



Test Report Summary

FCC CFR 47, Part 27

Wireless Communications Service

Manufacturer: ADC Telecommunications, Inc.

Name of Equipment: Spectrum AWS Path 1/AWS Path2 MIMO SRAU

Model Number(s): SPT-S1-2121-1MIMO

Manufacturer's Address: 1187 Park Place
Shakopee, MN 55739

Test Report Number: MN120730 AWSP1 AWSP2 MIMO SRAU

Test Date(s): 17 July, 2012 (Intertek)
11, 12, 13 July, 2012 (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 27.

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 27 and the EUT fulfills the requirements of the Federal Communications Commission's CFR 47 Part 27.

Date: 30 July, 2012

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
Fax: (952) 403-8858

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: MN120730 AWSP1 AWSP2 MIMO SRAU

Date of Issue: 30 July, 2012

Model Number(s): SPT-S1-2121-1MIMO

Product Name: Spectrum AWS Path 1/AWS Path2 MIMO SRAU

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: 100789984MIN-001
Reference(s)

Total pages including Appendices: 120



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2.0 REVISION DESCRIPTION

Rev	Total Pages	Date	Description
A	120	30 July, 2012	Original Release

3.0 DOCUMENTATION

3.1 Test Regulations

Results

27.50	Power limits	Pass
27.53	Emission limits	Pass
27.54	Frequency stability	Pass

The emissions tests were performed according to the following regulations:

☐ FCC Part 22

☐ FCC Part 24

■ **FCC Part 27**

☐ FCC Part 90

☐ IC RSS-131 Issue 2

Environmental Conditions in the lab:

ADC

Temperature: 25° C
Relative Humidity: 29%
Atmospheric Pressure: 98.0 kPa

Intertek

15-35° C
30-60%
86-106 kPa

Power Supply Utilized:

Power Supply System : 1 phase, 60 Hz, 120 VAC

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 – AWS – 2110 to 2155 MHz

3.4 Product Options:

None

3.5 EUT Specifications and Requirements:

Length: 11.50"

Width: 9.00"

Height: 3.50"

Weight: 7.49 pounds

3.6 Cables:

Cable Type	Length	From	To
RF	> 3M	Ancillary Equip	EUT
RF	< 3M	EUT	50 Ohm Load
Power (2)	< 3M	Power	Input Power (Ancillary)
Coax (75 Ohm)	> 3M	Ancillary Equip	EUT

3.7 Power Requirements:

Voltage: 54 VDC

3.8 Typical Installation and/or Operating Environment:

Indoor. System is typically employed as an indoor 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 Host Unit	FWP-0000HUII	None	
Spectrum DRU	SPT-0000DRUII	None	
Spectrum IFEU	742735-0	None	
Spectrum Power Supply	LTPCPR1U3C-Z-527		
Remote Access Unit	SPT-S1-2121-1MIMO	None	

3.12 Support Equipment

Description	Manufacturer	Model #	FCC ID #
Power Meter	HP	437B	
Signal Generator	Agilent	8648C	

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

Reference Intertek Report Number: 100789984MIN-001

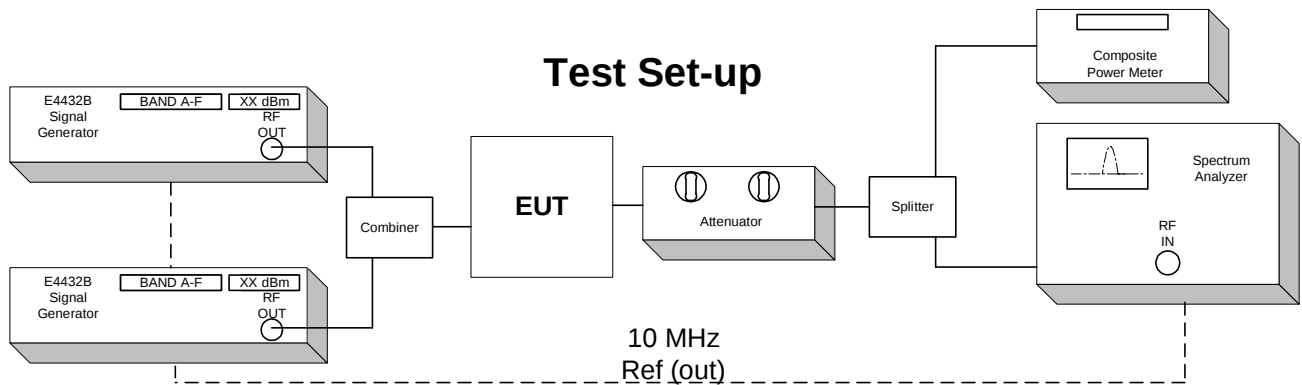
4.2 Test Set-up Drawings

Conducted and Radiated Emission Limits Test

Conducted Output Power Test

Inter-Modulation Test

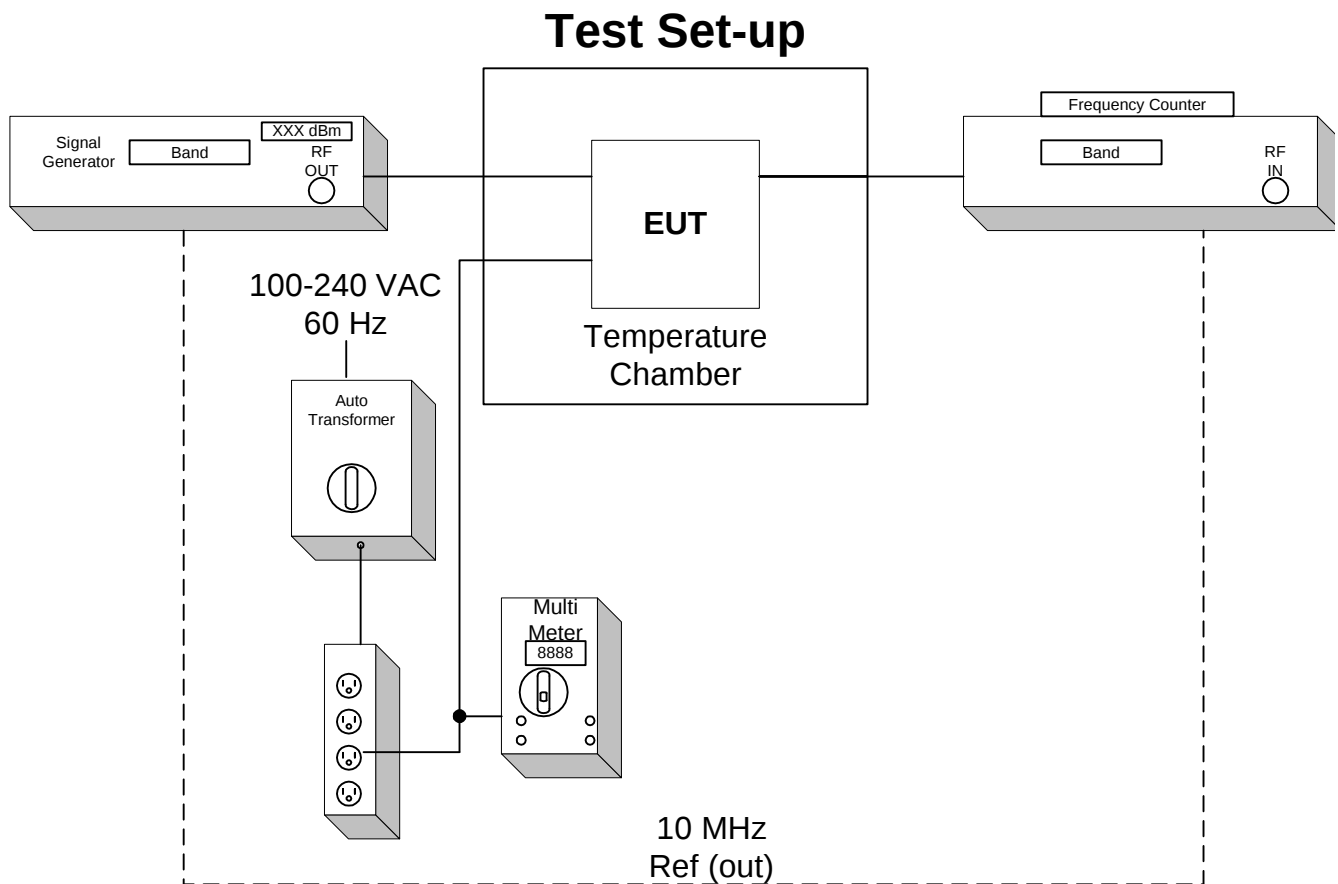
Occupied Bandwidth Modulation Test



Frequency Tolerance Test

The Host, DRU, and IFEU EUT are specified for indoor use with temperature range of 0° to +50° C, and were tested within their range.

The Remote Access Unit EUT is specified for indoor use with temperature range of -25° to +50° C, and was tested with its range.



5.0 TEST RESULTS

5.1.1 27.50 RF Power Limits

Test Summary:

- The requirements are: ☒ **MET** ☐ NOT MET
- Minimum margin of compliance is 20.09 dB (Path 1) at 2112.5 MHz (W-CDMA)
- Minimum margin of compliance is 20.12 dB (Path 1) at 2111.5 MHz (LTE 3MHz)
- Minimum margin of compliance is 19.17 dB (Path 1) at 2112.5 MHz (LTE 5MHz)
- Minimum margin of compliance is 19.73 dB (Path 1) at 2115.0 MHz (LTE 10MHz)
- Minimum margin of compliance is 19.46 dB (Path 1) at 2117.5 MHz (LTE 15MHz)
- Minimum margin of compliance is 19.11 dB (Path 1) at 2120.0 MHz (LTE 20MHz)
- Minimum margin of compliance is 20.10 dB (Path 2) at 2112.5 MHz (W-CDMA)
- Minimum margin of compliance is 20.07 dB (Path 2) at 2111.5 MHz (LTE 3MHz)
- Minimum margin of compliance is 19.21 dB (Path 2) at 2132.5 MHz (LTE 5MHz)
- Minimum margin of compliance is 19.58 dB (Path 2) at 2115.0 MHz (LTE 10MHz)
- Minimum margin of compliance is 19.62 dB (Path 2) at 2117.5 MHz (LTE 15MHz)
- Minimum margin of compliance is 19.04 dB (Path 2) at 2120.0 MHz (LTE 20MHz)

Test Location:

☐ INTERTEK (Oakdale, MN)

☒ **ADC facility (Shakopee, MN)**

Test Distance:

☐ 3 Meters

☐ 10 Meters

☒ **Conducted measurement**

Test Equipment (ADC):

1, 2, 6, 7, 12

Test Limit:

100 Watts or 50 dBm Limit

Test Data:

[Conducted Output Power; Section 7.2](#)

[Table of Contents; Section 1.0](#)

Test Engineer: Joshua J. Wittman

Date: 11 July, 2012

5.1.2 27.54 Frequency Stability

Test Summary:

- The requirements are: ☒ **MET** ☐ NOT MET
- The fundamental emission stays within the limit.
- Frequency measured over a temperature range of -25 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, 11, 12

Test Limit:

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

Test Data:

[Frequency Stability; Section 7.3](#)

[Table of Contents; Section 1.0](#)

Test Engineer: Joshua J. Wittman

Date: 13 July, 2012

5.1.3 27.53 Emission Limitations

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, 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](#))

[Table of Contents; Section 1.0](#)

Test Engineer: Joshua J. Wittman

Date: 11, 12 July, 2012

Date: 13 July, 2012

Date: 12 July, 2011

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	6-30-13	☒
2	Power Meter	HP	437B	MC27754	6-30-13	☒
3	Multimeter	Fluke	79	MC18758	6-30-13	☒
4	Frequency Counter	HP	5347A	MC27569	6-30-13	☒
5	Temperature Chamber	ESPEC	PSL-4G	MC10075	9-8-12	☒
6	Signal Generator	Aeroflex	3413	MC57343	11-9-12	☒
7	Signal Generator	Aeroflex	3414	341001/259	6-13-13	☒
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	Agilent	8481A	MC27649	6-30-12	☒
13	Spectrum Analyzer	Rohde & Schwarz	FSQ-8	MC57131	2-15-13	☒

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 in the TX path using a spectrum analyzer from 30 MHz to the 10th harmonic of the highest carrier frequency. Test signals used are WCDMA, LTE 3MHz, LTE 5MHz, LTE 10MHz, LTE 15MHz, & LTE 20MHz. 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 WCDMA signal at the upper and lower limits of the band.

The Prism Host, Spectrum DRU, and Spectrum IFEU are Part 15 devices and have been tested and are compliant as such.

Industry practice has generally set the input signal power level. Test signal used was $\approx$ -11 dBm input to Prism Host in the TX Path.

Industry practice has generally set the output signal power level.

Prism Host:	Spectrum DRU:	Spectrum IFEU	Remote Access Unit(RAU):
Range: 21 - 60 VDC	Range: 21 - 60 VDC	Range: 54 VDC	Range: 54 VDC
Tested @: 54 VDC	Tested @: 54 VDC	Tested @: 54 VDC	Tested @: 54 VDC

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

Final RF Amplifier Input DC Voltage and Current: 7.3V at 400mA

PLL creates all the Local Oscillators that convert signal to IF and RF signals. When PLL is unlocked the band is shut down, this is to avoid transmission of any incorrect frequency.

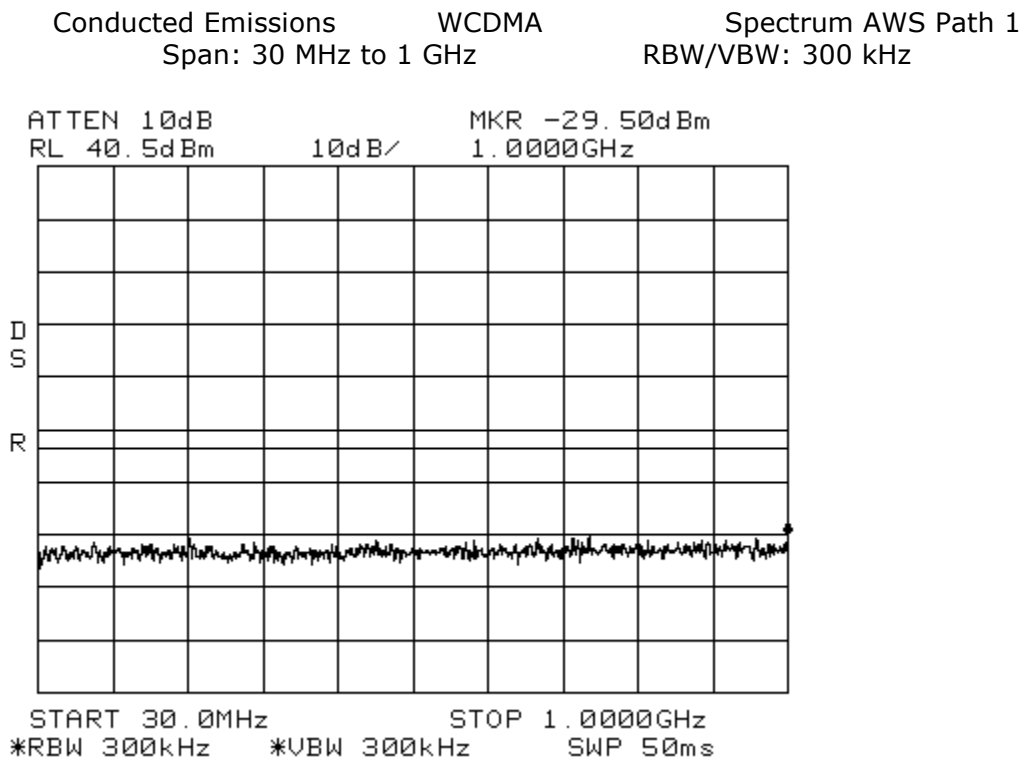
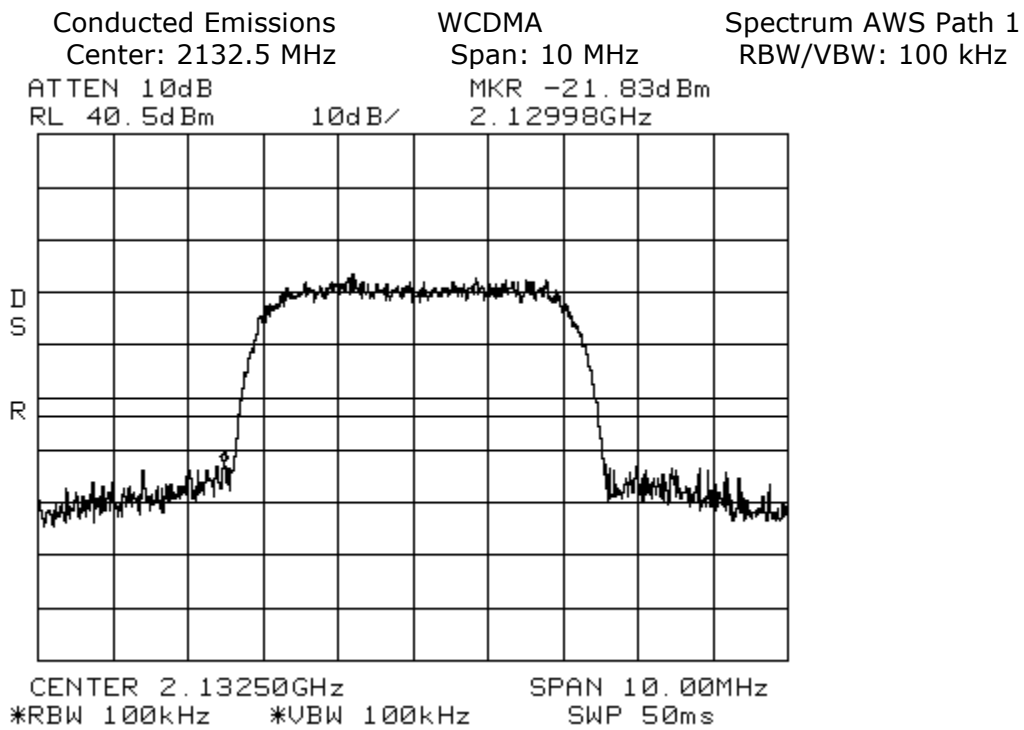
Internal to the electronics, the use of SAW filters provides for higher Q roll-off at band edges.

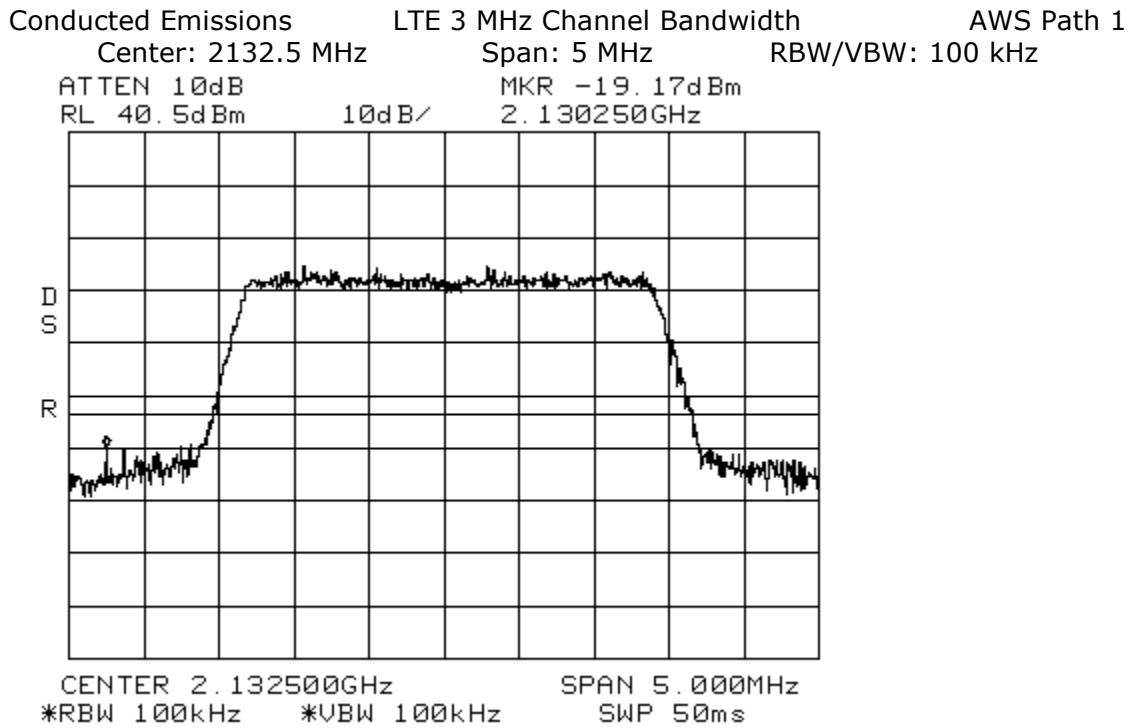
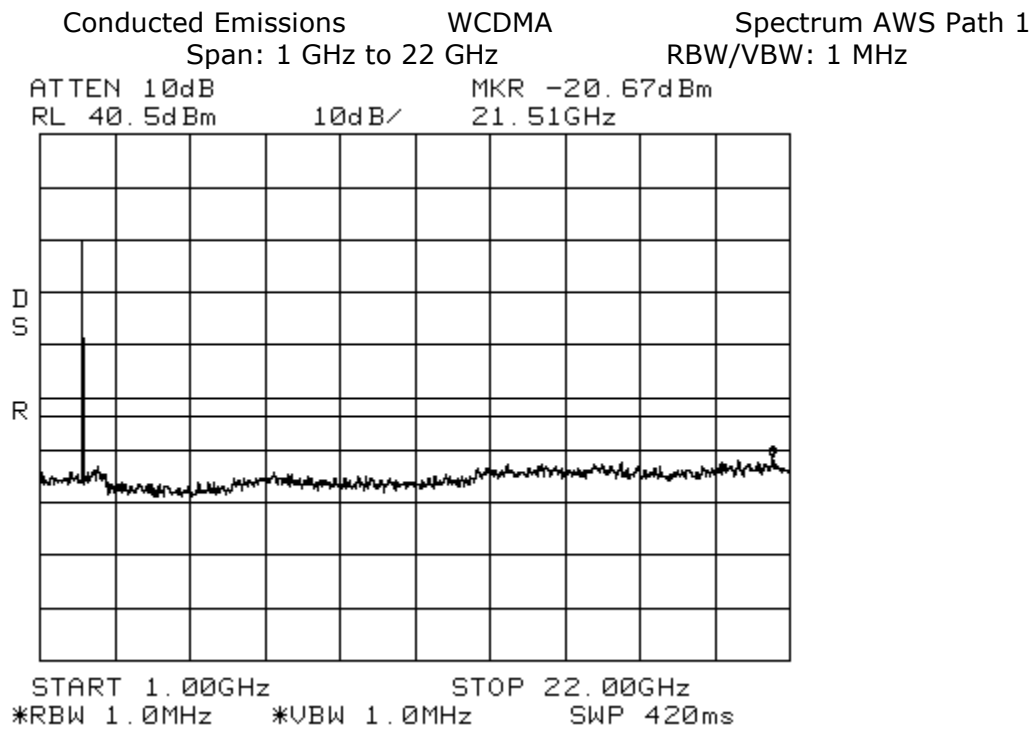
This equipment does not modulate the RF, so there is no modulation limiter. This equipment does not change the modulation of the RF or the occupied bandwidth of any channel. It transports the signal, as is, over TV (IF) coax cable. The RF input is not changed in the RF output.

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

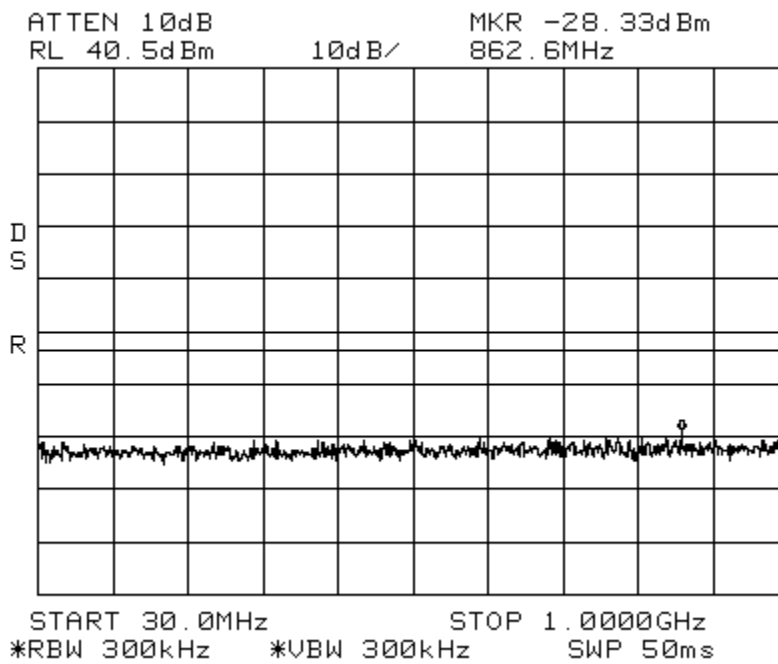
Results:

Pass (See plots)

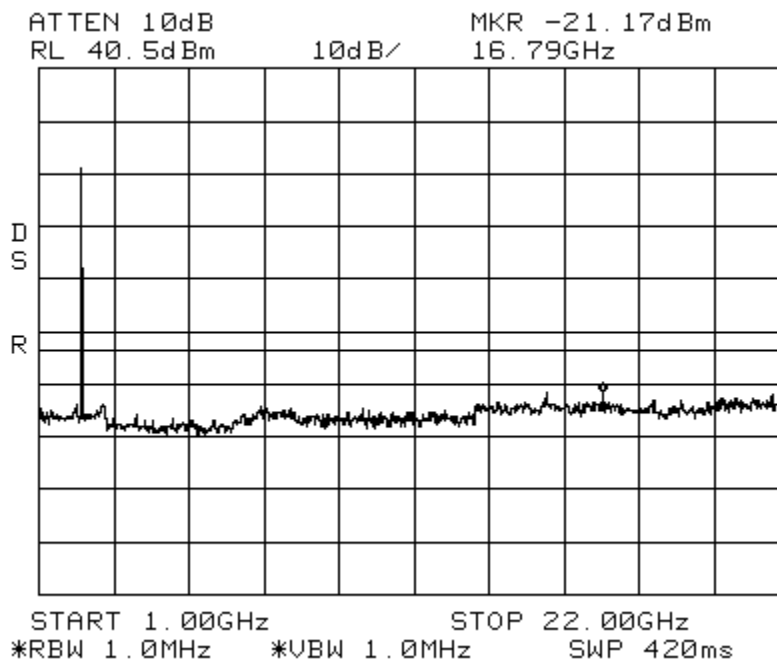




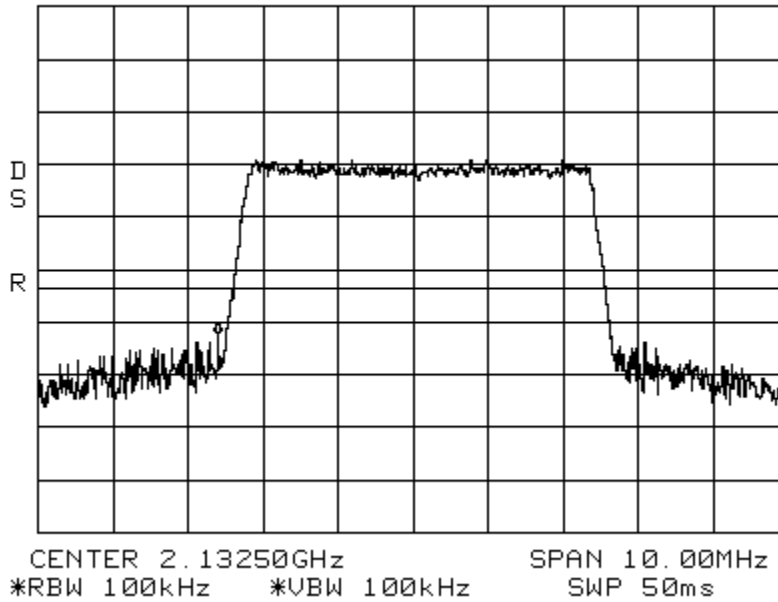
Conducted Emissions LTE 3 MHz Channel Bandwidth AWS Path 1
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



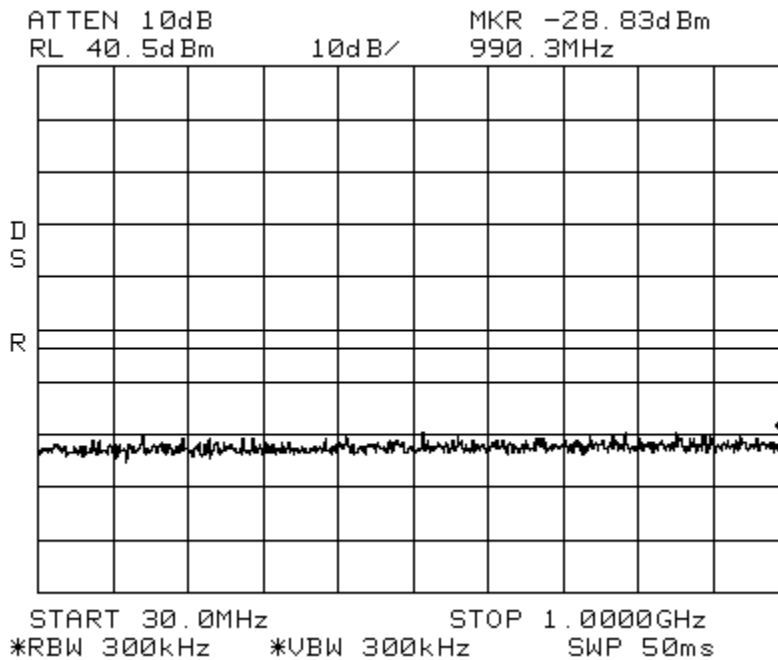
Conducted Emissions LTE 3 MHz Channel Bandwidth AWS Path 1
Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



Conducted Emissions LTE 5 MHz Channel Bandwidth AWS Path 1
Center: 2132.5 MHz Span: 10 MHz RBW/VBW: 100 kHz
ATTEN 10dB MKR -21.83dBm
RL 40.5dBm 10dB/ 2.12990GHz



Conducted Emissions LTE 5 MHz Channel Bandwidth AWS Path 1
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



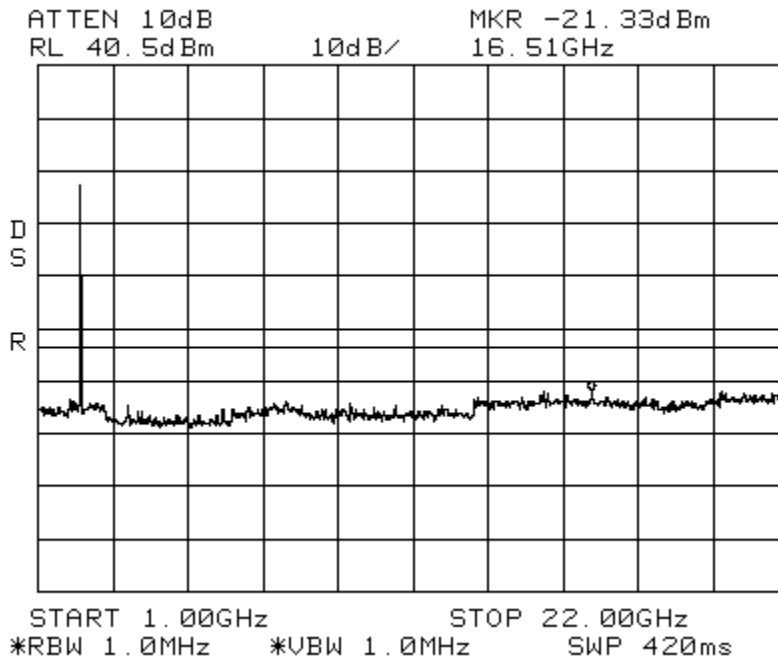
Conducted Emissions

LTE 5 MHz Channel Bandwidth

AWS Path 1

Span: 1 GHz to 22GHz

RBW/VBW: 1 MHz



Conducted Emissions

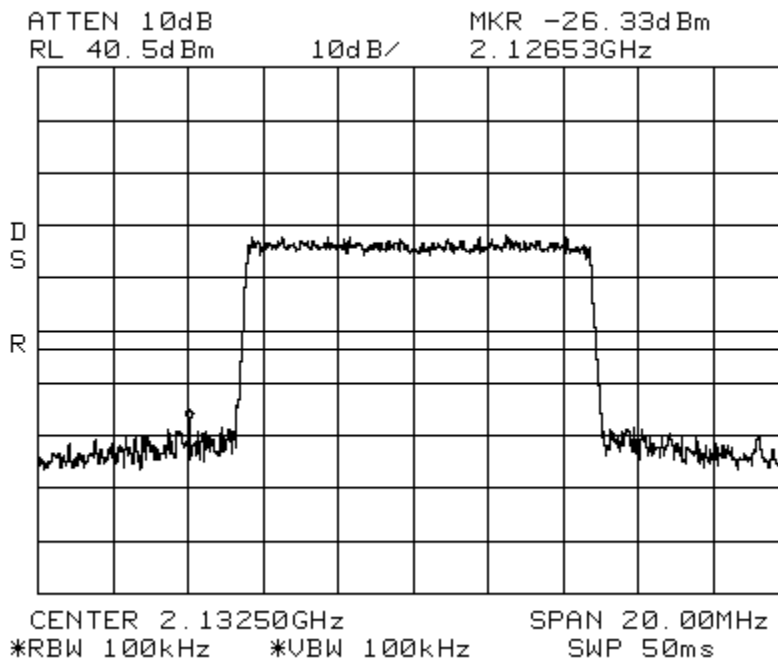
LTE 10 MHz Channel Bandwidth

AWS Path 1

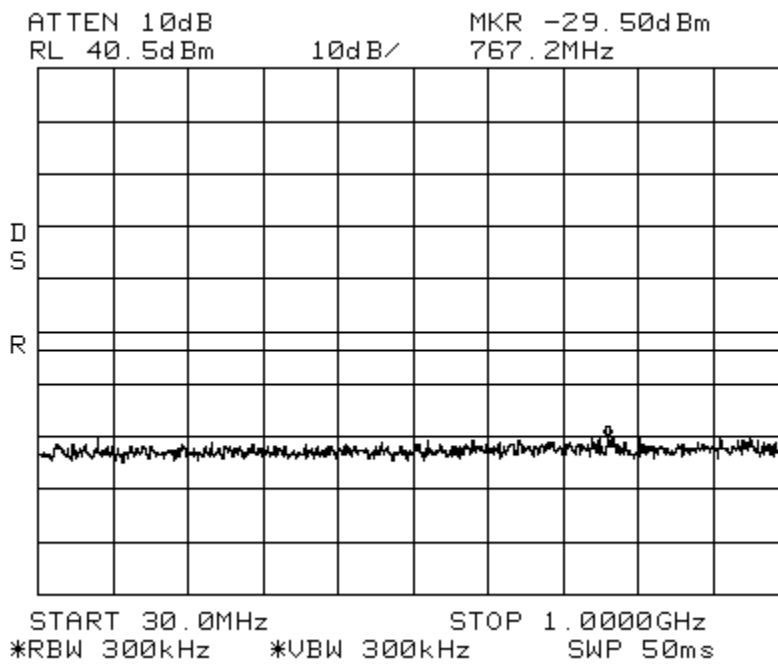
Center: 2132.5 MHz

Span: 20MHz

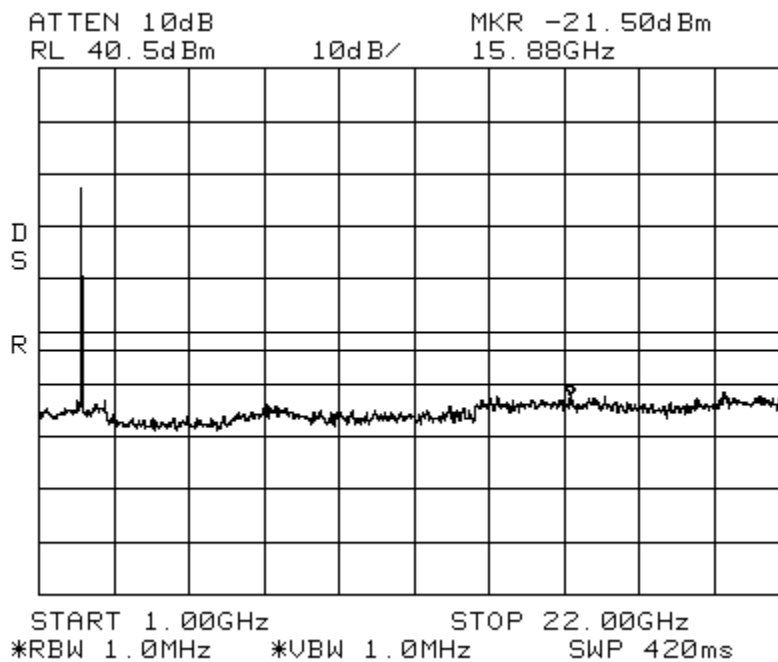
RBW/VBW: 100 kHz



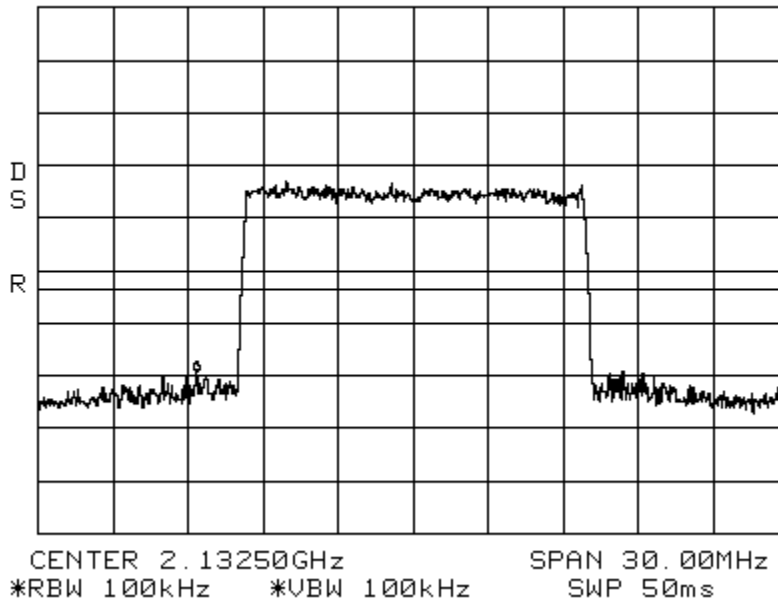
Conducted Emissions LTE 10 MHz Channel Bandwidth AWS Path 1
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



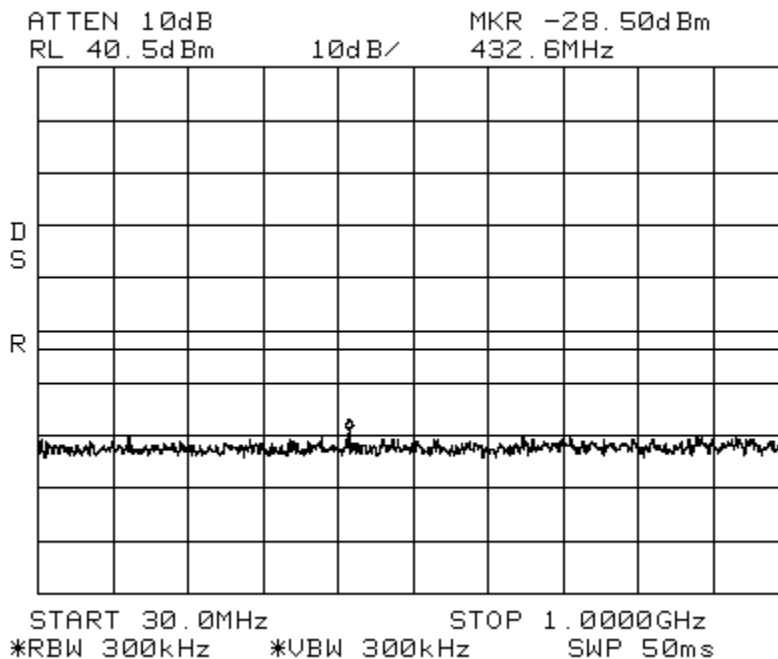
Conducted Emissions LTE 10 MHz Channel Bandwidth AWS Path 1
Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



Conducted Emissions LTE 15 MHz Channel Bandwidth AWS Path 1
Center: 2132.5 MHz Span: 30 MHz RBW/VBW: 100 kHz
ATTEN 10dB MKR -28.83dBm
RL 40.5dBm 10dB/ 2.12385GHz



Conducted Emissions LTE 15 MHz Channel Bandwidth AWS Path 1
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



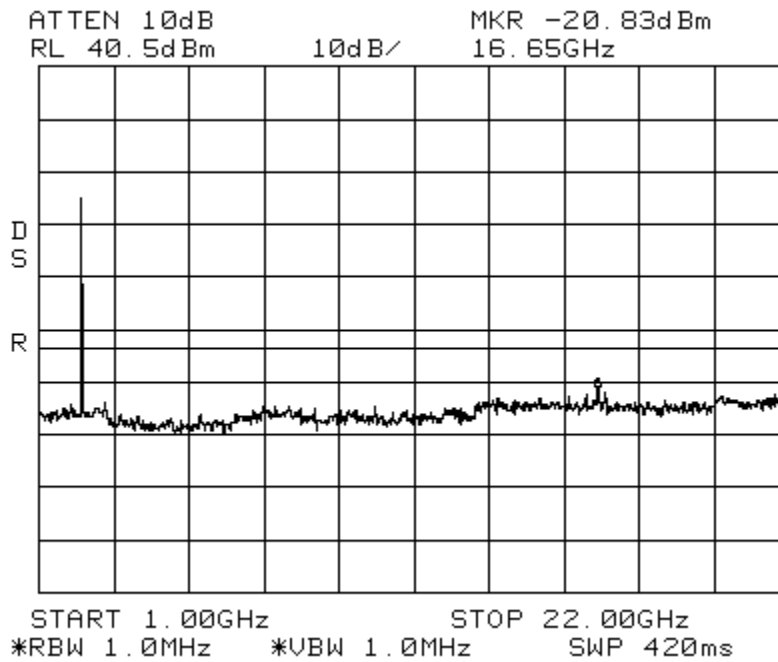
Conducted Emissions

LTE 15 MHz Channel Bandwidth

AWS Path 1

Span: 1 GHz to 22 GHz

RBW/VBW: 1 MHz



Conducted Emissions

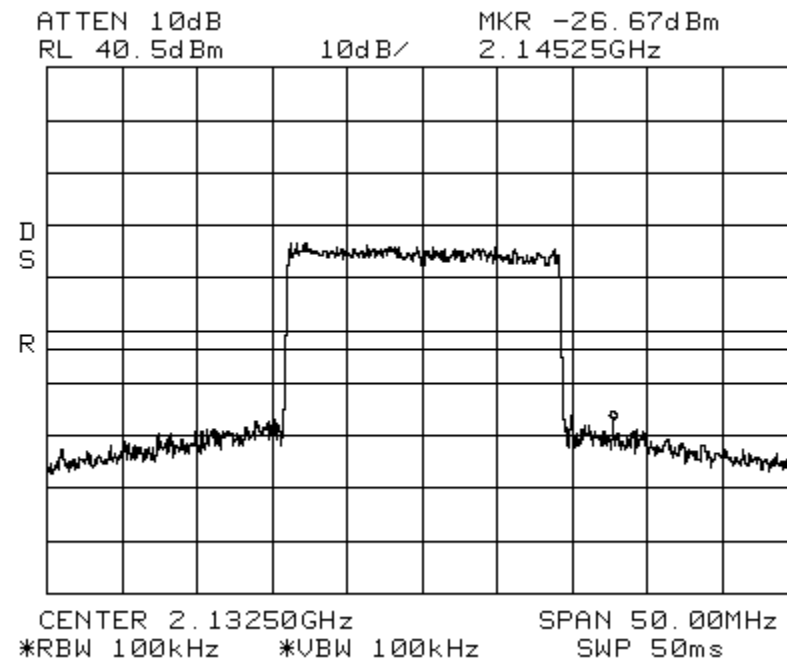
LTE 20 MHz Channel Bandwidth

AWS Path 1

Center: 2132.5 MHz

Span: 50MHz

RBW/VBW: 100 kHz



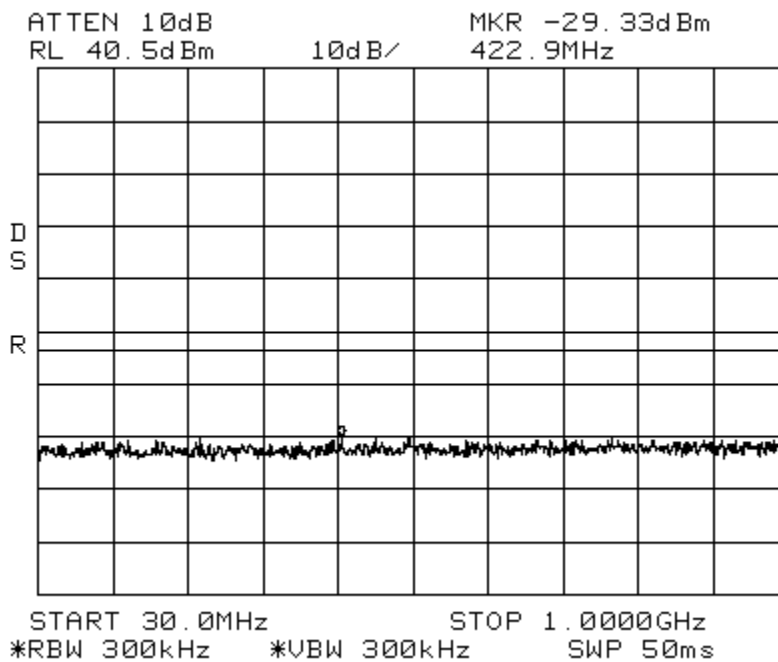
Conducted Emissions

LTE 20 MHz Channel Bandwidth

AWS Path 1

Span: 30 MHz to 1 GHz

RBW/VBW: 300 kHz



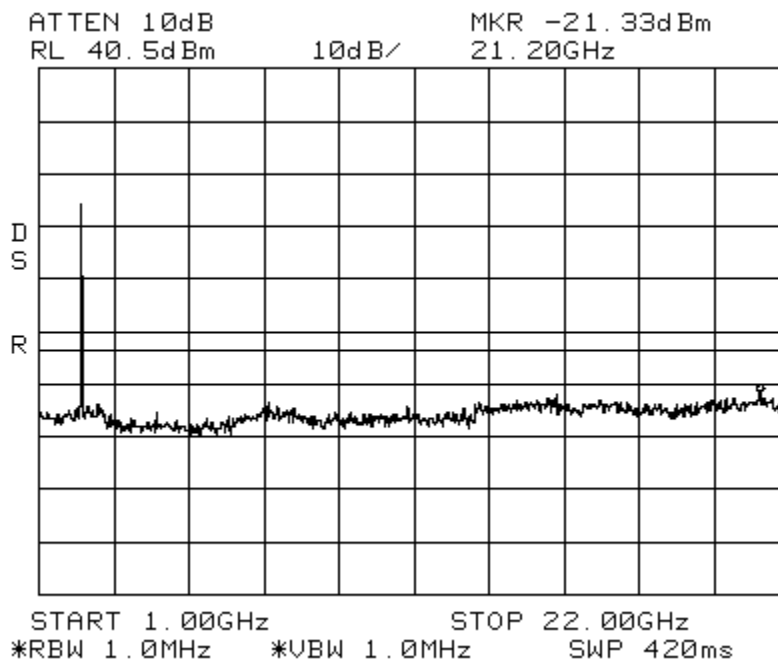
Conducted Emissions

LTE 20 MHz Channel Bandwidth

AWS Path 1

Span: 1 GHz to 22 GHz

RBW/VBW: 1 MHz



Conducted Emissions

Center: 2132.5 MHz

WCDMA

Span: 10 MHz

Spectrum AWS Path 2

RBW/VBW: 100 kHz

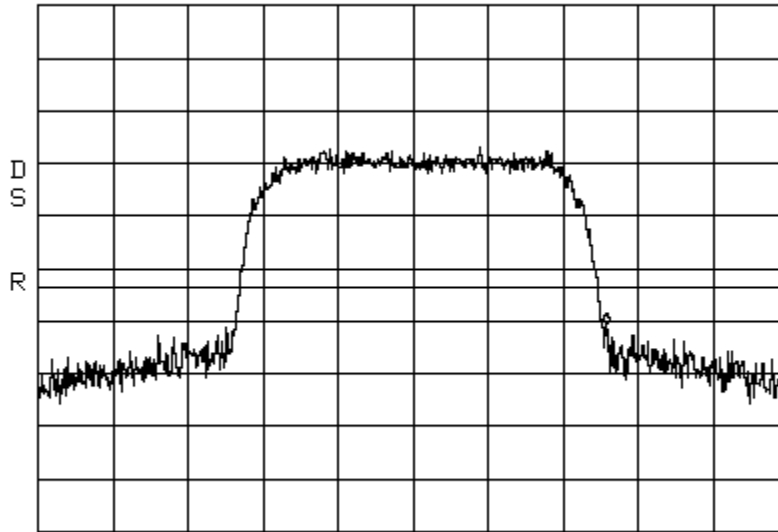
ATTEN 10dB

RL 40.5dBm

10dB/

MKR -20.17dBm

2.13508GHz



CENTER 2.13250GHz

SPAN 10.00MHz

*RBW 100kHz

*VBW 100kHz

SWP 50ms

Conducted Emissions

Span: 30 MHz to 1 GHz

WCDMA

Spectrum AWS Path 2

RBW/VBW: 300 kHz

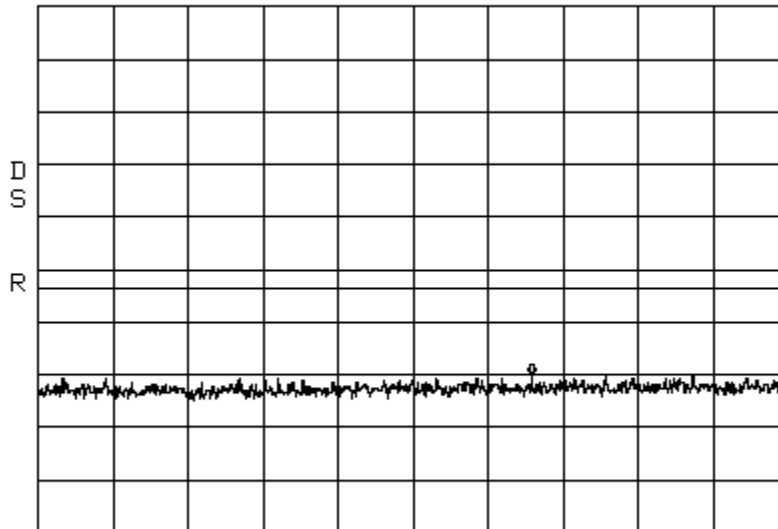
ATTEN 10dB

RL 40.5dBm

10dB/

MKR -29.50dBm

668.6MHz



START 30.0MHz

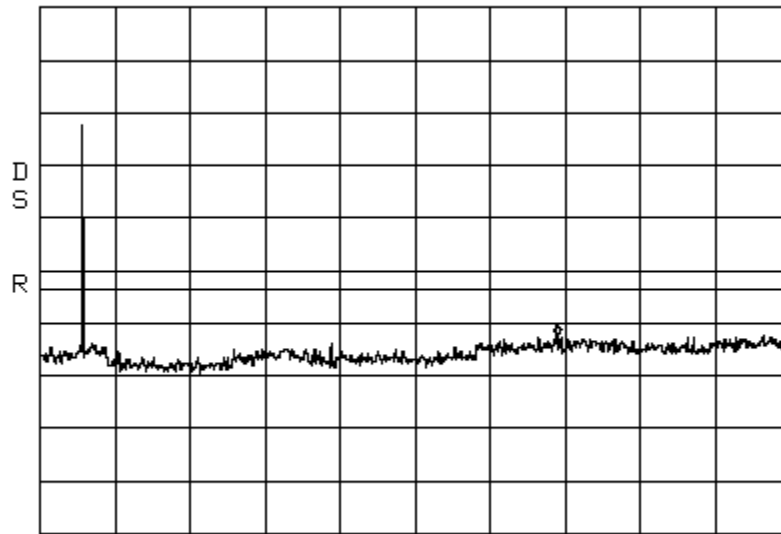
STOP 1.0000GHz

*RBW 300kHz

*VBW 300kHz

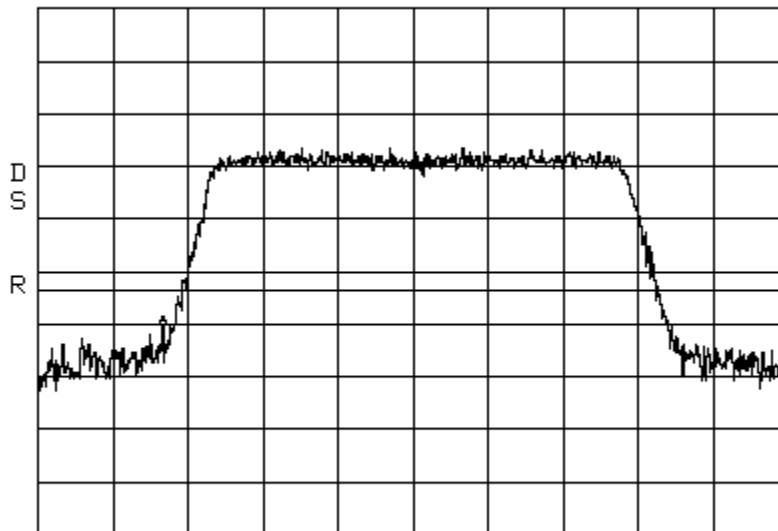
SWP 50ms

Conducted Emissions WCDMA Spectrum AWS Path 2
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz
 ATTN 10dB MKR -21.83dBm
 RL 40.5dBm 10dB/ 15.49GHz



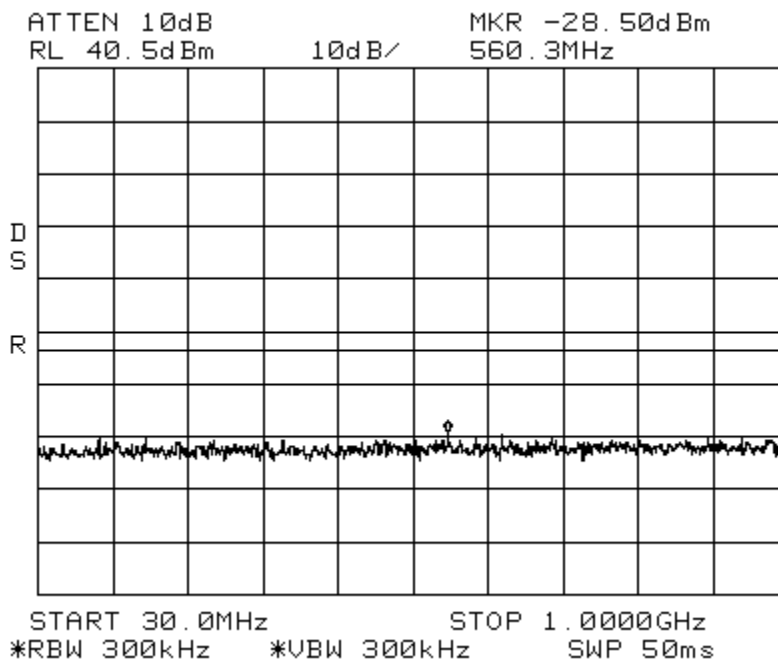
START 1.00GHz STOP 22.00GHz
 *RBW 1.0MHz *VBW 1.0MHz SWP 420ms

Conducted Emissions LTE 3 MHz Channel Bandwidth AWS Path 2
 Center: 2132.5 MHz Span: 5 MHz RBW/VBW: 100 kHz
 ATTN 10dB MKR -20.17dBm
 RL 40.5dBm 10dB/ 2.130833GHz

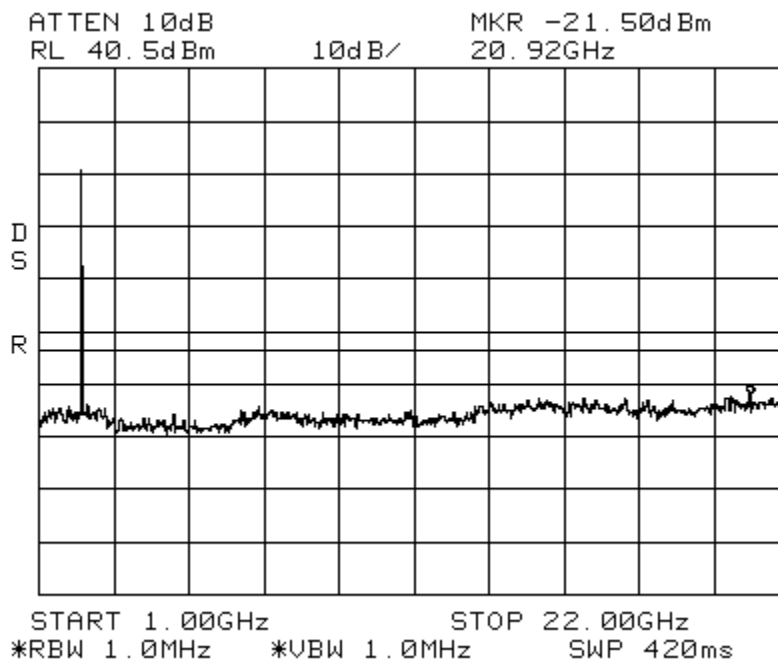


CENTER 2.132500GHz SPAN 5.000MHz
 *RBW 100kHz *VBW 100kHz SWP 50ms

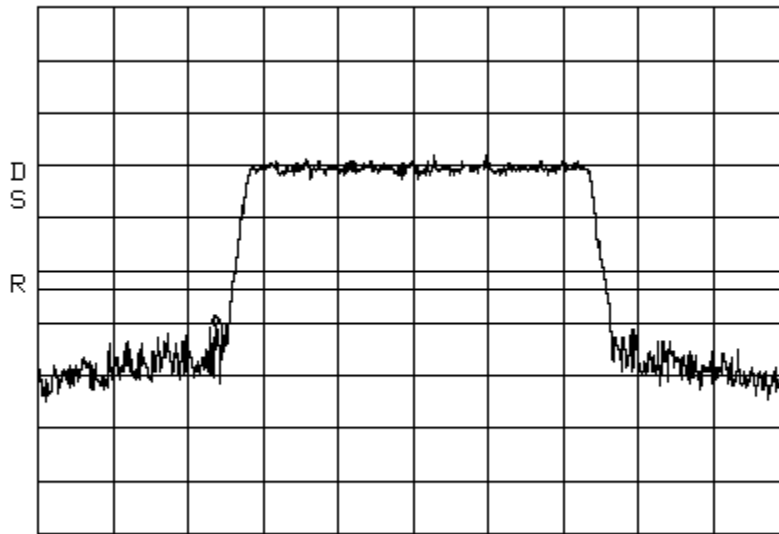
Conducted Emissions LTE 3 MHz Channel Bandwidth AWS Path 2
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



Conducted Emissions LTE 3 MHz Channel Bandwidth AWS Path 2
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz

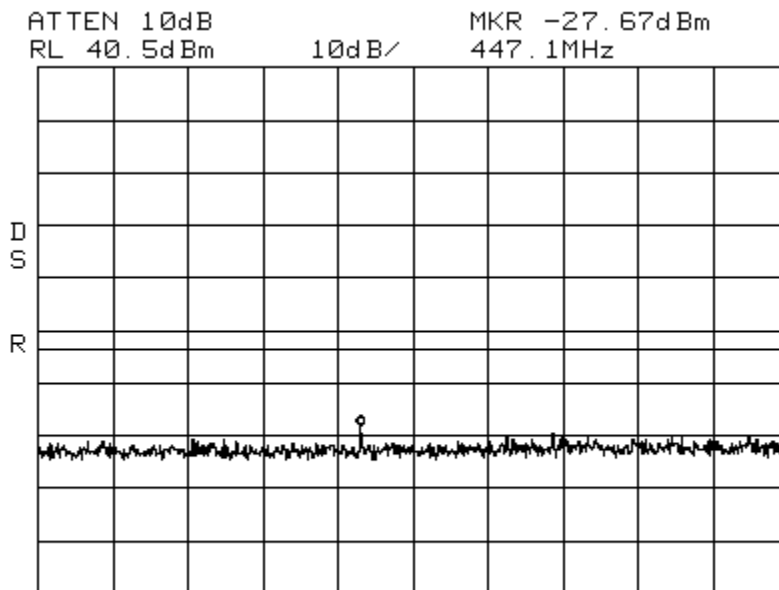


Conducted Emissions LTE 5 MHz Channel Bandwidth AWS Path 2
Center: 2132.5 MHz Span: 10 MHz RBW/VBW: 100 kHz
ATTEN 10dB MKR -20.00dBm
RL 40.5dBm 10dB/ 2.12987GHz



CENTER 2.13250GHz SPAN 10.00MHz
*RBW 100kHz *VBW 100kHz SWP 50ms

Conducted Emissions LTE 5 MHz Channel Bandwidth AWS Path 2
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



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

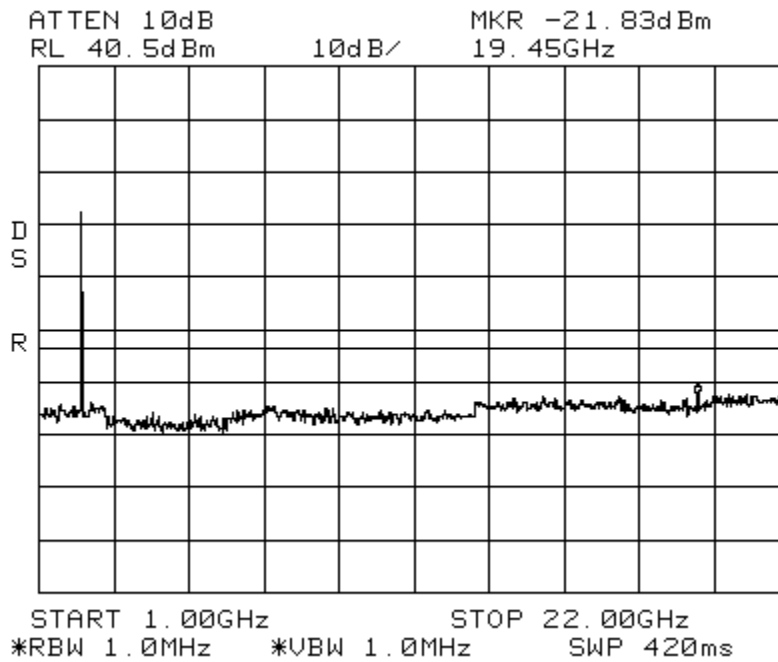
Conducted Emissions

LTE 5 MHz Channel Bandwidth

AWS Path 2

Span: 1 GHz to 22 GHz

RBW/VBW: 1 MHz



Conducted Emissions

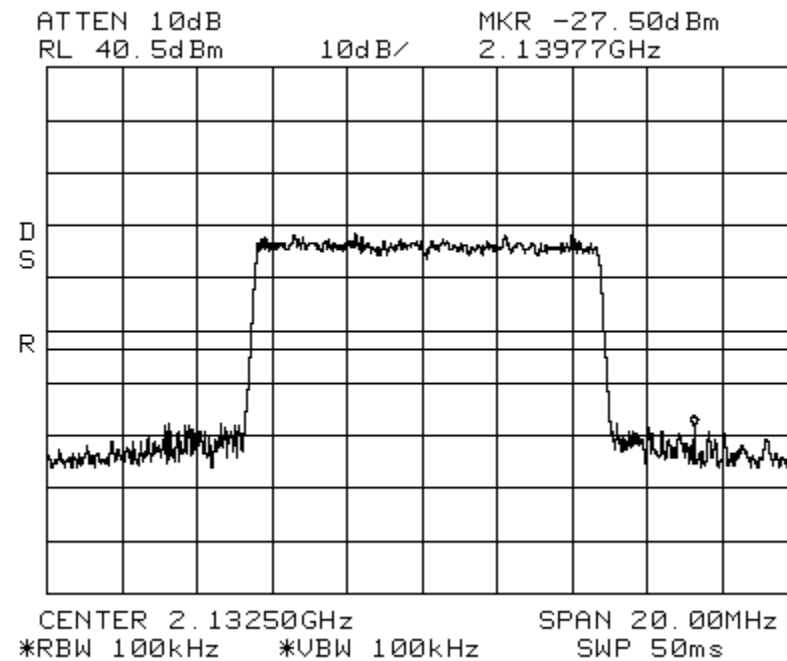
LTE 10 MHz Channel Bandwidth

AWS Path 2

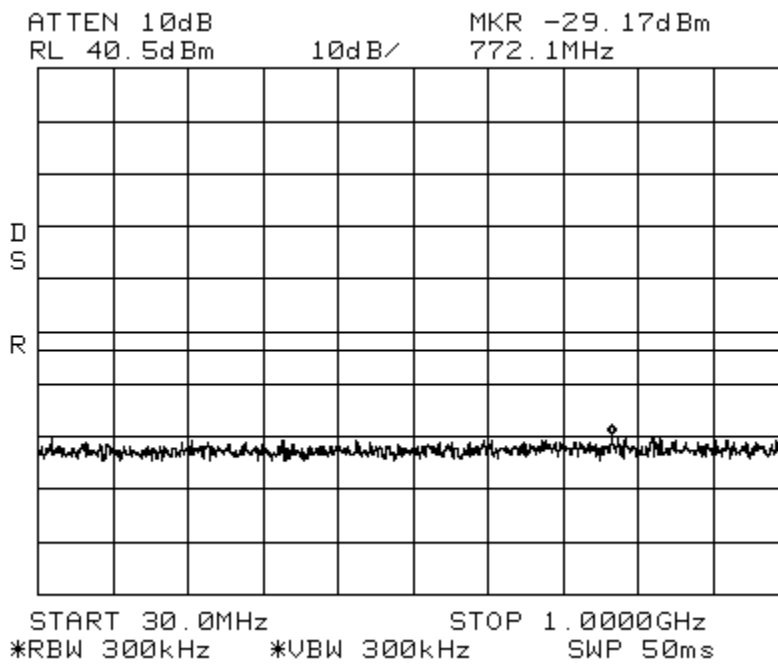
Center: 2132.5 MHz

Span: 20MHz

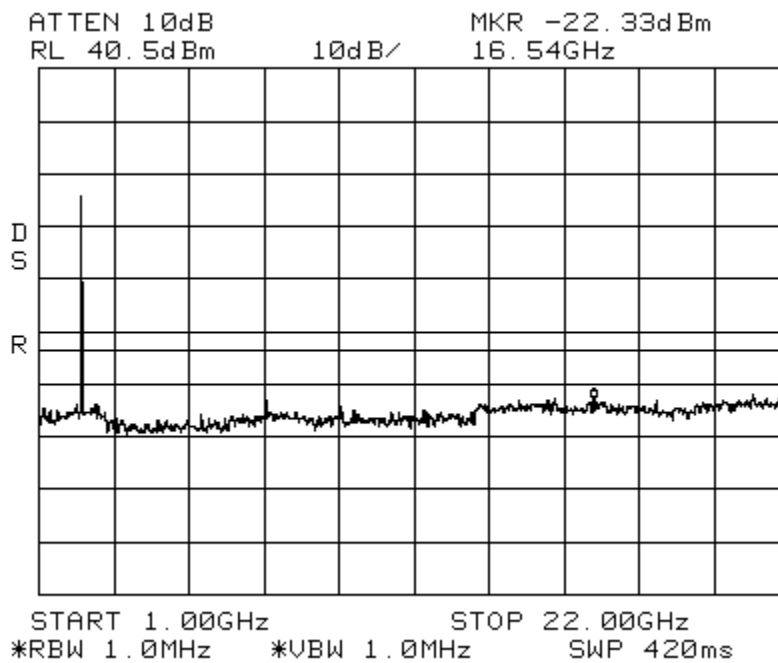
RBW/VBW: 100 kHz



Conducted Emissions LTE 10 MHz Channel Bandwidth AWS Path 2
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



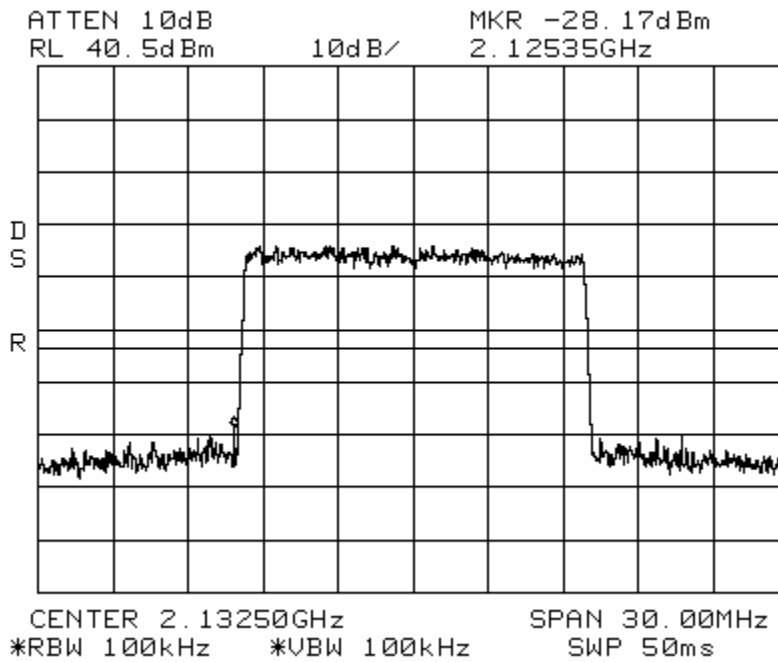
Conducted Emissions LTE 10 MHz Channel Bandwidth AWS Path 2
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



Conducted Emissions
Center: 2132.5 MHz

LTE 15 MHz Channel Bandwidth
Span: 30 MHz

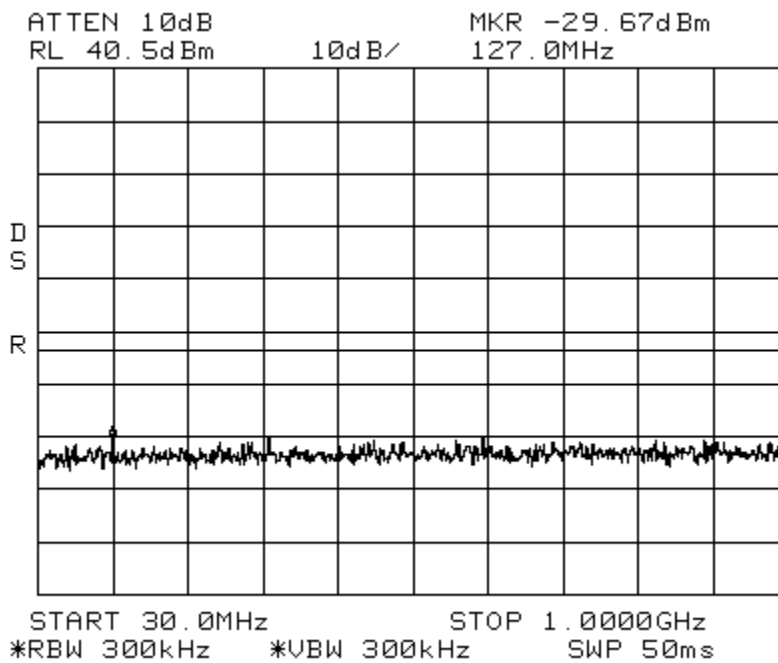
AWS Path 2
RBW/VBW: 100 kHz



Conducted Emissions

LTE 15 MHz Channel Bandwidth
Span: 30 MHz to 1 GHz

AWS Path 2
RBW/VBW: 300 kHz



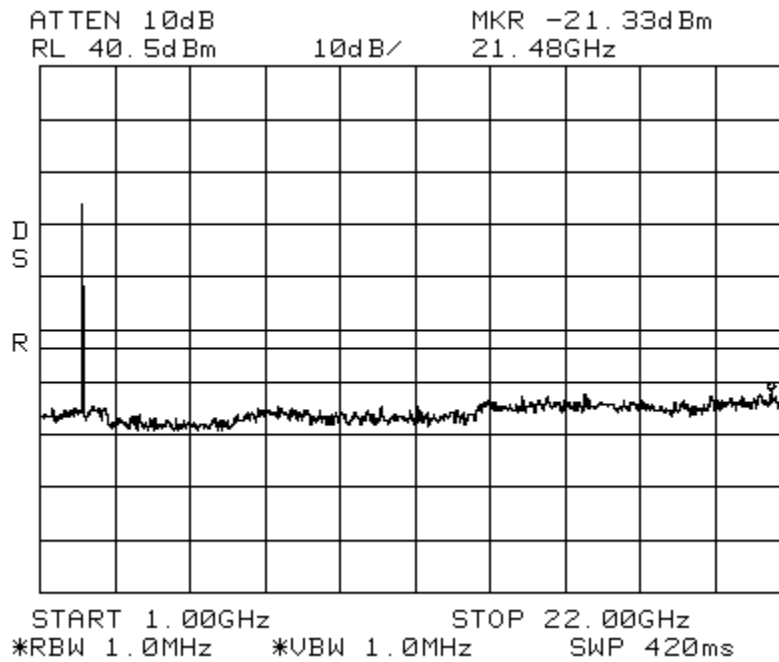
Conducted Emissions

LTE 15 MHz Channel Bandwidth

AWS Path 2

Span: 1 GHz to 22 GHz

RBW/VBW: 1 MHz



Conducted Emissions

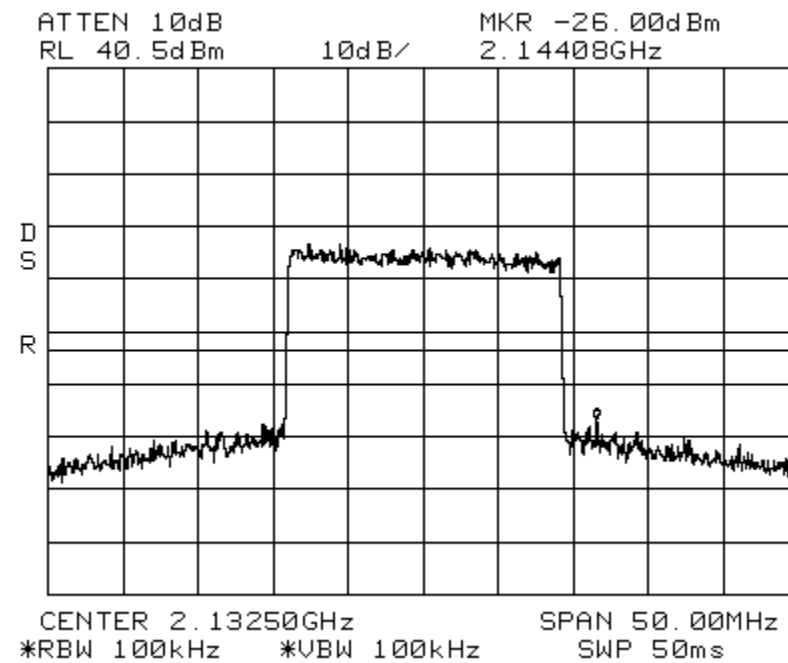
LTE 20 MHz Channel Bandwidth

AWS Path 2

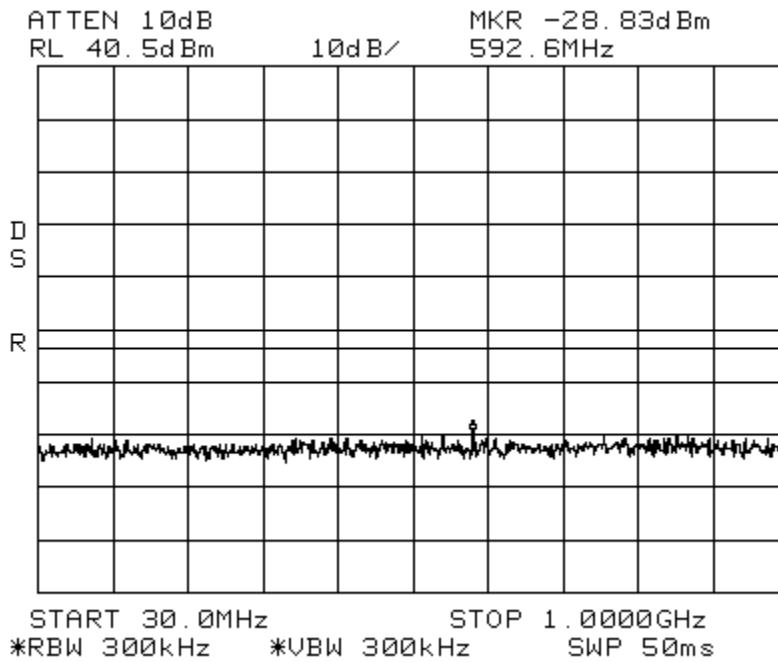
Center: 2132.5 MHz

Span: 50MHz

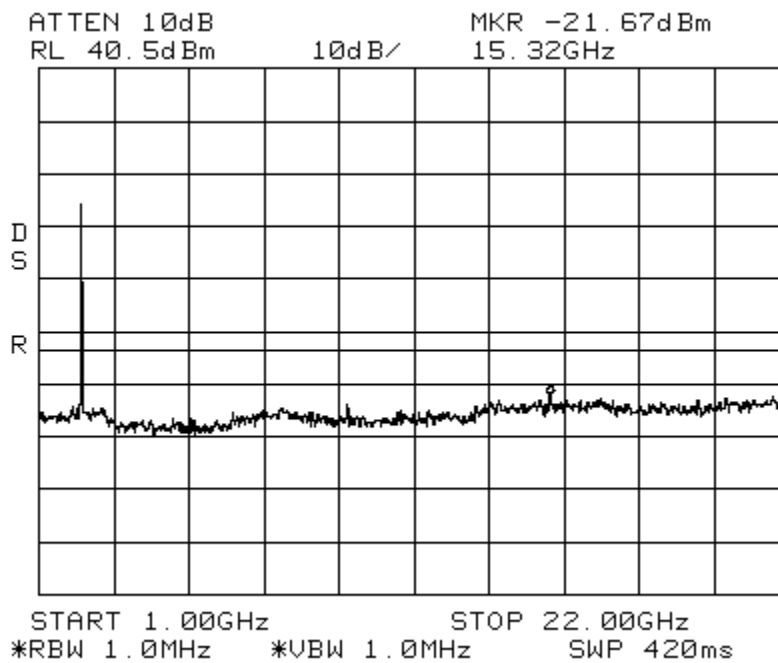
RBW/VBW: 100 kHz

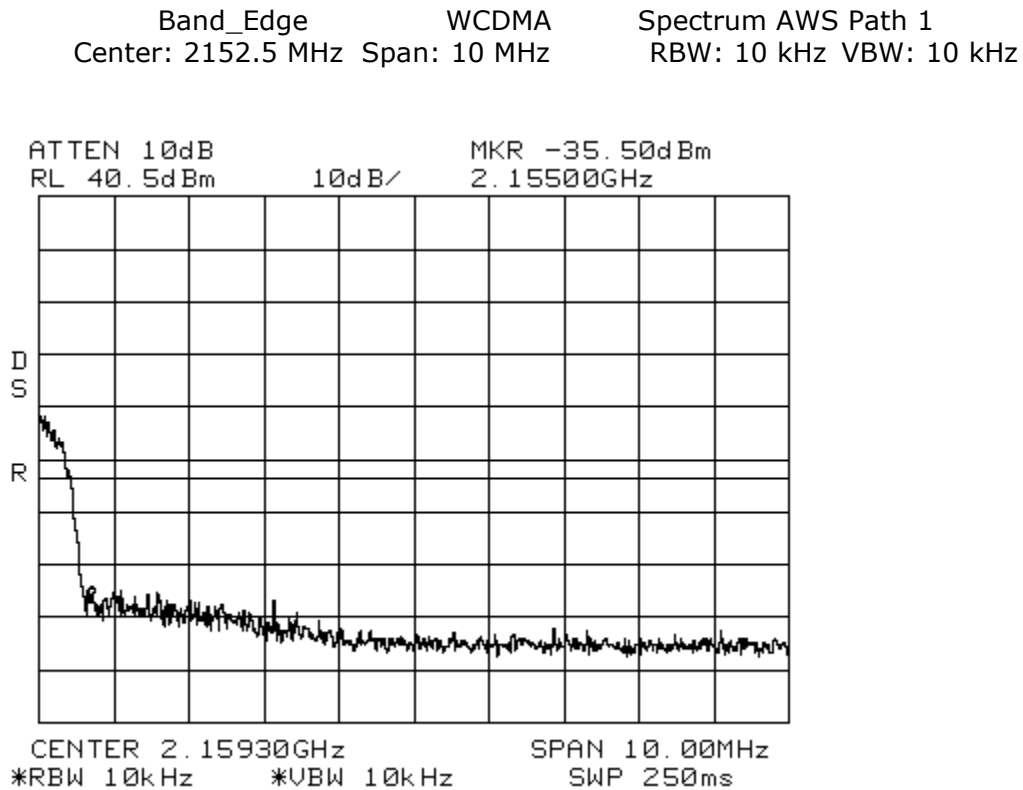
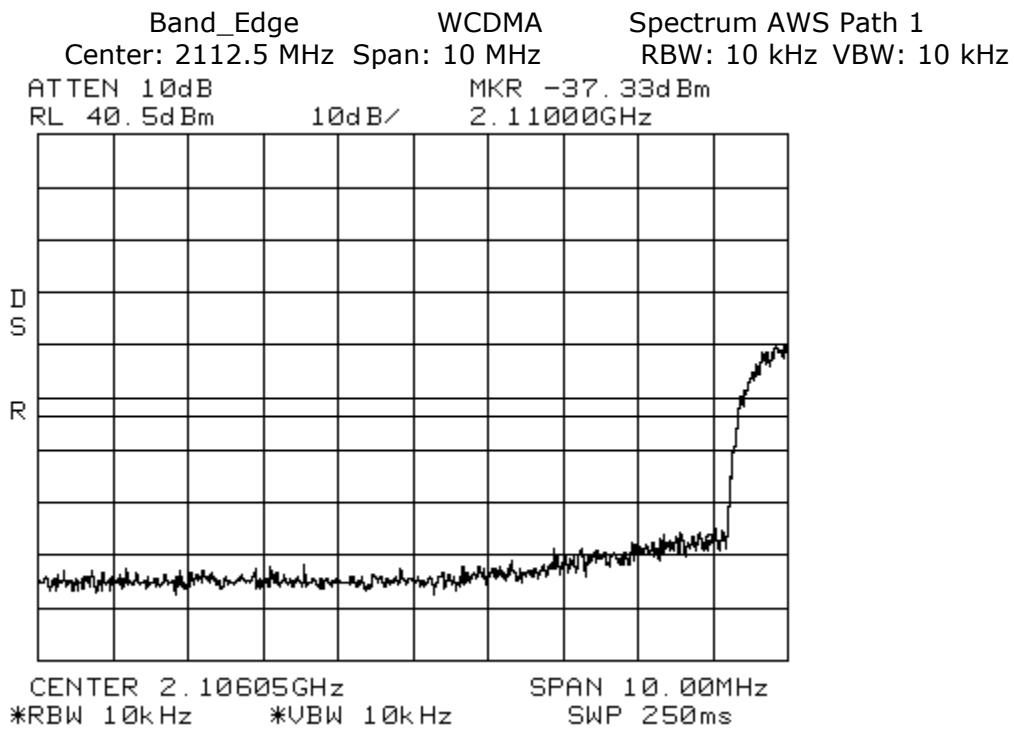


Conducted Emissions LTE 20 MHz Channel Bandwidth AWS Path 2
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz

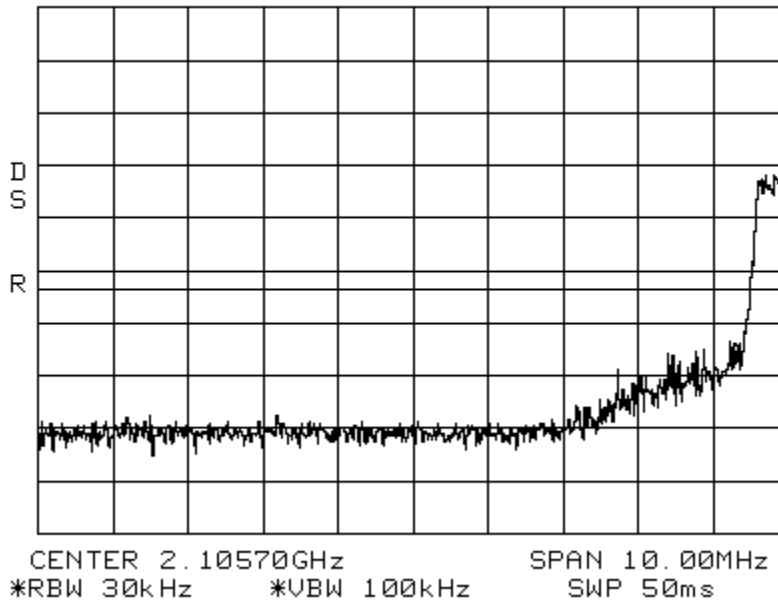


Conducted Emissions LTE 20 MHz Channel Bandwidth AWS Path 2
Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz

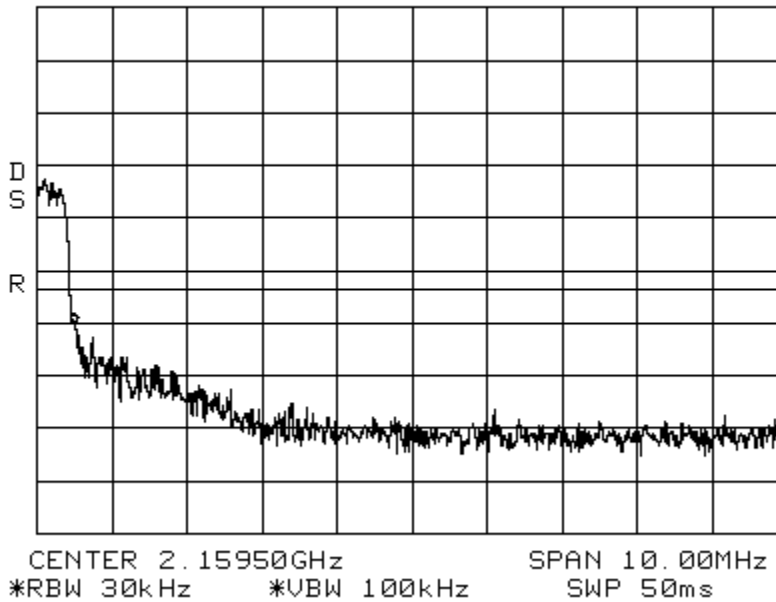




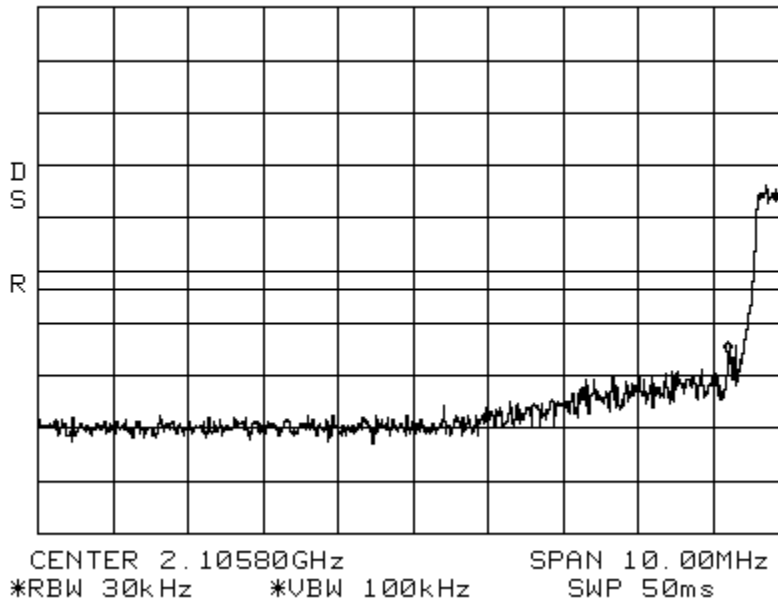
Band_Edge LTE 3 MHz Channel Bandwidth AWS Path 1
Center: 2111.5 MHz Span: 10 MHz RBW: 30 kHz VBW: 100 kHz
ATTEN 10dB MKR -25.33dBm
RL 40.5dBm 10dB/ 2.11000GHz



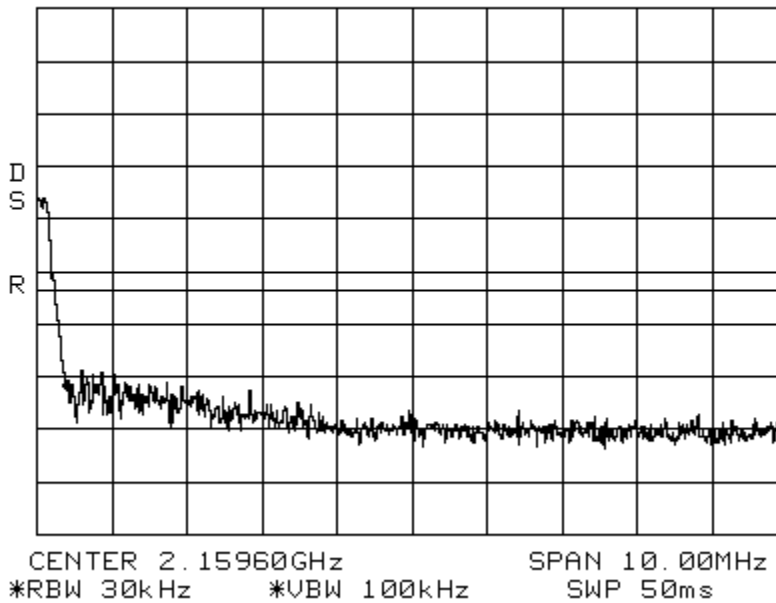
Band_Edge LTE 3 MHz Channel Bandwidth AWS Path 1
Center: 2153.5MHz Span: 10 MHz RBW: 30 kHz VBW: 100 kHz
ATTEN 10dB MKR -19.50dBm
RL 40.5dBm 10dB/ 2.15500GHz



Band_Edge LTE 5 MHz Channel Bandwidth AWS Path 1
Center: 2112.5MHz Span: 10 MHz RBW: 30 kHz VBW: 100 kHz
ATTEN 10dB MKR -25.00dBm
RL 40.5dBm 10dB/ 2.11000GHz

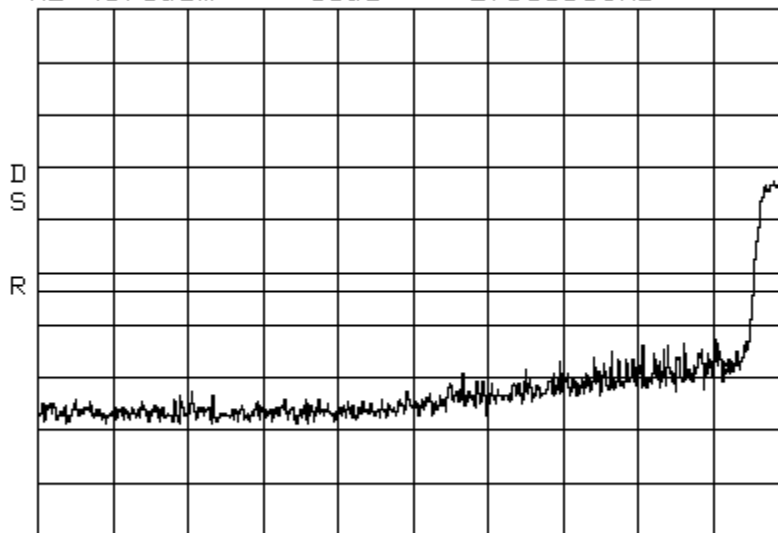


Band_Edge LTE 5 MHz Channel Bandwidth AWS Path 1
Center: 2152.5MHz Span: 10 MHz RBW: 30 kHz VBW: 100 kHz
ATTEN 10dB MKR -32.17dBm
RL 40.5dBm 10dB/ 2.15500GHz



Band_Edge LTE 10 MHz Channel Bandwidth
Center: 2115.0MHz Span: 15 MHz RBW: 100 kHz
ATTEN 10dB MKR -28.83dBm
RL 40.5dBm 10dB/ 2.11000GHz

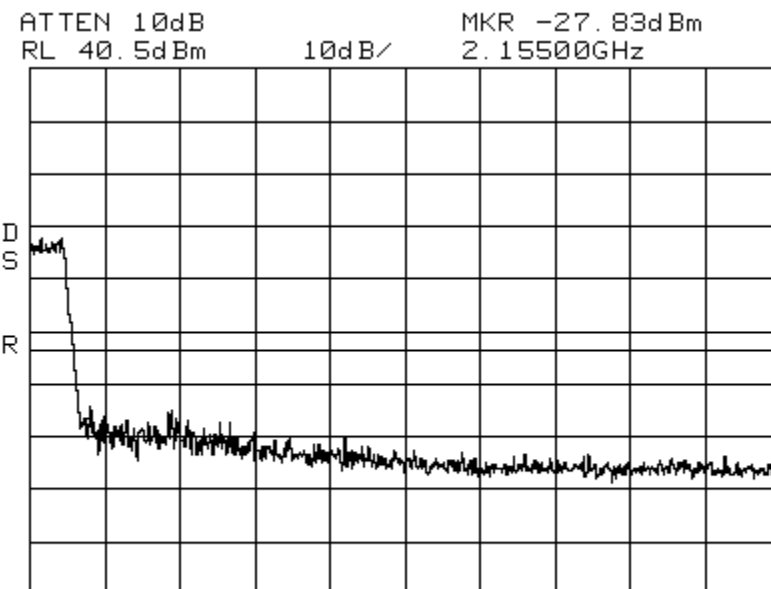
AWS Path 1
VBW: 100 kHz



CENTER 2.10375GHz SPAN 15.00MHz
*RBW 100kHz *VBW 100kHz SWP 50ms

Band_Edge LTE 10 MHz Channel Bandwidth
Center: 2150.0MHz Span: 15 MHz RBW: 100 kHz

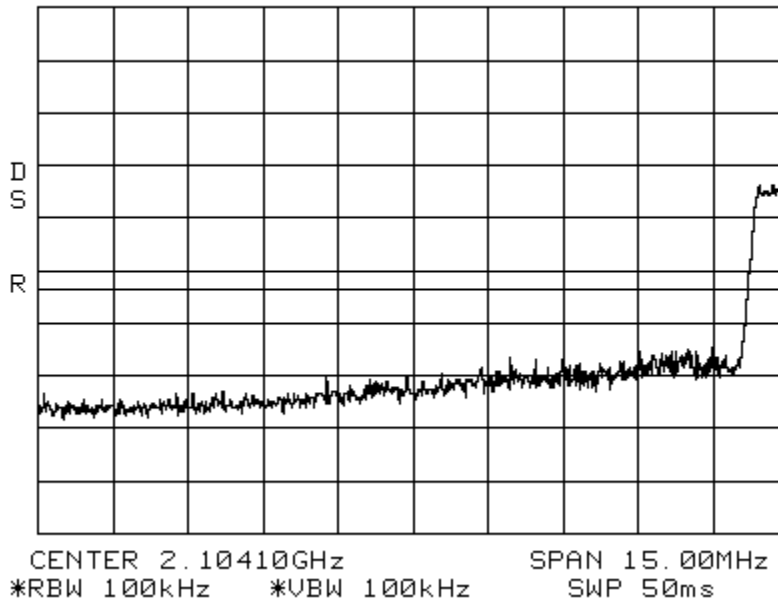
AWS Path 1
VBW: 100 kHz



CENTER 2.16133GHz SPAN 15.00MHz
*RBW 100kHz *VBW 100kHz SWP 50ms

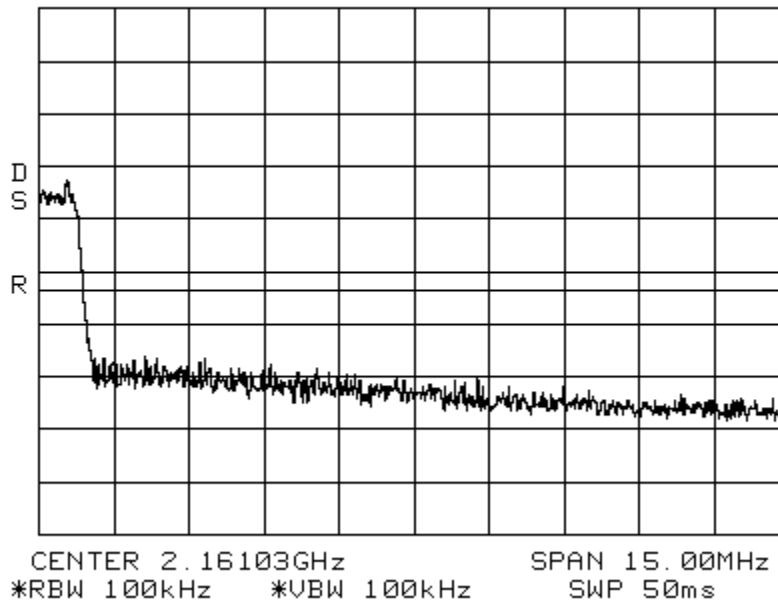
Band_Edge LTE 15 MHz Channel Bandwidth
Center: 2117.5 MHz Span: 15 MHz RBW: 100 kHz
ATTEN 10dB MKR -28.83dBm
RL 40.5dBm 10dB/ 2.11000GHz

AWS Path 1
VBW: 100 kHz



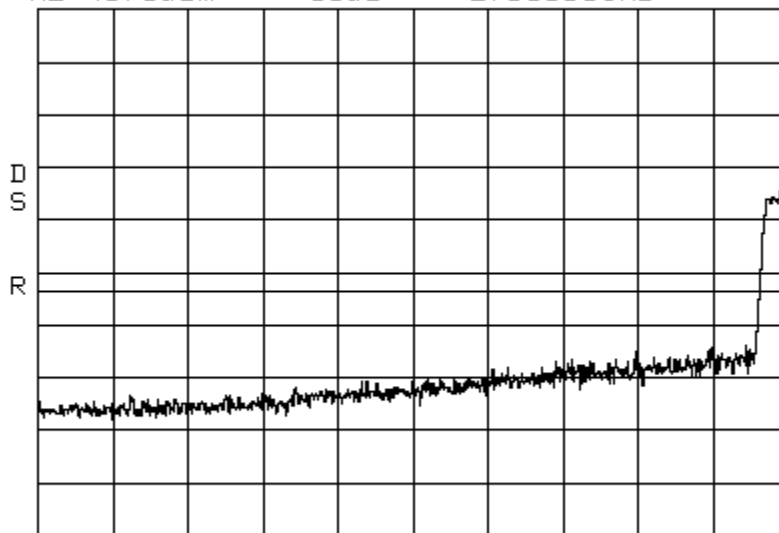
Band_Edge LTE 15 MHz Channel Bandwidth AWS Path 1
Center: 2147.5MHz Span: 15 MHz RBW: 100kHz VBW: 100 kHz

ATTEN 10dB MKR -28.83dBm
RL 40.5dBm 10dB/ 2.15500GHz



Band_Edge LTE 20 MHz Channel Bandwidth
Center: 2120.0MHz Span: 20 MHz RBW: 100 kHz
ATTEN 10dB MKR -28.67dBm
RL 40.5dBm 10dB/ 2.11000GHz

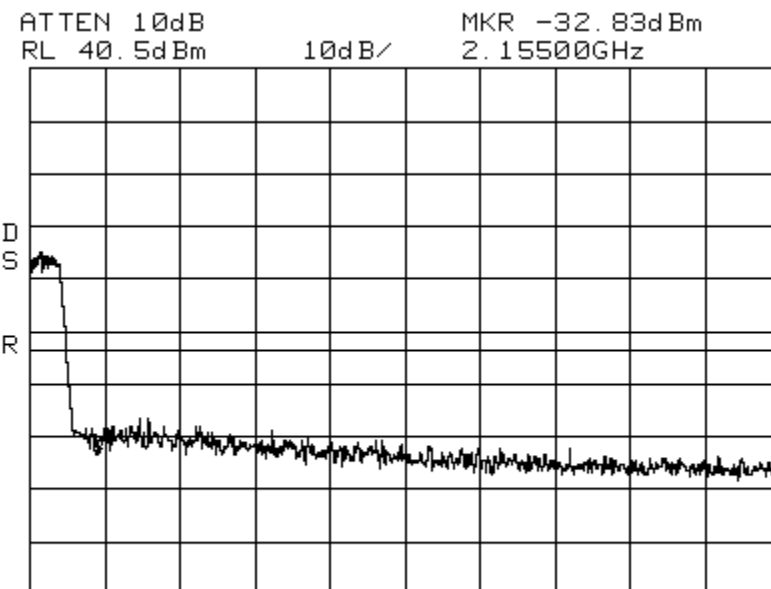
AWS Path 1
VBW: 100 kHz



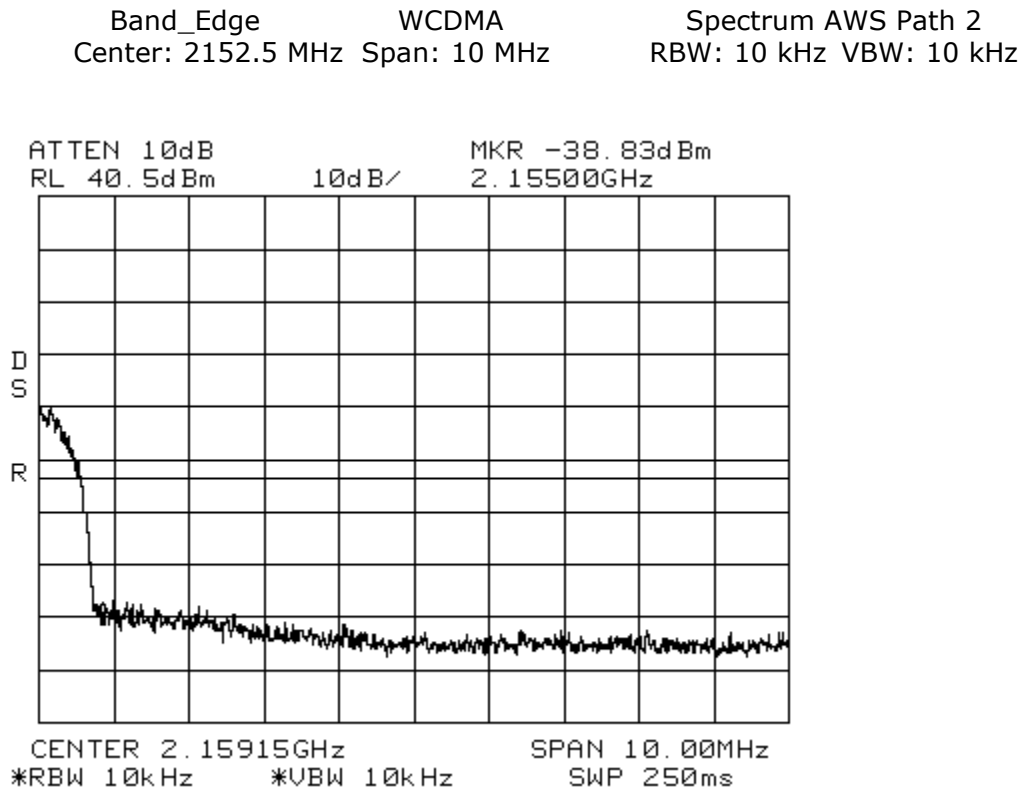
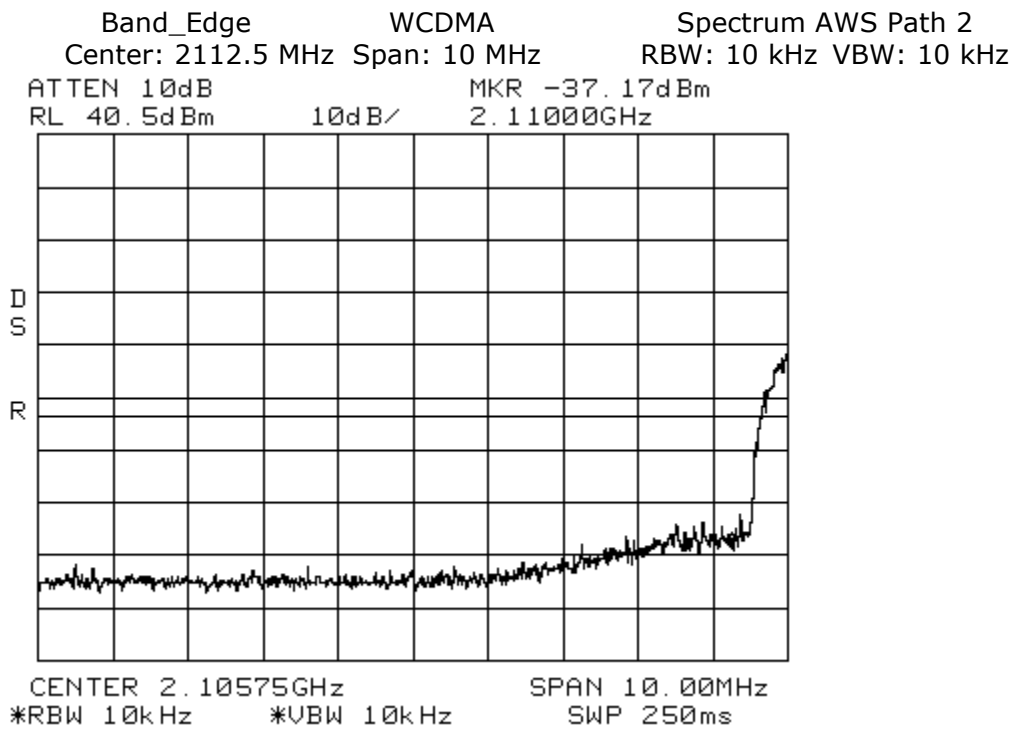
CENTER 2.10190GHz SPAN 20.00MHz
*RBW 100kHz *VBW 100kHz SWP 50ms

Band_Edge LTE 20 MHz Channel Bandwidth
Center: 2145.0MHz Span: 20 MHz RBW: 100 kHz

AWS Path 1
VBW: 100 kHz



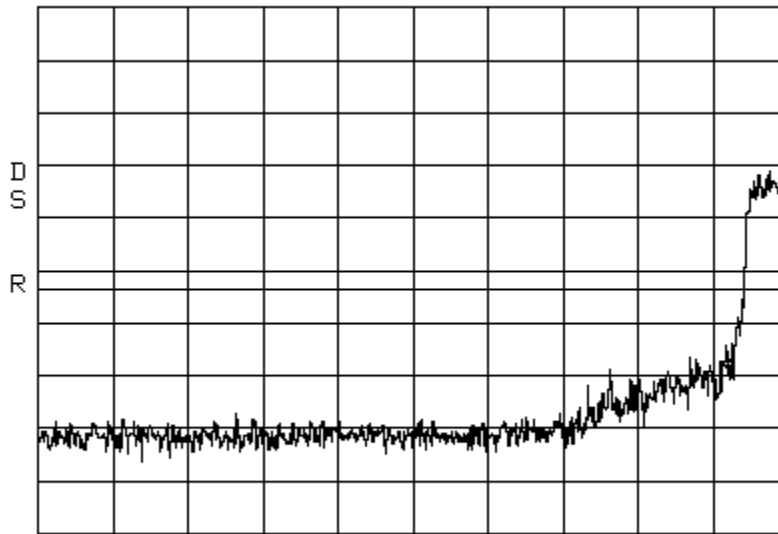
CENTER 2.16320GHz SPAN 20.00MHz
*RBW 100kHz *VBW 100kHz SWP 50ms



Band_Edge LTE 3 MHz Channel Bandwidth AWS Path 2

Center: 2111.5 MHz Span: 10 MHz RBW: 30 kHz VBW: 100 kHz

ATTEN 10dB MKR -28.17dBm
RL 40.5dBm 10dB/ 2.11000GHz

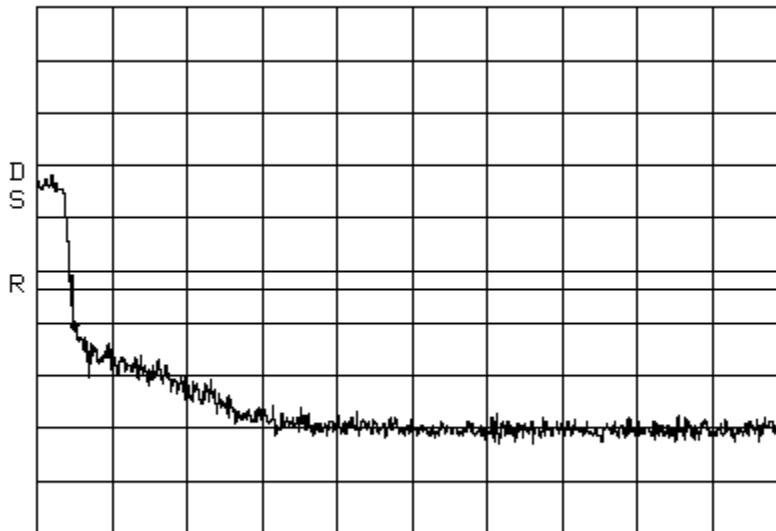


CENTER 2.10580GHz SPAN 10.00MHz
*RBW 30kHz *VBW 100kHz SWP 50ms

Band_Edge LTE 3 MHz Channel Bandwidth AWS Path 2

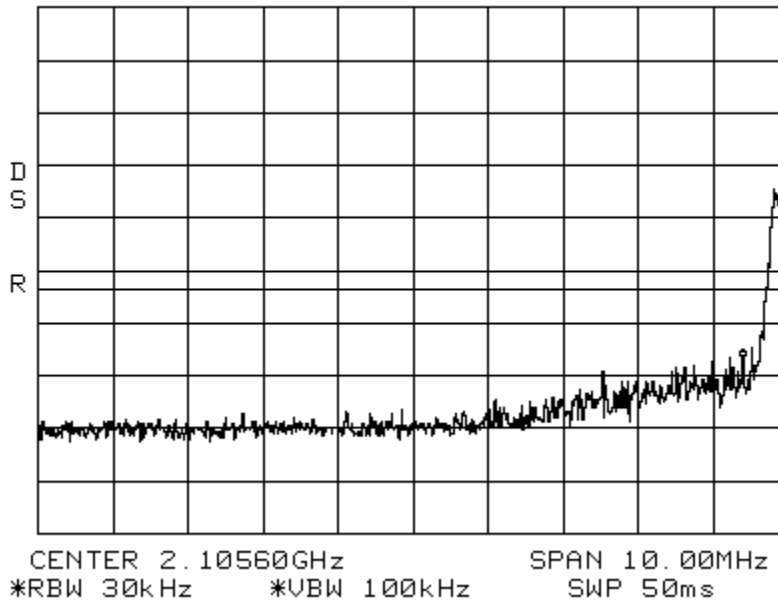
Center: 2153.5MHz Span: 10 MHz RBW: 30 kHz VBW: 100 kHz

ATTEN 10dB MKR -21.00dBm
RL 40.5dBm 10dB/ 2.15500GHz

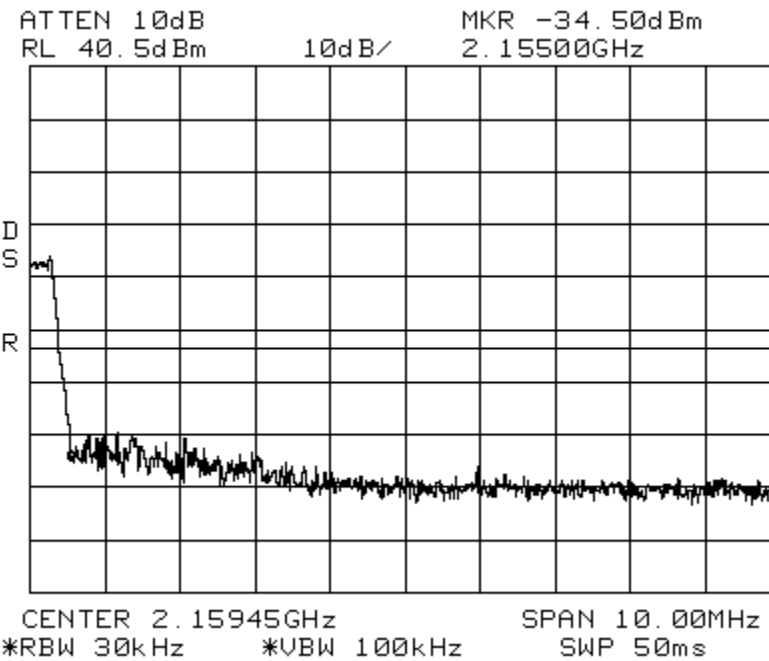


CENTER 2.15950GHz SPAN 10.00MHz
*RBW 30kHz *VBW 100kHz SWP 50ms

Band_Edge LTE 5 MHz Channel Bandwidth AWS Path 2
Center: 2112.5MHz Span: 10 MHz RBW: 30 kHz VBW: 100 kHz
ATTEN 10dB MKR -26.33dBm
RL 40.5dBm 10dB/ 2.11000GHz

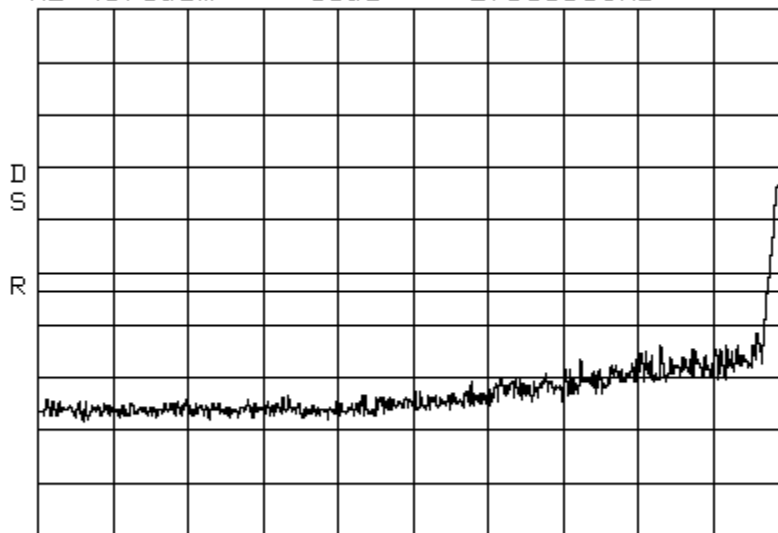


Band_Edge LTE 5 MHz Channel Bandwidth AWS Path 2
Center: 2152.5MHz Span: 10 MHz RBW: 30 kHz VBW: 100 kHz



Band_Edge LTE 10 MHz Channel Bandwidth
Center: 2115.0MHz Span: 15 MHz RBW: 100 kHz
ATTEN 10dB MKR -27.17dBm
RL 40.5dBm 10dB/ 2.11000GHz

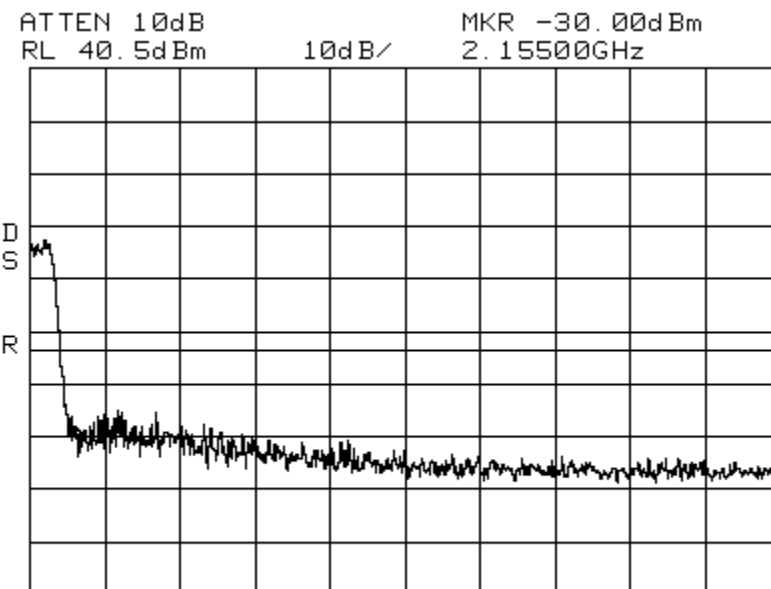
AWS Path 2
VBW: 100 kHz



CENTER 2.10345GHz SPAN 15.00MHz
*RBW 100kHz *VBW 100kHz SWP 50ms

Band_Edge LTE 10 MHz Channel Bandwidth
Center: 2150.0MHz Span: 15 MHz RBW: 100 kHz

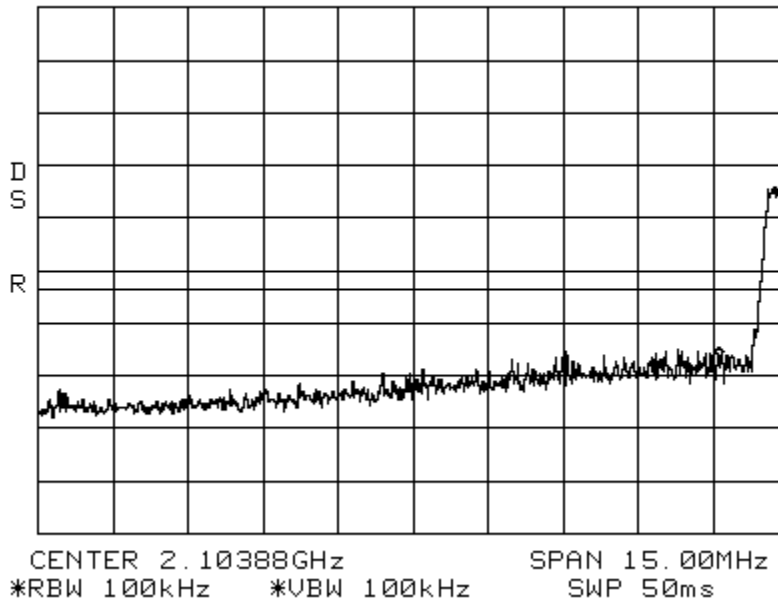
AWS Path 2
VBW: 100 kHz



CENTER 2.16155GHz SPAN 15.00MHz
*RBW 100kHz *VBW 100kHz SWP 50ms

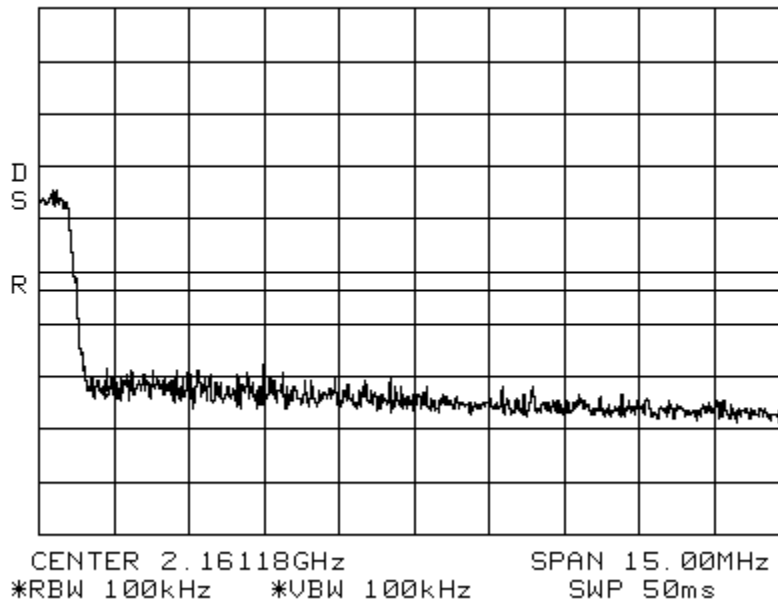
Band_Edge LTE 15 MHz Channel Bandwidth
Center: 2117.5MHz Span: 15 MHz RBW: 100 kHz
ATTEN 10dB MKR -26.00dBm
RL 40.5dBm 10dB/ 2.11000GHz

AWS Path 2
VBW: 100 kHz



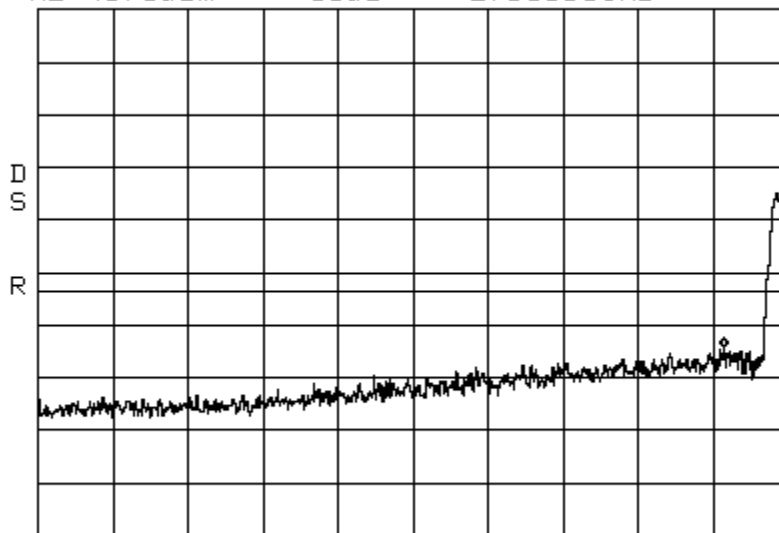
Band_Edge LTE 15 MHz Channel Bandwidth AWS Path 2
Center: 2147.5MHz Span: 15 MHz RBW: 100kHz VBW: 100 kHz

ATTEN 10dB MKR -33.50dBm
RL 40.5dBm 10dB/ 2.15500GHz



Band_Edge LTE 20 MHz Channel Bandwidth
Center: 2120.0MHz Span: 20 MHz RBW: 100 kHz
ATTEN 10dB MKR -23.83dBm
RL 40.5dBm 10dB/ 2.11000GHz

AWS Path 2
VBW: 100 kHz

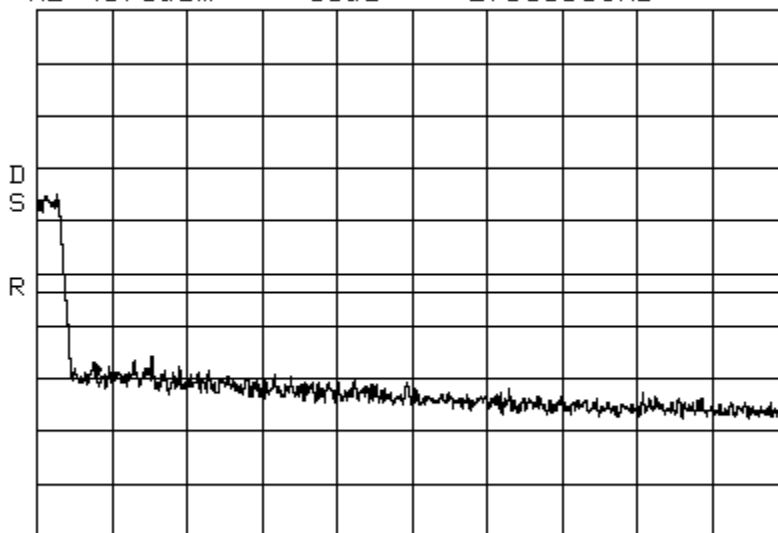


CENTER 2.10170GHz SPAN 20.00MHz
*RBW 100kHz *VBW 100kHz SWP 50ms

Band_Edge LTE 20 MHz Channel Bandwidth
Center: 2145.0MHz Span: 20 MHz RBW: 100 kHz

AWS Path 2
VBW: 100 kHz

ATTEN 10dB MKR -28.83dBm
RL 40.5dBm 10dB/ 2.15500GHz



CENTER 2.16340GHz SPAN 20.00MHz
*RBW 100kHz *VBW 100kHz SWP 50ms

7.2 Conducted Output Power Test

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[Back to Conducted Output Power; Section 5.1.1](#)

*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 WCDMA, LTE 3MHz, LTE 5MHz, LTE 10MHz, LTE 15MHz, & LTE 20MHz signal generator. The power meter level was offset to compensate for attenuators and cable loss between the EUT and the power meter.

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

AWS Path 1

WCDMA 0.1020 Watts

Carrier Frequency	Carrier Output
2112.5 MHz	<u>20.09</u> dBm
2132.5 MHz	<u>19.72</u> dBm
2152.5 MHz	<u>18.81</u> dBm

AWS Path 1

LTE 3MHz 0.1028 Watts

Carrier Frequency	Carrier Output
2111.5 MHz	<u>20.12</u> dBm
2132.5 MHz	<u>20.07</u> dBm
2153.5 MHz	<u>19.08</u> dBm

AWS Path 1

LTE 5MHz 0.0826 Watts

Carrier Frequency	Carrier Output
2112.5 MHz	<u>19.17</u> dBm
2132.5 MHz	<u>19.16</u> dBm
2152.5 MHz	<u>18.10</u> dBm

AWS Path 1

LTE 10MHz 0.0939 Watts

Carrier Frequency	Carrier Output
2115.0 MHz	<u>19.73</u> dBm
2132.5 MHz	<u>19.17</u> dBm
2150.0 MHz	<u>18.17</u> dBm

AWS Path 1

LTE 15MHz 0.0883 Watts

Carrier Frequency	Carrier Output
2117.5 MHz	<u>19.46</u> dBm
2132.5 MHz	<u>18.17</u> dBm
2147.5 MHz	<u>17.83</u> dBm

AWS Path 1

LTE 20MHz 0.0814 Watts

Carrier Frequency	Carrier Output
2120.0 MHz	<u>19.11</u> dBm
2132.5 MHz	<u>18.66</u> dBm
2145.0 MHz	<u>18.13</u> dBm

AWS Path 2**WCDMA 0.1023 Watts**

Carrier Frequency	Carrier Output
2112.5 MHz	<u>20.10</u> dBm
2132.5 MHz	<u>19.92</u> dBm
2152.5 MHz	<u>19.47</u> dBm

AWS Path 2**LTE 3MHz 0.1016 Watts**

Carrier Frequency	Carrier Output
2111.5 MHz	<u>20.07</u> dBm
2132.5 MHz	<u>19.86</u> dBm
2153.5 MHz	<u>19.09</u> dBm

AWS Path 2**LTE 5MHz 0.0833 Watts**

Carrier Frequency	Carrier Output
2112.5 MHz	<u>19.19</u> dBm
2132.5 MHz	<u>19.21</u> dBm
2152.5 MHz	<u>18.23</u> dBm

AWS Path 2**LTE 10MHz 0.0907 Watts**

Carrier Frequency	Carrier Output
2115.0 MHz	<u>19.58</u> dBm
2132.5 MHz	<u>19.26</u> dBm
2150.0 MHz	<u>18.01</u> dBm

AWS Path 2**LTE 15MHz 0.0916 Watts**

Carrier Frequency	Carrier Output
2117.5 MHz	<u>19.62</u> dBm
2132.5 MHz	<u>18.43</u> dBm
2147.5 MHz	<u>17.86</u> dBm

AWS Path 2**LTE 20MHz 0.0801 Watts**

Carrier Frequency	Carrier Output
2120.0 MHz	<u>19.04</u> dBm
2132.5 MHz	<u>18.83</u> dBm
2145.0 MHz	<u>18.12</u> dBm

7.3 Frequency Stability Test

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

Path 1

Host/ DRU	IFEU	RAU			
Input Voltage	Input Voltage	Input Voltage	Carrier Frequency	Measured Frequency	Meets Requirements?
100 VAC	54VDC	54 VDC	2110.200 MHz	2110.200 MHz	Yes
170 VAC	54VDC	54 VDC	2110.200 MHz	2110.200 MHz	Yes
240 VAC	54VDC	54 VDC	2110.200 MHz	2110.200 MHz	Yes
100 VAC	54VDC	54 VDC	2132.500 MHz	2132.500 MHz	Yes
170 VAC	54VDC	54 VDC	2132.500 MHz	2132.500 MHz	Yes
240 VAC	54VDC	54 VDC	2132.500 MHz	2132.500 MHz	Yes
100 VAC	54VDC	54 VDC	2154.800 MHz	2154.800 MHz	Yes
170 VAC	54VDC	54 VDC	2154.800 MHz	2154.800 MHz	Yes
240 VAC	54VDC	54 VDC	2154.800 MHz	2154.800 MHz	Yes
Temperature			Carrier Frequency	Measured Frequency	Meets Requirements?
-25 Deg. C			2110.200 MHz	2110.200 MHz	Yes
-20 Deg. C			2110.200 MHz	2110.200 MHz	Yes
-10 Deg. C			2110.200 MHz	2110.200 MHz	Yes
0 Deg. C			2110.200 MHz	2110.200 MHz	Yes
10 Deg. C			2110.200 MHz	2110.200 MHz	Yes
20 Deg. C			2110.200 MHz	2110.200 MHz	Yes
30 Deg. C			2110.200 MHz	2110.200 MHz	Yes
40 Deg. C			2110.200 MHz	2110.200 MHz	Yes
45 Deg. C			2110.200 MHz	2110.200 MHz	Yes
50 Deg. C			2110.200 MHz	2110.200 MHz	Yes
-25 Deg. C			2132.500 MHz	2132.500 MHz	Yes
-20 Deg. C			2132.500 MHz	2132.500 MHz	Yes
-10 Deg. C			2132.500 MHz	2132.500 MHz	Yes
0 Deg. C			2132.500 MHz	2132.500 MHz	Yes
10 Deg. C			2132.500 MHz	2132.500 MHz	Yes
20 Deg. C			2132.500 MHz	2132.500 MHz	Yes
30 Deg. C			2132.500 MHz	2132.500 MHz	Yes
40 Deg. C			2132.500 MHz	2132.500 MHz	Yes
45 Deg. C			2132.500 MHz	2132.500 MHz	Yes
50 Deg. C			2132.500 MHz	2132.500 MHz	Yes
-25 Deg. C			2154.800 MHz	2154.800 MHz	Yes
-20 Deg. C			2154.800 MHz	2154.800 MHz	Yes
-10 Deg. C			2154.800 MHz	2154.800 MHz	Yes
0 Deg. C			2154.800 MHz	2154.800 MHz	Yes
10 Deg. C			2154.800 MHz	2154.800 MHz	Yes
20 Deg. C			2154.800 MHz	2154.800 MHz	Yes
30 Deg. C			2154.800 MHz	2154.800 MHz	Yes
40 Deg. C			2154.800 MHz	2154.800 MHz	Yes
45 Deg. C			2154.800 MHz	2154.800 MHz	Yes
50 Deg. C			2154.800 MHz	2154.800 MHz	Yes

Path 2

Host/ DRU	IFEU	RAU			
Input Voltage	Input Voltage	Input Voltage	Carrier Frequency	Measured Frequency	Meets Requirements?
100 VAC	54VDC	54 VDC	2110.200 MHz	2110.200 MHz	Yes
170 VAC	54VDC	54 VDC	2110.200 MHz	2110.200 MHz	Yes
240 VAC	54VDC	54 VDC	2110.200 MHz	2110.200 MHz	Yes
100 VAC	54VDC	54 VDC	2132.500 MHz	2132.500 MHz	Yes
170 VAC	54VDC	54 VDC	2132.500 MHz	2132.500 MHz	Yes
240 VAC	54VDC	54 VDC	2132.500 MHz	2132.500 MHz	Yes
100 VAC	54VDC	54 VDC	2154.800 MHz	2154.800 MHz	Yes
170 VAC	54VDC	54 VDC	2154.800 MHz	2154.800 MHz	Yes
240 VAC	54VDC	54 VDC	2154.800 MHz	2154.800 MHz	Yes
Temperature			Carrier Frequency	Measured Frequency	Meets Requirements?
-25 Deg. C			2110.200 MHz	2110.200 MHz	Yes
-20 Deg. C			2110.200 MHz	2110.200 MHz	Yes
-10 Deg. C			2110.200 MHz	2110.200 MHz	Yes
0 Deg. C			2110.200 MHz	2110.200 MHz	Yes
10 Deg. C			2110.200 MHz	2110.200 MHz	Yes
20 Deg. C			2110.200 MHz	2110.200 MHz	Yes
30 Deg. C			2110.200 MHz	2110.200 MHz	Yes
40 Deg. C			2110.200 MHz	2110.200 MHz	Yes
45 Deg. C			2110.200 MHz	2110.200 MHz	Yes
50 Deg. C			2110.200 MHz	2110.200 MHz	Yes
-25 Deg. C			2132.500 MHz	2132.500 MHz	Yes
-20 Deg. C			2132.500 MHz	2132.500 MHz	Yes
-10 Deg. C			2132.500 MHz	2132.500 MHz	Yes
0 Deg. C			2132.500 MHz	2132.500 MHz	Yes
10 Deg. C			2132.500 MHz	2132.500 MHz	Yes
20 Deg. C			2132.500 MHz	2132.500 MHz	Yes
30 Deg. C			2132.500 MHz	2132.500 MHz	Yes
40 Deg. C			2132.500 MHz	2132.500 MHz	Yes
45 Deg. C			2132.500 MHz	2132.500 MHz	Yes
50 Deg. C			2132.500 MHz	2132.500 MHz	Yes
-25 Deg. C			2154.800 MHz	2154.800 MHz	Yes
-20 Deg. C			2154.800 MHz	2154.800 MHz	Yes
-10 Deg. C			2154.800 MHz	2154.800 MHz	Yes
0 Deg. C			2154.800 MHz	2154.800 MHz	Yes
10 Deg. C			2154.800 MHz	2154.800 MHz	Yes
20 Deg. C			2154.800 MHz	2154.800 MHz	Yes
30 Deg. C			2154.800 MHz	2154.800 MHz	Yes
40 Deg. C			2154.800 MHz	2154.800 MHz	Yes
45 Deg. C			2154.800 MHz	2154.800 MHz	Yes
50 Deg. C			2154.800 MHz	2154.800 MHz	Yes

7.4 Intermodulation Test

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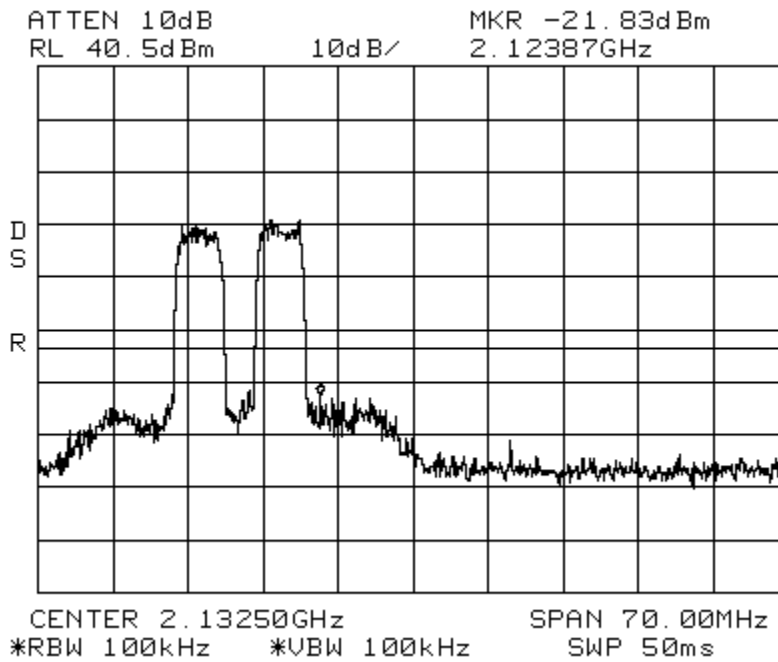
The inter-modulation products test was performed for the EUT. Three tests were performed with the modulation type. Test 1 was with 2 signals input to the EUT at lower end channels. Test 2 was with 2 signals input to the EUT at upper end channels. Test 3 was with 2 signals input to the EUT at upper and lower end channels. The modulation types tested were WCDMA, LTE 3MHz, LTE 5MHz, LTE 10MHz, LTE 15MHz, & LTE 20MHz. An investigation was made from 30 MHz to the 10th Harmonic of the highest fundamental frequency (~20 GHz). The following plots show the results.

Results:
(See Plots)

Intermodulation
Center: 2132.5 MHz

WCDMA_Low
Span: 70 MHz

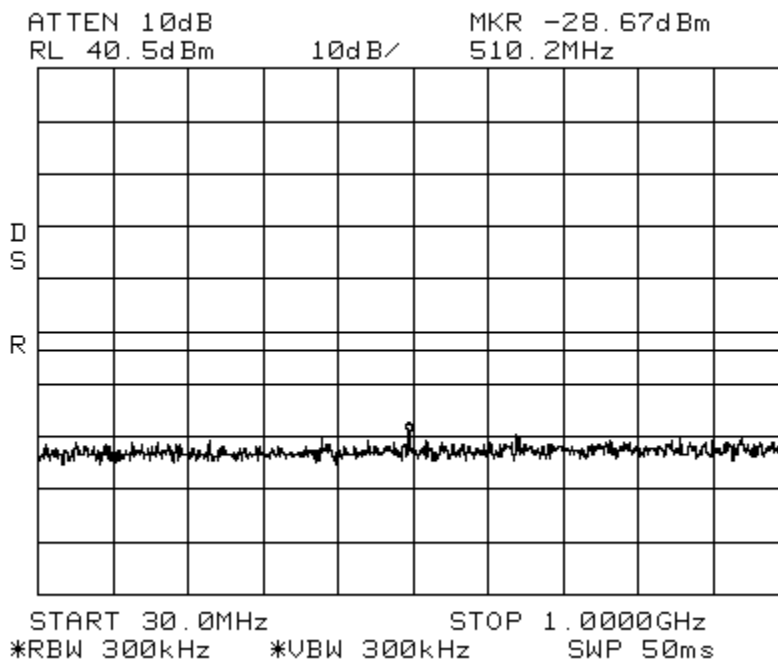
Spectrum AWS Path 1
RBW/VBW: 100 kHz



Intermodulation
Span: 30 MHz to 1 GHz

WCDMA_Low

Spectrum AWS Path 1
RBW/VBW: 300 kHz



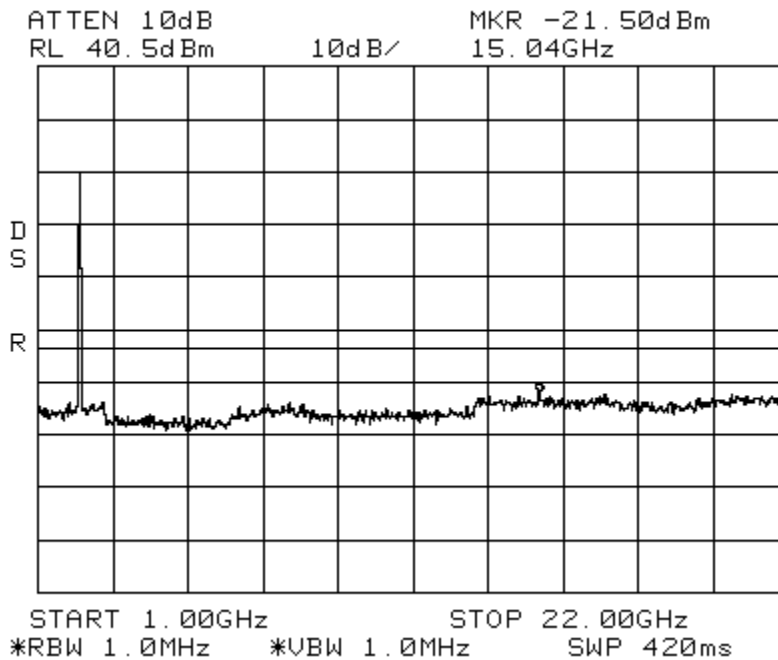
Intermodulation

WCDMA_Low

Spectrum AWS Path 1

Span: 1 GHz to 22 GHz

RBW/VBW: 1 MHz



Intermodulation

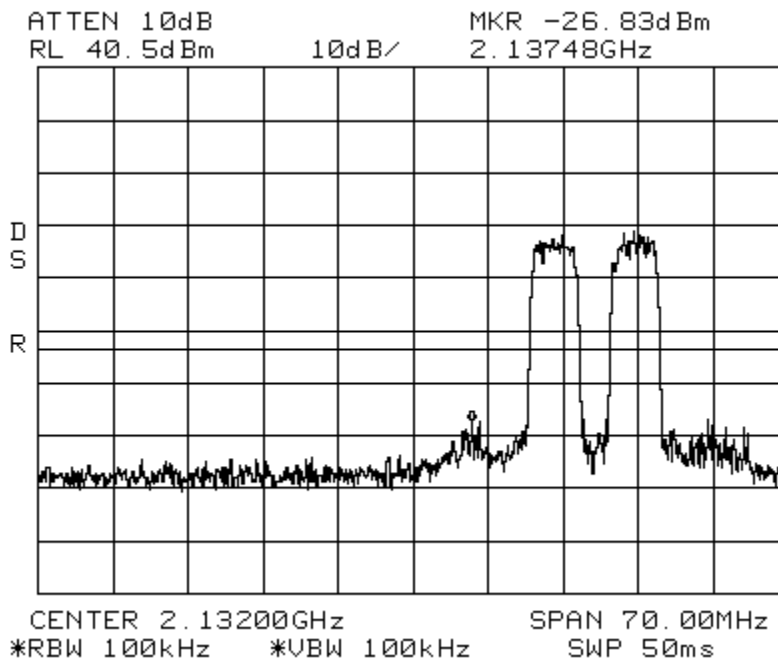
WCDMA_High

Spectrum AWS Path 1

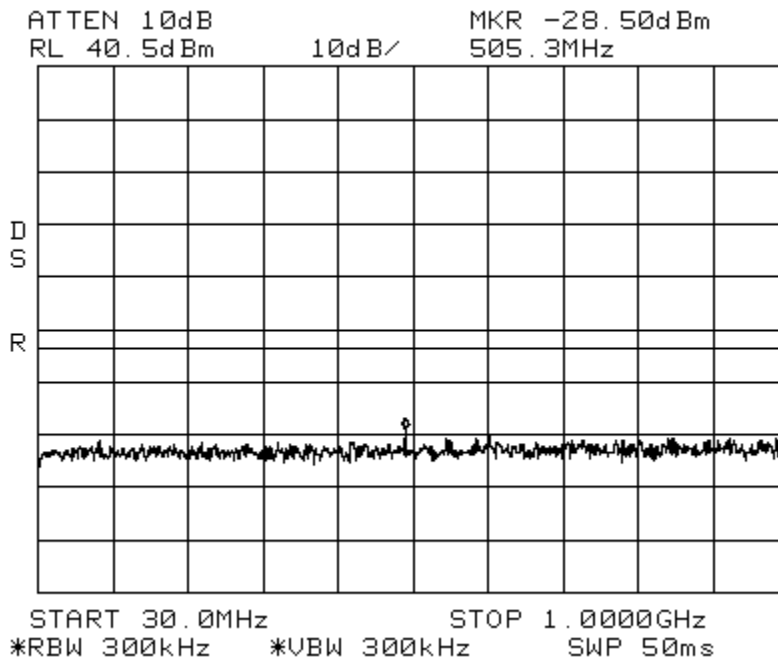
Center: 2132.5 MHz

Span: 70 MHz

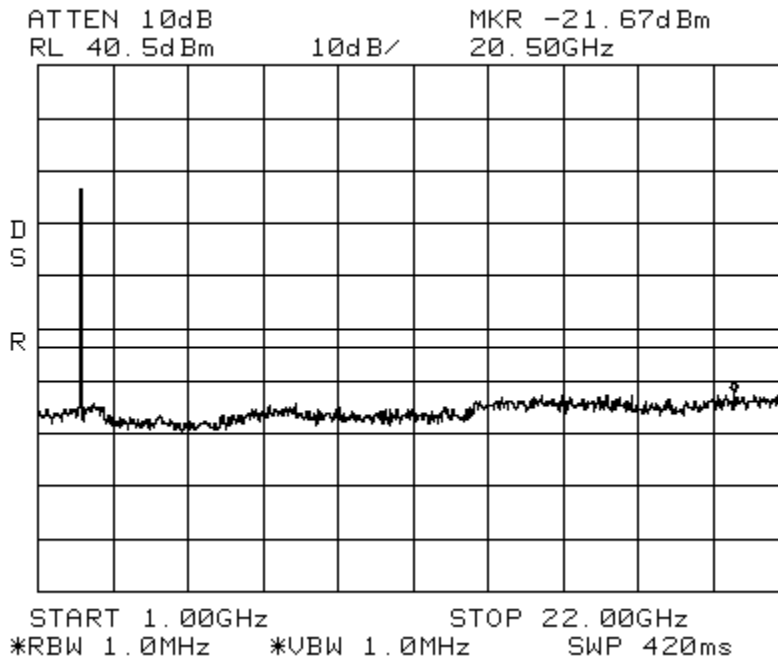
RBW/VBW: 100 kHz



Intermodulation WCDMA_High Spectrum AWS Path 1
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



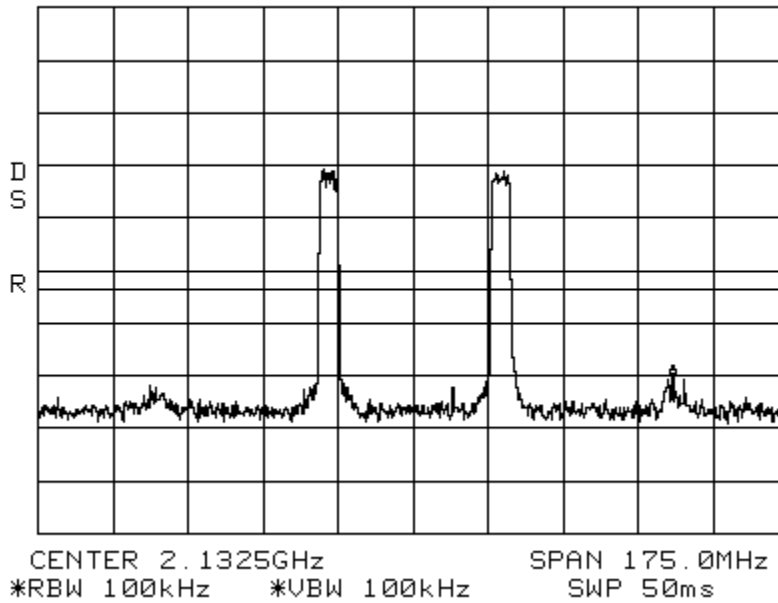
Intermodulation WCDMA_High Spectrum AWS Path 1
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



Intermodulation
Center: 2132.5 MHz
ATTEN 10dB
RL 40.5dBm

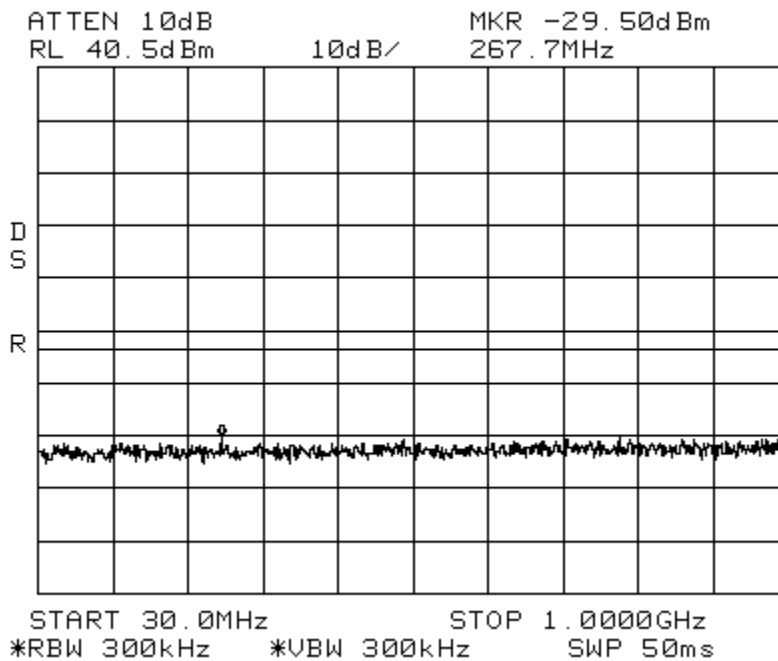
WCDMA_Apart
Span: 175 MHz
MKR -29.67dBm
2.1932GHz

Spectrum AWS Path 1
RBW/VBW: 100 kHz

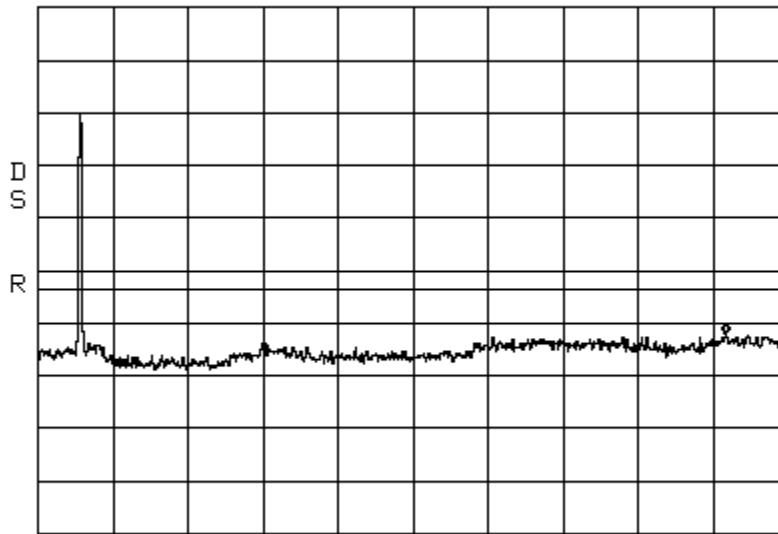


Intermodulation
Span: 30 MHz to 1 GHz

Spectrum AWS Path 1
RBW/VBW: 300 kHz



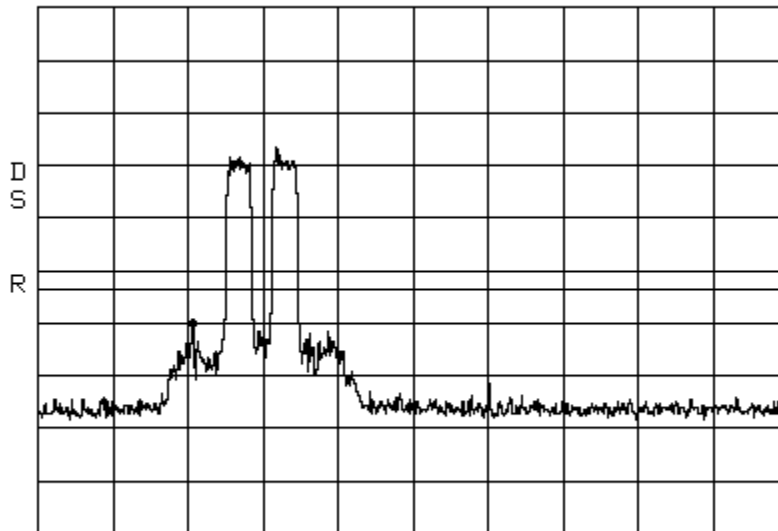
Intermodulation WCDMA_Apart Spectrum AWS Path 1
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz
 ATTN 10dB MKR -21.50dBm
 RL 40.5dBm 10dB/ 20.25GHz



START 1.00GHz STOP 22.00GHz
 *RBW 1.0MHz *VBW 1.0MHz SWP 420ms

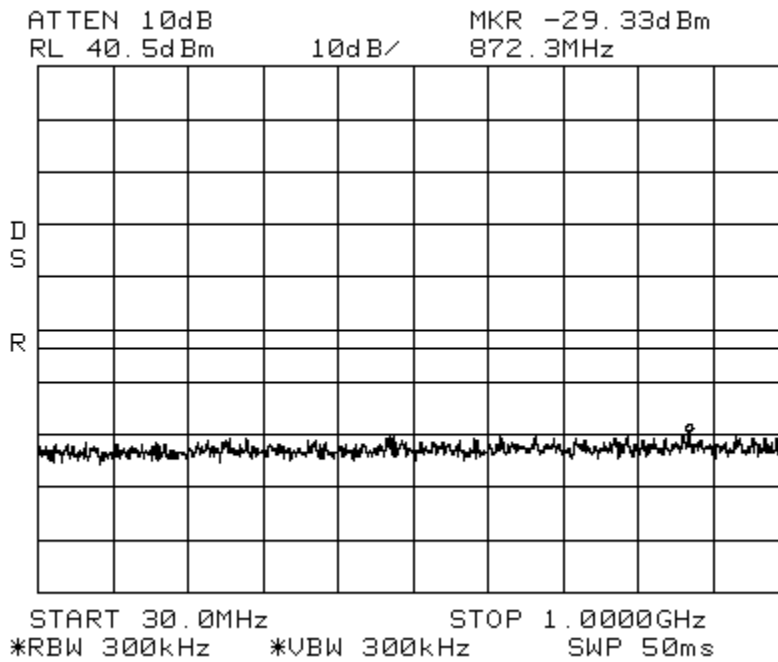
Intermodulation LTE 3 MHz Channel Bandwidth_Low AWS Path 1
 Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz

ATTEN 10dB MKR -20.67dBm
 RL 40.5dBm 10dB/ 2.10610GHz

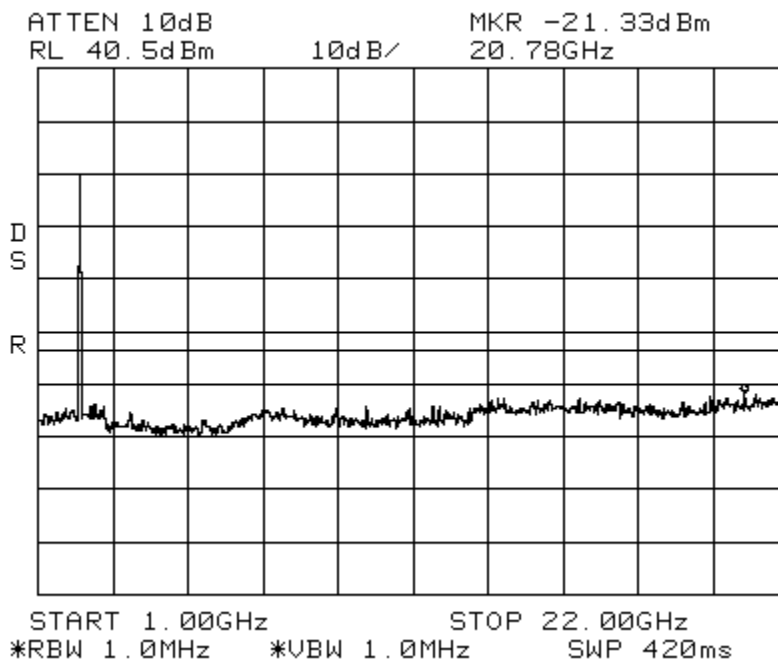


CENTER 2.1325GHz SPAN 90.00MHz
 *RBW 100kHz *VBW 100kHz SWP 50ms

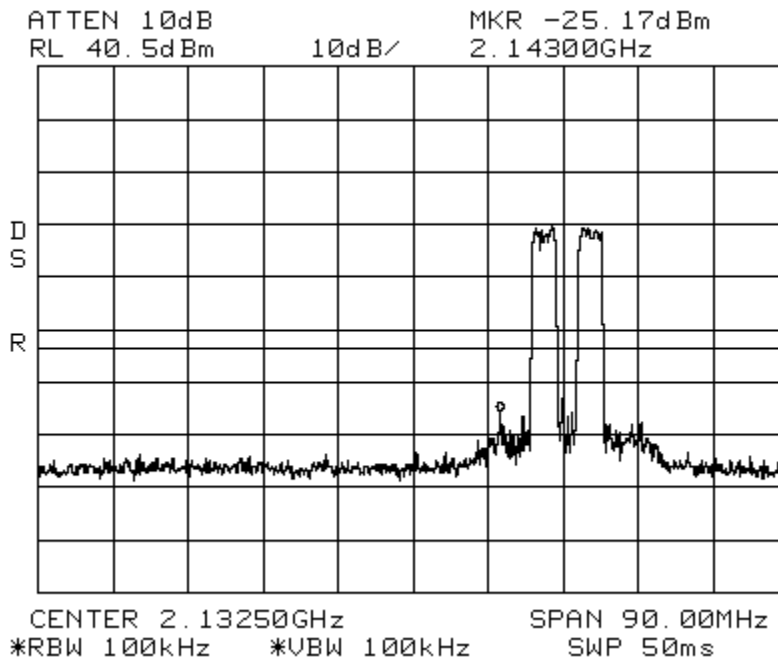
Intermodulation LTE 3MHz Channel Bandwidth _LowAWS Path 1
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



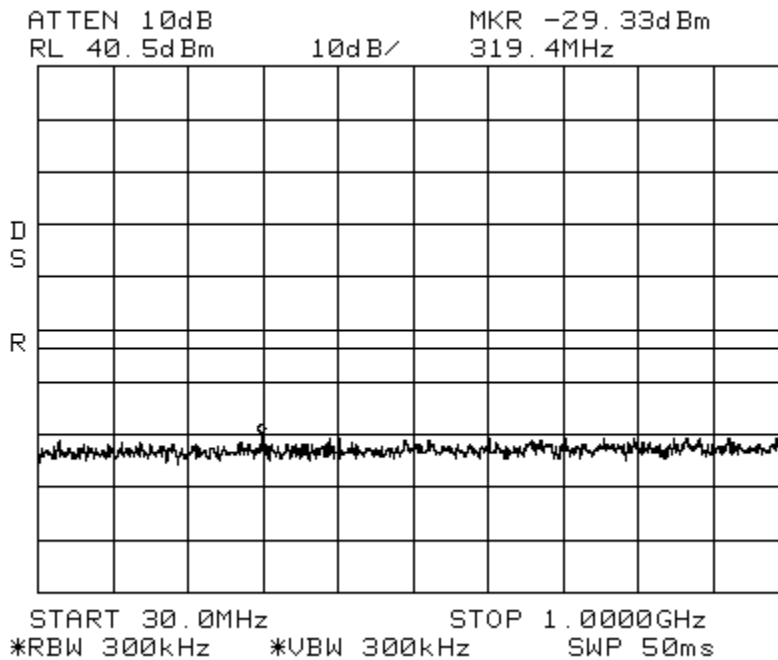
Intermodulation LTE 3 MHz Channel Bandwidth _Low AWS Path 1
Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



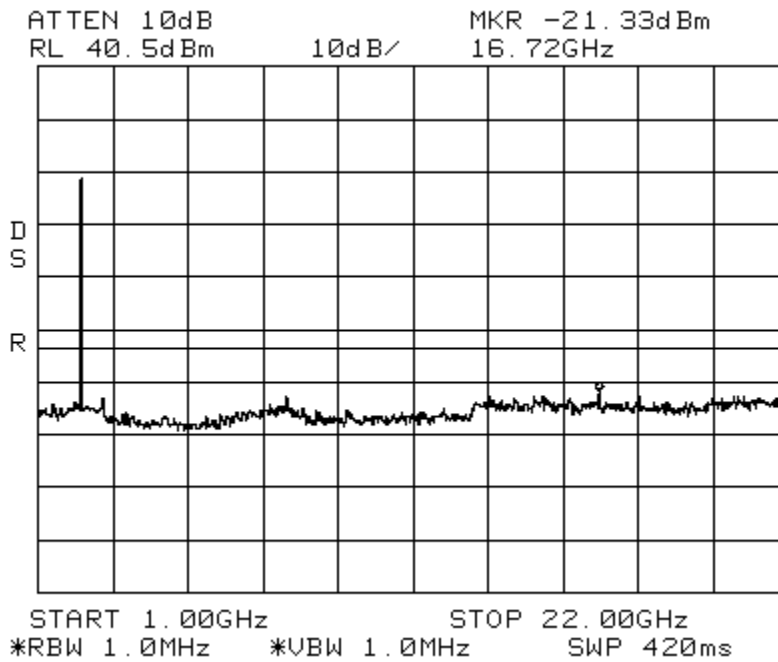
Intermodulation LTE 3 MHz Channel Bandwidth _High AWS Path 1
Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



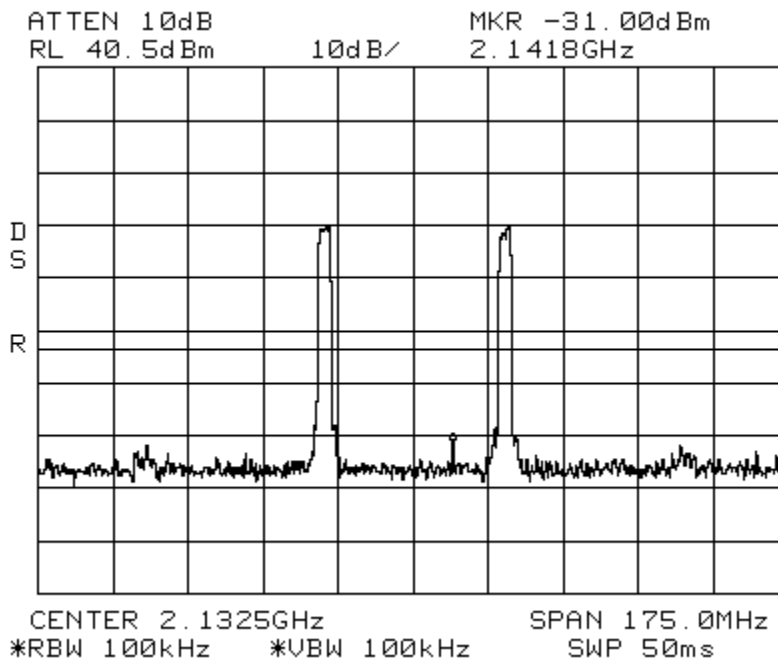
Intermodulation LTE 3 MHz Channel Bandwidth _High AWS Path 1
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



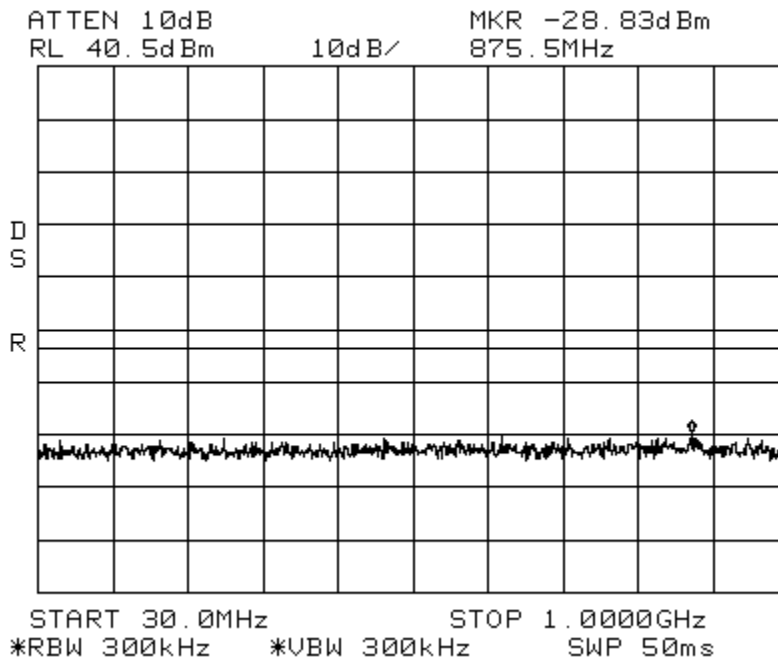
Intermodulation LTE 3 MHz Channel Bandwidth _High AWS Path 1
Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



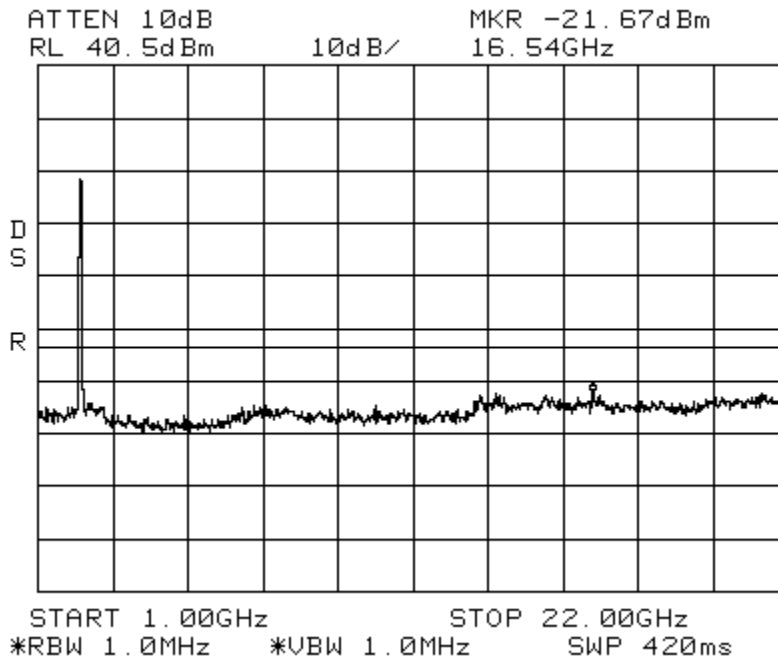
Intermodulation LTE 3 MHz Channel Bandwidth _Apart AWS Path 1
Center: 2132.5 MHz Span: 175 MHz RBW/VBW: 100 kHz



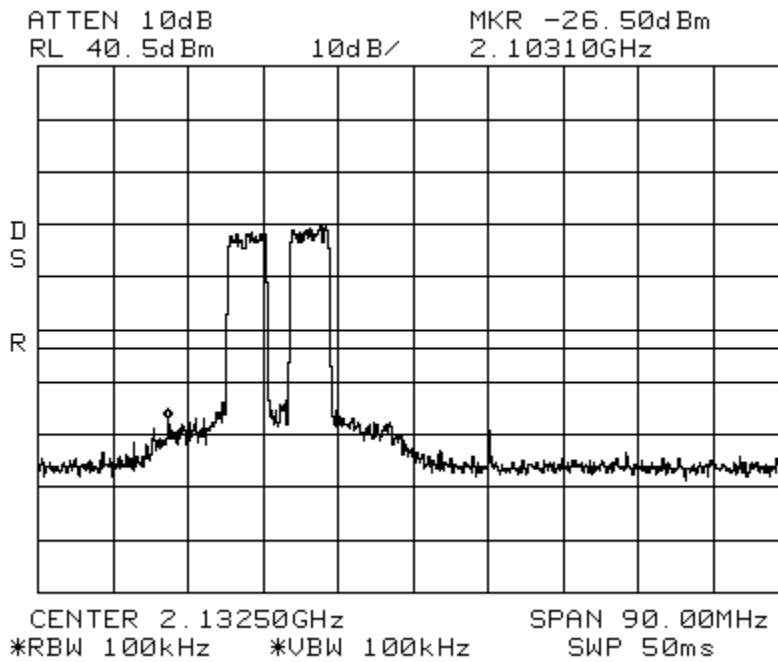
Intermodulation LTE 3 MHz Channel Bandwidth _Apart AWS Path 1
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



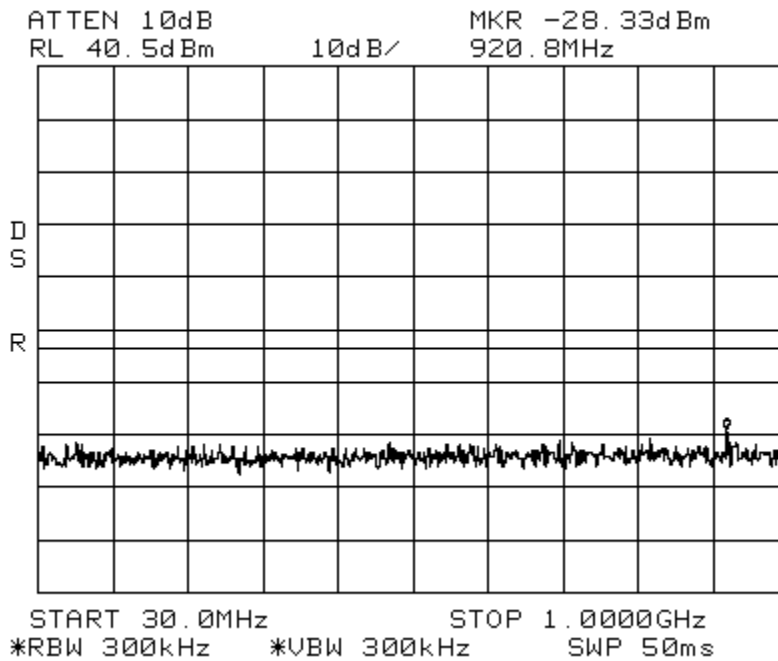
Intermodulation LTE 3 MHz Channel Bandwidth _Apart AWS Path 1
 Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



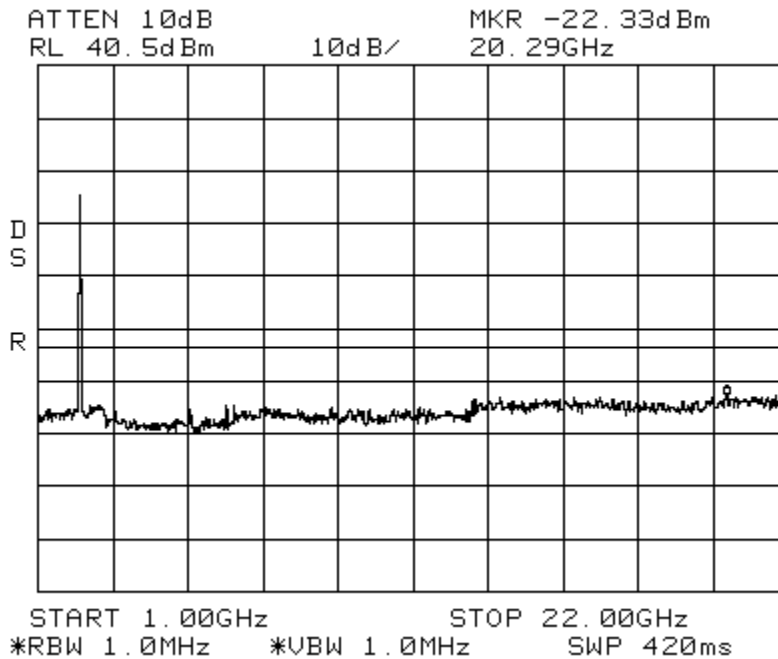
Intermodulation LTE 5 MHz Channel Bandwidth_Low AWS Path 1
Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



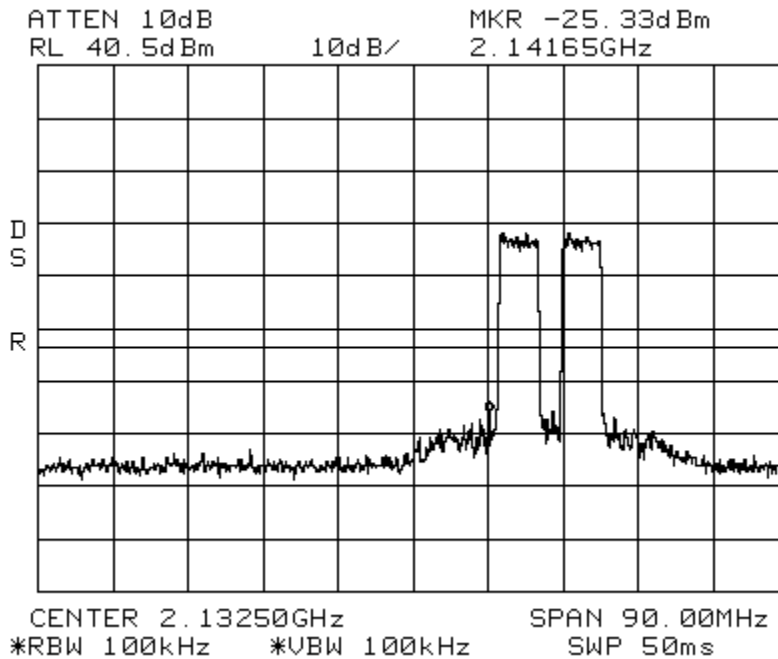
Intermodulation LTE 5 MHz Channel Bandwidth_Low AWS Path 1
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



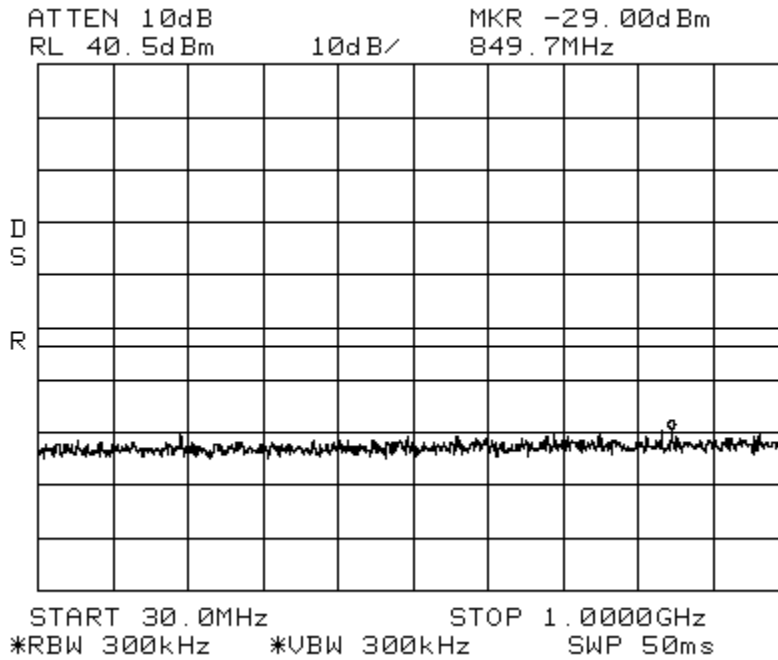
Intermodulation LTE 5 MHz Channel Bandwidth _Low AWS Path 1
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



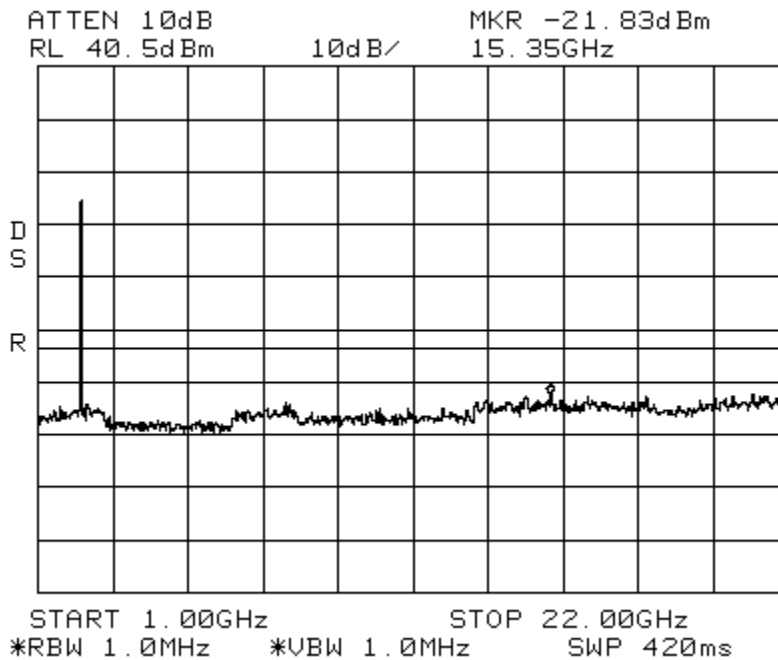
Intermodulation LTE 5 MHz Channel Bandwidth _High AWS Path 1
 Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



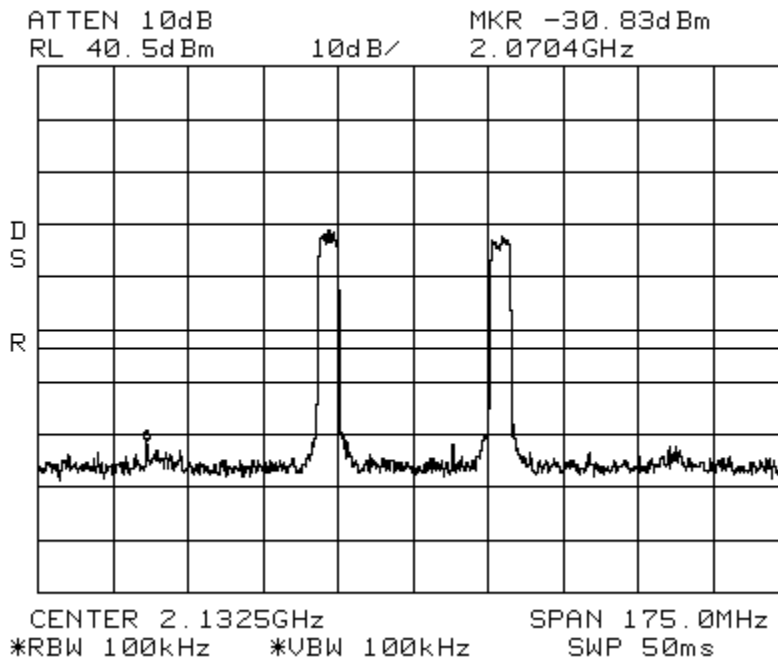
Intermodulation LTE 5 MHz Channel Bandwidth_High AWS Path 1
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



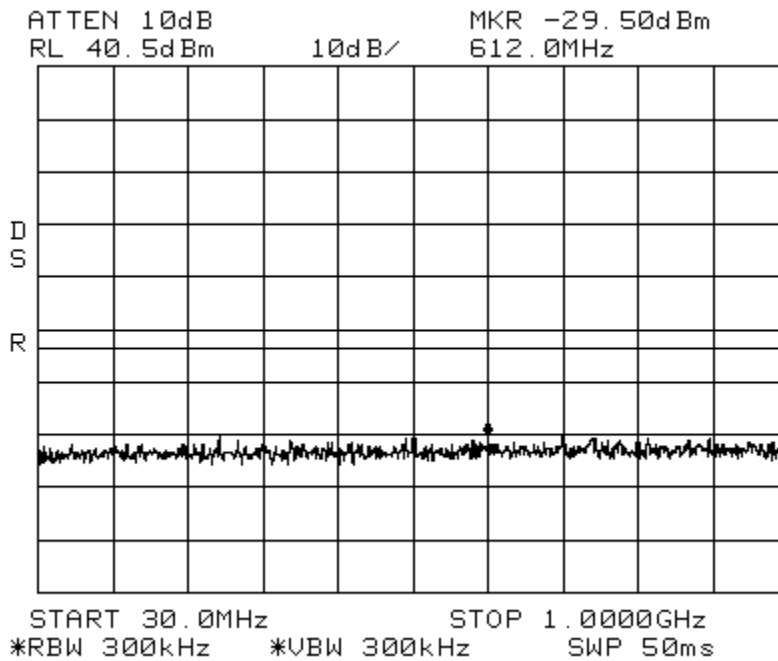
Intermodulation LTE 5 MHz Channel Bandwidth_High AWS Path 1
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



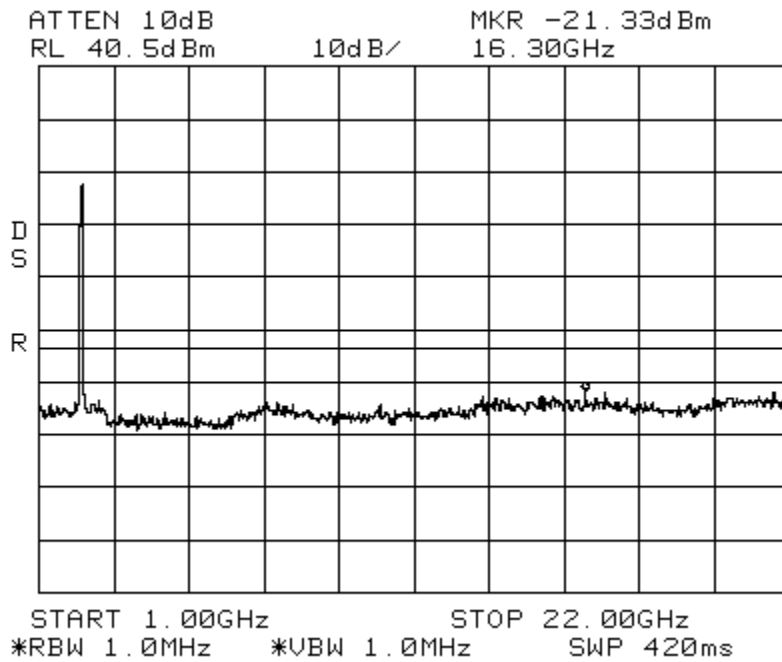
Intermodulation LTE 5 MHz Channel Bandwidth _Apart AWS Path 1
Center: 2132.5 MHz Span: 175 MHz RBW/VBW: 100 kHz



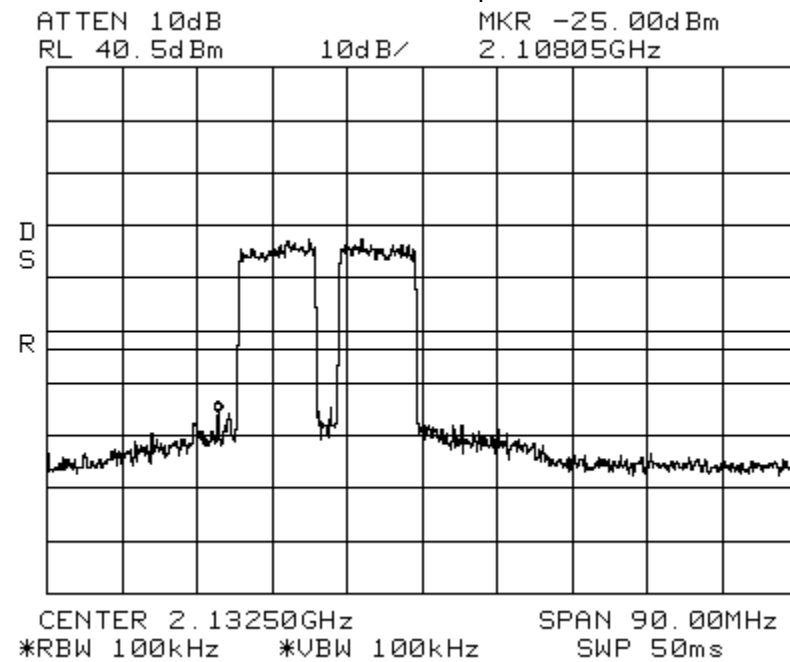
Intermodulation LTE 5 MHz Channel Bandwidth _Apart AWS Path 1
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



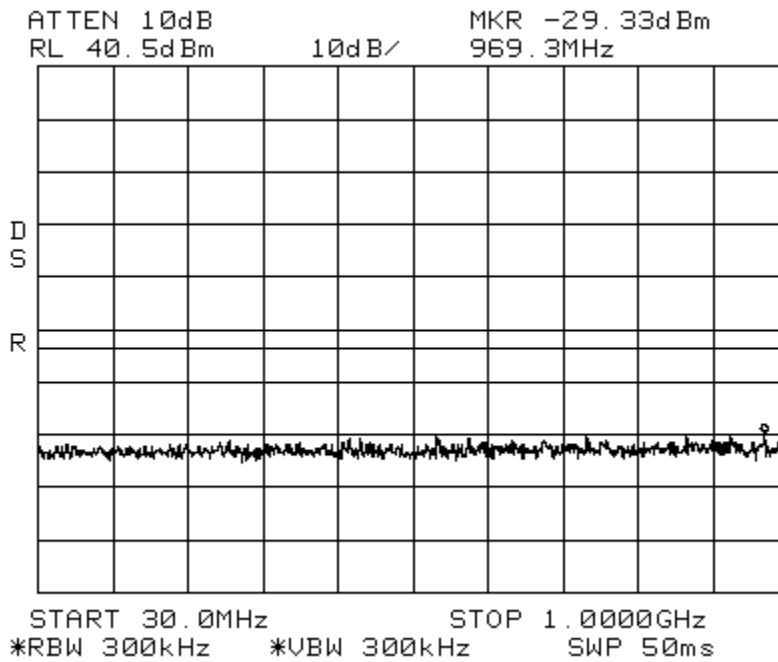
Intermodulation LTE 5 MHz Channel Bandwidth_Apart AWS Path 1
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



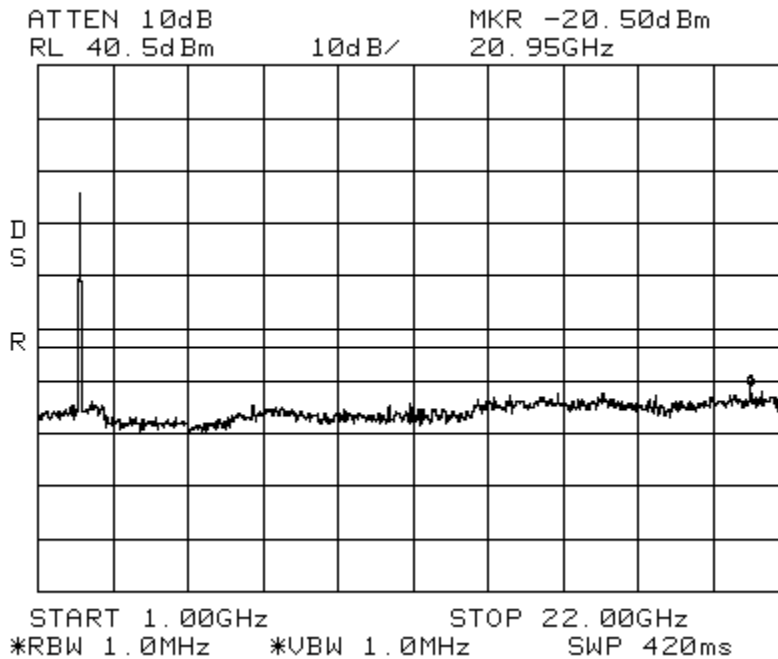
Intermodulation LTE 10 MHz Channel Bandwidth_Low AWS Path 1
 Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



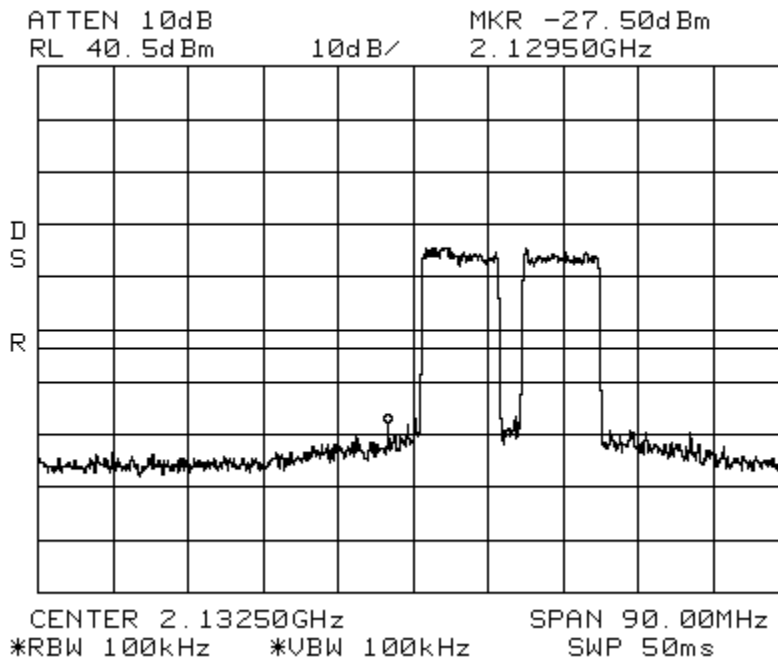
Intermodulation LTE 10 MHz Channel Bandwidth _Low AWS Path 1
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



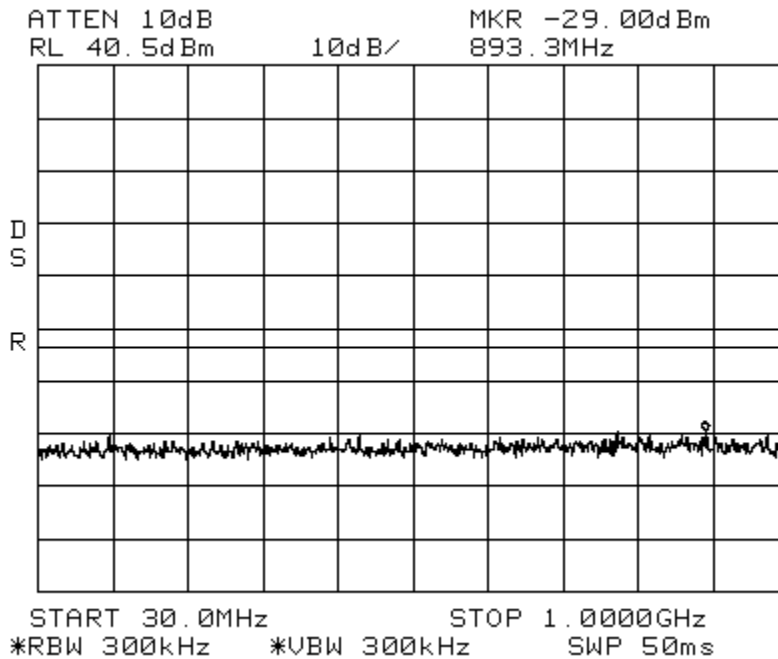
Intermodulation LTE 10 MHz Channel Bandwidth _Low AWS Path 1
 Span: 1 GHz to 22GHz RBW/VBW: 1 MHz



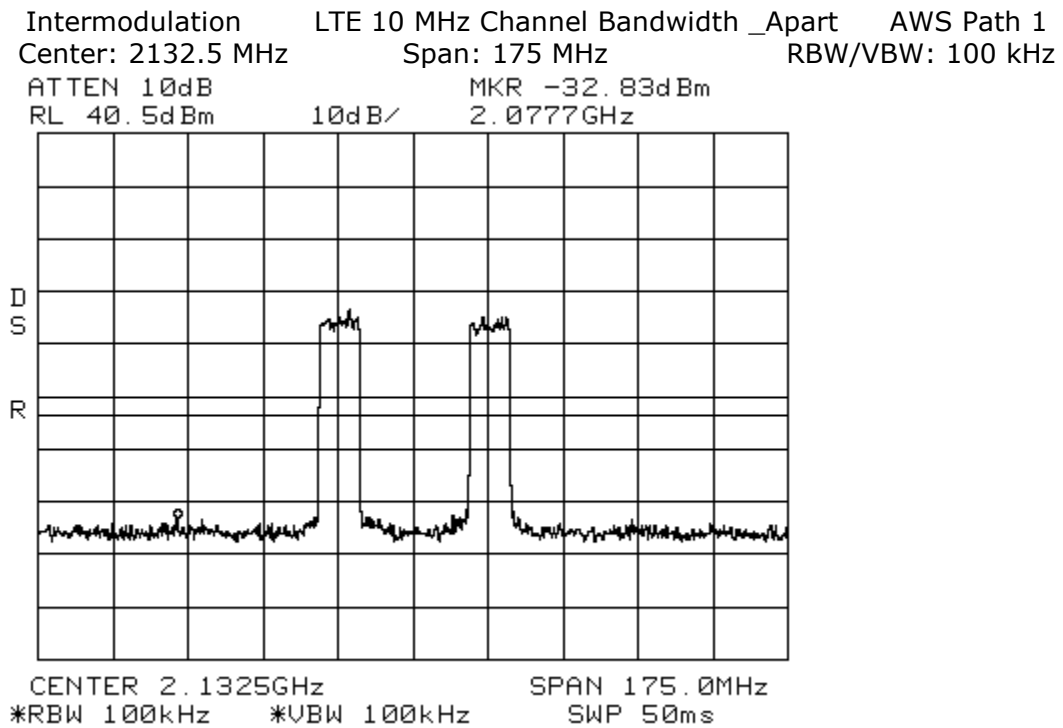
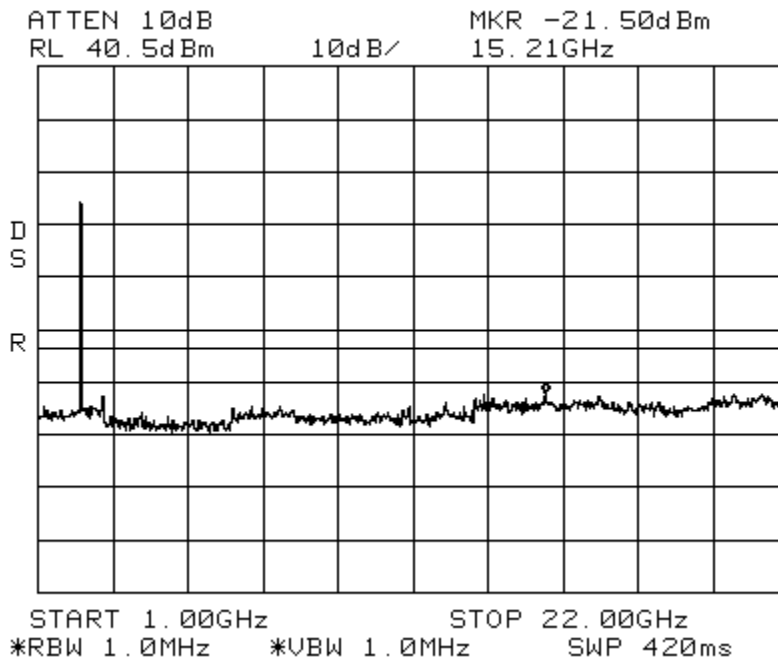
Intermodulation LTE 10 MHz Channel Bandwidth_High AWS Path 1
Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



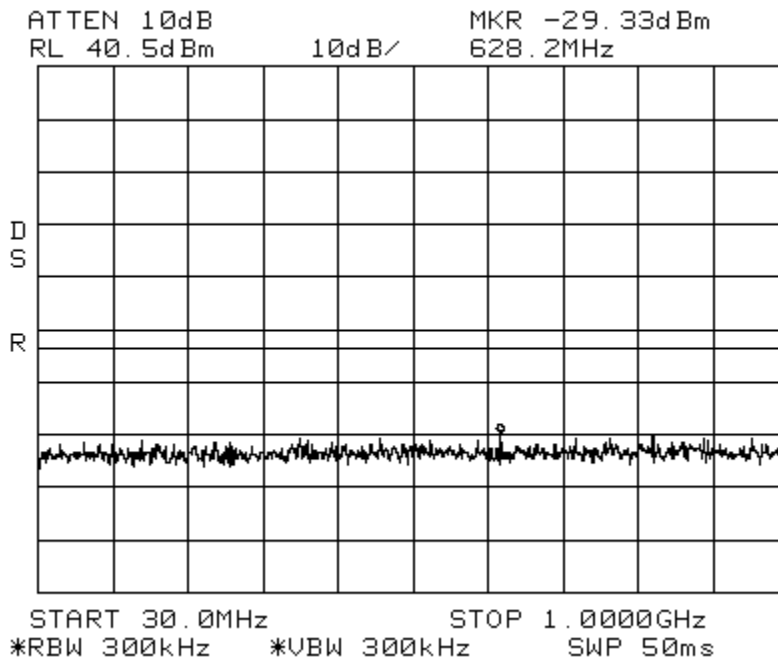
Intermodulation LTE 10 MHz Channel Bandwidth_High AWS Path 1
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



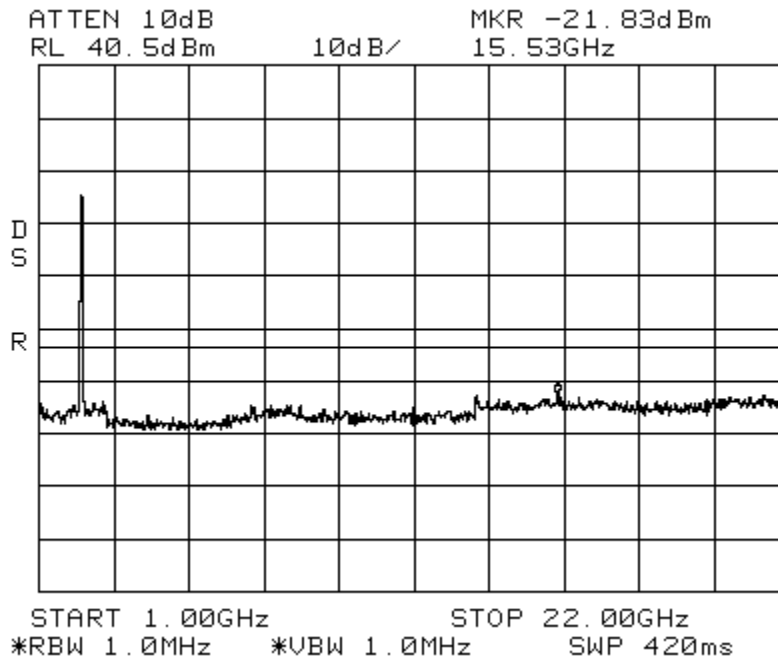
Intermodulation LTE 10 MHz Channel Bandwidth_High AWS Path 1
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



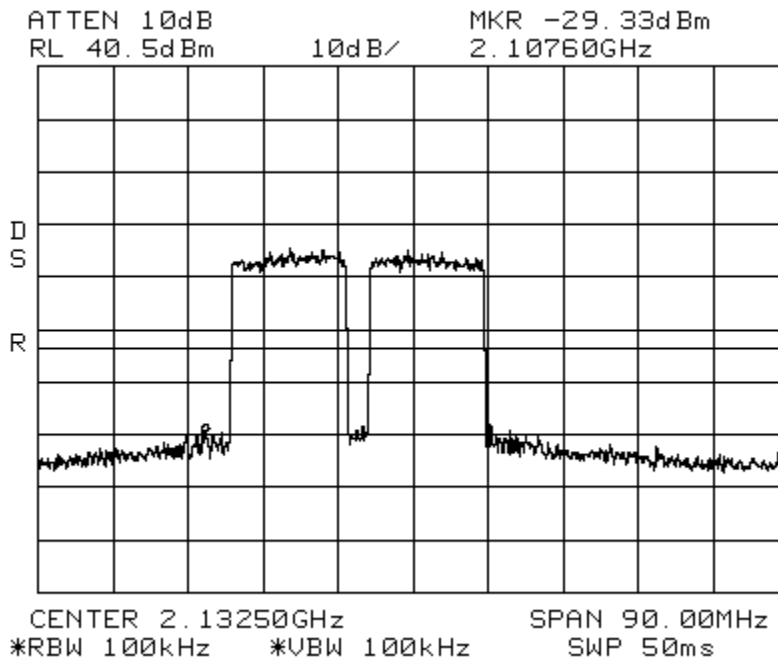
Intermodulation LTE 10 MHz Channel Bandwidth _Apart AWS Path 1
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



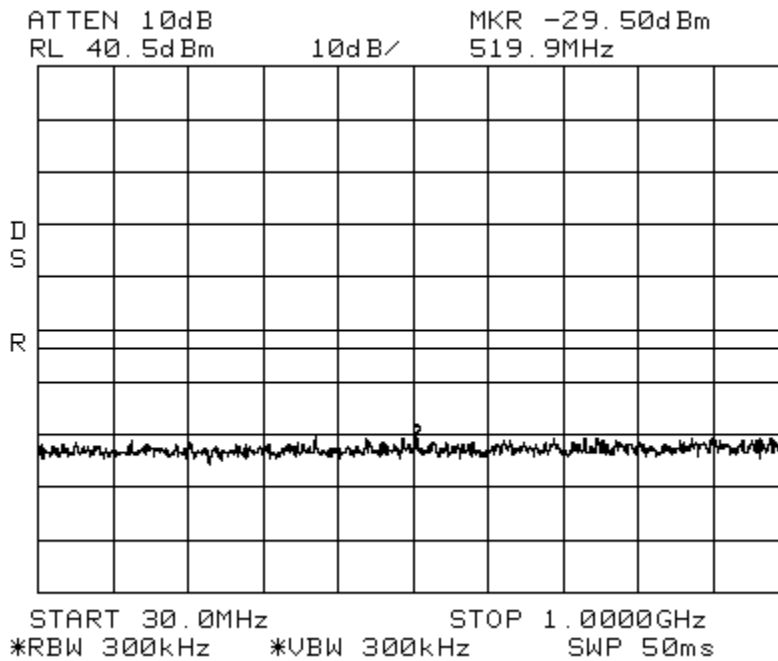
Intermodulation LTE 10 MHz Channel Bandwidth _Apart AWS Path 1
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



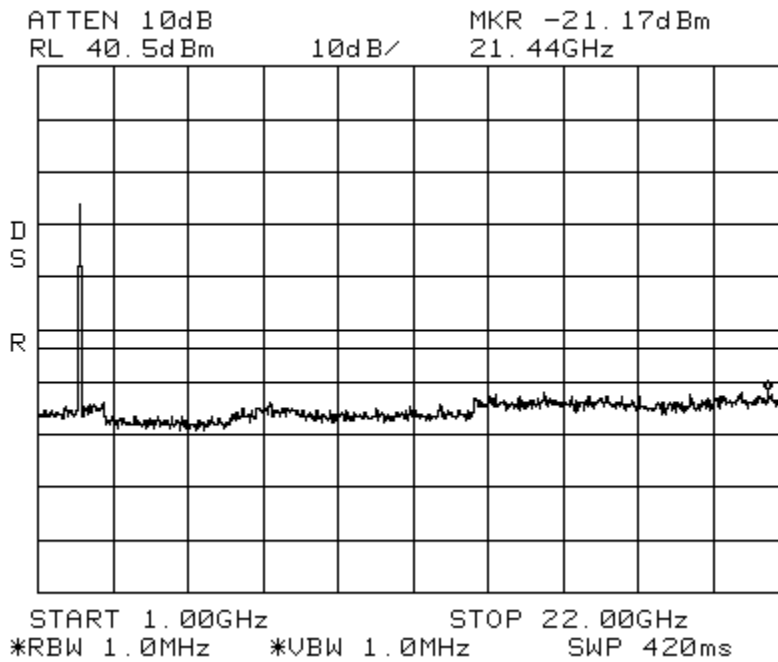
Intermodulation LTE 15 MHz Channel Bandwidth **Low** AWS Path 1
Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



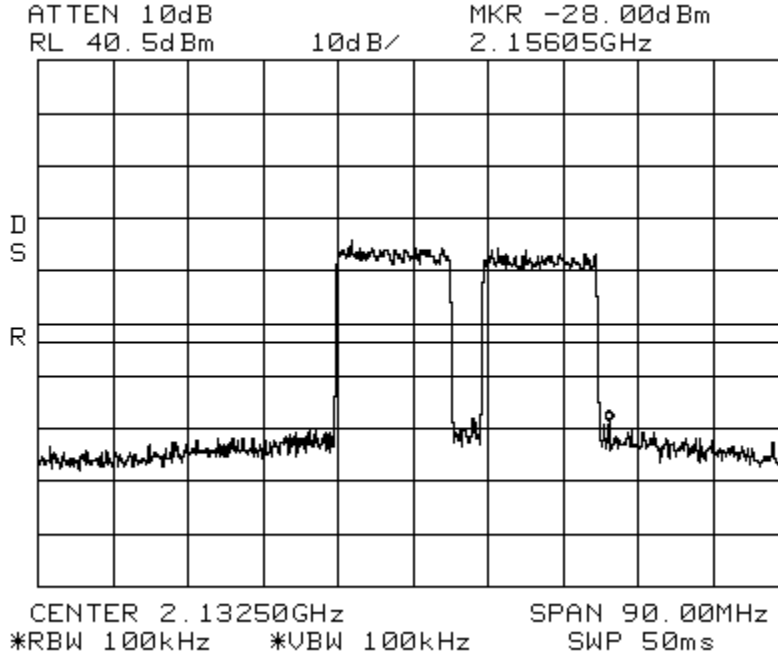
Intermodulation LTE 15 MHz Channel Bandwidth **Low** AWS Path 1
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



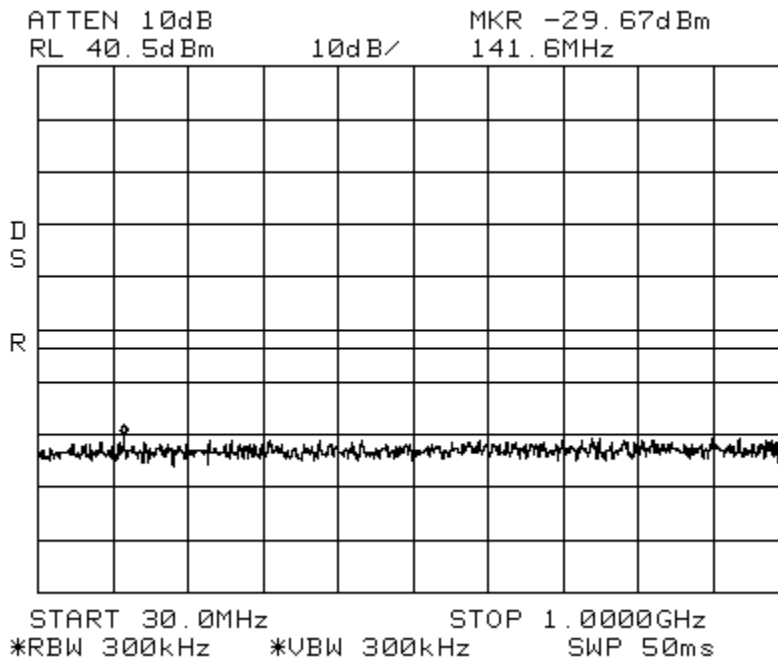
Intermodulation LTE 15 MHz Channel Bandwidth _Low AWS Path 1
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



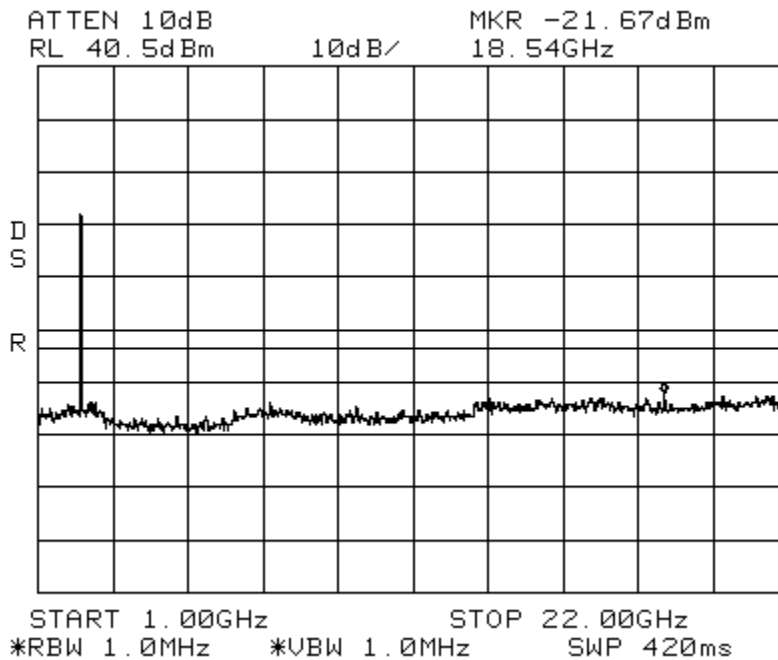
Intermodulation LTE 15 MHz Channel Bandwidth _High AWS Path 1
 Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



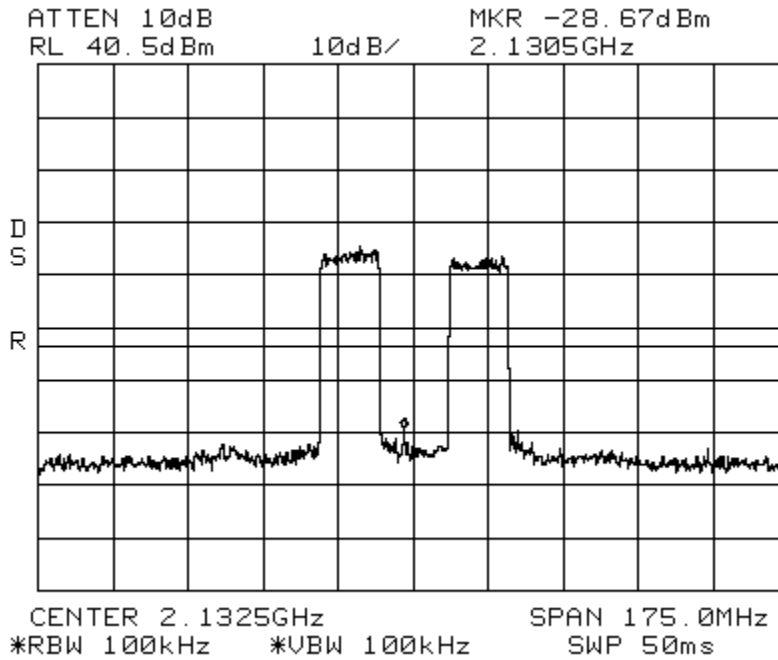
Intermodulation LTE 15 MHz Channel Bandwidth_High AWS Path 1
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



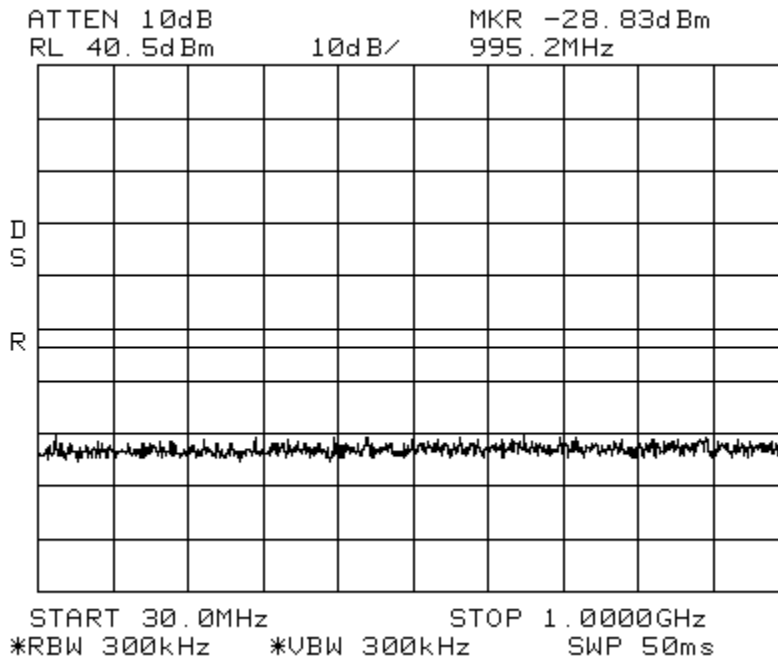
Intermodulation LTE 15 MHz Channel Bandwidth_High AWS Path 1
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



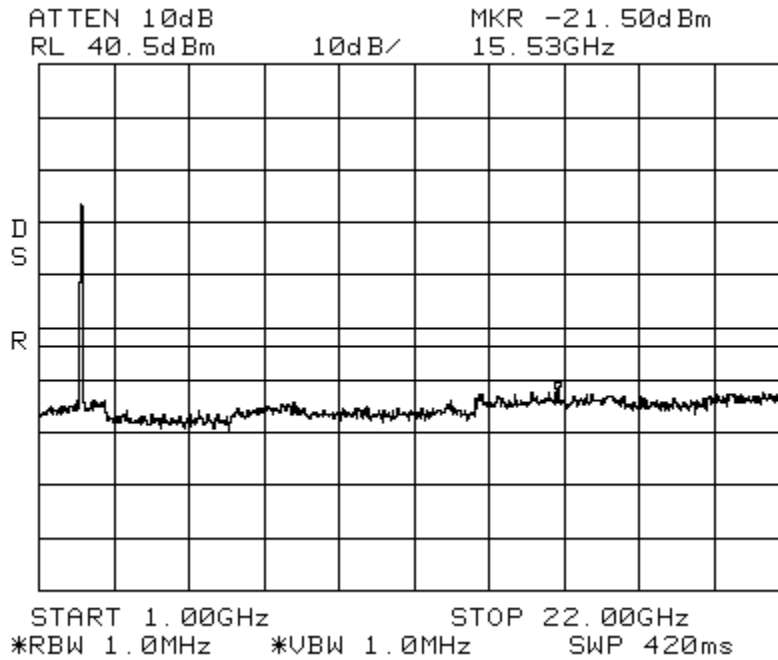
Intermodulation LTE 15 MHz Channel Bandwidth _Apart AWS Path 1
Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



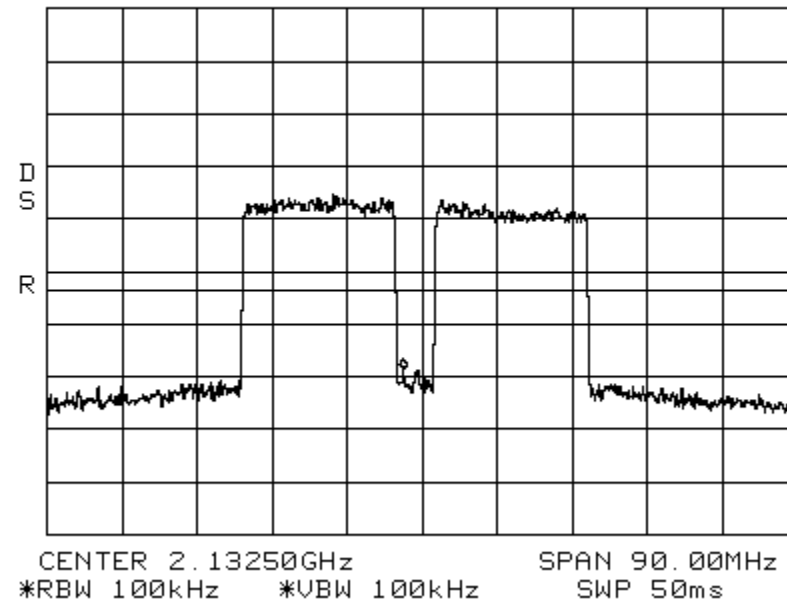
Intermodulation LTE 15 MHz Channel Bandwidth _Apart AWS Path 1
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



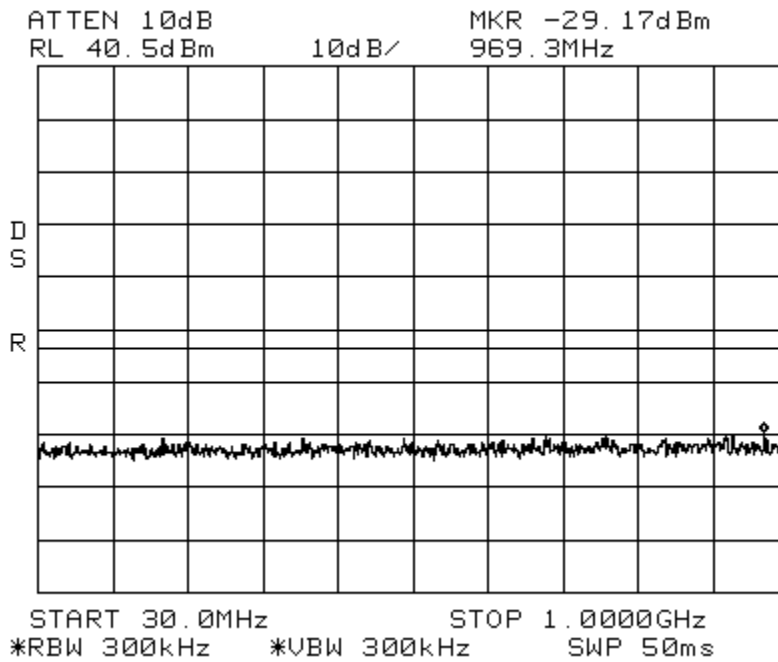
Intermodulation LTE 15 MHz Channel Bandwidth_Apart AWS Path 1
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



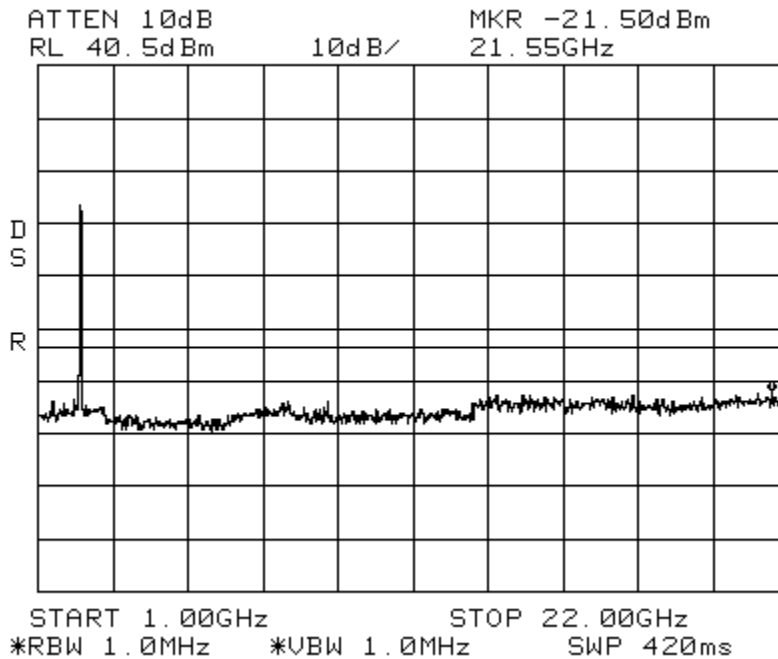
Intermodulation LTE 20 MHz Channel Bandwidth_**Low** AWS Path 1
 Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz
 ATTN 10dB MKR -28.17dBm
 RL 40.5dBm 10dB/ 2.13025GHz



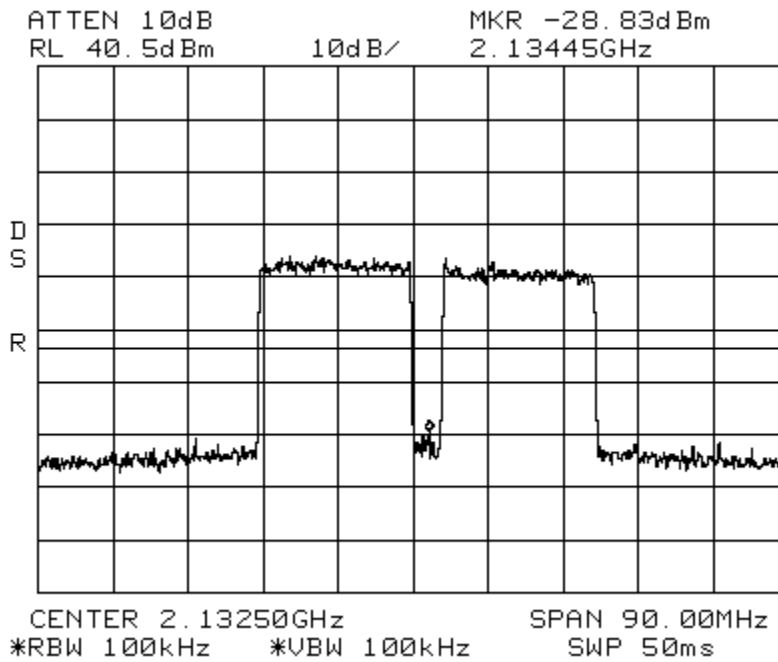
Intermodulation LTE 20 MHz Channel Bandwidth _Low AWS Path 1
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



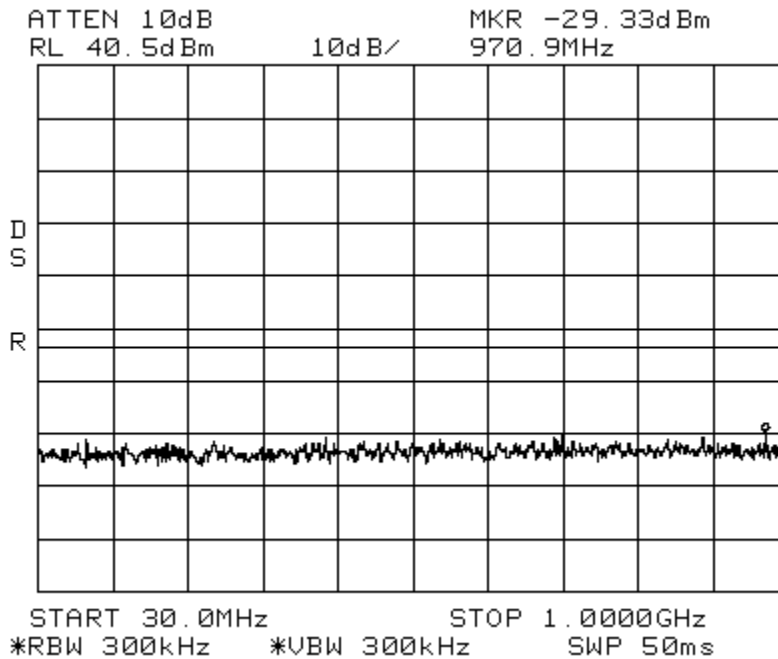
Intermodulation LTE 20 MHz Channel Bandwidth _Low AWS Path 1
 Span: 1 GHz to 22GHz RBW/VBW: 1 MHz



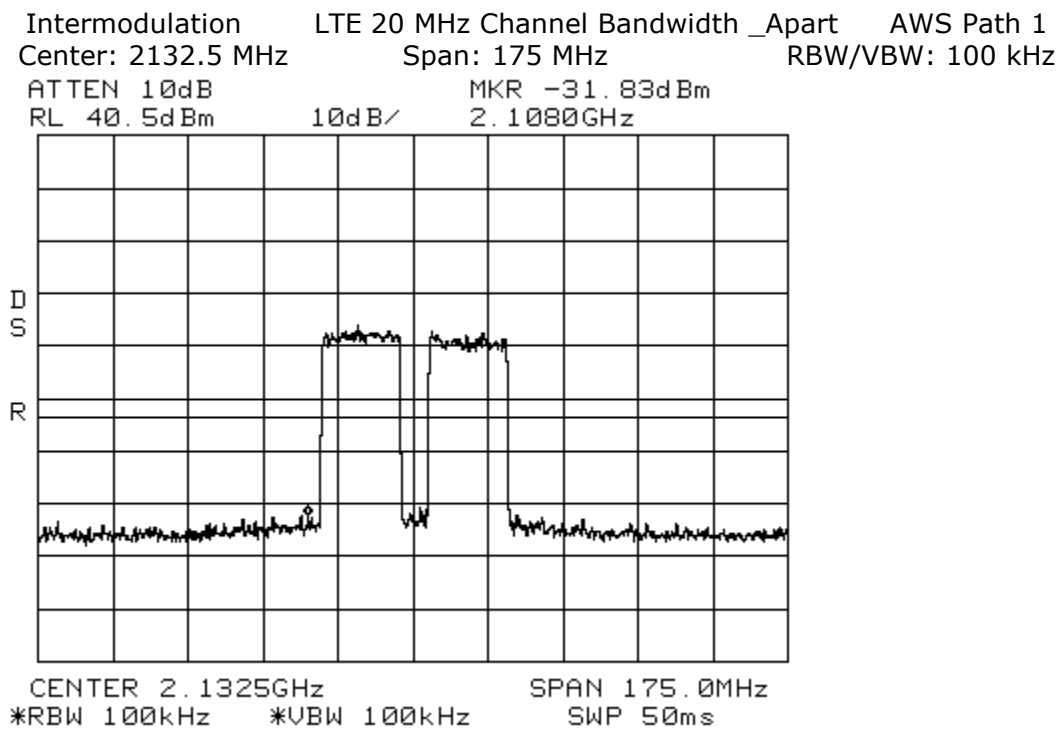
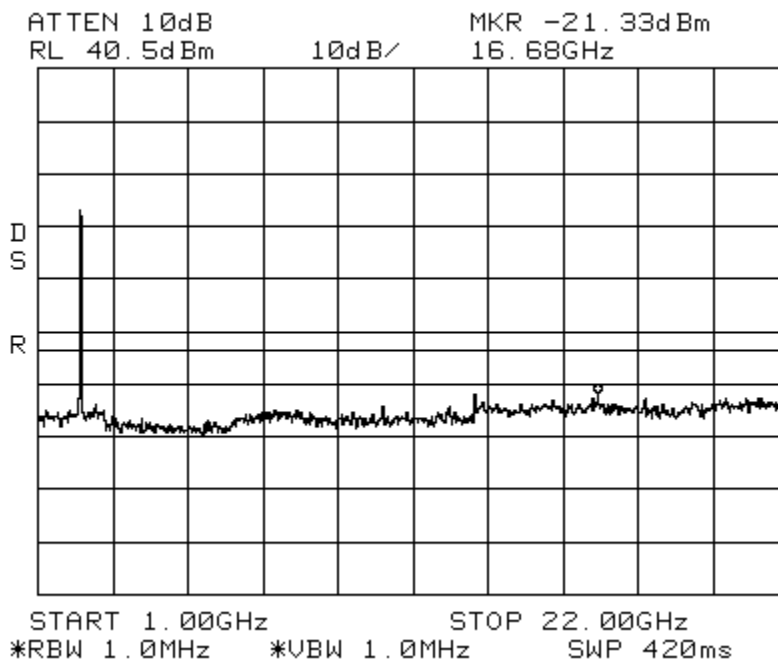
Intermodulation LTE 20 MHz Channel Bandwidth_High AWS Path 1
Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



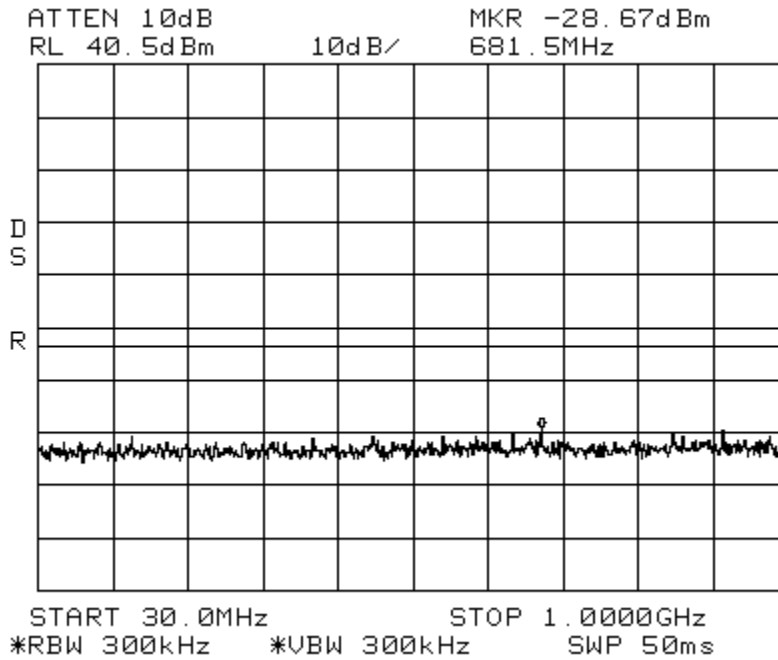
Intermodulation LTE 20 MHz Channel Bandwidth_High AWS Path 1
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



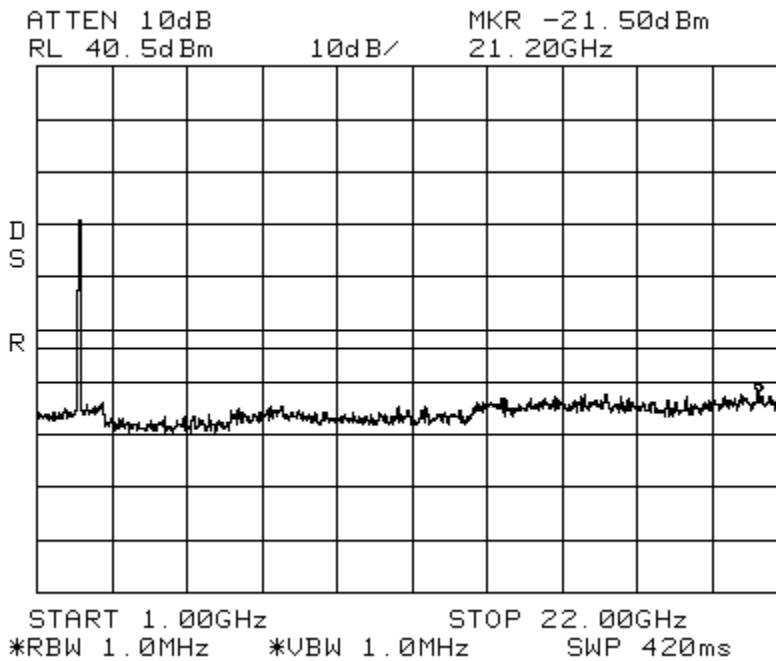
Intermodulation LTE 20 MHz Channel Bandwidth_High AWS Path 1
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



Intermodulation LTE 20 MHz Channel Bandwidth _Apart AWS Path 1
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



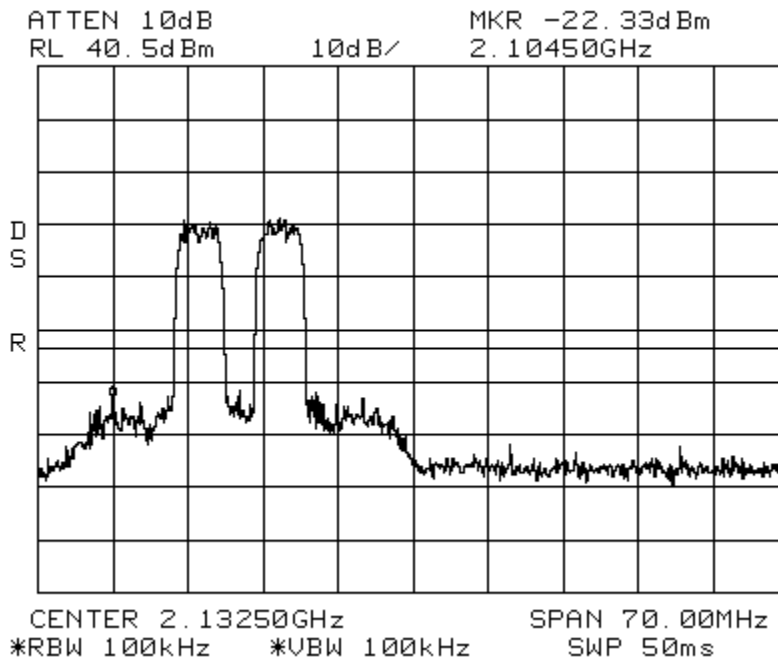
Intermodulation LTE 20 MHz Channel Bandwidth _Apart AWS Path 1
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



Intermodulation
Center: 2132.5 MHz

WCDMA_Low
Span: 70 MHz

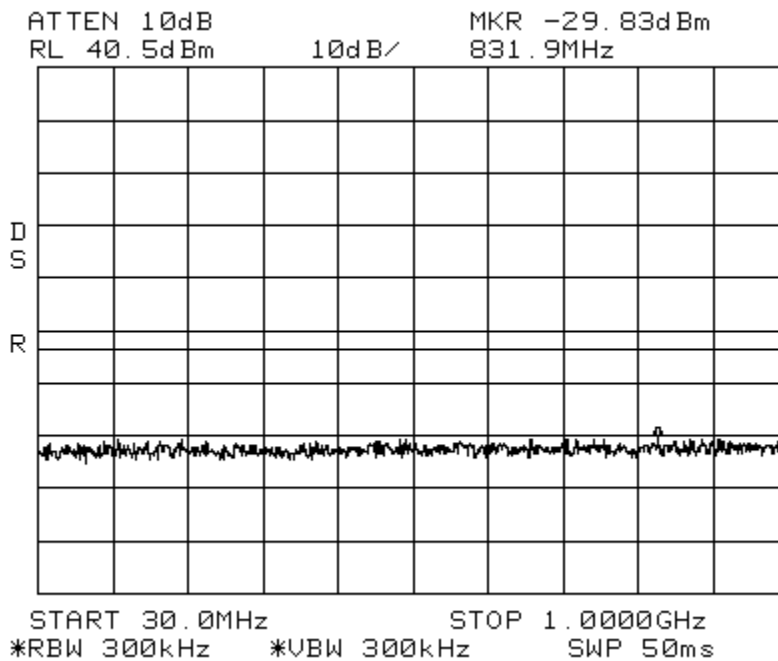
Spectrum AWS Path 2
RBW/VBW: 100 kHz



Intermodulation
Span: 30 MHz to 1 GHz

WCDMA_Low

Spectrum AWS Path 2
RBW/VBW: 300 kHz



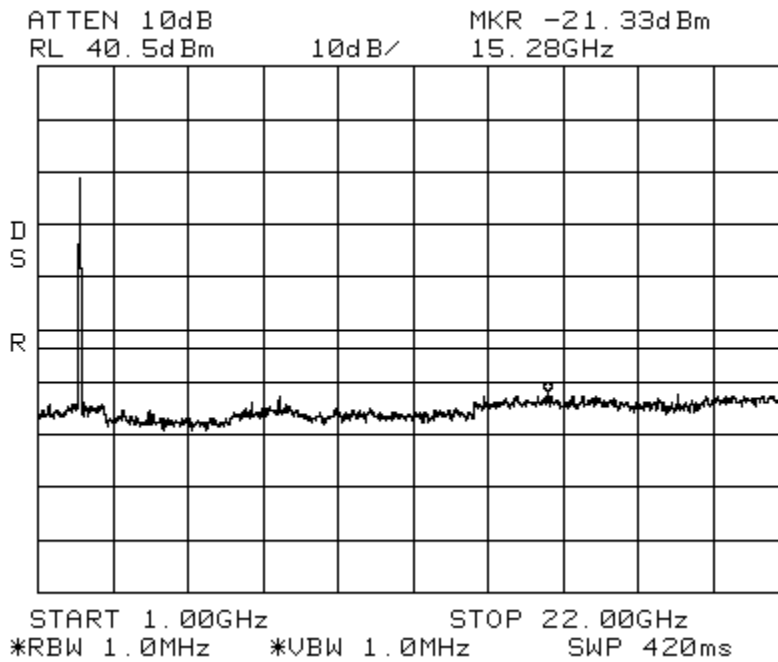
Intermodulation

WCDMA_Low

Spectrum AWS Path 2

Span: 1 GHz to 22 GHz

RBW/VBW: 1 MHz



Intermodulation

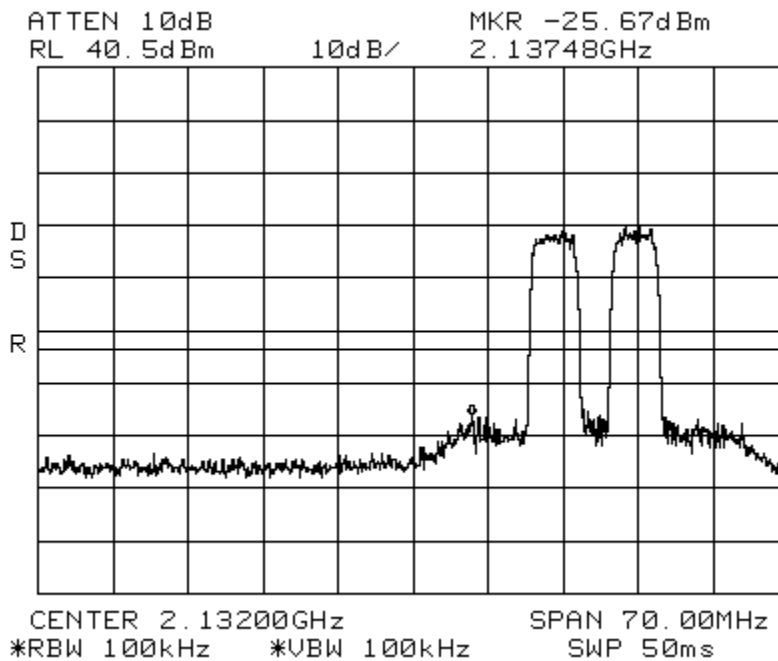
WCDMA_High

Spectrum AWS Path 2

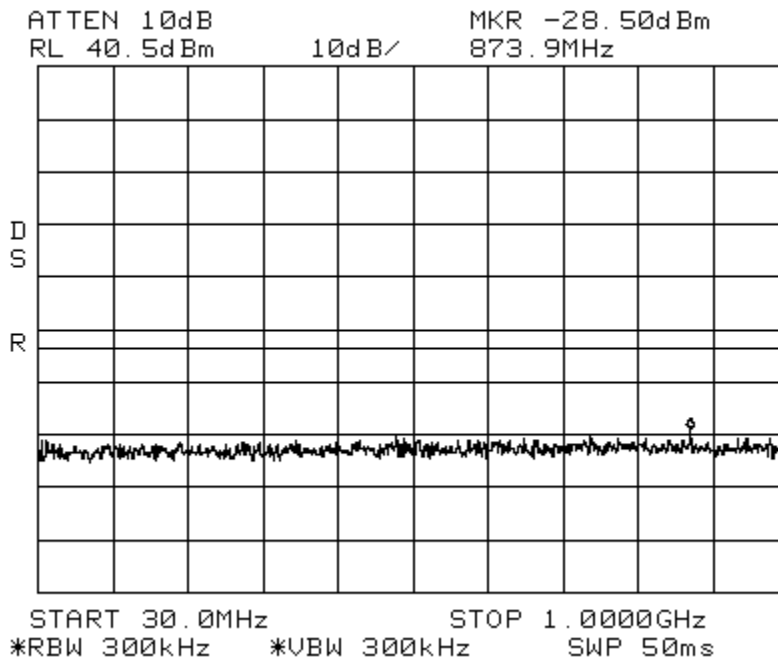
Center: 2132.5 MHz

Span: 70 MHz

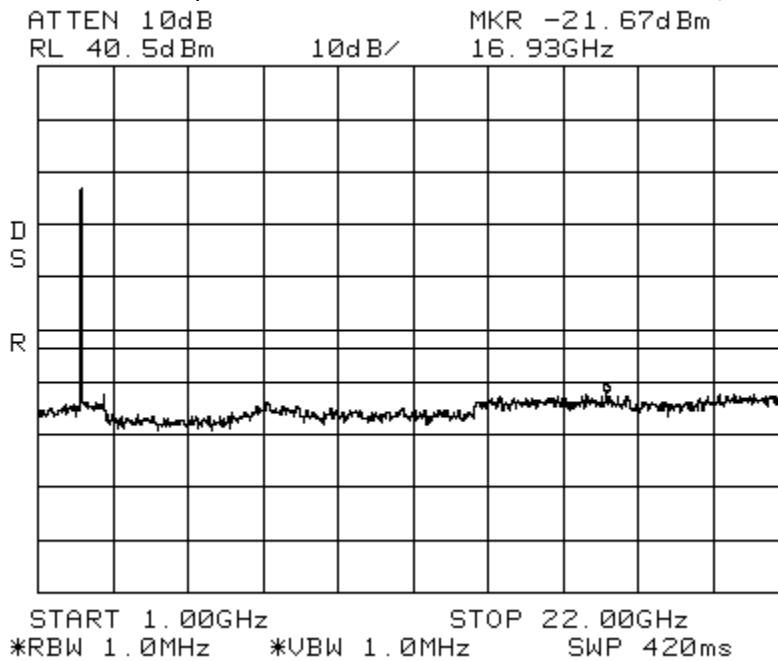
RBW/VBW: 100 kHz



Intermodulation WCDMA_High Spectrum AWS Path 2
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



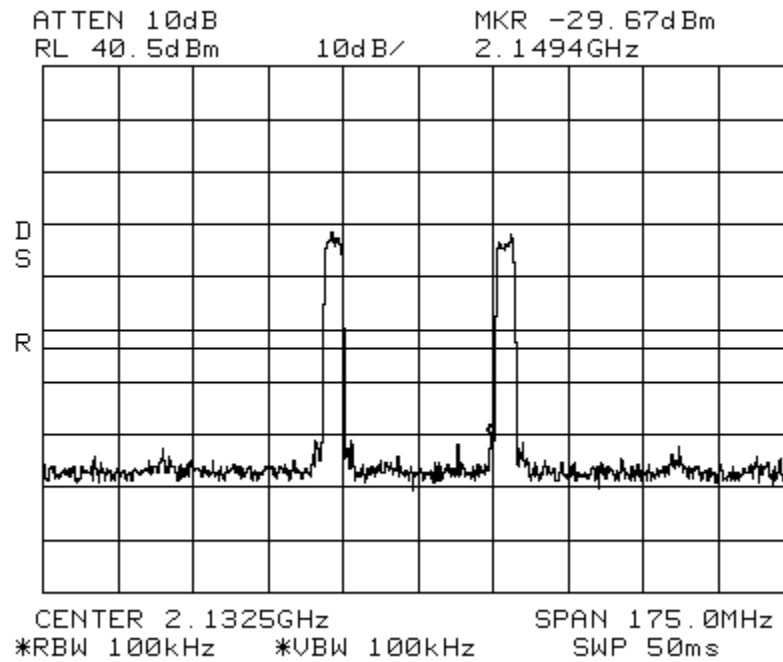
Intermodulation WCDMA_High Spectrum AWS Path 2
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



Intermodulation
Center: 2132.5 MHz

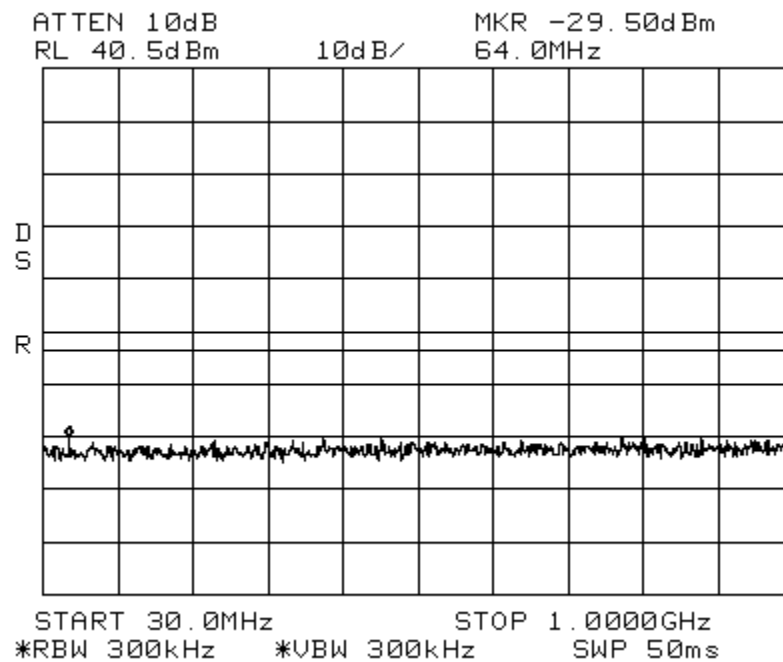
WCDMA_Apart
Span: 175 MHz

Spectrum AWS Path 2
RBW/VBW: 100 kHz



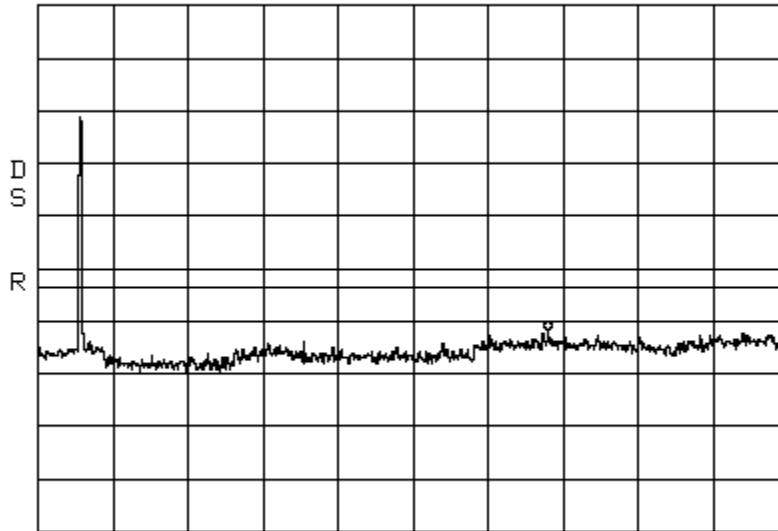
Intermodulation
Span: 30 MHz to 1 GHz

Spectrum AWS Path 2
RBW/VBW: 300 kHz



Intermodulation WCDMA_Apart Spectrum AWS Path 2
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz

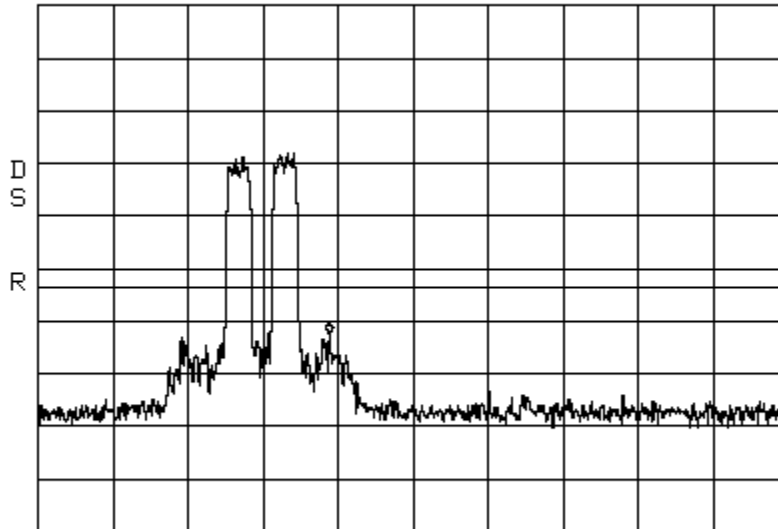
ATTEN 10dB MKR -21.33dBm
 RL 40.5dBm 10dB/ 15.28GHz



START 1.00GHz STOP 22.00GHz
 *RBW 1.0MHz *VBW 1.0MHz SWP 420ms

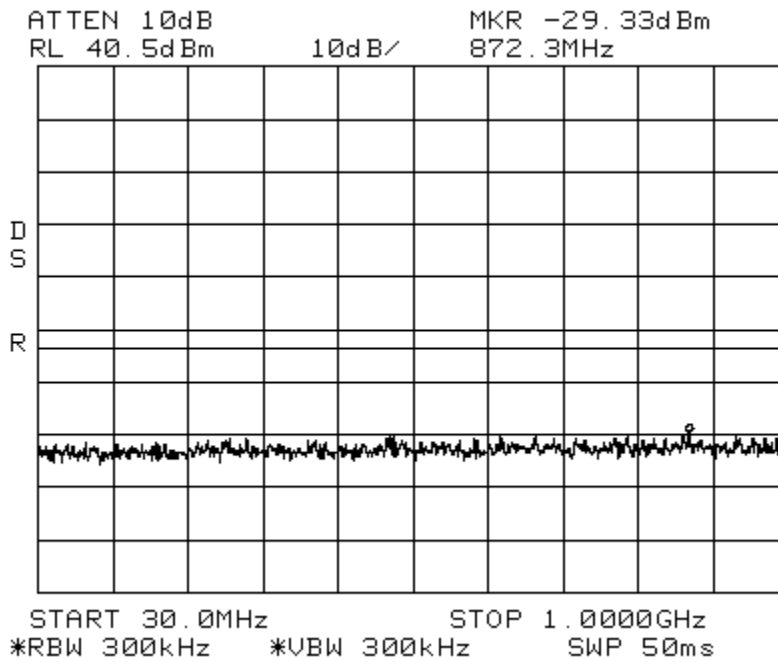
Intermodulation LTE 3 MHz Channel Bandwidth_Low AWS Path 2
 Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz

ATTEN 10dB MKR -21.83dBm
 RL 40.5dBm 10dB/ 2.12245GHz

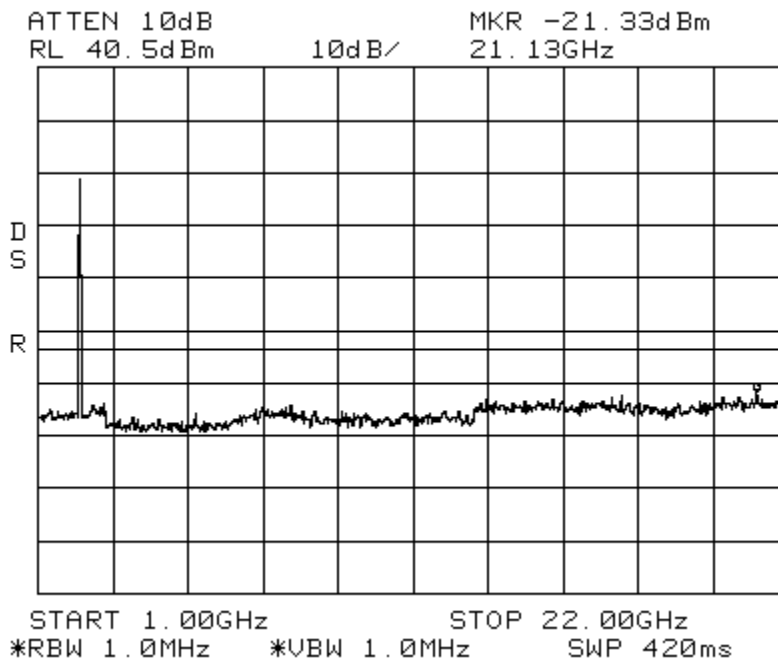


CENTER 2.13250GHz SPAN 90.00MHz
 *RBW 100kHz *VBW 100kHz SWP 50ms

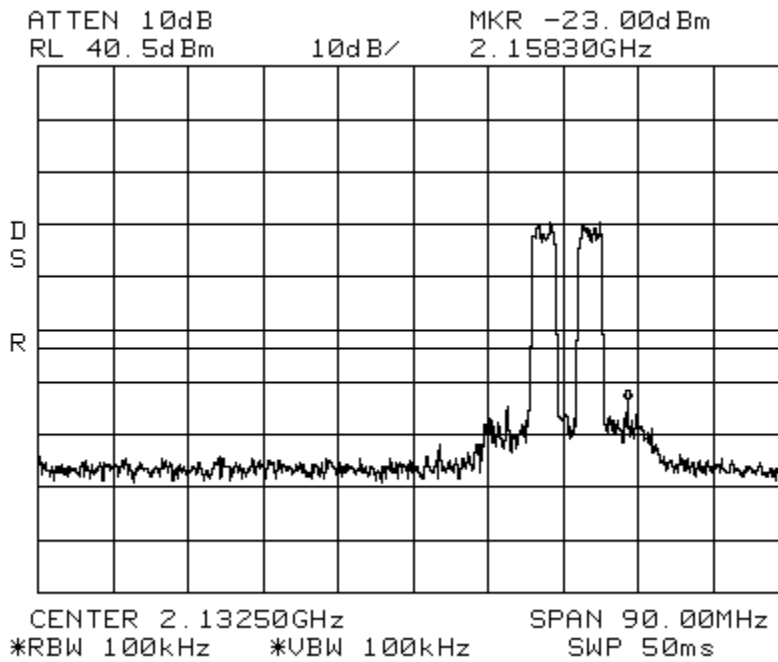
Intermodulation LTE 3MHz Channel Bandwidth _LowAWS Path 2
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



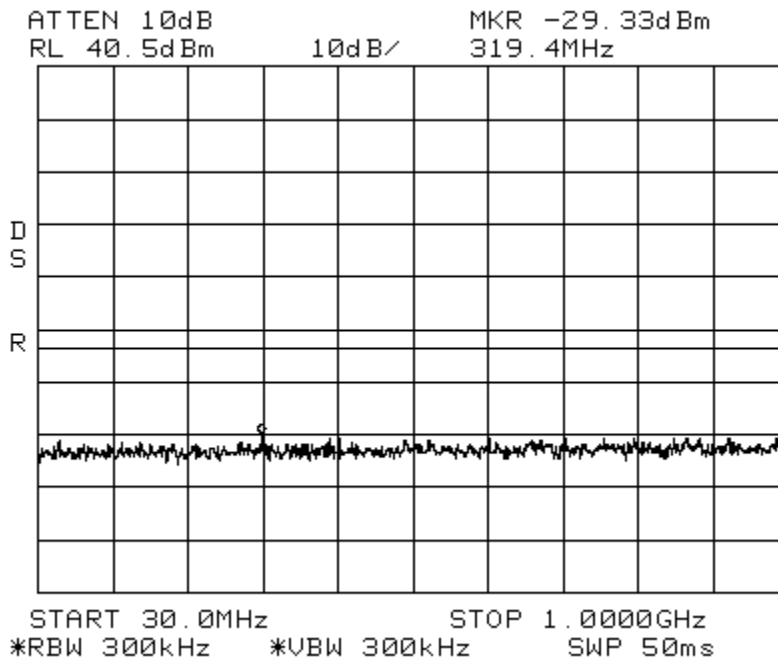
Intermodulation LTE 3 MHz Channel Bandwidth _Low AWS Path 2
 Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



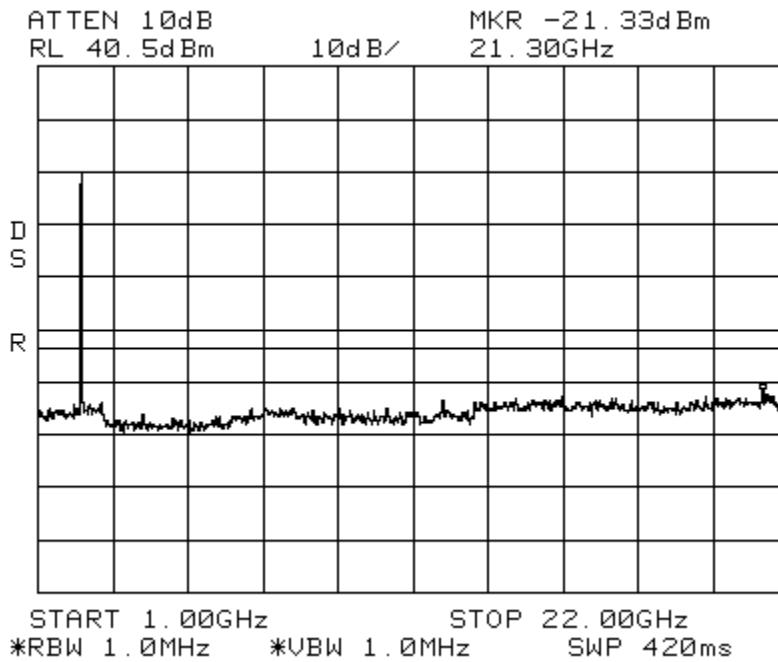
Intermodulation LTE 3 MHz Channel Bandwidth _High AWS Path 2
Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



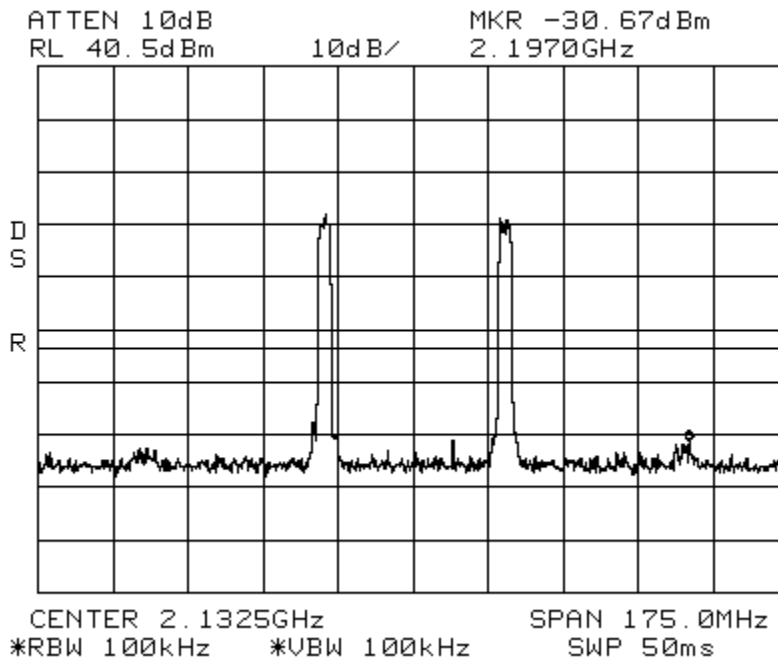
Intermodulation LTE 3 MHz Channel Bandwidth _High AWS Path 2
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



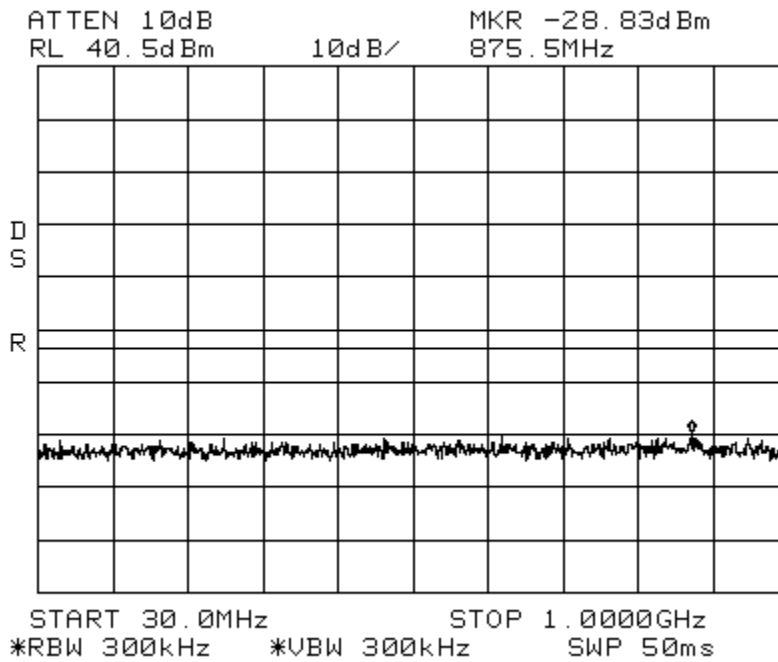
Intermodulation LTE 3 MHz Channel Bandwidth _High AWS Path 2
Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



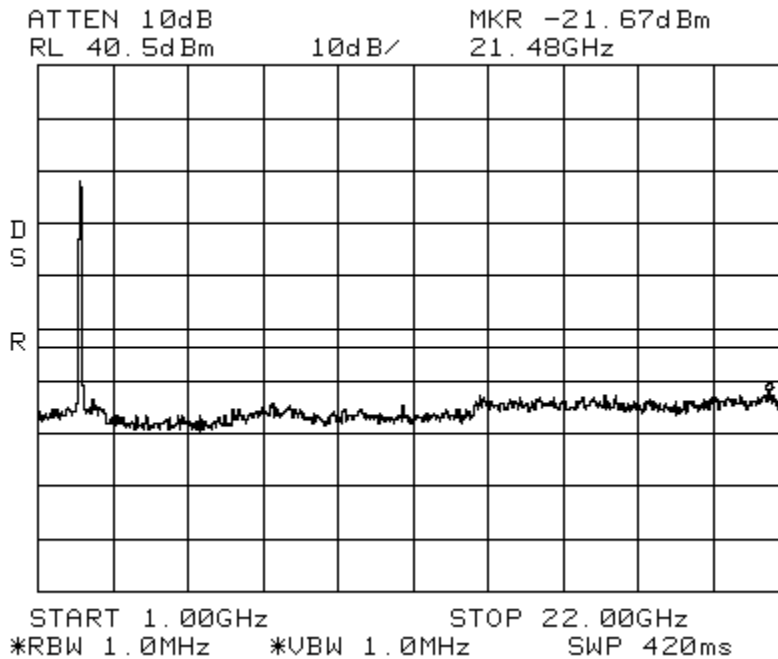
Intermodulation LTE 3 MHz Channel Bandwidth _Apart AWS Path 2
Center: 2132.5 MHz Span: 175 MHz RBW/VBW: 100 kHz



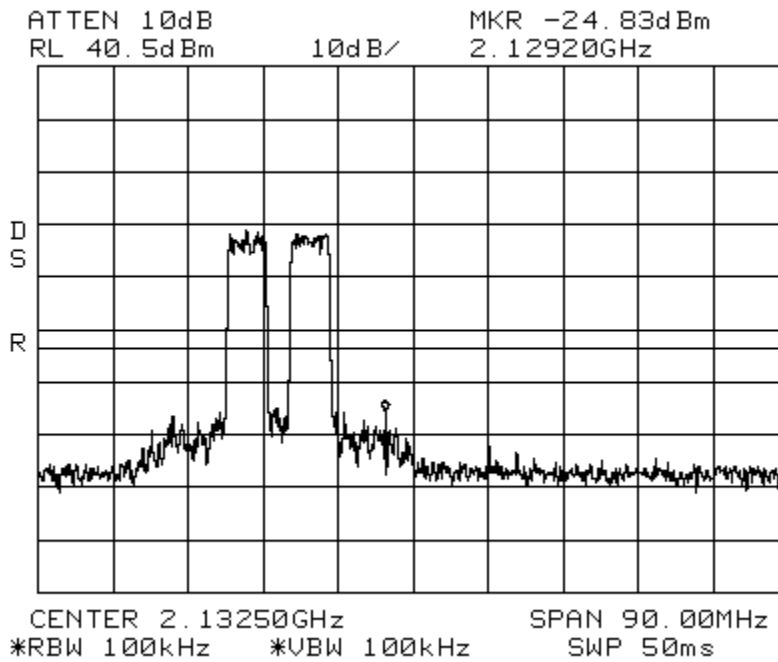
Intermodulation LTE 3 MHz Channel Bandwidth _Apart AWS Path 2
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



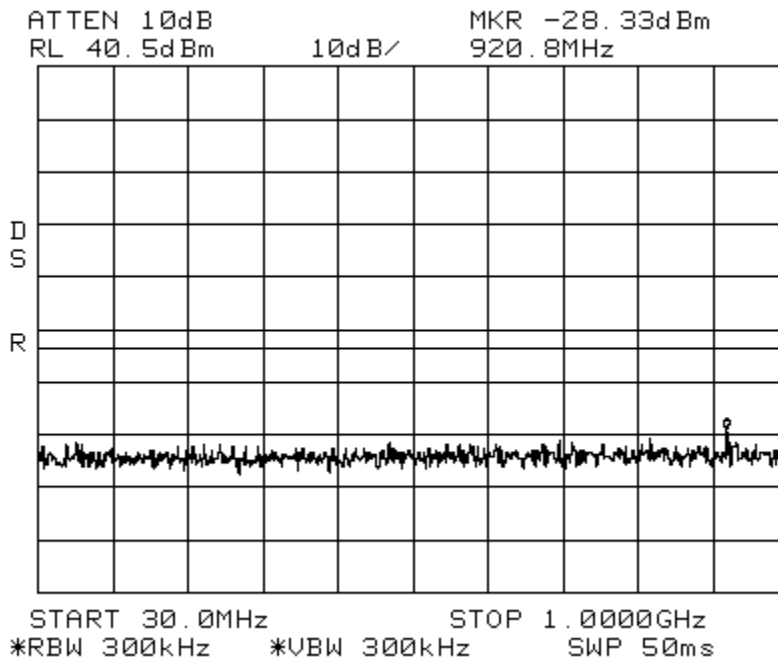
Intermodulation LTE 3 MHz Channel Bandwidth _Apart AWS Path 2
 Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



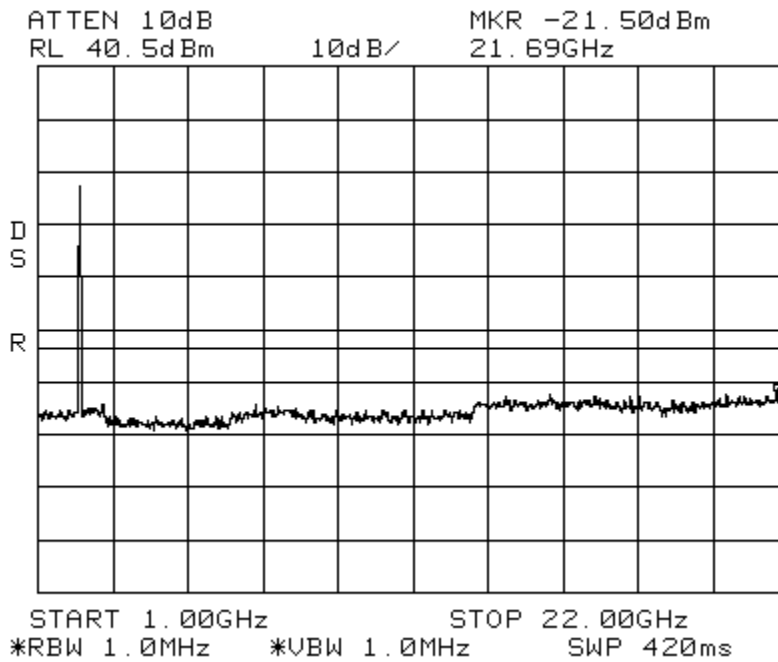
Intermodulation LTE 5 MHz Channel Bandwidth **_Low** AWS Path 2
Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



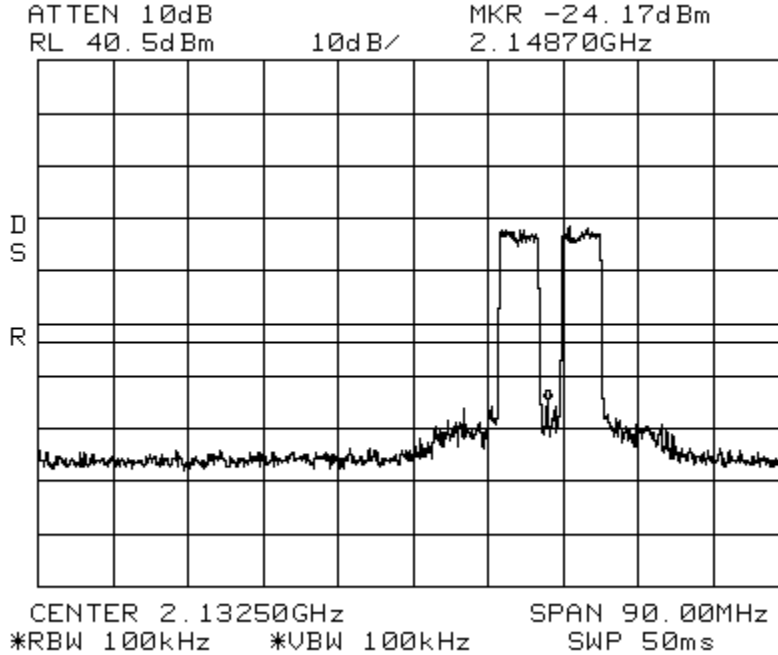
Intermodulation LTE 5 MHz Channel Bandwidth **_Low** AWS Path 2
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



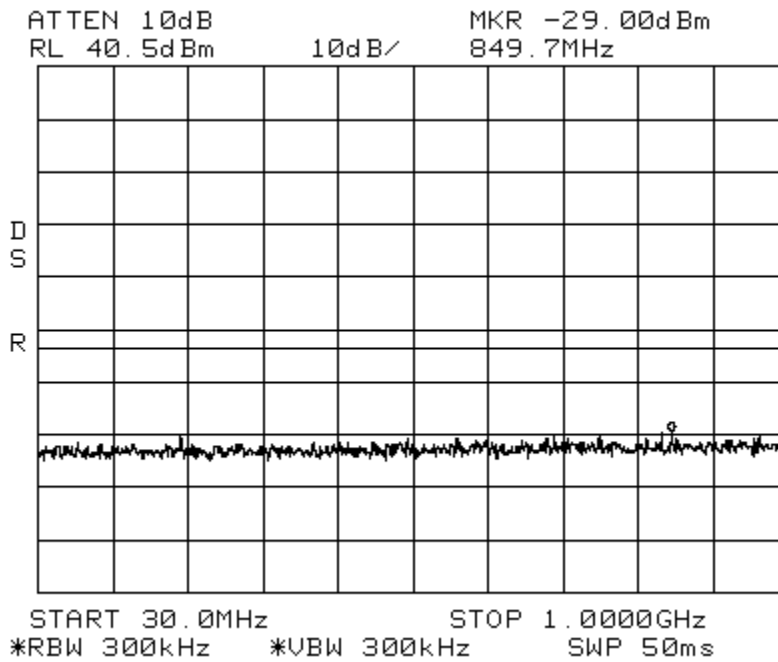
Intermodulation LTE 5 MHz Channel Bandwidth _Low AWS Path 2
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



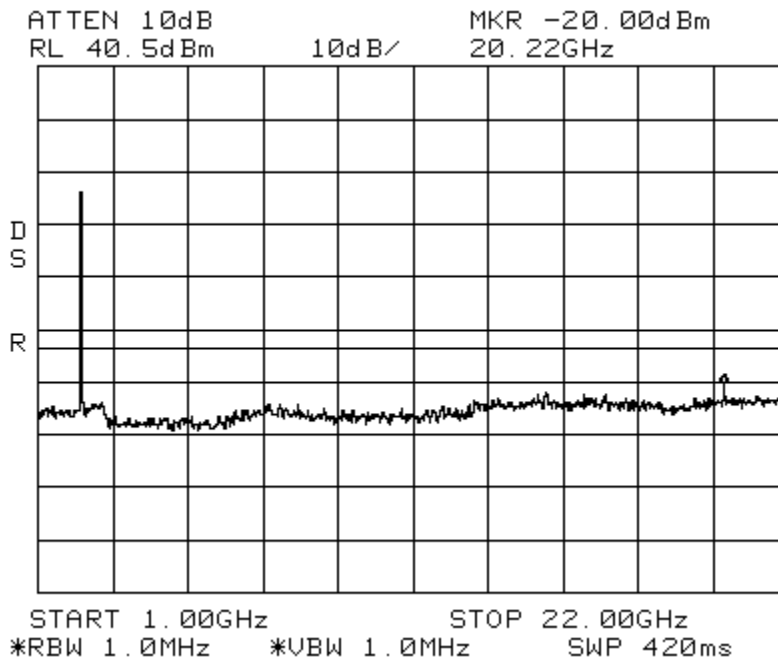
Intermodulation LTE 5 MHz Channel Bandwidth _High AWS Path 2
 Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



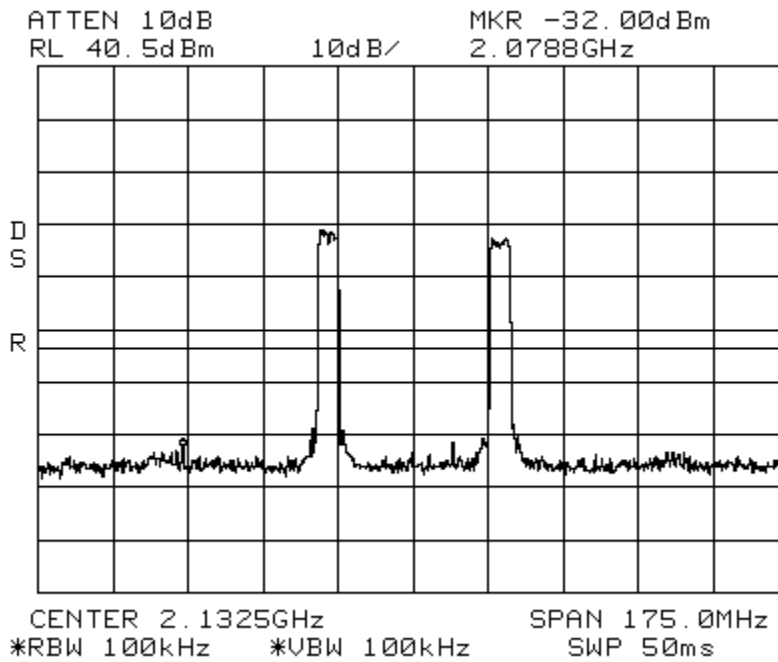
Intermodulation LTE 5 MHz Channel Bandwidth_High AWS Path 2
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



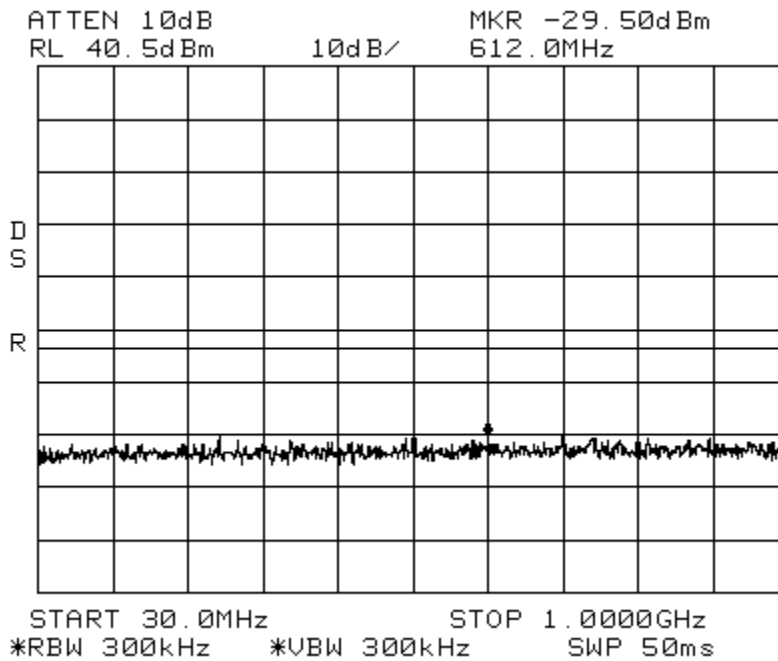
Intermodulation LTE 5 MHz Channel Bandwidth_High AWS Path 2
 Span: 1 GHz to 22GHz RBW/VBW: 1 MHz



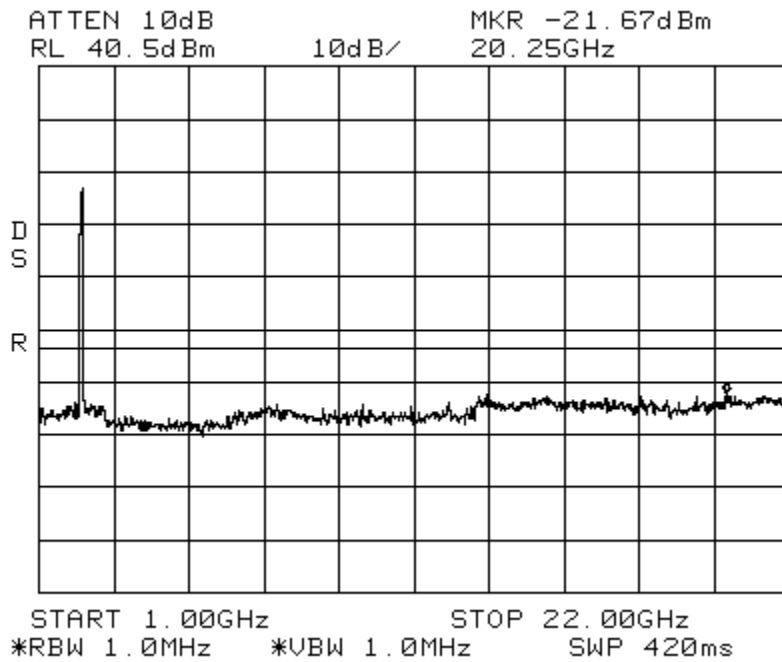
Intermodulation LTE 5 MHz Channel Bandwidth _Apart AWS Path 2
Center: 2132.5 MHz Span: 175 MHz RBW/VBW: 100 kHz



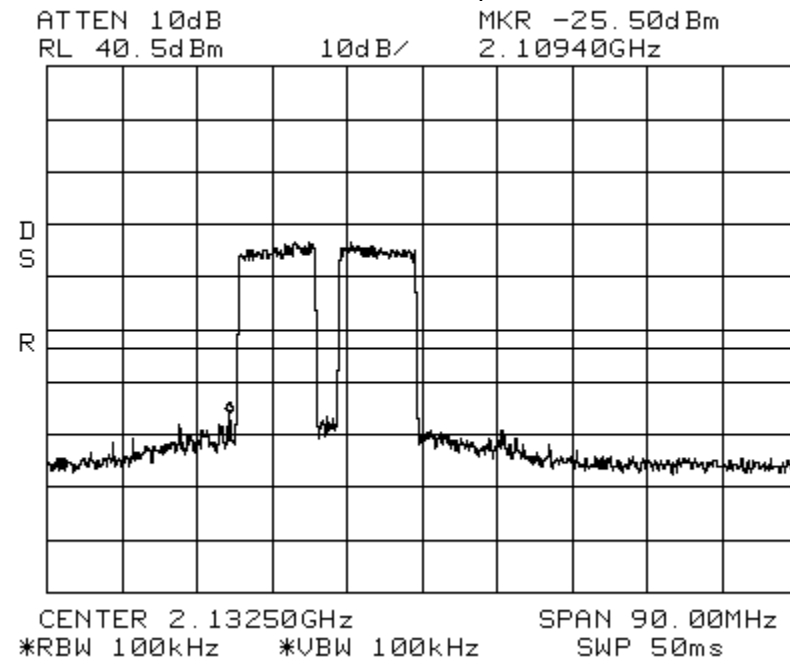
Intermodulation LTE 5 MHz Channel Bandwidth _Apart AWS Path 2
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



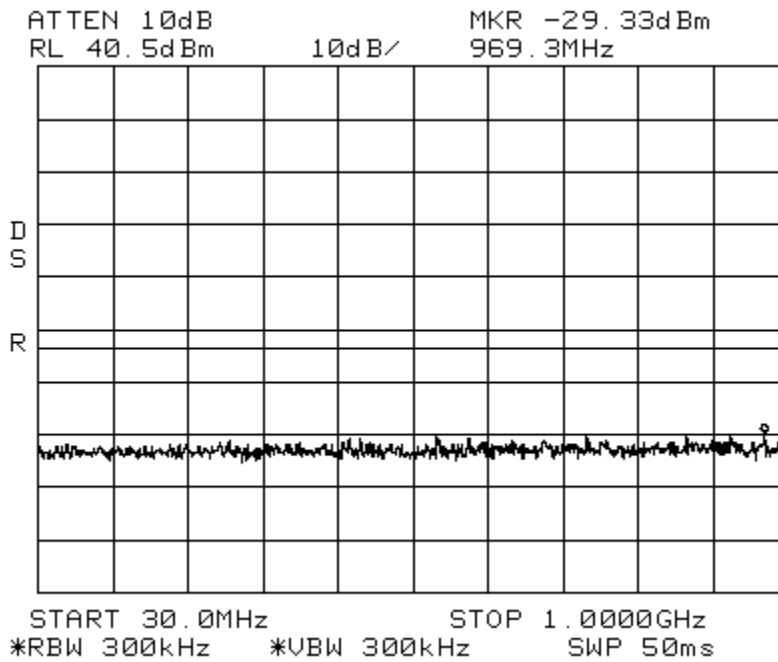
Intermodulation LTE 5 MHz Channel Bandwidth_Apart AWS Path 2
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



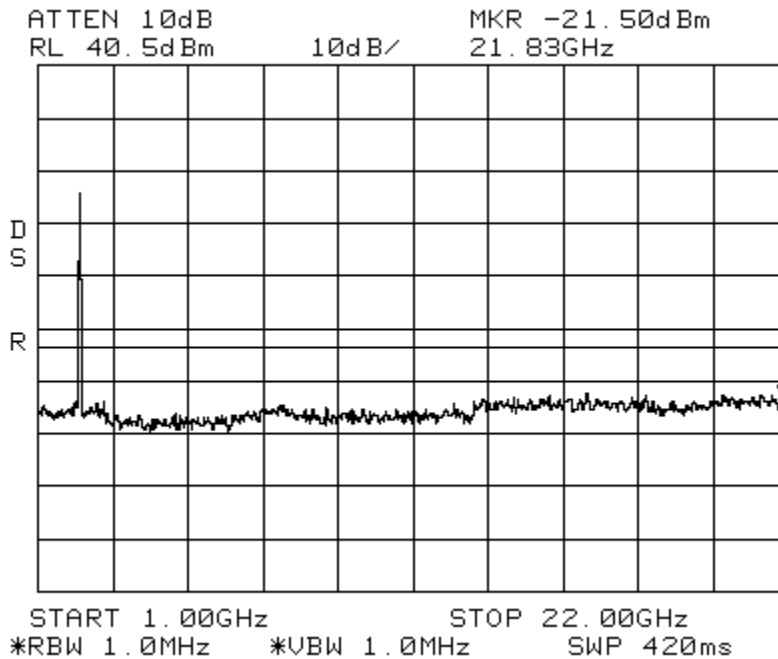
Intermodulation LTE 10 MHz Channel Bandwidth_**Low** AWS Path 2
 Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



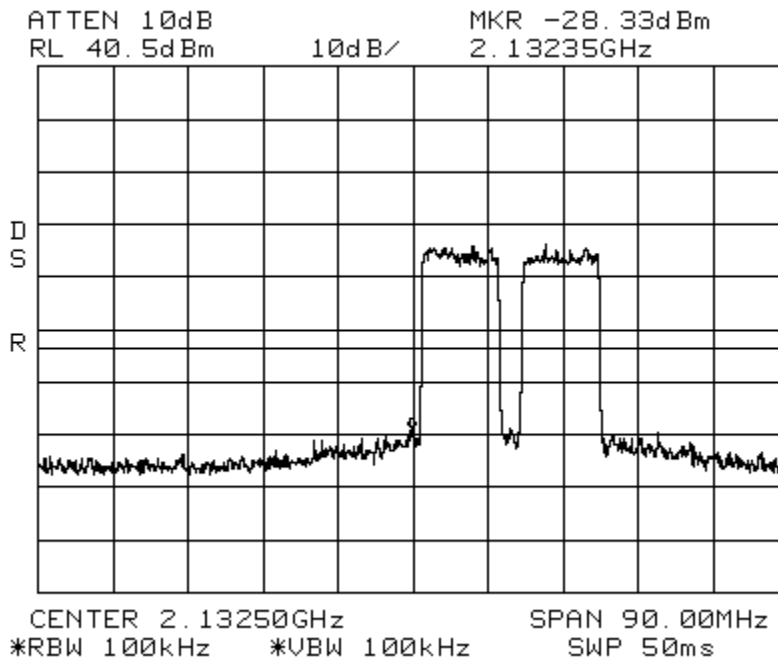
Intermodulation LTE 10 MHz Channel Bandwidth _Low AWS Path 2
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



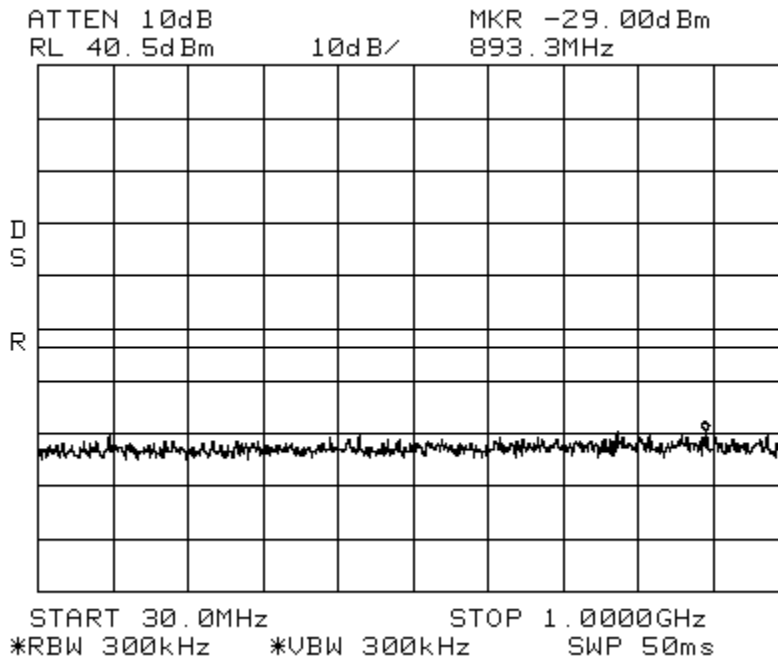
Intermodulation LTE 10 MHz Channel Bandwidth _Low AWS Path 2
 Span: 1 GHz to 22GHz RBW/VBW: 1 MHz



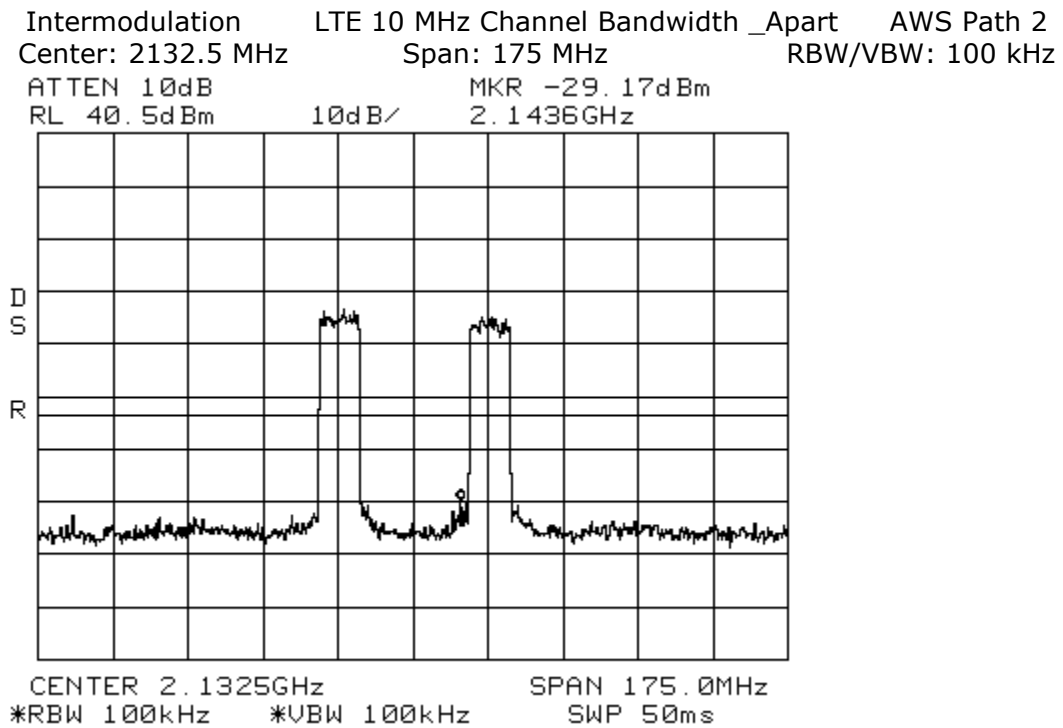
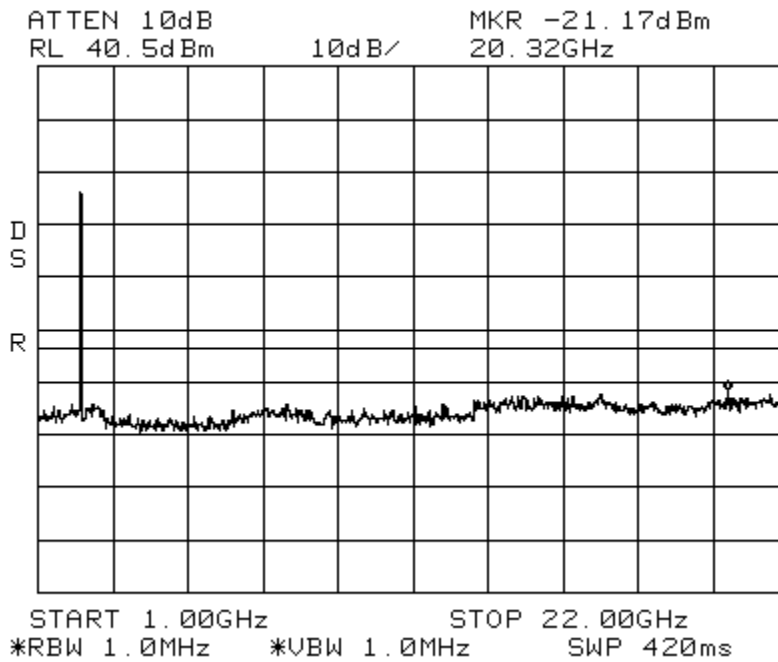
Intermodulation LTE 10 MHz Channel Bandwidth_High AWS Path 2
Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



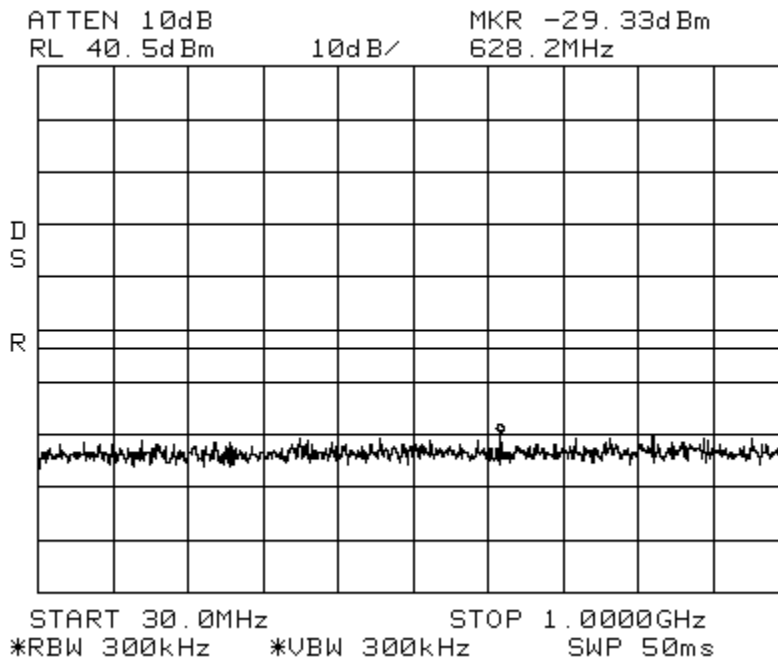
Intermodulation LTE 10 MHz Channel Bandwidth_High AWS Path 2
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



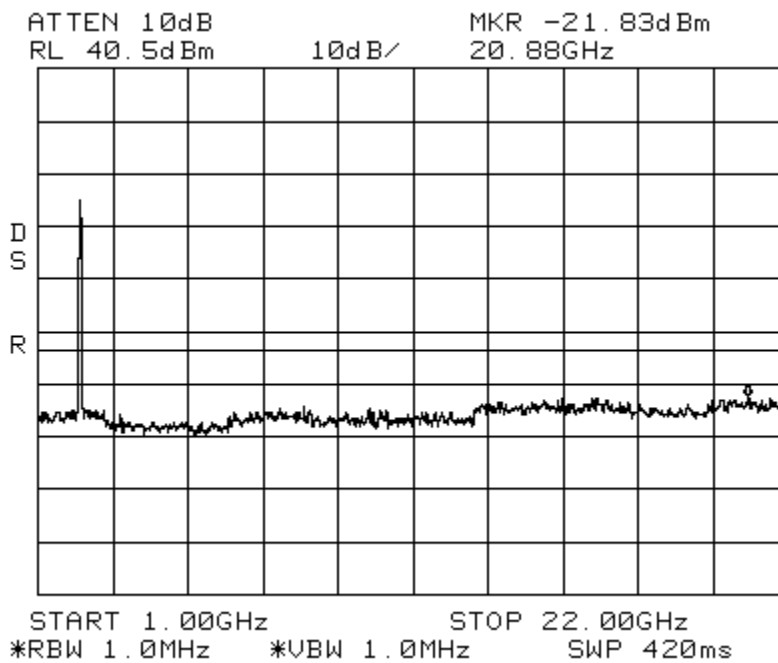
Intermodulation LTE 10 MHz Channel Bandwidth_High AWS Path 2
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



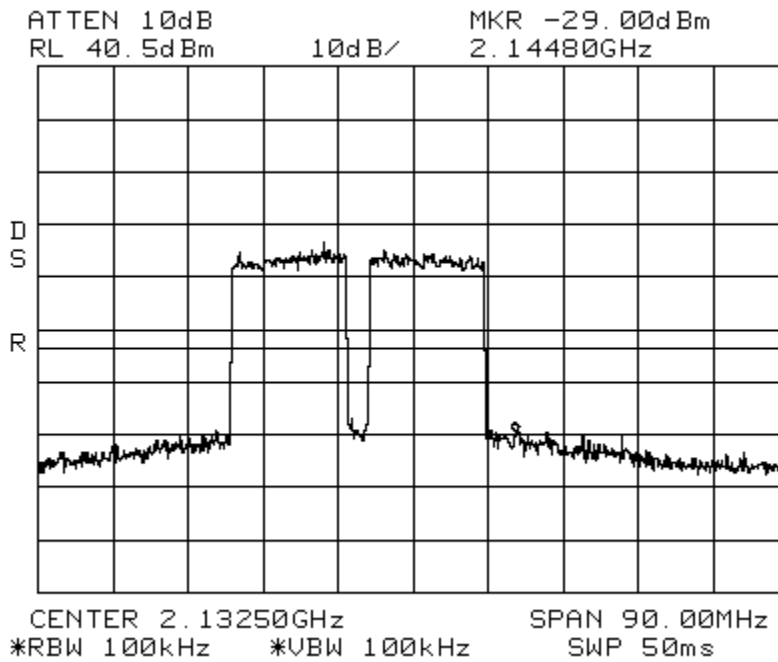
Intermodulation LTE 10 MHz Channel Bandwidth _Apart AWS Path 2
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



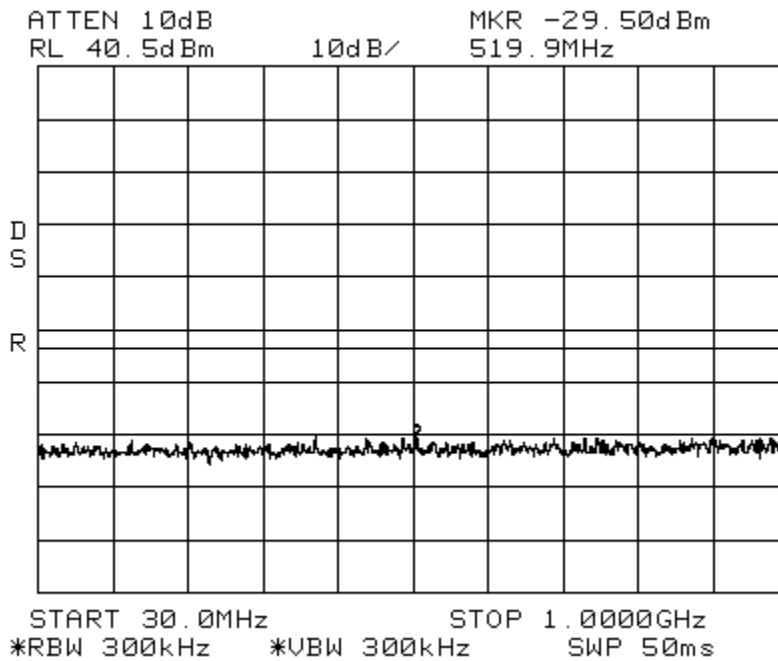
Intermodulation LTE 10 MHz Channel Bandwidth _Apart AWS Path 2
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



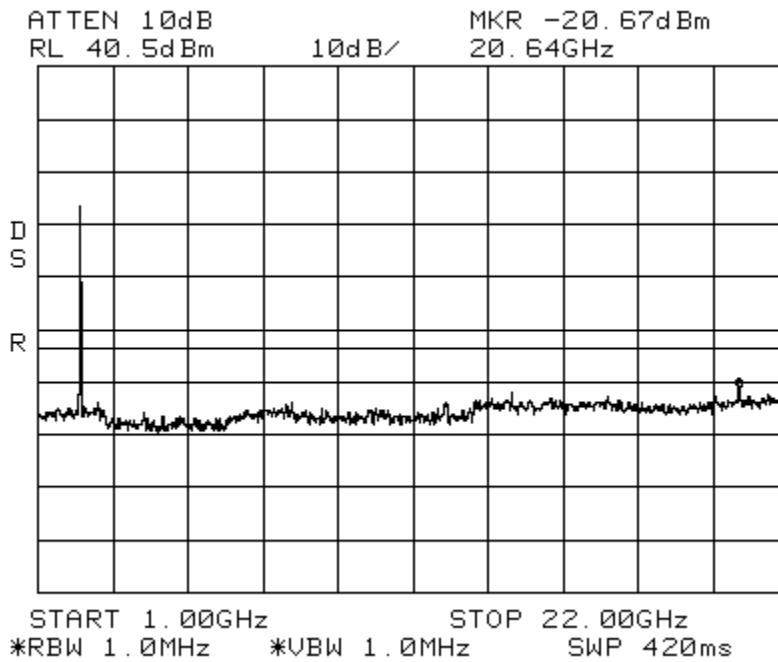
Intermodulation LTE 15 MHz Channel Bandwidth **Low** AWS Path 2
Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



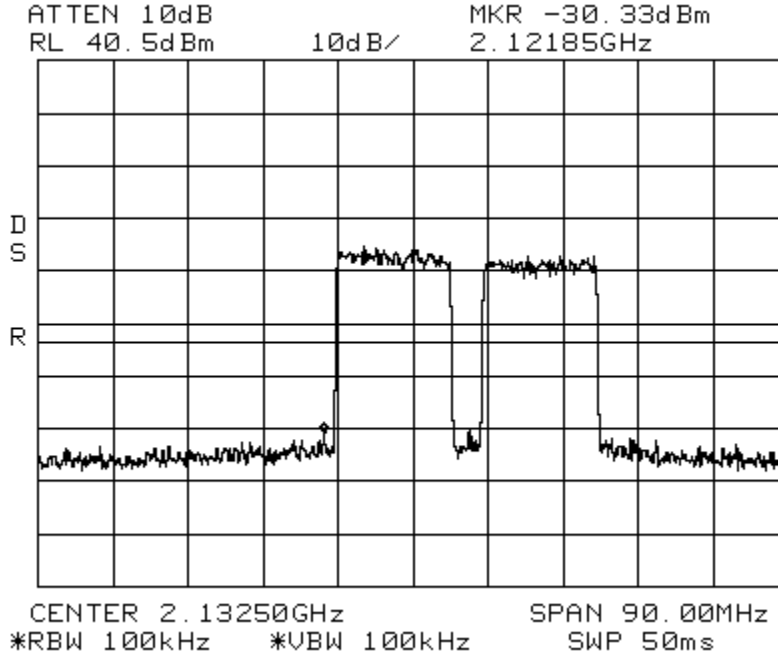
Intermodulation LTE 15 MHz Channel Bandwidth **Low** AWS Path 2
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



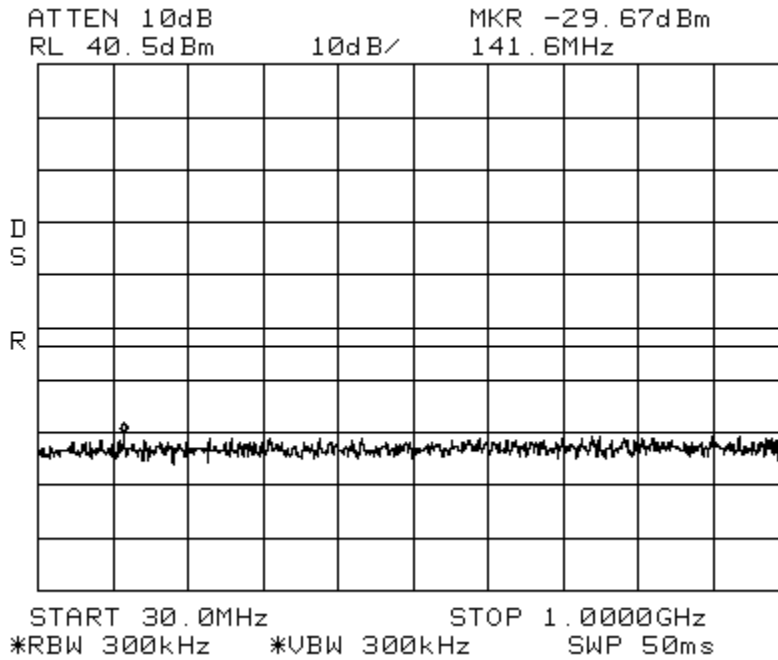
Intermodulation LTE 15 MHz Channel Bandwidth _Low AWS Path 2
Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



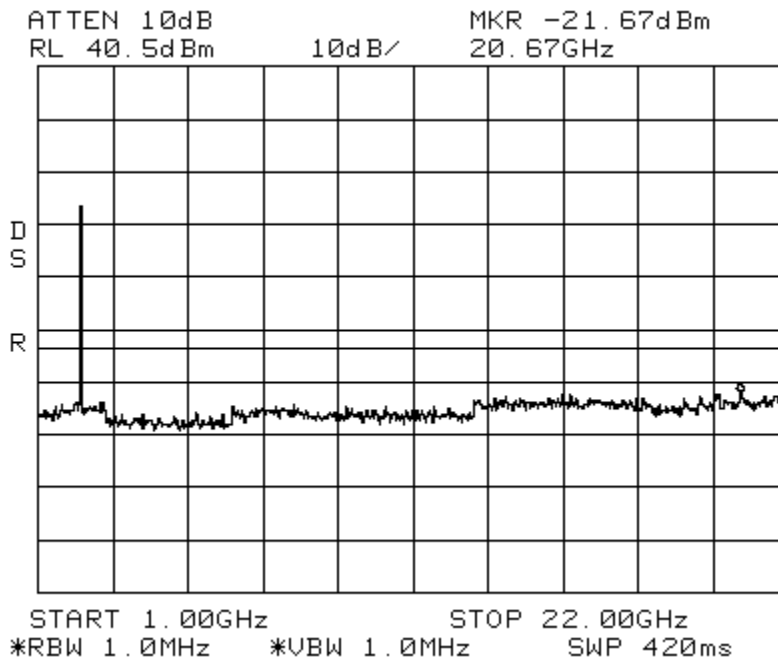
Intermodulation LTE 15 MHz Channel Bandwidth _High AWS Path 2
Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



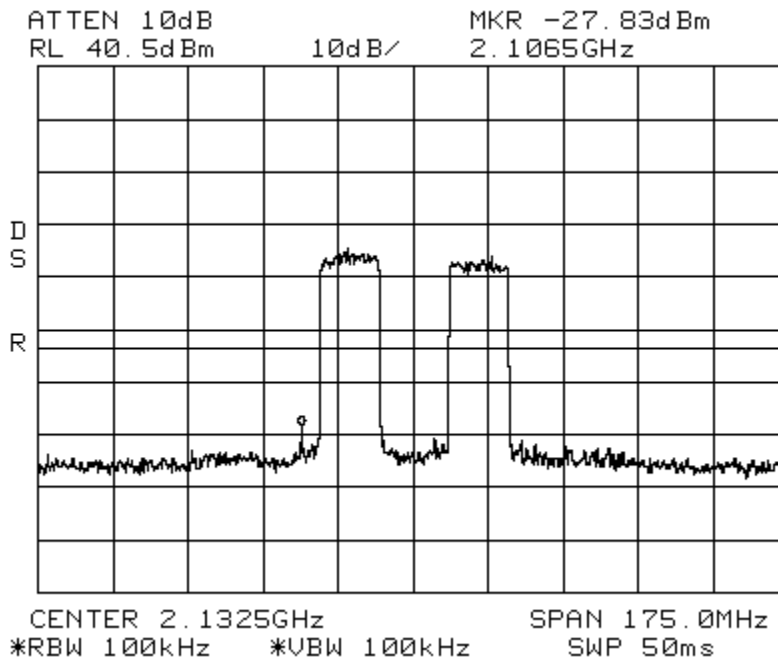
Intermodulation LTE 15 MHz Channel Bandwidth_High AWS Path 2
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



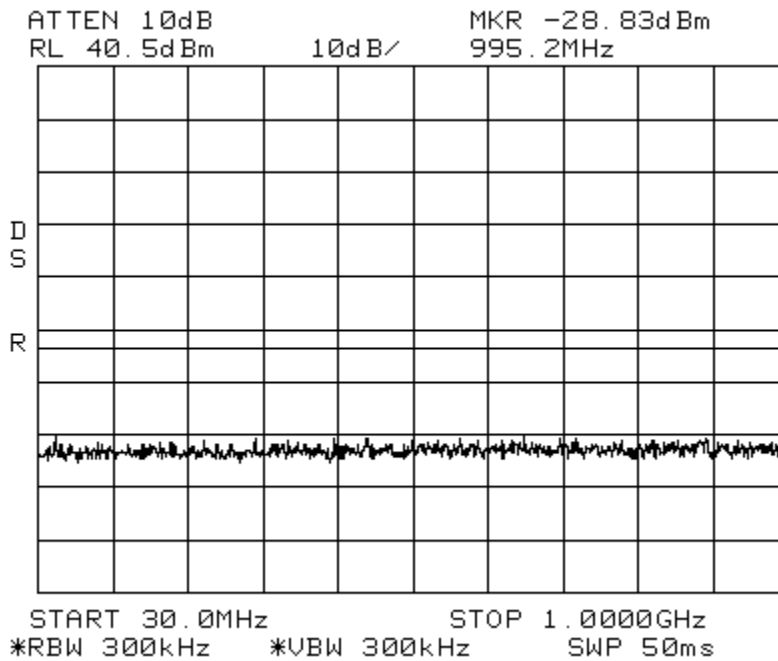
Intermodulation LTE 15 MHz Channel Bandwidth_High AWS Path 2
Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



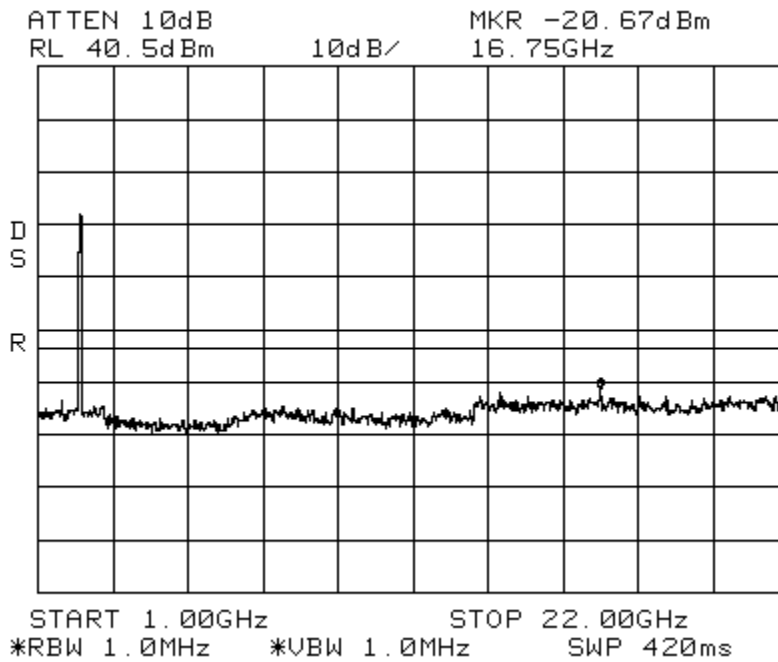
Intermodulation LTE 15 MHz Channel Bandwidth _Apart AWS Path 2
Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



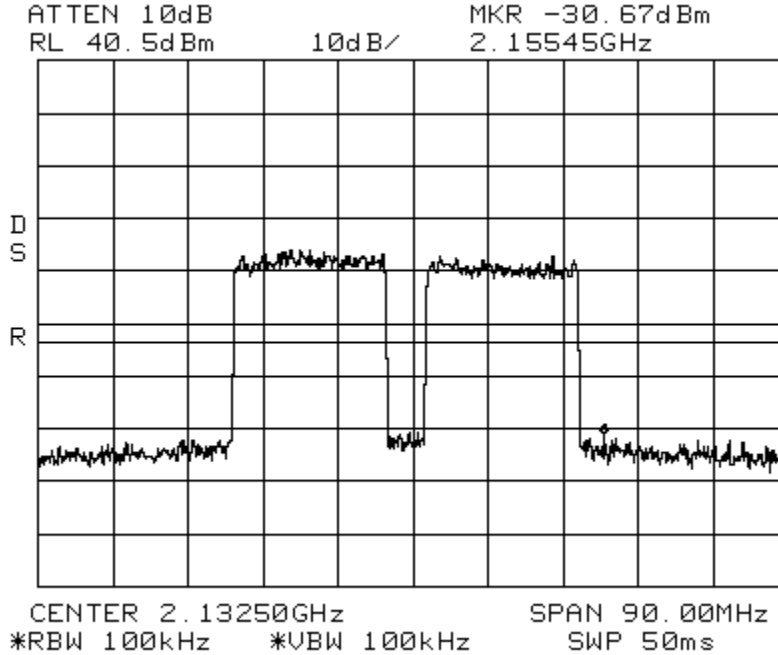
Intermodulation LTE 15 MHz Channel Bandwidth _Apart AWS Path 2
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



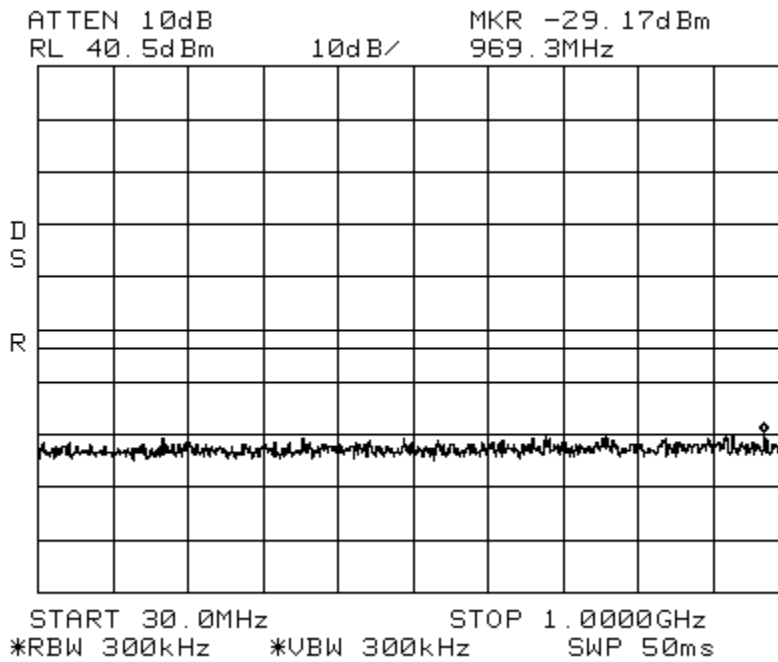
Intermodulation LTE 15 MHz Channel Bandwidth_Apart AWS Path 2
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



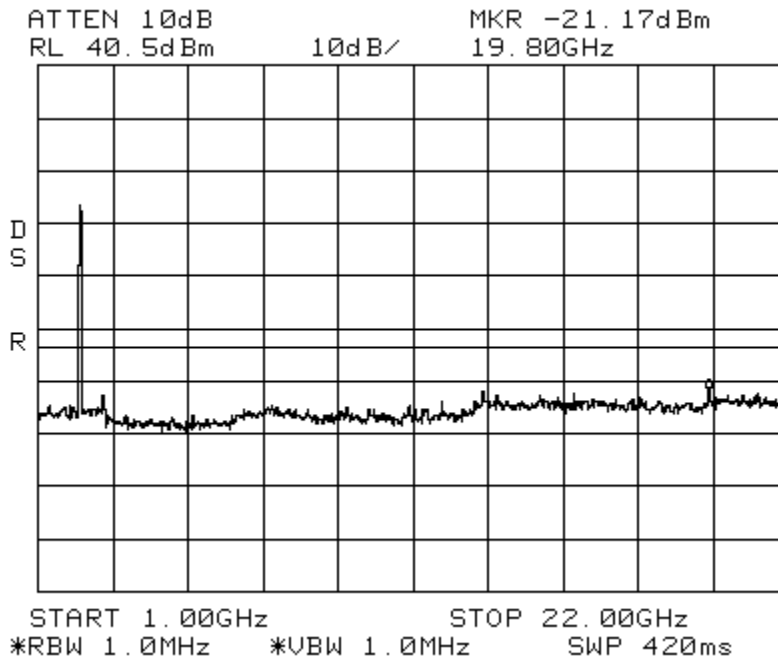
Intermodulation LTE 20 MHz Channel Bandwidth_**Low** AWS Path 2
 Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



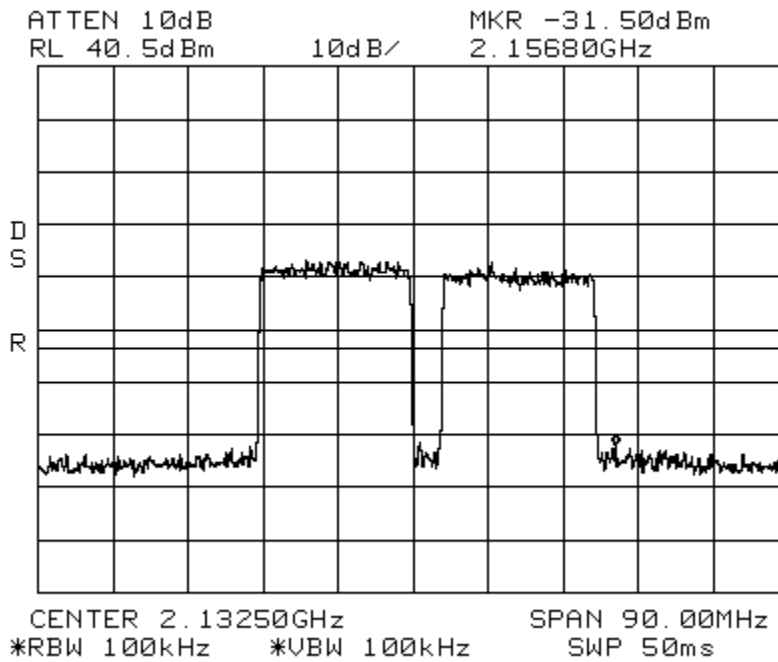
Intermodulation LTE 20 MHz Channel Bandwidth _Low AWS Path 2
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



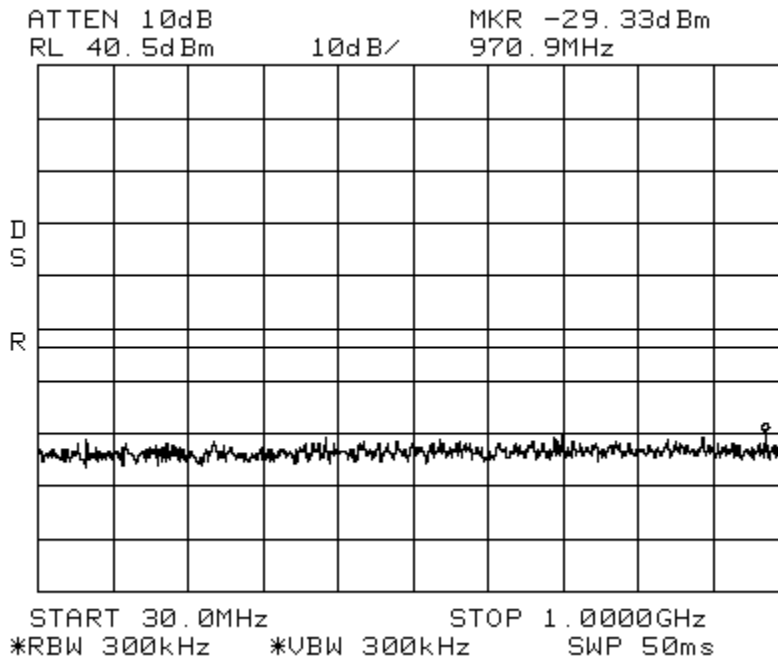
Intermodulation LTE 20 MHz Channel Bandwidth _Low AWS Path 2
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



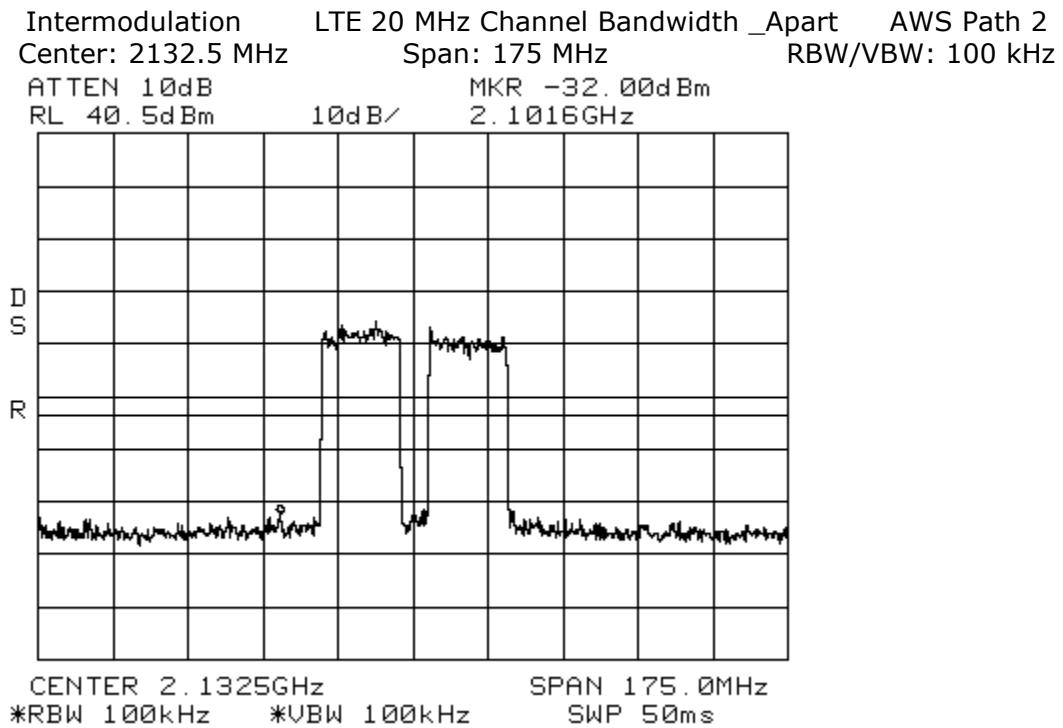
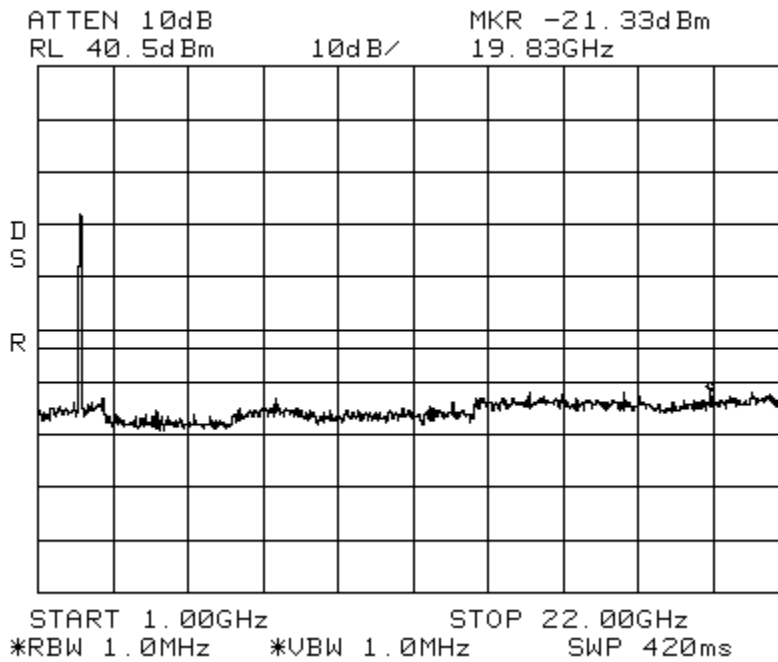
Intermodulation LTE 20 MHz Channel Bandwidth_High AWS Path 2
Center: 2132.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



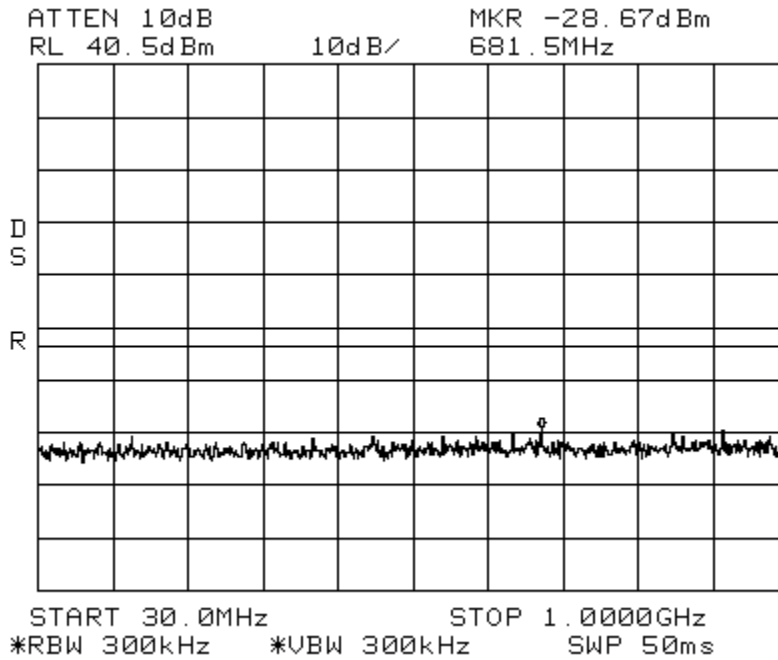
Intermodulation LTE 20 MHz Channel Bandwidth_High AWS Path 2
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



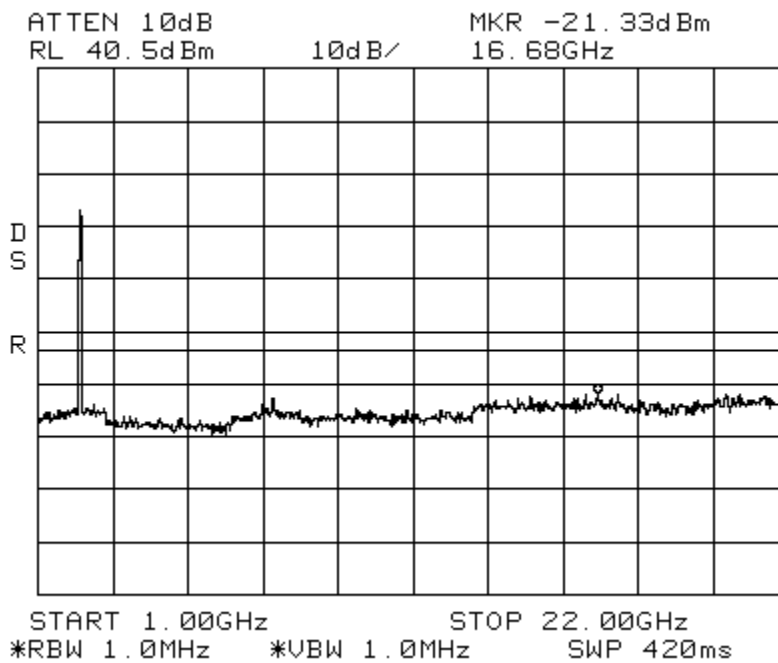
Intermodulation LTE 20 MHz Channel Bandwidth_High AWS Path 2
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



Intermodulation LTE 20 MHz Channel Bandwidth _Apart AWS Path 2
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



Intermodulation LTE 20 MHz Channel Bandwidth _Apart AWS Path 2
 Span: 1 GHz to 22 GHz RBW/VBW: 1 MHz



7.5 Occupied Bandwidth Modulation Test

[Table of Contents; Section 1.0](#)

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

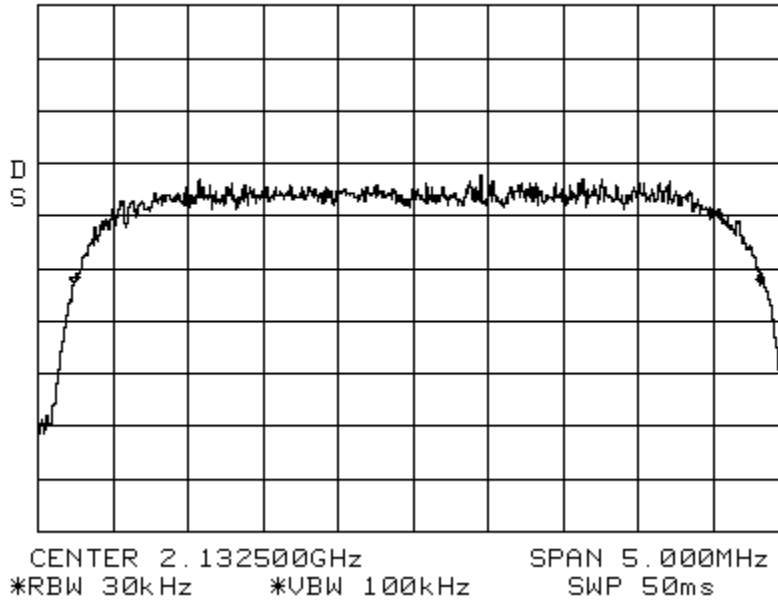
An input/output Occupied Bandwidth test was done with modulation types: WCDMA, LTE 3MHz, LTE 5MHz, LTE 10MHz, LTE 15MHz, & LTE 20MHz. The purpose was to determine the amount of distortion added to different types of modulation schemes by the EUT. The following plots show input signals vs. output signals.

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.

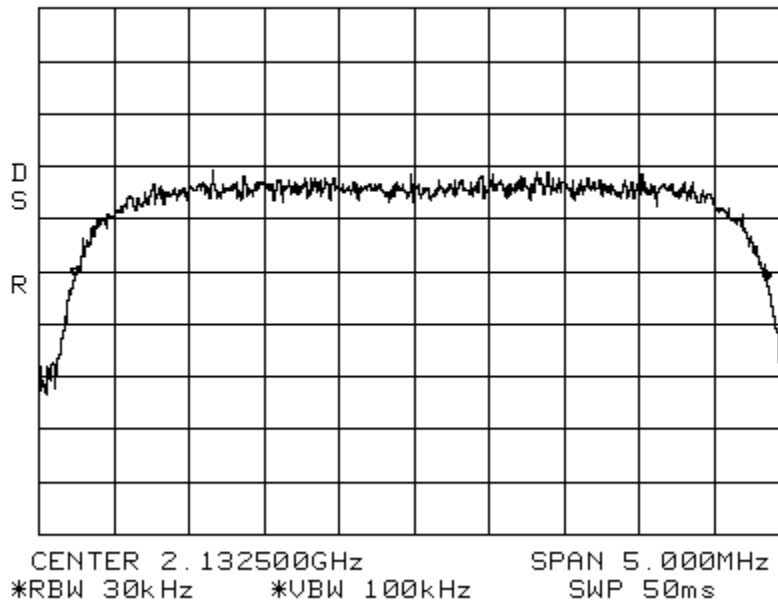
Results:

Pass (see plots)

Occupied Bandwidth WCDMA_Signal_In Spectrum AWS Path 1
 Span: 4.8 MHz RBW: 30 kHz VBW: 100 kHz
 ATTEN 10dB Δ MKR -1.17dB
 RL 0dBm 10dB/ 4.575MHz



Occupied Bandwidth WCDMA_Signal_Out Spectrum AWS Path 1
 Span: 4.8 MHz RBW: 30 kHz VBW: 100 kHz
 ATTEN 10dB Δ MKR -1.00dB
 RL 40.5dBm 10dB/ 4.608MHz



Occupied Bandwidth

LTE 3 MHz Channel Bandwidth_Signal_In

AWS Path 1

Span: 3 MHz

RBW: 30kHz VBW: 100 kHz

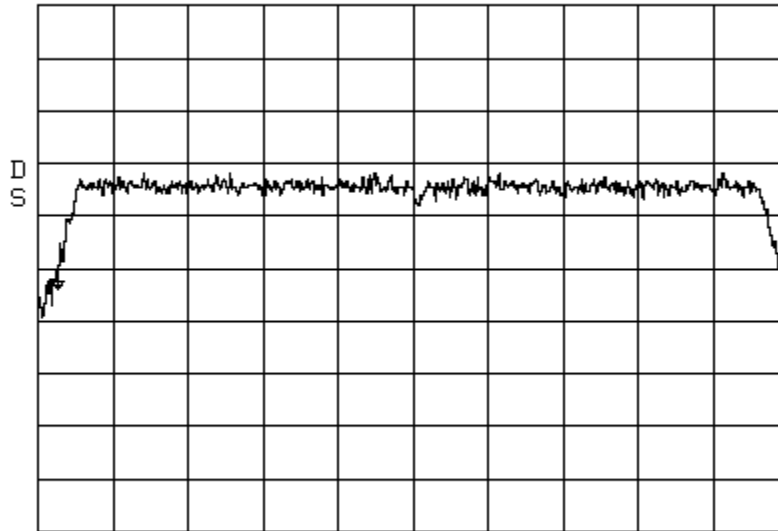
ATTEN 10dB

Δ MKR 0dB

RL 0dBm

10dB/

2.900MHz



CENTER 2.132500GHz

SPAN 3.000MHz

*RBW 30kHz

*VBW 100kHz

SWP 50ms

Occupied Bandwidth

LTE 3 MHz Channel Bandwidth_Signal_Out

AWS Path 1

Span: 3 MHz

RBW: 30 kHz VBW: 100 kHz

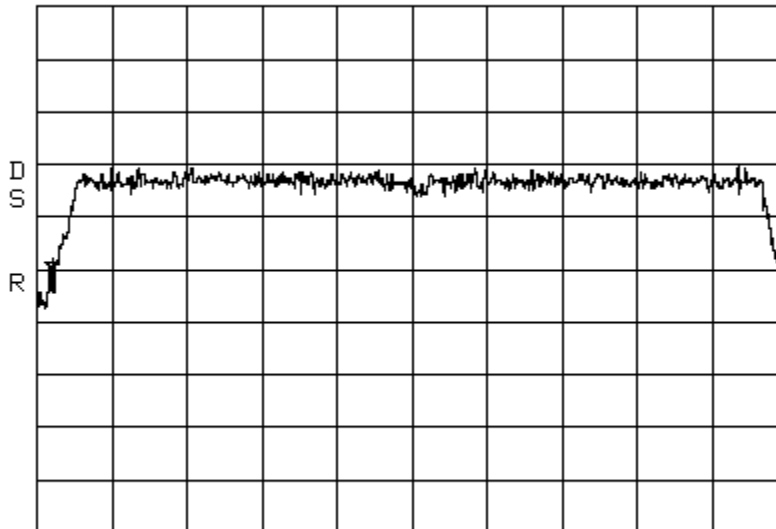
ATTEN 10dB

Δ MKR .83dB

RL 40.5dBm

10dB/

2.915MHz



CENTER 2.132500GHz

SPAN 3.000MHz

*RBW 30kHz

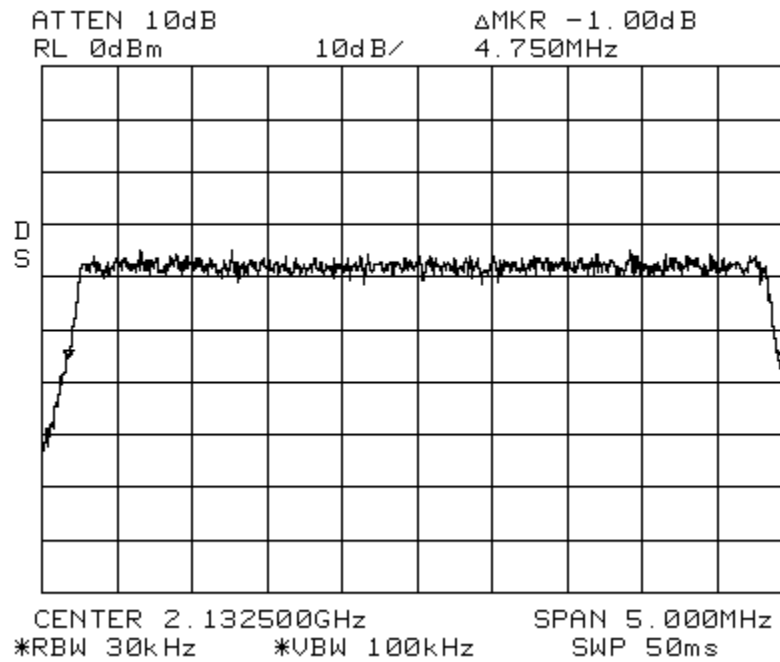
*VBW 100kHz

SWP 50ms

Occupied Bandwidth

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

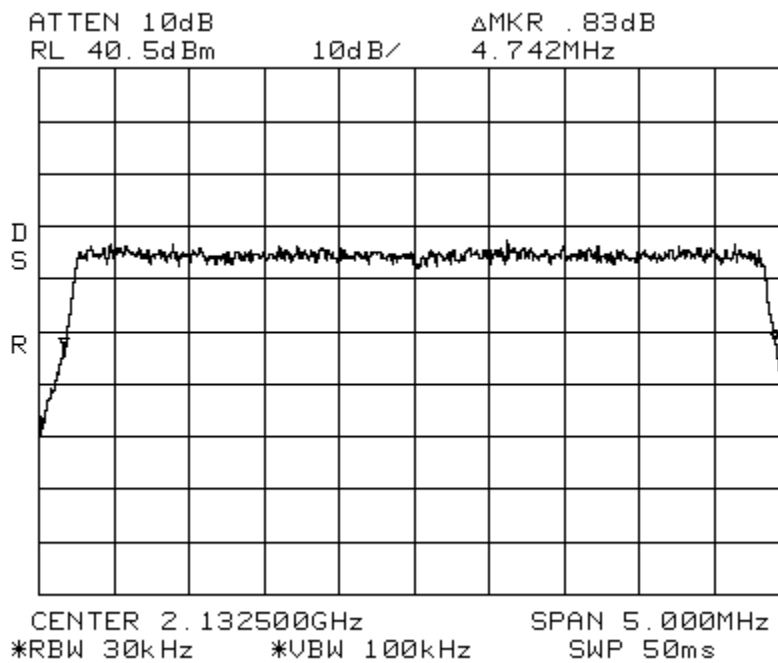
AWS Path 1



Occupied Bandwidth

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

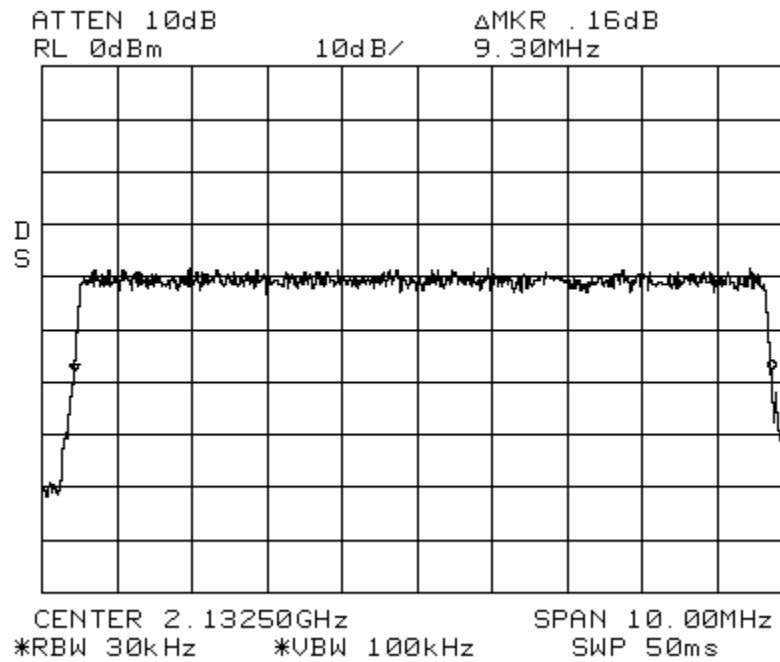
AWS Path 1



Occupied Bandwidth

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

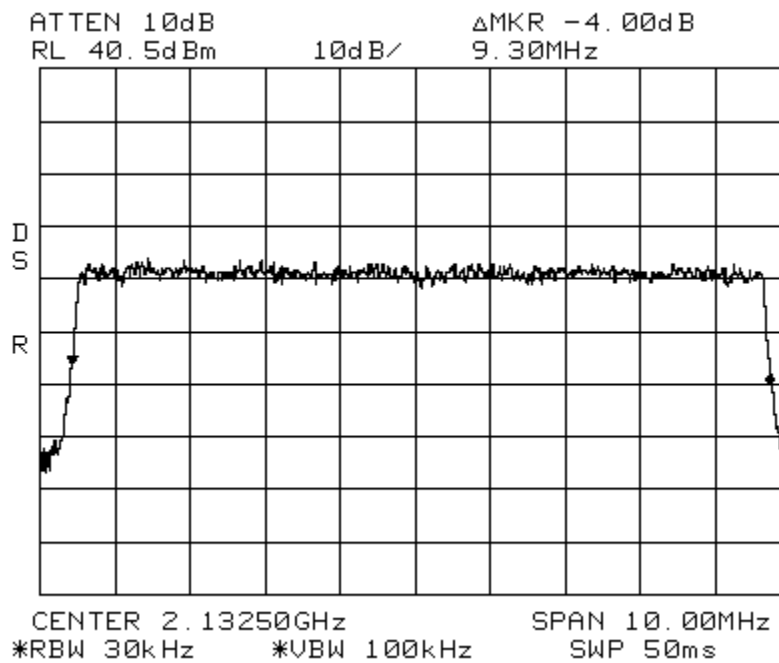
AWS Path 1



Occupied Bandwidth

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

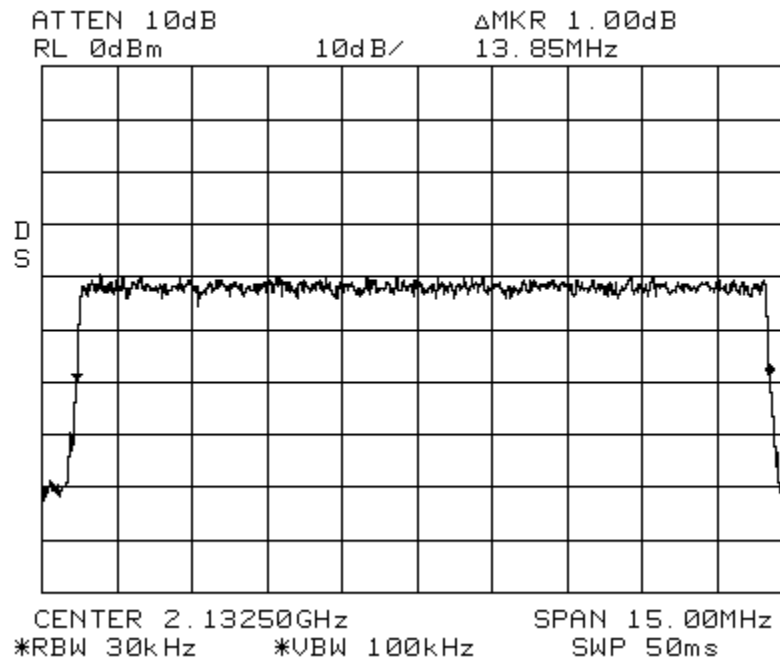
AWS Path 1



Occupied Bandwidth

LTE 15 MHz Channel Bandwidth_Signal_In
Span: 15 MHz RBW: 30 kHz VBW: 100 kHz

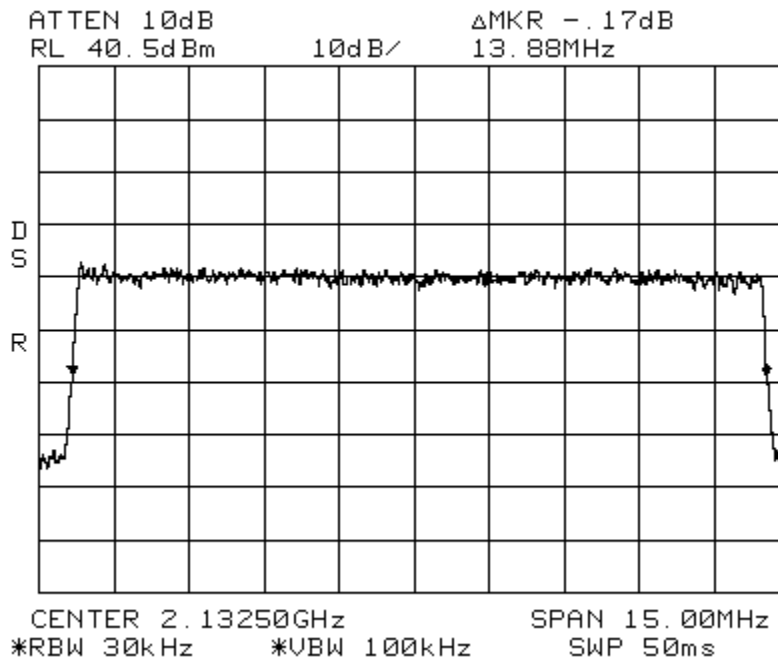
AWS Path 1



Occupied Bandwidth

LTE 15 MHz Channel Bandwidth_Signal_Out
Span: 15 MHz RBW: 30 kHz VBW: 100 kHz

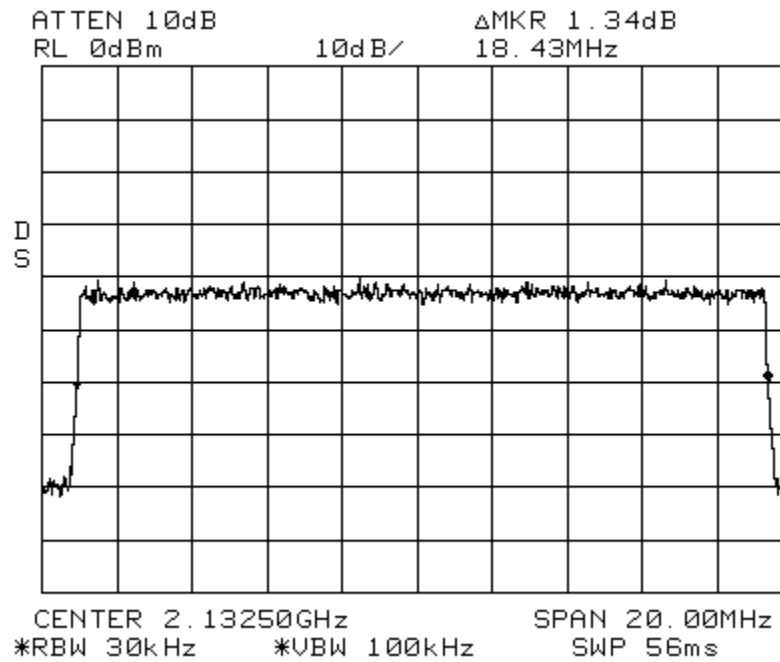
AWS Path 1



Occupied Bandwidth

LTE 20 MHz Channel Bandwidth_Signal_In
Span: 20 MHz RBW: 30 kHz VBW: 100 kHz

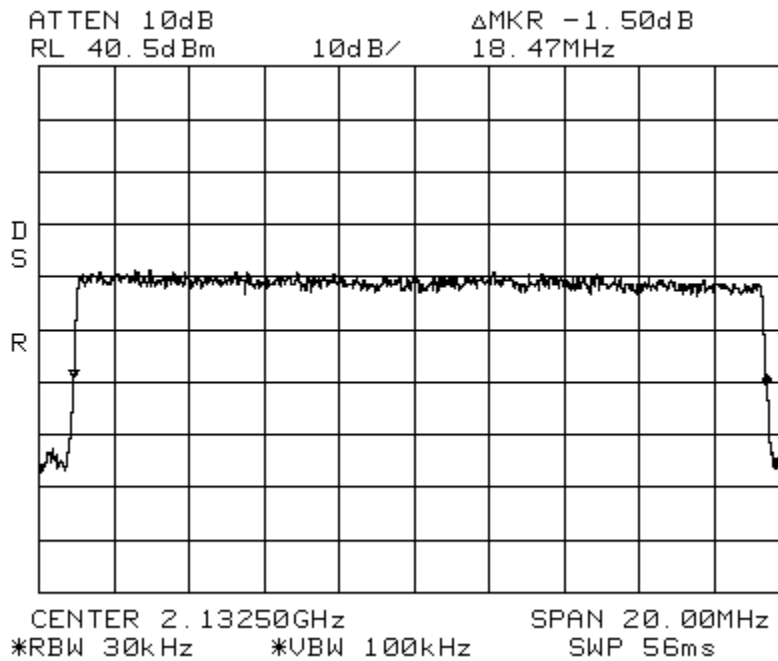
AWS Path 1



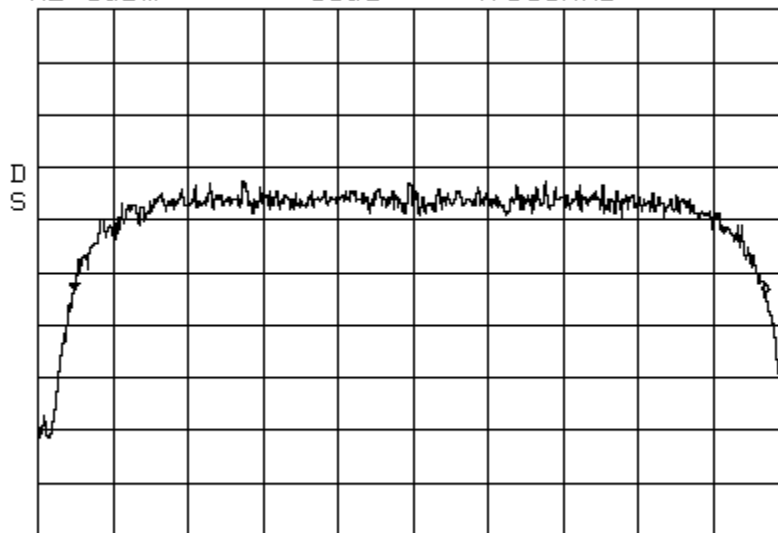
Occupied Bandwidth

LTE 20 MHz Channel Bandwidth_Signal_Out
Span: 20 MHz RBW: 30 kHz VBW: 100 kHz

AWS Path 1



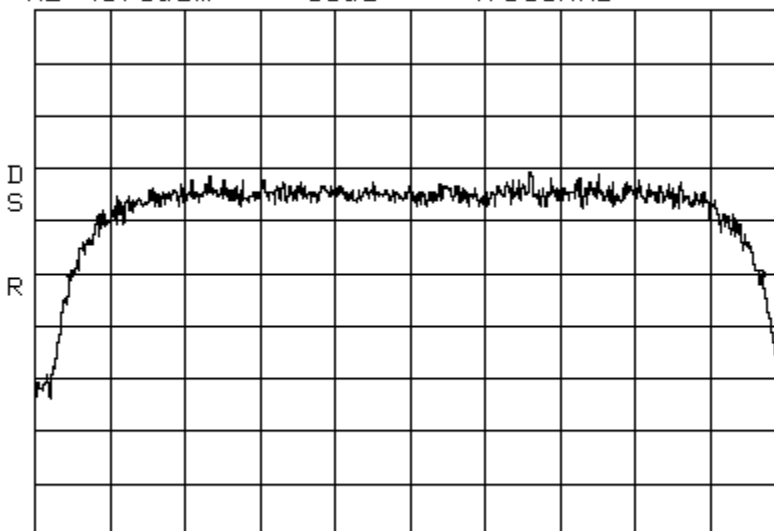
Occupied Bandwidth WCDMA_Signal_In Spectrum AWS Path 2
 Span: 4.8 MHz RBW: 30 kHz VBW: 100 kHz
 ATTEN 10dB Δ MKR -.84dB
 RL 0dBm 10dB/ 4.608MHz



CENTER 2.13250GHz SPAN 5.000MHz
 *RBW 30kHz *VBW 100kHz SWP 50ms

Occupied Bandwidth WCDMA_Signal_Out Spectrum AWS Path 2
 Span: 4.8 MHz RBW: 30 kHz VBW: 100 kHz

ATTEN 10dB Δ MKR .16dB
 RL 40.5dBm 10dB/ 4.608MHz



CENTER 2.13250GHz SPAN 5.000MHz
 *RBW 30kHz *VBW 100kHz SWP 50ms

Occupied Bandwidth

LTE 3 MHz Channel Bandwidth_Signal_In

AWS Path 2

Span: 3 MHz

RBW: 30kHz VBW: 100 kHz

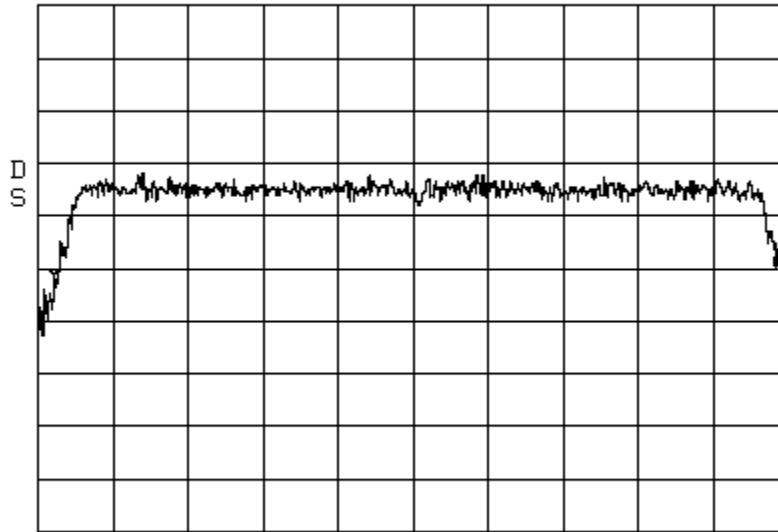
ATTEN 10dB

Δ MKR 1.66dB

RL 0dBm

10dB/

2.890MHz



CENTER 2.132500GHz

SPAN 3.000MHz

*RBW 30kHz

*VBW 100kHz

SWP 50ms

Occupied Bandwidth

LTE 3 MHz Channel Bandwidth_Signal_Out

AWS Path 2

Span: 3 MHz

RBW: 30 kHz VBW: 100 kHz

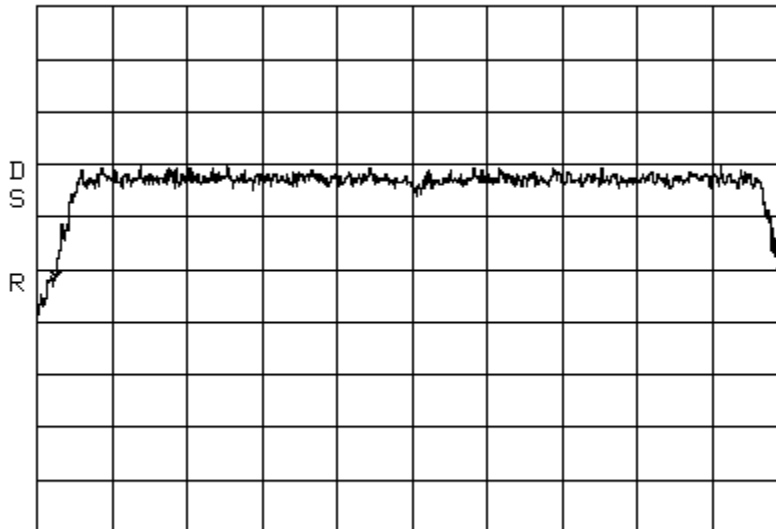
ATTEN 10dB

Δ MKR .50dB

RL 40.5dBm

10dB/

2.900MHz



CENTER 2.132500GHz

SPAN 3.000MHz

*RBW 30kHz

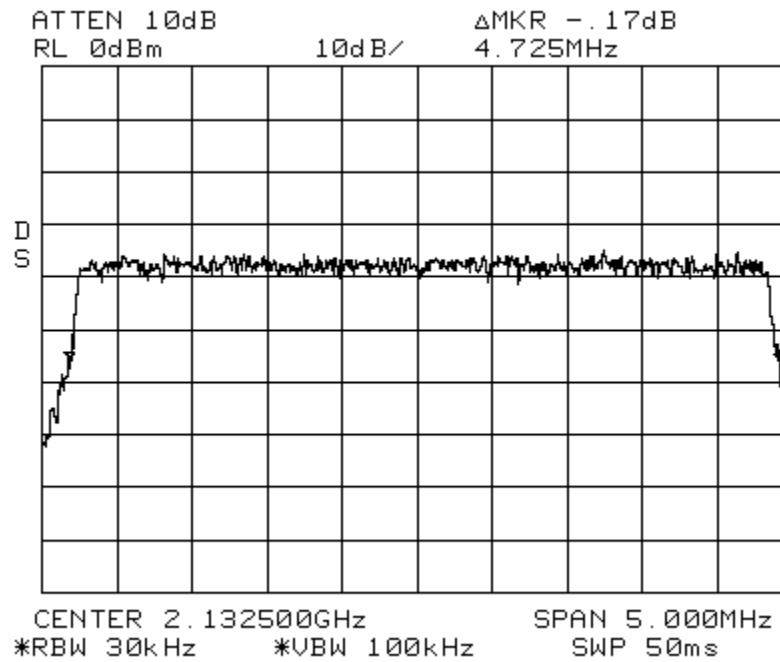
*VBW 100kHz

SWP 50ms

Occupied Bandwidth

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

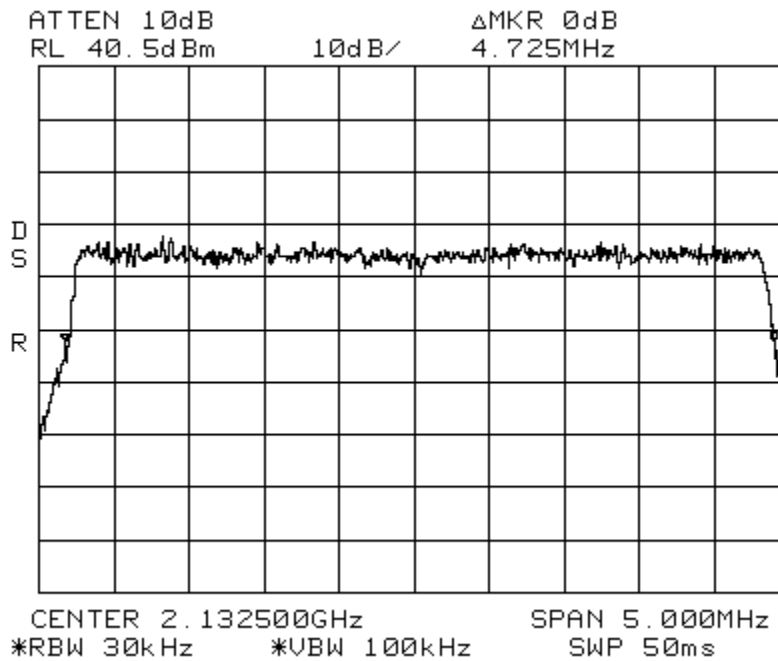
AWS Path 2



Occupied Bandwidth

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

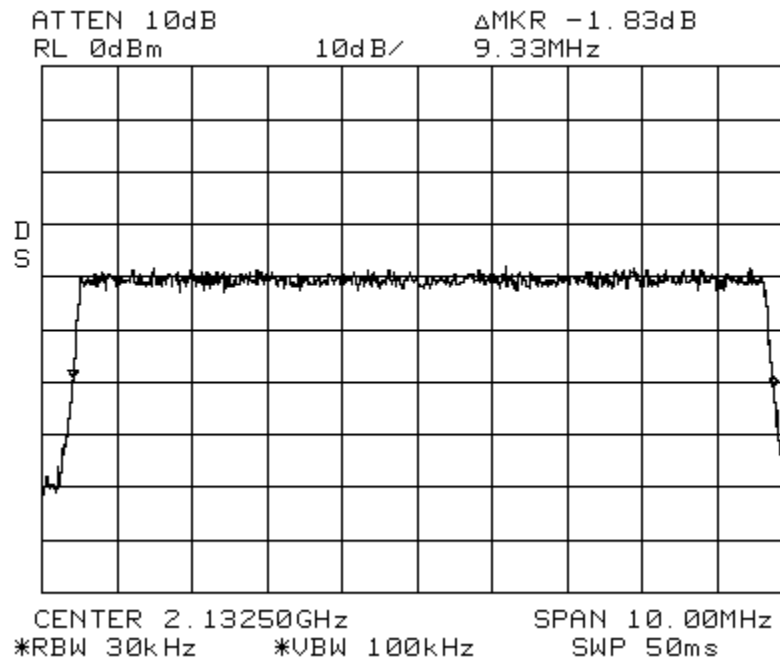
AWS Path 2



Occupied Bandwidth

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

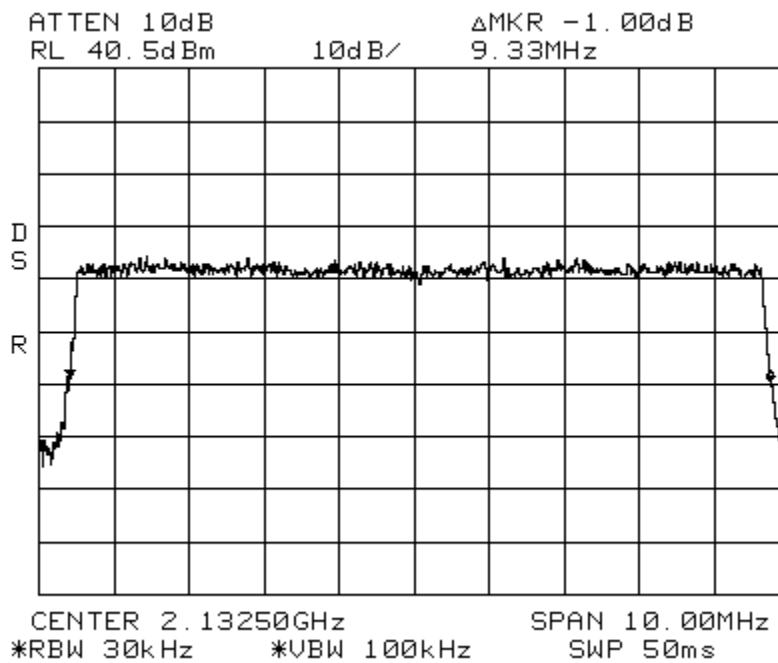
AWS Path 2



Occupied Bandwidth

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

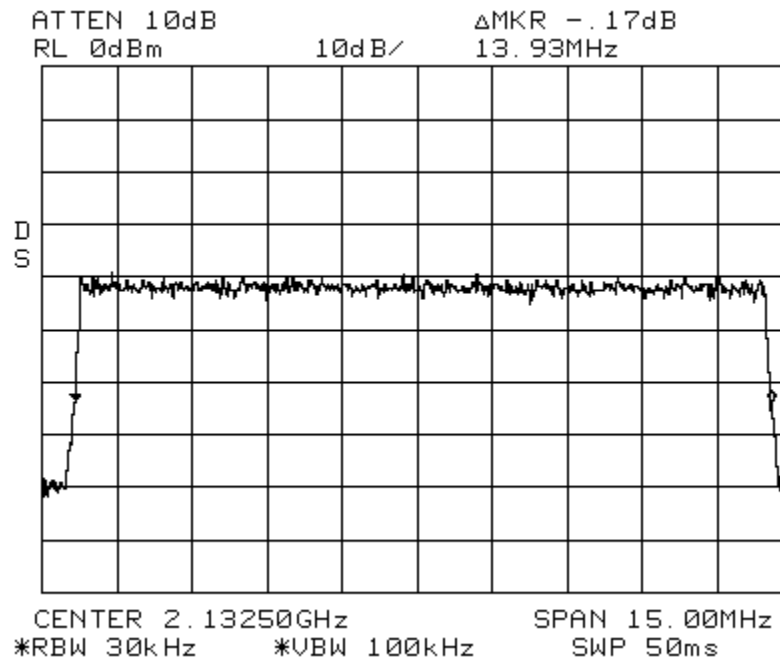
AWS Path 2



Occupied Bandwidth

LTE 15 MHz Channel Bandwidth_Signal_In
Span: 15 MHz RBW: 30 kHz VBW: 100 kHz

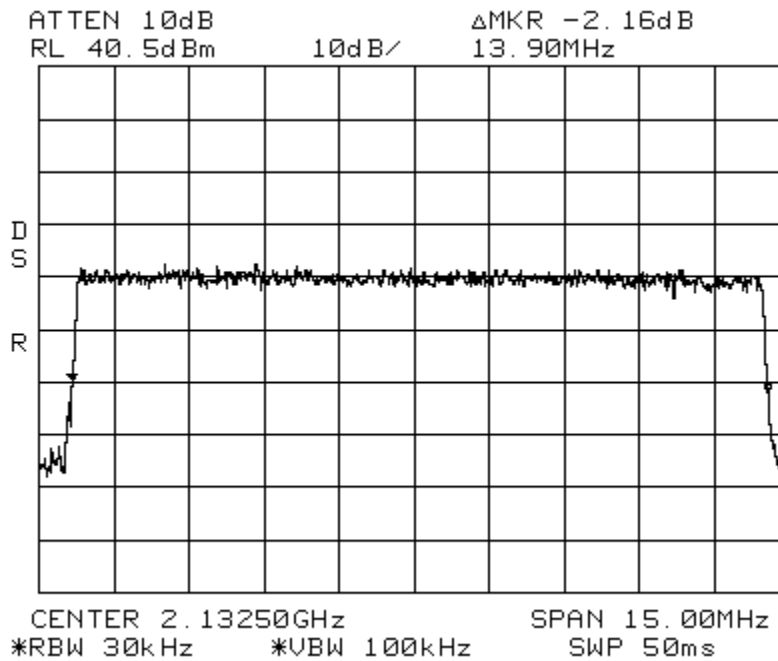
AWS Path 2



Occupied Bandwidth

LTE 15 MHz Channel Bandwidth_Signal_Out
Span: 15 MHz RBW: 30 kHz VBW: 100 kHz

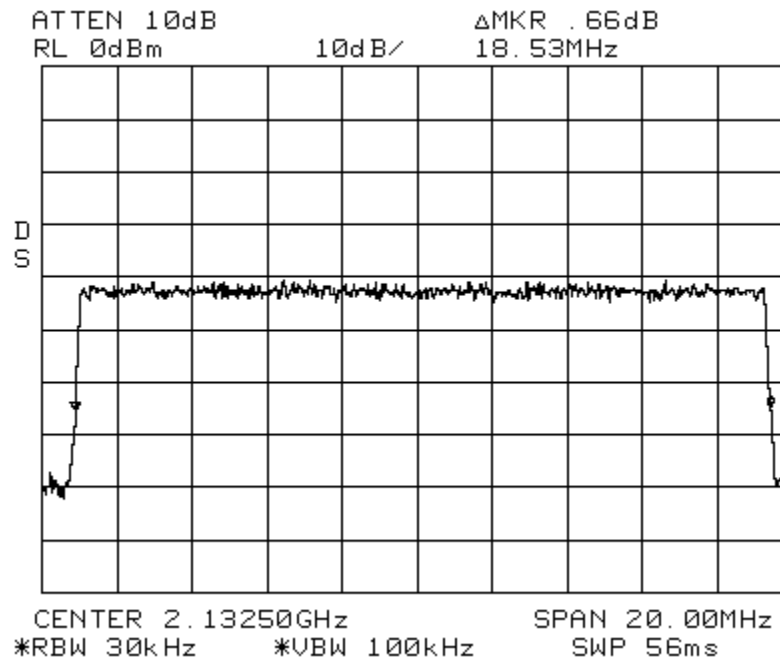
AWS Path 2



Occupied Bandwidth

LTE 20 MHz Channel Bandwidth_Signal_In
Span: 20 MHz RBW: 30 kHz VBW: 100 kHz

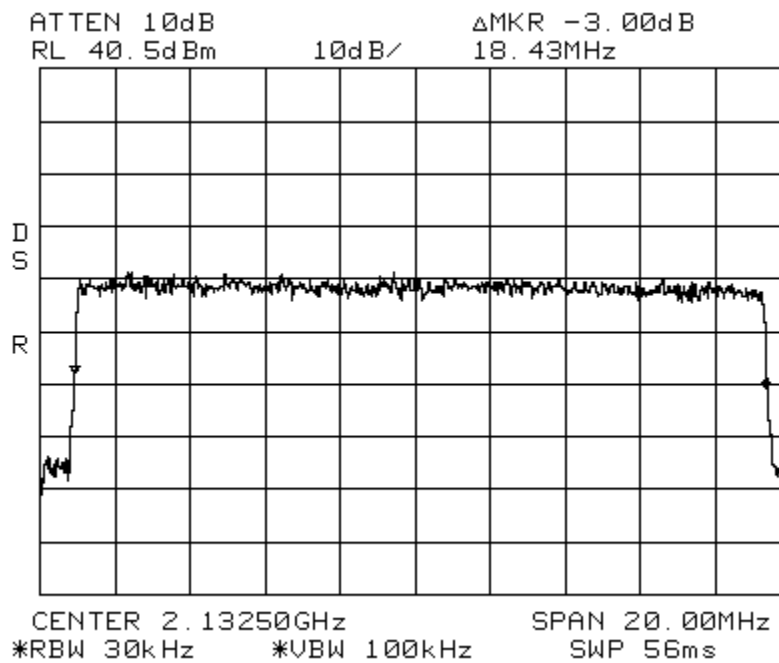
AWS Path 2



Occupied Bandwidth

LTE 20 MHz Channel Bandwidth_Signal_Out
Span: 20 MHz RBW: 30 kHz VBW: 100 kHz

AWS Path 2



Measurement Protocol

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Measurement Protocol

Environmental conditions of the lab, (ADC)

Temperature: 25° C

Relative Humidity: 29 %

Atmospheric Pressure: 98.0 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: 100789984MIN-001

Test Engineer: Richard Blonigen**Date:** 20 July, 2012**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