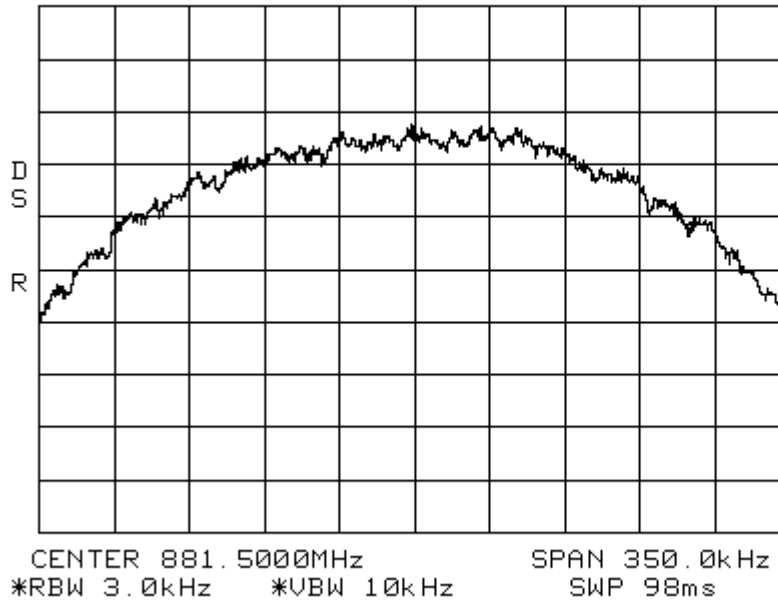
ATTEN 10dB VAUG 100 ΔMKR .16dB
RL -10.0dBm 10dB/ 268.3kHz



Occupied Bandwidth
Span: 350 kHz

EDGE_Signal_Out CELL
RBW: 3 kHz VBW: 10 kHz

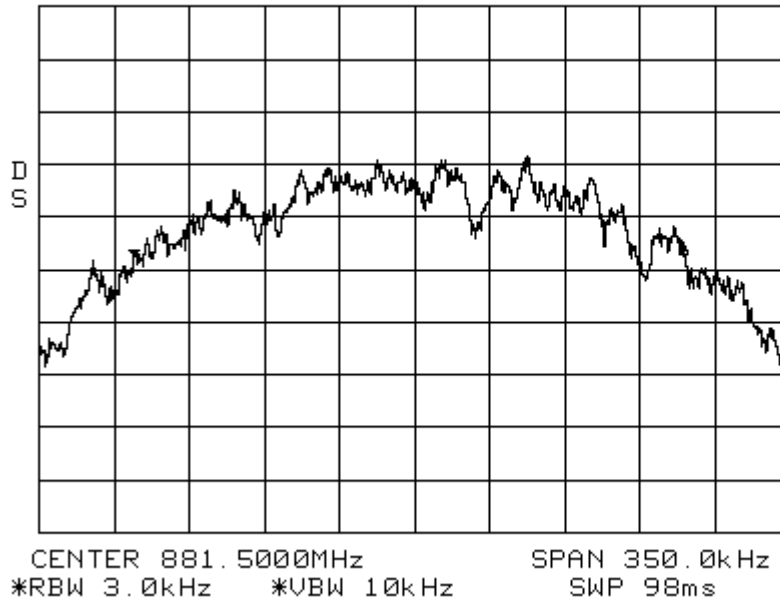
ATTEN 30dB VAUG 100 ΔMKR -.50dB
RL 50.2dBm 10dB/ 266.6kHz



Occupied Bandwidth
Span: 350 kHz

GSM_Signal_In CELL
RBW: 3 kHz VBW: 10 kHz

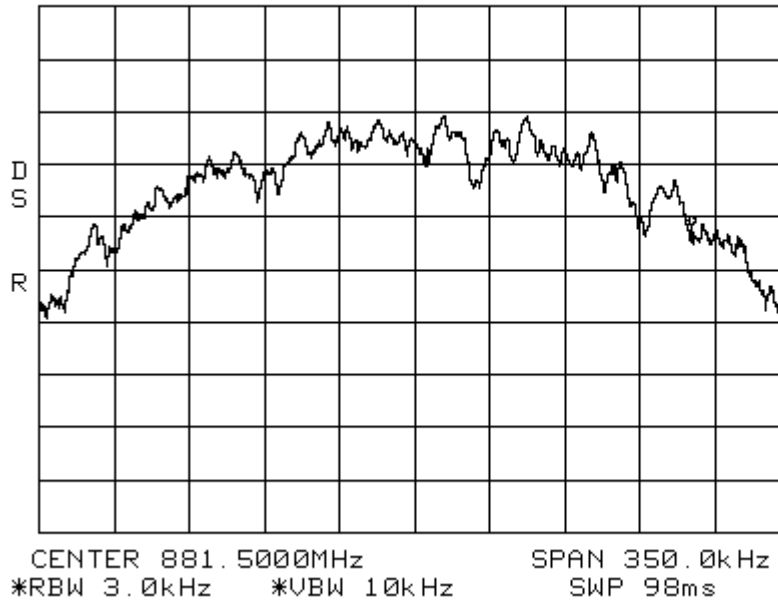
ATTEN 10dB VAUG 100 Δ MKR -.17dB
RL -10.0dBm 10dB/ 256.7kHz



Occupied Bandwidth
Span: 350 kHz

GSM_Signal_Out CELL
RBW: 3 kHz VBW: 10 kHz

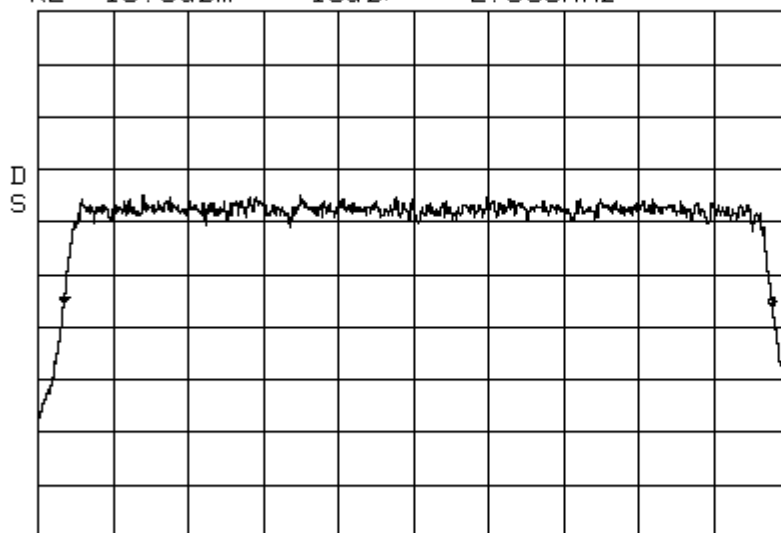
ATTEN 30dB VAUG 100 Δ MKR -1.00dB
RL 50.2dBm 10dB/ 258.4kHz



Occupied Bandwidth LTE 3 MHz Channel Bandwidth_Signal_In

CELL

Span: 3 MHz RBW: 30kHz VBW: 100 kHz
ATTEN 10dB VAUG 100 ΔMKR -.67dB
RL -10.0dBm 10dB/ 2.830MHz



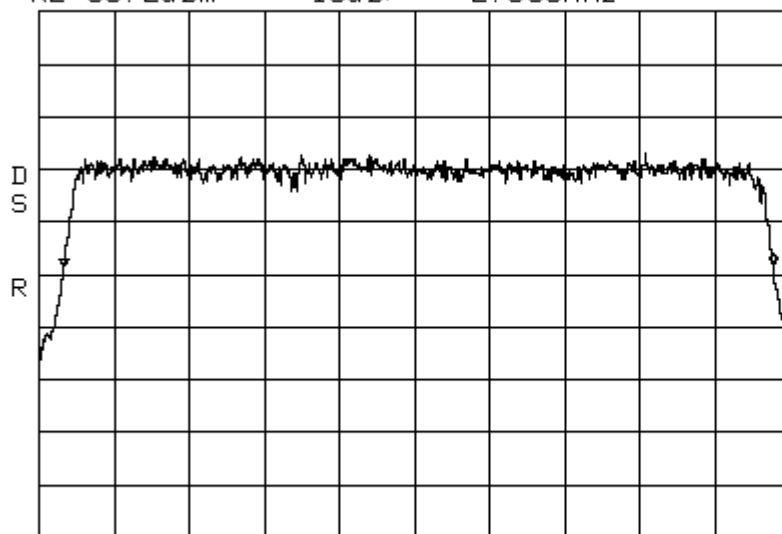
CENTER 881.500MHz SPAN 3.000MHz
*RBW 30kHz *VBW 100kHz SWP 50ms

Occupied Bandwidth LTE 3 MHz Channel Bandwidth_Signal_Out

CELL

Span: 3 MHz RBW: 30 kHz VBW: 100 kHz

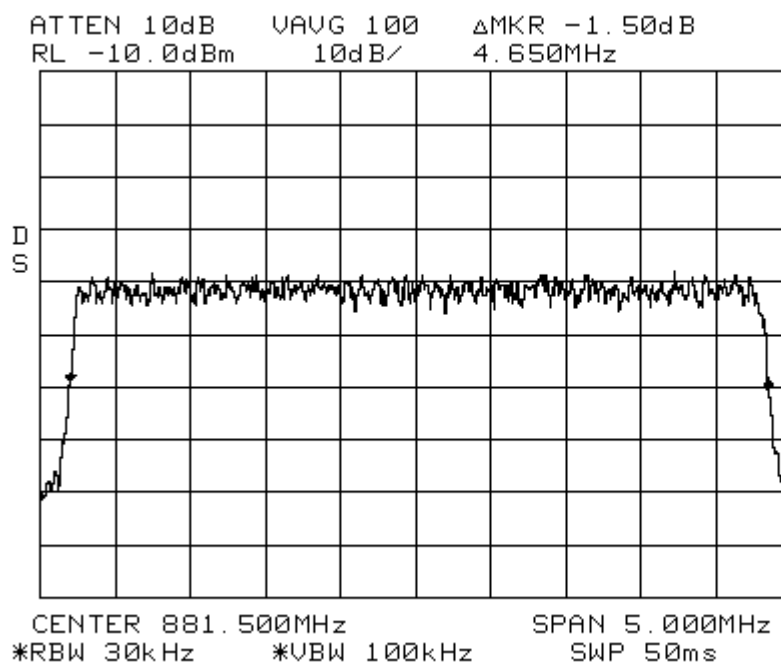
ATTEN 30dB VAUG 100 ΔMKR .33dB
RL 50.2dBm 10dB/ 2.835MHz



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

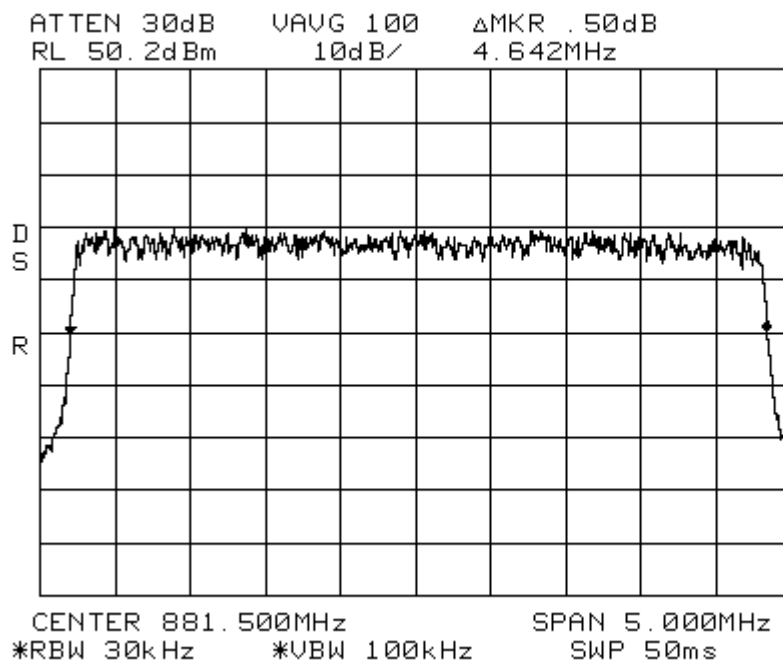
Occupied Bandwidth LTE 5 MHz Channel Bandwidth_Signal_In
Span: 5 MHz RBW: 30 kHz VBW: 100 kHz

CELL



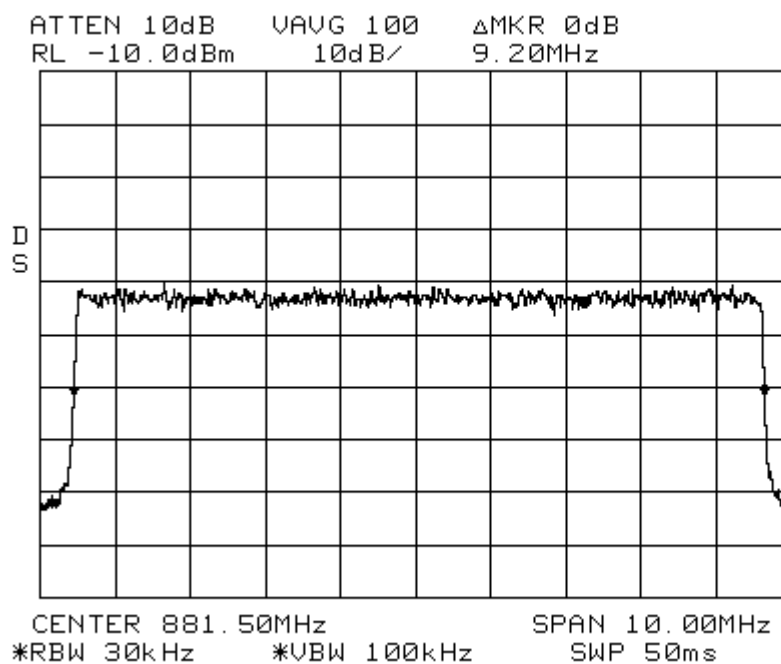
Occupied Bandwidth LTE 5 MHz Channel Bandwidth_Signal_Out
Span: 5 MHz RBW: 30 kHz VBW: 100 kHz

CELL



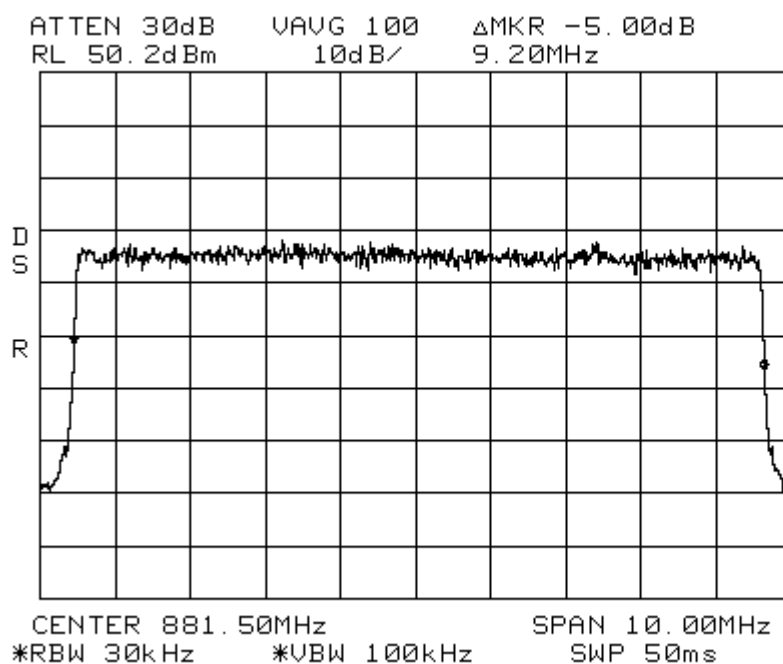
Occupied Bandwidth LTE 10 MHz Channel Bandwidth_Signal_In
Span: 10 MHz RBW: 30 kHz VBW: 100 kHz

CELL



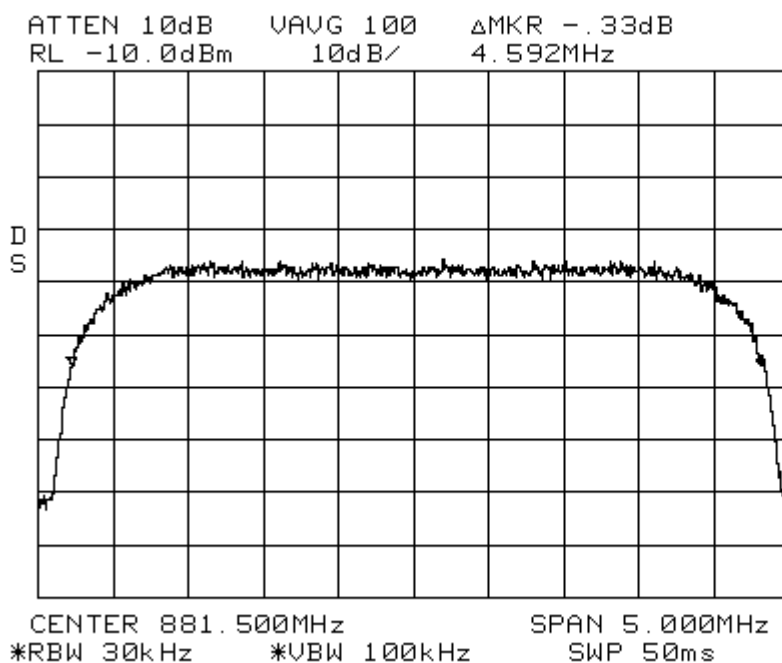
Occupied Bandwidth LTE 10 MHz Channel Bandwidth_Signal_Out
Span: 10 MHz RBW: 30 kHz VBW: 100 kHz

CELL



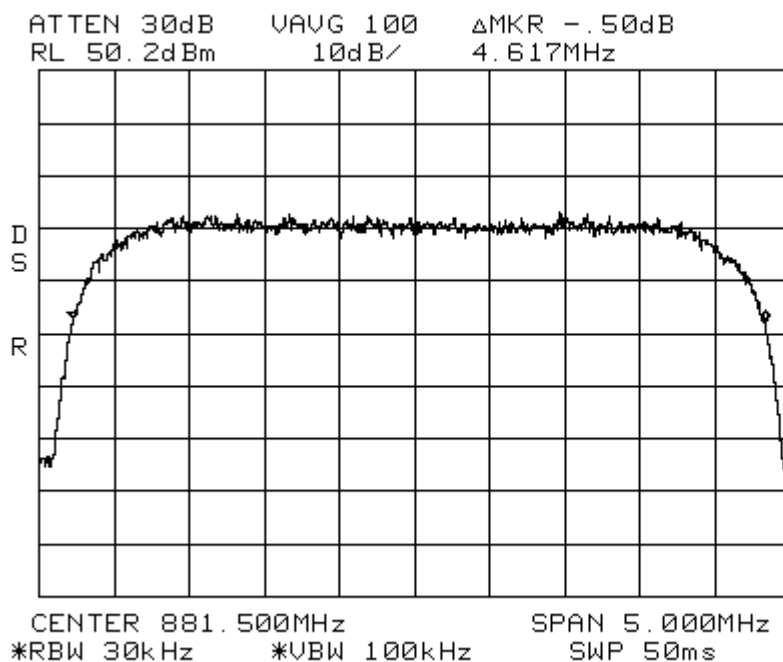
Occupied Bandwidth
Span: 5.0 MHz

WCDMA_Signal_In CELL
RBW: 30 kHz VBW: 100 kHz



Occupied Bandwidth
Span: 5.0 MHz

WCDMA_Signal_Out CELL
RBW: 30 kHz VBW: 100 kHz



6.3 FCC 2.1046, 22.913 Power Limits – Output Power

Test Summary:

- The requirements are: ▪ **MET** ▫ NOT MET
- Minimum margin of compliance is 43.78 dB at 881.5 MHz (CDMA)
- Minimum margin of compliance is 43.68 dB at 881.5 MHz (GSM)
- Minimum margin of compliance is 44.10 dB at 881.5 MHz (EDGE)
- Minimum margin of compliance is 43.34 dB at 881.5 MHz (W-CDMA)
- Minimum margin of compliance is 43.45 dB at 881.5 MHz (LTE3MHz)
- Minimum margin of compliance is 43.14 dB at 881.5 MHz (LTE5MHz)
- Minimum margin of compliance is 43.16 dB at 881.5 MHz (LTE10MHz)

Test Methods Used:

TIA-603-C 2004, ANSI C63.4-2003, FCC 2.1046, 22.913

Test Procedure:

Conducted: The RF Output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

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, WCDMA, LTE 3 MHz, LTE 5MHz, LTE 10MHz, LTE 15MHz Channel Bandwidths & signal generator.

A signal was used at the low, mid and high parts of the selected band.

Test Limit:

100 Watts or 50 dBm Limit

Test Date: 10/30/12

Tests Conducted By: Joshua J. Wittman

Test Equipment: 2, 6, 9, 12, 13

Number	Description	Manufacturer	Model	ADC TELECOMMUNICATIONS Serial Number	Cal Due	Used
2	Power Meter	HP	437B	MC27754	6-30-13	☒
6	Signal Generator	Aeroflex	3413	MC57343	11-9-12	☒
9	Digital Barometer	Fisher Scientific	02-403	MC50719	1-25-13	☒
12	RF Power Sensor	Agilent	8481A	MC48747	6-30-13	☒
13	Spectrum Analyzer	Rohde & Schwarz	FSQ-8	MC57131	2-15-13	☒

Environmental Conditions in the lab:

Temperature: 28° C

Relative Humidity: 20%

Atmospheric Pressure: 99.0 kPa

Test Results:

***Note: Output power is total conducted for 2×2 MIMO. It will be displayed 2 times the output power listed below on the FCC Grant.**

CELL

CDMA **23.878 Watts**

Carrier Frequency	Carrier Output
869.8 MHz	<u>42.60</u> dBm
881.5 MHz	<u>43.78</u> dBm
893.2 MHz	<u>42.73</u> dBm

CELL

GSM **23.014 Watts**

Carrier Frequency	Carrier Output
869.2 MHz	<u>42.62</u> dBm
881.5 MHz	<u>43.62</u> dBm
893.8 MHz	<u>42.57</u> dBm

CELL

EDGE **25.703 Watts**

Carrier Frequency	Carrier Output
869.2 MHz	<u>43.04</u> dBm
881.5 MHz	<u>44.10</u> dBm
893.8 MHz	<u>43.06</u> dBm

CELL

WCDMA **21.577 Watts**

Carrier Frequency	Carrier Output
871.5 MHz	<u>42.45</u> dBm
881.5 MHz	<u>43.34</u> dBm
891.5 MHz	<u>42.35</u> dBm

CELL

LTE 3.0 MHz **22.130 Watts**

Carrier Frequency	Carrier Output
870.5 MHz	<u>42.80</u> dBm
881.5 MHz	<u>43.45</u> dBm
892.5 MHz	<u>42.40</u> dBm

CELL

LTE 5.0 MHz **20.606 Watts**

Carrier Frequency	Carrier Output
871.5 MHz	<u>42.10</u> dBm
881.5 MHz	<u>43.14</u> dBm
891.5 MHz	<u>42.05</u> dBm

CELL

LTE 10.0 MHz **20.701 Watts**

Carrier Frequency	Carrier Output
874.0 MHz	<u>42.54</u> dBm
881.5 MHz	<u>43.16</u> dBm
889.0 MHz	<u>42.47</u> dBm

6.4 FCC 2.1051, 22.917 Emissions Limits – Spurious Emissions at Antenna

Test Summary:

- The requirements are: **• MET** **◦ NOT MET**

Test Methods Used:

TIA-603-C 2004, ANSI C63.4-2003, FCC 2.1051, 22.917

Test Procedure:

The RF Output of the transmitter was connected to input of the spectrum analyzer through sufficient attenuation.

The out of band emissions were measured directly from the EUT antenna output in the TX path using a spectrum analyzer from 30 MHz to the 10th harmonic of the highest carrier frequency. Test signals used are GSM, EDGE, CDMA, WCDMA, LTE 3 MHz, LTE 5MHz, LTE 10MHz, & LTE 15MHz Channel Bandwidths. The different signals were input one at a time to the EUT.

The inter-modulation products test was performed for the EUT. Three tests were performed with the modulation type. Test 1 was with 2 signals input to the EUT at lower end channels. Test 2 was with 2 signals input to the EUT at upper end channels. Test 3 was with 2 signals input to the EUT at upper and lower end channels. The modulation types tested were GSM, EDGE, CDMA, WCDMA, 3 MHz, 5MHz, 10MHz, & 15MHz Channel Bandwidths.

Test Limit:

The spectrum shall be investigated to the tenth harmonics of the highest fundamental frequency as specified in FCC 2.1057

Out of band emissions:

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

Test Dates: 10/31/12, 11/1/12, 11/2/12, 11/6/12, 11/7/12, & 11/8/12

Tests Conducted By: Joshua J. Wittman

Test Equipment: 1, 2, 6, 7, 9, 12, 13

Number	Description	Manufacturer	Model	ADC TELECOMMUNICATIONS Serial Number	Cal Due	Used
1	Spectrum Analyzer	HP	8563E	MC27690	6-30-13	☒
2	Power Meter	HP	437B	MC27754	6-30-13	☒
6	Signal Generator	Aeroflex	3413	MC57343	2-9-13	☒
7	Signal Generator	Aeroflex	3413	MC57947	6-26-14	☒
9	Digital Barometer	Fisher Scientific	02-403	MC50719	1-25-13	☒
12	RF Power Sensor	Agilent	8482A	MC48747	6-30-13	☒
13	Spectrum Analyzer	Rohde & Schwarz	FSQ-8	MC57131	2-15-13	☒

Environmental Conditions in the lab:

Temperature: 28° C

Relative Humidity: 20%

Atmospheric Pressure: 99.0 kPa

Test Results:

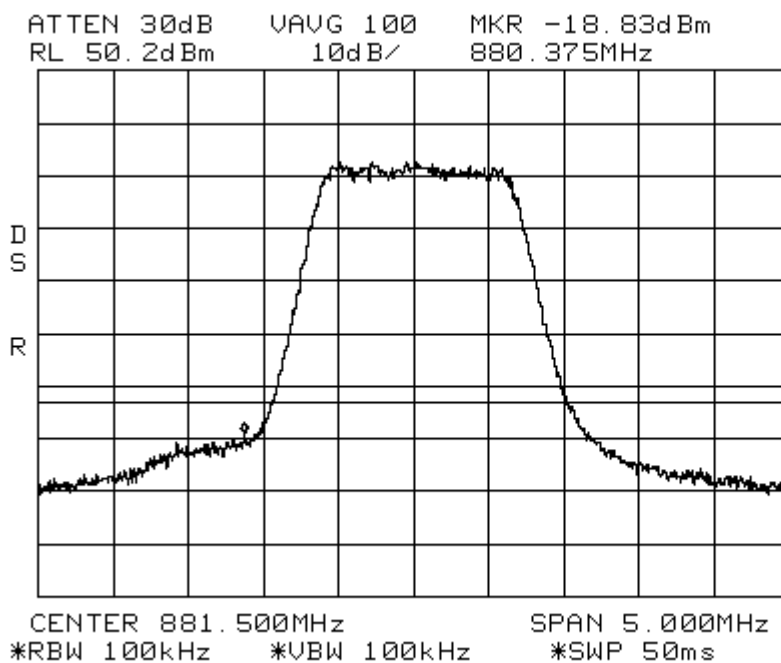
Conducted Emissions

CDMA

CELL

Center: 881.5 MHz Span: 5 MHz

RBW/VBW: 100 kHz



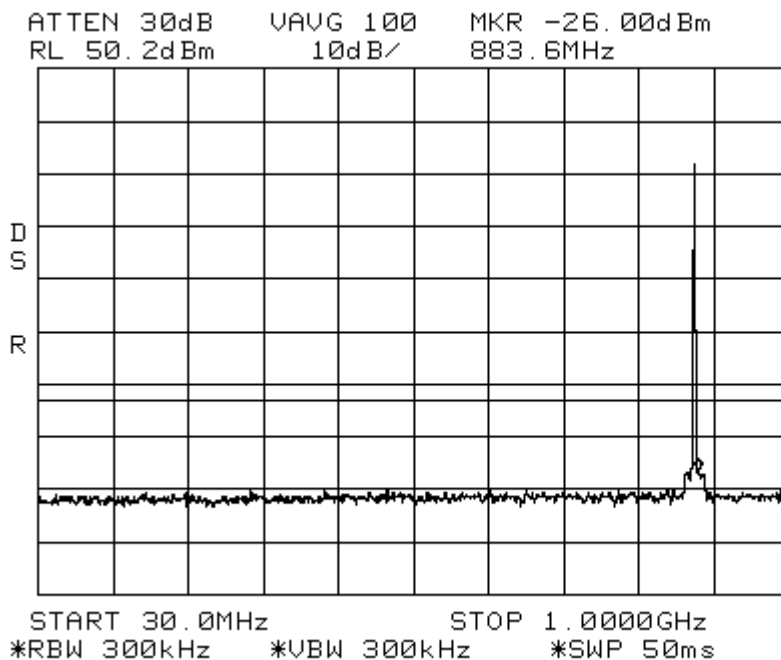
Conducted Emissions

CDMA

CELL

Span: 30 MHz to 1 GHz

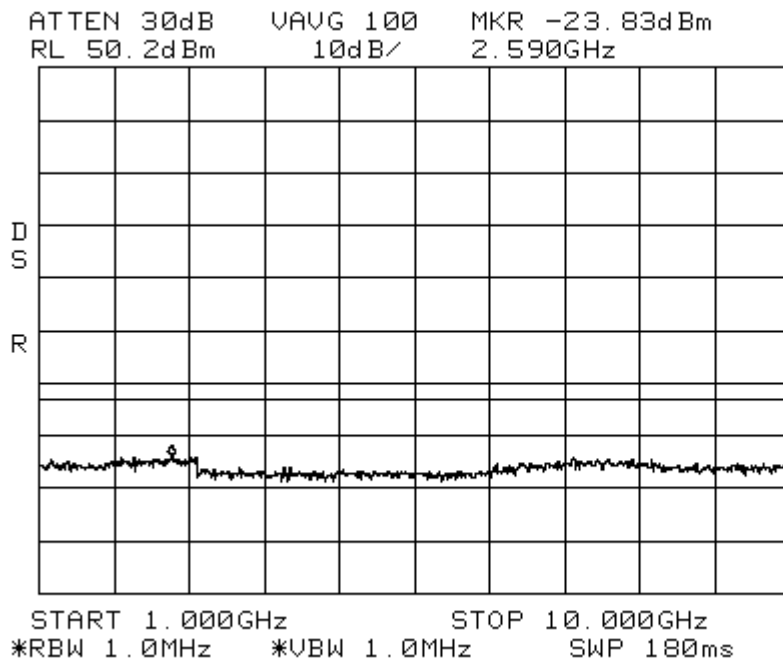
RBW/VBW: 300 kHz



Conducted Emissions
Span: 1 GHz to 10 GHz

CDMA

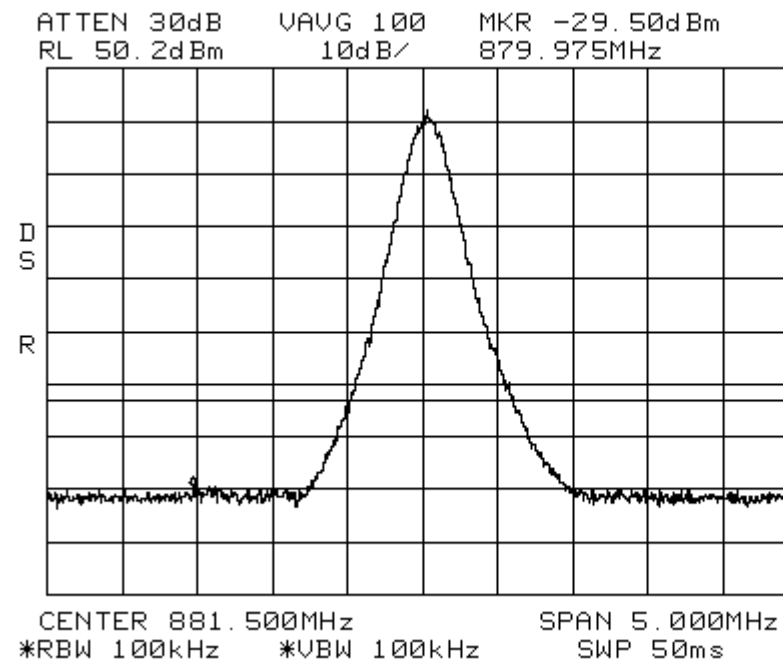
CELL
RBW/VBW: 1 MHz



Conducted Emissions
Center: 881.5 MHz

EDGE

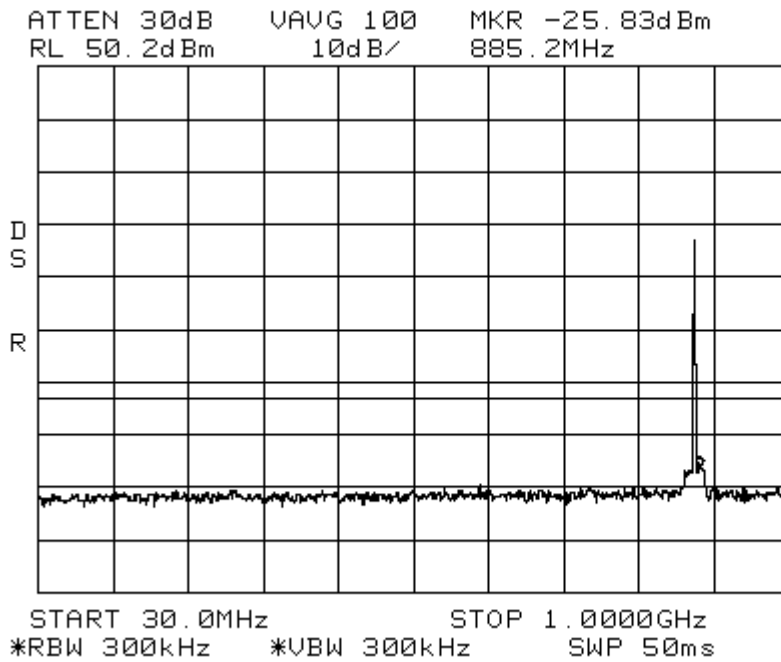
CELL
Span: 5 MHz
RBW/VBW: 100 kHz



Conducted Emissions
Span: 30 MHz to 1 GHz

EDGE

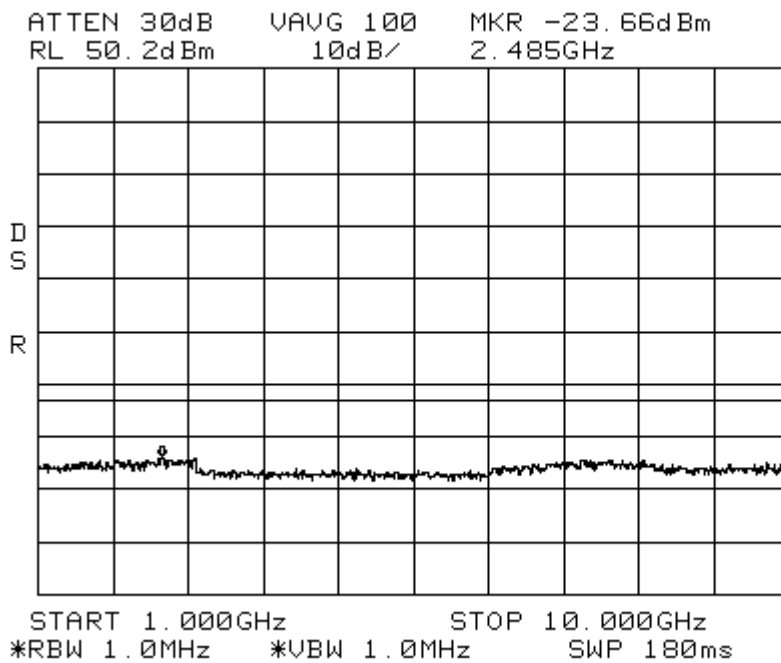
CELL
RBW/VBW: 300 kHz



Conducted Emissions
Span: 1 GHz to 10 GHz

EDGE

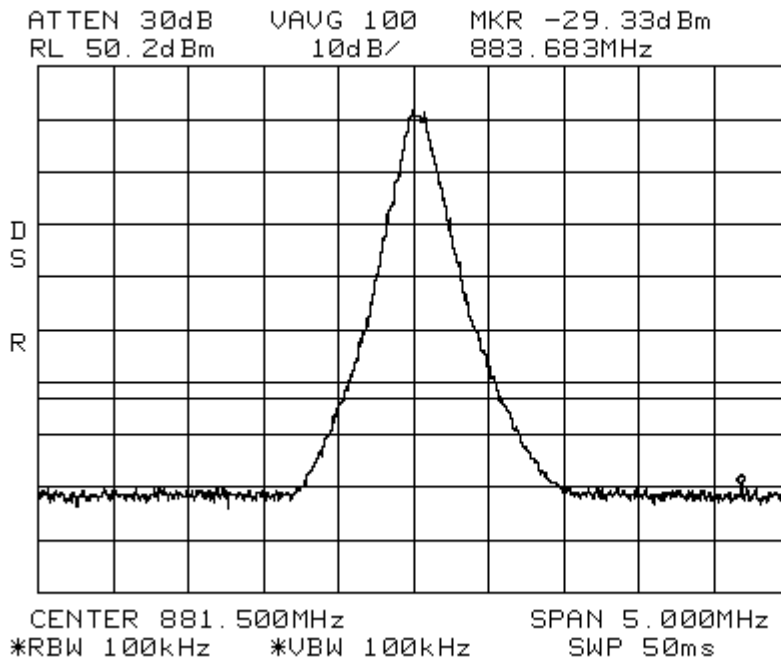
CELL
RBW/VBW: 1 MHz



Conducted Emissions
Center: 881.5 MHz

GSM
Span: 5 MHz

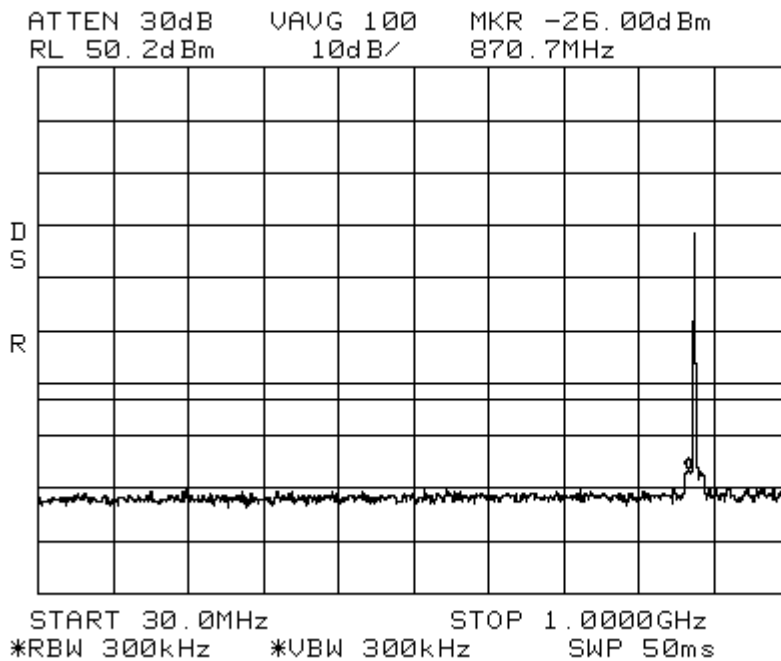
CELL
RBW/VBW: 100 kHz



Conducted Emissions
Span: 30 MHz to 1 GHz

GSM

CELL
RBW/VBW: 300 kHz

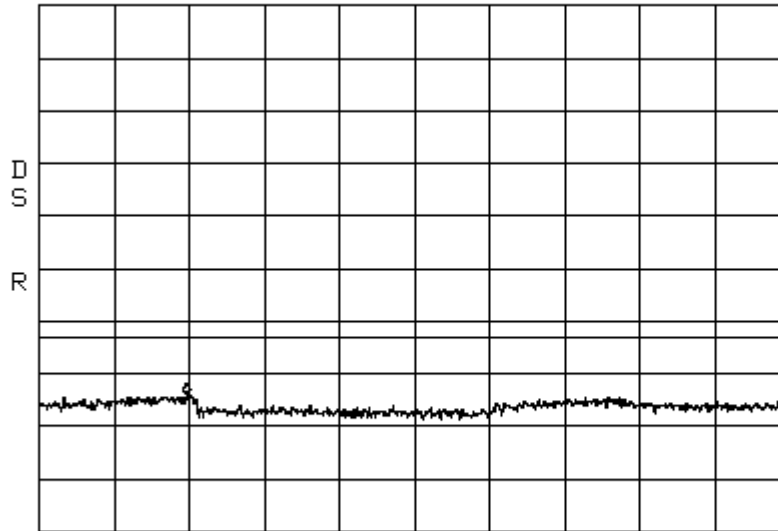


Conducted Emissions
Span: 1 GHz to 10 GHz

GSM

CELL
RBW/VBW: 1 MHz

ATTEN 30dB VAUG 100 MKR -23.83dBm
RL 50.2dBm 10dB/ 2.770GHz



START 1.000GHz STOP 10.000GHz
*RBW 1.0MHz *VBW 1.0MHz SWP 180ms

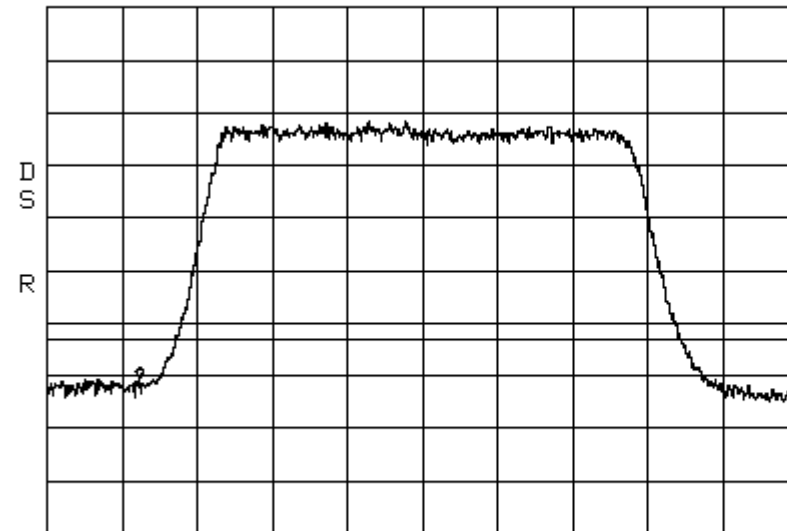
Conducted Emissions
Center: 881.5 MHz

LTE 3 MHz Channel Bandwidth
Span: 5 MHz

CELL

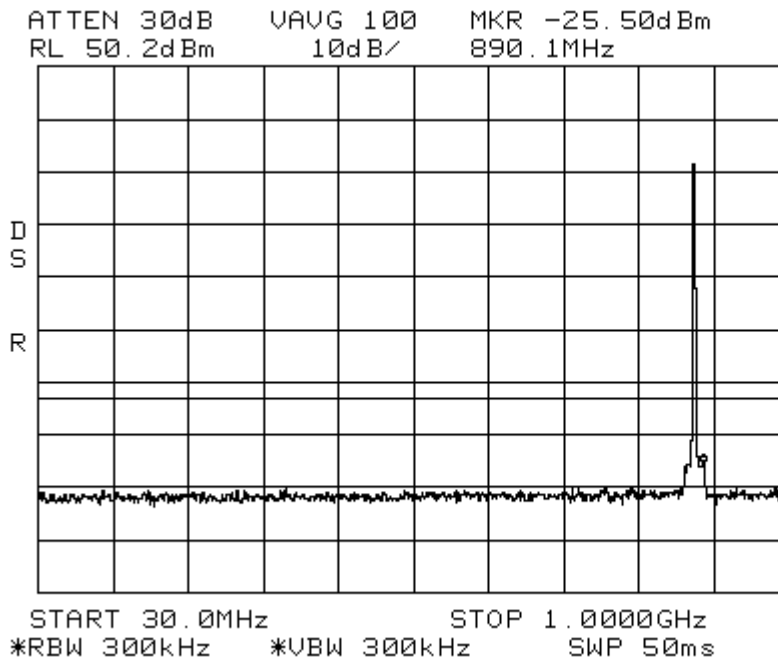
RBW/VBW: 100 kHz

ATTEN 30dB VAUG 100 MKR -20.16dBm
RL 50.2dBm 10dB/ 879.617MHz

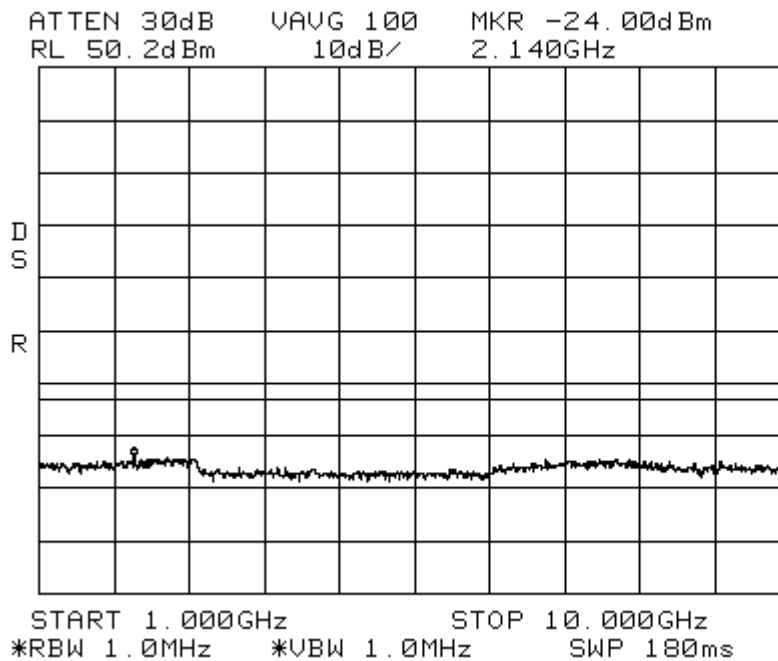


CENTER 881.500MHz SPAN 5.000MHz
*RBW 100kHz *VBW 100kHz SWP 50ms

Conducted Emissions LTE 3 MHz Channel Bandwidth CELL
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



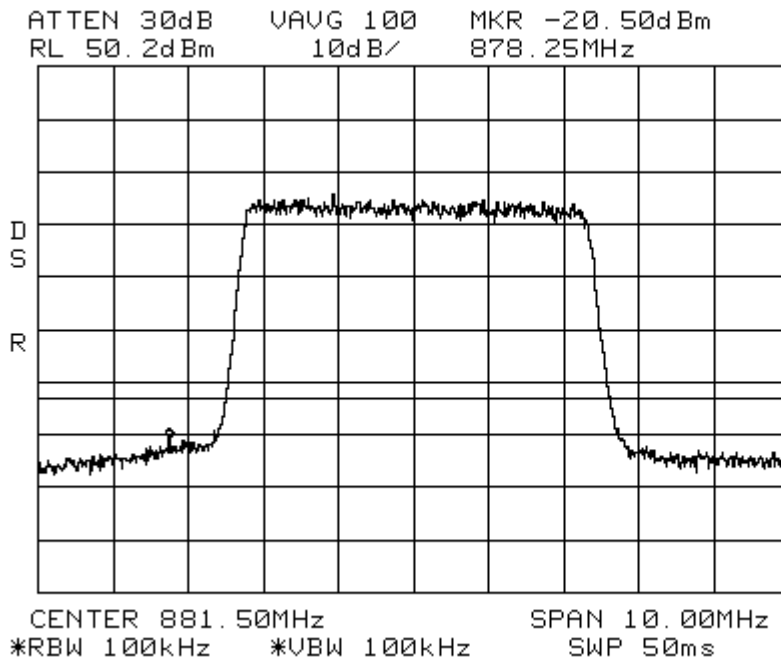
Conducted Emissions LTE 3 MHz Channel Bandwidth CELL
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



Conducted Emissions
Center: 881.5 MHz

LTE 5 MHz Channel Bandwidth
Span: 10 MHz

CELL
RBW/VBW: 100 kHz



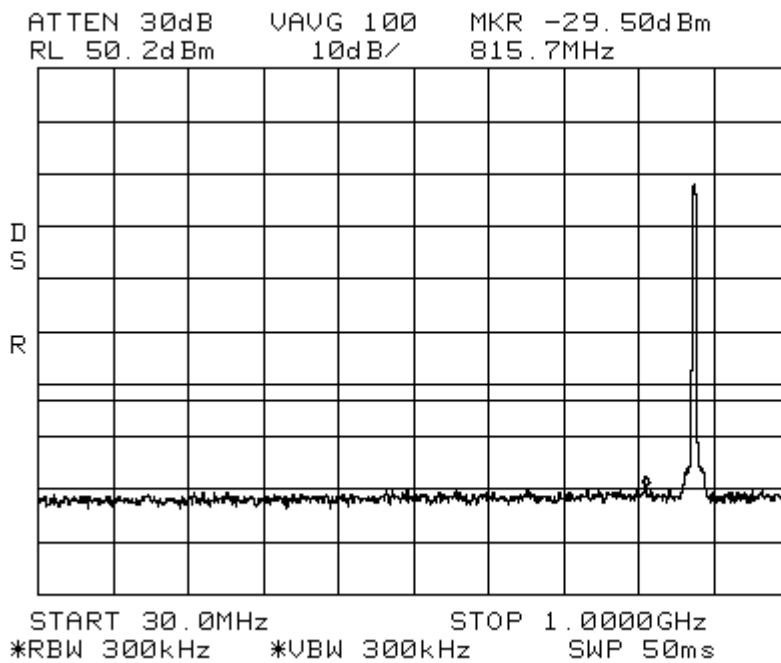
Conducted Emissions

LTE 5 MHz Channel Bandwidth

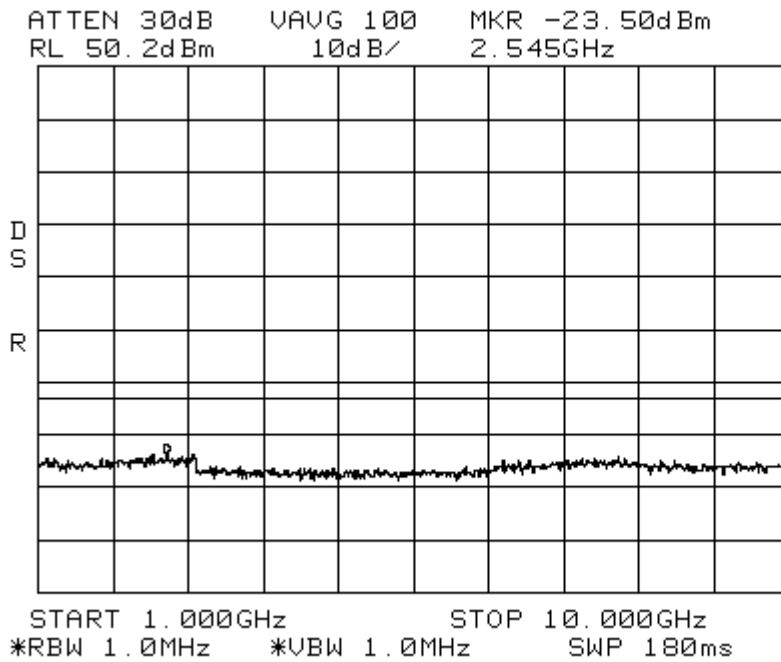
CELL

Span: 30 MHz to 1 GHz

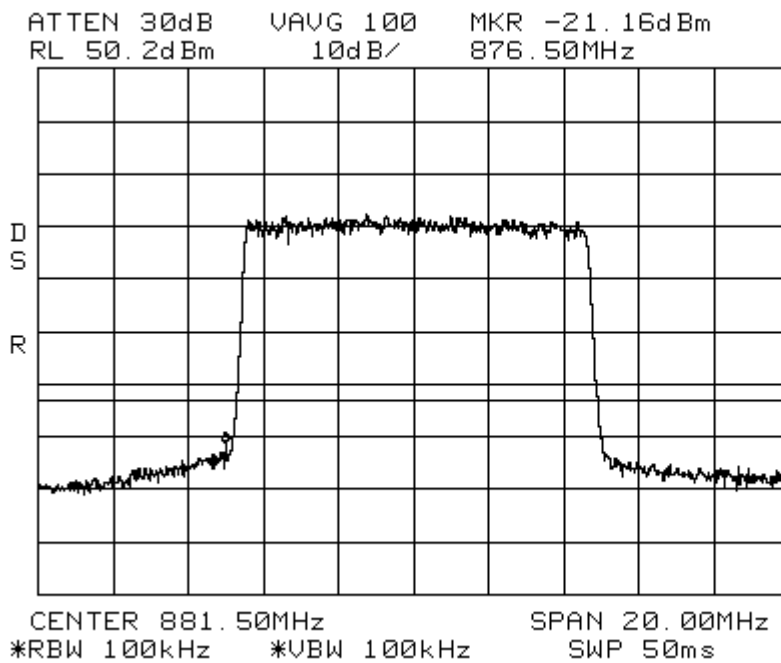
RBW/VBW: 300 kHz



Conducted Emissions LTE 5 MHz Channel Bandwidth CELL
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz

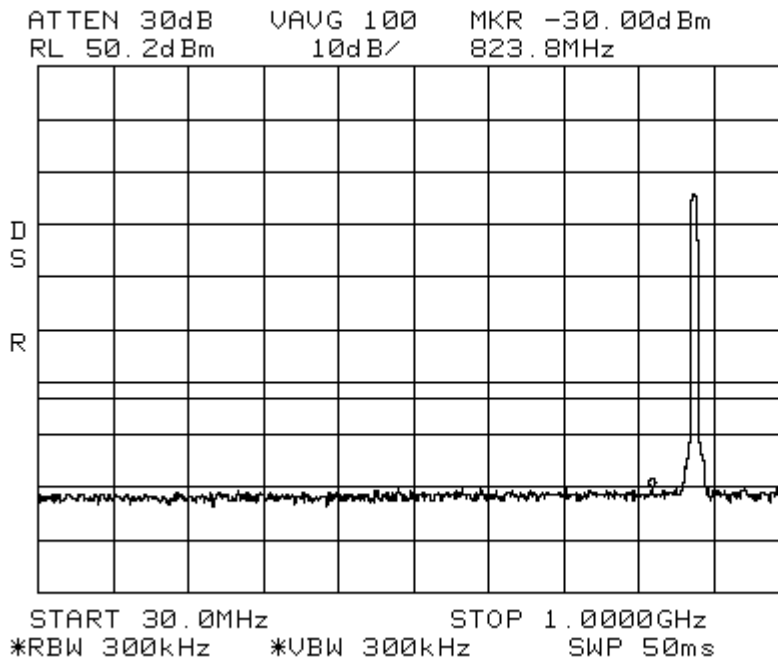


Conducted Emissions LTE 10 MHz Channel Bandwidth CELL
Center: 881.5 MHz Span: 20MHz RBW/VBW: 100 kHz



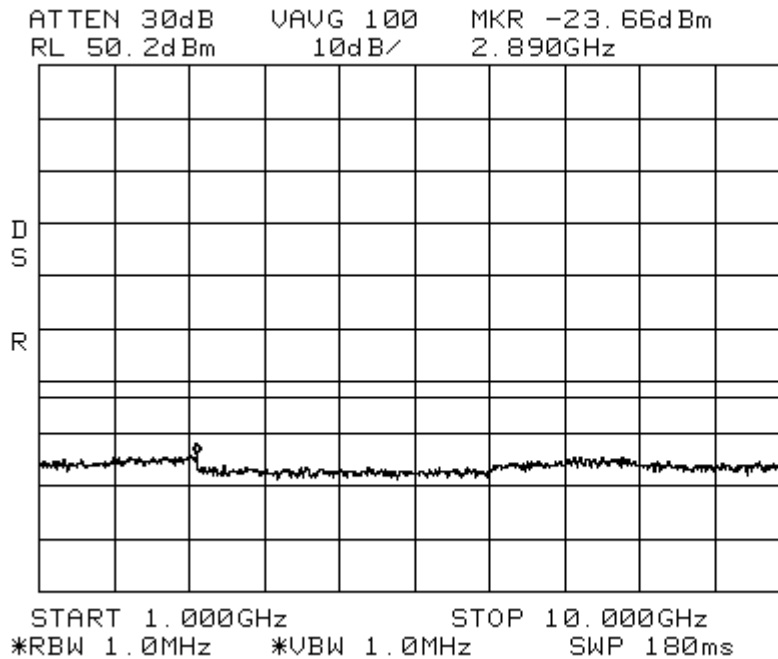
Conducted Emissions LTE 10 MHz Channel Bandwidth
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz

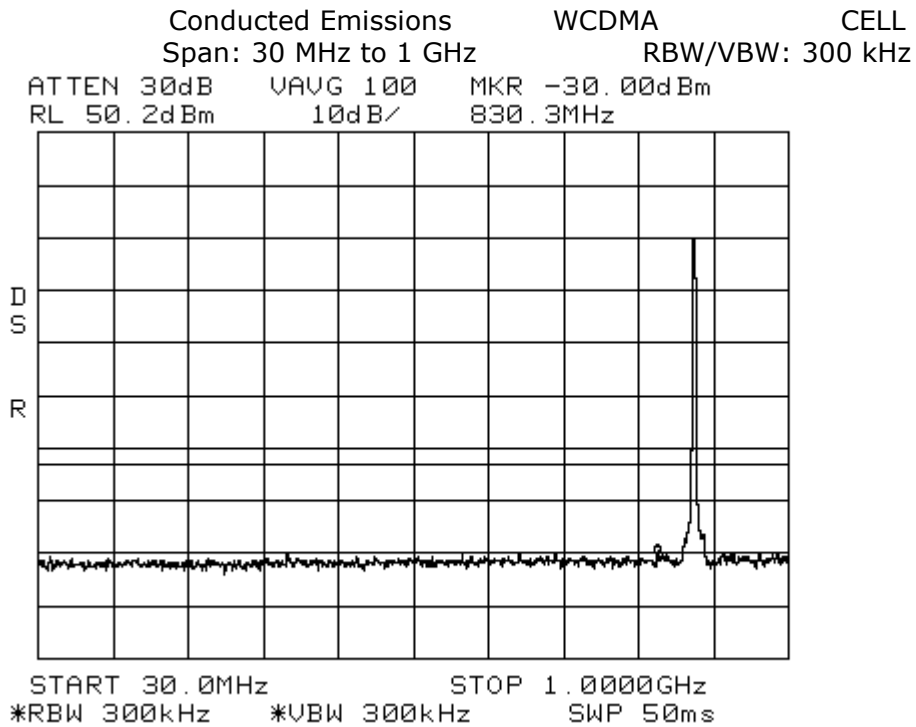
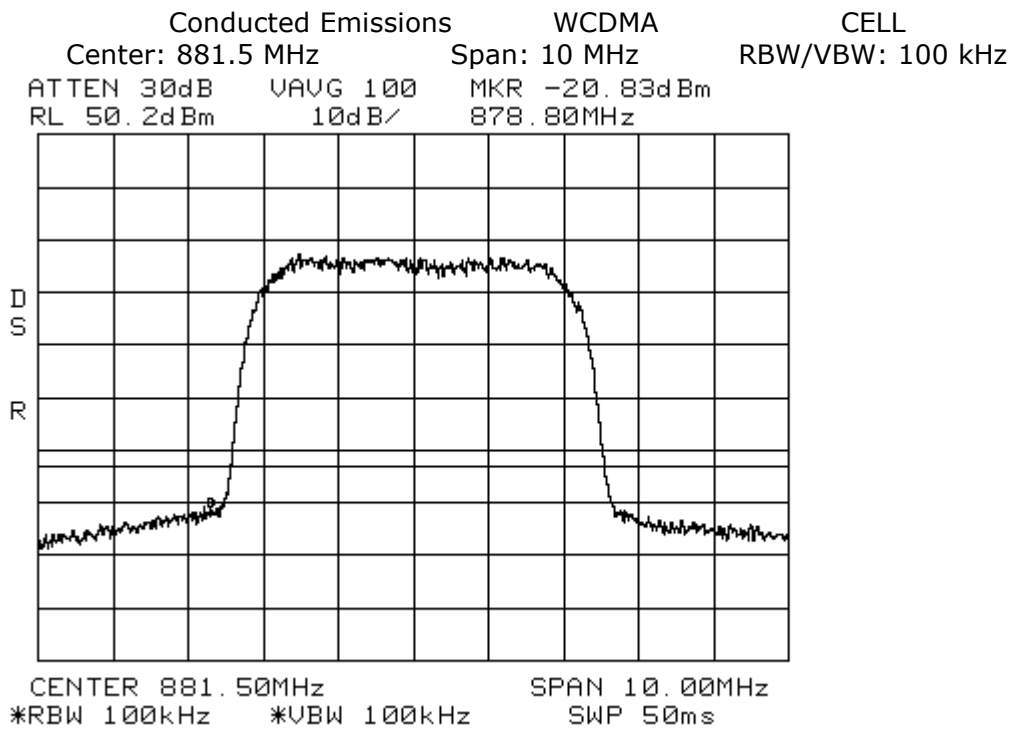
CELL



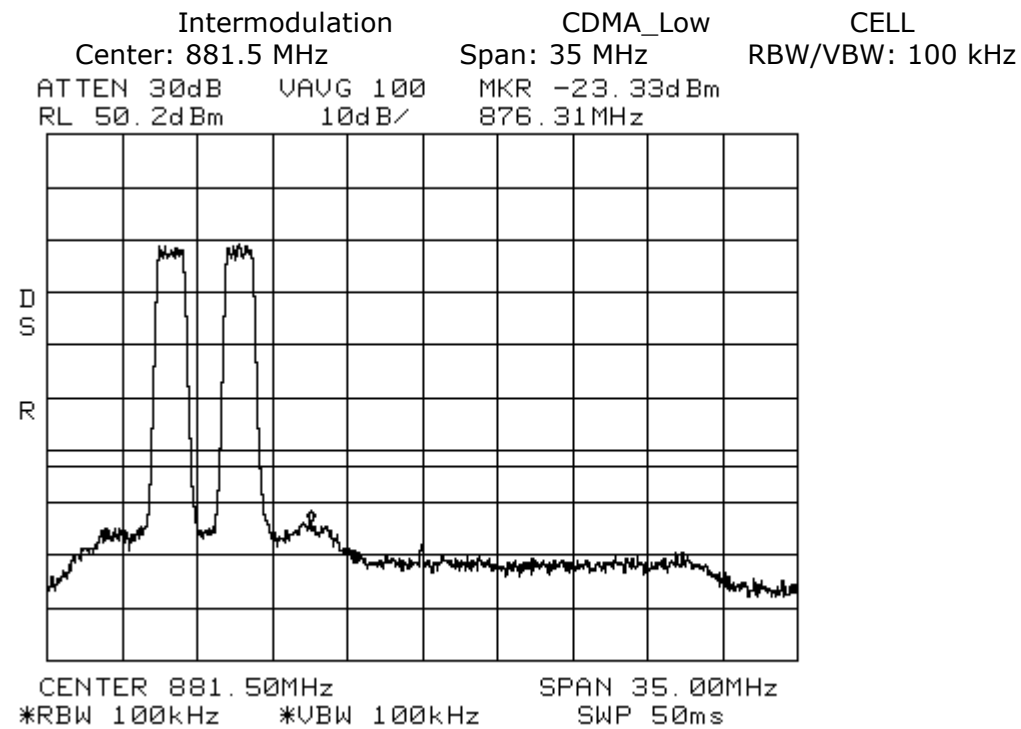
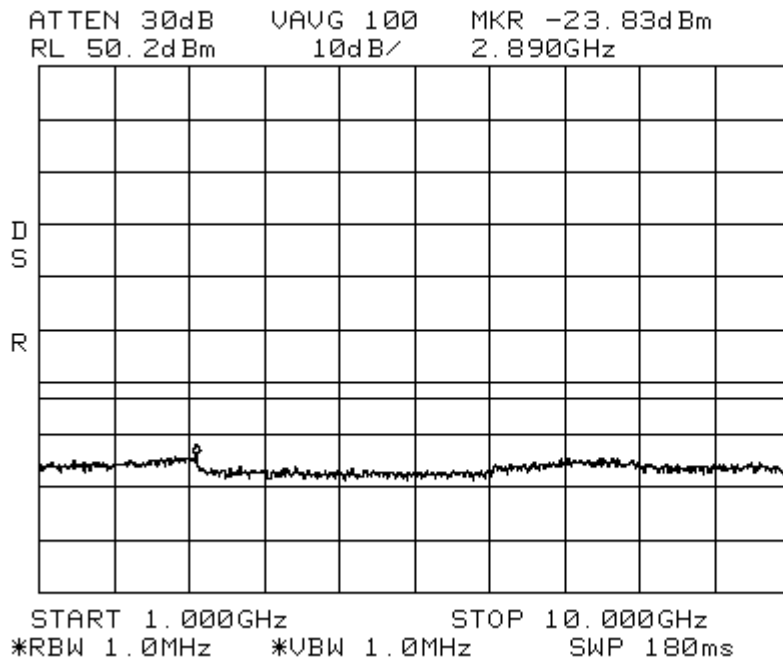
Conducted Emissions LTE 10 MHz Channel Bandwidth
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz

CELL



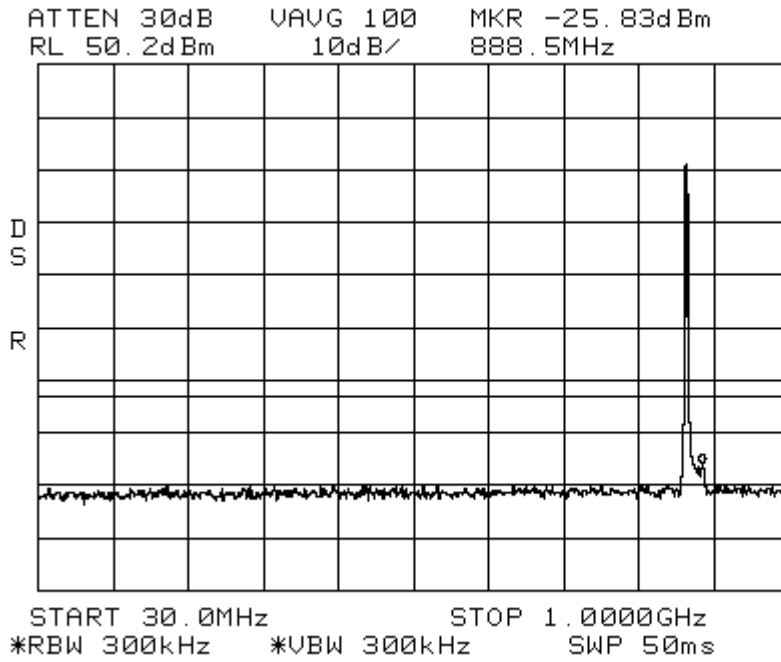


Conducted Emissions WCDMA CELL
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



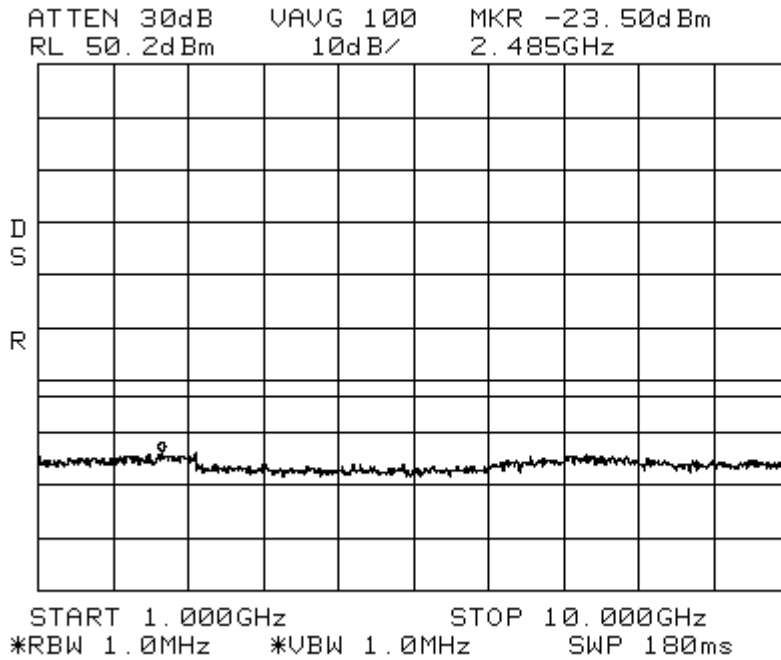
Intermodulation
Span: 30 MHz to 1 GHz

CDMA_Low CELL
RBW/VBW: 300 kHz



Intermodulation
Span: 1 GHz to 10 GHz

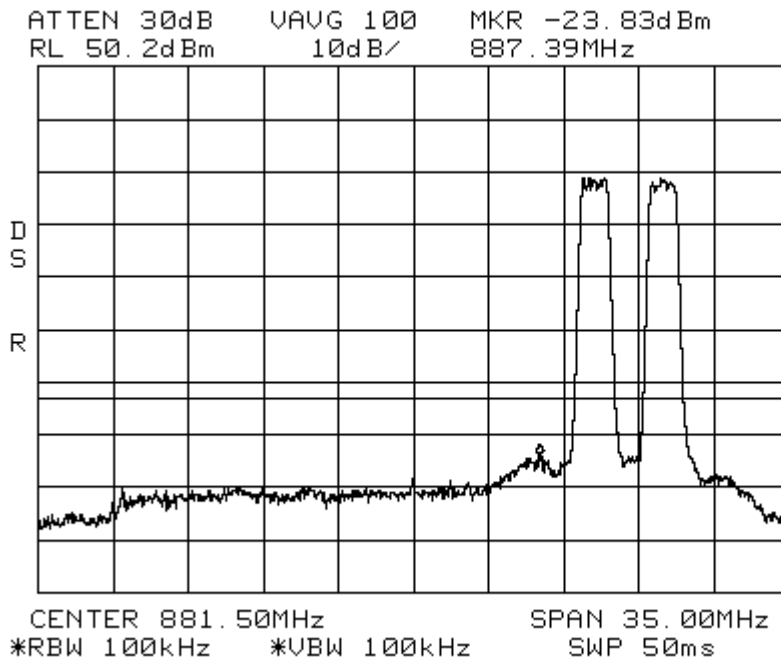
CDMA_Low CELL
RBW/VBW: 1 MHz



Intermodulation
Center: 881.5 MHz

CDMA_High
Span: 35 MHz

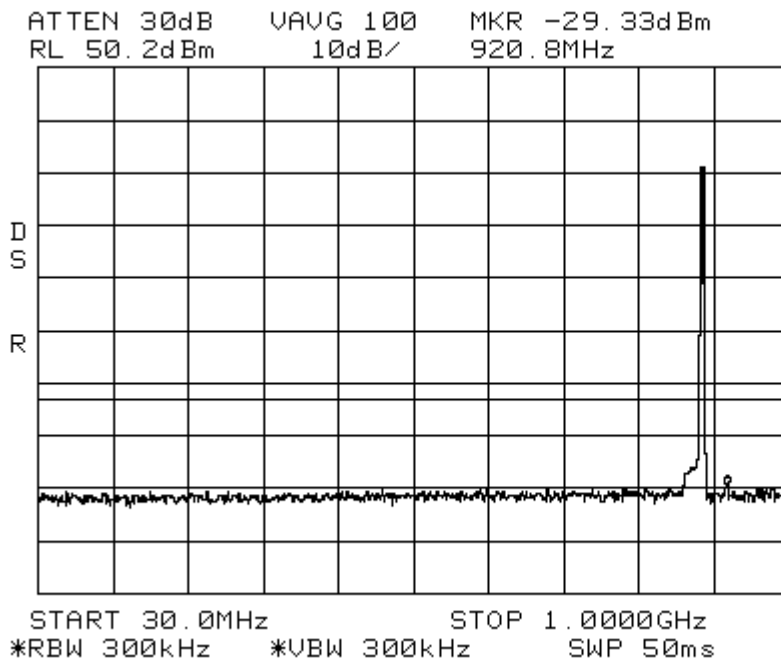
CELL
RBW/VBW: 100 kHz



Intermodulation
Span: 30 MHz to 1 GHz

CDMA_High
RBW/VBW: 300 kHz

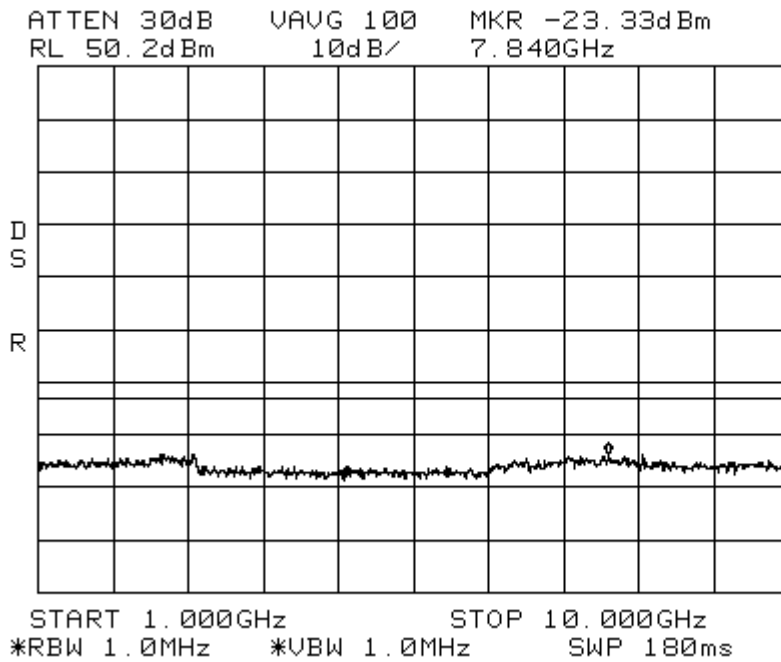
CELL



Intermodulation
Span: 1 GHz to 10 GHz

CDMA_High
RBW/VBW: 1 MHz

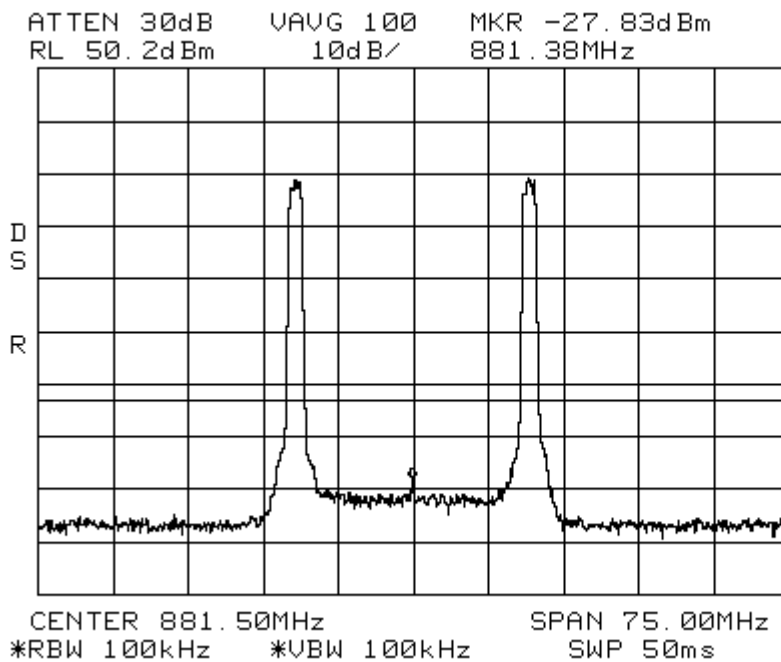
CELL



Intermodulation
Center: 881.5 MHz

CDMA_Apart
Span: 75 MHz

CELL
RBW/VBW: 100 kHz



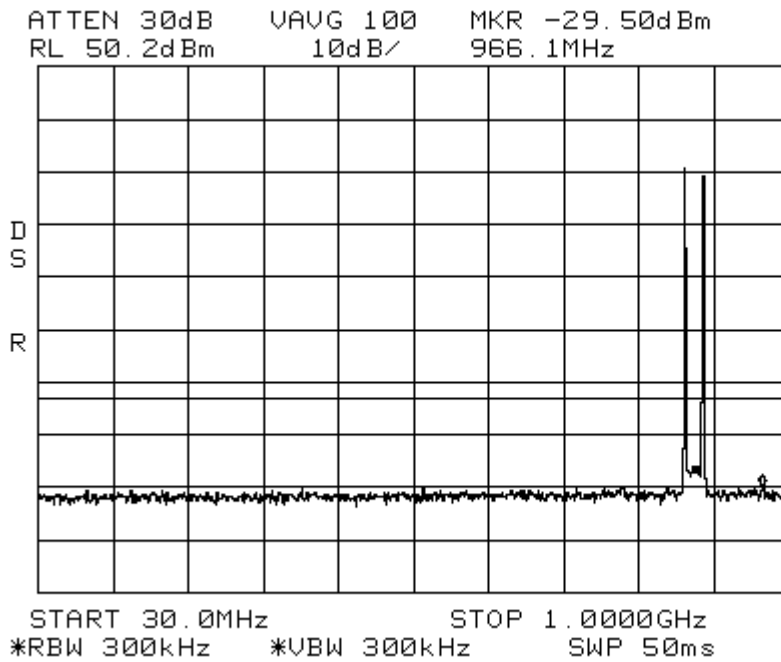
Intermodulation

CDMA_Apart

CELL

Span: 30 MHz to 1 GHz

RBW/VBW: 300 kHz



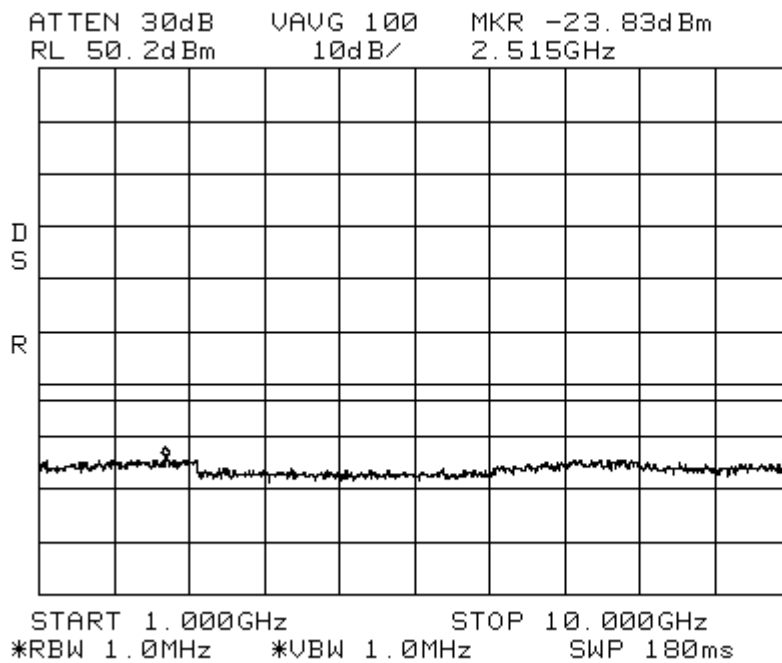
Intermodulation

CDMA_Apart

CELL

Span: 1 GHz to 10 GHz

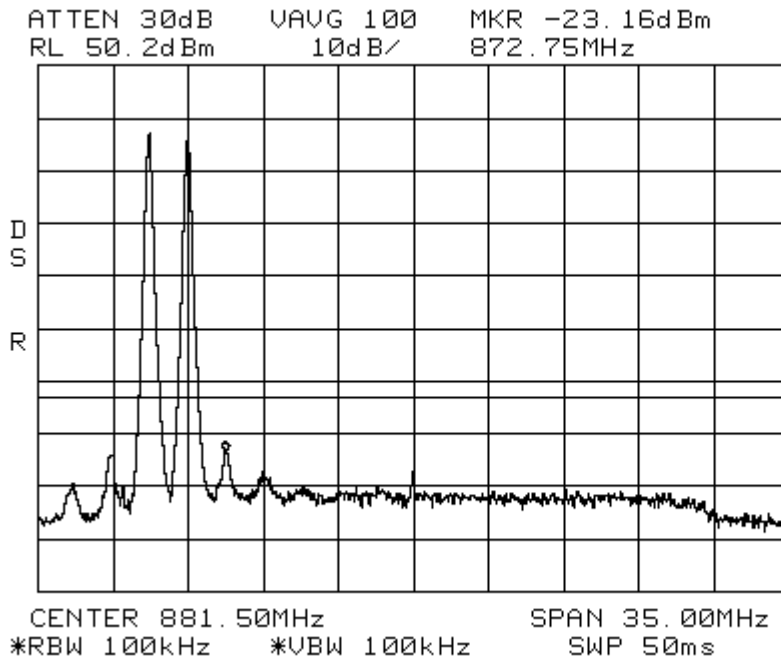
RBW/VBW: 1 MHz



Intermodulation
Center: 881.5 MHz

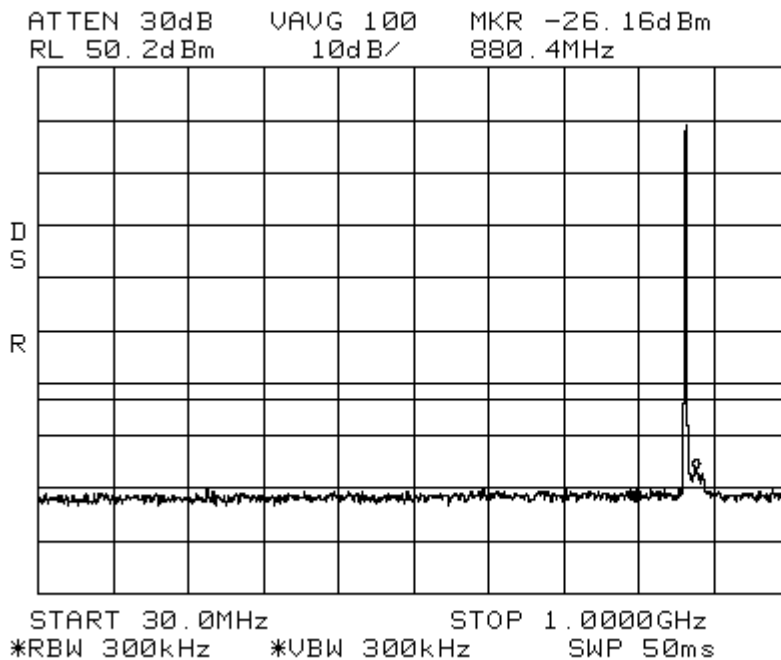
EDGE_Low
Span: 35 MHz

CELL
RBW/VBW: 100 kHz



Intermodulation
Span: 30 MHz to 1 GHz

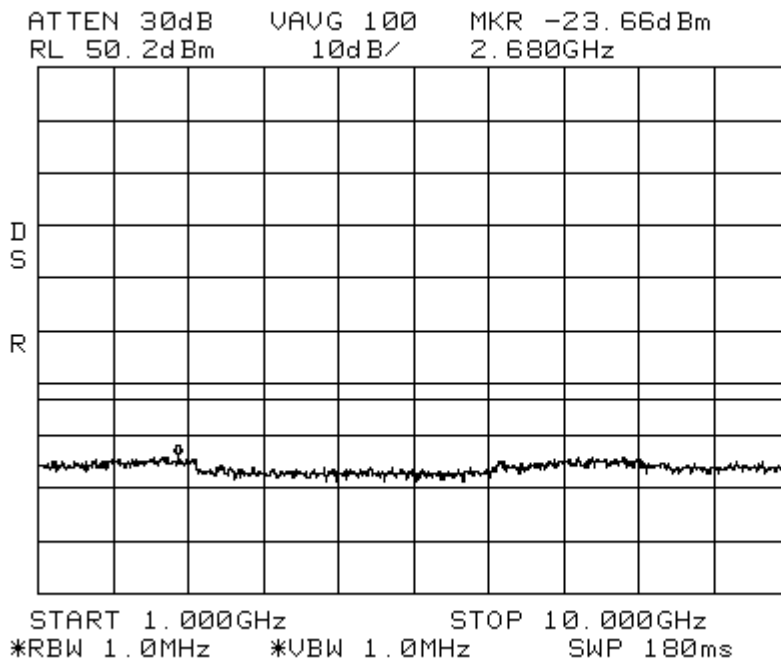
EDGE_Low
RBW/VBW: 300 kHz



Intermodulation
Span: 1 GHz to 10 GHz

EDGE_Low
RBW/VBW: 1 MHz

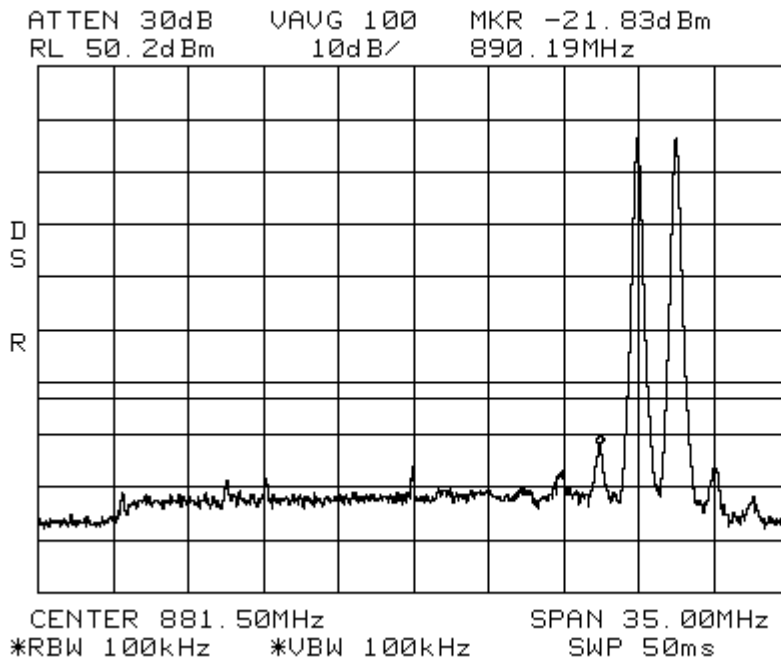
CELL



Intermodulation
Center: 881.5 MHz

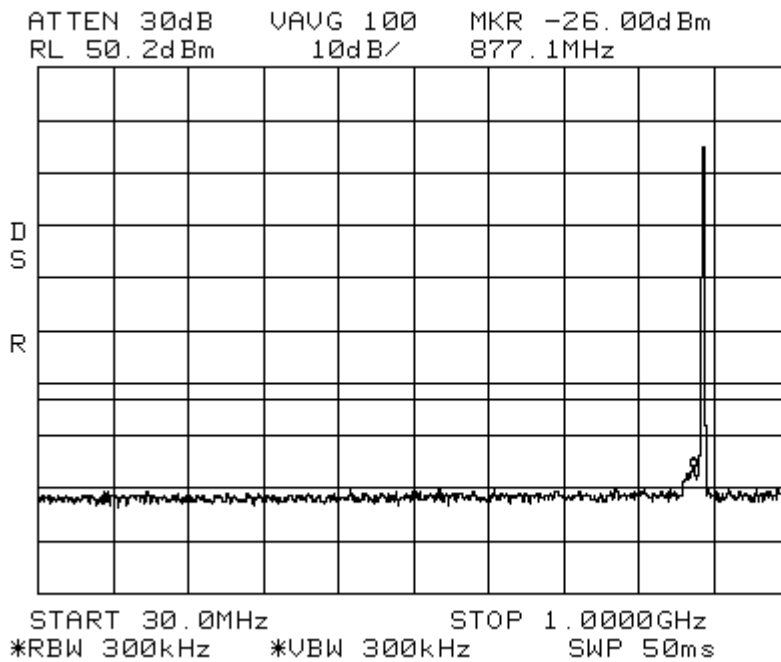
EDGE_High
Span: 35 MHz

CELL
RBW/VBW: 100 kHz



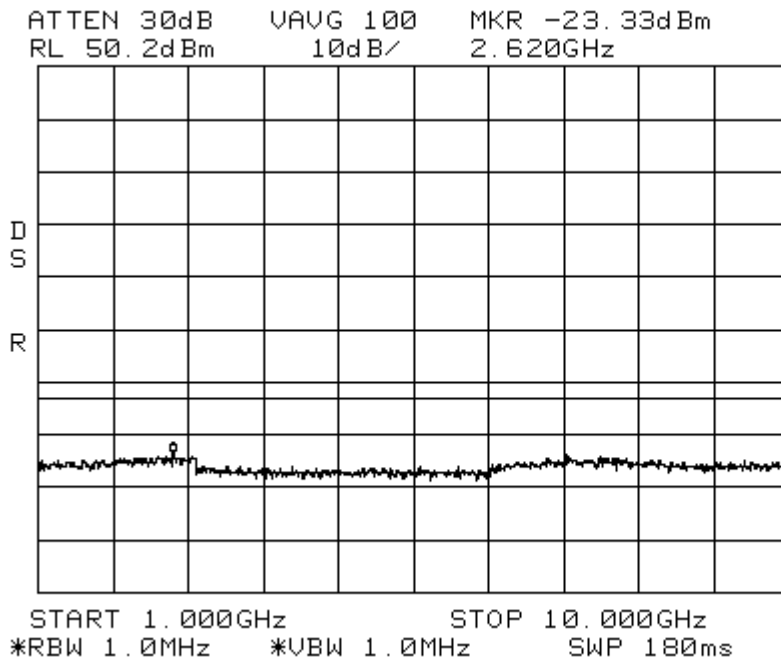
Intermodulation
Span: 30 MHz to 1 GHz

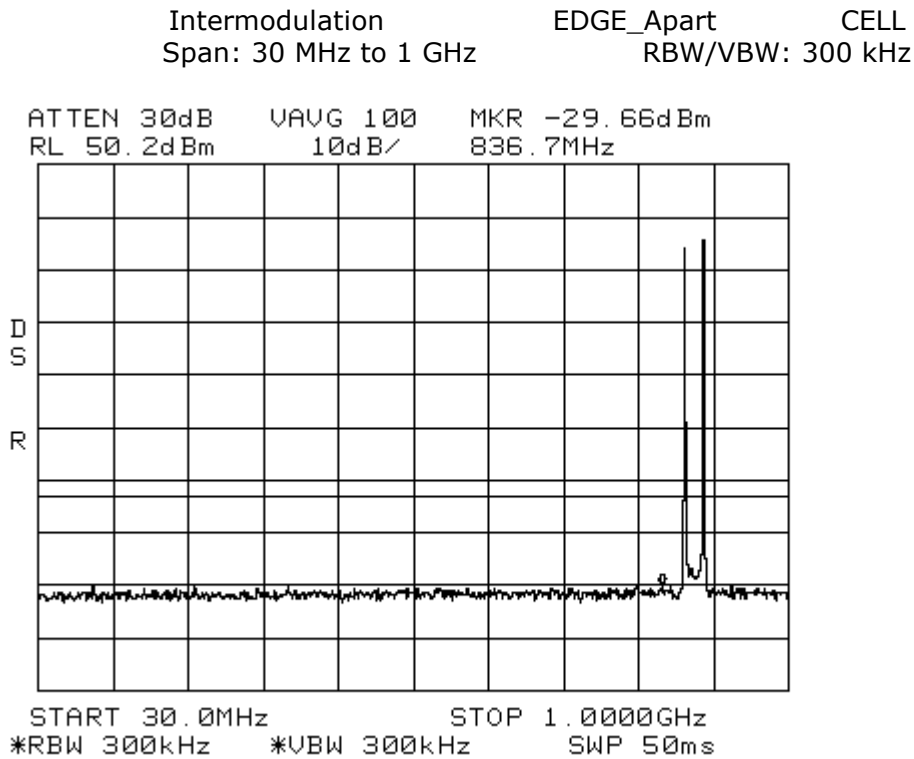
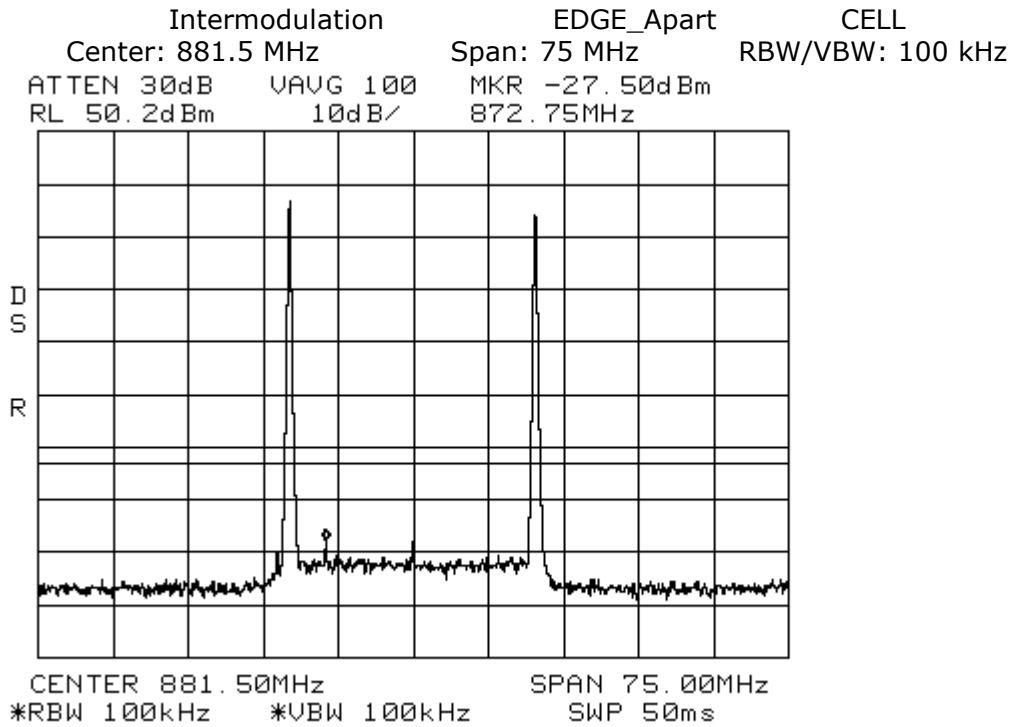
EDGE_High CELL
RBW/VBW: 300 kHz



Intermodulation
Span: 1 GHz to 10 GHz

EDGE_High CELL
RBW/VBW: 1 MHz

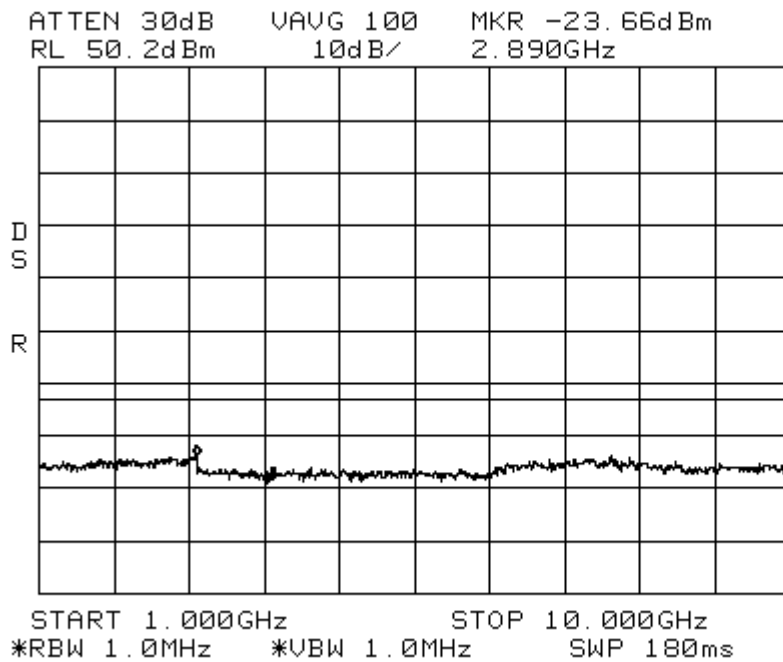




Intermodulation
Span: 1 GHz to 10 GHz

EDGE_Apart
RBW/VBW: 1 MHz

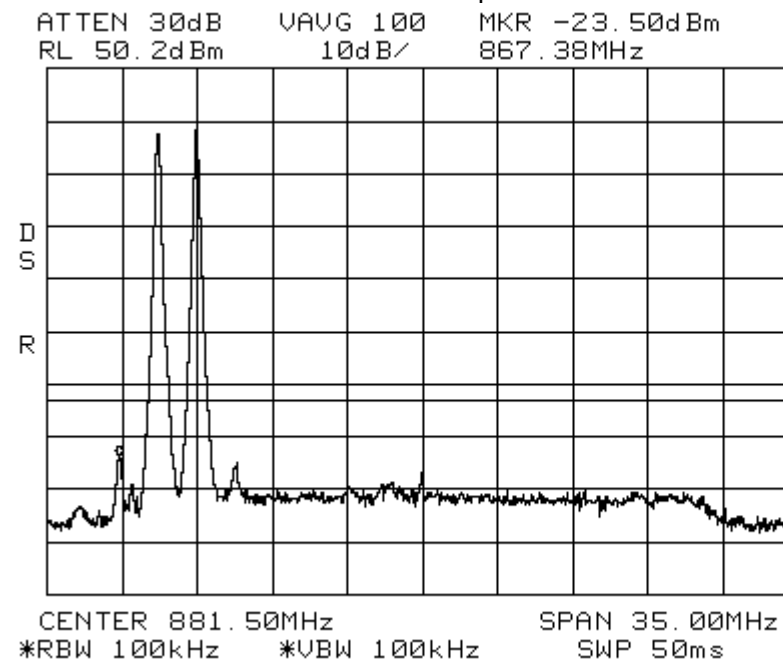
CELL



Intermodulation
Center: 881.5 MHz

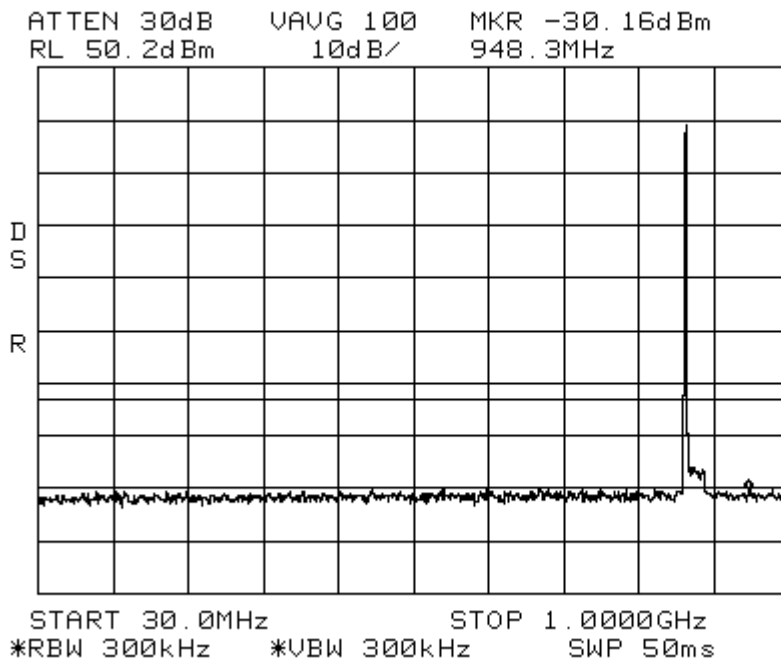
GSM_Low
Span: 35 MHz
MKR -23.50dBm
867.38MHz

CELL
RBW/VBW: 100 kHz



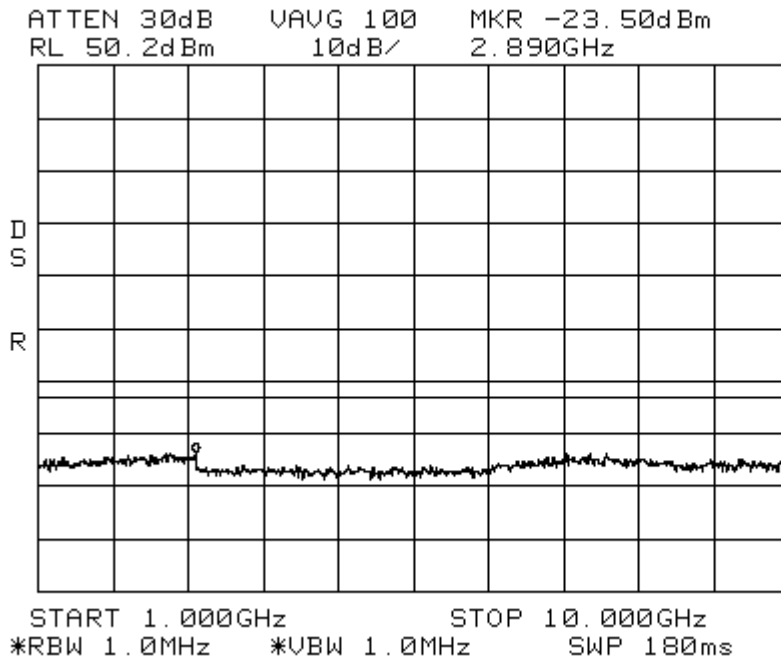
Intermodulation
Span: 30 MHz to 1 GHz

GSM_Low CELL
RBW/VBW: 300 kHz



Intermodulation
Span: 1 GHz to 10 GHz

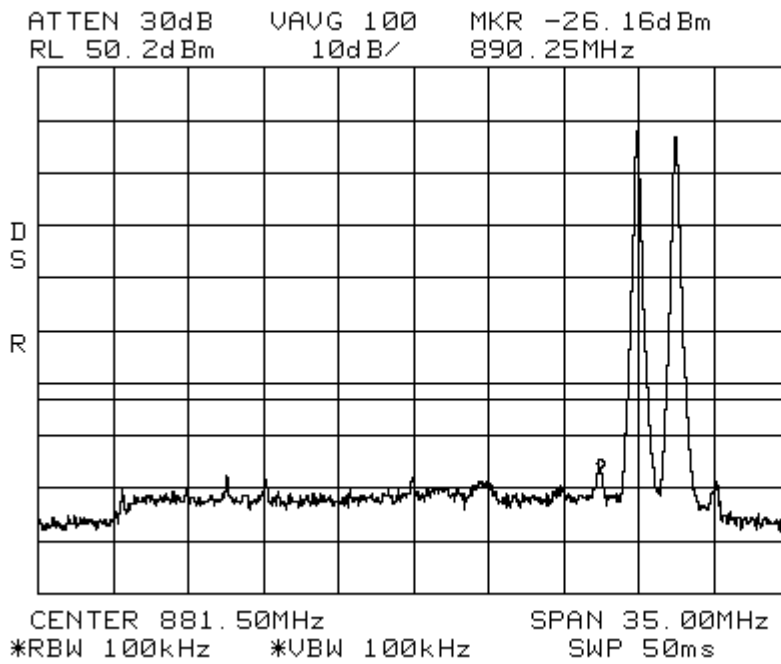
GSM_Low CELL
RBW/VBW: 1 MHz



Intermodulation
Center: 881.5 MHz

GSM_High
Span: 35 MHz

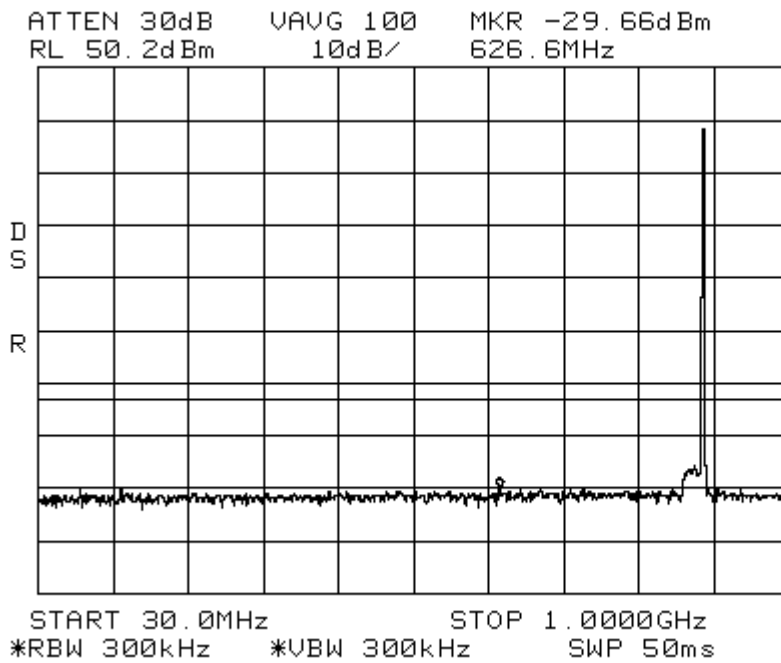
CELL
RBW/VBW: 100 kHz



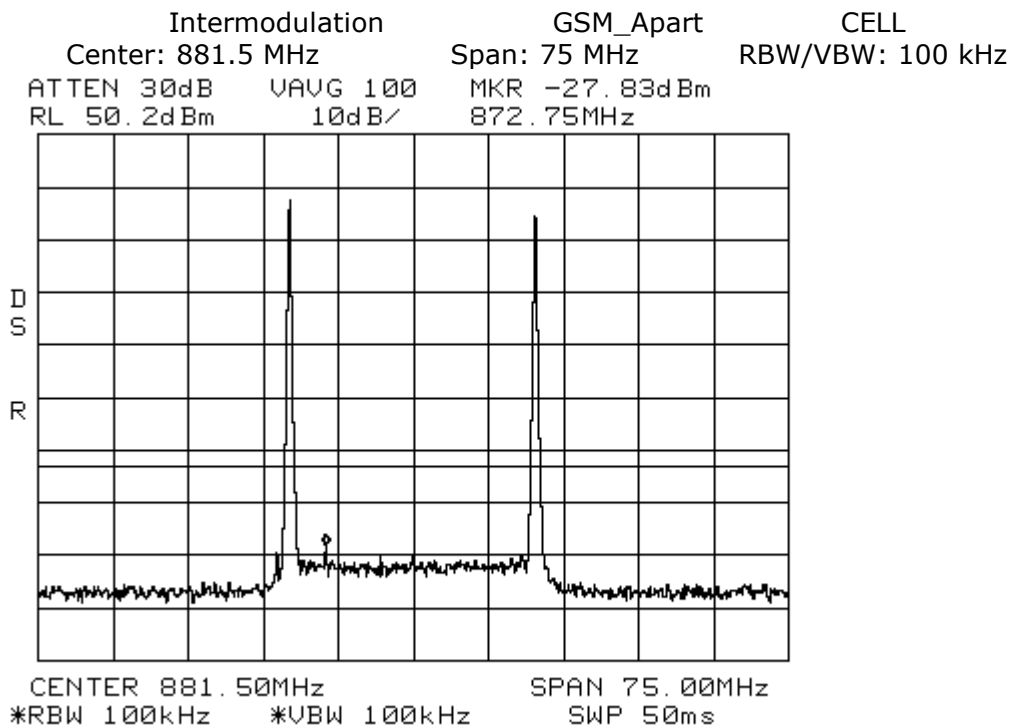
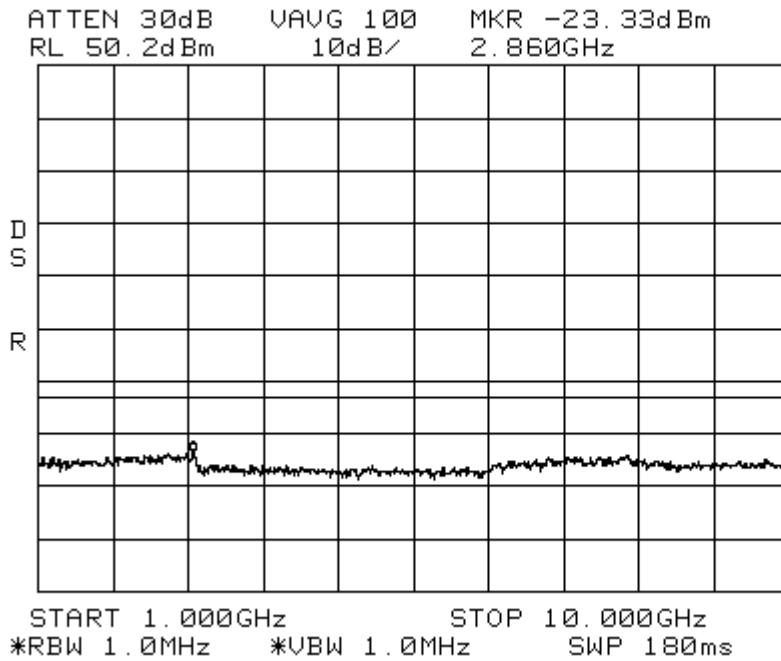
Intermodulation
Span: 30 MHz to 1 GHz

GSM_High
RBW/VBW: 300 kHz

CELL



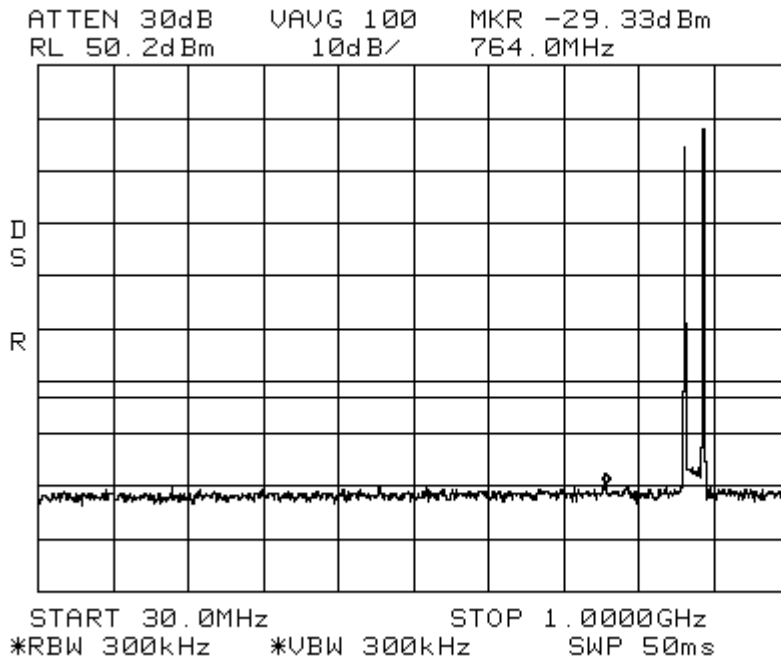
Intermodulation GSM_High CELL
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



Intermodulation
Span: 30 MHz to 1 GHz

GSM_Apart
RBW/VBW: 300 kHz

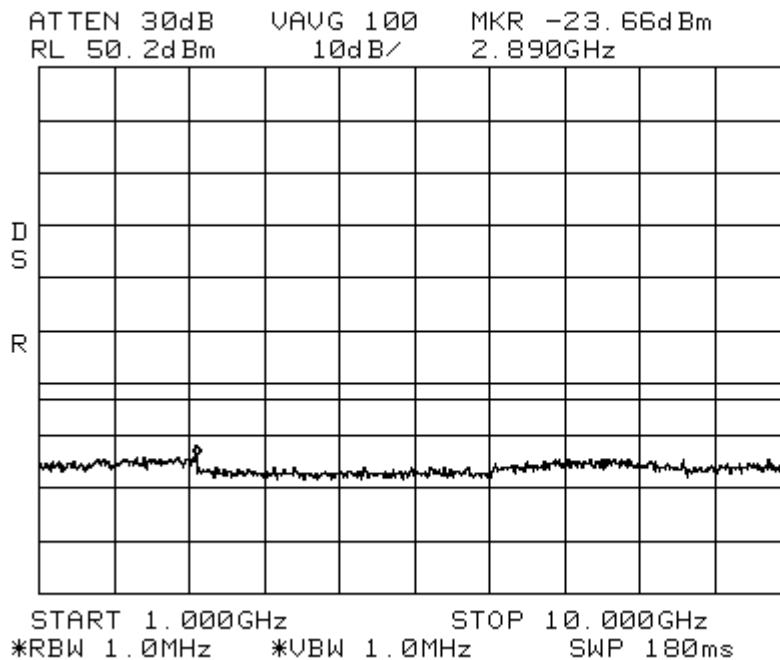
CELL



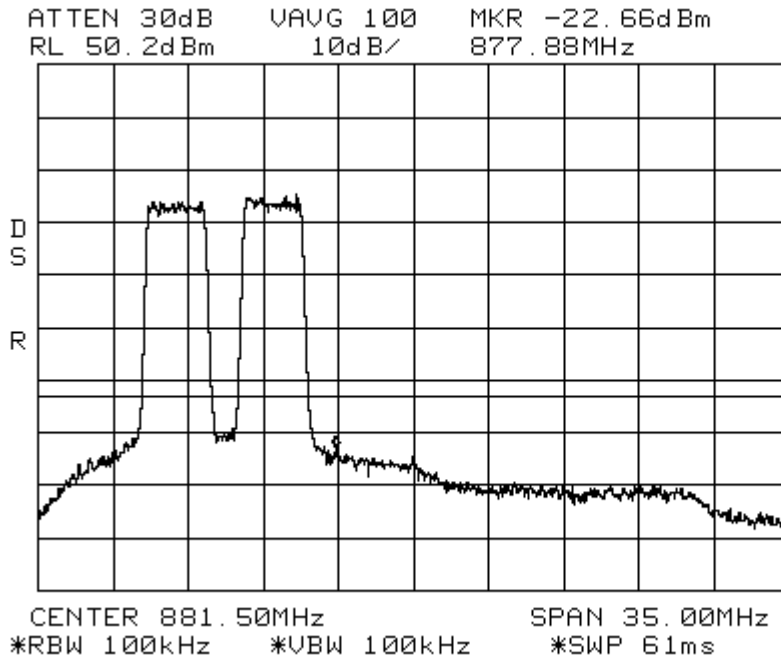
Intermodulation
Span: 1 GHz to 10 GHz

GSM_Apart
RBW/VBW: 1 MHz

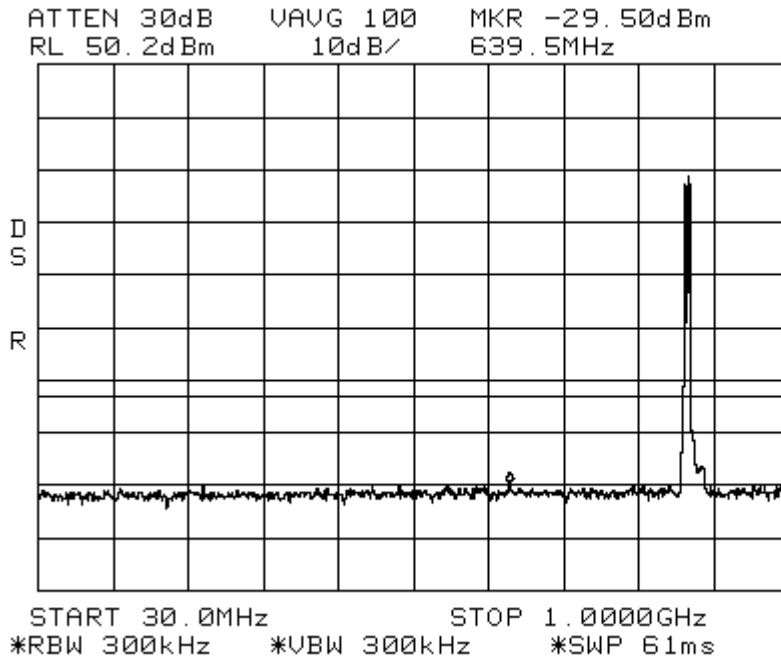
CELL



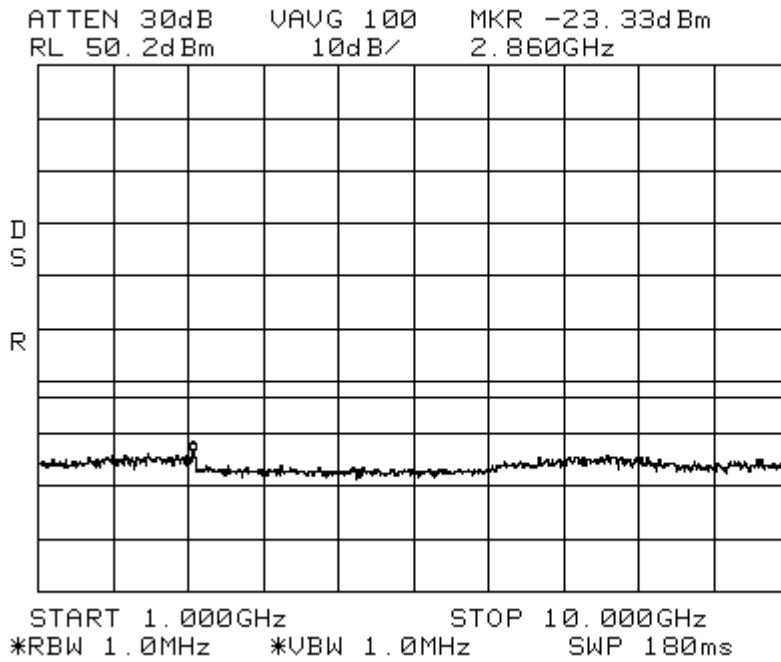
Intermodulation LTE 3MHz Channel Bandwidth _Low CELL
Center: 881.5 MHz Span: 35 MHz RBW/VBW: 100 kHz



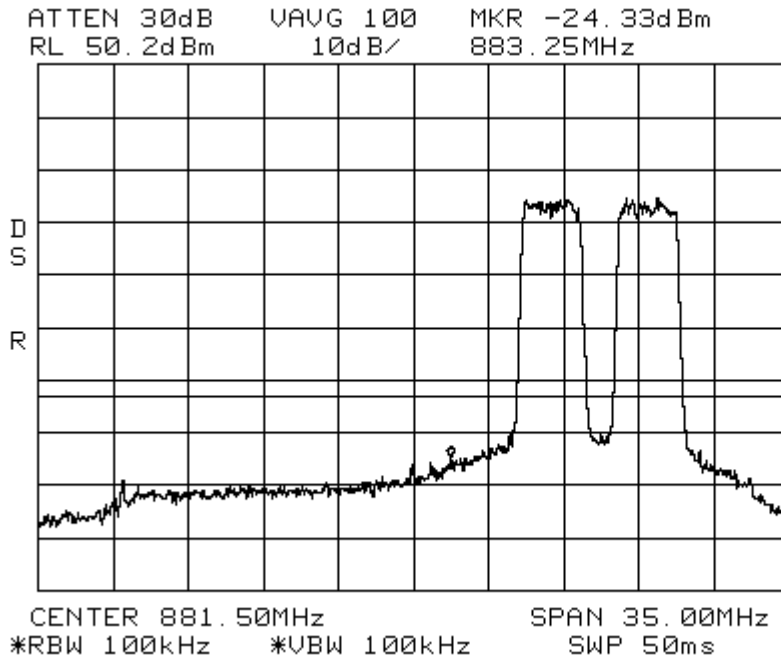
Intermodulation LTE 3MHz Channel Bandwidth _Low CELL
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



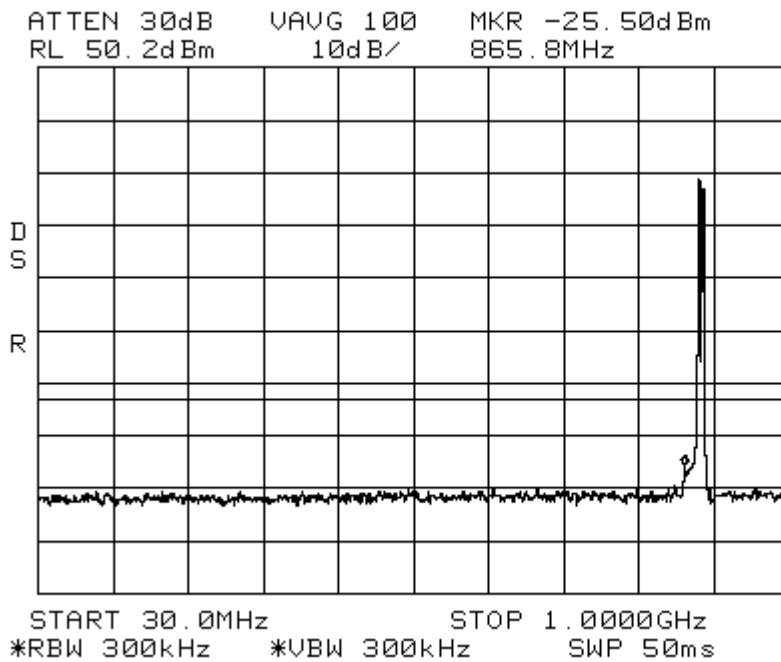
Intermodulation LTE 3 MHz Channel Bandwidth _Low CELL
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



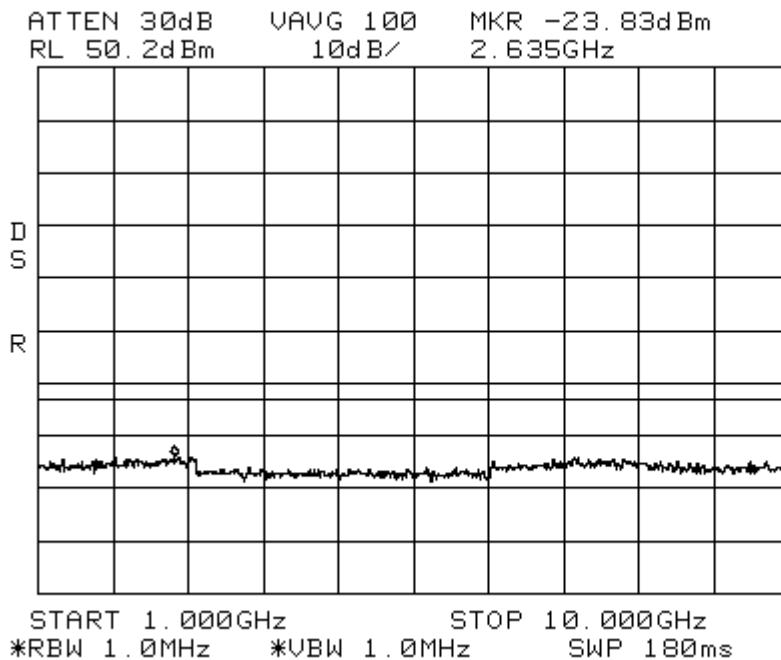
Intermodulation LTE 3 MHz Channel Bandwidth _High CELL
Center: 881.5 MHz Span: 35 MHz RBW/VBW: 100 kHz



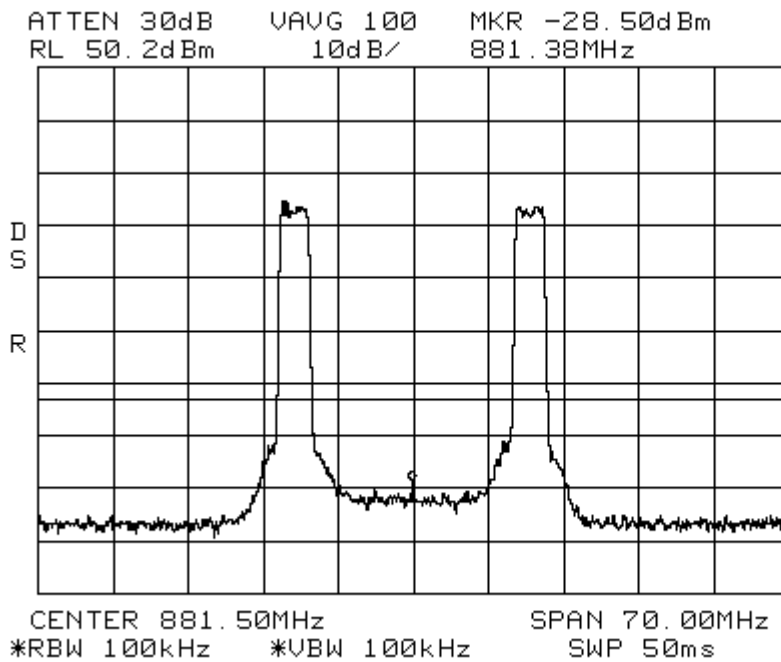
Intermodulation LTE 3 MHz Channel Bandwidth _High CELL
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



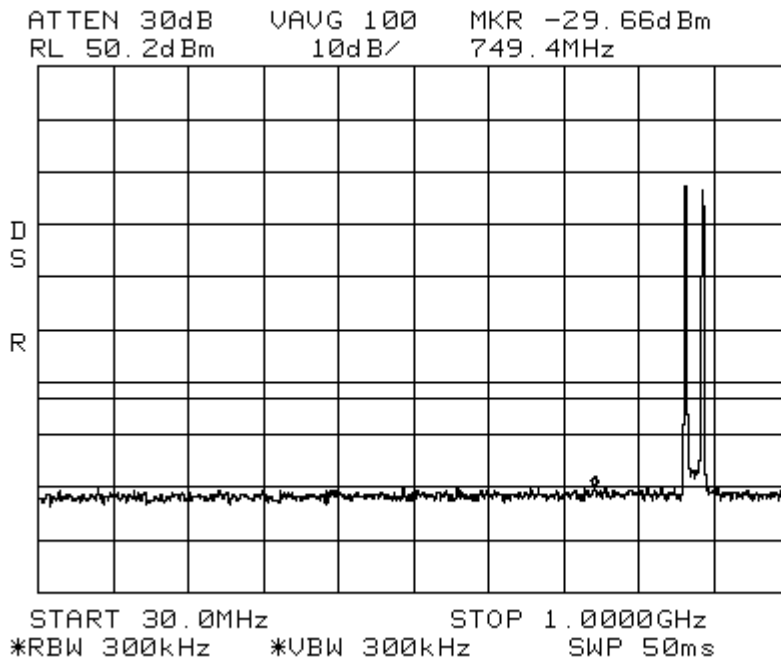
Intermodulation LTE 3 MHz Channel Bandwidth _High CELL
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



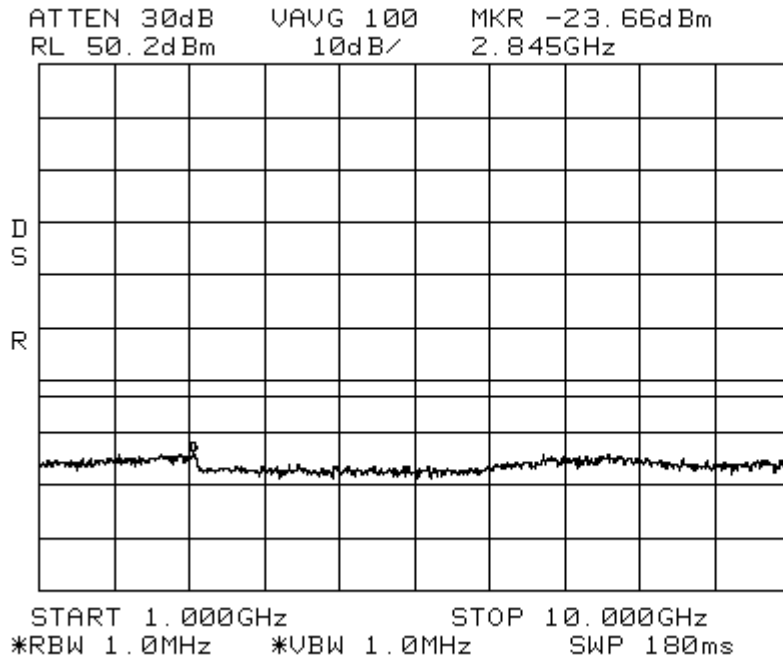
Intermodulation LTE 3 MHz Channel Bandwidth _Apart CELL
Center: 881.5 MHz Span: 70 MHz RBW/VBW: 100 kHz



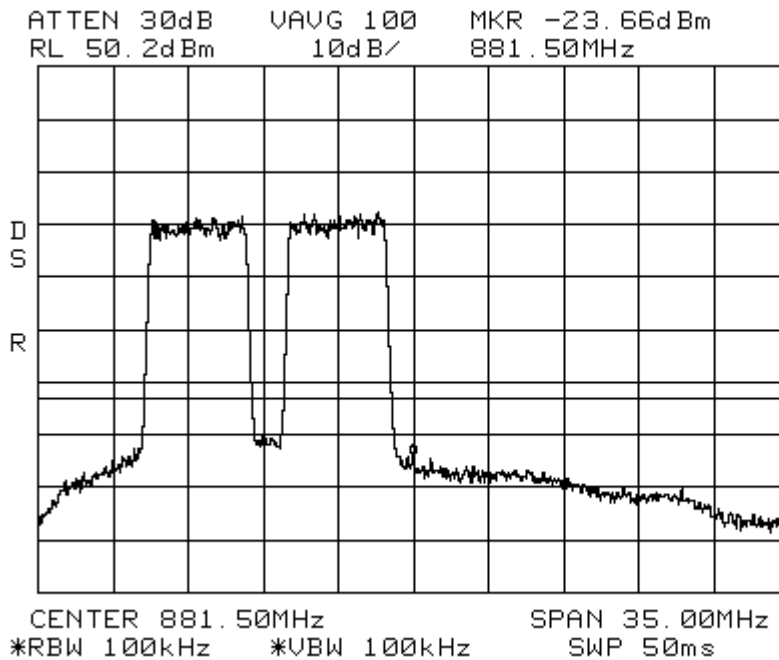
Intermodulation LTE 3 MHz Channel Bandwidth _Apart CELL
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



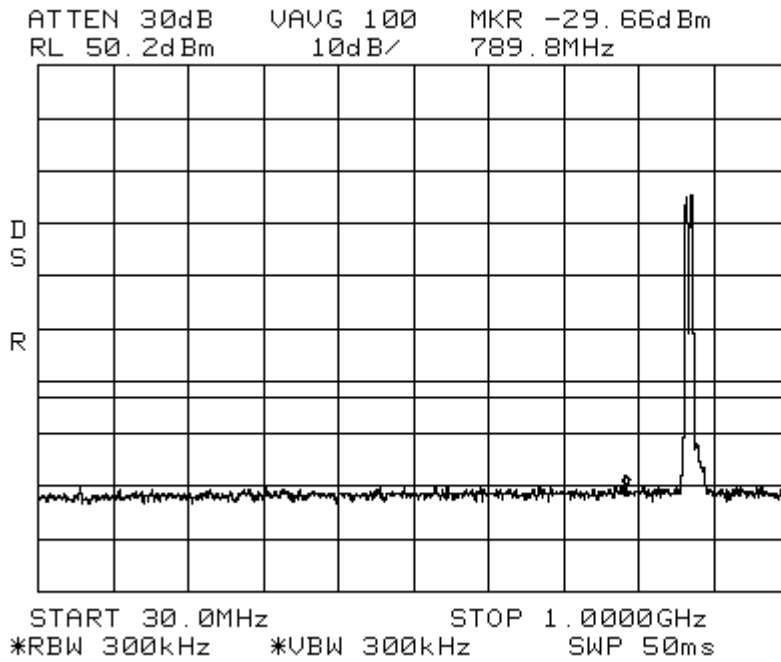
Intermodulation LTE 3 MHz Channel Bandwidth_Apart CELL
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



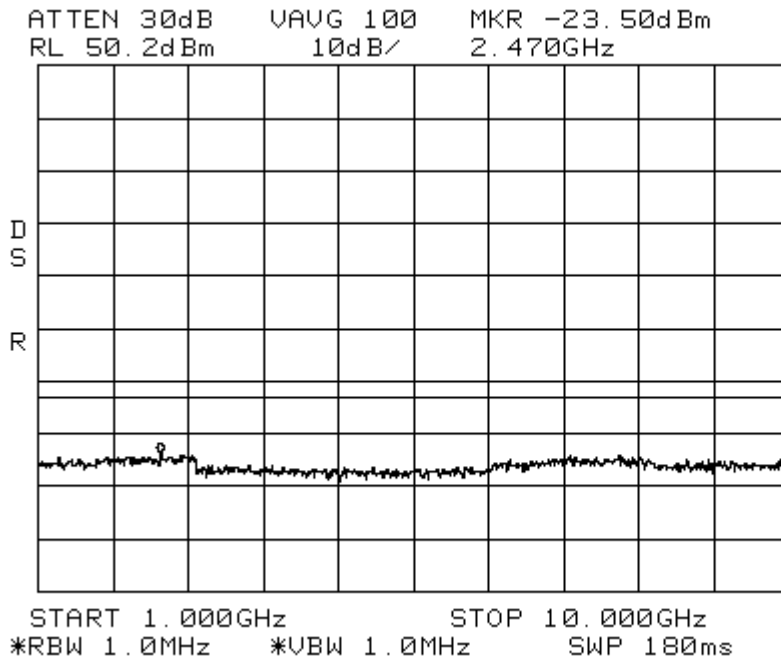
Intermodulation LTE 5 MHz Channel Bandwidth_Low CELL
Center: 881.5 MHz Span: 35 MHz RBW/VBW: 100 kHz



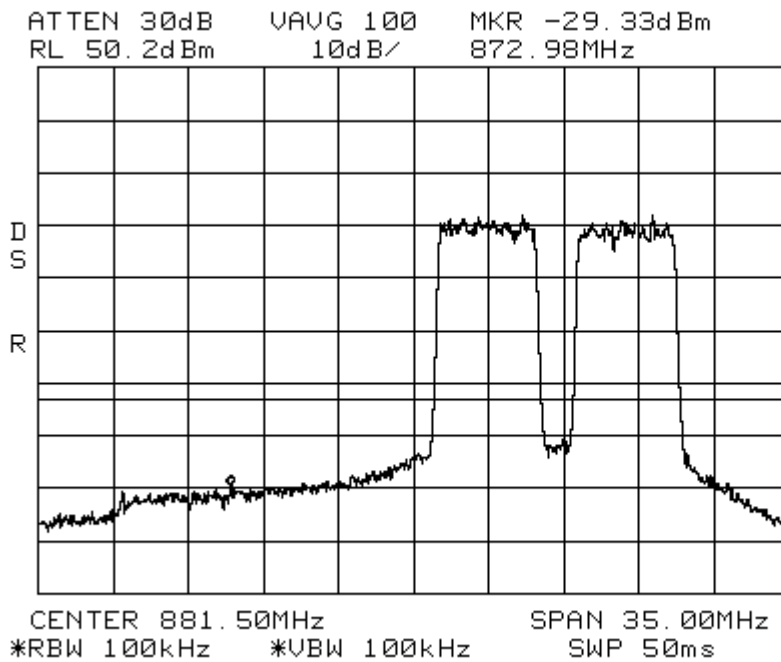
Intermodulation LTE 5 MHz Channel Bandwidth _Low CELL
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



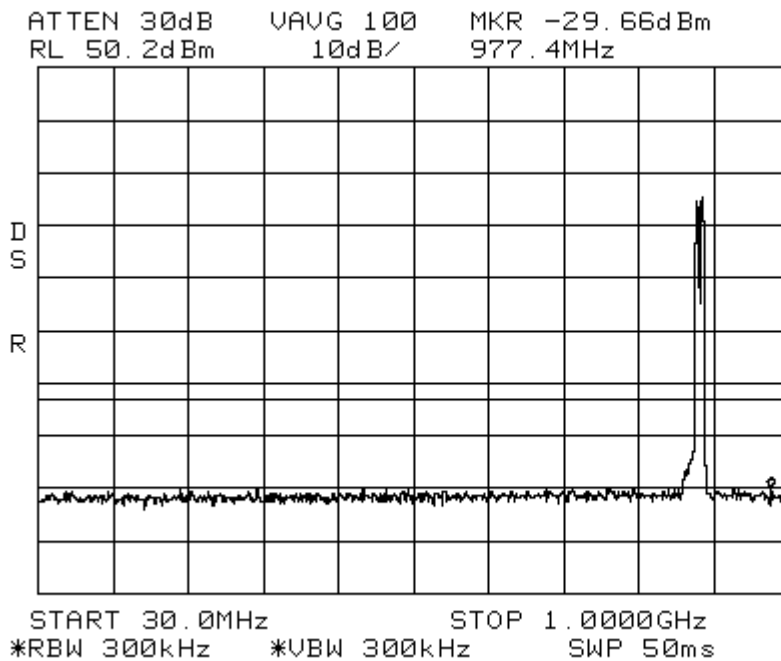
Intermodulation LTE 5 MHz Channel Bandwidth _Low CELL
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



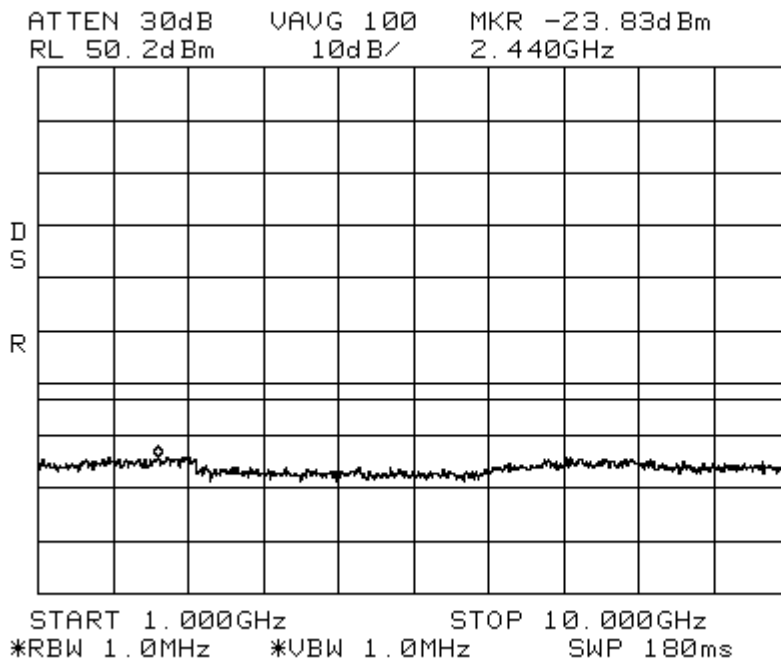
Intermodulation LTE 5 MHz Channel Bandwidth _High CELL
Center: 881.5 MHz Span: 35 MHz RBW/VBW: 100 kHz



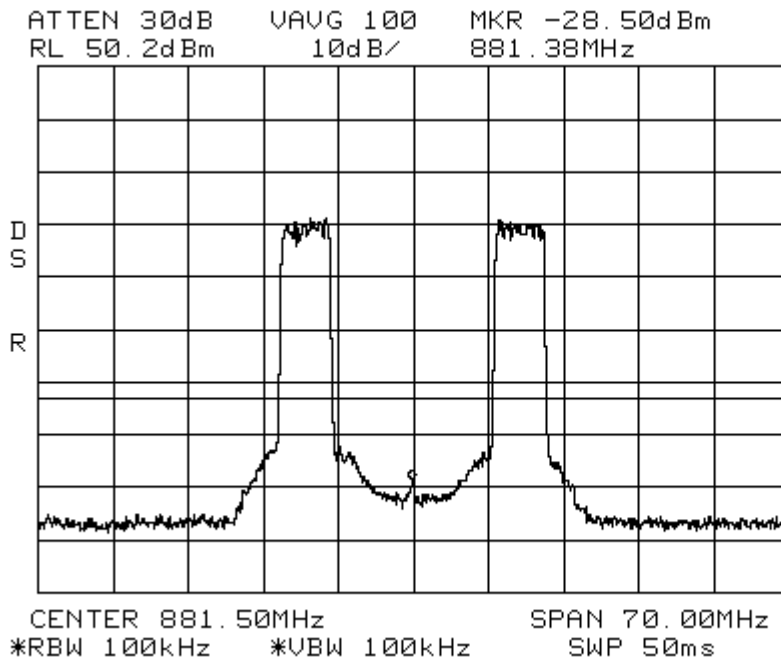
Intermodulation LTE 5 MHz Channel Bandwidth _High CELL
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



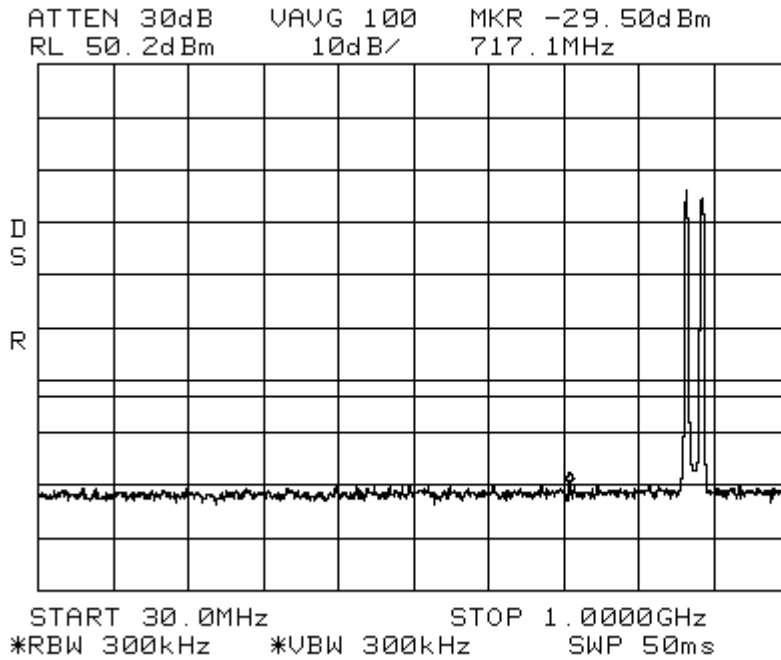
Intermodulation LTE 5 MHz Channel Bandwidth _High CELL
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



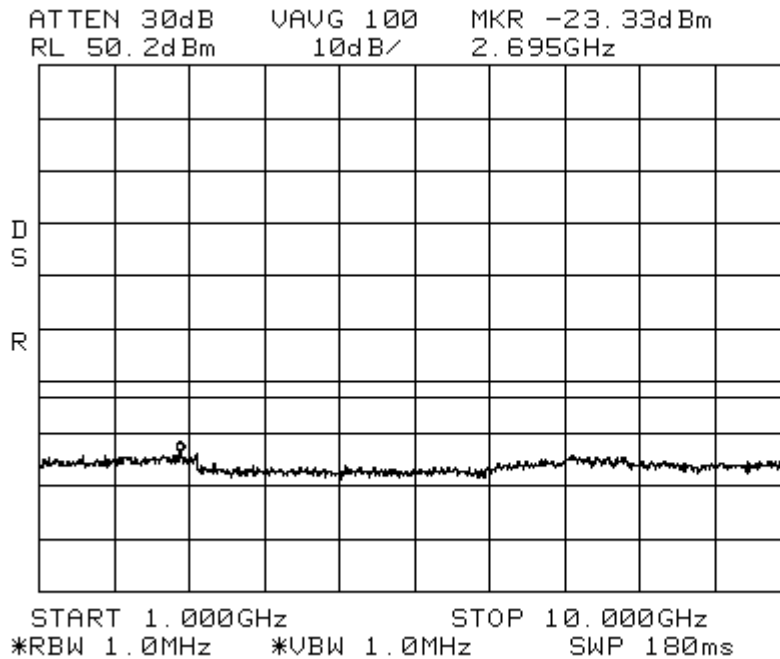
Intermodulation LTE 5 MHz Channel Bandwidth _Apart CELL
Center: 881.5 MHz Span: 70 MHz RBW/VBW: 100 kHz



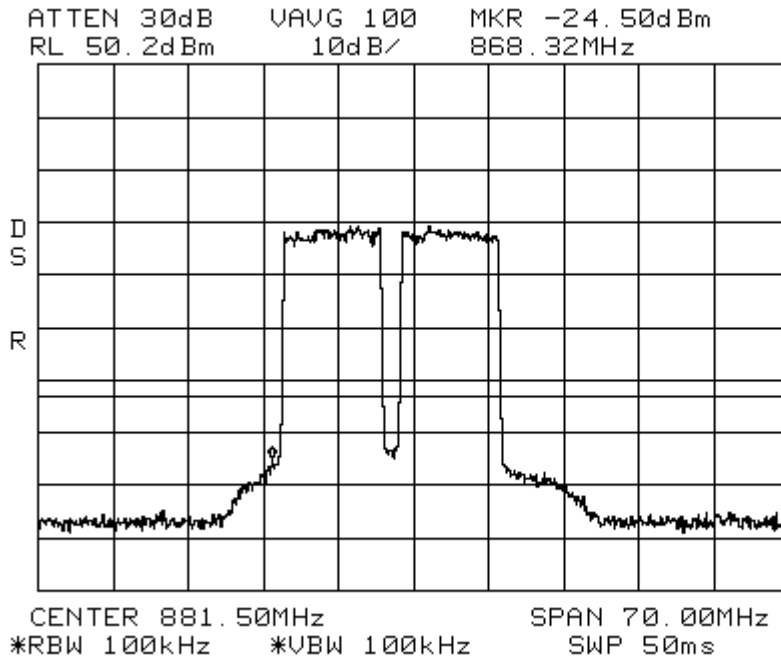
Intermodulation LTE 5 MHz Channel Bandwidth _Apart CELL
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



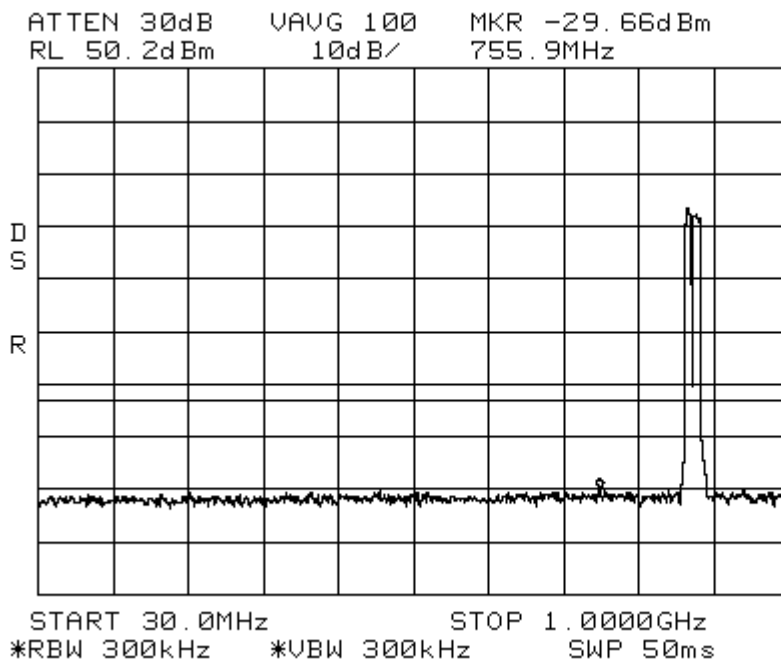
Intermodulation LTE 5 MHz Channel Bandwidth _Apart CELL
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



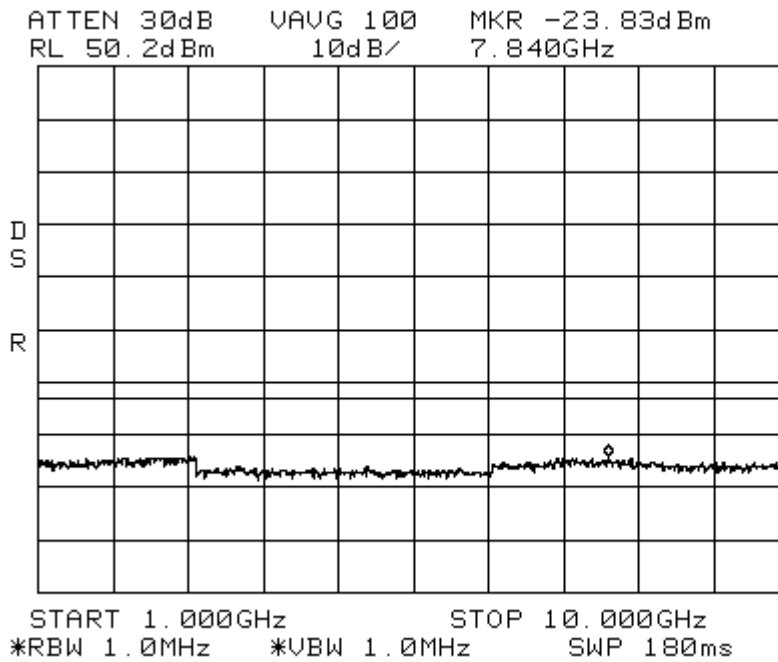
Intermodulation LTE 10 MHz Channel Bandwidth **Low** CELL
Center: 881.5 MHz Span: 70 MHz RBW/VBW: 100 kHz



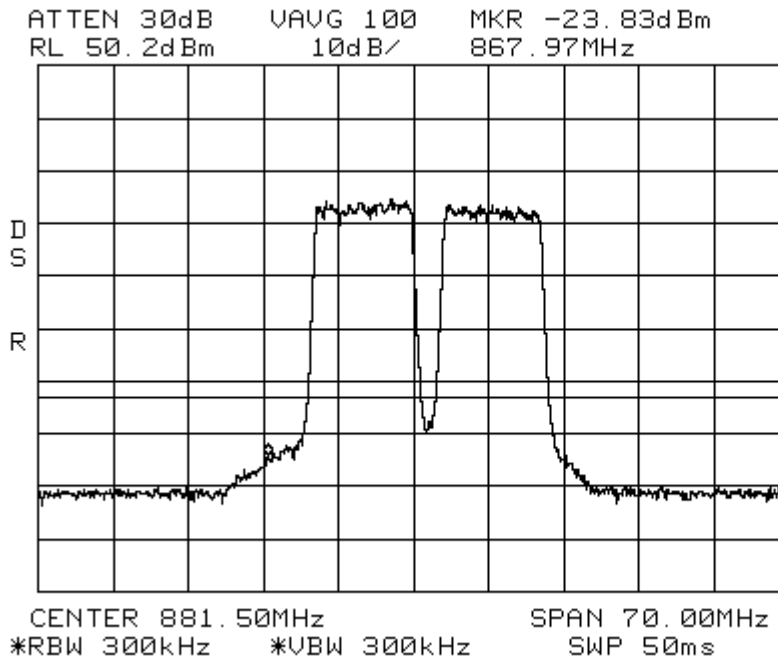
Intermodulation LTE 10 MHz Channel Bandwidth **Low** CELL
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



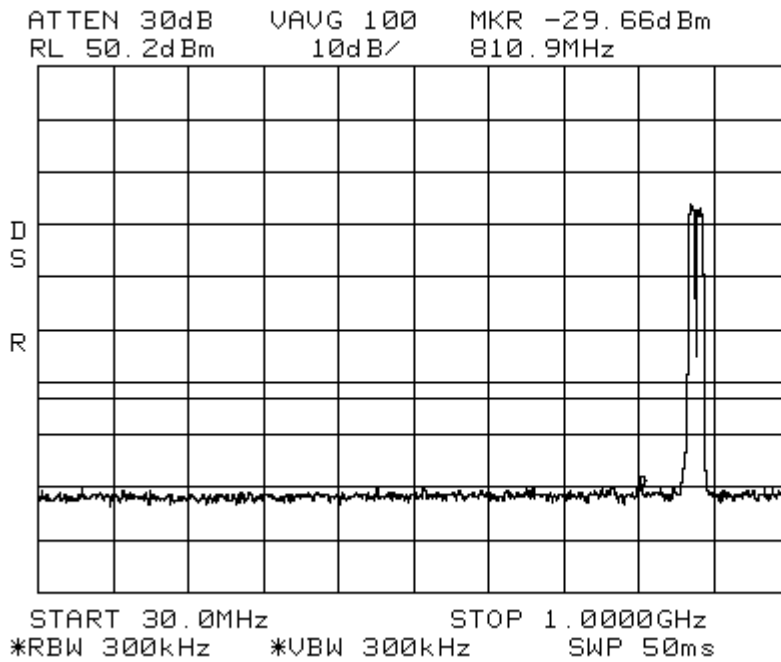
Intermodulation LTE 10 MHz Channel Bandwidth _Low CELL
Span: 1 GHz to 10GHz RBW/VBW: 1 MHz



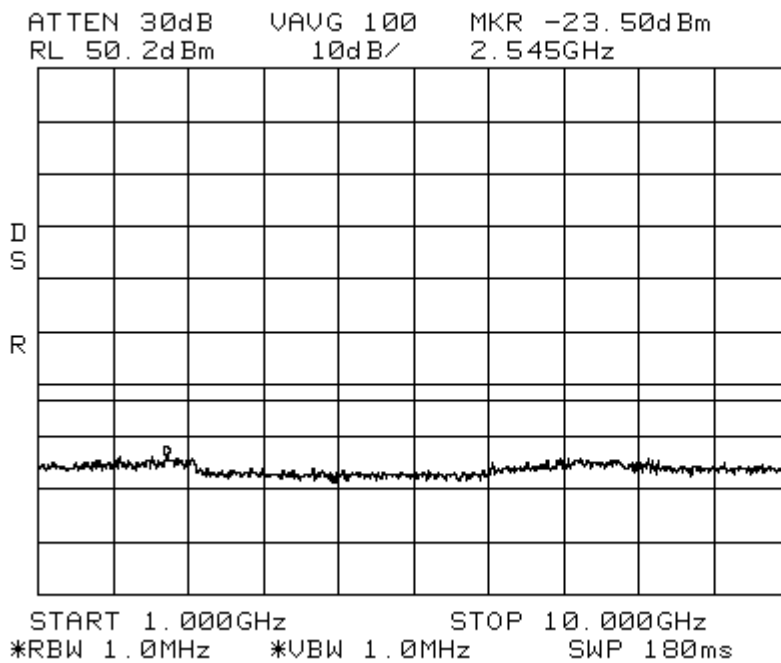
Intermodulation LTE 10 MHz Channel Bandwidth _High CELL
Center: 881.5 MHz Span: 70 MHz RBW/VBW: 100 kHz



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



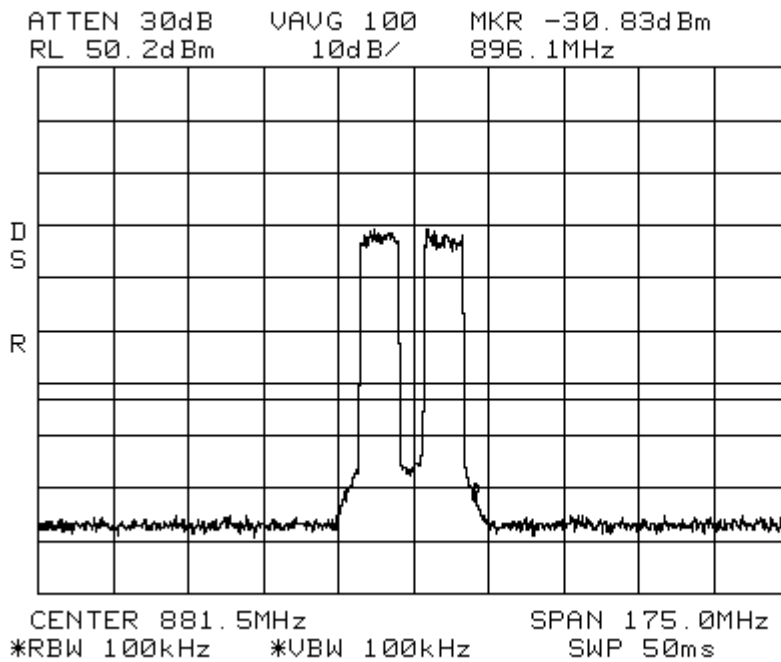
Intermodulation LTE 10 MHz Channel Bandwidth _High CELL
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



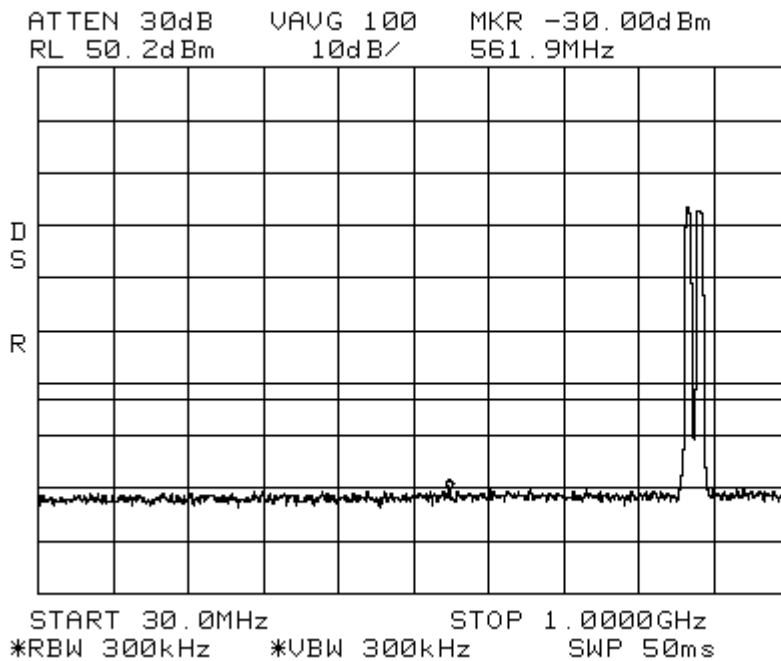
Intermodulation
Center: 881.5 MHz

LTE 10 MHz Channel Bandwidth_Apart
Span: 175 MHz

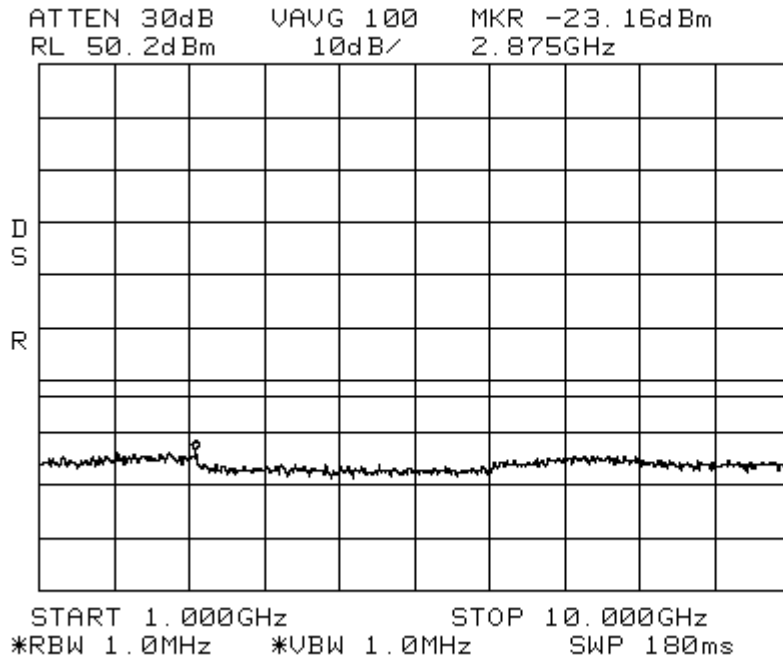
CELL
RBW/VBW: 100 kHz



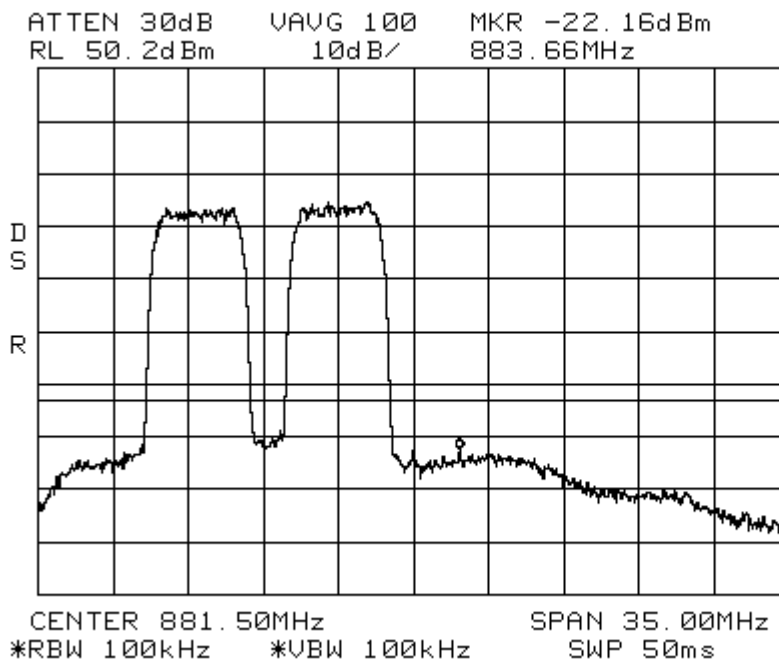
Intermodulation LTE 10 MHz Channel Bandwidth_Apart CELL
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



Intermodulation LTE 10 MHz Channel Bandwidth_Apart CELL
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz

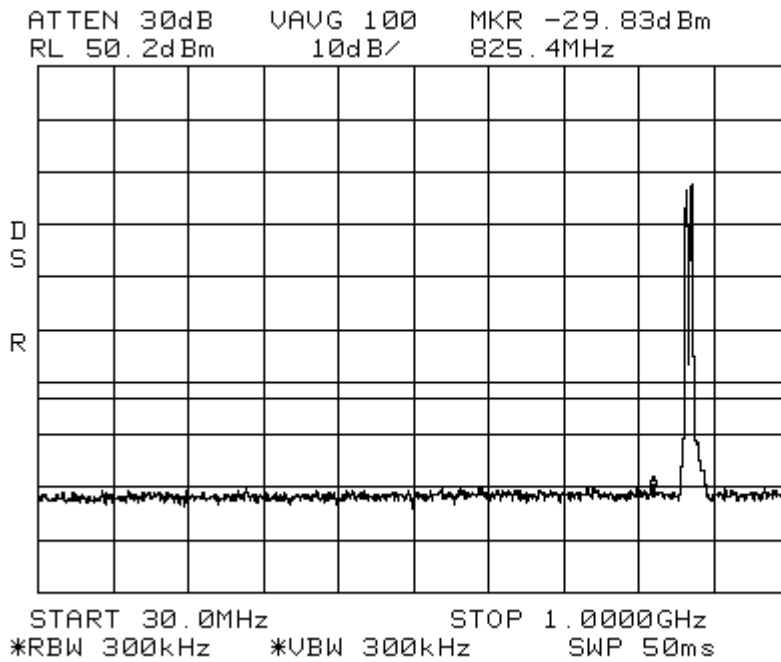


Intermodulation WCDMA_Low CELL
Center: 881.5 MHz Span: 35 MHz RBW/VBW: 100 kHz



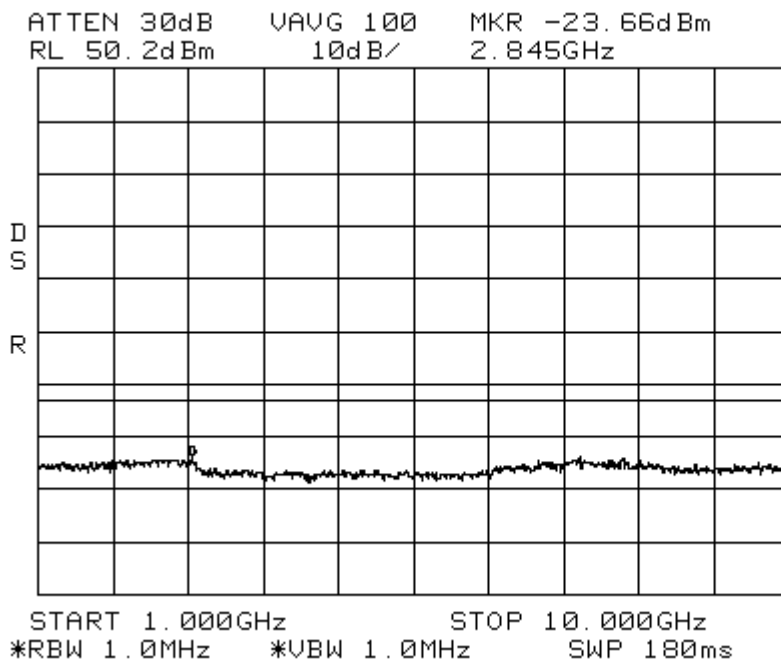
Intermodulation
Span: 30 MHz to 1 GHz

WCDMA_Low CELL
RBW/VBW: 300 kHz



Intermodulation
Span: 1 GHz to 10 GHz

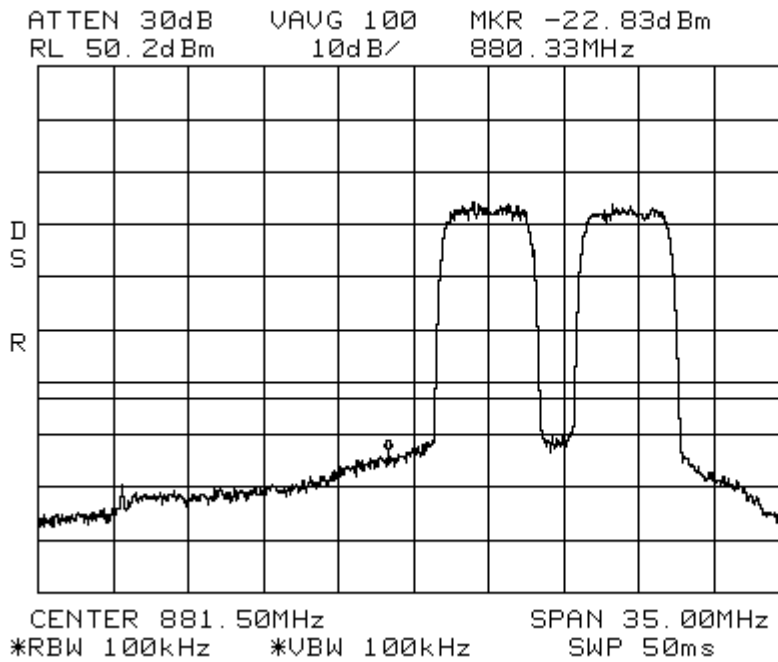
WCDMA_Low CELL
RBW/VBW: 1 MHz



Intermodulation
Center: 881.5 MHz

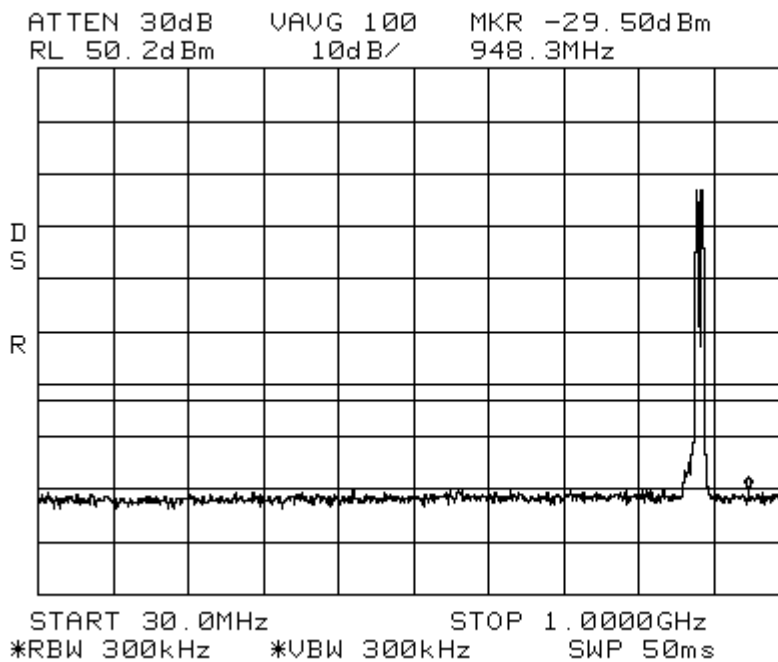
WCDMA_High
Span: 35 MHz

CELL
RBW/VBW: 100 kHz



Intermodulation
Span: 30 MHz to 1 GHz

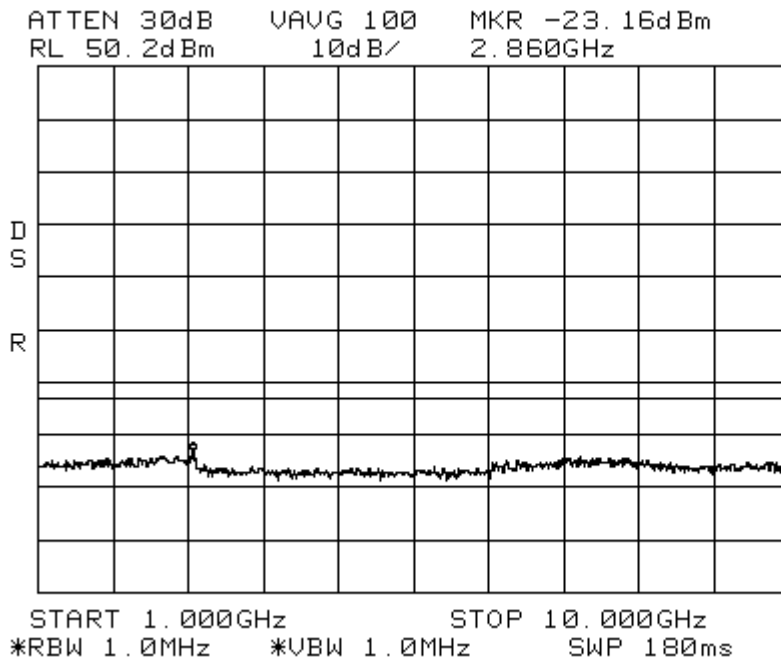
WCDMA_High CELL
RBW/VBW: 300 kHz



Intermodulation
Span: 1 GHz to 10 GHz

WCDMA_High
RBW/VBW: 1 MHz

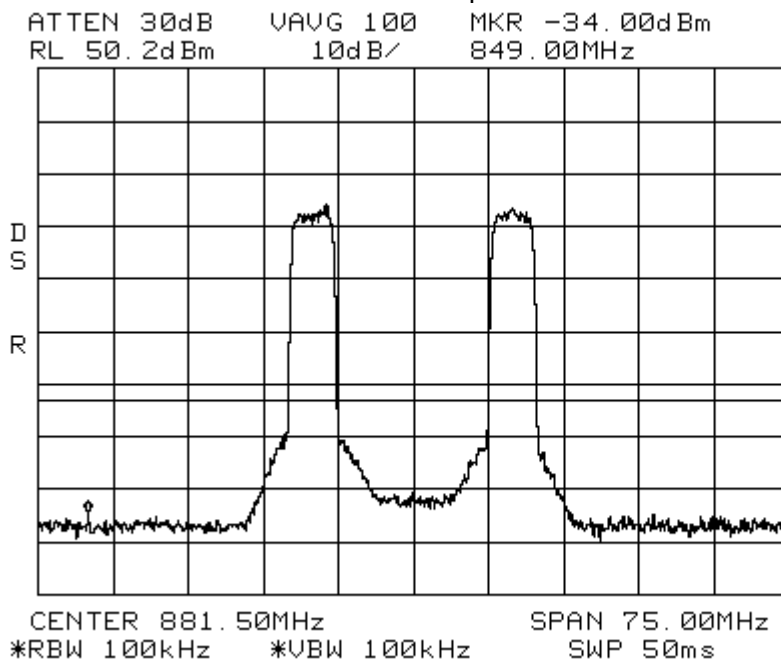
CELL



Intermodulation
Center: 881.5 MHz

WCDMA_Apart
Span: 75 MHz

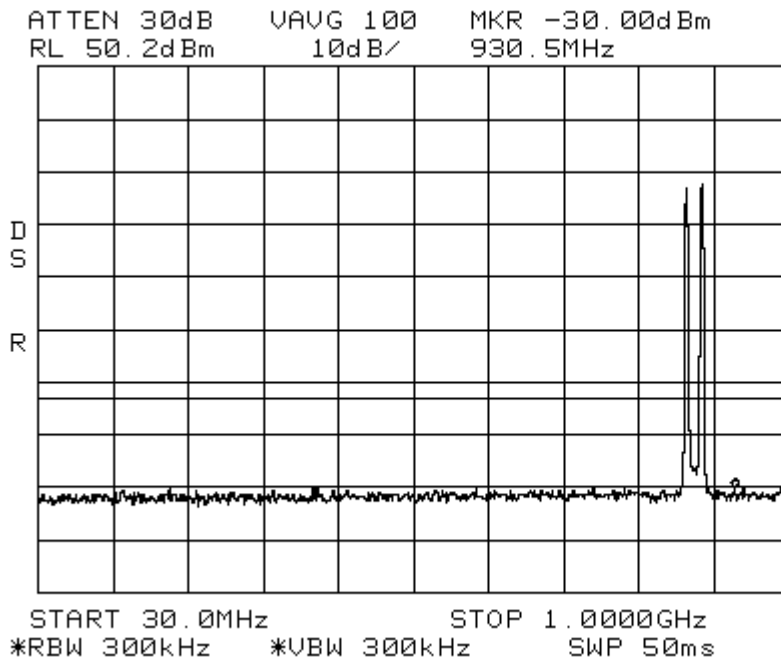
CELL
RBW/VBW: 100 kHz



Intermodulation
Span: 30 MHz to 1 GHz

WCDMA_Apart
RBW/VBW: 300 kHz

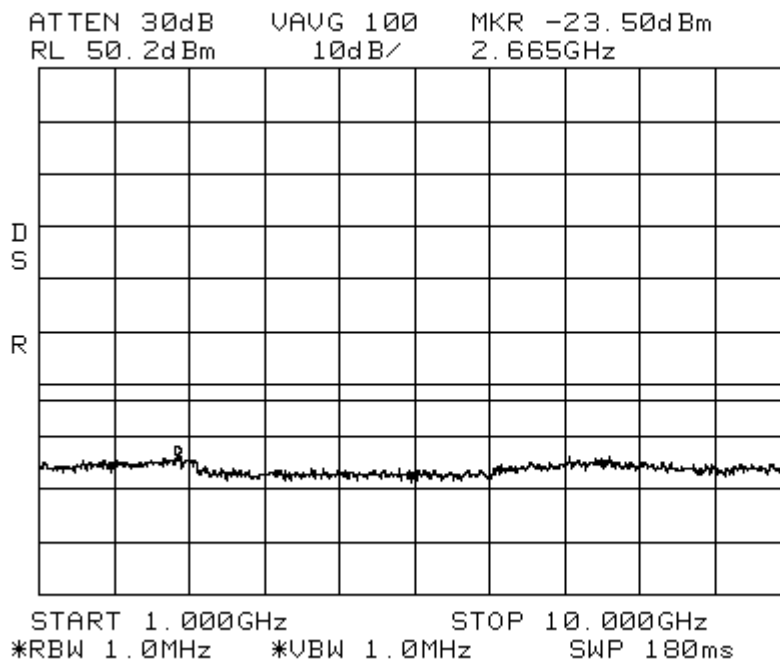
CELL



Intermodulation
Span: 1 GHz to 10 GHz

WCDMA_Apart
RBW/VBW: 1 MHz

CELL



6.5 FCC 2.1055, 22.355 – Frequency Stability

Test Summary:

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

Test Methods Used:

TIA-603-C 2004, ANSI C63.4-2003, FCC 2.1055, 22.355

Test Procedure:

Temperature: The temperature is varied from -30°C to +50°C using an environmental chamber.

Primary Supply Voltage: Vary primary voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

Test Limit:

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Date: 10/25/12

Tests Conducted By: Joshua J. Wittman

Test Equipment: 3, 4, 5, 6, 9, 11, 12

Number	Description	Manufacturer	Model	ADC TELECOMMUNICAT IONS Serial Number	Cal Due	Used
3	Multimeter	Fluke	79	MC18758	6-30-13	☒
4	Frequency Counter	HP	5347A	MC27569	6-30-13	☒
5	Temperature Chamber	ESPEC	PSL-4G	MC10075	9-10-13	☒
6	Signal Generator	Aeroflex	3413	MC57343	2-9-13	☒
9	Digital Barometer	Fisher Scientific	02-403	MC50719	1-25-13	☒
11	Attenuator	Aeroflex	86-30-12	N/A	CNR	☒
12	RF Power Sensor	HP	8482A	MC48747	6-30-13	☒

Environmental Conditions in the lab:

Temperature: 26° C

Relative Humidity: 24%

Atmospheric Pressure: 98.0 kPa

Test Results:

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

Measurement Protocol

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

Measurement Protocol

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: 101716480MIN-001.pdf

Test Engineer: Simon Khazon**Date:** 9 July, 2014**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