



Test Report Summary

FCC CFR 47, Part 90

Private Land Mobile Radio Service/Commercial Radio Services

**FCC CFR 47, Part 24
Subpart E Broadband PCS**

Manufacturer: ADC Telecommunications, Inc.

Name of Equipment: Spectrum 800SMR/1900PCS HP MRAU

Model Number(s): SPT-M3-8019-31-HP

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

Test Report Number: MN140203 800SMR 1900PCS HP MRAU

Test Date(s): 15, 16 October, 2013 (Intertek)
20, 22 June & 10 July, 2012 (ADC)
21 October, 2013 (ADC)
31 January, 2014, 3, 26 February, 2014 (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 90 and 24.

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 90 and 24. The EUT fulfills the requirements of the Federal Communications Commission's CFR 47 Part 90 and 24.

Date: 3 February, 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 55739
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: MN140203 800SMR 1900PCS HP MRAU

Date of Issue: 3 February, 2014

Model Number(s): SPT-M3-8019-31-HP

Product Name: Spectrum 800 SMR/1900PCS HP MRAU

Product Type: Industrial Booster/Indoor DAS/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: **101358077MIN-001**
Reference(s)

Total pages including Appendices: 142



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2.0 REVISION DESCRIPTION

Rev	Total Pages	Date	Description
A	135	October 28, 2013	Original Release
B	142		Added IMD Plots 90.219(d) Section 5.4 and updated Section 5.1
C	139	February 3, 2014	Updated for separating 800 band into 851-862MHz and 862-869MHz band to comply with new FCC booster classifications.
D	139	February 18, 2014	Update to 3.8 "Installation"
E	142	February 26, 2014	Added UL Noise Figure and DL Noise Floor Plots

3.0 DOCUMENTATION

3.1 Test Regulations

<u>FCC Section</u>	<u>Test</u>	<u>Results</u>
90.213	Frequency Stability	Pass
90.205	Power and Antenna Height Limits	Pass
90.209	Bandwidth Limitations	Pass
90.210	Emission Masks	N/A
90.219	Use of Signal Boosters	Pass
24.235	Frequency Stability	Pass
24.232	Effective Radiated Power Limits	Pass
24.238	Emissions Limits for PCS	Pass

The emissions tests were performed according to the following regulations:

- **FCC Part 90**

- **FCC Part 24**

Environmental Conditions in the lab:

ADC

Temperature: 25° C

Relative Humidity: 30%

Atmospheric Pressure: 98.2 kPa

Power Supply Utilized: Power Supply System

Intertek

15-35° C

30-60%

86-106 kPa

: 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 – SMR – 851 to 862 PLMRS (Class B) & 862 - 869 MHz CRMS

Normal Operation – PCS – 1930 to 1995 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:

System is employed as an indoor booster/repeater. Certification of this product is contained in the "Downlink Path" only. The Host section of the system will be hardwired to the operator's base station in which a certification in the uplink path is not required.

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-M3-8019-31-HP	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/Product Information:

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 ≈ -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.

The RAU will incorporate an antenna of 3dBi when installed. See section 5.1 for compliance to 90.219(e)(1)

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

See Intertek report: **101358077MIN-001**

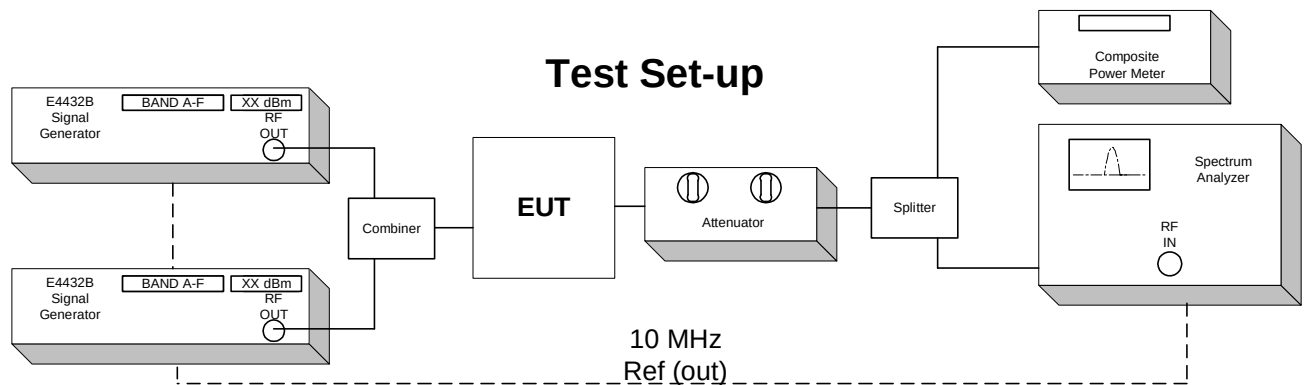
4.2 Test Set-up Drawings

Conducted and Radiated Emission Limits Test

Conducted Output Power Test

Inter-Modulation Test

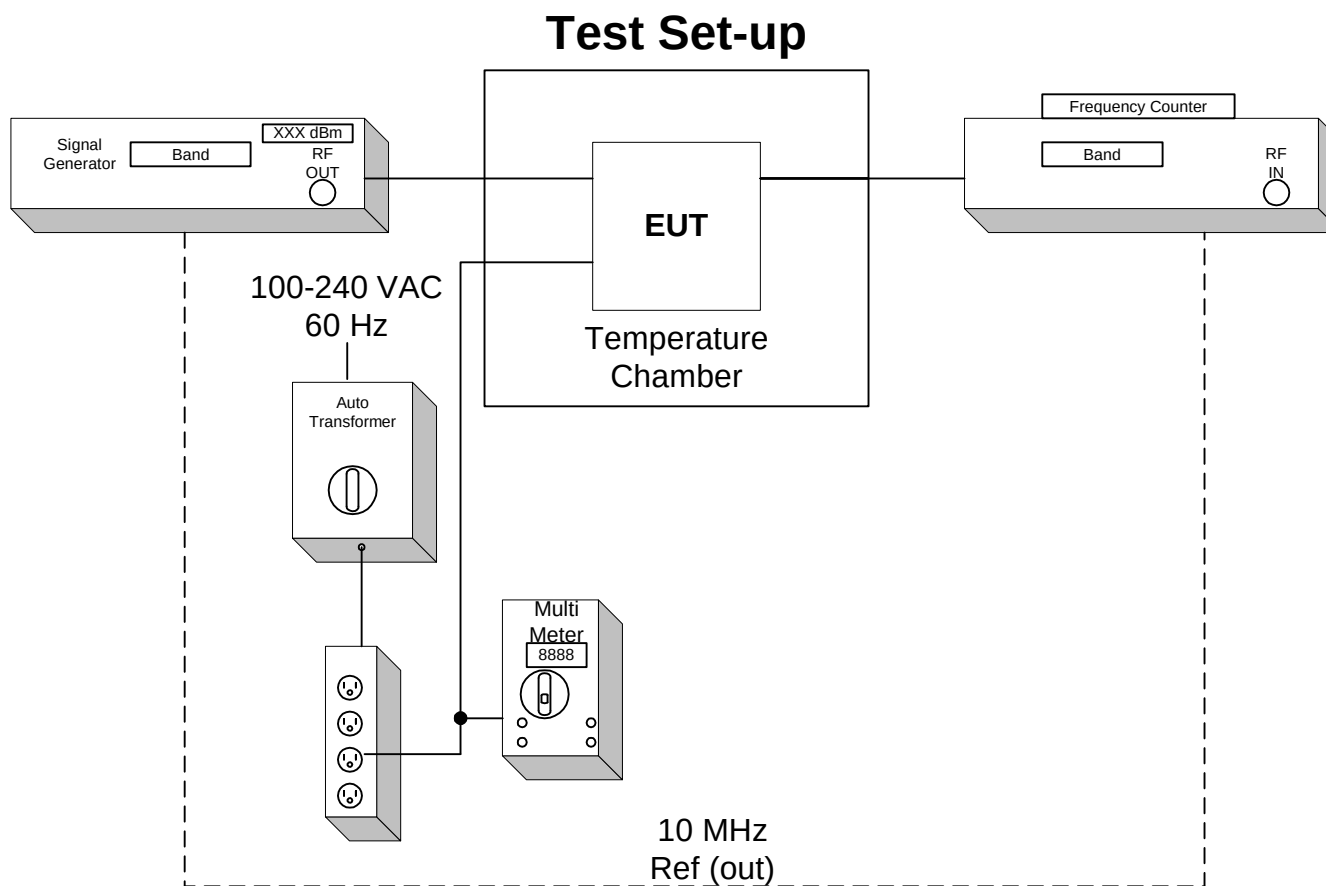
Occupied Bandwidth Modulation Test



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 FCC 2.1046, 90.205, 90.219(e)(1) & 24.232 Power Limits – Output Power

Test Summary:

- The requirements are: ▪ **MET** □ NOT MET
- Minimum margin of compliance is 19.69 dB at 862.04 MHz SMR iDEN
 - Using +3dBi antenna = 22.69 dB (.1857 W ERP)
- Minimum margin of compliance is 26.54 dB at 851.04 MHz SMR APCO 25 C4FM
 - Using +3dBi antenna = 29.54 dB (.8994 W ERP)
- Minimum margin of compliance is 19.27 dB at 865.5 MHz SMR CDMA
 - Using +3dBi antenna = 22.27 dB (.1686 W ERP)
- Minimum margin of compliance is 18.35 dB at 865.5 MHz SMR LTE 3 MHz
 - Using +3dBi antenna = 21.35 dB (.1364 W ERP)
- Minimum margin of compliance is 25.55 dB at 1962.5 MHz PCS CDMA
- Minimum margin of compliance is 27.53 dB at 1962.5 MHz PCS GSM
- Minimum margin of compliance is 27.83 dB at 1962.5 MHz PCS EDGE
- Minimum margin of compliance is 23.26 dB at 1962.5 MHz PCS WCDMA
- Minimum margin of compliance is 23.99 dB at 1962.5 MHz PCS LTE 3MHz
- Minimum margin of compliance is 23.33 dB at 1962.5 MHz PCS LTE 5MHz
- Minimum margin of compliance is 23.79 dB at 1962.5 MHz PCS LTE 10MHz
- Minimum margin of compliance is 23.48 dB at 1962.5 MHz PCS LTE 15MHz
- Minimum margin of compliance is 23.48 dB at 1962.5 MHz PCS LTE 20MHz

Test Methods Used:

TIA-603-C 2004, ANSI C63.4-2003, FCC 2.1046, 90.205, 90.219 & 24.232

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 input drive level was at maximum input rating of -11dBm (before saturation) and all gain settings in the software were set at maximum. The output from the EUT antenna connector was connected to the power meter. The carrier output, below, was conducted using a single iDEN, APCO 25 C4FM, LTE 3 MHz, 5MHz, 10MHz, 15MHz, 20MHz Channel Bandwidths & WCDMA signal generator. The output measurement was per carrier.

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: 10/14/13, 1/31/14 (800 SMR) & 6/20/12 (1900 PCS)

Tests Conducted By: Joshua J. Wittman

Test Equipment: 2, 6, 12, 13

Number	Description	Manufacturer	Model	ADC TELECOMMUNICATIONS Serial Number	Cal Due	Used
2	Power Meter	HP	437B	MC27754	6-30-14	☒
6	Signal Generator	Aeroflex	3413	MC57947	6-26-14	☒
9	Digital Barometer	Fisher Scientific	02-403	MC50719	3-4-14	☒
12	RF Power Sensor	Agilent	8482A	MC48747	6-30-14	☒
13	Spectrum Analyzer	Rohde & Schwarz	FSQ-8	MC57131	6-30-15	☒

Environmental Conditions in the lab:

Temperature: 23° C

Relative Humidity: 22%

Atmospheric Pressure: 99.7 kPa

Test Results:

800 SMR

iDEN 0.09311 Watts

Carrier Frequency	Carrier Output
862.04 MHz	<u>19.69</u> dBm
865.50 MHz	<u>18.79</u> dBm
868.96 MHz	<u>18.77</u> dBm

800 SMR

APCO 25 C4FM 0.45081 Watts

Carrier Frequency	Carrier Output
851.04 MHz	<u>26.54</u> dBm
856.50 MHz	<u>26.29</u> dBm
861.96 MHz	<u>26.28</u> dBm

800 SMR

CDMA 0.08452 Watts

Carrier Frequency	Carrier Output
862.8 MHz	<u>18.61</u> dBm
865.50 MHz	<u>19.27</u> dBm
868.2 MHz	<u>18.82</u> dBm

800 SMR

LTE 3 MHz 0.0683 Watts

Carrier Frequency	Carrier Output
863.5 MHz	<u>18.19</u> dBm
865.50 MHz	<u>18.35</u> dBm
867.5 MHz	<u>18.12</u> dBm

PCS

CDMA .3589 Watts

Carrier Frequency	Carrier Output
1930.8 MHz	<u>24.39</u> dBm
1962.5 MHz	<u>25.55</u> dBm
1994.2 MHz	<u>23.30</u> dBm

PCS**GSM .5662 Watts**

Carrier Frequency	Carrier Output
1930.2 MHz	<u>27.51</u> dBm
1962.5 MHz	<u>27.53</u> dBm
1994.8 MHz	<u>26.07</u> dBm

PCS**EDGE .6067 Watts**

Carrier Frequency	Carrier Output
1930.2 MHz	<u>26.62</u> dBm
1962.5 MHz	<u>27.83</u> dBm
1994.8 MHz	<u>26.10</u> dBm

PCS**WCDMA .2118 Watts**

Carrier Frequency	Carrier Output
1932.5 MHz	<u>20.65</u> dBm
1962.5 MHz	<u>23.26</u> dBm
1992.5 MHz	<u>20.34</u> dBm

PCS**LTE 3.0 MHz Ch. BW .2506 Watts**

Carrier Frequency	Carrier Output
1931.5 MHz	<u>22.58</u> dBm
1962.5 MHz	<u>23.99</u> dBm
1993.5 MHz	<u>21.15</u> dBm

PCS**LTE 5.0 MHz Ch. BW .2152 Watts**

Carrier Frequency	Carrier Output
1932.5 MHz	<u>22.00</u> dBm
1962.5 MHz	<u>23.33</u> dBm
1992.5 MHz	<u>20.45</u> dBm

PCS**LTE 10.0 MHz Ch. BW .2393 Watts**

Carrier Frequency	Carrier Output
1935.0 MHz	<u>23.22</u> dBm
1962.5 MHz	<u>23.79</u> dBm
1990.0 MHz	<u>20.81</u> dBm

PCS**LTE 15.0 MHz Ch. BW .2228 Watts**

Carrier Frequency	Carrier Output
1937.5 MHz	<u>22.90</u> dBm
1962.5 MHz	<u>23.48</u> dBm
1987.5 MHz	<u>21.22</u> dBm

PCS**LTE 20.0 MHz Ch. BW .2228 Watts**

Carrier Frequency	Carrier Output
1940.0 MHz	<u>23.20</u> dBm
1962.5 MHz	<u>23.48</u> dBm
1985.0 MHz	<u>21.68</u> dBm

5.2 FCC 90.209 & 24.238 – Occupied Bandwidth

Test Summary:

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

Test Methods Used:

TIA-603-C 2004, ANSI C63.4-2003, FCC 90.209, & 24.238

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: iDEN, APCO 25 C4FM, LTE 3 MHz, 5MHz, 10MHz, 15MHz, 20MHz Channel Bandwidths & WCDMA. 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: 10/14/13, 1/31/14 (800 SMR) & 6/20/12 (1900 PCS)

Tests Conducted By: Joshua J. Wittman

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

Number	Description	Manufacturer	Model	ADC TELECOMMUNICAT IONS Serial Number	Cal Due	Used
1	Spectrum Analyzer	HP	8563E	MC27690	8-21-14	☒
2	Power Meter	HP	437B	MC27839	6-30-14	☒
6	Signal Generator	Aeroflex	3413	MC57947	6-26-14	☒
9	Digital Barometer	Fisher Scientific	02-403	MC50719	3-4-14	☒
12	RF Power Sensor	Agilent	8482A	MC48773	6-30-14	☒

Environmental Conditions in the lab:

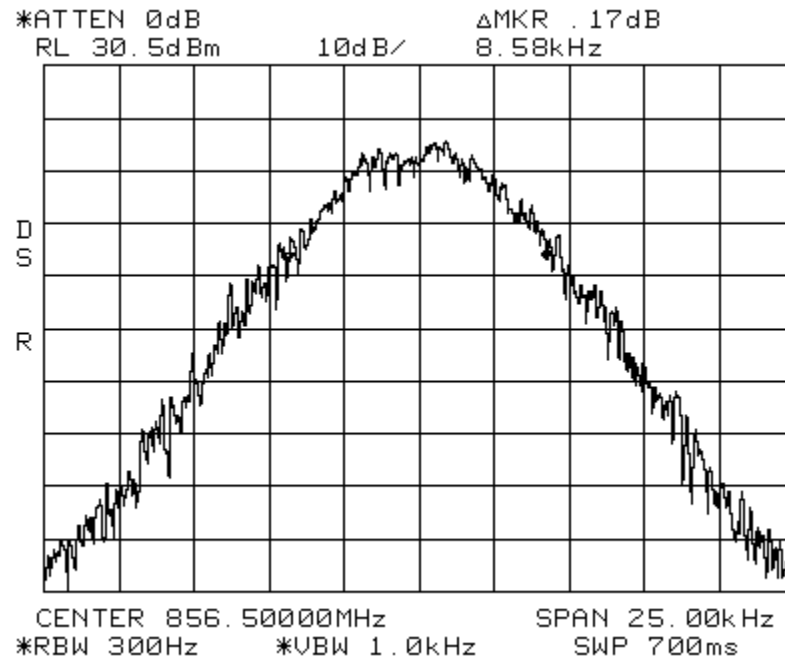
Temperature: 26° C

Relative Humidity: 25%

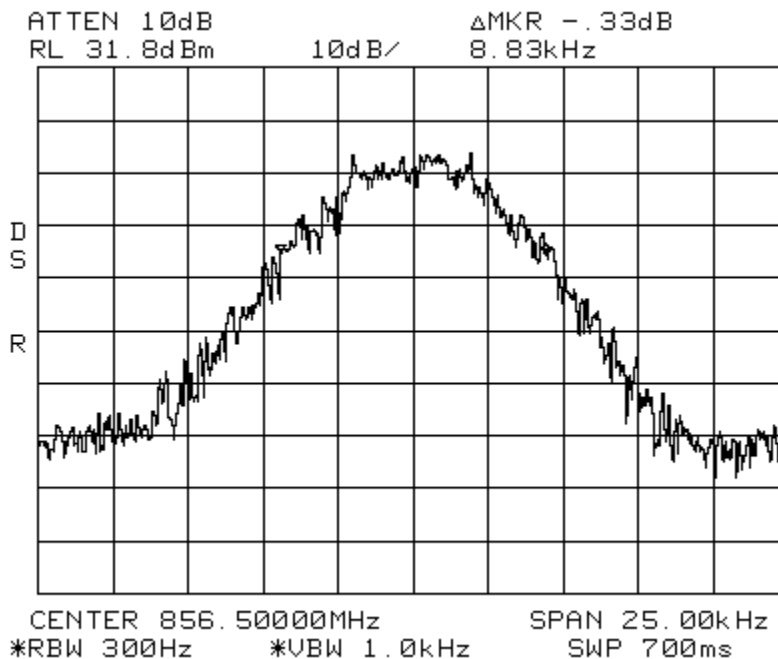
Atmospheric Pressure: 98.0 kPa

Test Results:

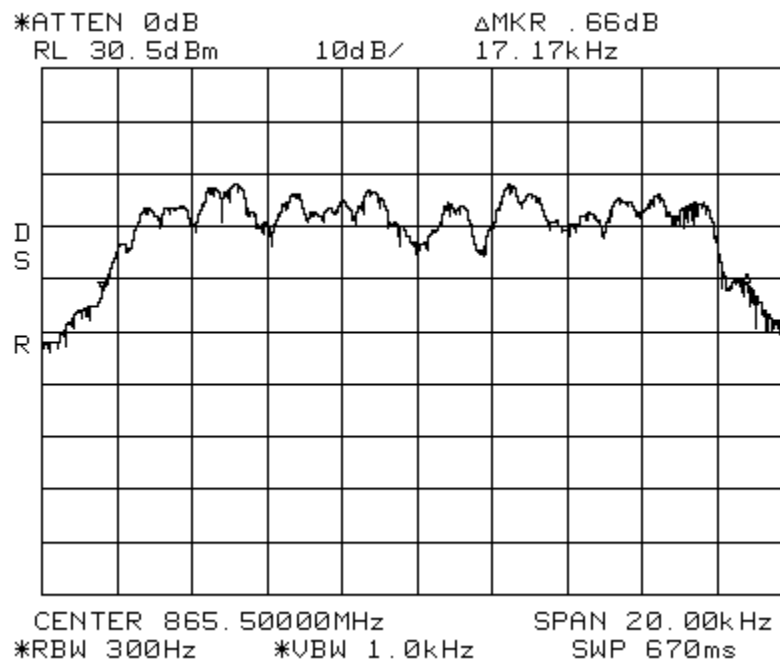
Occupied Bandwidth APCO 25 C4FM_Signal_In Spectrum 800 MHz SMR
Span: 25 kHz RBW: 300 Hz VBW: 1 kHz



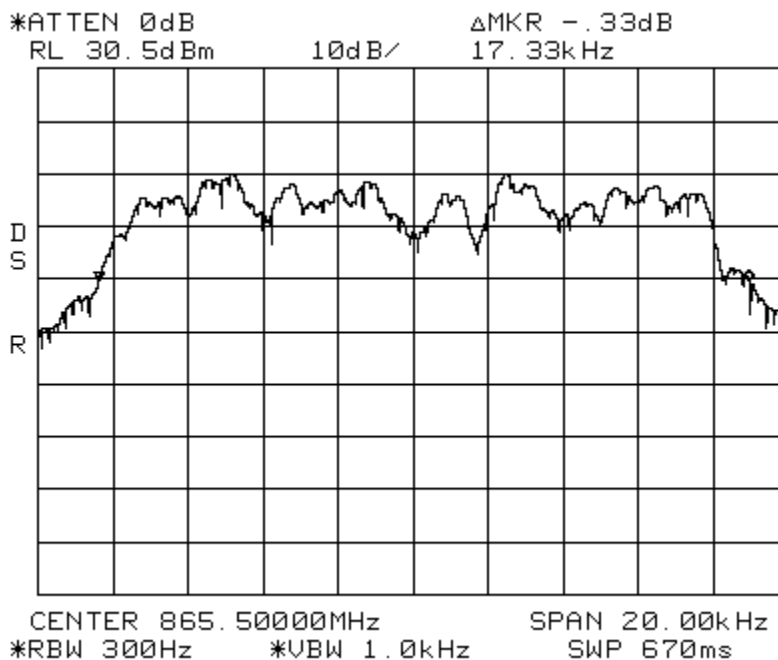
Occupied Bandwidth APCO 25 C4FM_Signal_Out Spectrum 800 MHz SMR
Span: 25 kHz RBW: 300 Hz VBW: 1 kHz



Occupied Bandwidth iDEN_Signal_In Spectrum 800 MHz SMR
 Span: 20 kHz RBW: 300 Hz VBW: 1 kHz



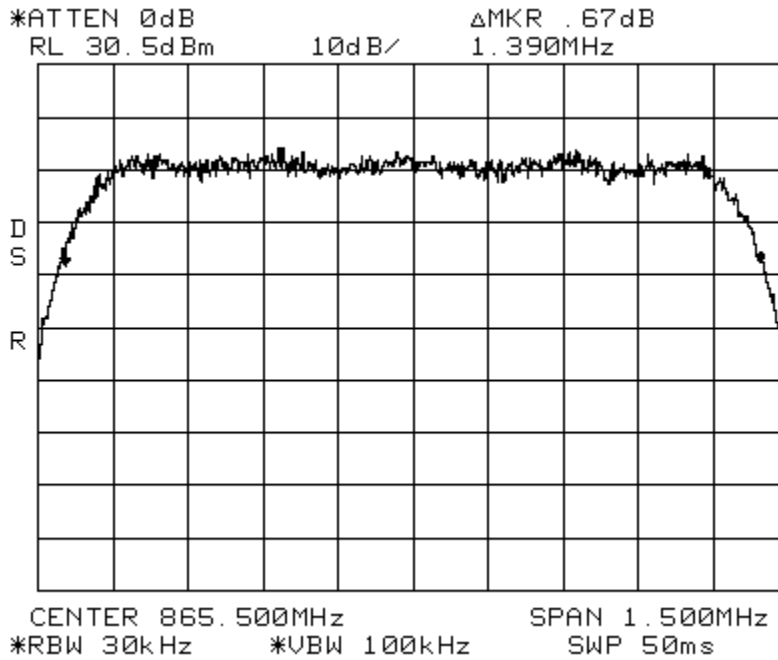
Occupied Bandwidth iDEN_Signal_Out Spectrum 800 MHz SMR
 Span: 20 kHz RBW: 300 Hz VBW: 1 kHz



Occupied Bandwidth
Span: 1.5 MHz

CDMA_Signal_In

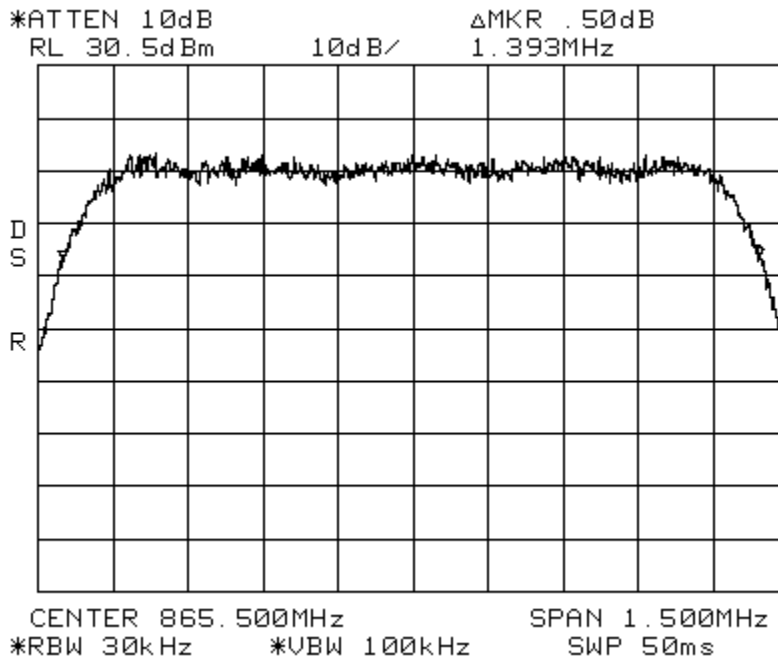
Spectrum 800 MHz SMR
RBW: 30 kHz VBW: 100 kHz



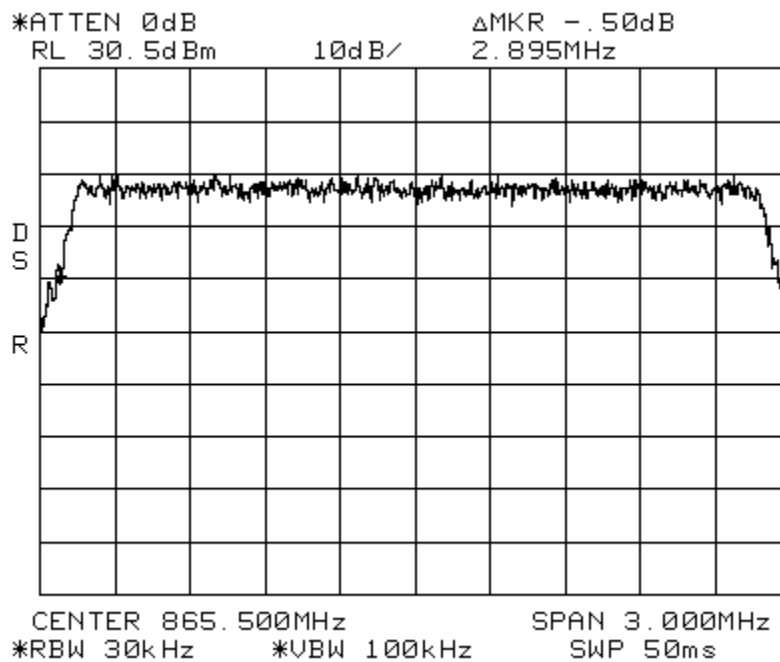
Occupied Bandwidth
Span: 1.5 MHz

CDMA_Signal_Out

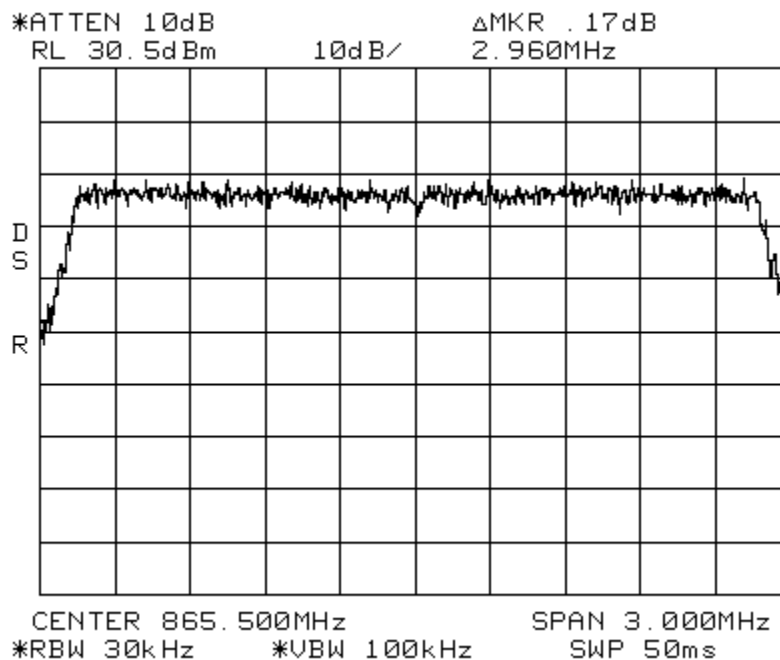
Spectrum 800 MHz SMR
RBW: 30 kHz VBW: 100 kHz

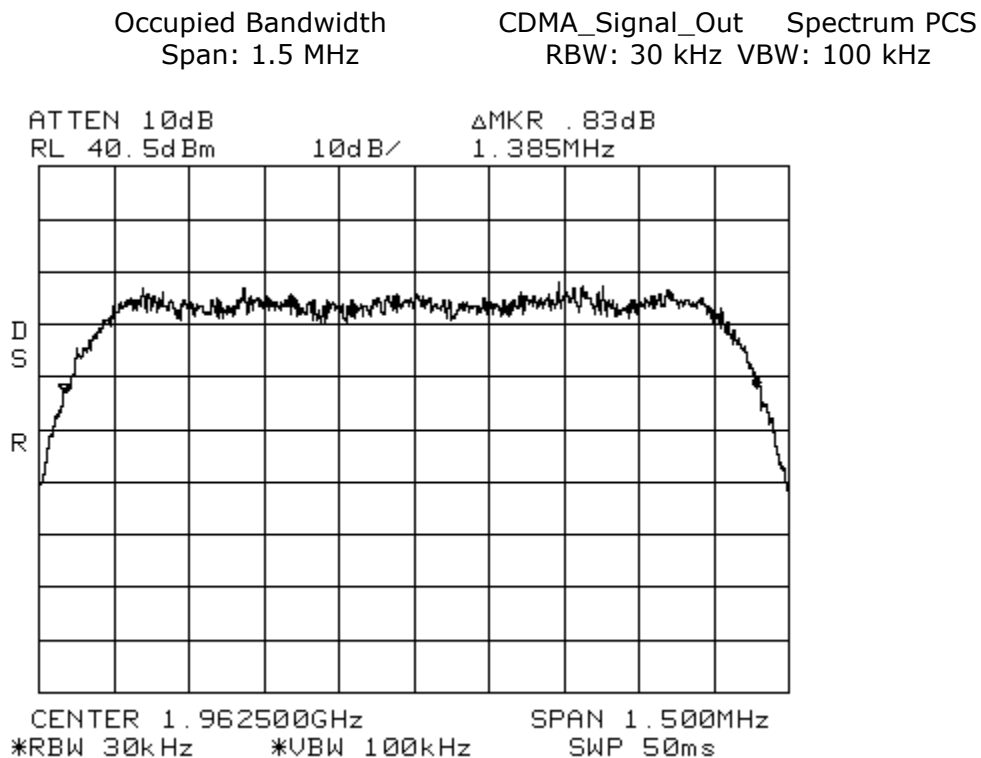
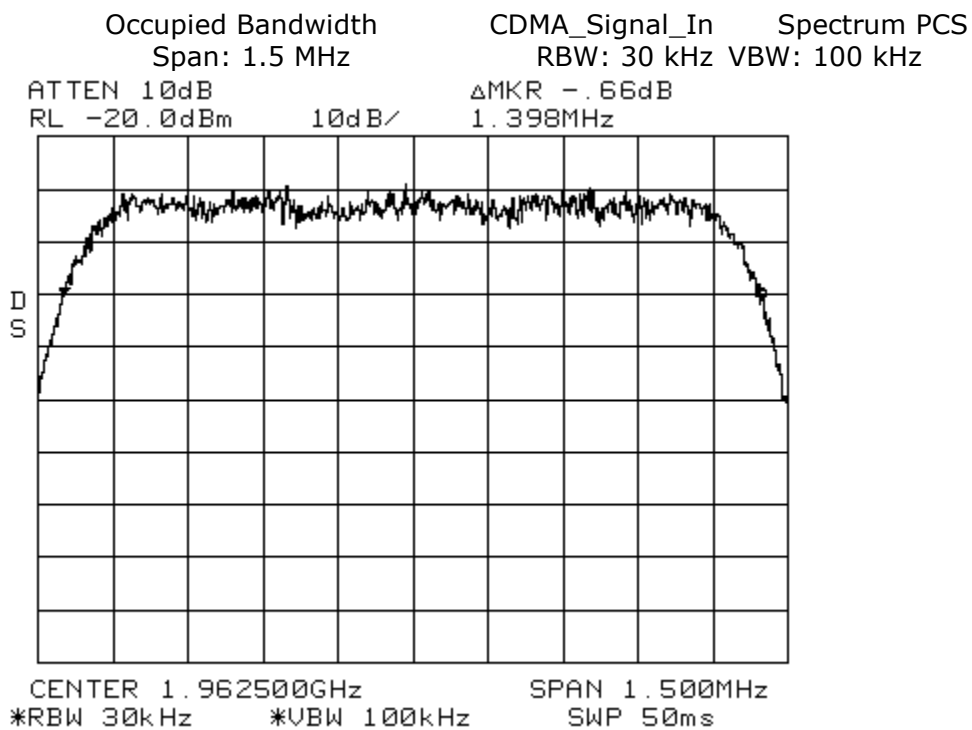


Occupied Bandwidth LTE 3 MHz Channel Bandwidth_Signal_In Spectrum 800 MHz SMR
 Span: 3 MHz RBW: 30 kHz VBW: 100 kHz



Occupied Bandwidth LTE 3 MHz Channel Bandwidth_Signal_OutSpectrum 800 MHz SMR
 Span: 3 MHz RBW: 30 kHz VBW: 100 kHz

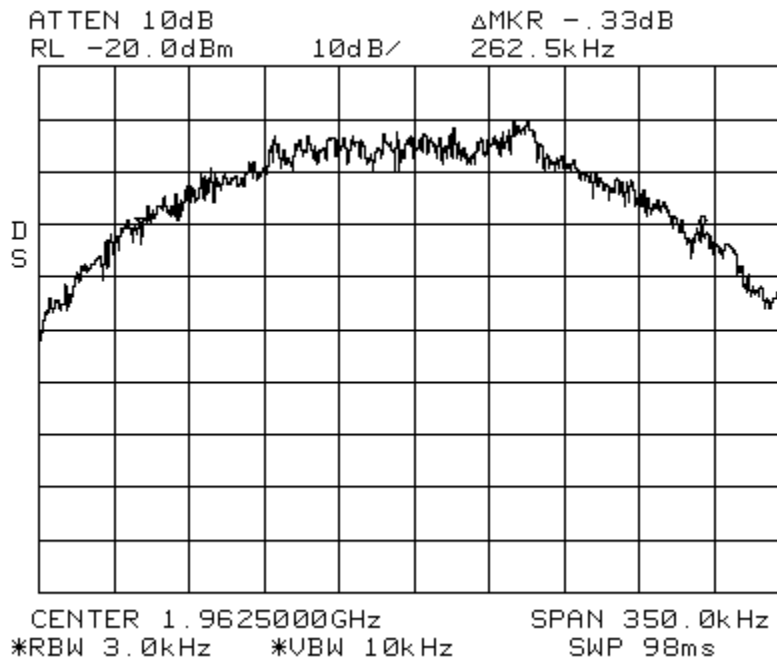




Occupied Bandwidth
Span: 350 kHz

EDGE_Signal_In
RBW: 3 kHz

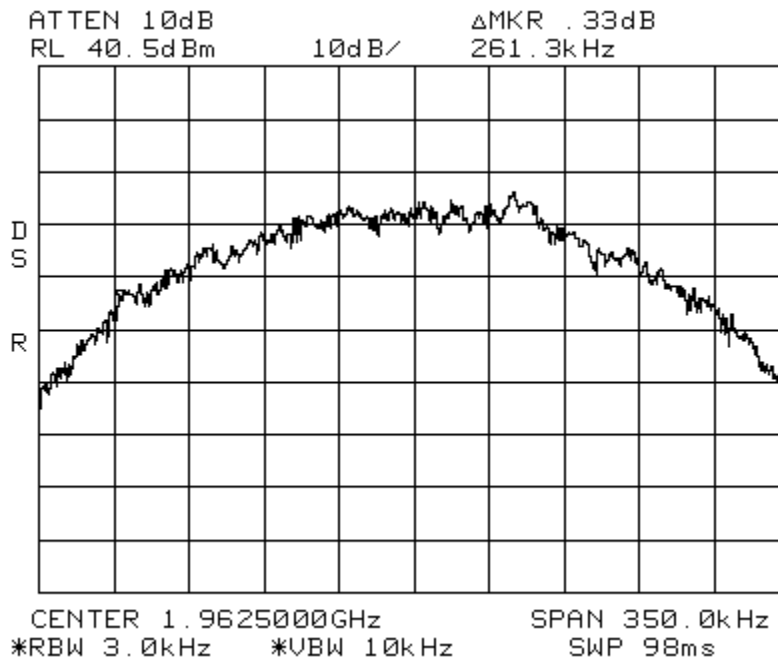
Spectrum PCS
VBW: 10 kHz



Occupied Bandwidth
Span: 350 kHz

EDGE_Signal_Out
RBW: 3 kHz

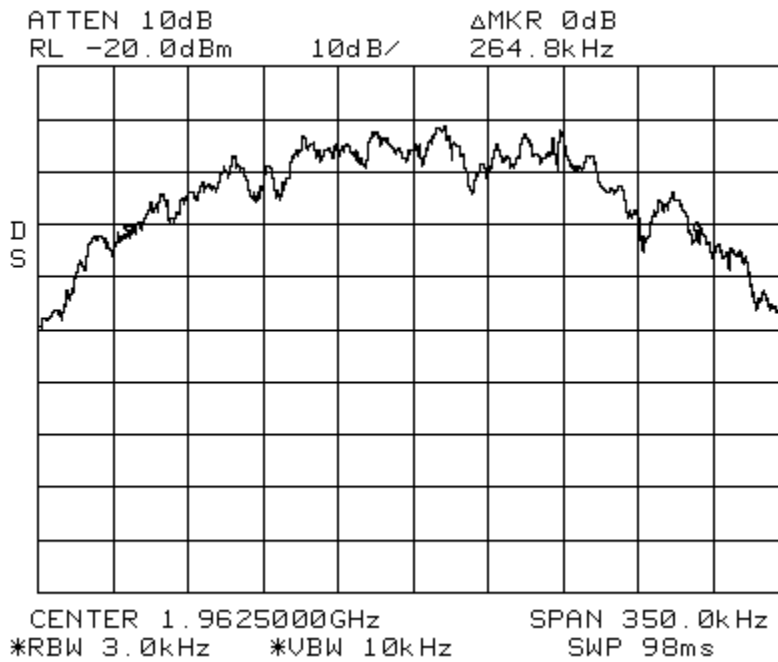
Spectrum PCS
VBW: 10 kHz



Occupied Bandwidth
Span: 350 kHz

GSM_Signal_In
RBW: 3 kHz VBW: 10 kHz

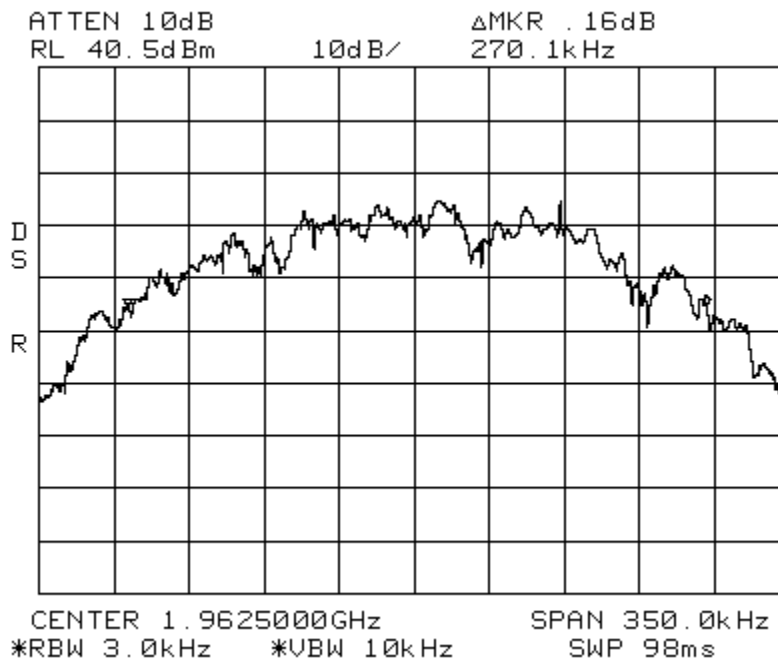
Spectrum PCS



Occupied Bandwidth
Span: 350 kHz

GSM_Signal_Out
RBW: 3 kHz VBW: 10 kHz

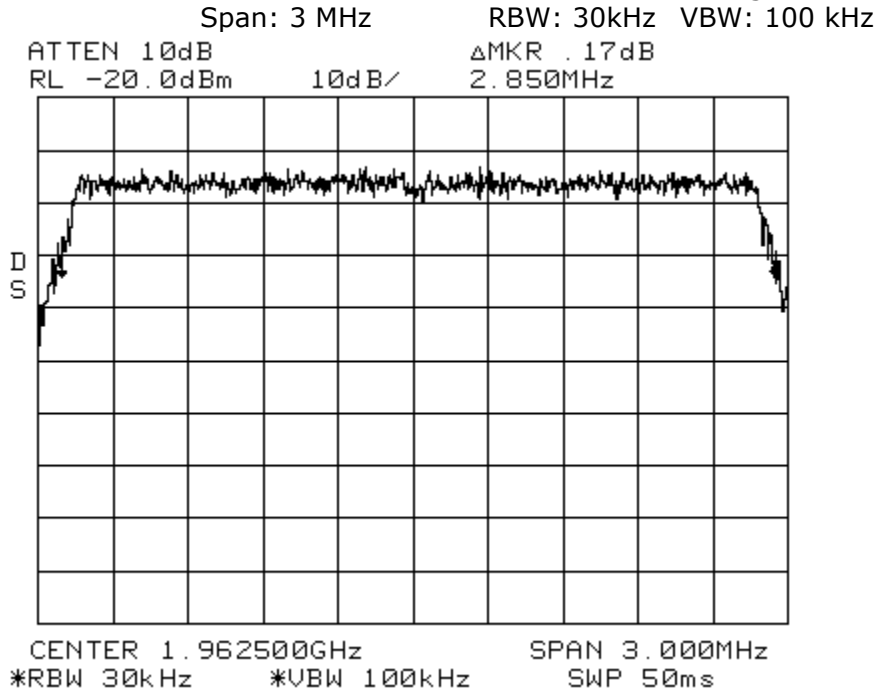
Spectrum PCS



Occupied Bandwidth

LTE 3 MHz Channel Bandwidth_Signal_In

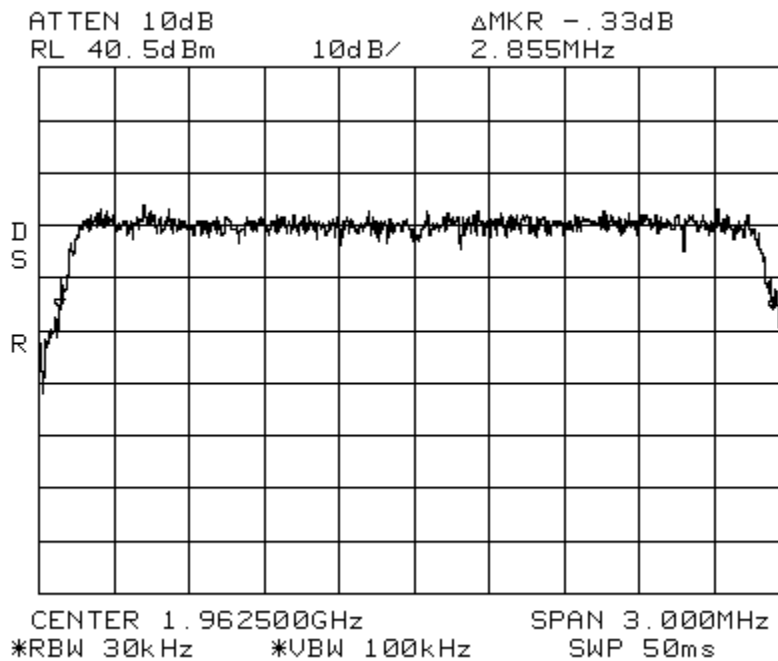
Spectrum PCS



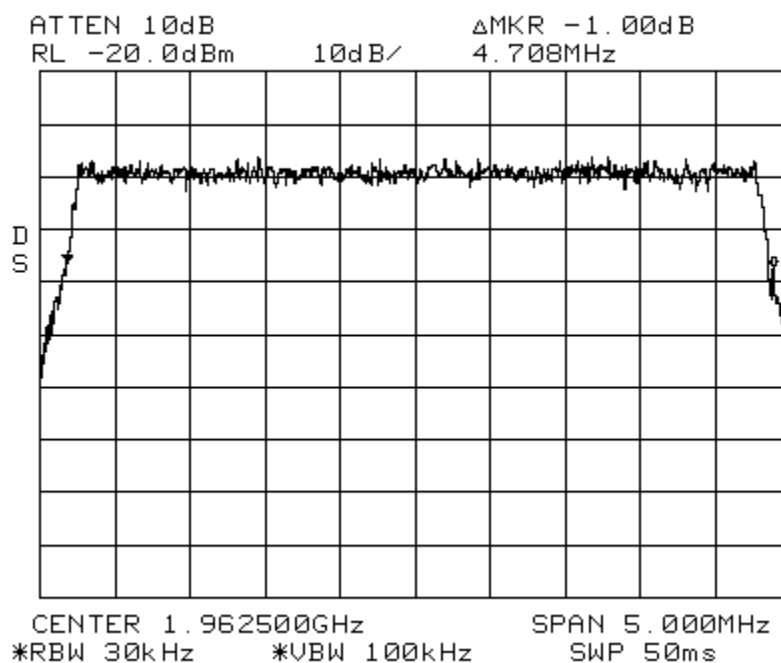
Occupied Bandwidth

LTE 3 MHz Channel Bandwidth_Signal_Out

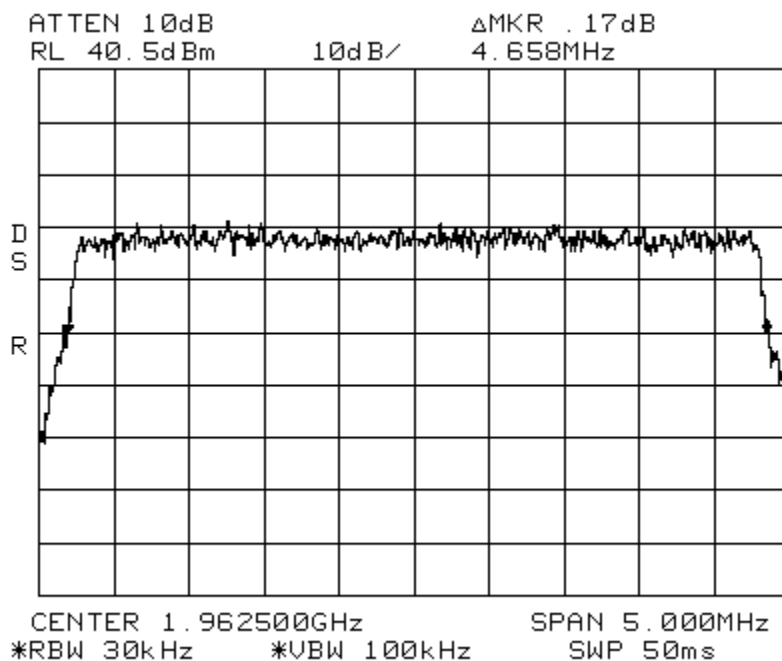
Spectrum PCS



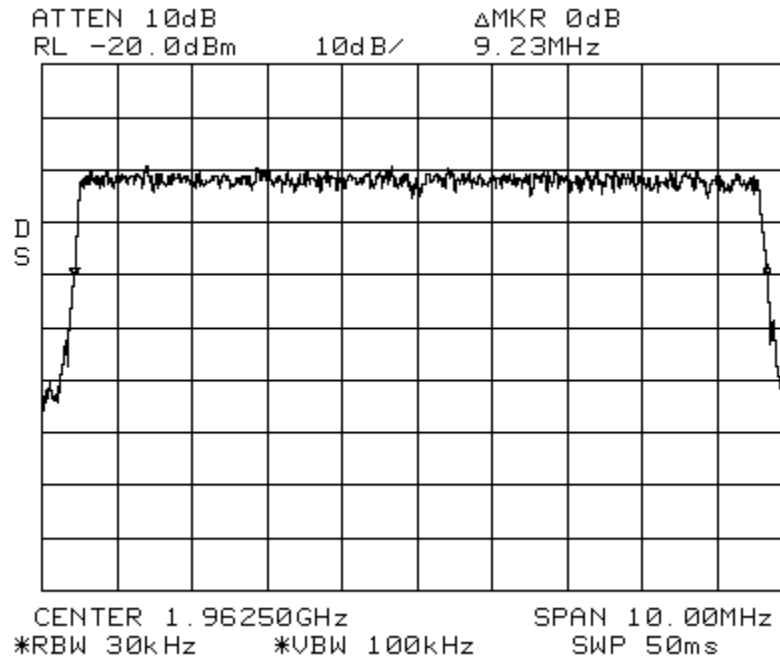
Occupied Bandwidth LTE 5 MHz Channel Bandwidth_Signal_In Spectrum PCS
 Span: 5 MHz RBW: 30 kHz VBW: 100 kHz



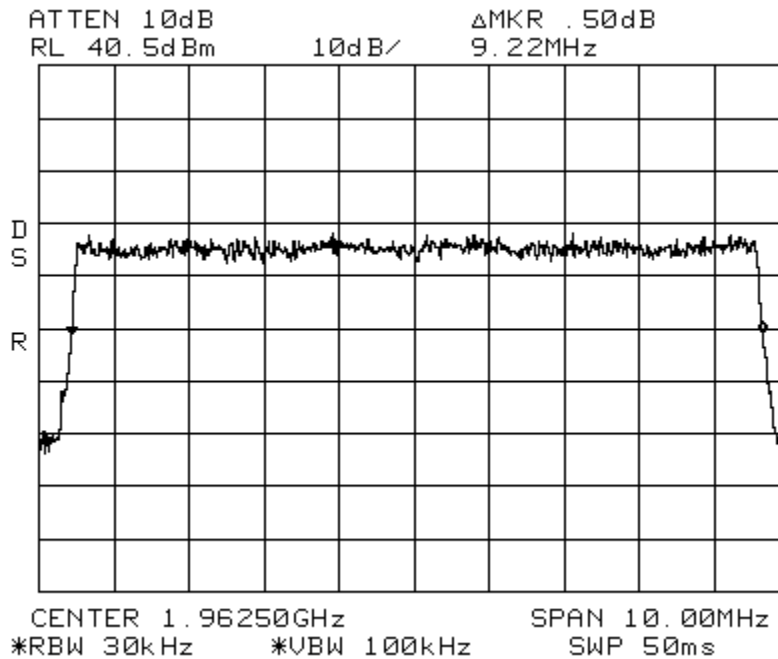
Occupied Bandwidth LTE 5 MHz Channel Bandwidth_Signal_Out Spectrum PCS
 Span: 5 MHz RBW: 30 kHz VBW: 100 kHz



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



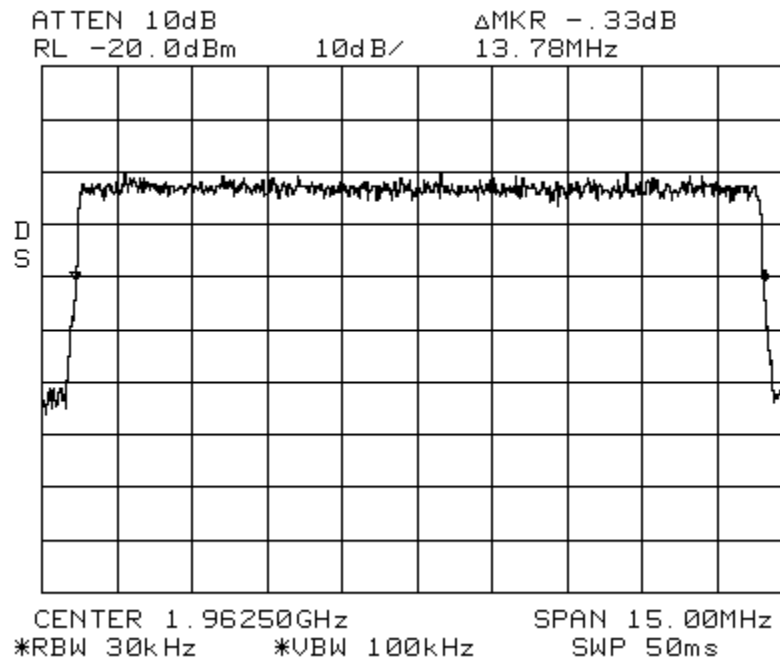
Occupied Bandwidth LTE 10 MHz Channel Bandwidth_Signal_Out Spectrum PCS
 Span: 10 MHz RBW: 30 kHz VBW: 100 kHz



Occupied Bandwidth

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

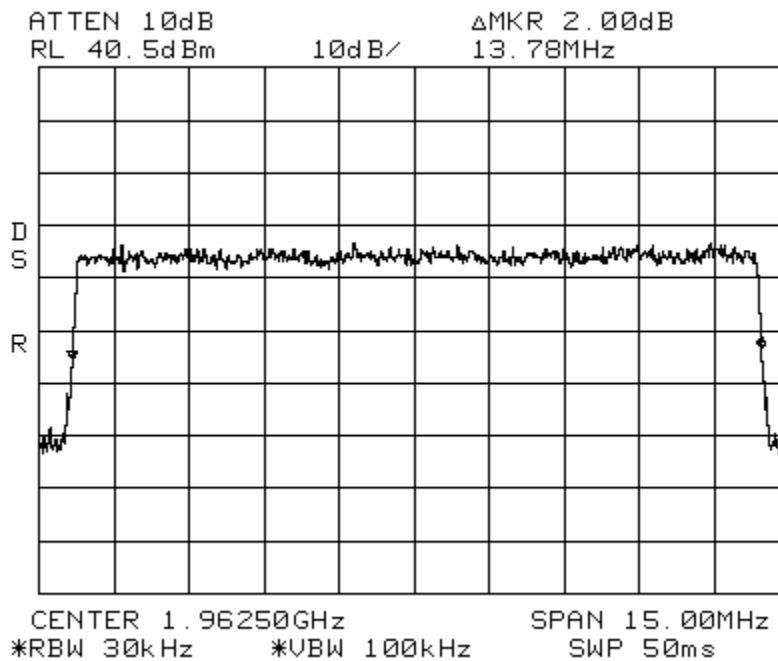
Spectrum PCS



Occupied Bandwidth

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

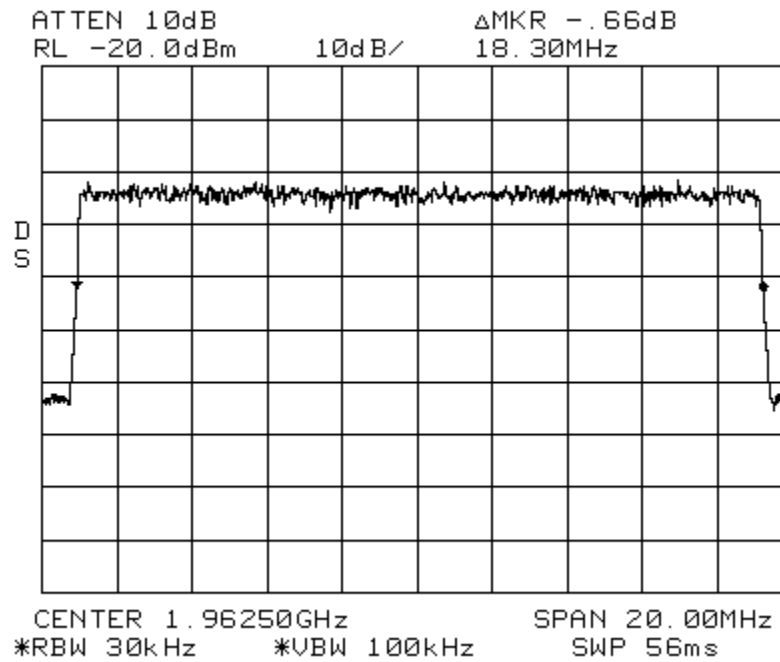
Spectrum PCS



Occupied Bandwidth

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

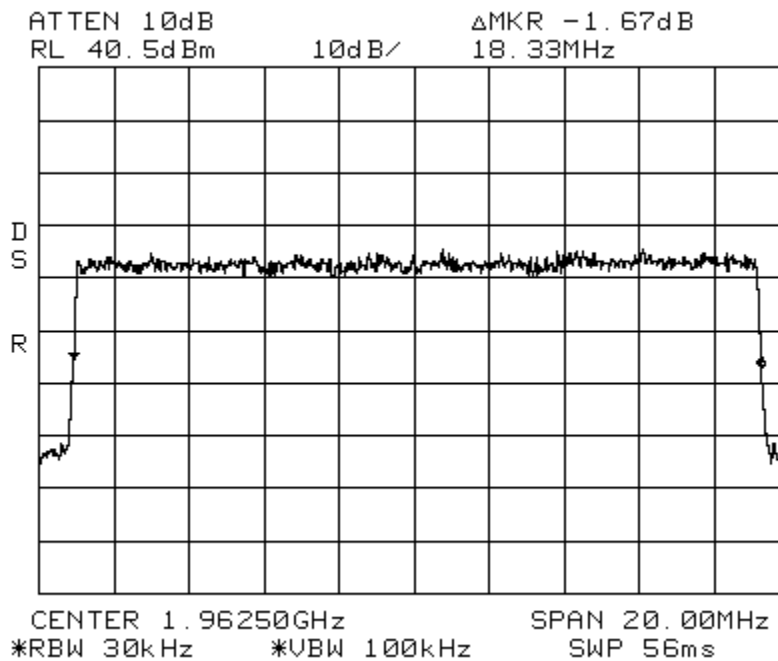
Spectrum PCS

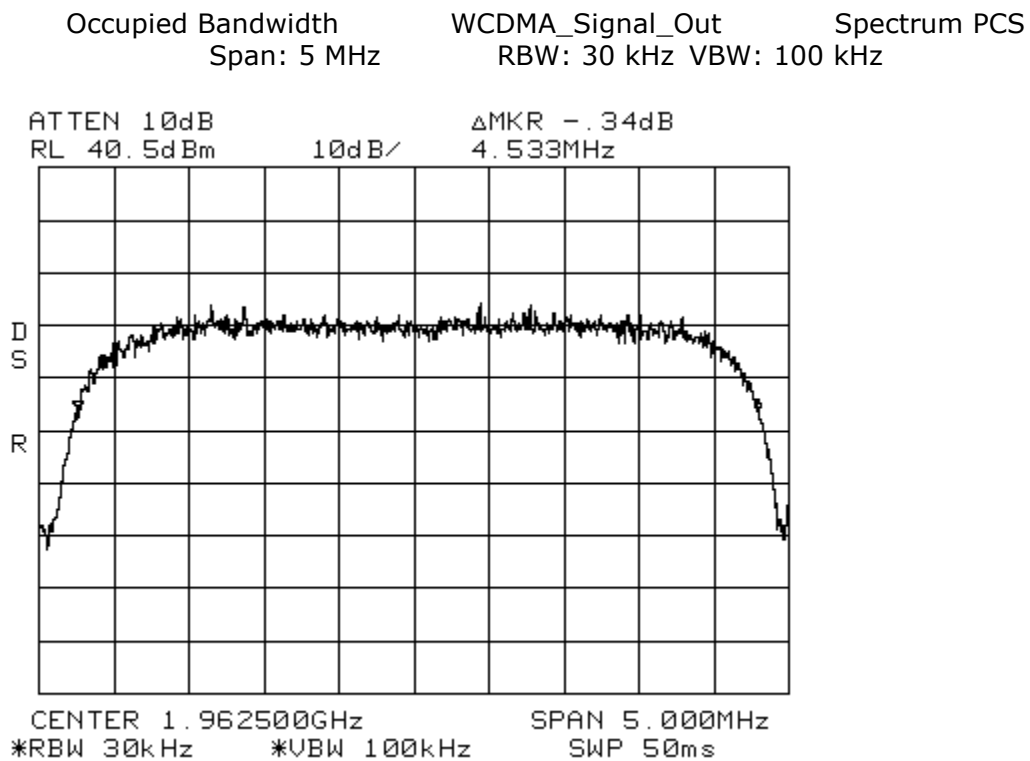
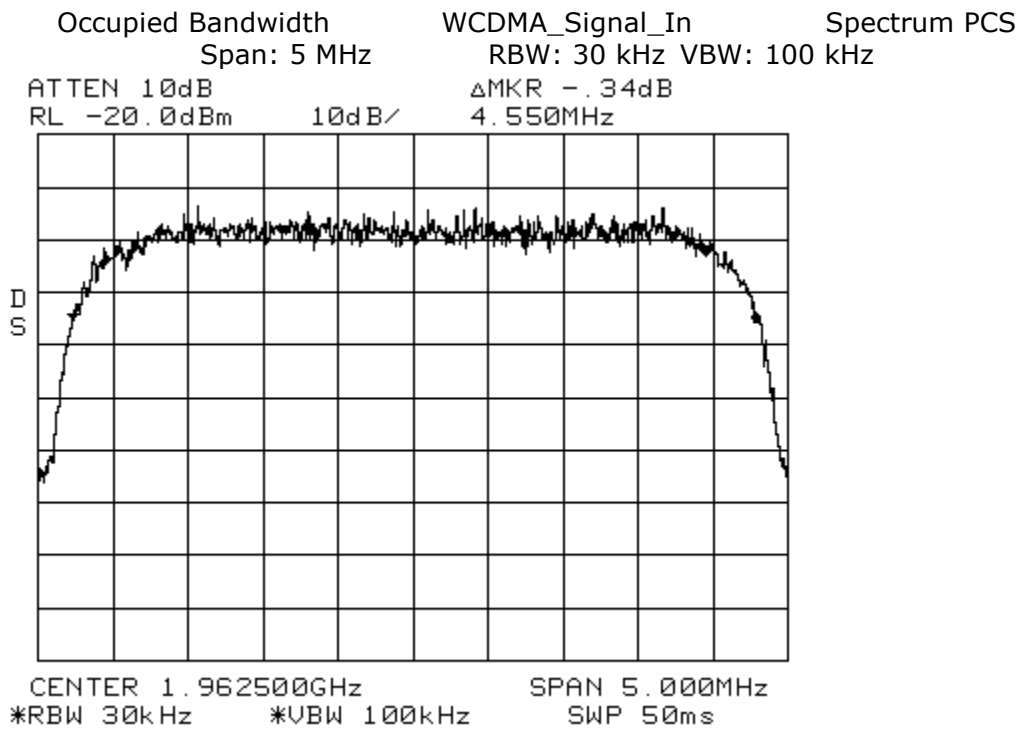


Occupied Bandwidth

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

Spectrum PCS





5.3 FCC 90.210 & 24.238 Emissions Limits – Band Edge

Test Summary:

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

Test Methods Used:

TIA-603-C 2004, ANSI C63.4-2003, FCC 90.210, FCC 24.238

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 iDEN, APCO 25 C4FM, LTE 3 MHz, 5MHz, 10MHz, 15MHz, 20MHz Channel Bandwidths & WCDMA 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: 10/14/13, 1/31/14 (800 SMR) & 6/20/12 (1900 PCS)

Tests Conducted By: Joshua J. Wittman

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

Number	Description	Manufacturer	Model	ADC TELECOMMUNICAT IONS Serial Number	Cal Due	Used
1	Spectrum Analyzer	HP	8563E	MC27690	8-21-14	☒
2	Power Meter	HP	437B	MC27839	6-30-14	☒
6	Signal Generator	Aeroflex	3413	MC57947	6-26-14	☒
9	Digital Barometer	Fisher Scientific	02-403	MC50719	3-4-14	☒
12	RF Power Sensor	HP	8482A	MC48773	6-30-14	☒

Environmental Conditions in the lab:

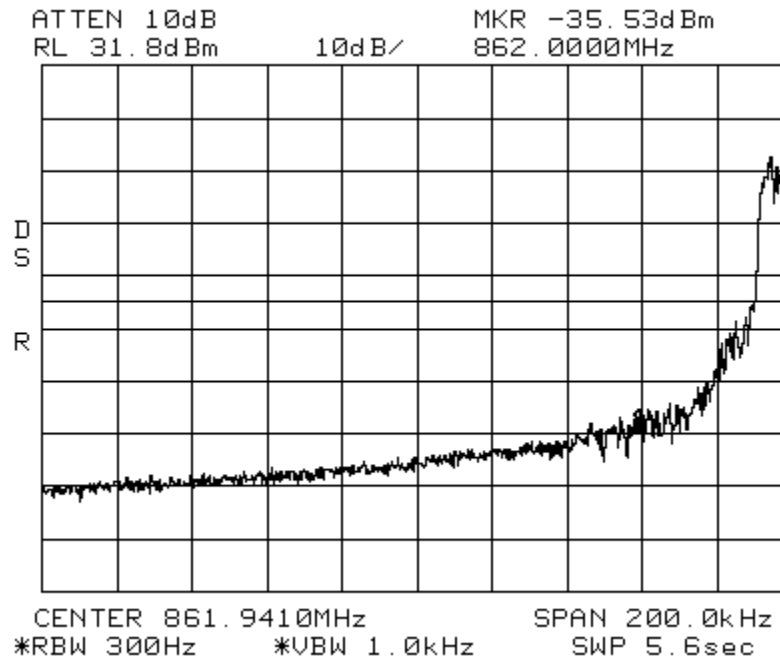
Temperature: 23° C

Relative Humidity: 22%

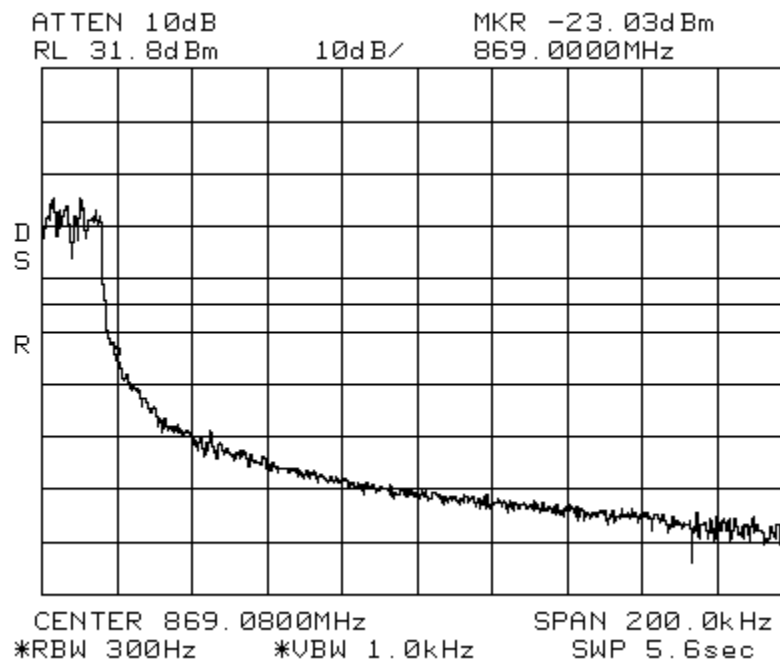
Atmospheric Pressure: 99.7 kPa

Test Results:

Band_Edge iDEN Spectrum 800 SMR
Center: 862.04 MHz Span: 200 kHz RBW: 300 Hz VBW: 1 kHz

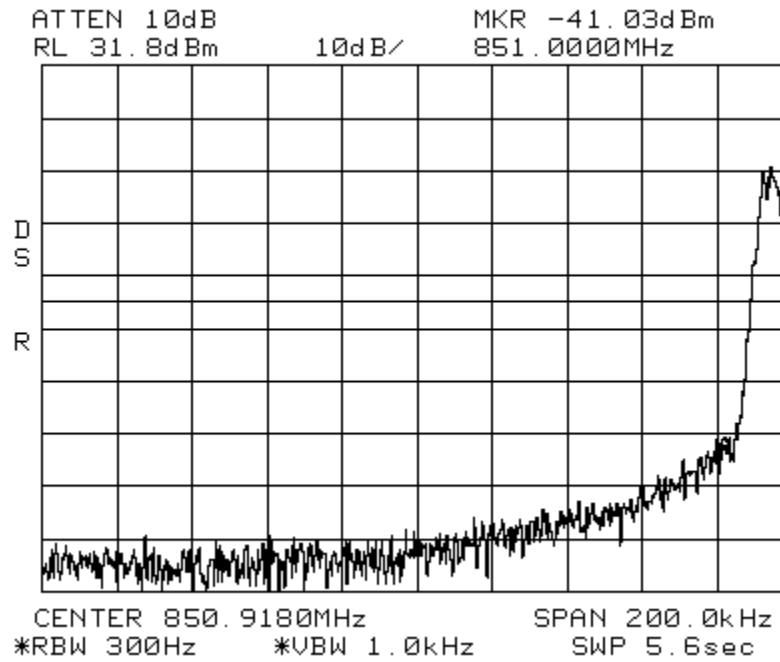


Band_Edge iDEN Spectrum 800 SMR
Center: 868.96 MHz Span: 200 kHz RBW: 300 Hz VBW: 1 kHz



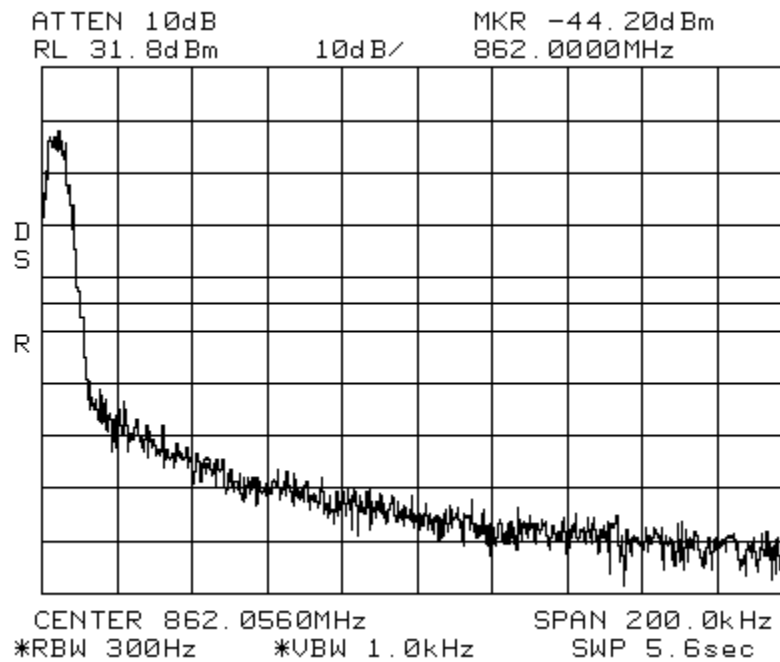
Band_Edge APCO 25 C4FM
Center: 851.04 MHz Span: 200 kHz

Spectrum 800 SMR
RBW: 300 Hz VBW: 1 kHz

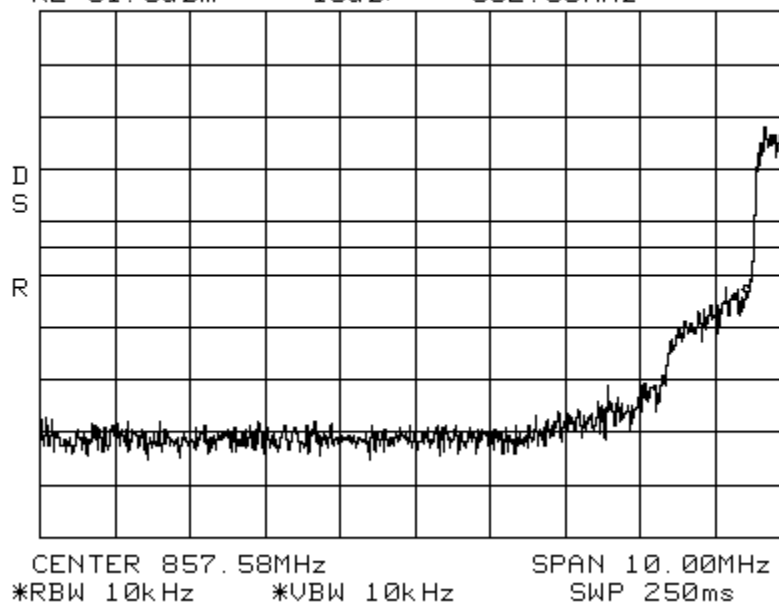


Band_Edge APCO 25 C4FM
Center: 861.96MHz Span: 200 kHz

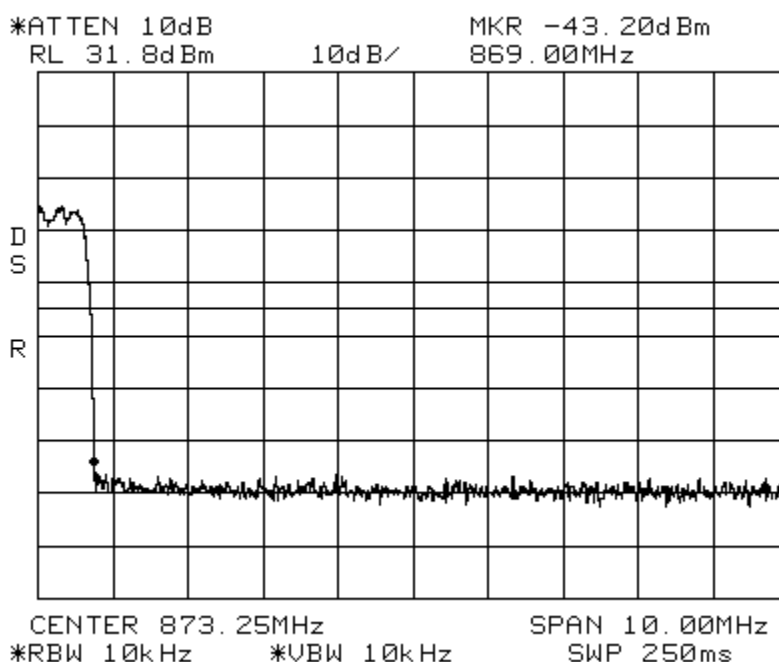
Spectrum 800 SMR
RBW: 300 Hz VBW: 1 kHz



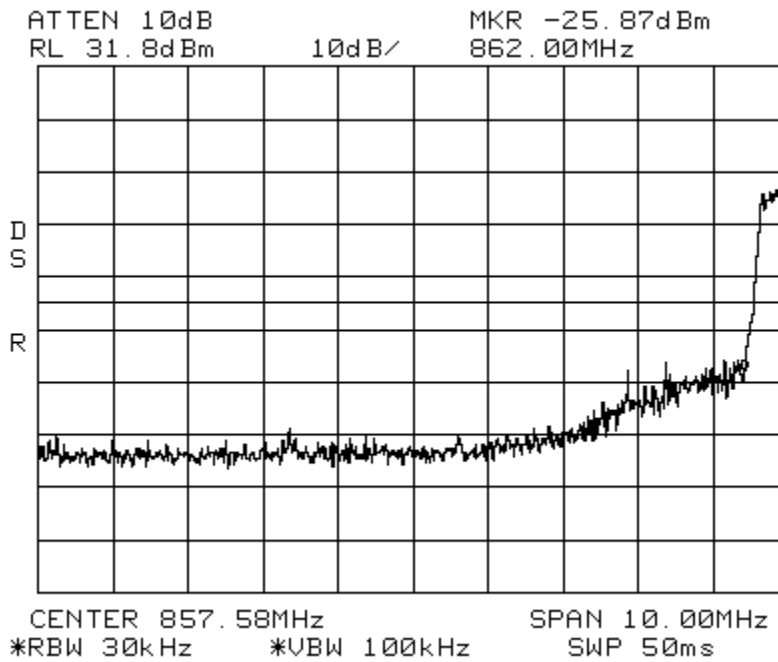
Band_Edge CDMA Spectrum 800 MHz SMR
 Center: 862.75 MHz Span: 10 MHz RBW: 10 kHz VBW: 10 kHz
 ATTN 10dB MKR -22.03dBm
 RL 31.8dBm 10dB/ 862.00MHz



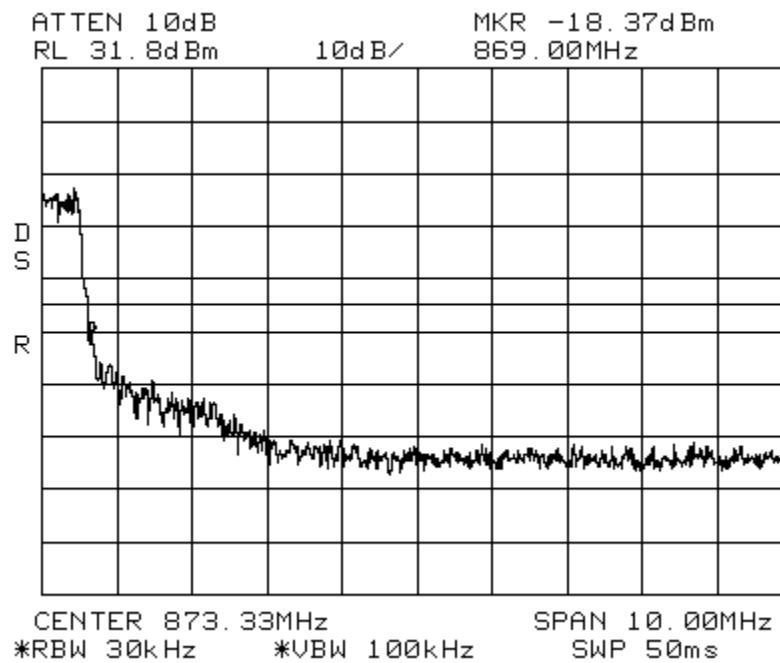
Band_Edge CDMA Spectrum 800 MHz SMR
 Center: 868.25 MHz Span: 10 MHz RBW: 10 kHz VBW: 10 kHz



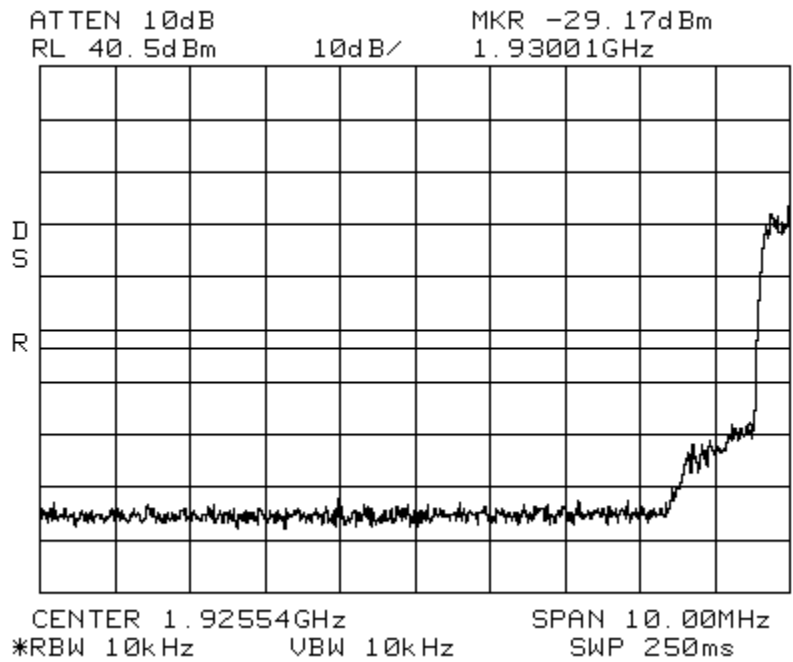
Band_Edge LTE 3 MHz Channel Bandwidth Spectrum 800 MHz SMR
Center: 863.5 MHz Span: 10 MHz RBW: 30 kHz VBW: 100 kHz



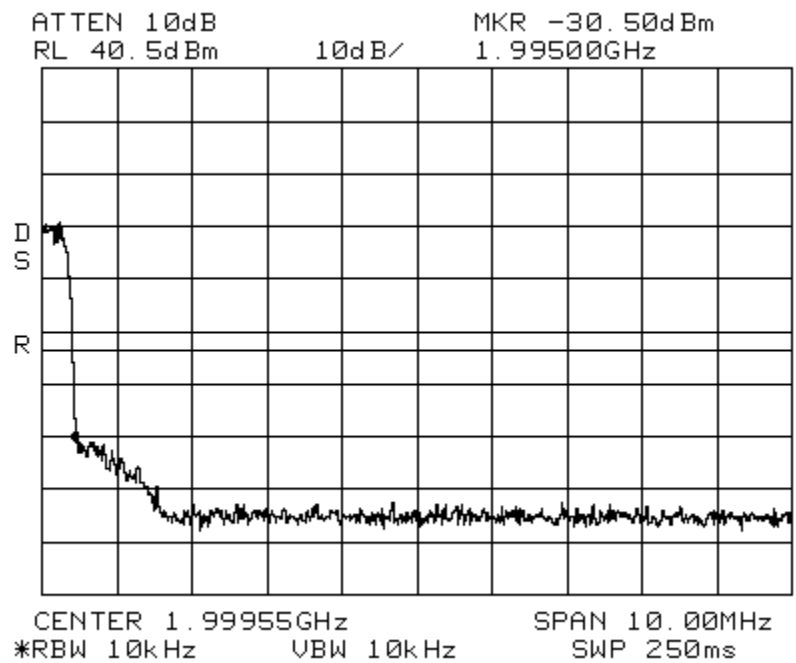
Band_Edge LTE 3 MHz Channel Bandwidth Spectrum 800 MHz SMR
Center: 867.5 MHz Span: 10 MHz RBW: 30 kHz VBW: 100 kHz

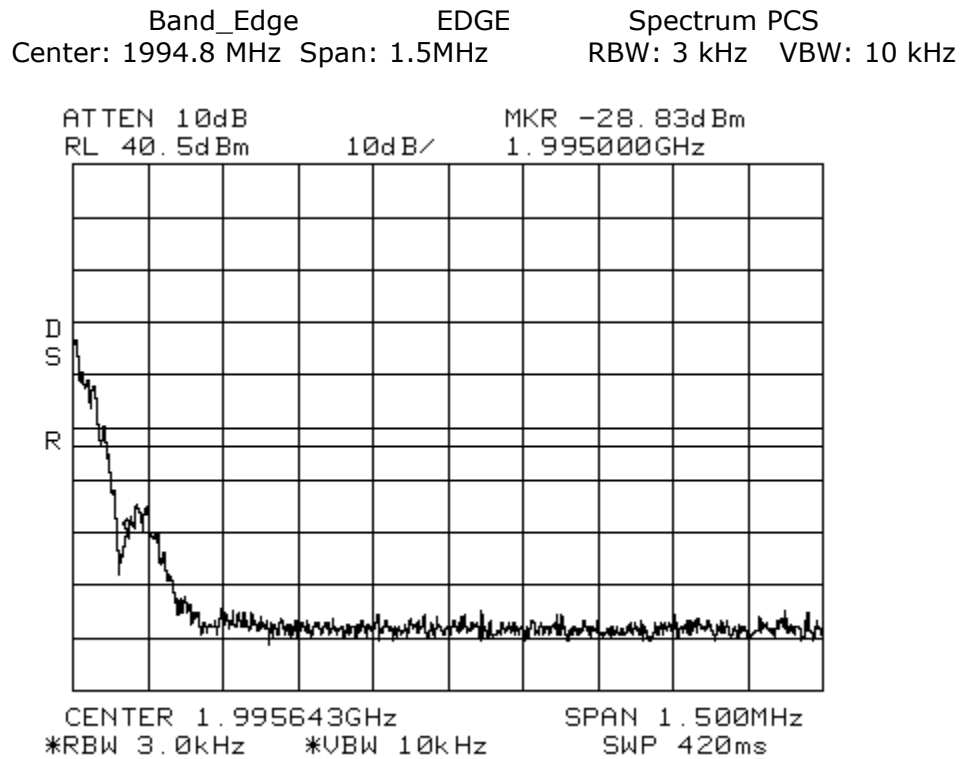
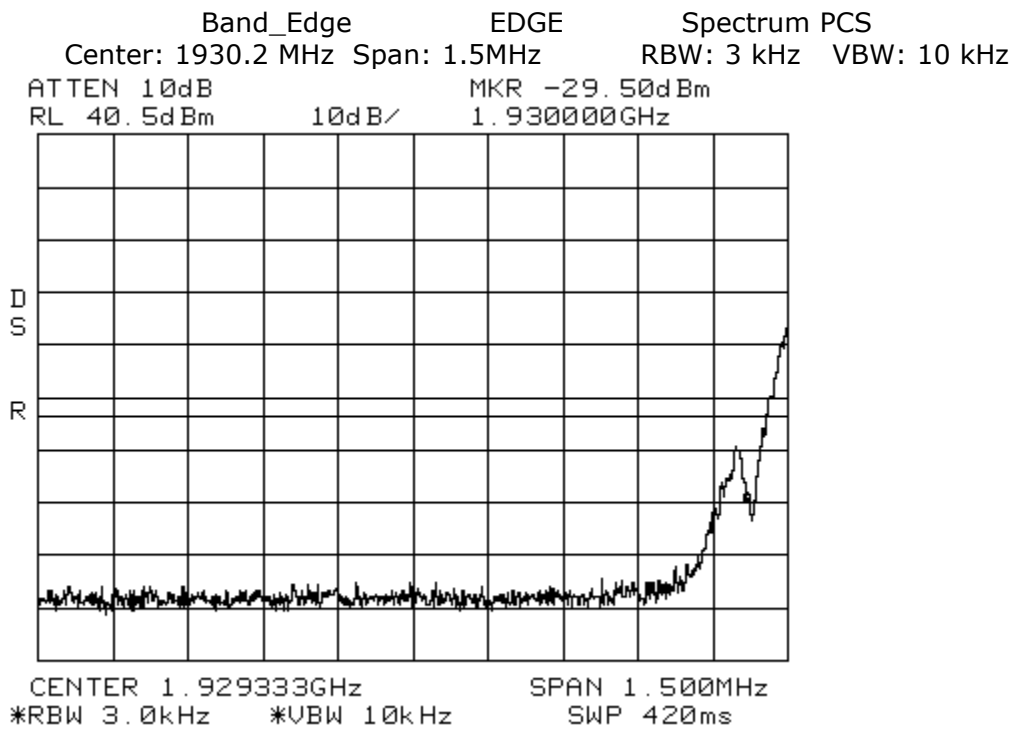


Band_Edge CDMA Spectrum PCS
Center: 1930.75 MHz Span: 10 MHz RBW: 10 kHz VBW: 10 kHz

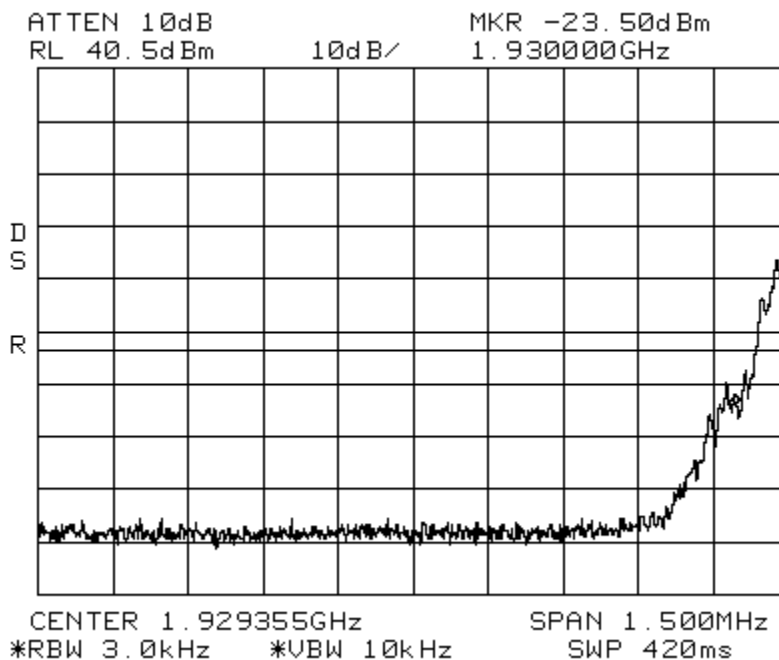


Band_Edge CDMA Spectrum PCS
Center: 1994.25 MHz Span: 10 MHz RBW: 10 kHz VBW: 10 kHz

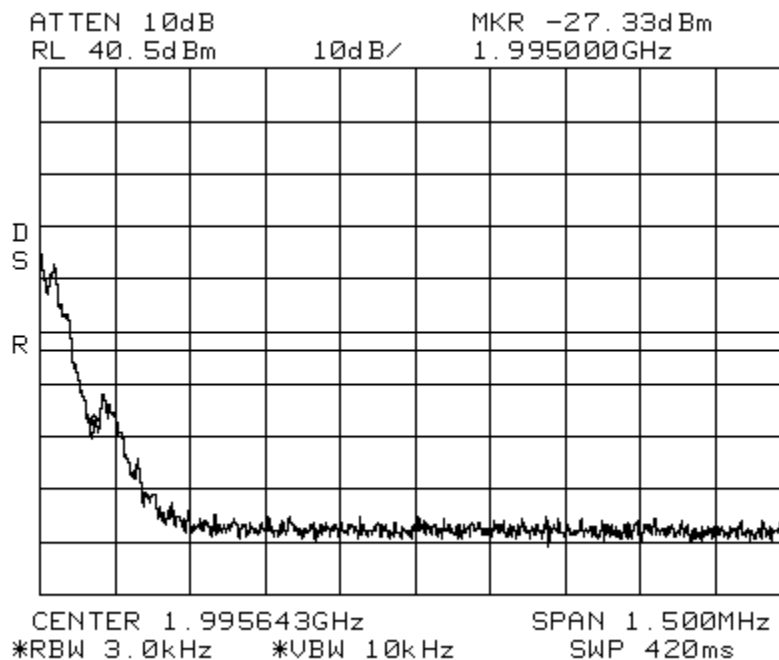


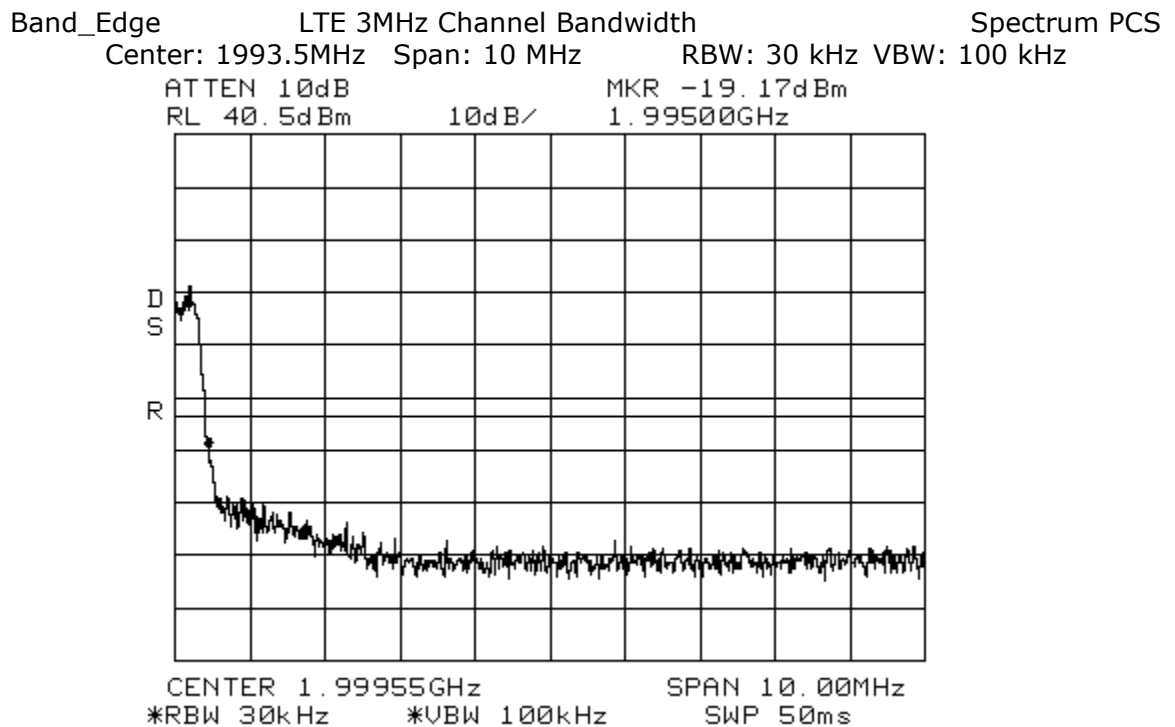
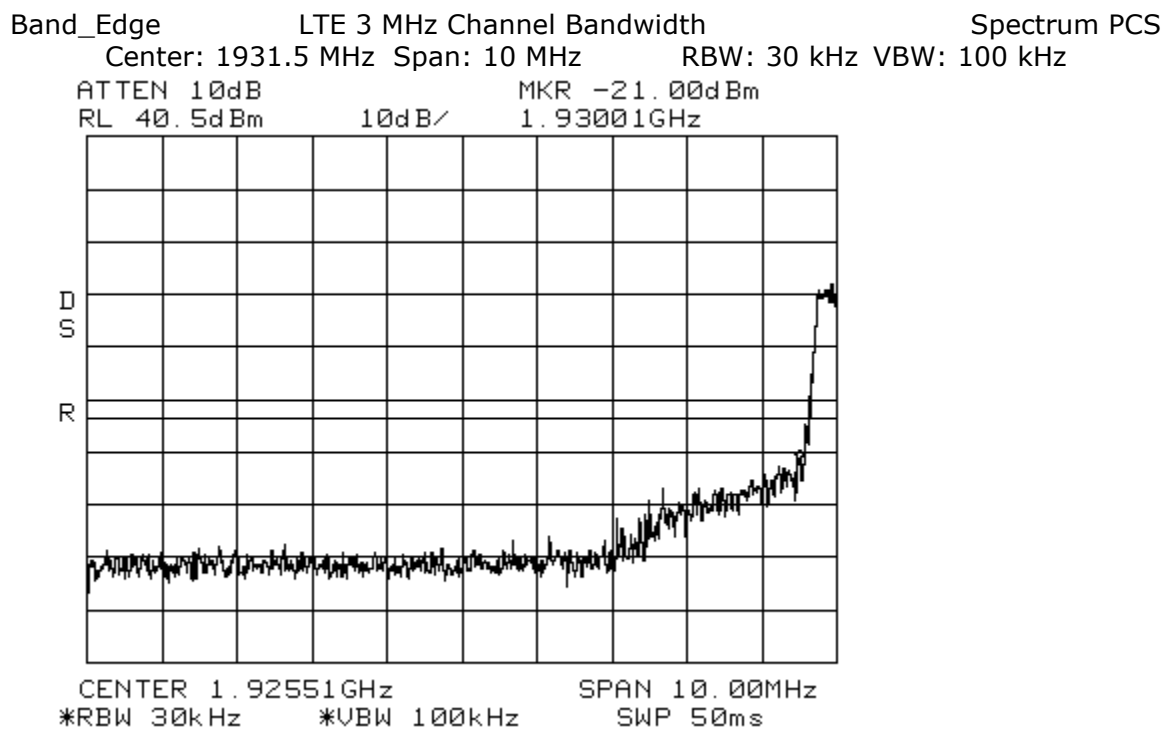


Band_Edge GSM Spectrum PCS
 Center: 1930.2 MHz Span: 1.5MHz RBW: 3 kHz VBW: 10 kHz

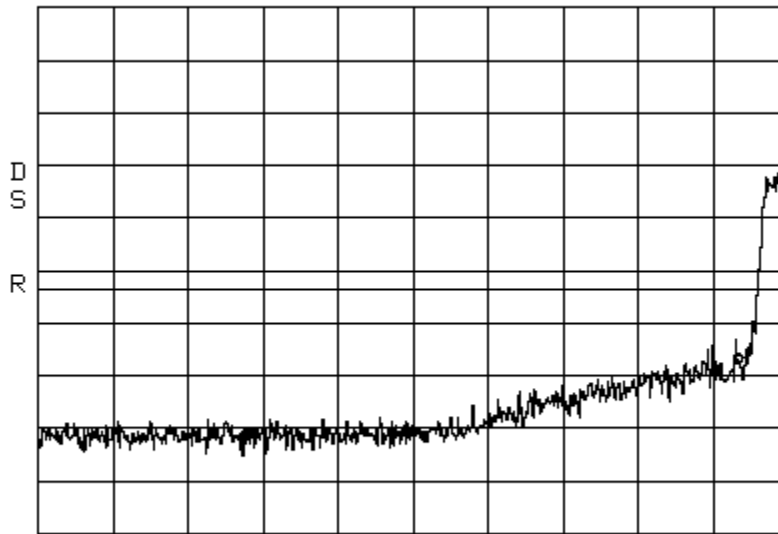


Band_Edge GSM Spectrum PCS
 Center: 1994.8 MHz Span: 1.5MHz RBW: 3 kHz VBW: 10 kHz





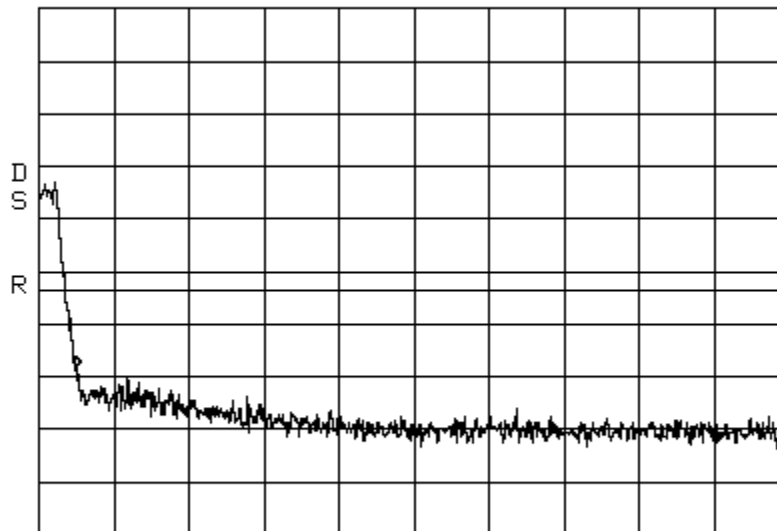
Band_Edge LTE 5 MHz Channel Bandwidth Spectrum PCS
Center: 1932.5MHz Span: 10 MHz RBW: 30 kHz VBW: 100 kHz
ATTEN 10dB MKR -27.17dBm
RL 40.5dBm 10dB/ 1.93000GHz



CENTER 1.92565GHz SPAN 10.00MHz
*RBW 30kHz *VBW 100kHz SWP 50ms

Band_Edge LTE 5 MHz Channel Bandwidth Spectrum PCS
Center: 1992.5MHz Span: 10 MHz RBW: 30 kHz VBW: 100 kHz

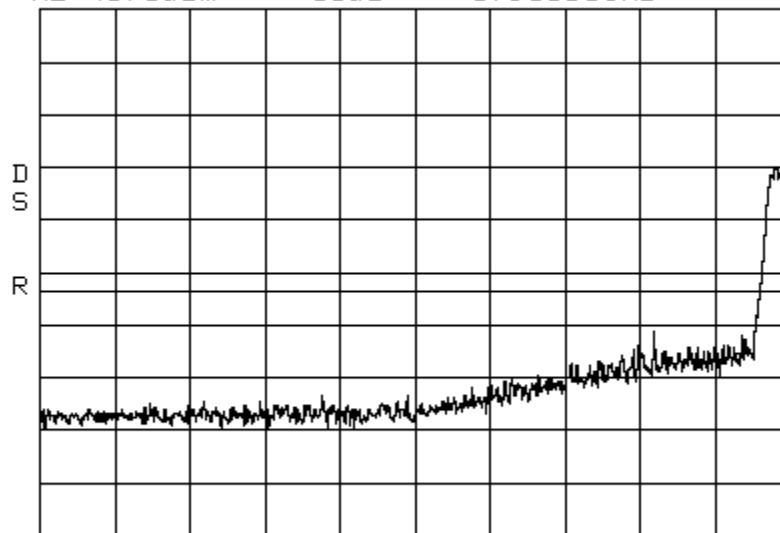
ATTEN 10dB MKR -27.67dBm
RL 40.5dBm 10dB/ 1.99500GHz



CENTER 1.99950GHz SPAN 10.00MHz
*RBW 30kHz *VBW 100kHz SWP 50ms

Band_Edge LTE 10 MHz Channel Bandwidth
Center: 1935.0MHz Span: 15 MHz RBW: 100 kHz
ATTEN 10dB MKR -26.67dBm
RL 40.5dBm 10dB/ 1.93000GHz

Spectrum PCS
VBW: 100 kHz

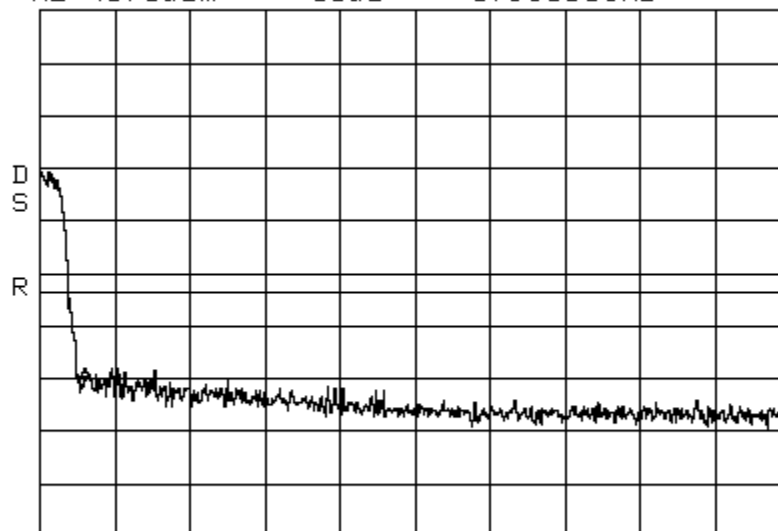


CENTER 1.92355GHz SPAN 15.00MHz
*RBW 100kHz *VBW 100kHz SWP 50ms

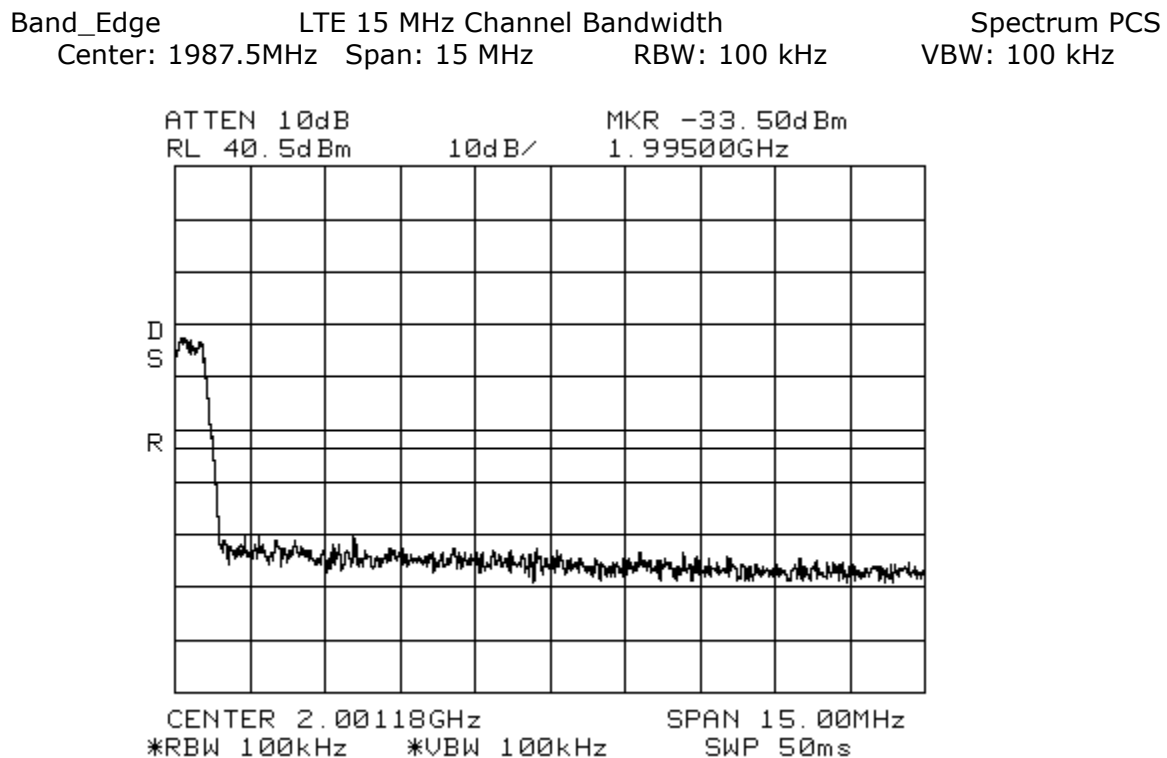
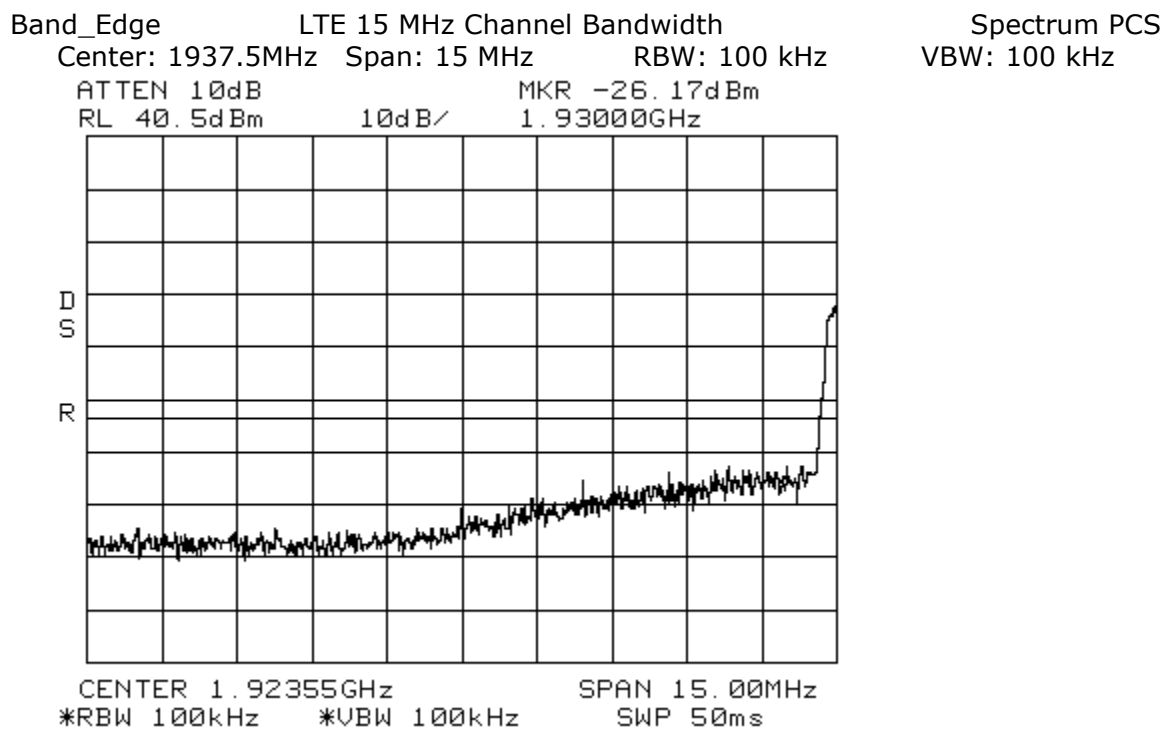
Band_Edge LTE 10 MHz Channel Bandwidth
Center: 1990.0MHz Span: 15 MHz RBW: 100 kHz

Spectrum PCS
VBW: 100 kHz

ATTEN 10dB MKR -29.67dBm
RL 40.5dBm 10dB/ 1.99500GHz

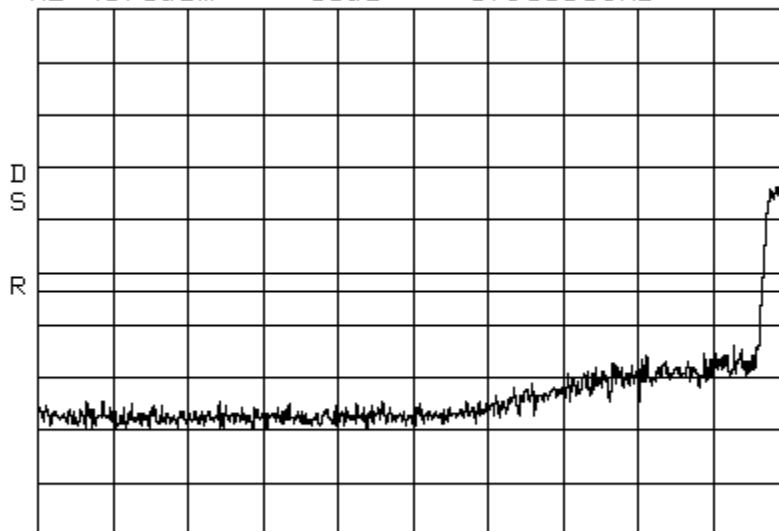


CENTER 2.00160GHz SPAN 15.00MHz
*RBW 100kHz *VBW 100kHz SWP 50ms



Band_Edge LTE 20 MHz Channel Bandwidth
Center: 1940.0MHz Span: 20 MHz RBW: 100 kHz
ATTEN 10dB MKR -27.33dBm
RL 40.5dBm 10dB/ 1.93000GHz

Spectrum PCS
VBW: 100 kHz

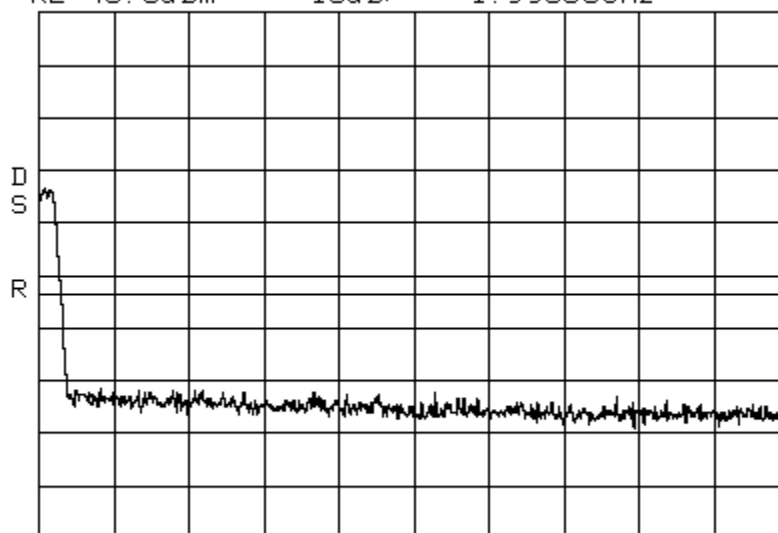


CENTER 1.92170GHz SPAN 20.00MHz
*RBW 100kHz *VBW 100kHz SWP 50ms

Band_Edge LTE 20 MHz Channel Bandwidth
Center: 1985.0MHz Span: 20 MHz RBW: 100 kHz

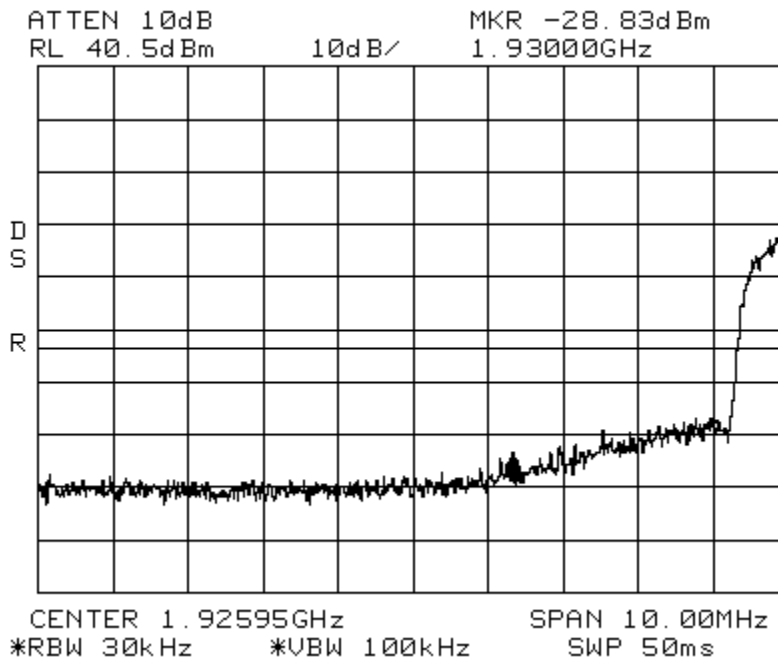
Spectrum PCS
VBW: 100 kHz

ATTEN 10dB MKR -34.00dBm
RL 40.5dBm 10dB/ 1.99500GHz

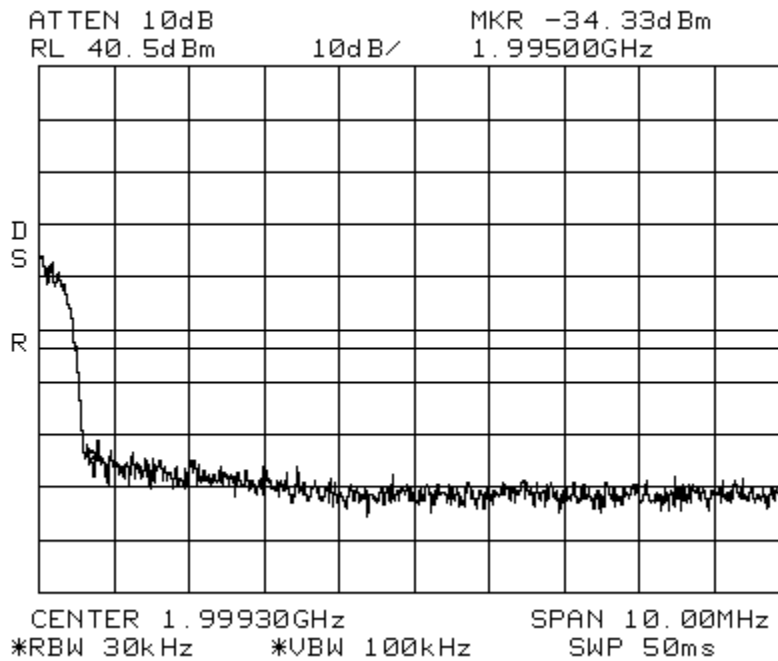


CENTER 2.00360GHz SPAN 20.00MHz
*RBW 100kHz *VBW 100kHz SWP 50ms

Band_Edge WCDMA Spectrum PCS
Center: 1932.5 MHz Span: 10 MHz RBW: 30 kHz VBW: 100 kHz



Band_Edge WCDMA Spectrum PCS
Center: 1992.5 MHz Span: 10 MHz RBW: 30 kHz VBW: 100 kHz



5.4 FCC 2.1051, 90.210, 90.219(d), (e)(2), (e)(3), & 24.238 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, 90.210, 90.219(d), (e)(2), (e)(3)& 27.53

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 iDEN, APCO 25 C4FM, LTE 3 MHz, 5MHz, 10MHz, 15MHz, 20 MHz Channel Bandwidths & WCDMA. 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 iDEN, APCO 25 C4FM, LTE 3 MHz, 5MHz, 10MHz, 15MHz, 20 MHz Channel Bandwidths & WCDMA.

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.

Good engineering practice must be used in regard to the radiation of intermodulation products and noise, such that interference to licensed communications systems is avoided. In the event of harmful interference caused by any given deployment, the FCC may require additional attenuation or filtering of the emissions and/or noise from signal boosters or signal booster systems, as necessary to eliminate the interference.

In general, the ERP of intermodulation products should not exceed -30 dBm in 10 kHz measurement bandwidth.

The noise figure of a signal booster must not exceed 9 dB in either direction.

- Uplink measurements only required. Uplink signal is received from booster/repeater antenna "over the air". Downlink signal is NOT "over the air" fed but hardwired via licensed operator basestation which the noise floor is well below -100dBm/Hz (See Plot Below)

Spurious emissions from a signal booster must not exceed -13 dBm within any 100 kHz measurement bandwidth.

Test Date: 10/21/13, 1/31/14, 2/3/14, 2/26/14 (800 SMR), 6/22/12, & 7/10/12 (1900 PCS)

Tests Conducted By: Joshua J. Wittman

Test Equipment: 1, 2, 6, 7, 12, 13, 14, 15

Number	Description	Manufacturer	Model	ADC TELECOMMUNICAT IONS Serial Number	Cal Due	Used
1	Spectrum Analyzer	HP	8563E	MC27690	8-21-14	☒
2	Power Meter	HP	437B	MC27839	6-30-14	☒
6	Signal Generator	Aeroflex	3413	MC57947	6-26-14	☒
7	Signal Generator	Aeroflex	3413	MC60301	8-29-14	☒
9	Digital Barometer	Fisher Scientific	02-403	MC50719	3-4-14	☒
12	RF Power Sensor	HP	8482A	MC48773	6-30-14	☒
13	Spectrum Analyzer	Rohde & Schwarz	FSQ-8	MC57131	6-30-15	☒
14	Noise Figure Analyzer	Agilent	N8973A	MC32236	6-30-14	☒
15	Noise Source	HP	346A	MC27792	6-30-14	☒

Environmental Conditions in the lab:

Temperature: 23° C

Relative Humidity: 22%

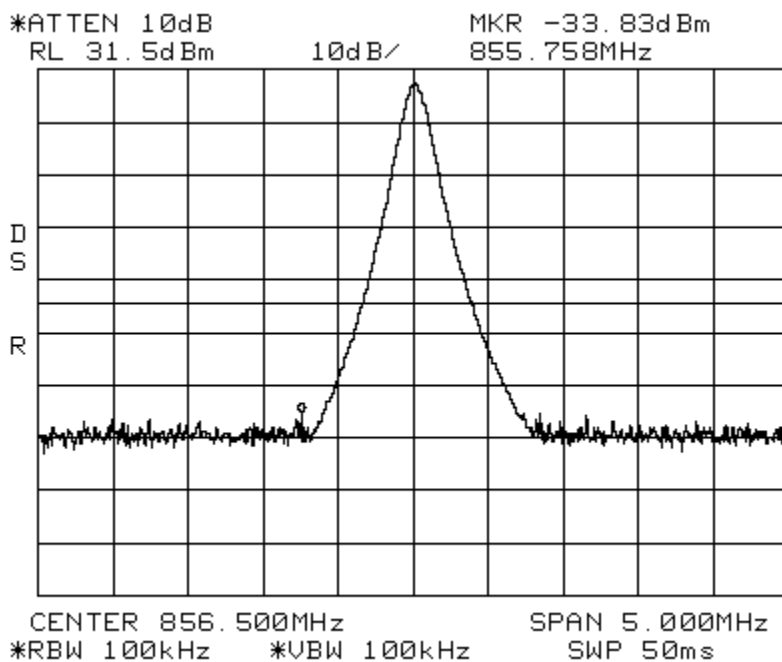
Atmospheric Pressure: 99.7 kPa

Test Results:

Conducted Emissions
Center: 856.5 MHz

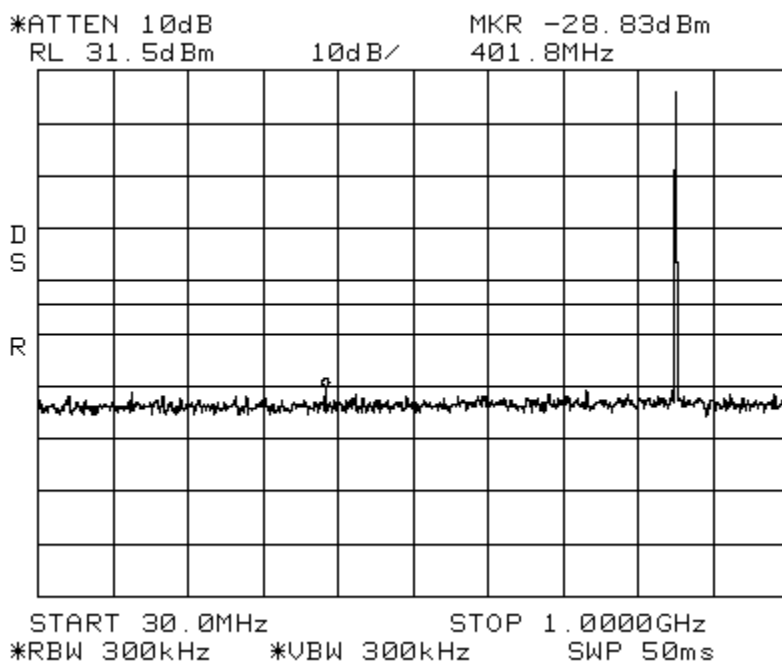
APCO 25 C4FM
Span: 5 MHz

Spectrum 800 MHz SMR
RBW/VBW: 100 kHz



Conducted Emissions
APCO 25 C4FM
Span: 30 MHz to 1 GHz

Spectrum 800 MHz SMR
RBW/VBW: 300 kHz



Conducted Emissions

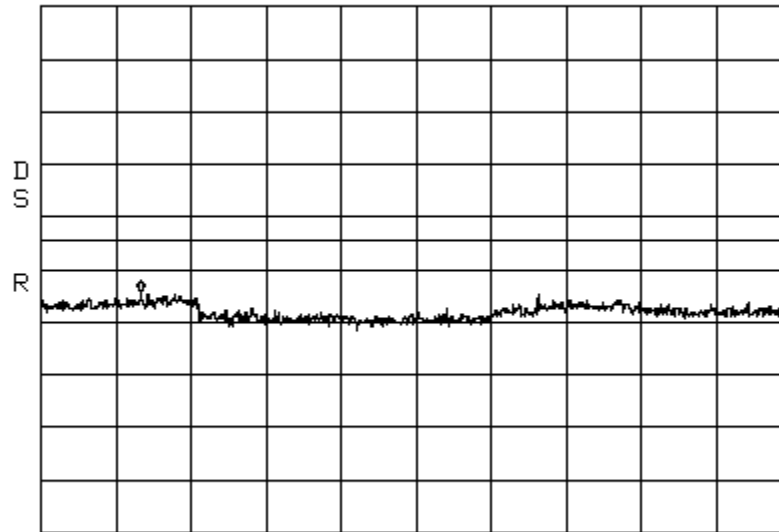
APCO 25 C4FM

Spectrum 800 MHz SMR

Span: 1 GHz to 10 GHz

RBW/VBW: 1 MHz

*ATTEN 10dB
RL 31.5dBm 10dB/ MKR -22.67dBm
2.200GHz



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

Conducted Emissions

iDEN

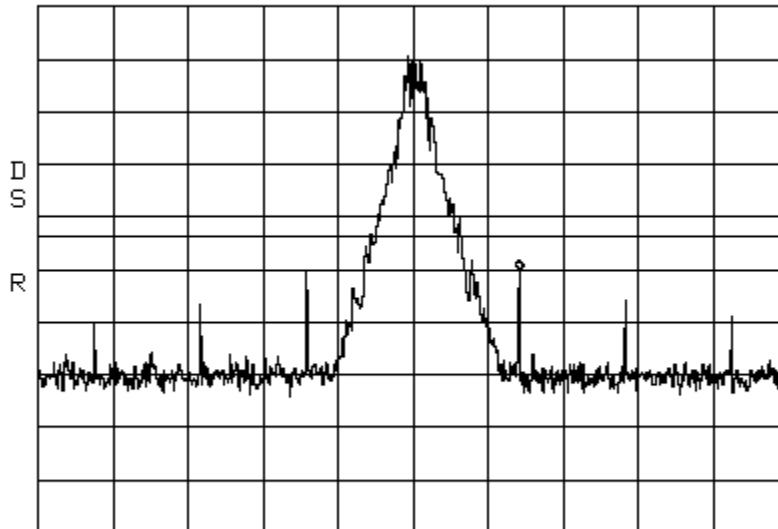
Spectrum 800 MHz SMR

Center: 865.5MHz

Span: 5 MHz

RBW/VBW: 100 kHz

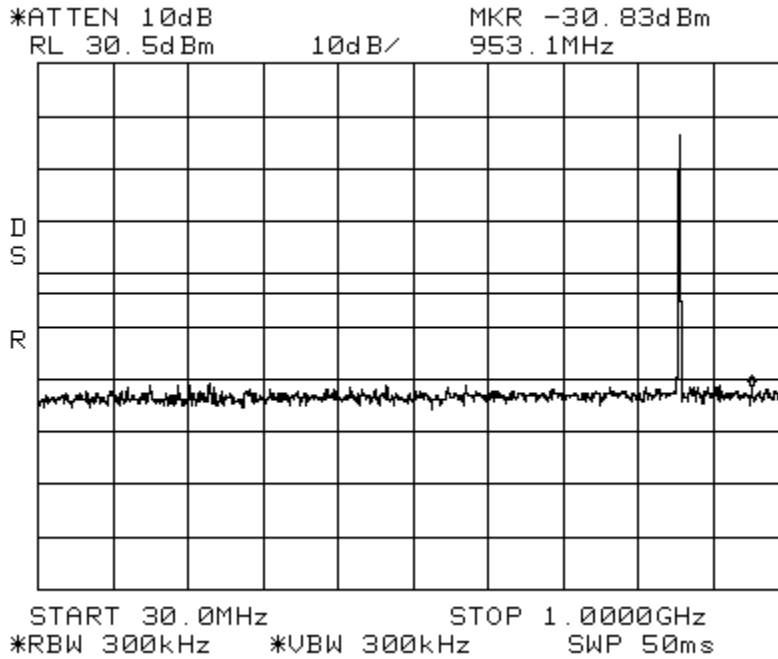
*ATTEN 10dB
RL 30.5dBm 10dB/ MKR -19.67dBm
866.208MHz



CENTER 865.500MHz SPAN 5.000MHz
*RBW 100kHz *VBW 100kHz SWP 50ms

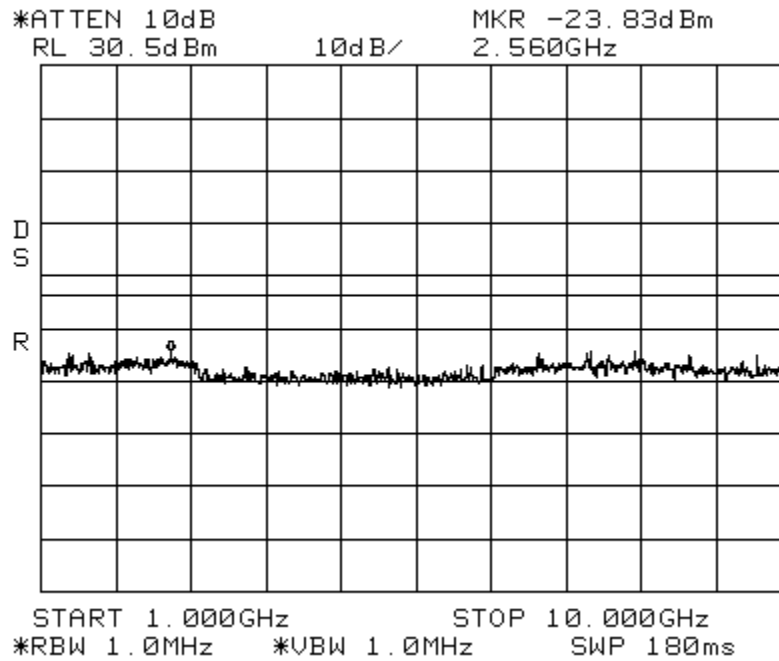
Conducted Emissions iDEN
Span: 30 MHz to 1 GHz

Spectrum 800 MHz SMR
RBW/VBW: 300 kHz



Conducted Emissions iDEN
Span: 1 GHz to 10 GHz

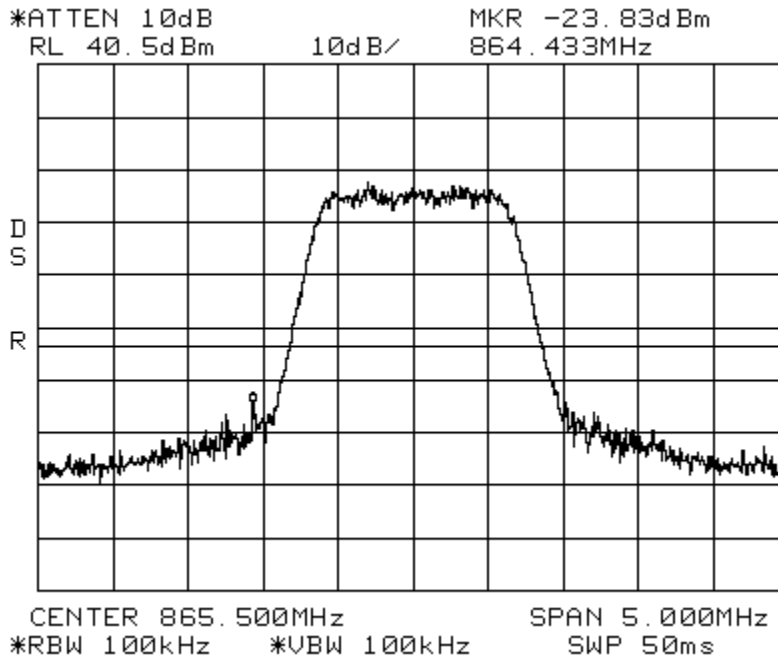
Spectrum 800 MHz SMR
RBW/VBW: 1 MHz



Conducted Emissions
Center: 865.5 MHz

CDMA
Span: 5 MHz

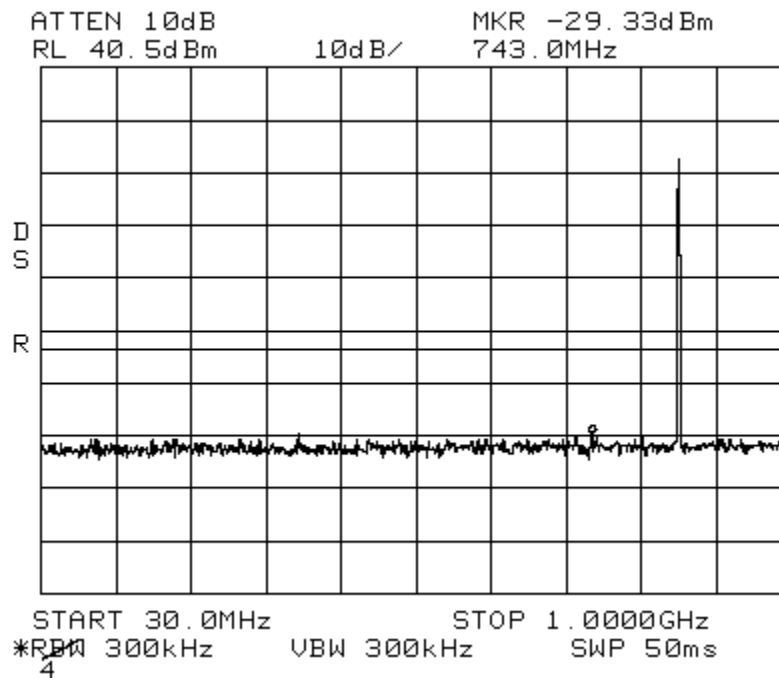
Spectrum 800 MHz SMR
RBW/VBW: 100 kHz



Conducted Emissions
Span: 30 MHz to 1 GHz

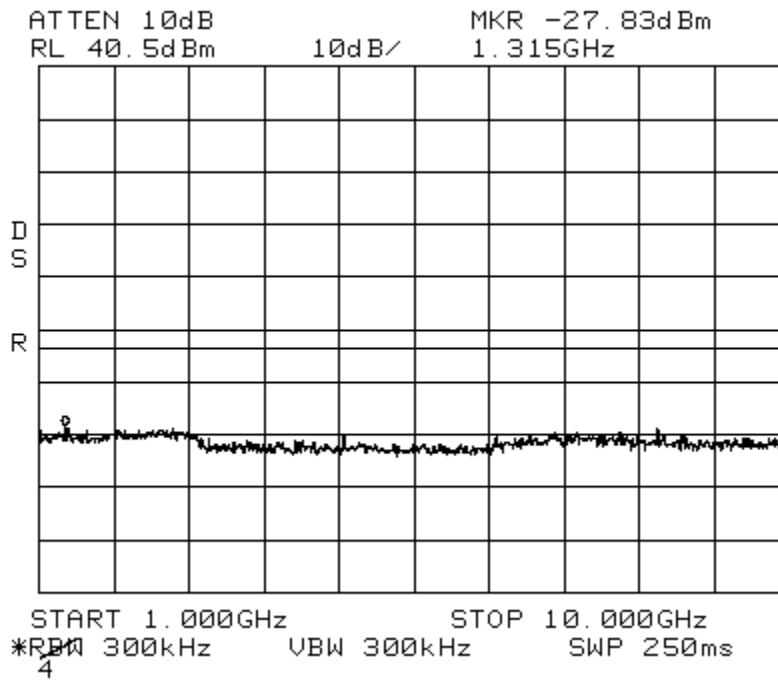
CDMA

Spectrum 800 MHz SMR
RBW/VBW: 300 kHz



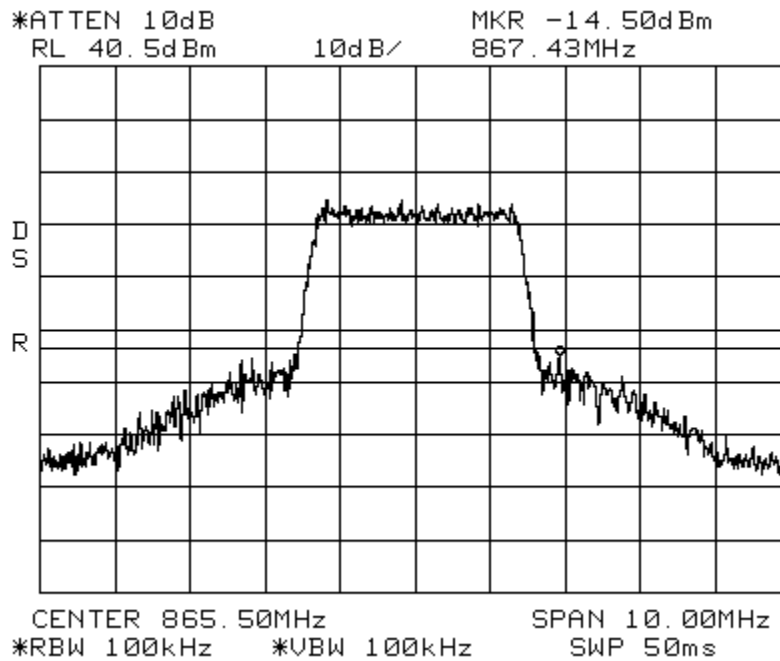
Conducted Emissions CDMA
Span: 1 GHz to 10 GHz

Spectrum 800 MHz SMR
RBW/VBW: 1 MHz

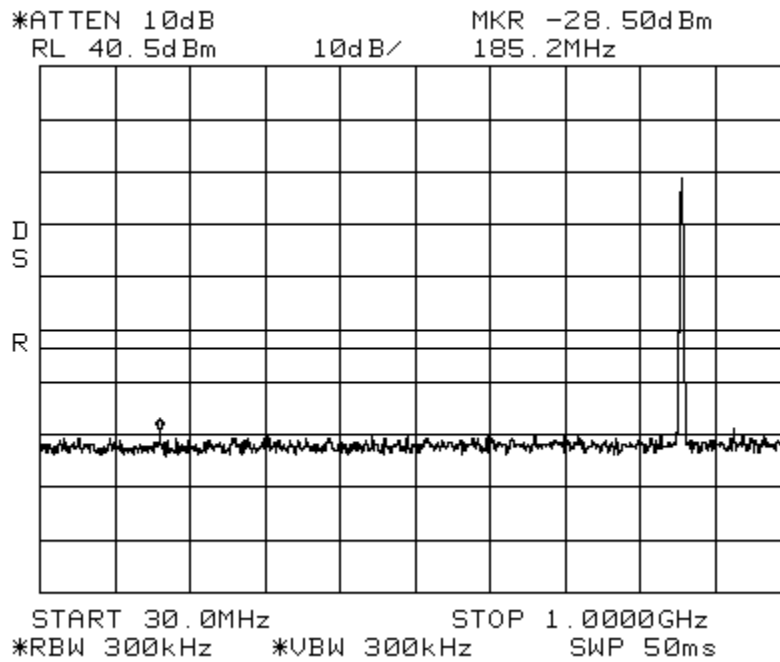


Conducted Emissions LTE 3 MHz Channel Bandwidth
Center: 865.5 MHz Span: 10 MHz

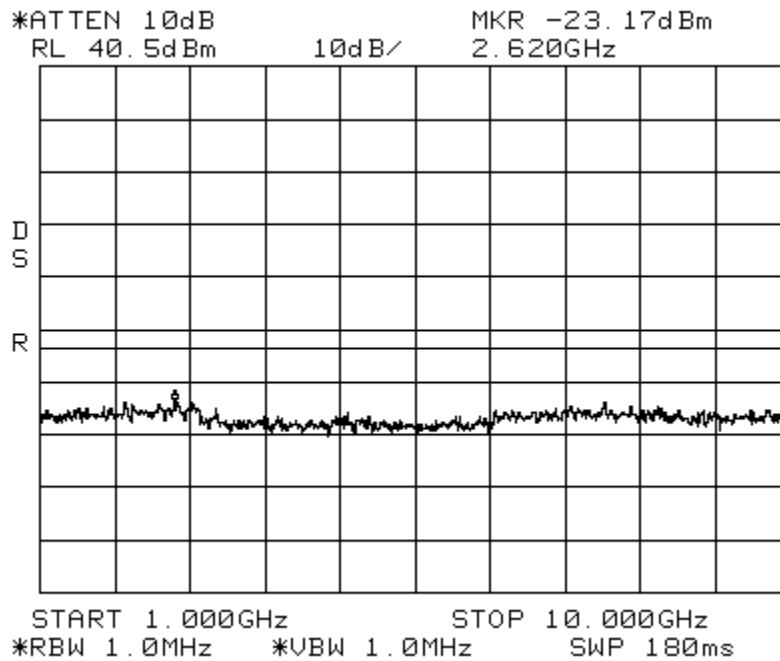
Spectrum 800 MHz SMR
RBW/VBW: 100 kHz



Conducted Emissions LTE 3 MHz Channel Bandwidth Spectrum 800 MHz SMR
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz

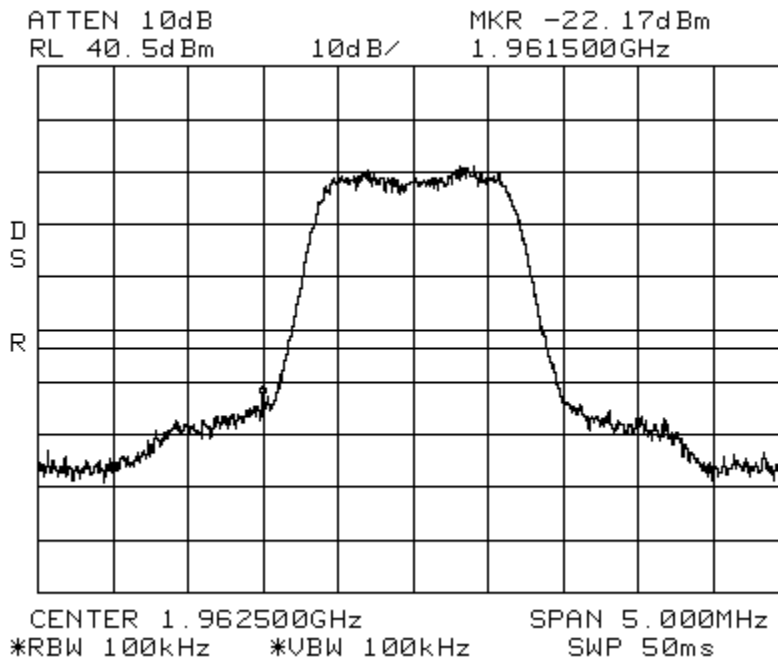


Conducted Emissions LTE 3 MHz Channel Bandwidth Spectrum 800 MHz SMR
 Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



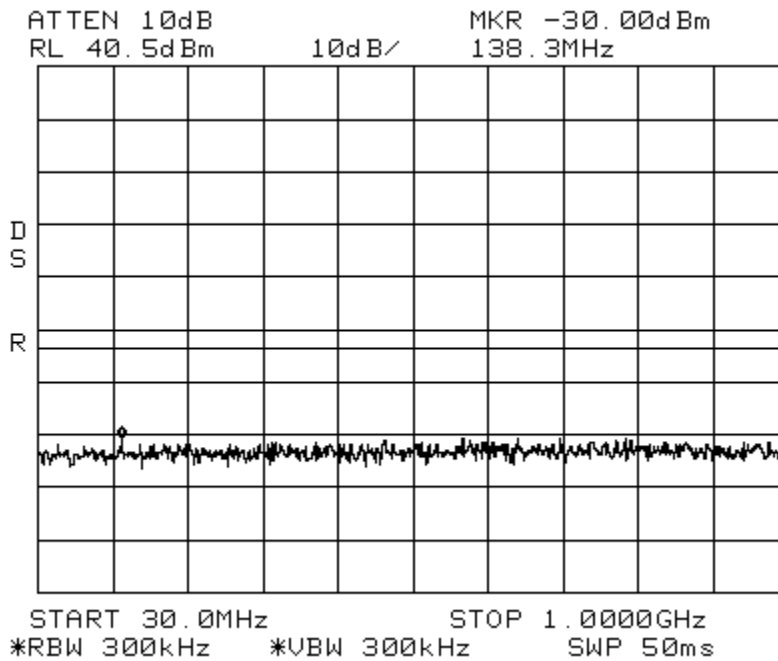
Conducted Emissions CDMA
Center: 1962.5 MHz Span: 5 MHz

Spectrum PCS
RBW/VBW: 100 kHz



Conducted Emissions
Span: 30 MHz to 1 GHz

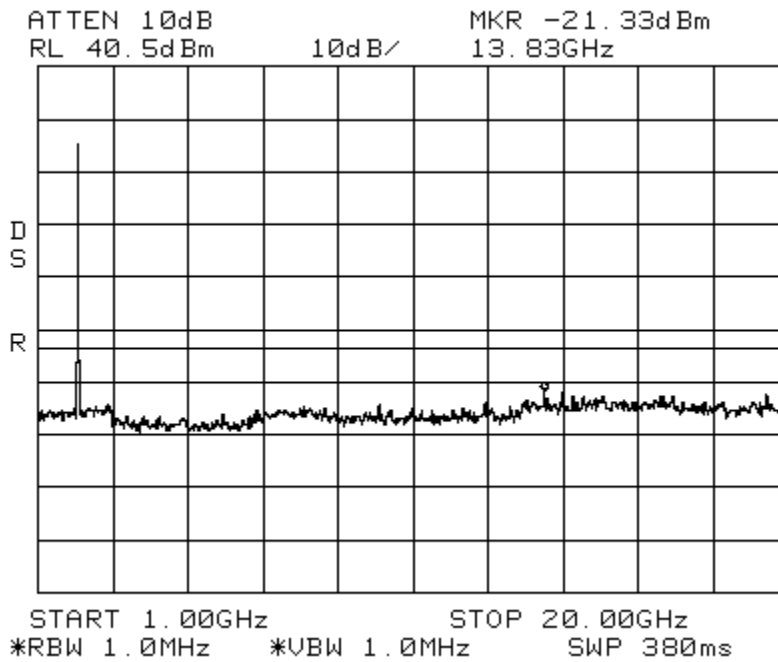
CDMA Spectrum PCS
RBW/VBW: 300 kHz



Conducted Emissions
Span: 1 GHz to 20 GHz

CDMA

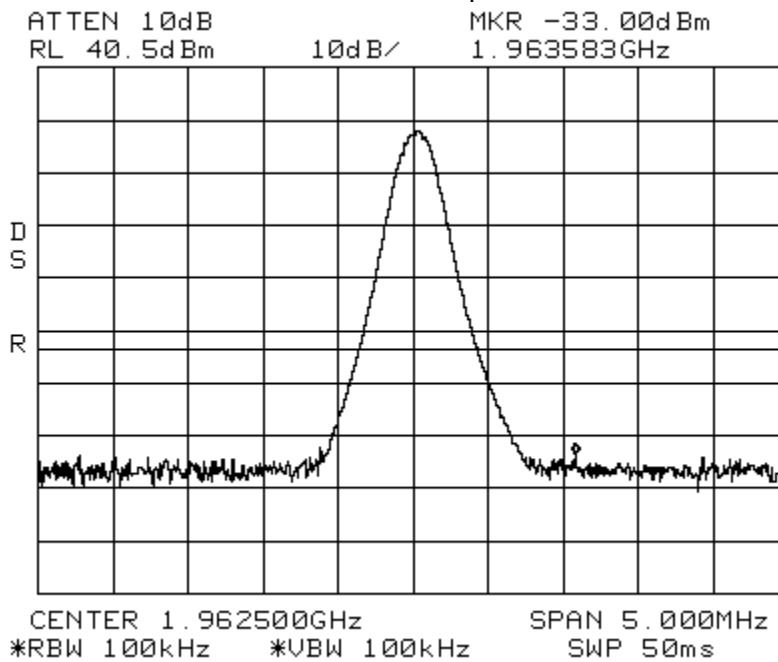
Spectrum PCS
RBW/VBW: 1 MHz



Conducted Emissions
Center: 1962.5 MHz

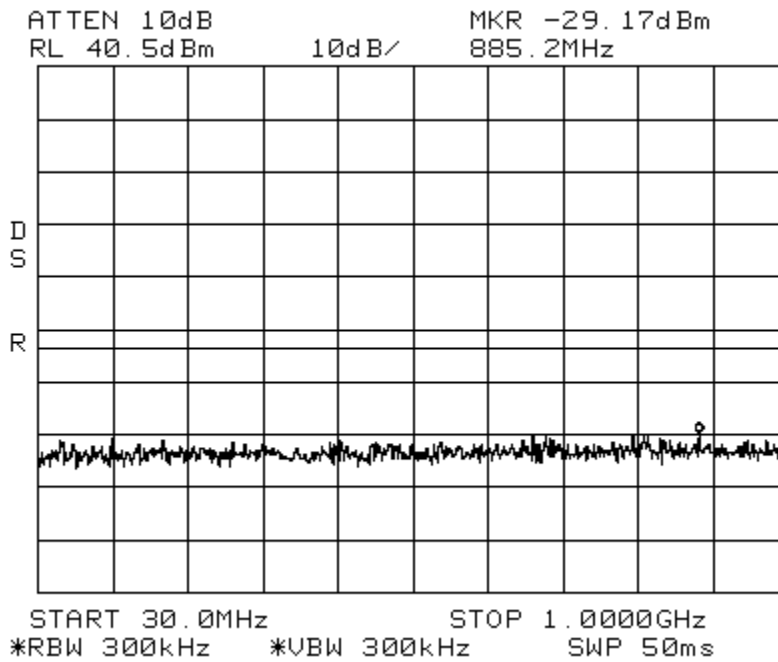
EDGE
Span: 5 MHz

Spectrum PCS
RBW/VBW: 100 kHz



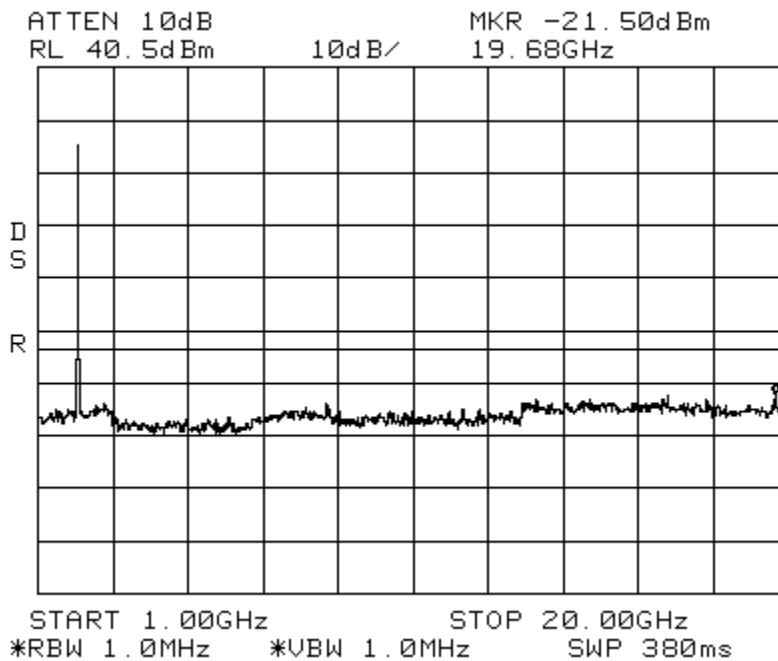
Conducted Emissions
Span: 30 MHz to 1 GHz

EDGE Spectrum PCS
RBW/VBW: 300 kHz



Conducted Emissions
Span: 1 GHz to 20 GHz

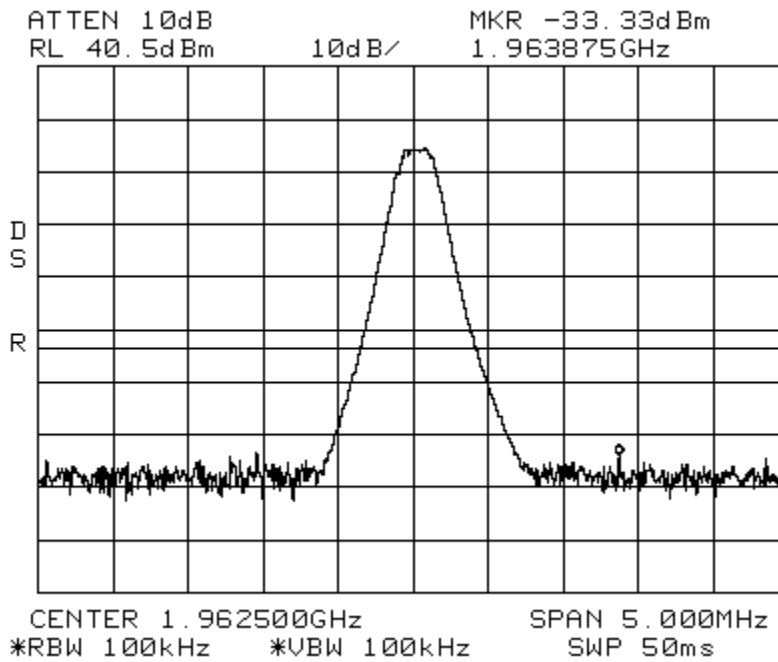
EDGE Spectrum PCS
RBW/VBW: 1 MHz



Conducted Emissions
Center: 1962.5 MHz

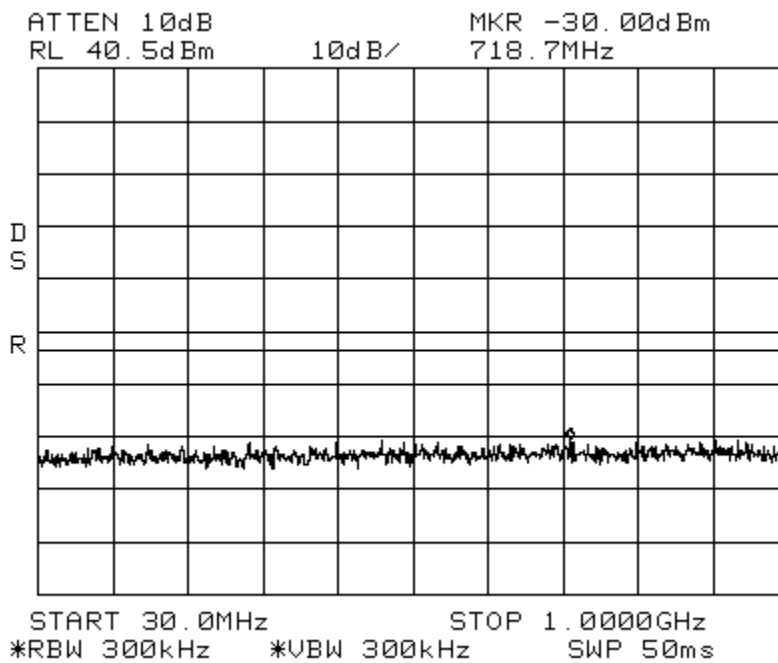
GSM
Span: 5 MHz

Spectrum PCS
RBW/VBW: 100 kHz



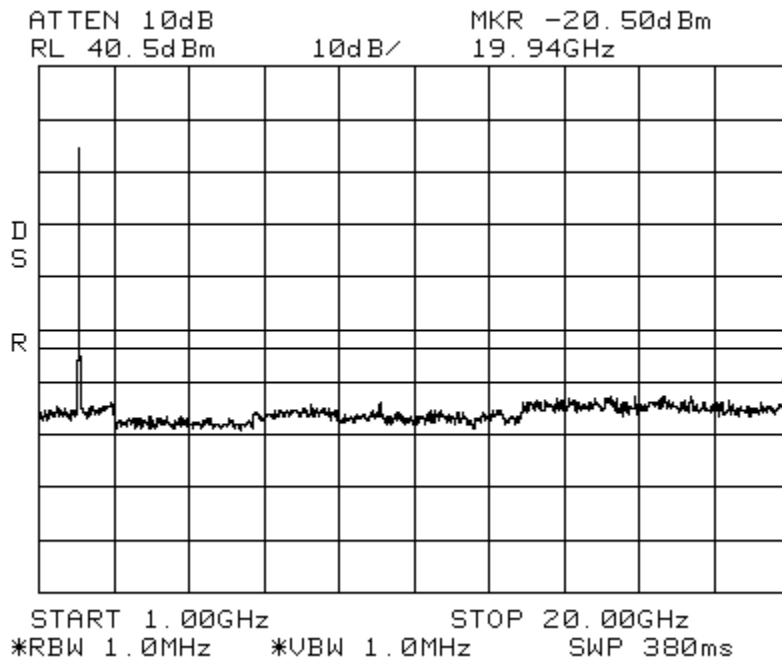
Conducted Emissions
Span: 30 MHz to 1 GHz

GSM
Spectrum PCS
RBW/VBW: 300 kHz

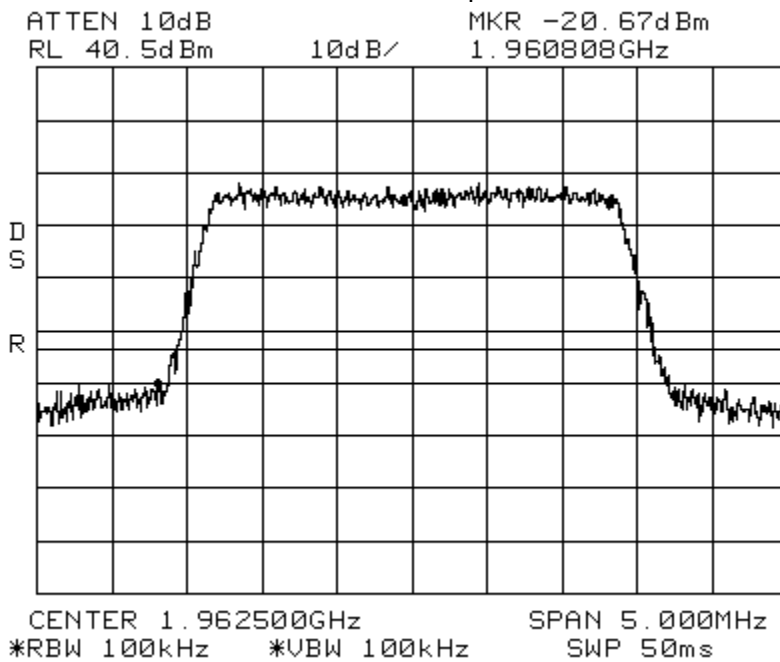


Conducted Emissions
Span: 1 GHz to 20 GHz

GSM
Spectrum PCS
RBW/VBW: 1 MHz



Conducted Emissions
Center: 1962.5 MHz
LTE 3 MHz Channel Bandwidth
Span: 5 MHz
Spectrum PCS
RBW/VBW: 100 kHz



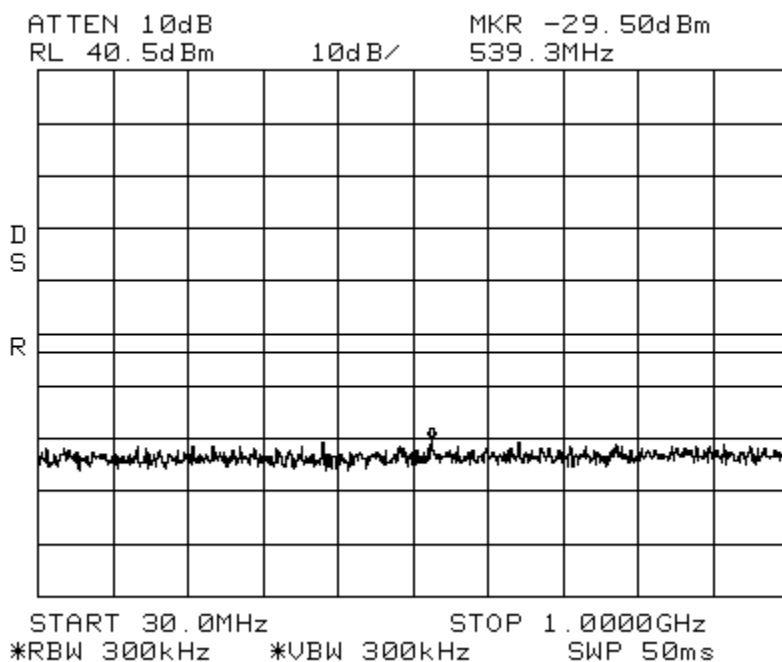
Conducted Emissions

LTE 3 MHz Channel Bandwidth

Spectrum PCS

Span: 30 MHz to 1 GHz

RBW/VBW: 300 kHz



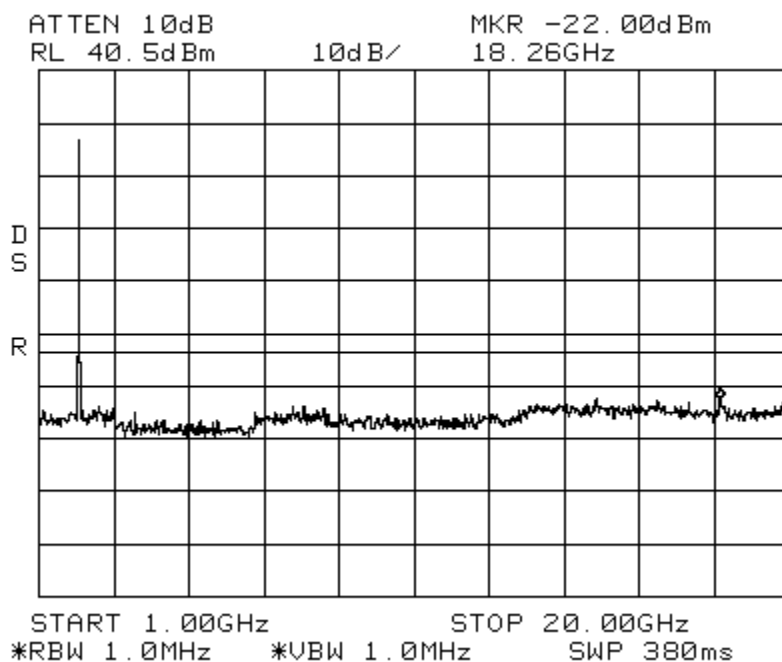
Conducted Emissions

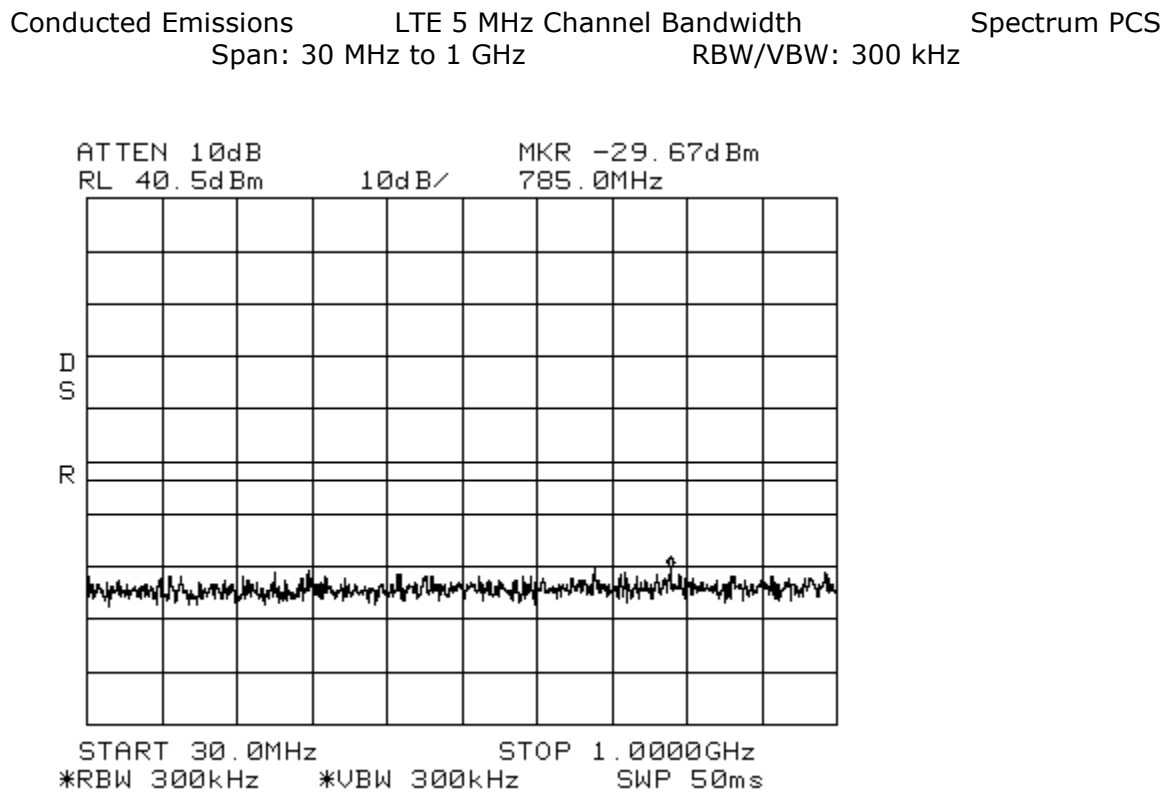
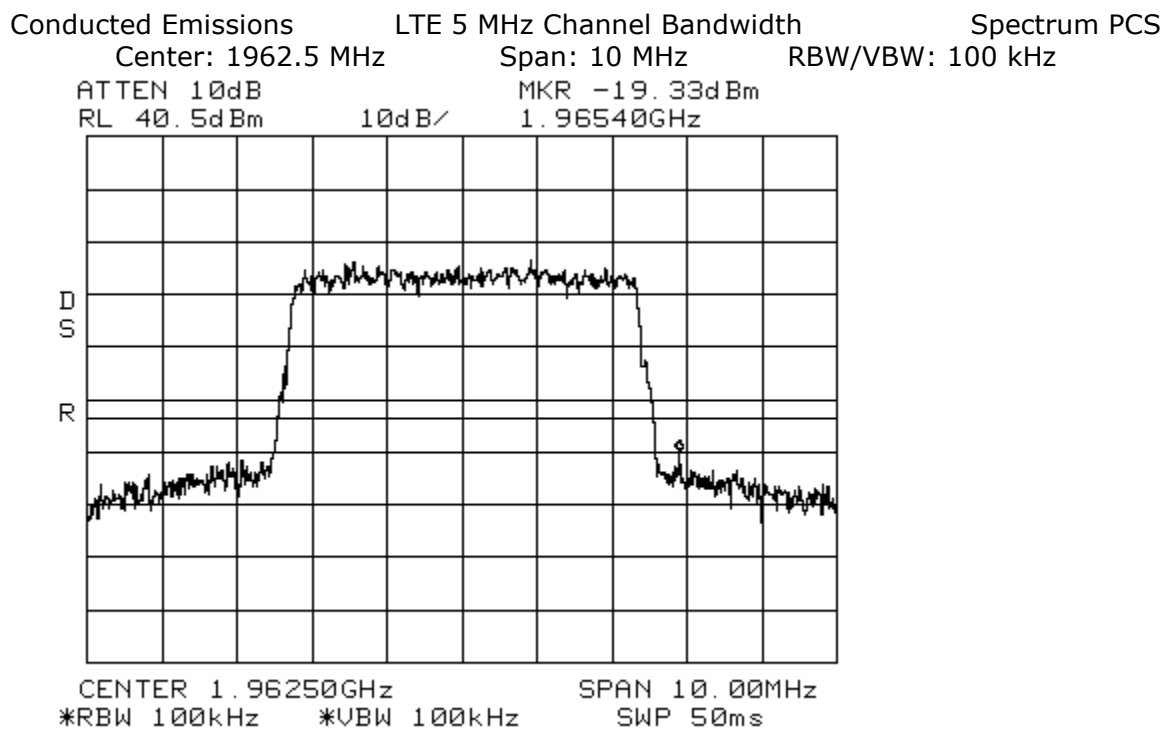
LTE 3 MHz Channel Bandwidth

Spectrum PCS

Span: 1 GHz to 20 GHz

RBW/VBW: 1 MHz





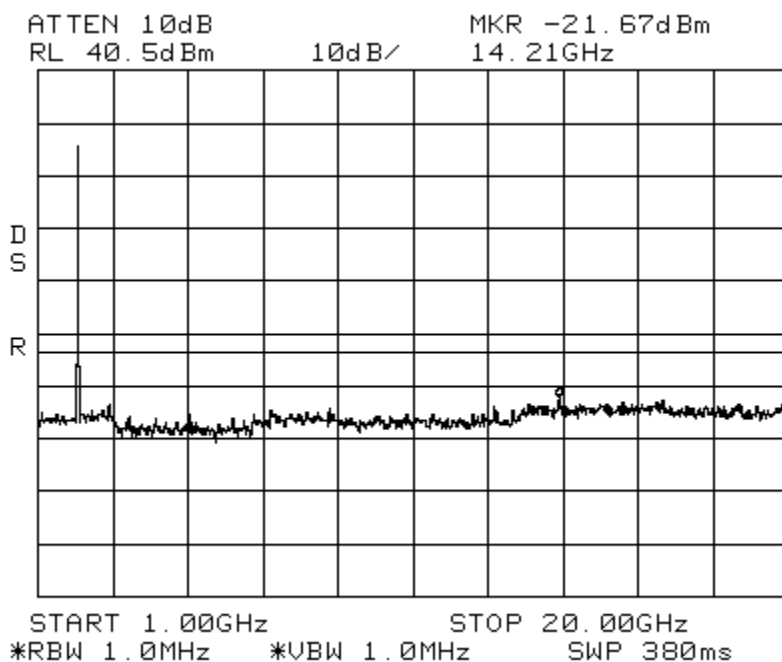
Conducted Emissions

LTE 5 MHz Channel Bandwidth

Spectrum PCS

Span: 1 GHz to 20 GHz

RBW/VBW: 1 MHz



Conducted Emissions

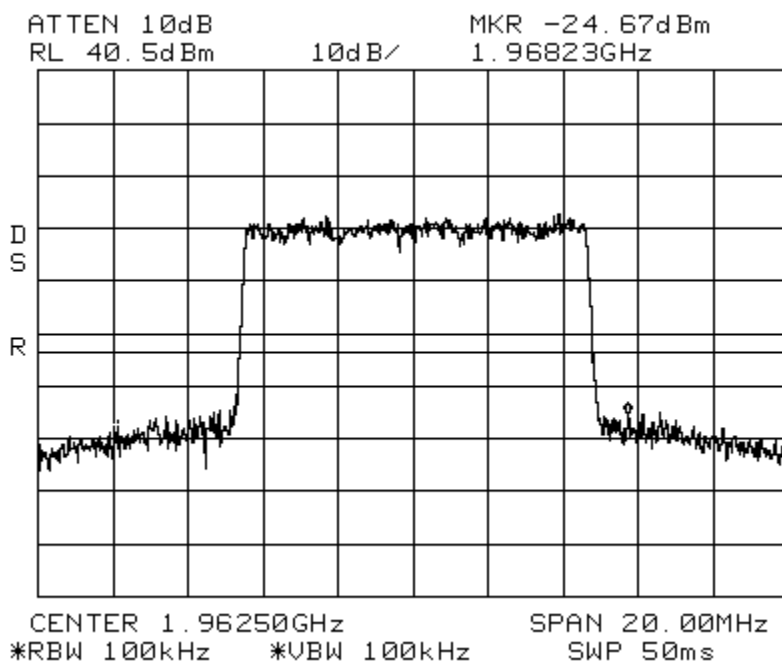
LTE 10 MHz Channel Bandwidth

Spectrum PCS

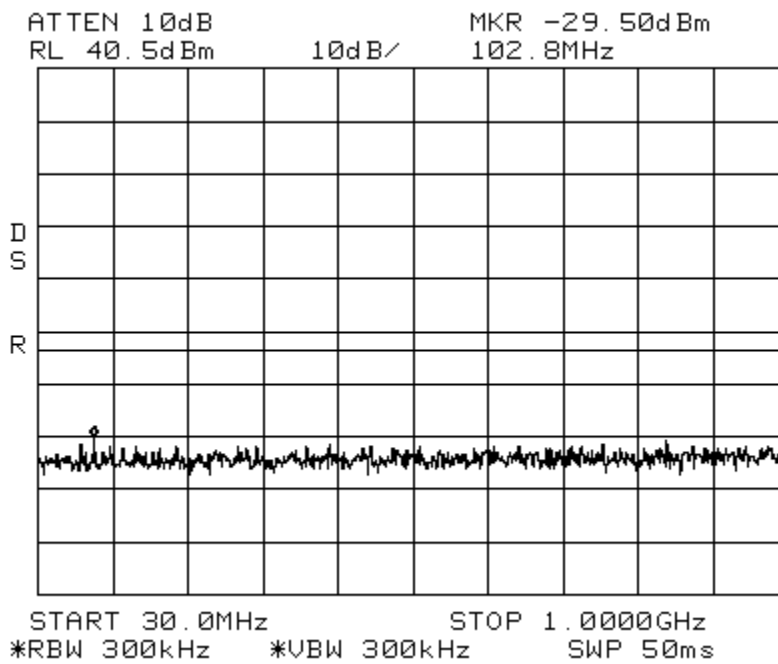
Center: 1962.5 MHz

Span: 20MHz

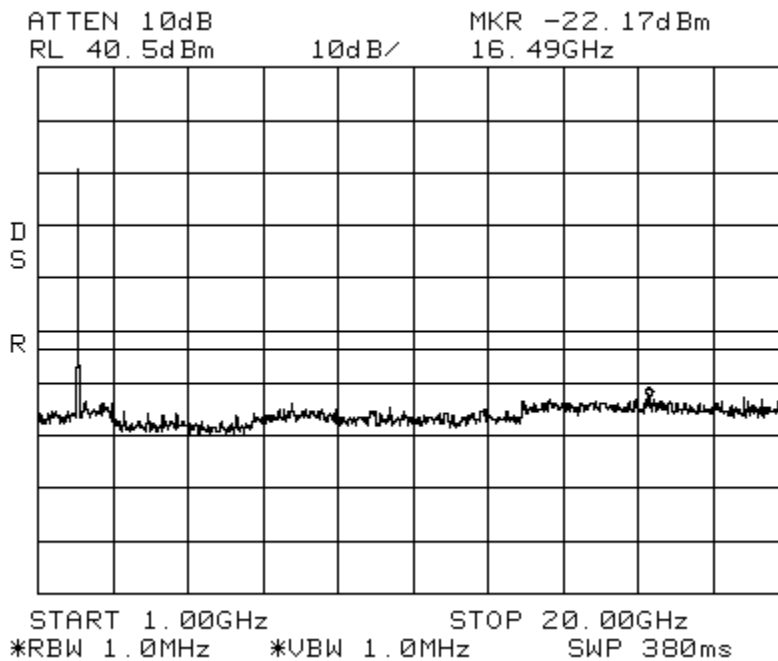
RBW/VBW: 100 kHz



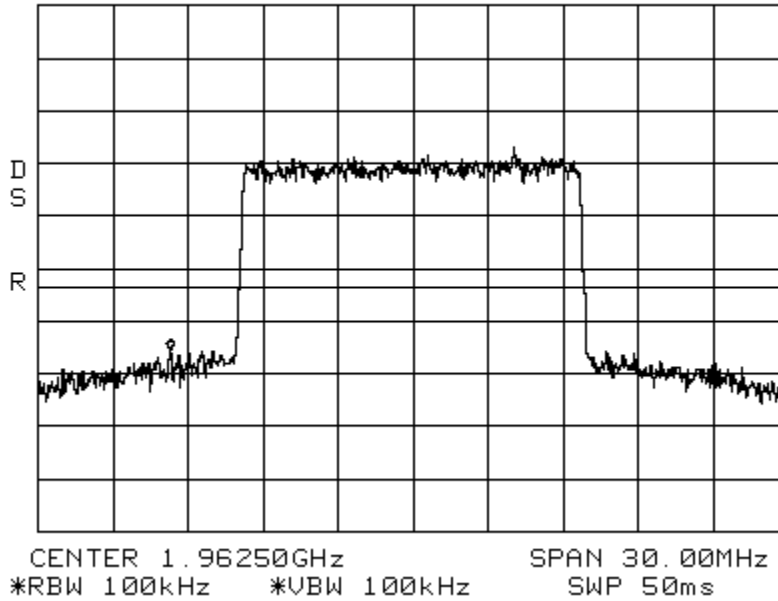
Conducted Emissions LTE 10 MHz Channel Bandwidth Spectrum PCS
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



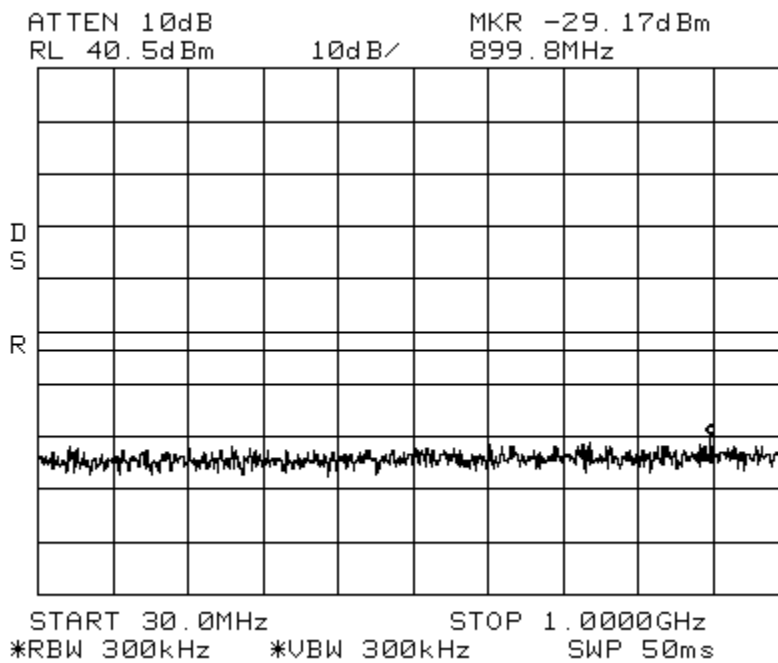
Conducted Emissions LTE 10 MHz Channel Bandwidth Spectrum PCS
Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



Conducted Emissions LTE 15 MHz Channel Bandwidth Spectrum PCS
Center: 1962.5 MHz Span: 30 MHz RBW/VBW: 100 kHz
ATTEN 10dB MKR -24.83dBm
RL 40.5dBm 10dB/ 1.95280GHz



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



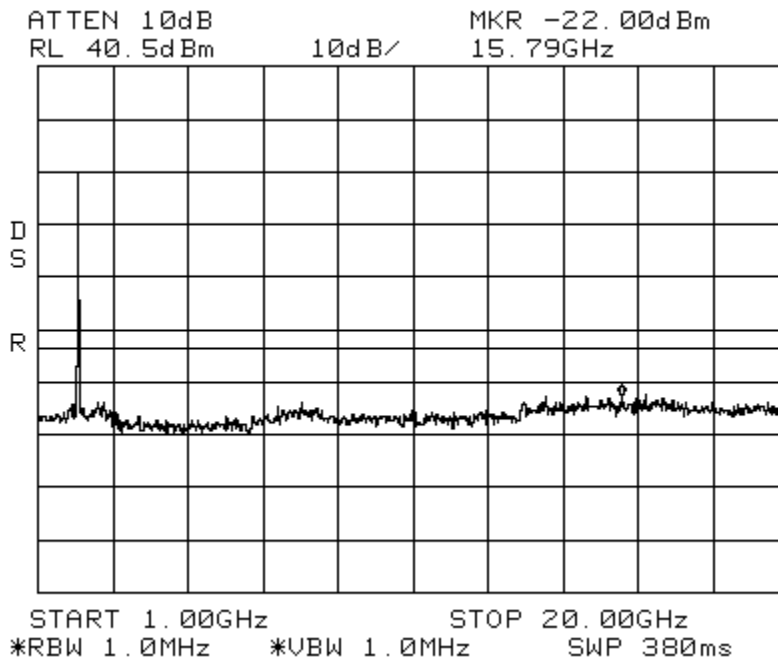
Conducted Emissions

LTE 15 MHz Channel Bandwidth

Spectrum PCS

Span: 1 GHz to 20 GHz

RBW/VBW: 1 MHz



Conducted Emissions

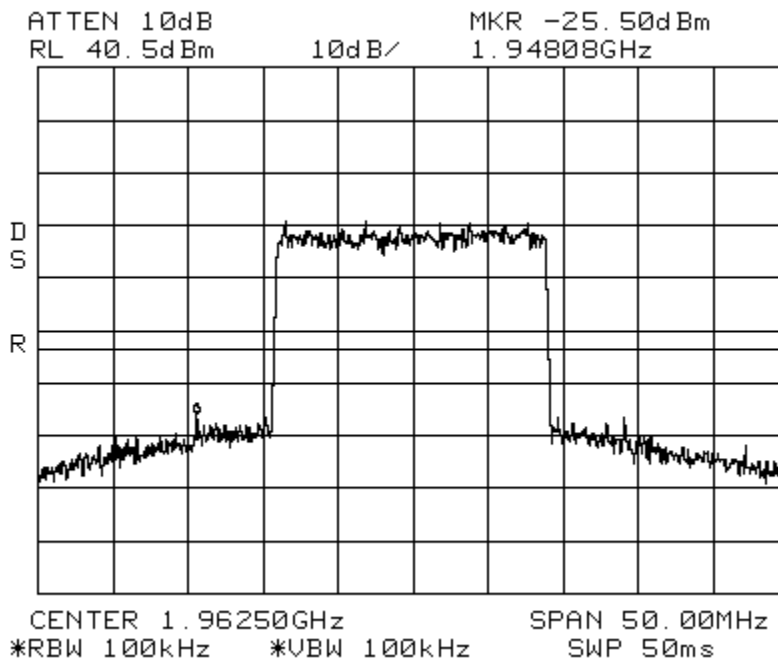
LTE 20 MHz Channel Bandwidth

Spectrum PCS

Center: 1962.5 MHz

Span: 50MHz

RBW/VBW: 100 kHz



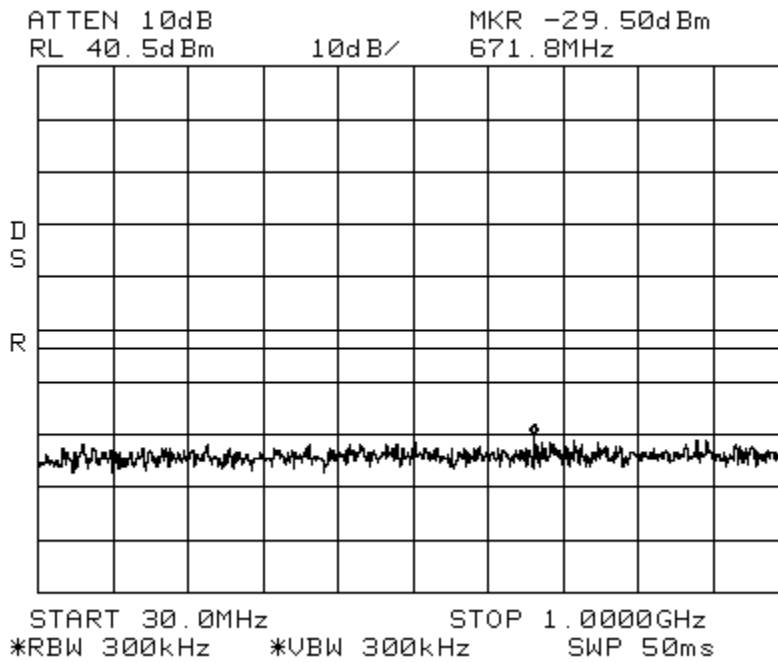
Conducted Emissions

LTE 20 MHz Channel Bandwidth

Spectrum PCS

Span: 30 MHz to 1 GHz

RBW/VBW: 300 kHz



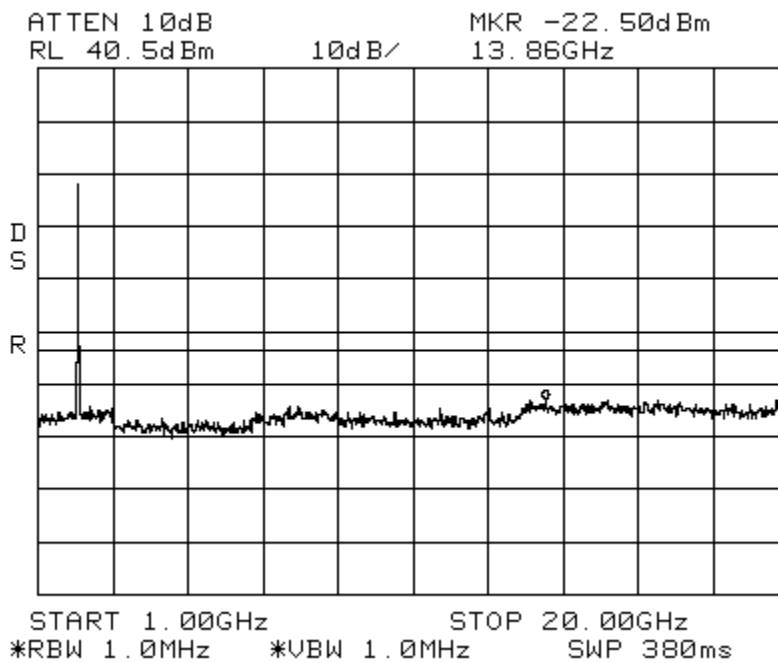
Conducted Emissions

LTE 20 MHz Channel Bandwidth

Spectrum PCS

Span: 1 GHz to 20 GHz

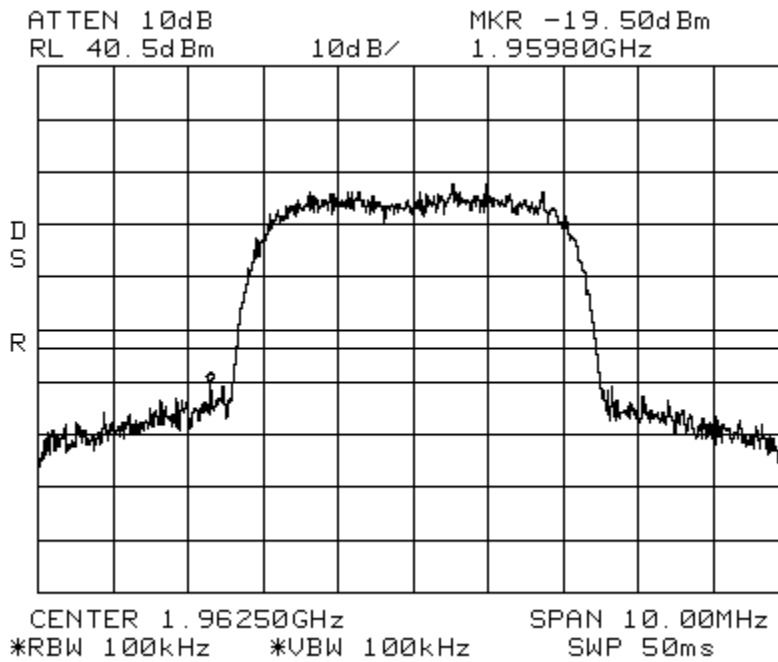
RBW/VBW: 1 MHz



Conducted Emissions
Center: 1962.5 MHz

WCDMA
Span: 10 MHz

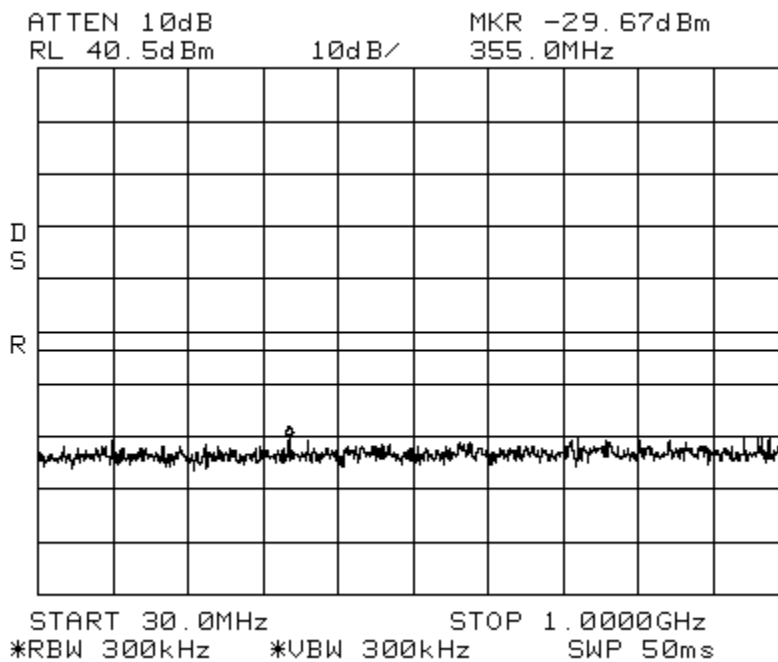
Spectrum PCS
RBW/VBW: 100 kHz

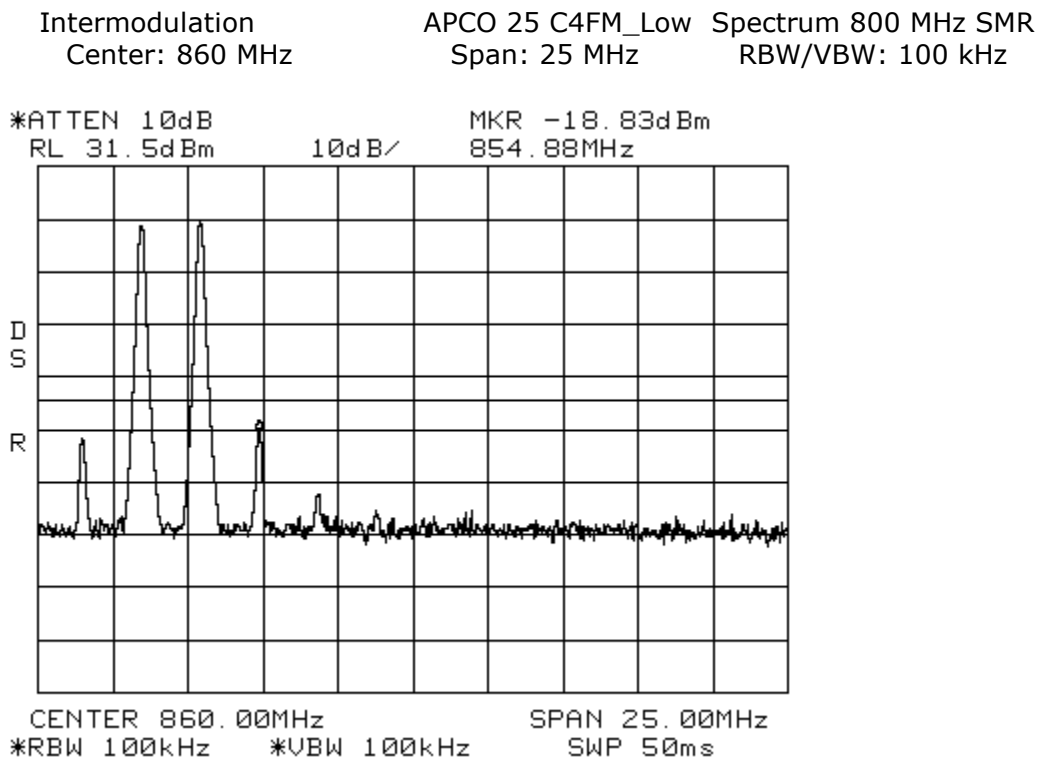
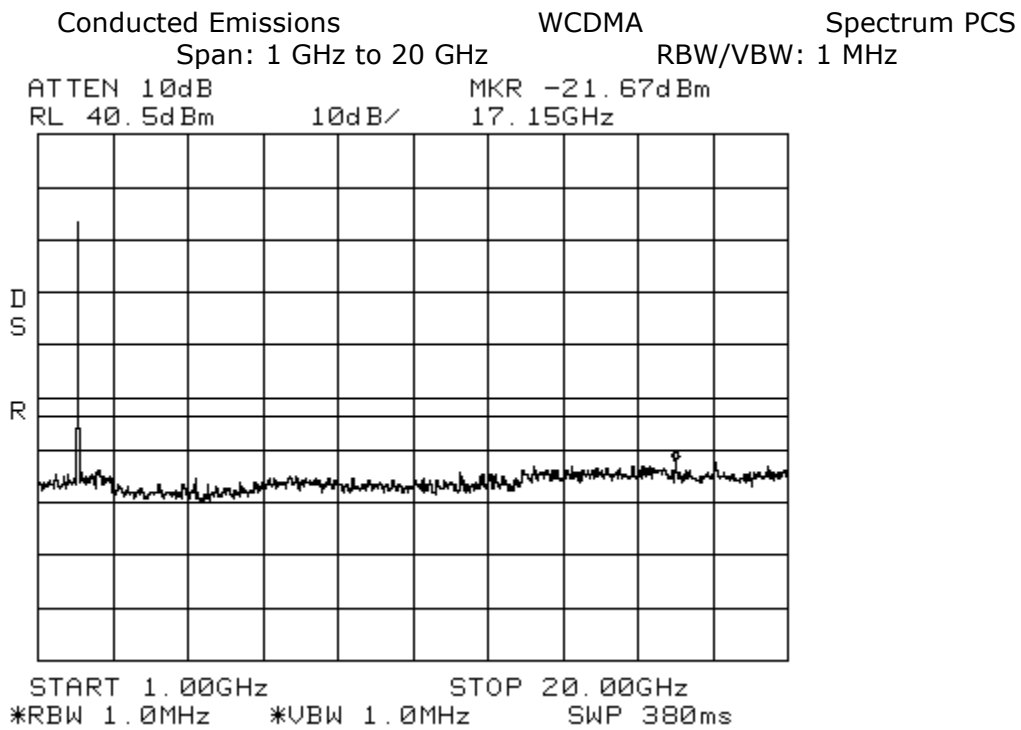


Conducted Emissions
Span: 30 MHz to 1 GHz

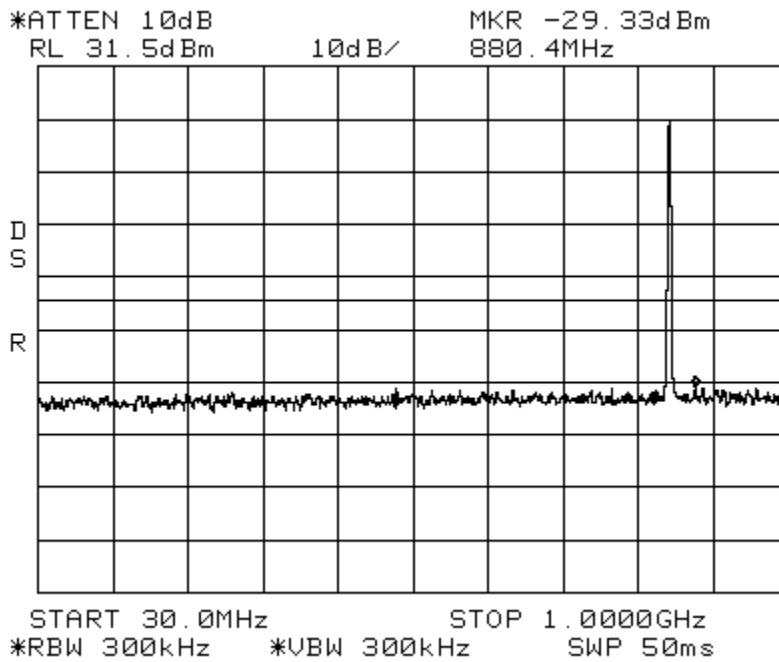
WCDMA

Spectrum PCS
RBW/VBW: 300 kHz

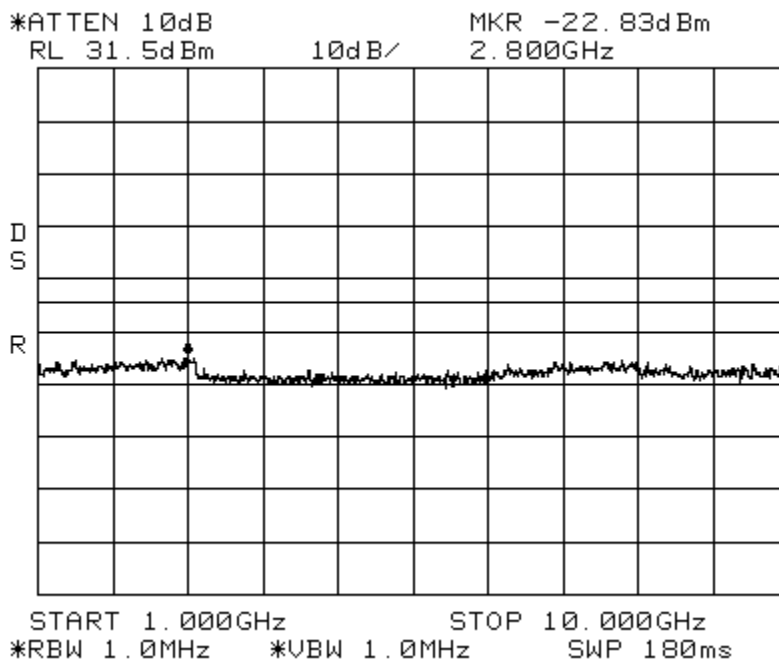




Intermodulation APCO 25 C4FM _Low Spectrum 800 MHz SMR
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



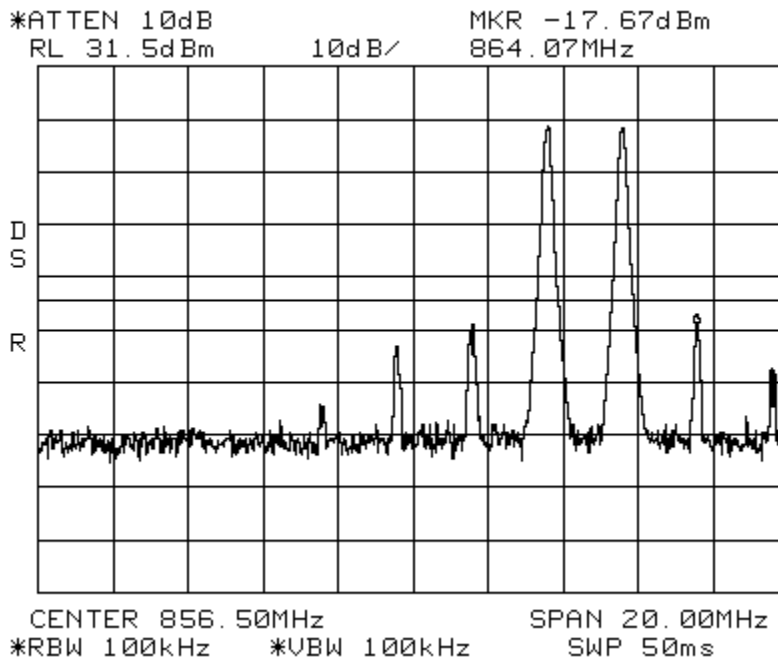
Intermodulation APCO 25 C4FM _Low Spectrum 800 MHz SMR
 Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



Intermodulation
Center: 856.5 MHz

APCO 25 C4FM_High
Span: 25 MHz

Spectrum 800 MHz SMR
RBW/VBW: 100 kHz

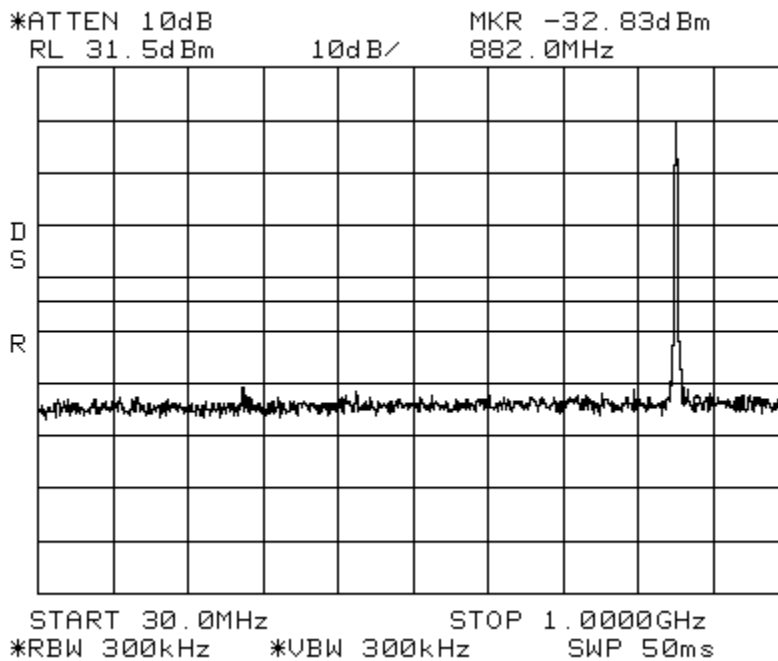


Intermodulation

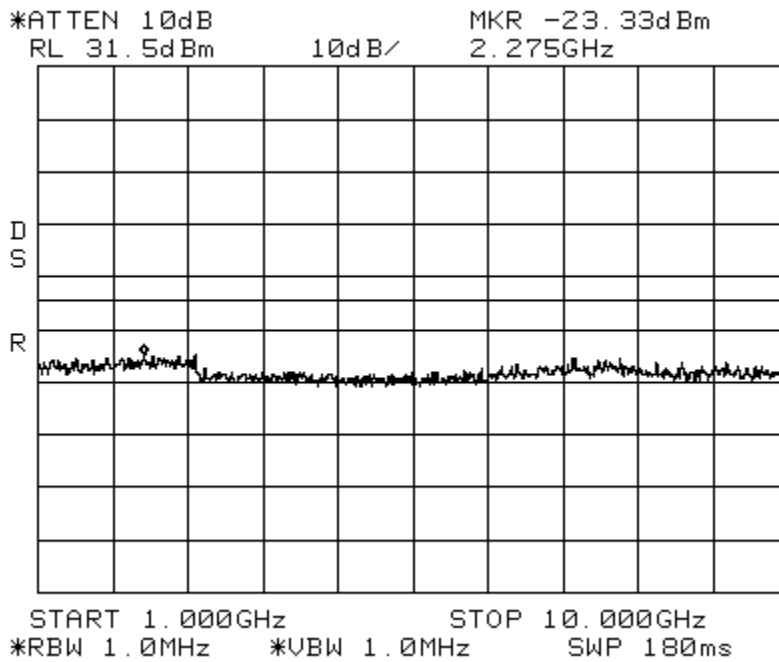
APCO 25 C4FM_High Spectrum 800 MHz SMR

Span: 30 MHz to 1 GHz

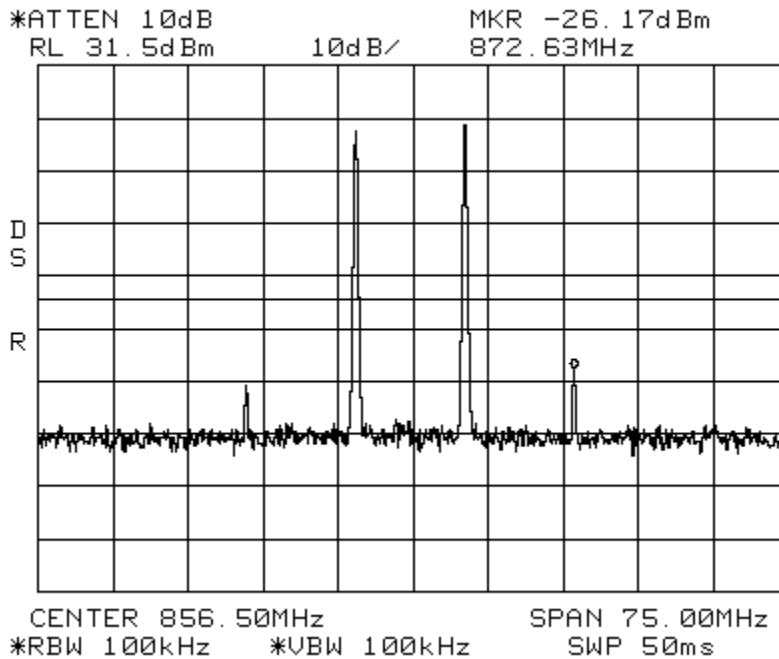
RBW/VBW: 300 kHz



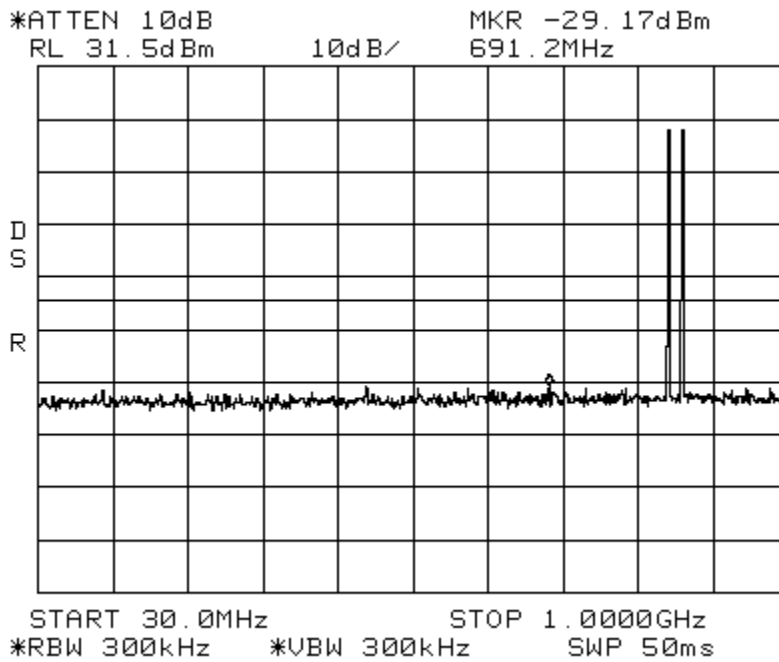
Intermodulation APCO 25 C4FM _HighSpectrum 800 MHz SMR
 Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



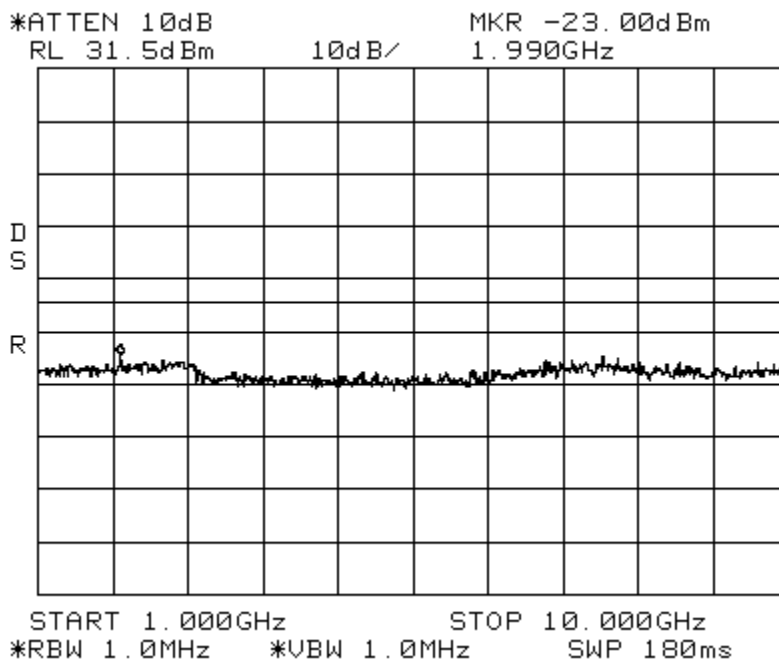
Intermodulation APCO 25 C4FM _Apart Spectrum 800 MHz SMR
 Center: 856.5 MHz Span: 75 MHz RBW/VBW: 100 kHz



Intermodulation APCO 25 C4FM_Apart Spectrum 800 MHz SMR
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



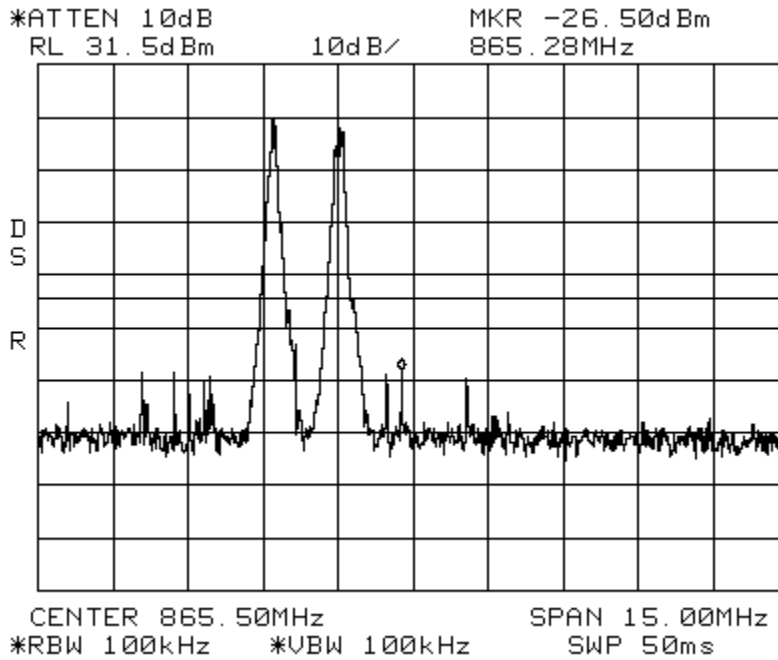
Intermodulation APCO 25 C4FM_Apart Spectrum 800 MHz SMR
 Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



Intermodulation
Center: 865.5 MHz

iDEN_Low
Span: 25 MHz

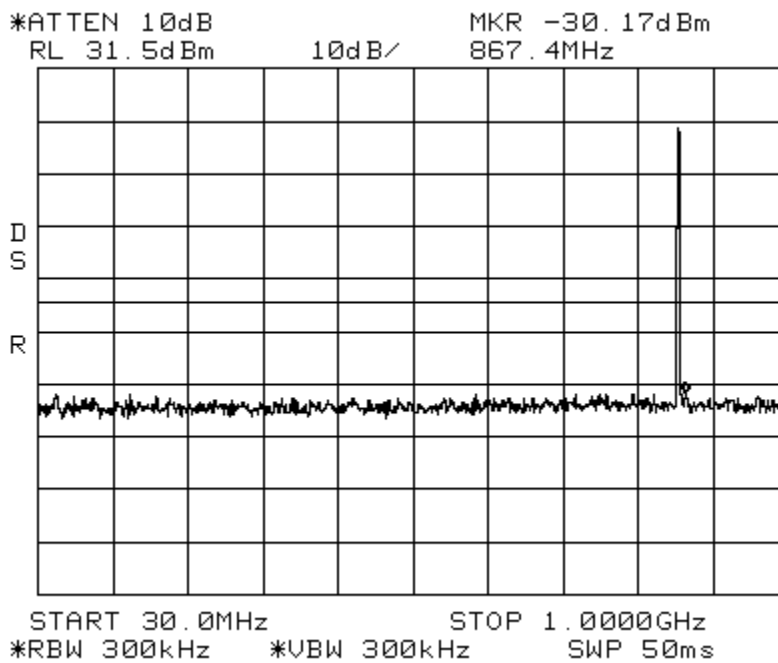
Spectrum 800 MHz SMR
RBW/VBW: 100 kHz



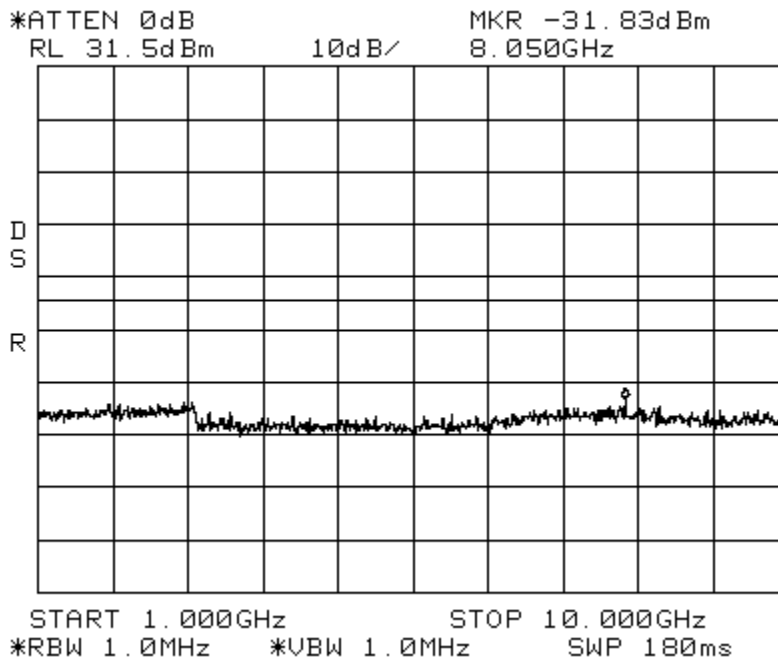
Intermodulation
Span: 30 MHz to 1 GHz

iDEN_Low

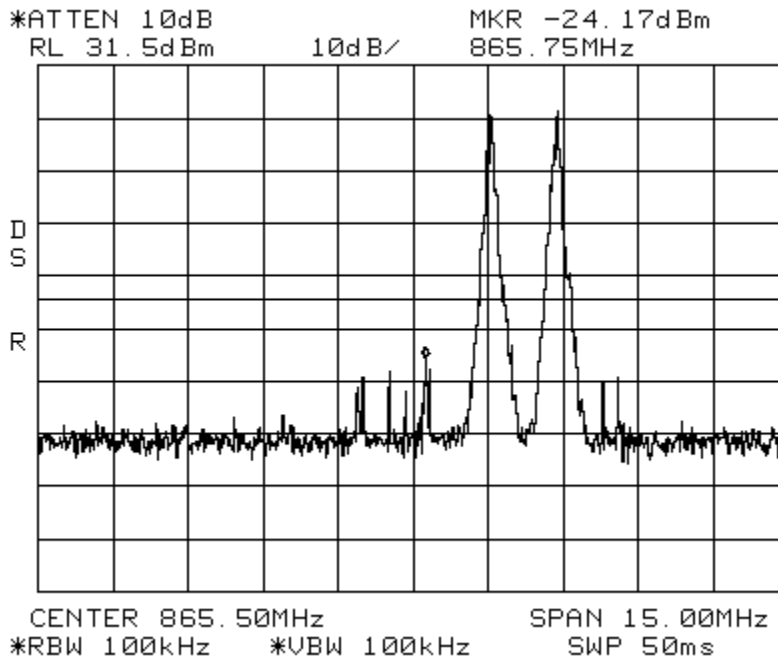
Spectrum 800 MHz SMR
RBW/VBW: 300 kHz



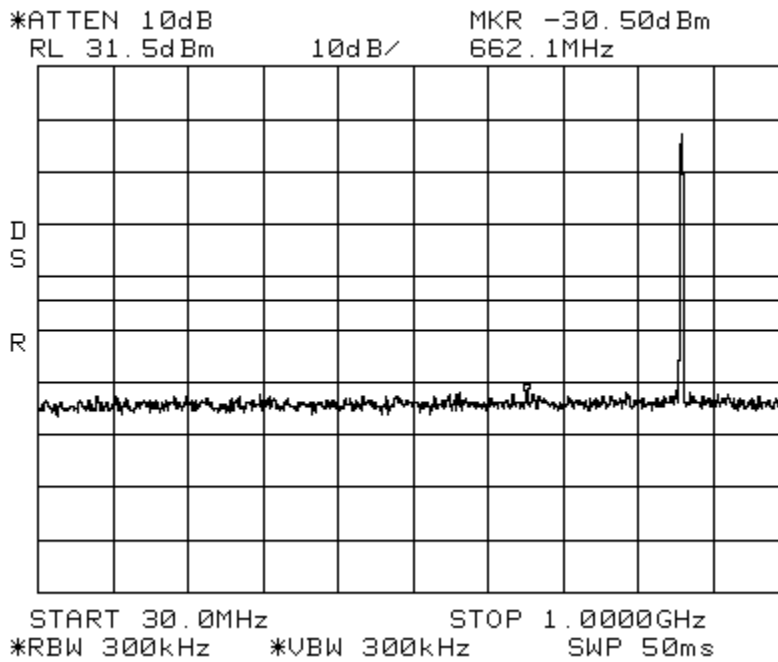
Intermodulation iDEN_Low Spectrum 800 MHz SMR
 Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



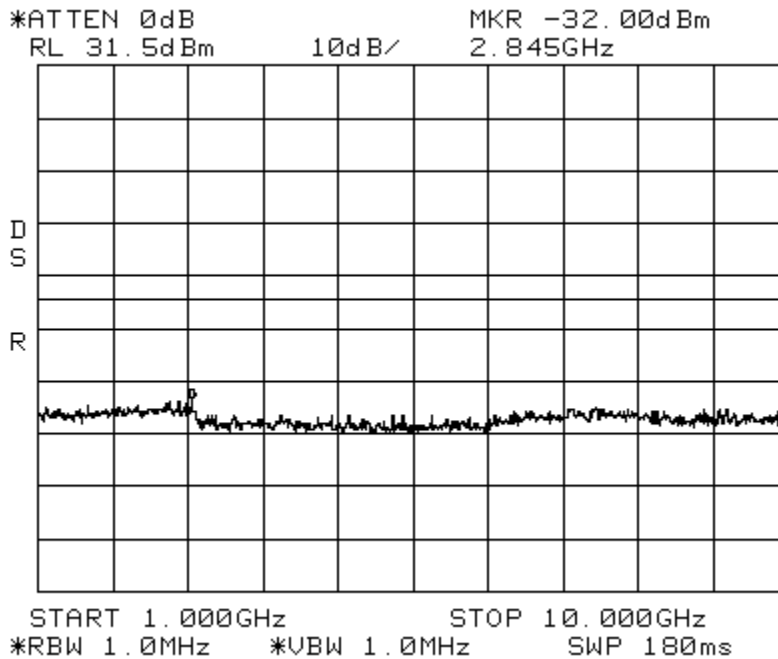
Intermodulation iDEN_High Spectrum 800 MHz SMR
 Center: 865.5 MHz Span: 25 MHz RBW/VBW: 100 kHz



Intermodulation iDEN_High Spectrum 800 MHz SMR
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



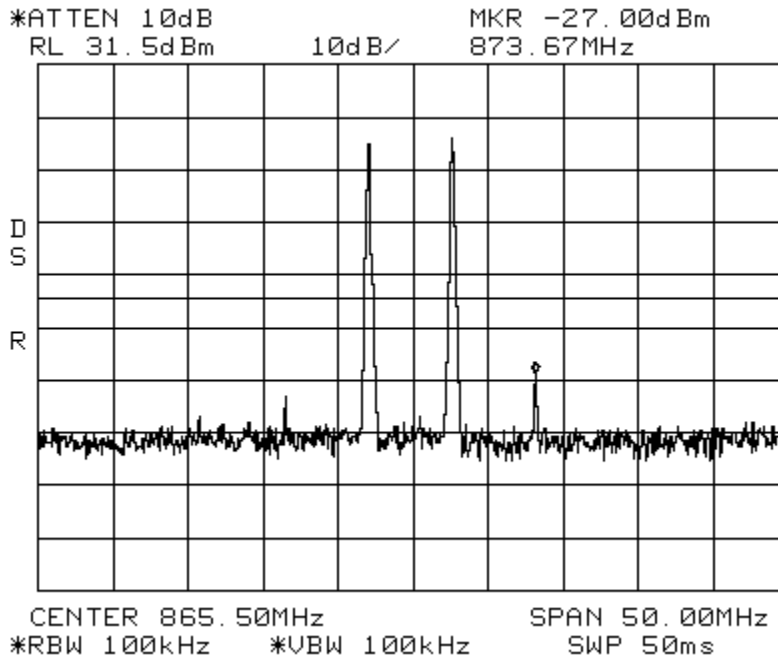
Intermodulation iDEN_High Spectrum 800 MHz SMR
 Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



Intermodulation
Center: 865.5 MHz

iDEN_Apart
Span: 50 MHz

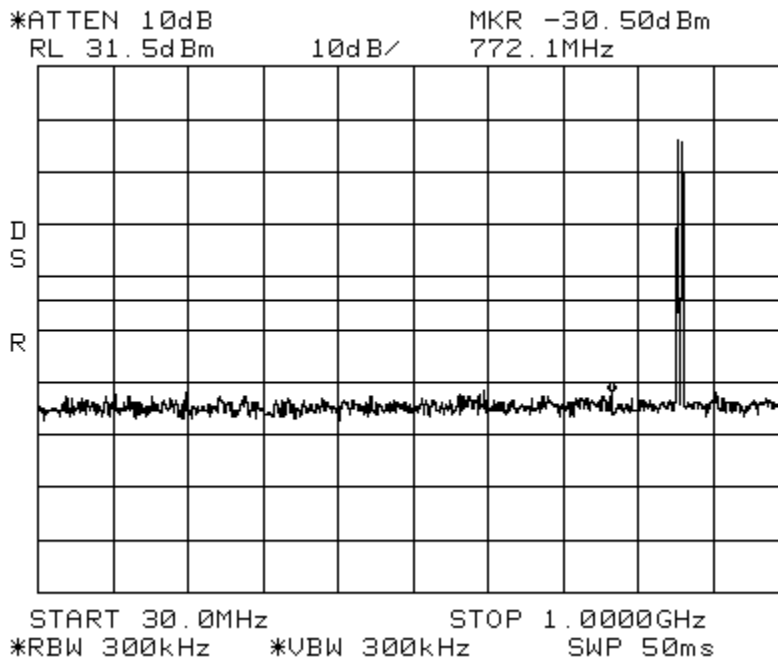
Spectrum 800 MHz SMR
RBW/VBW: 100 kHz



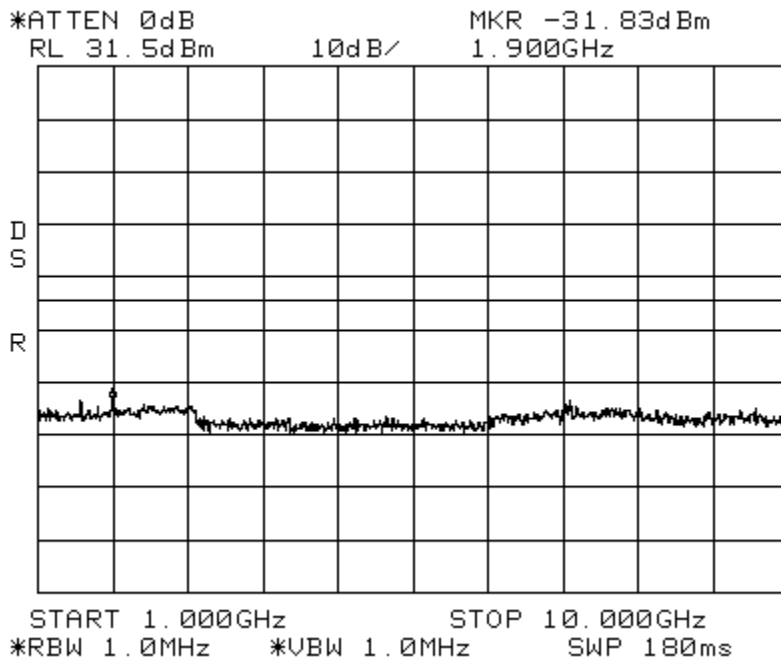
Intermodulation
Span: 30 MHz to 1 GHz

iDEN_Apart

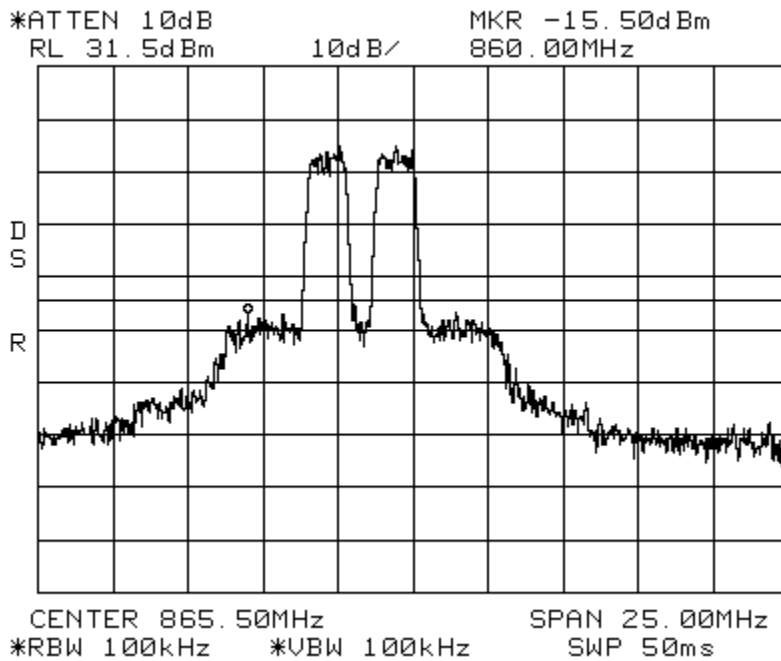
Spectrum 800 MHz SMR
RBW/VBW: 300 kHz



Intermodulation iDEN_Apart Spectrum 800 MHz SMR
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



Intermodulation CDMA_Low Spectrum 800 MHz SMR
Center: 865.5 MHz Span: 25 MHz RBW/VBW: 100 kHz



Intermodulation

CDMA_Low

Spectrum 800 MHz SMR

Span: 30 MHz to 1 GHz

RBW/VBW: 300 kHz

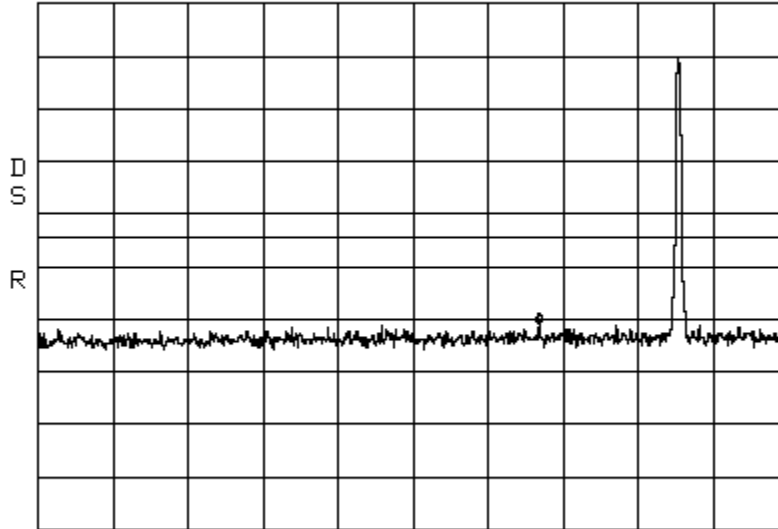
*ATTEN 10dB

RL 31.5dBm

10dB/

MKR -29.50dBm

678.3MHz



START 30.0MHz

STOP 1.0000GHz

*RBW 300kHz

*VBW 300kHz

SWP 50ms

Intermodulation

CDMA_Low

Spectrum 800 MHz SMR

Span: 1 GHz to 10 GHz

RBW/VBW: 1 MHz

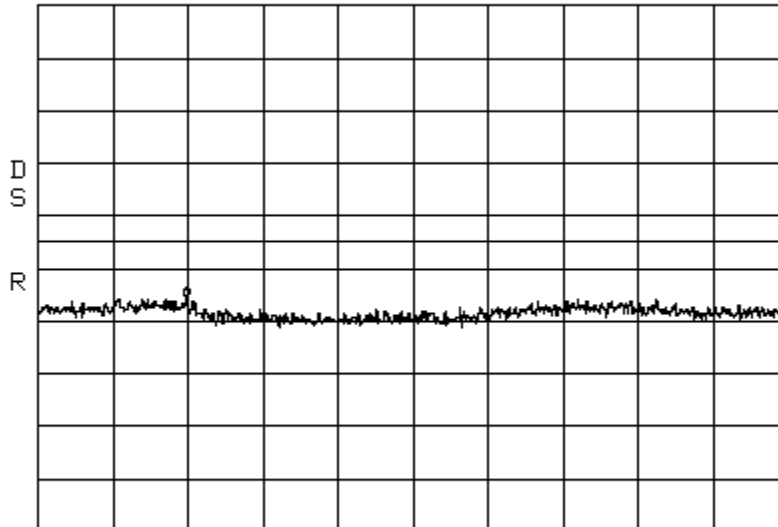
*ATTEN 10dB

RL 31.8dBm

10dB/

MKR -23.70dBm

2.785GHz



START 1.000GHz

STOP 10.000GHz

*RBW 1.0MHz

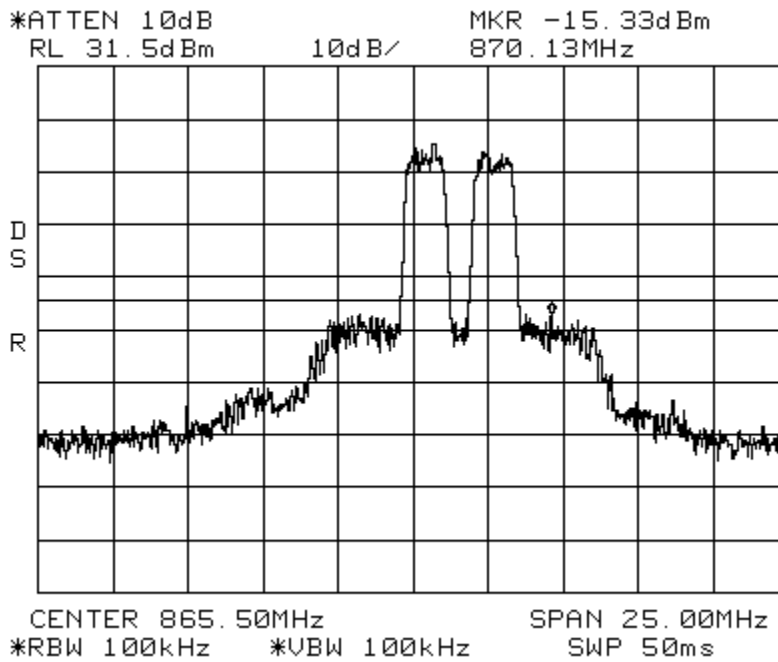
*VBW 1.0MHz

SWP 180ms

Intermodulation
Center: 865.5 MHz

CDMA_High
Span: 25 MHz

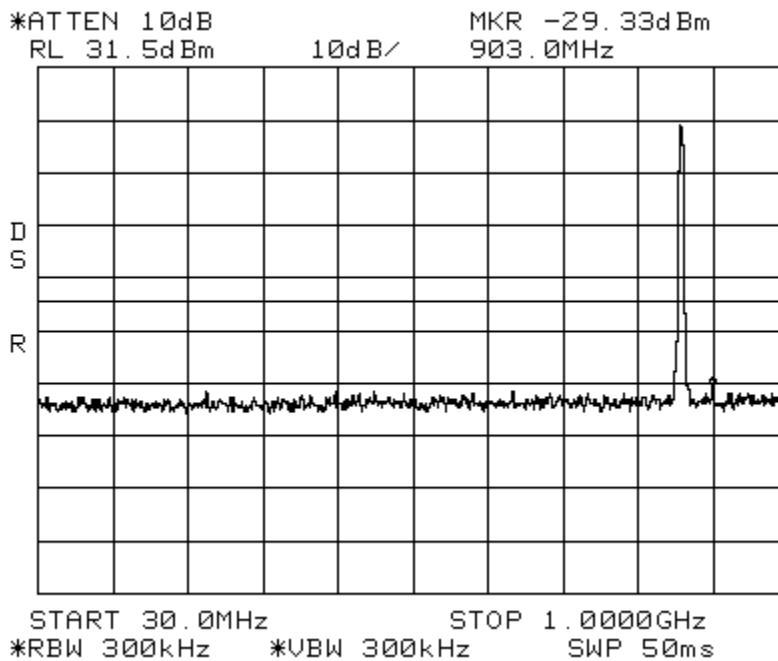
Spectrum 800 MHz SMR
RBW/VBW: 100 kHz



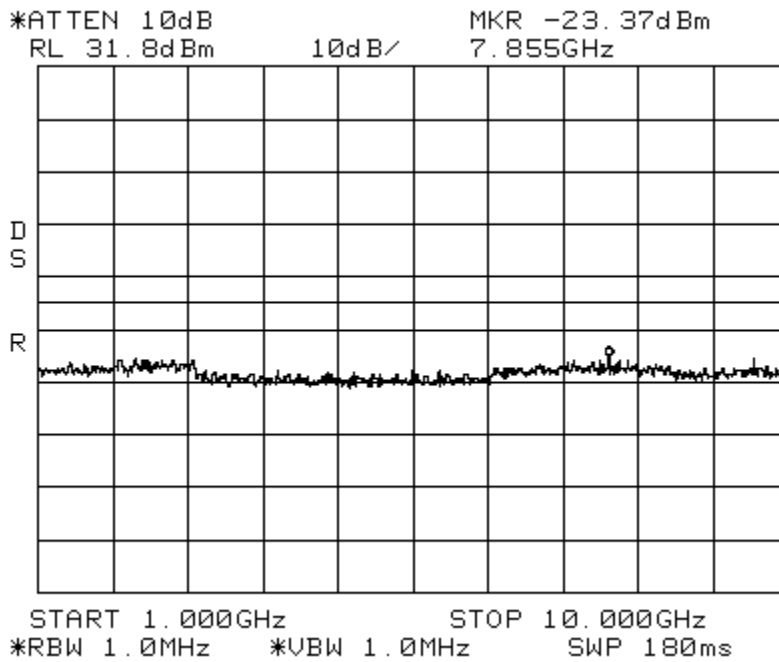
Intermodulation
Span: 30 MHz to 1 GHz

CDMA_High

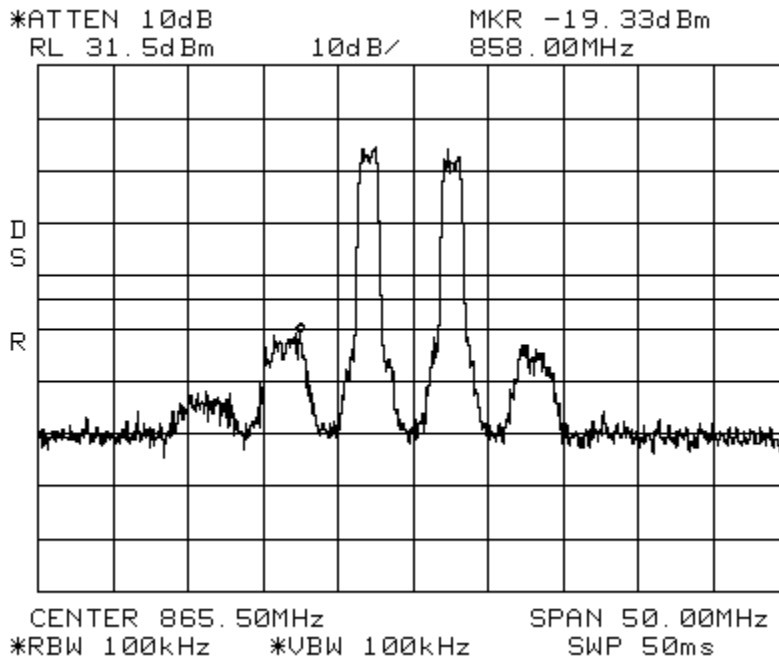
Spectrum 800 MHz SMR
RBW/VBW: 300 kHz



Intermodulation CDMA_High Spectrum 800 MHz SMR
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



Intermodulation CDMA_Apart Spectrum 800 MHz SMR
Center: 865.5 MHz Span: 50 MHz RBW/VBW: 100 kHz



Intermodulation

CDMA_Apart

Spectrum 800 MHz SMR

Span: 30 MHz to 1 GHz

RBW/VBW: 300 kHz

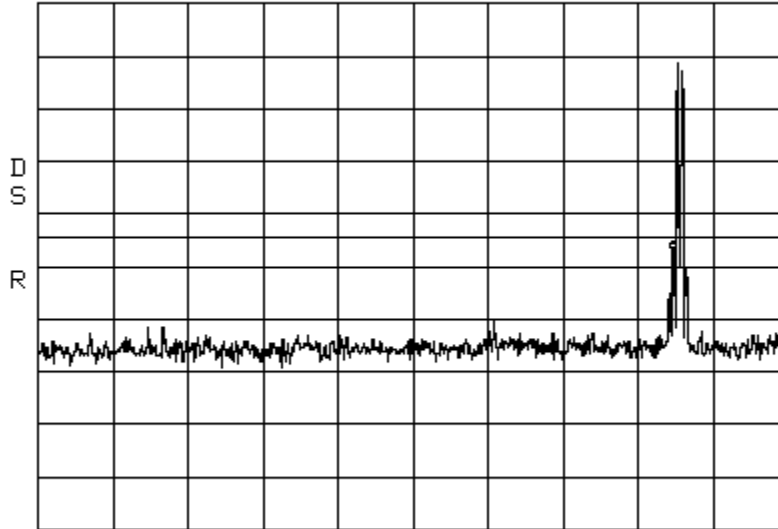
*ATTEN 10dB

RL 31.5dBm

10dB/

MKR -15.50dBm

851.3MHz



START 30.0MHz

STOP 1.0000GHz

*RBW 300kHz

*VBW 300kHz

SWP 50ms

Intermodulation

CDMA_Apart

Spectrum 800 MHz SMR

Span: 1 GHz to 10 GHz

RBW/VBW: 1 MHz

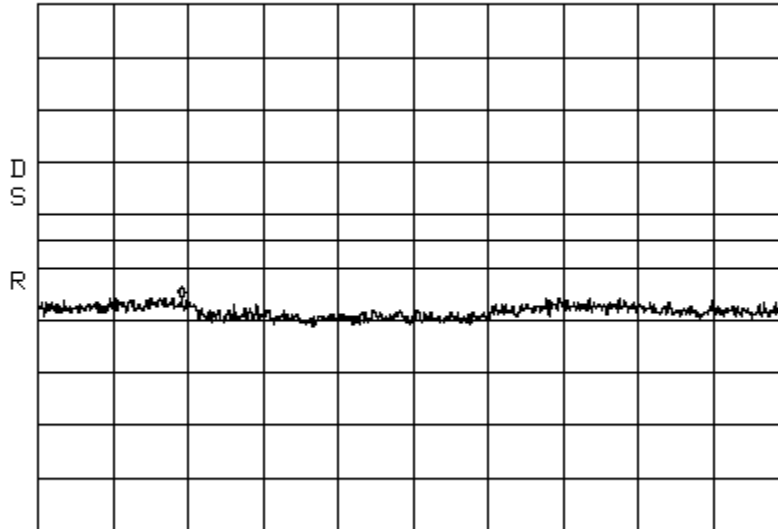
*ATTEN 10dB

RL 31.8dBm

10dB/

MKR -23.87dBm

2.725GHz



START 1.000GHz

STOP 10.000GHz

*RBW 1.0MHz

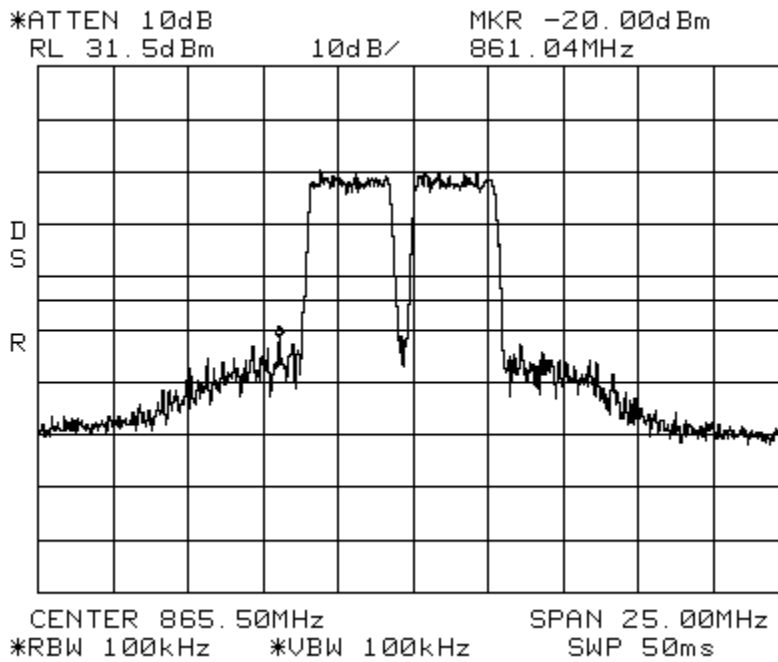
*VBW 1.0MHz

SWP 180ms

Intermodulation
Center: 865.5 MHz

LTE 3MHz Channel Bandwidth
Span: 25 MHz

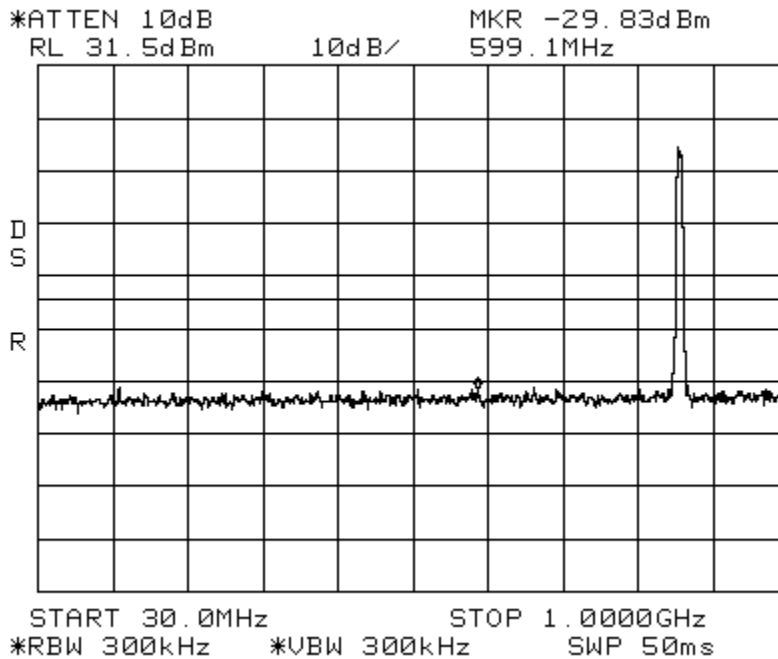
Spectrum 800 MHz SMR
RBW/VBW: 100 kHz



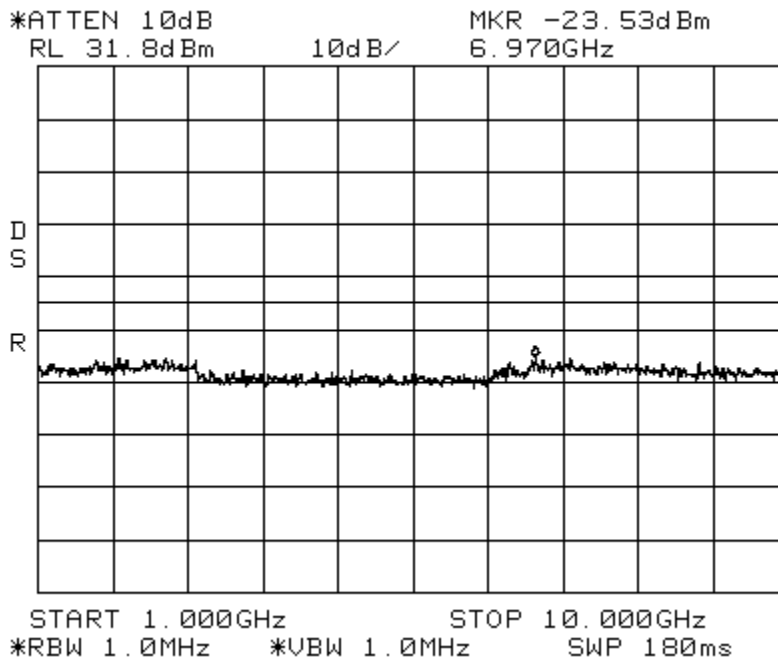
Intermodulation

LTE 3 MHz Channel Bandwidth
Span: 30 MHz to 1 GHz

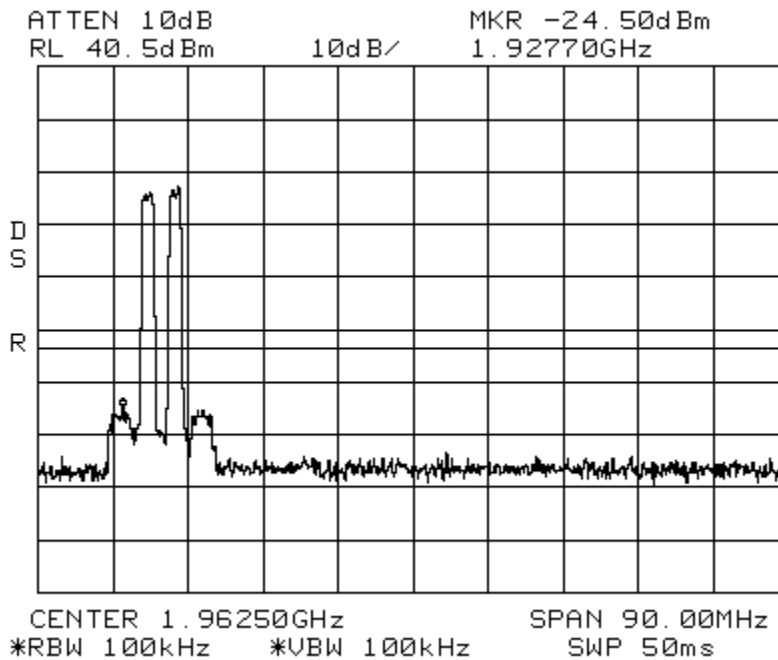
Spectrum 800 MHz SMR
RBW/VBW: 300 kHz



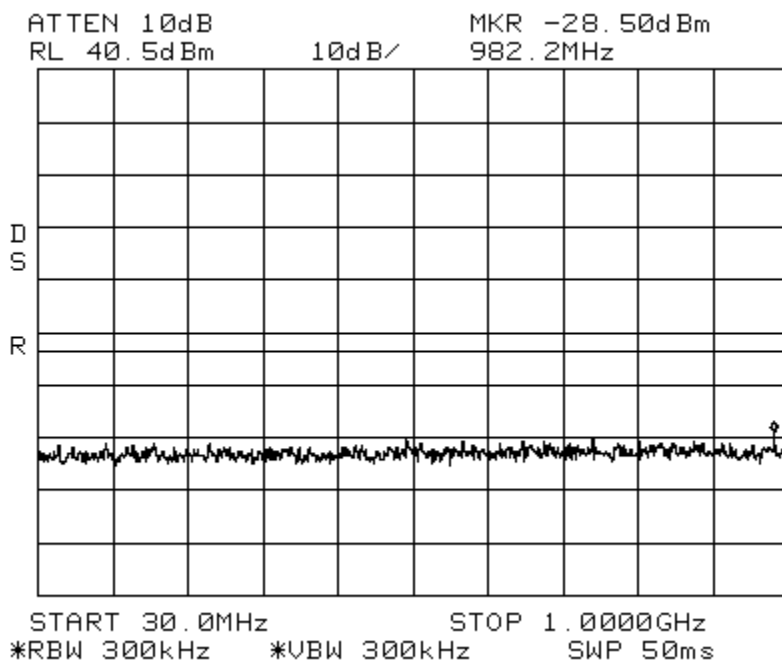
Intermodulation LTE 3 MHz Channel Bandwidth Spectrum 800 MHz SMR
 Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



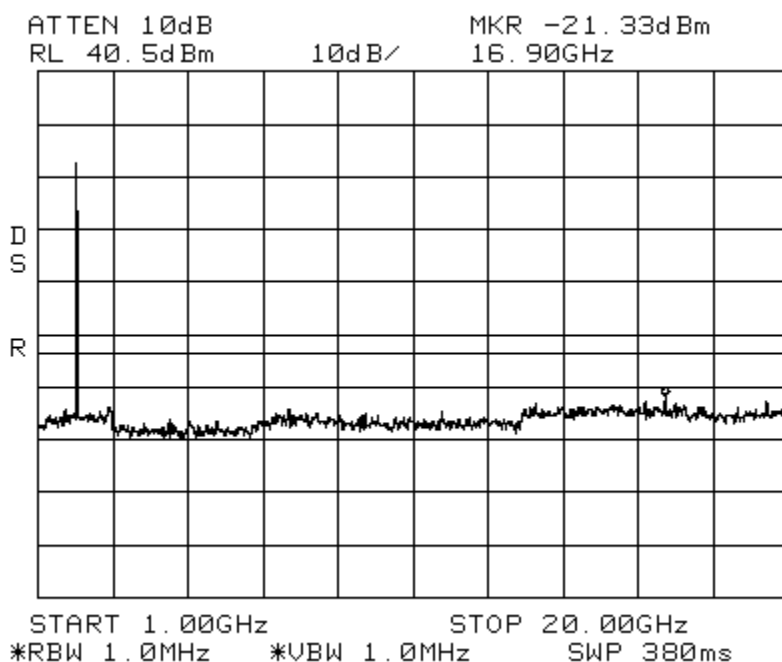
Intermodulation CDMA_Low Spectrum PCS
 Center: 1962.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



Intermodulation CDMA_Low Spectrum PCS
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



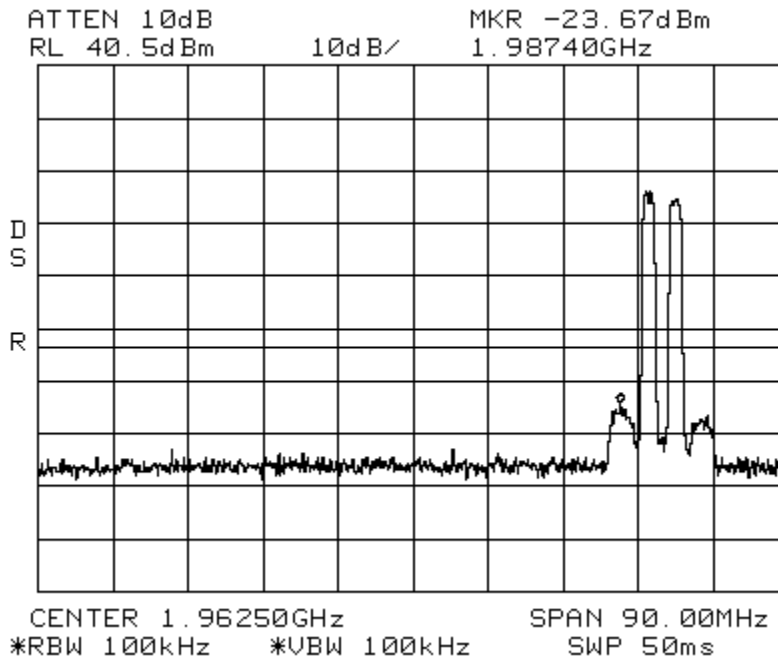
Intermodulation CDMA_Low Spectrum PCS
 Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



Intermodulation
Center: 1962.5 MHz

CDMA_High
Span: 90 MHz

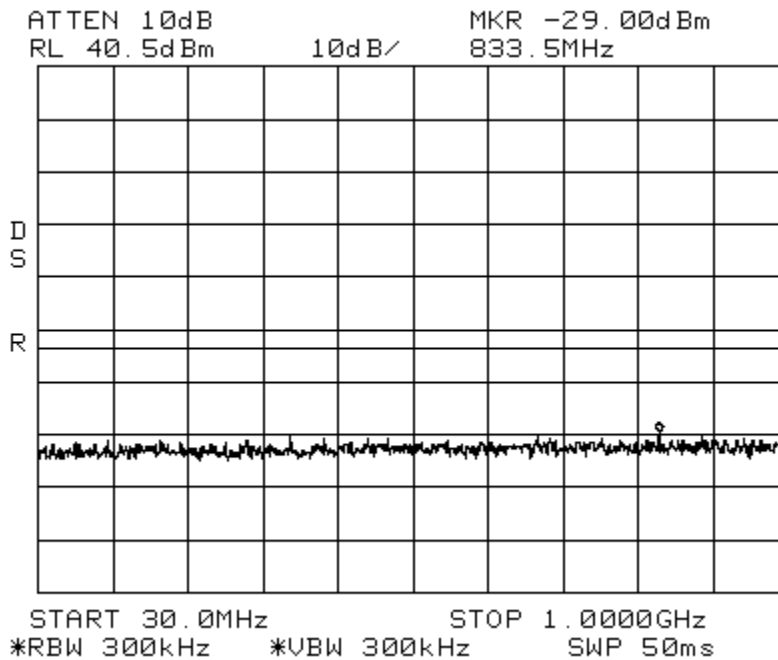
Spectrum PCS
RBW/VBW: 100 kHz



Intermodulation
Span: 30 MHz to 1 GHz

CDMA_High

Spectrum PCS
RBW/VBW: 300 kHz



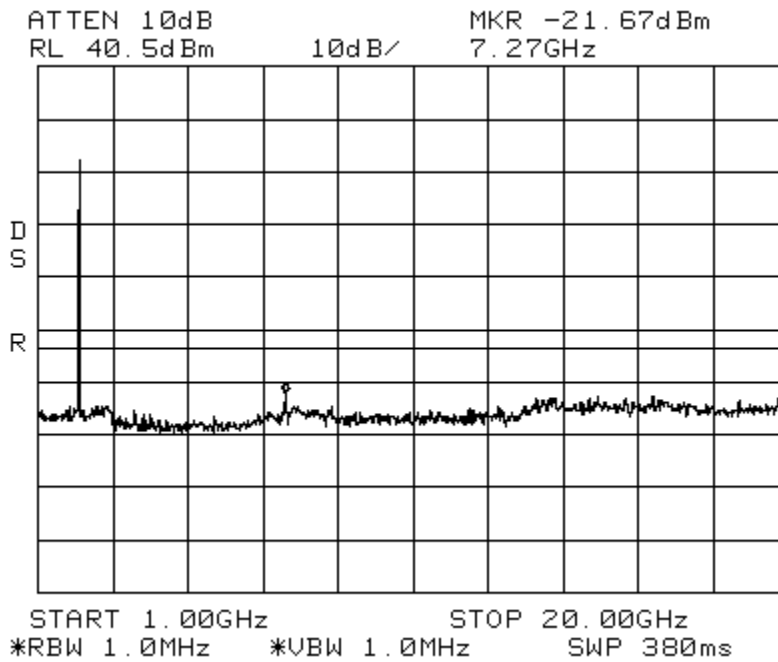
Intermodulation

CDMA_High

Spectrum PCS

Span: 1 GHz to 20 GHz

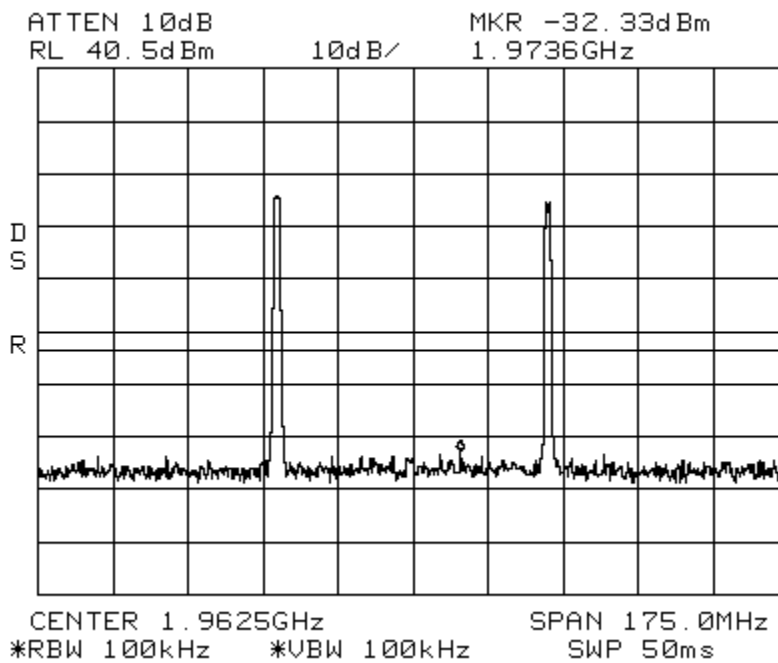
RBW/VBW: 1 MHz



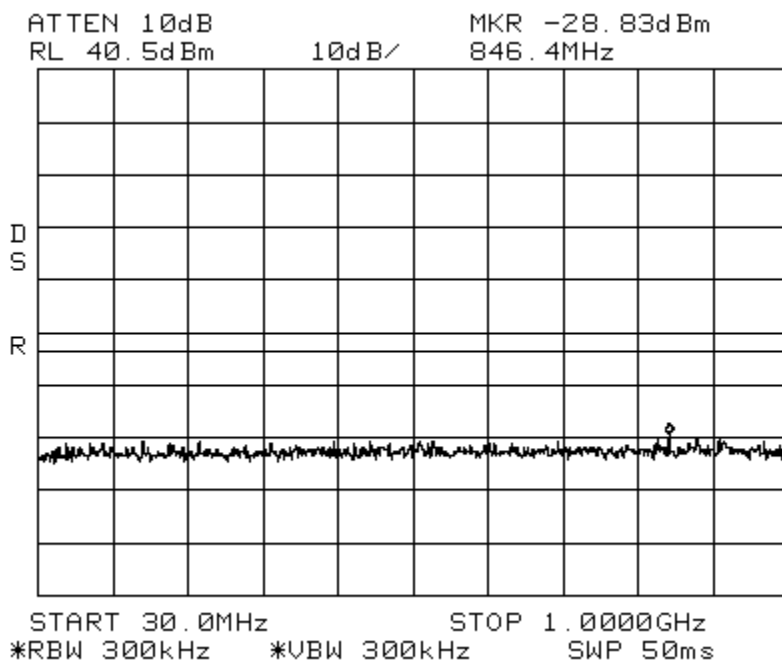
Intermodulation
Center: 1962.5 MHz

CDMA_Apart
Span: 175 MHz

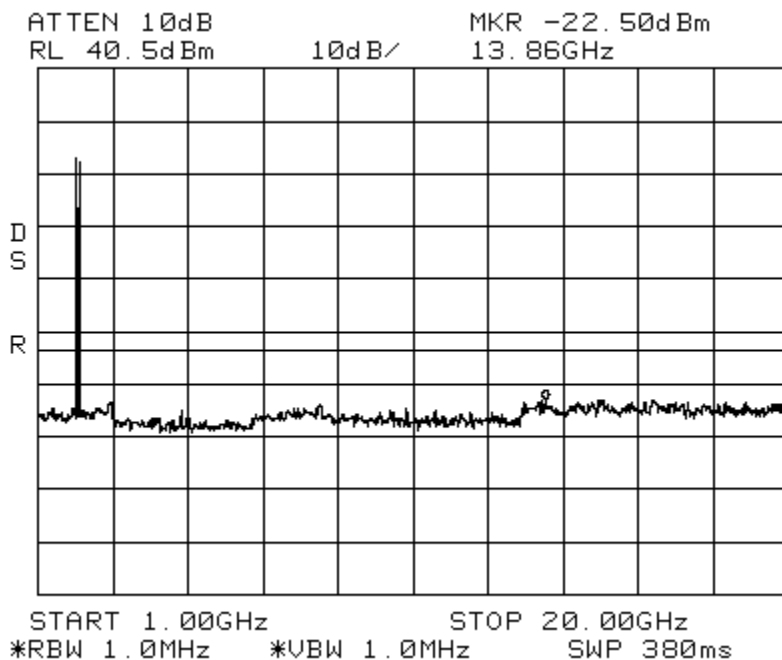
Spectrum PCS
RBW/VBW: 100 kHz



Intermodulation CDMA_Apart Spectrum PCS
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



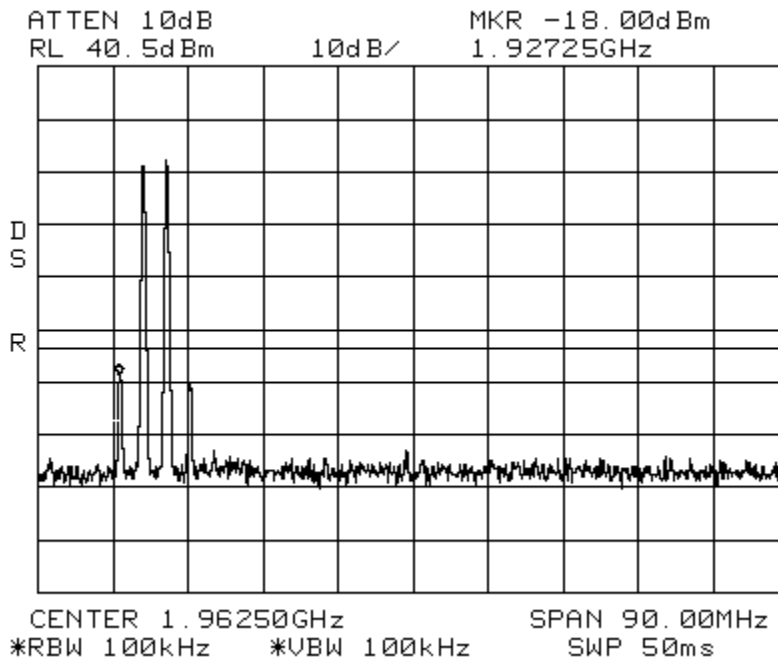
Intermodulation CDMA_Apart Spectrum PCS
 Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



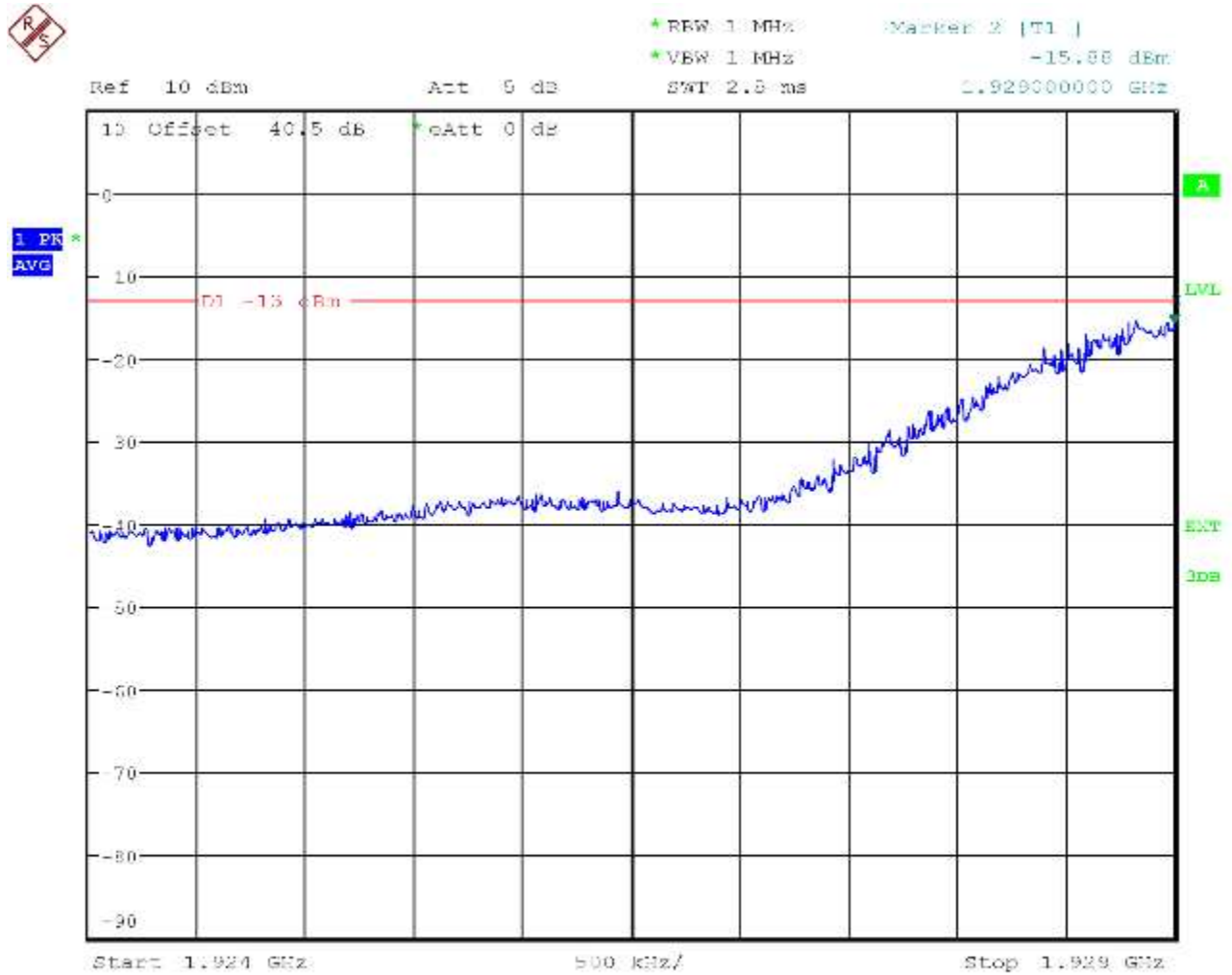
Intermodulation
Center: 1962.5 MHz

EDGE_Low
Span: 90 MHz

Spectrum PCS
RBW/VBW: 100 kHz



Intermodulation EDGE_Low Spectrum PCS
 Start: 1924MHz Stop: 1929 MHz RBW/VBW: 1 MHz



Date: 10.JUL.2012 09:42:43

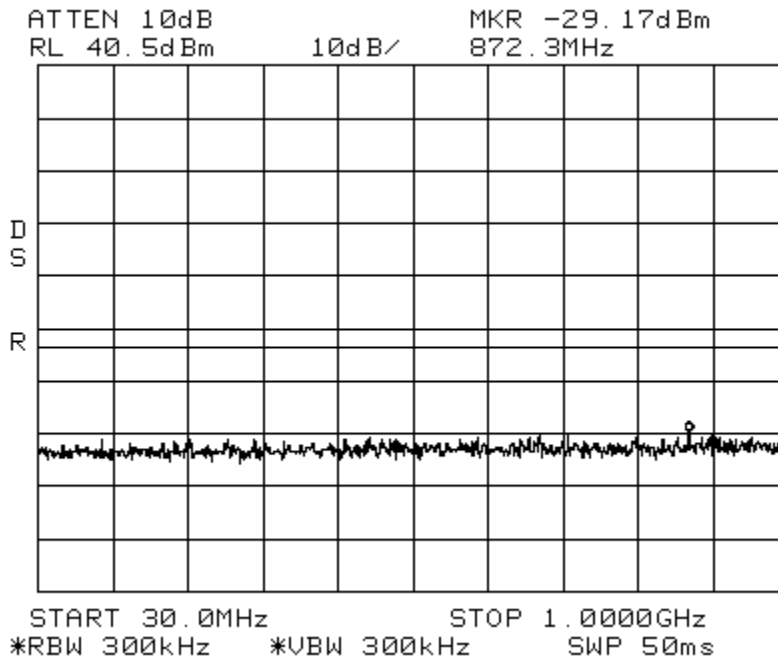
Intermodulation

EDGE_Low

Spectrum PCS

Span: 30 MHz to 1 GHz

RBW/VBW: 300 kHz



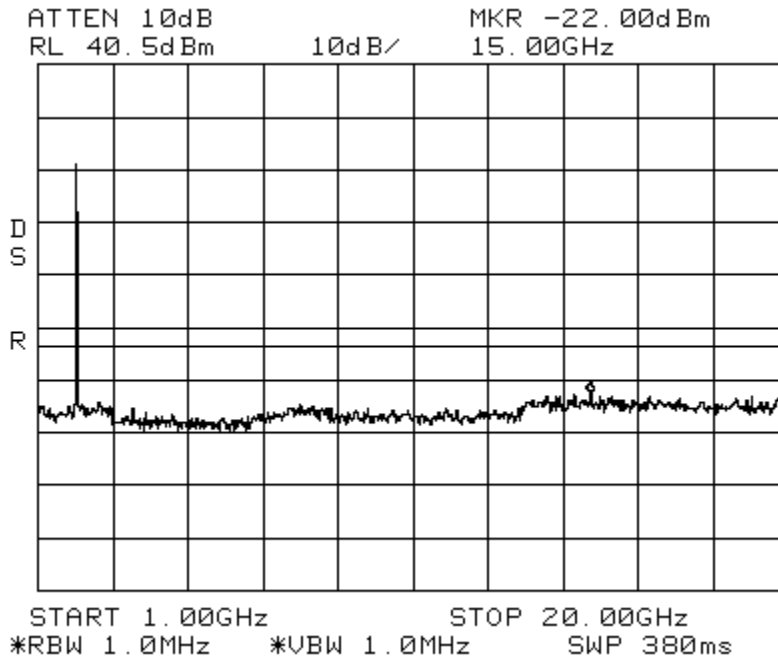
Intermodulation

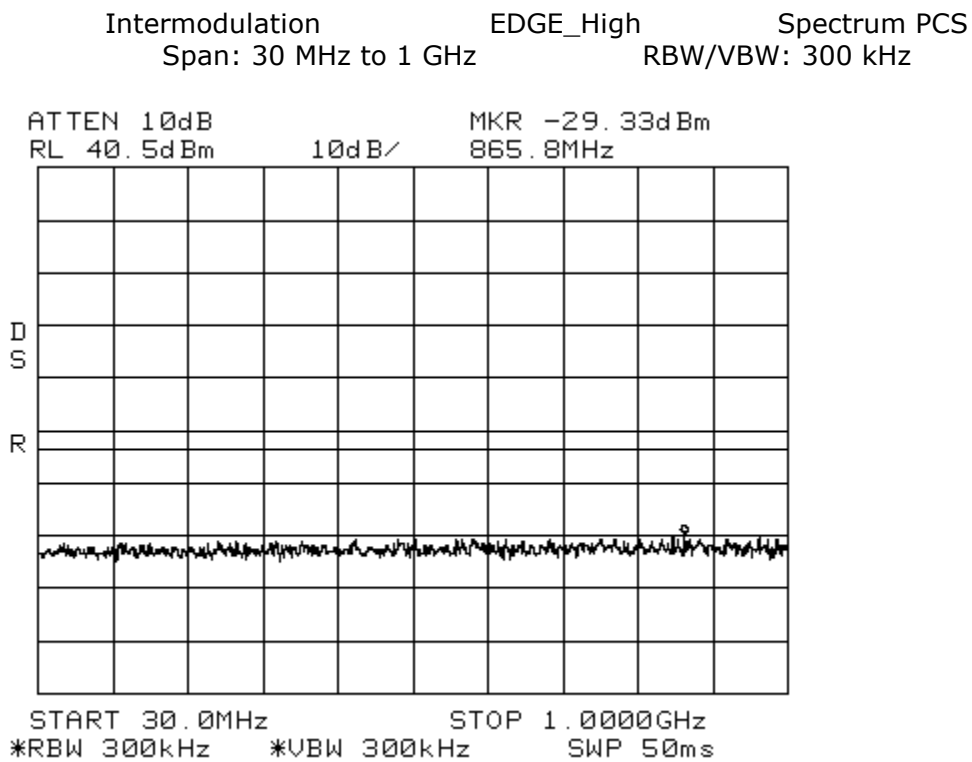
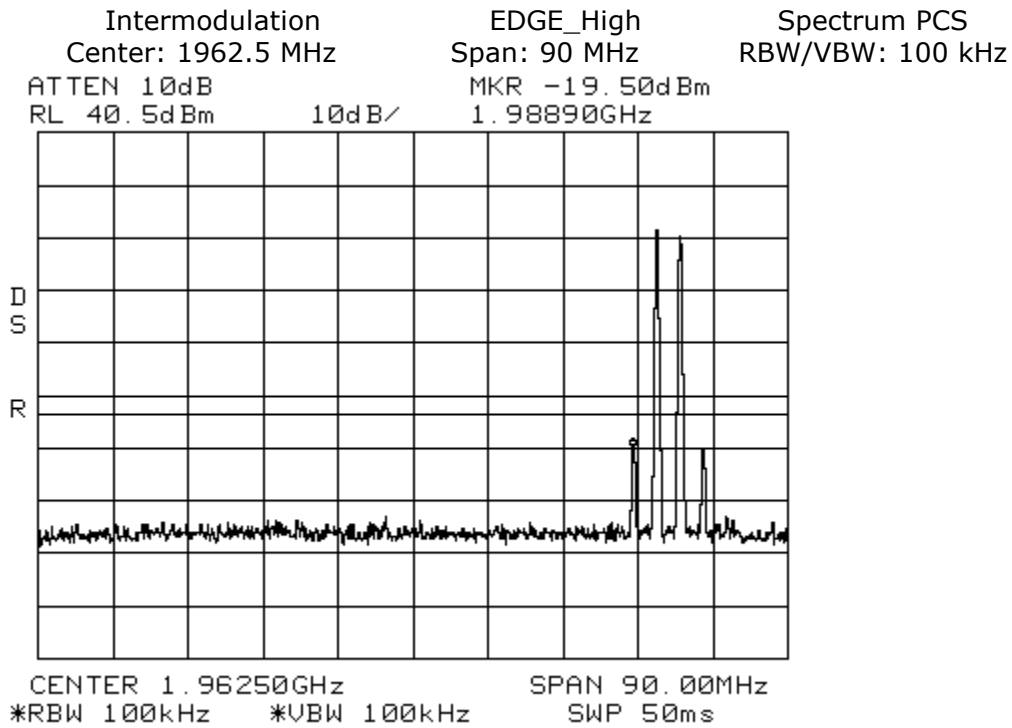
EDGE_Low

Spectrum PCS

Span: 1 GHz to 20 GHz

RBW/VBW: 1 MHz





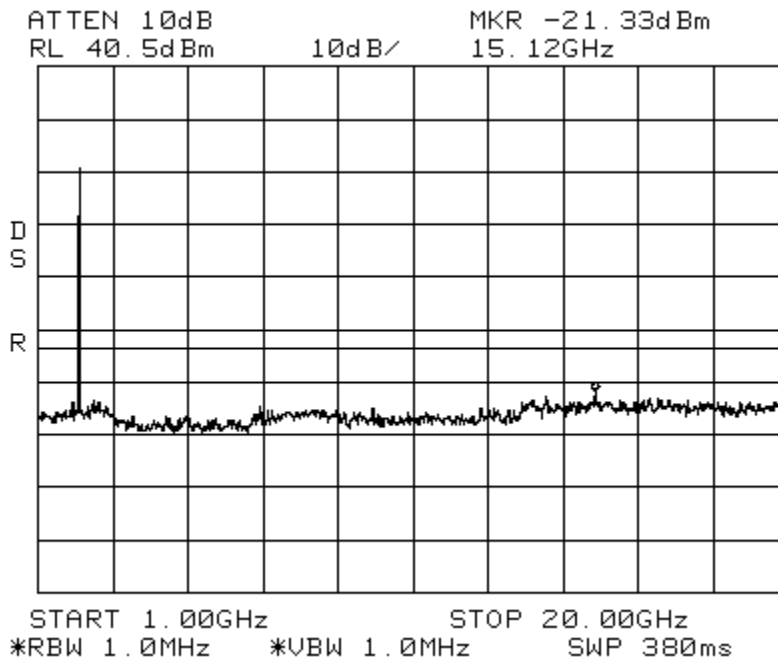
Intermodulation

EDGE_High

Spectrum PCS

Span: 1 GHz to 20 GHz

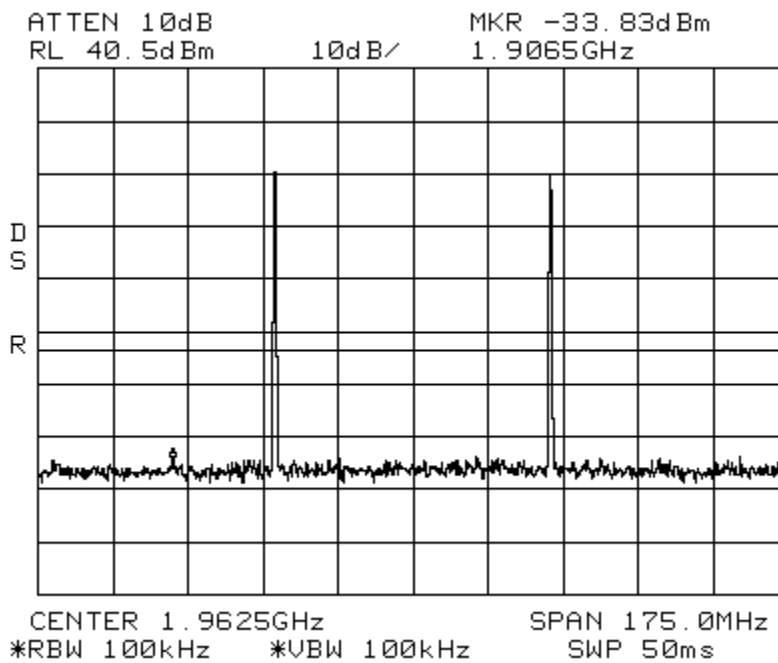
RBW/VBW: 1 MHz



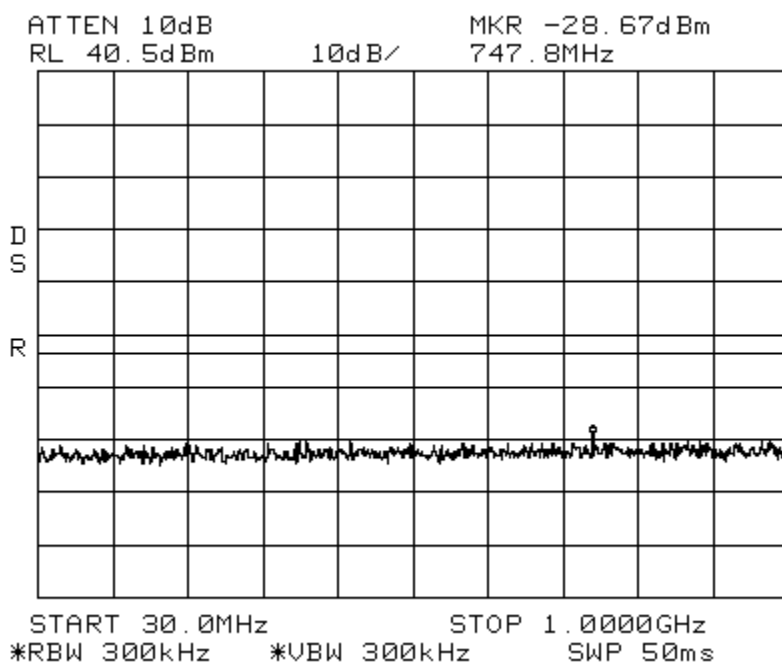
Intermodulation
Center: 1962.5 MHz

EDGE_Apart
Span: 175 MHz

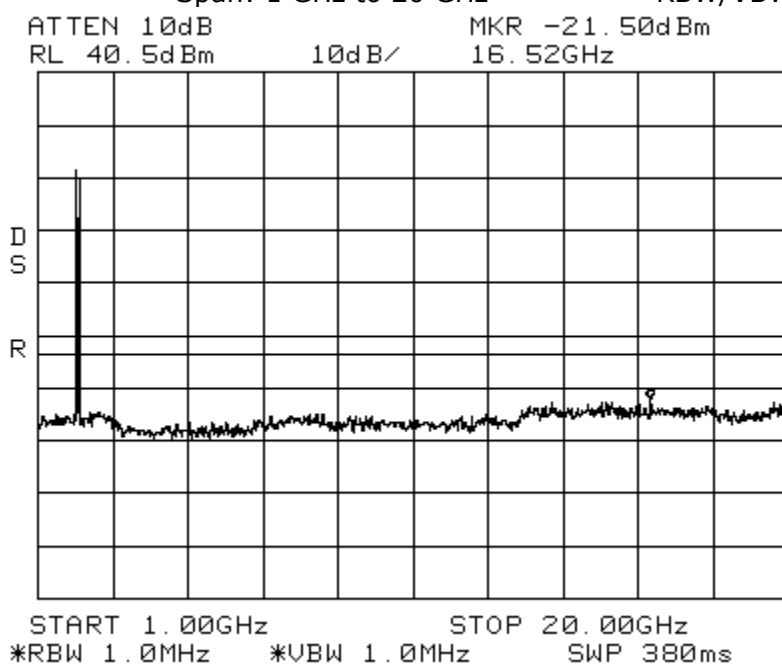
Spectrum PCS
RBW/VBW: 100 kHz



Intermodulation EDGE_Apart Spectrum PCS
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



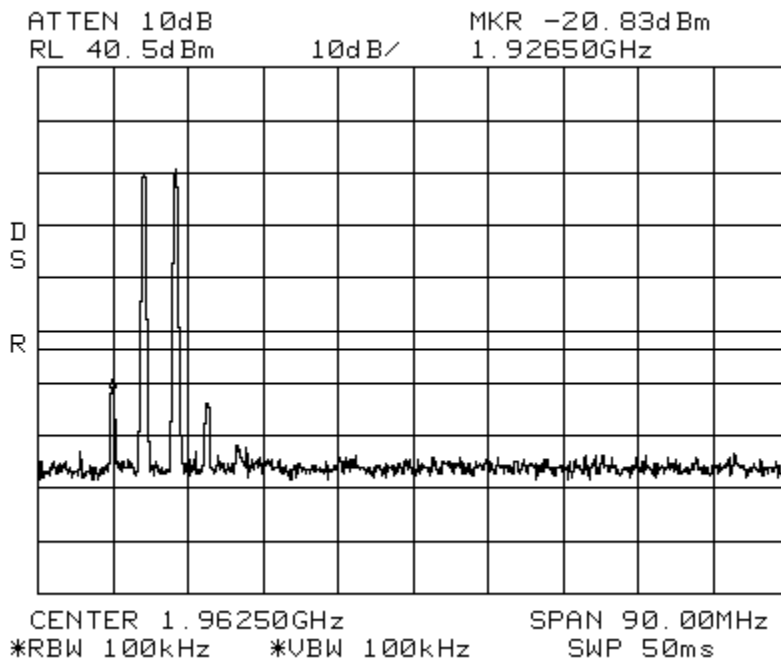
Intermodulation EDGE_Apart Spectrum PCS
Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



Intermodulation
Center: 1962.5 MHz

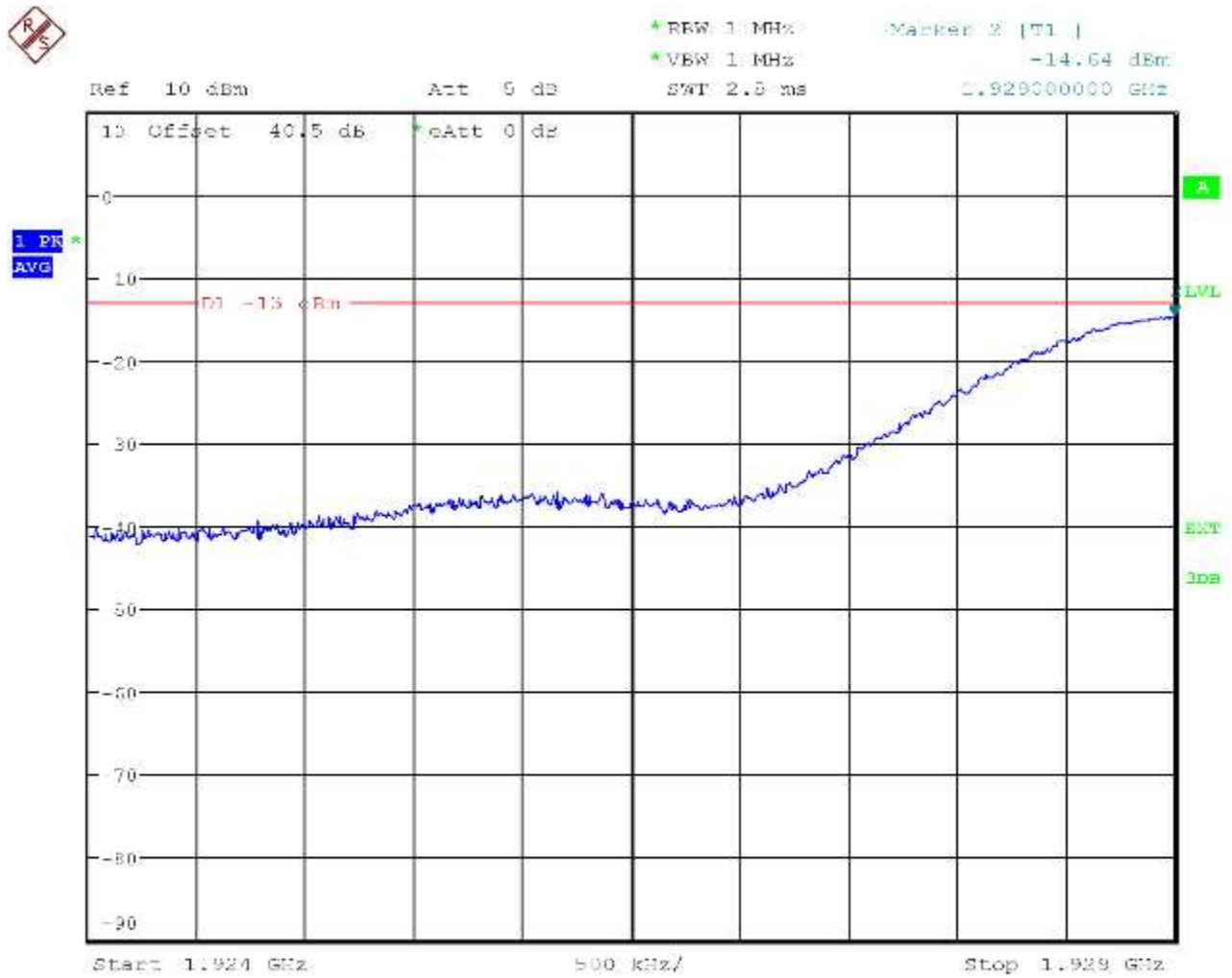
GSM_Low
Span: 90 MHz

Spectrum PCS
RBW/VBW: 100 kHz



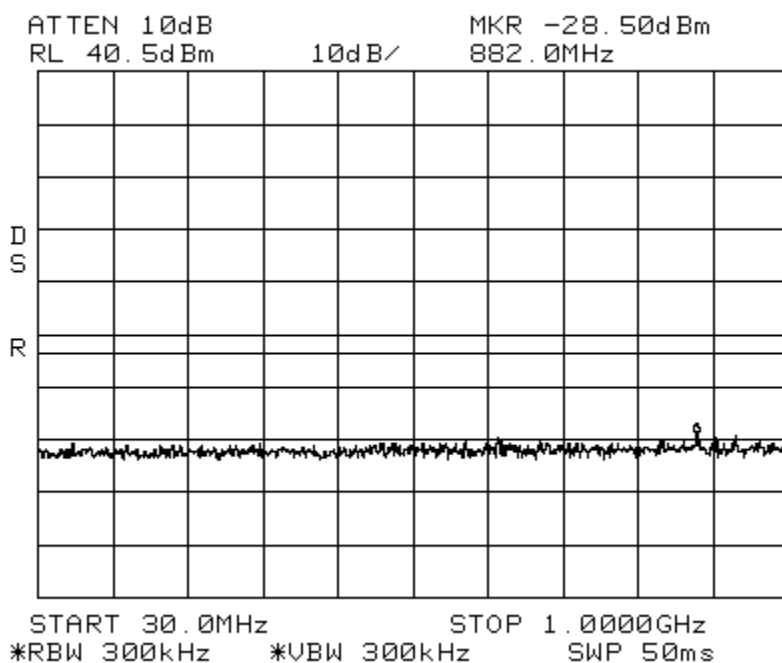
Intermodulation
Start: 1924 MHz Stop: 1929 MHz

GSM_Low
Spectrum PCS
RBW/VBW: 1 MHz

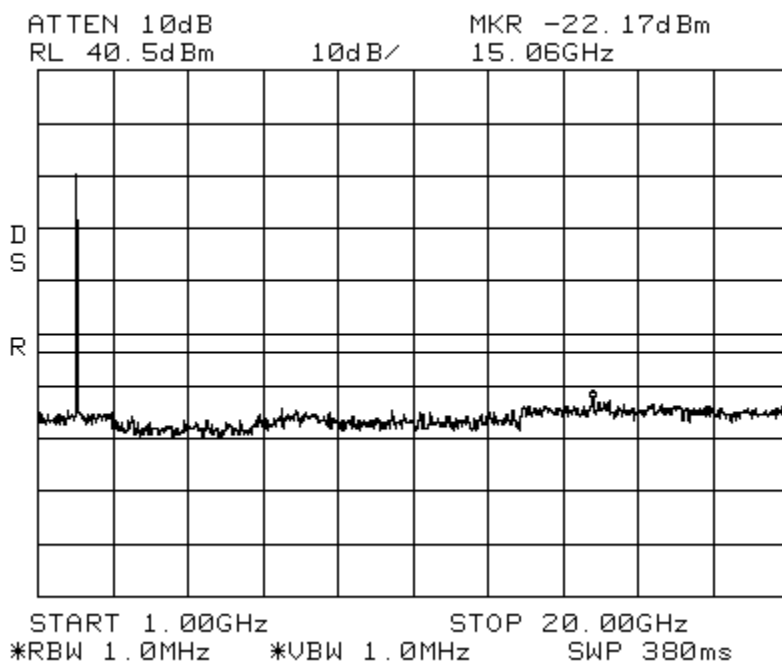


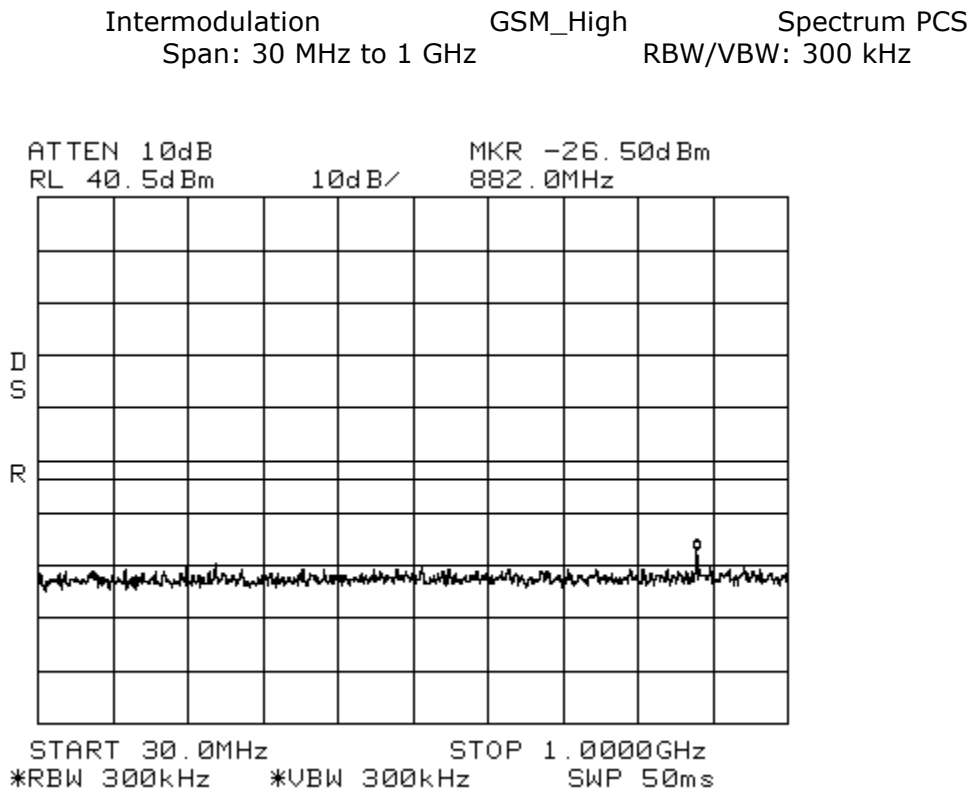
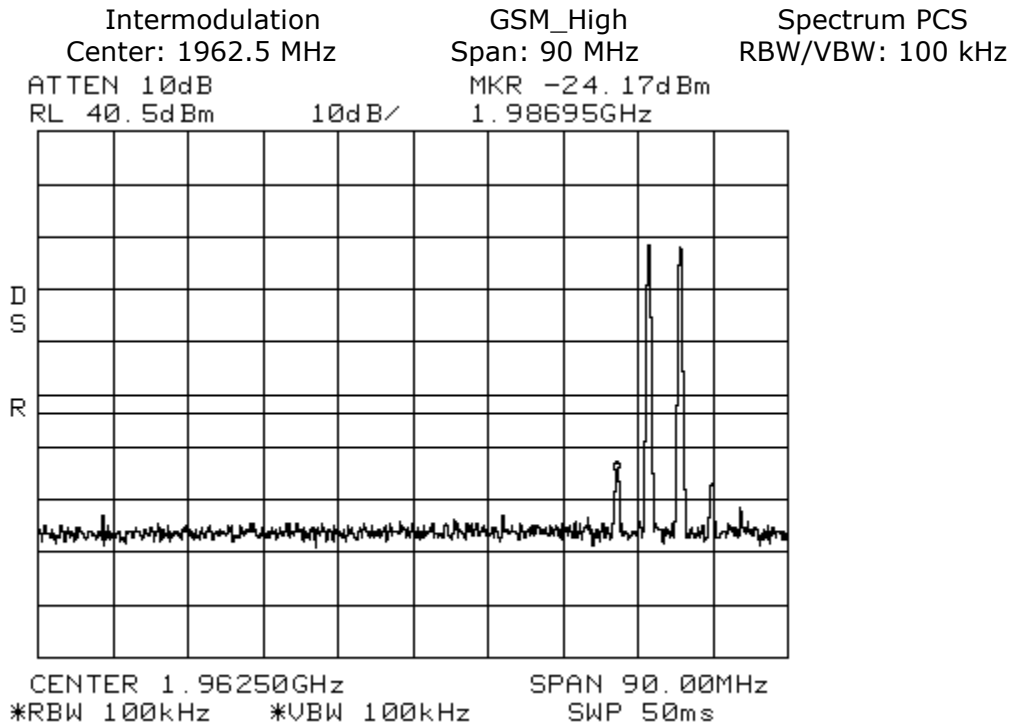
Date: 10.JUL.2012 09:40:39

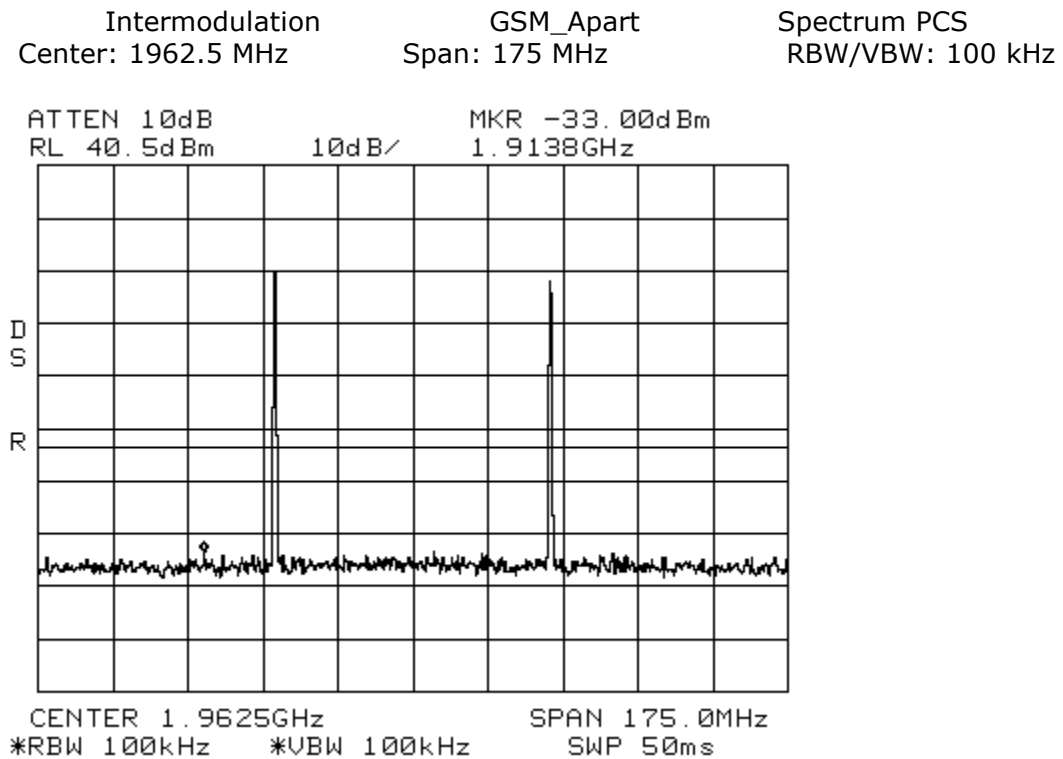
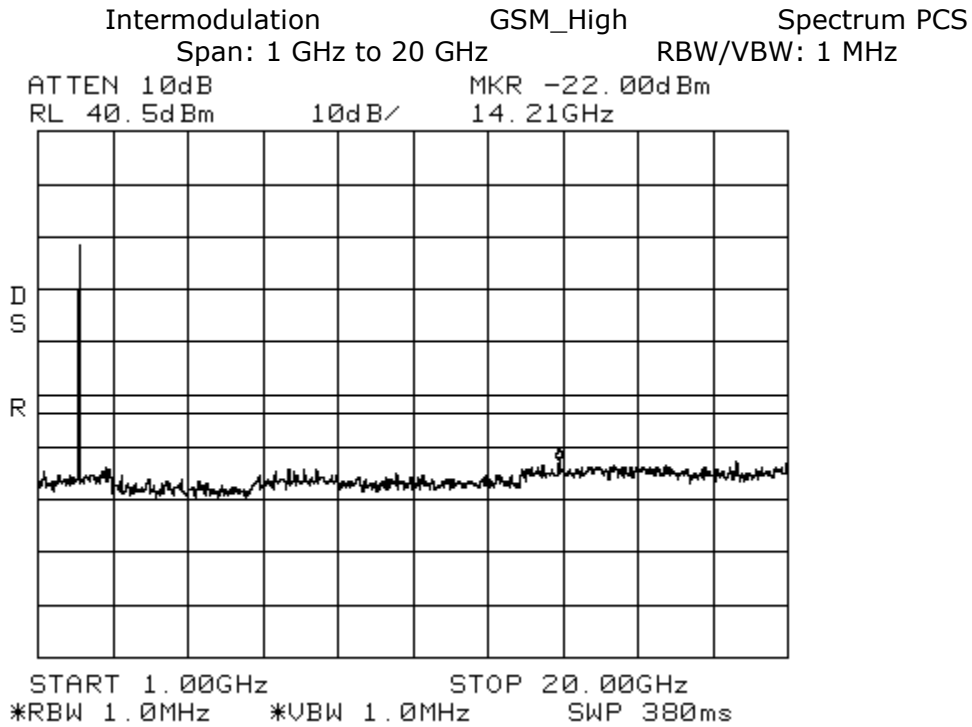
Intermodulation GSM_Low Spectrum PCS
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



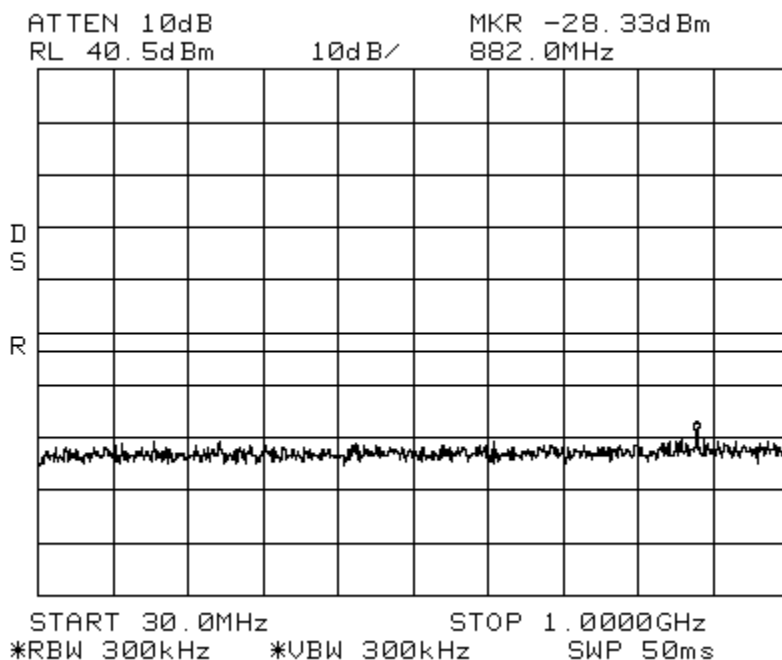
Intermodulation GSM_Low Spectrum PCS
Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



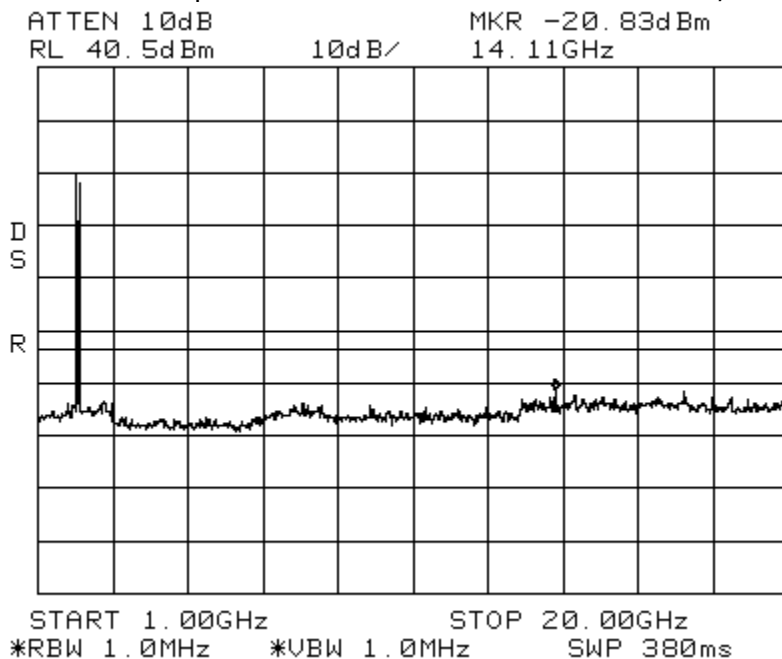




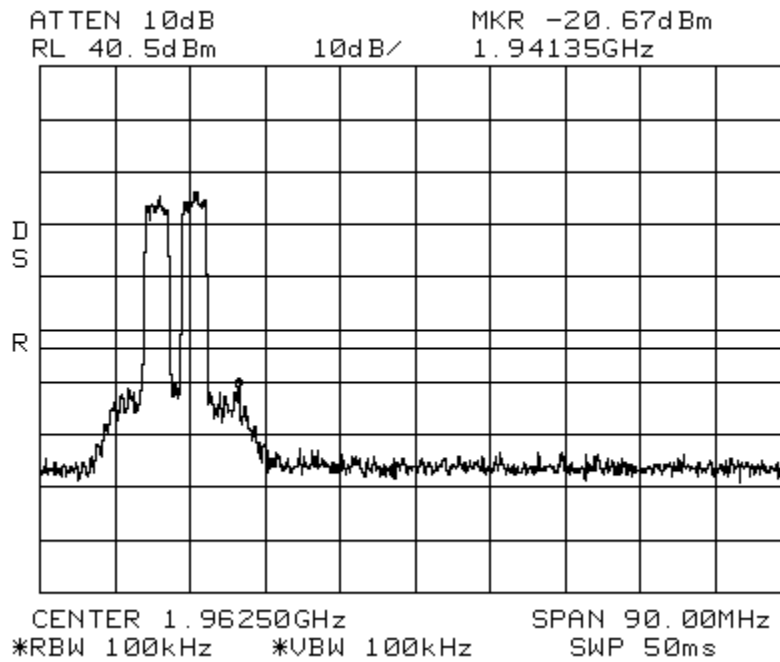
Intermodulation GSM_Apart Spectrum PCS
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



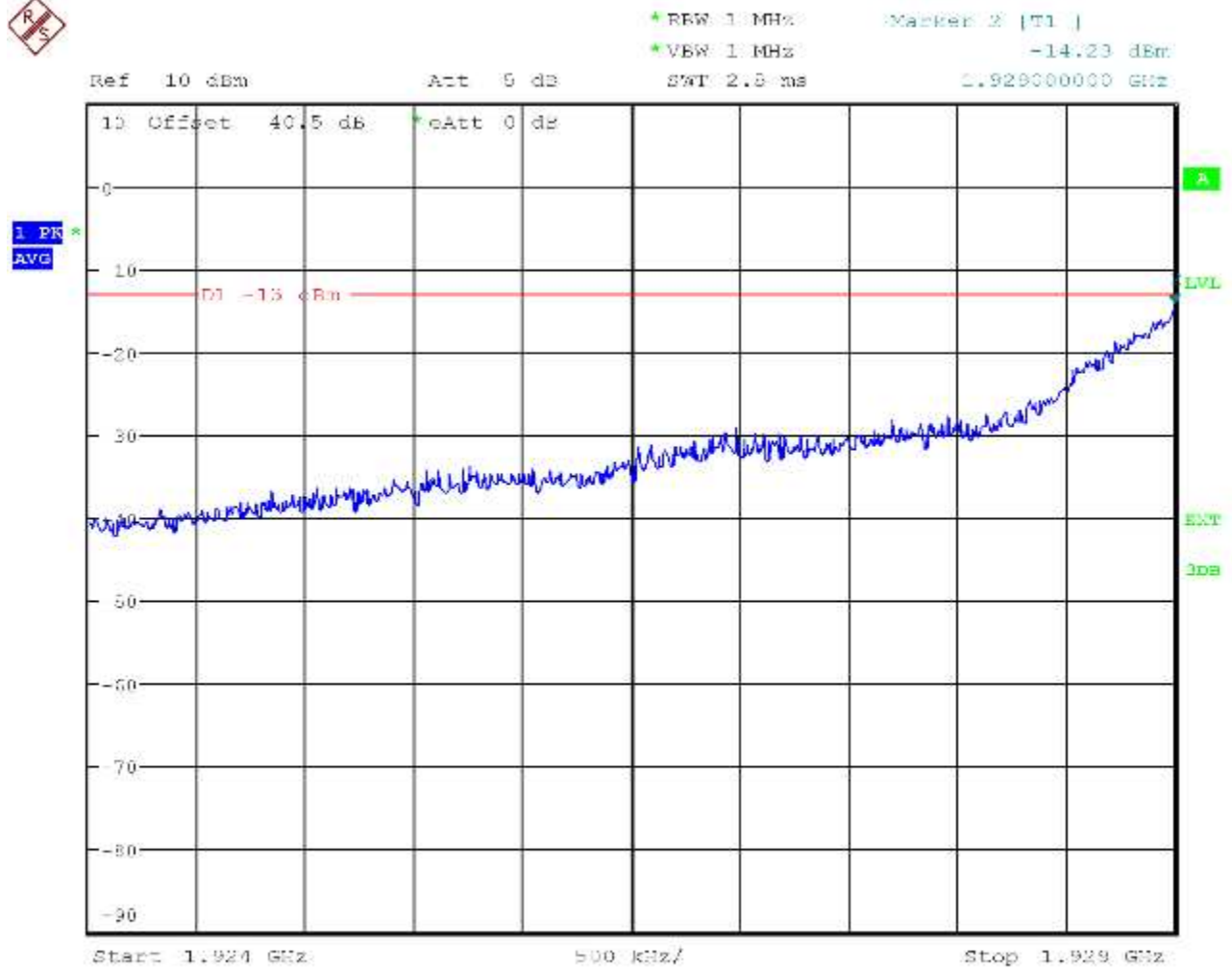
Intermodulation GSM_Apart Spectrum PCS
Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



Intermodulation LTE 3 MHz Channel Bandwidth_ **Low** Spectrum PCS
Center: 1962.5 MHz Span: 90 MHz RBW/VBW: 100 kHz

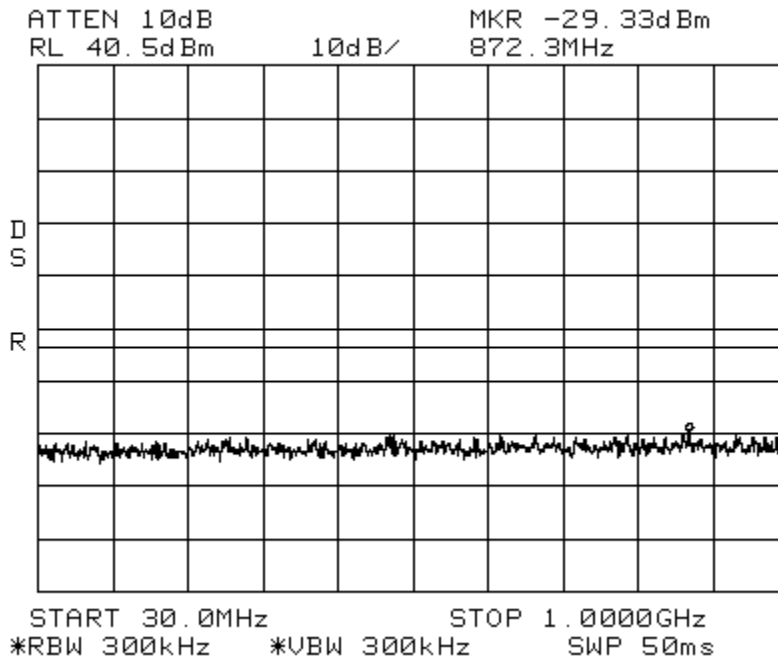


Intermodulation LTE 3 MHz Channel Bandwidth _Low Spectrum PCS
 Start: 1924 MHz Stop: 1929 MHz RBW/VBW: 1 MHz

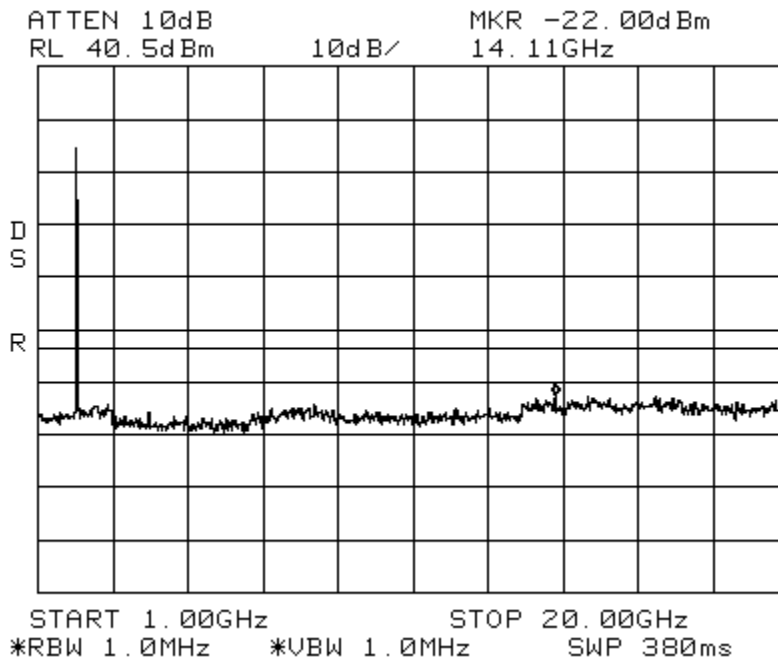


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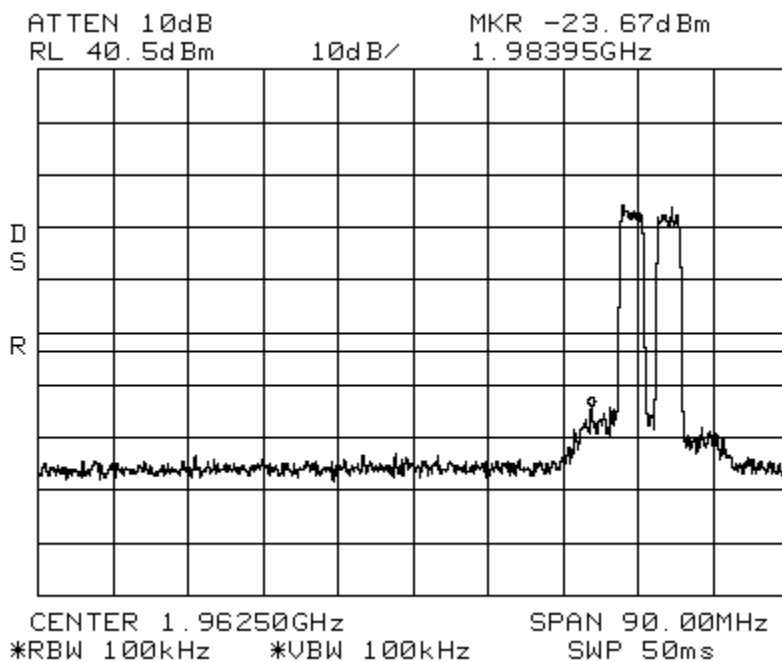
Intermodulation LTE 3MHz Channel Bandwidth _LowSpectrum PCS
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



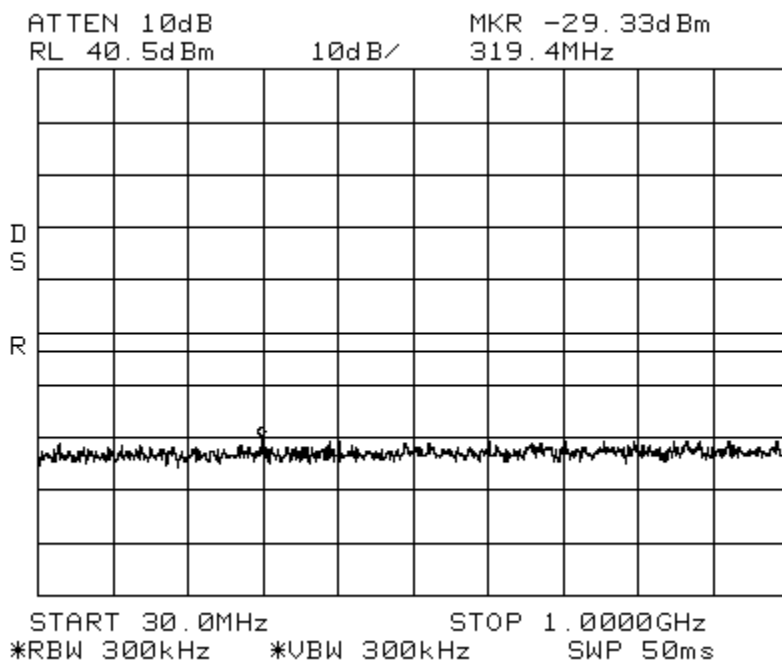
Intermodulation LTE 3 MHz Channel Bandwidth _Low Spectrum PCS
 Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



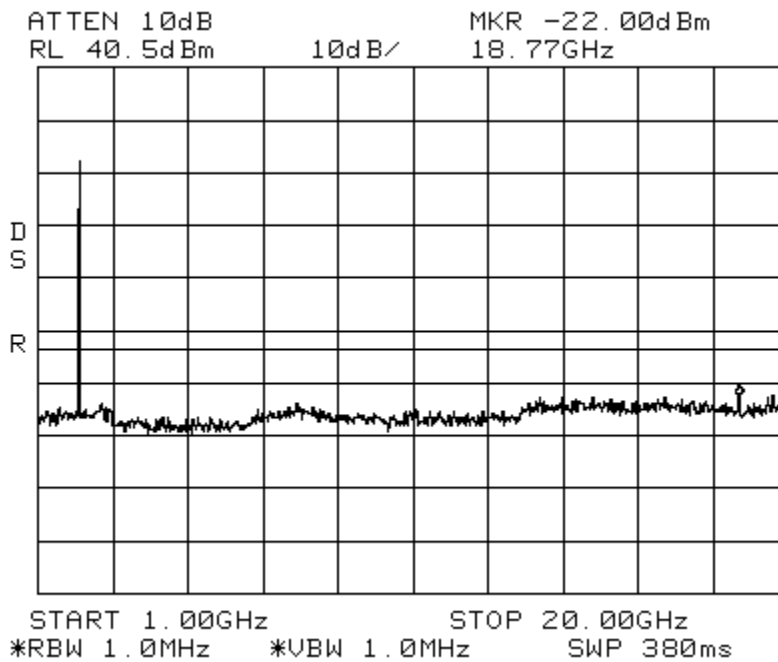
Intermodulation LTE 3 MHz Channel Bandwidth _High Spectrum PCS
Center: 1962.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



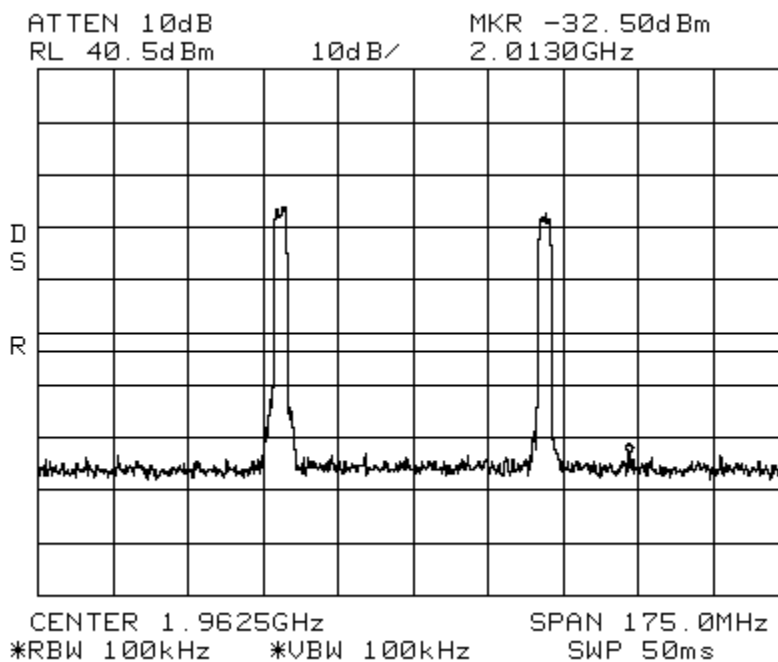
Intermodulation LTE 3 MHz Channel Bandwidth _High Spectrum PCS
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



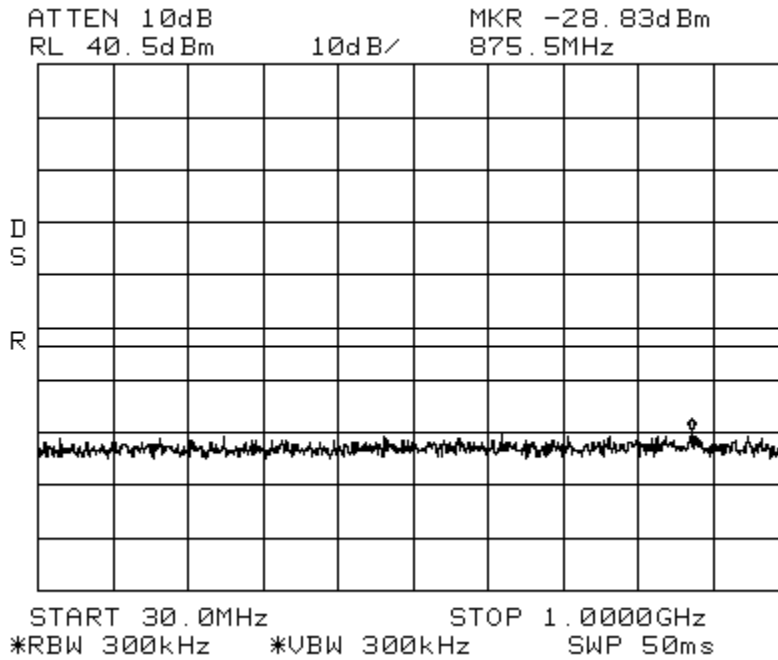
Intermodulation LTE 3 MHz Channel Bandwidth _High Spectrum PCS
 Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



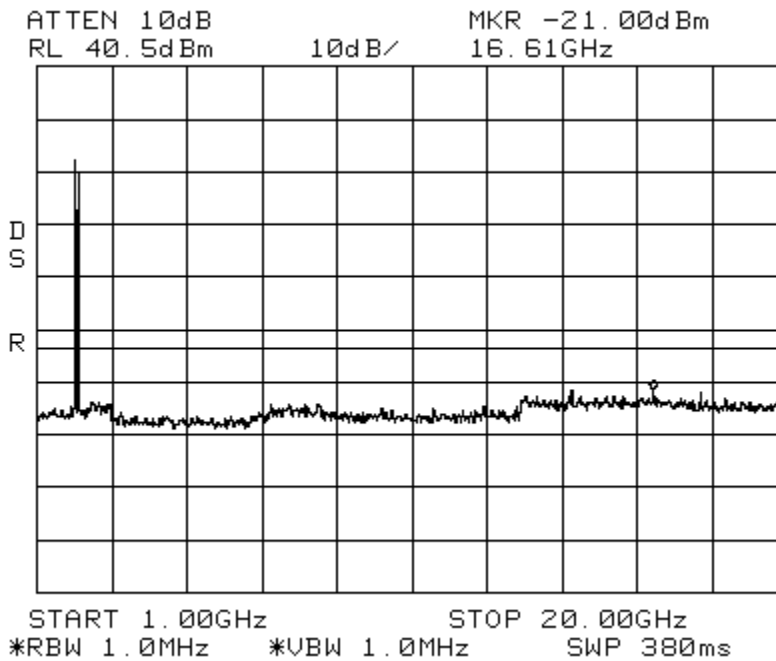
Intermodulation LTE 3 MHz Channel Bandwidth _Apart Spectrum PCS
 Center: 1962.5 MHz Span: 175 MHz RBW/VBW: 100 kHz



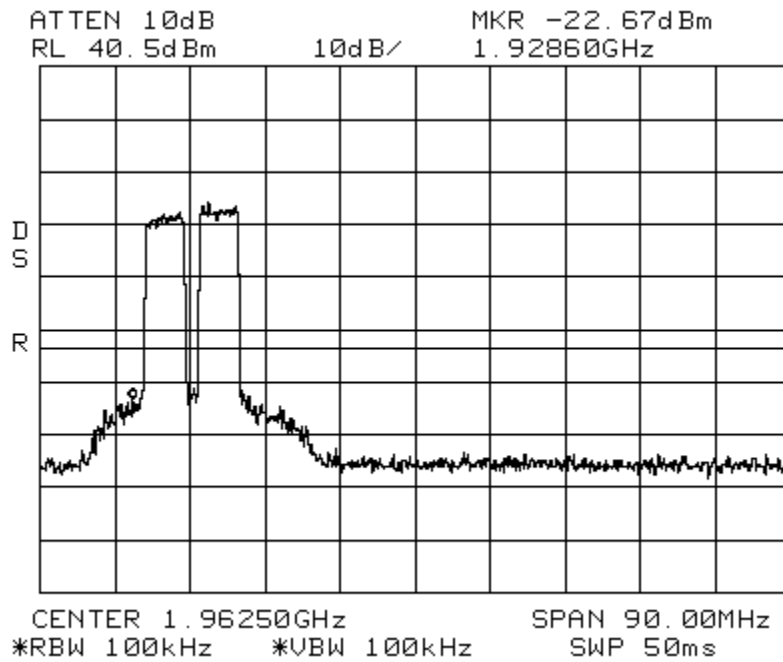
Intermodulation LTE 3 MHz Channel Bandwidth _Apart Spectrum PCS
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



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

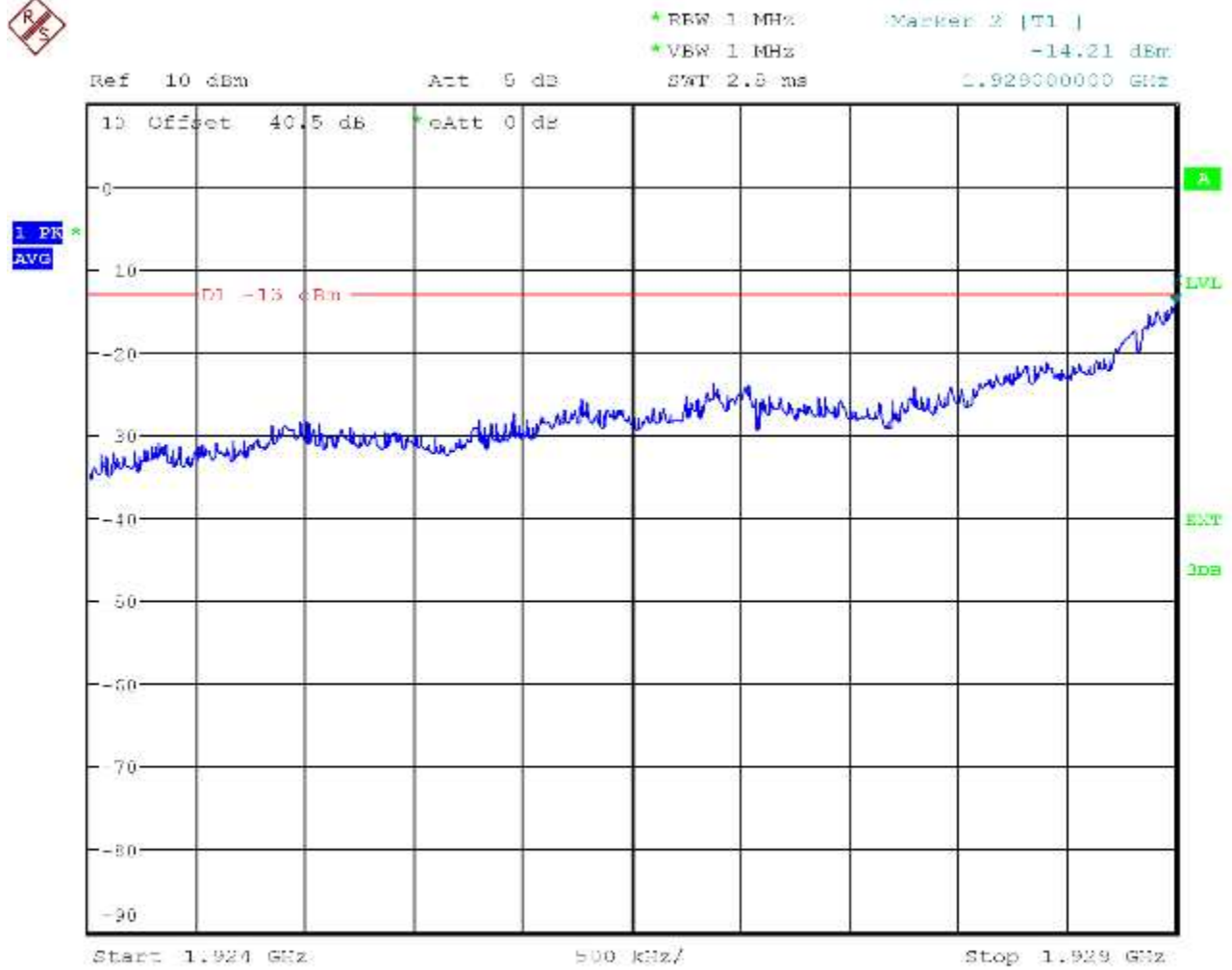


Intermodulation LTE 5 MHz Channel Bandwidth_ **Low** Spectrum PCS
Center: 1962.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



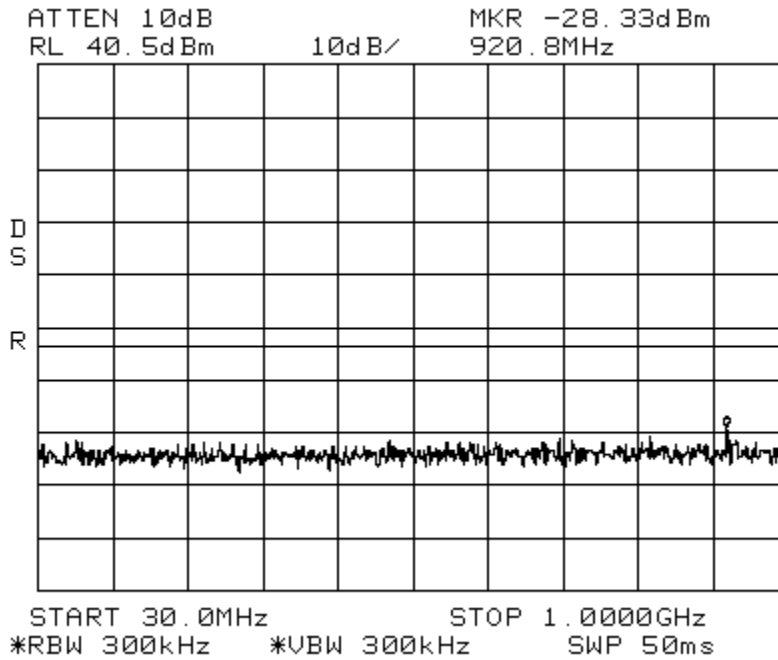
Intermodulation
Start: 1924 MHz

LTE 5 MHz Channel Bandwidth_LowSpectrum PCS
Stop: 1929 MHz
RBW/VBW: 1 MHz

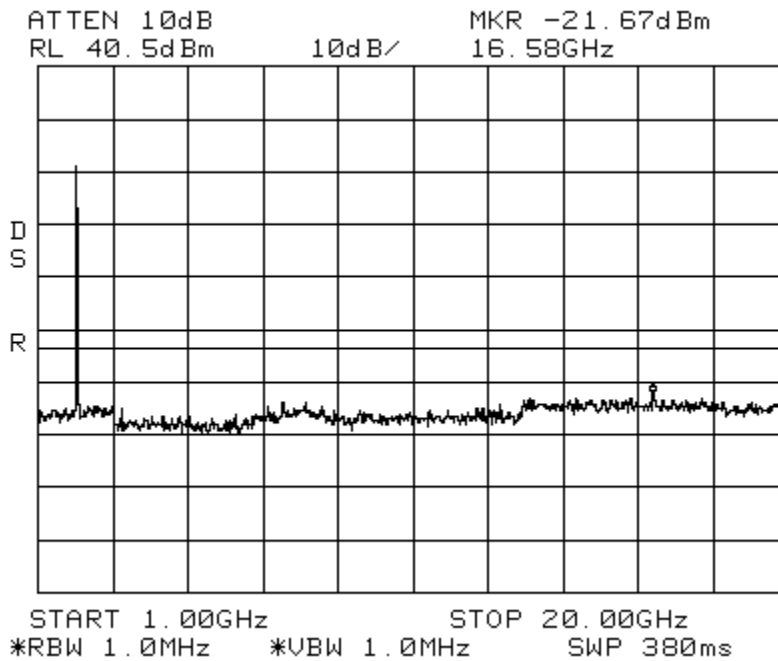


Date: 10.JUL.2012 10:19:48

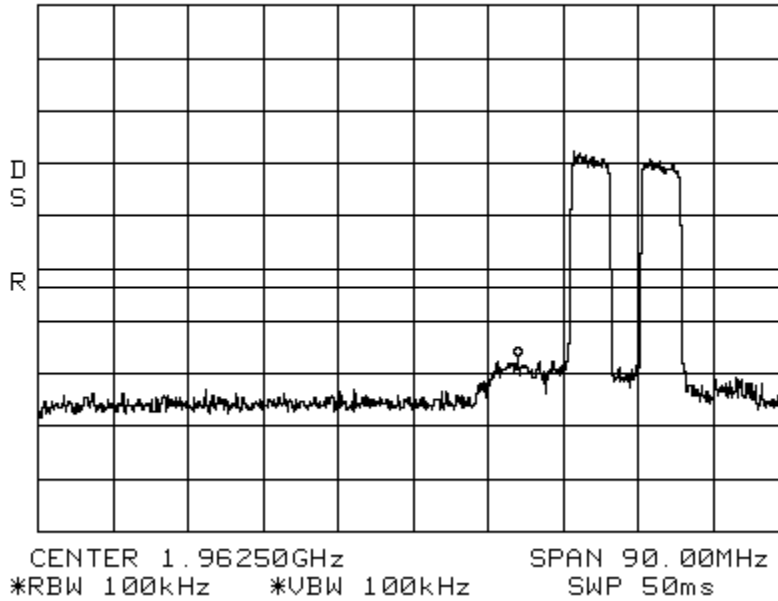
Intermodulation LTE 5 MHz Channel Bandwidth _Low Spectrum PCS
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



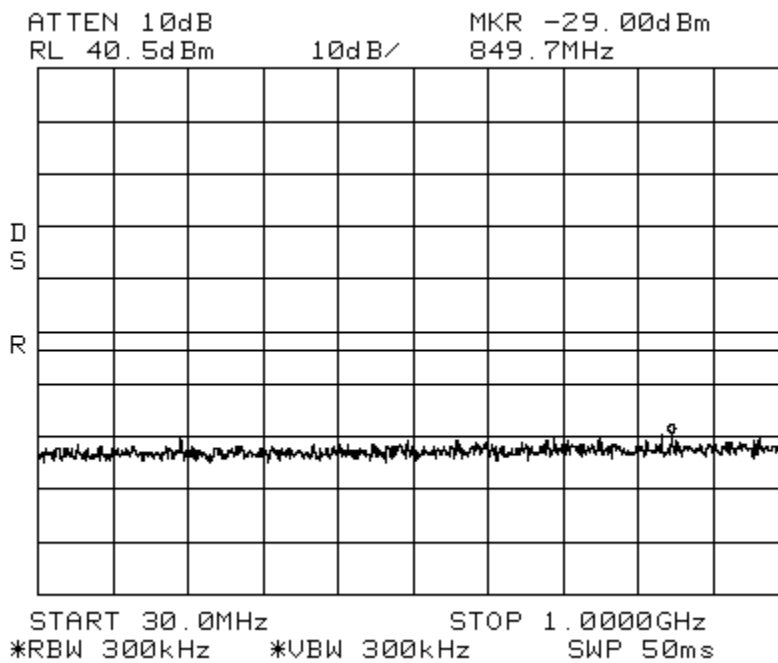
Intermodulation LTE 5 MHz Channel Bandwidth _Low Spectrum PCS
 Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



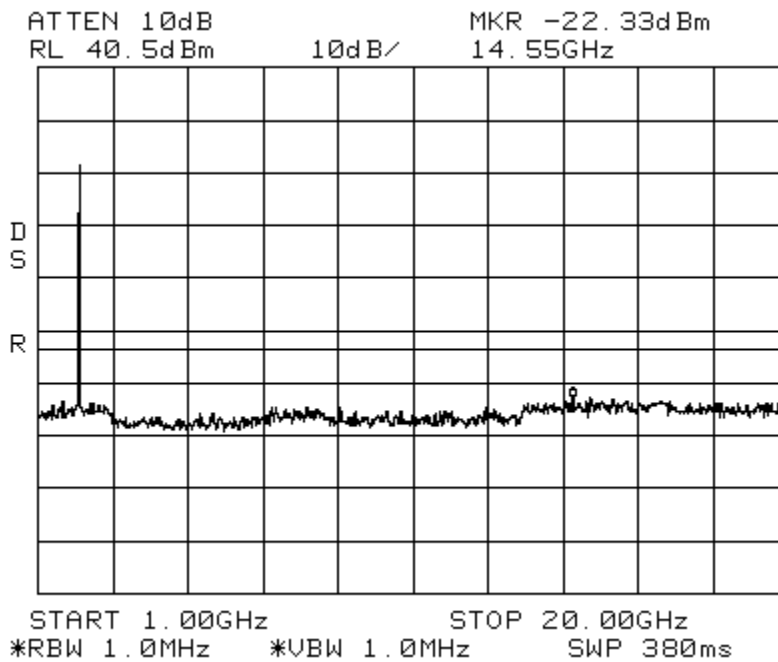
Intermodulation LTE 5 MHz Channel Bandwidth _High Spectrum PCS
Center: 1962.5 MHz Span: 90 MHz RBW/VBW: 100 kHz
ATTEN 10dB MKR -26.33dBm
RL 40.5dBm 10dB/ 1.97510GHz



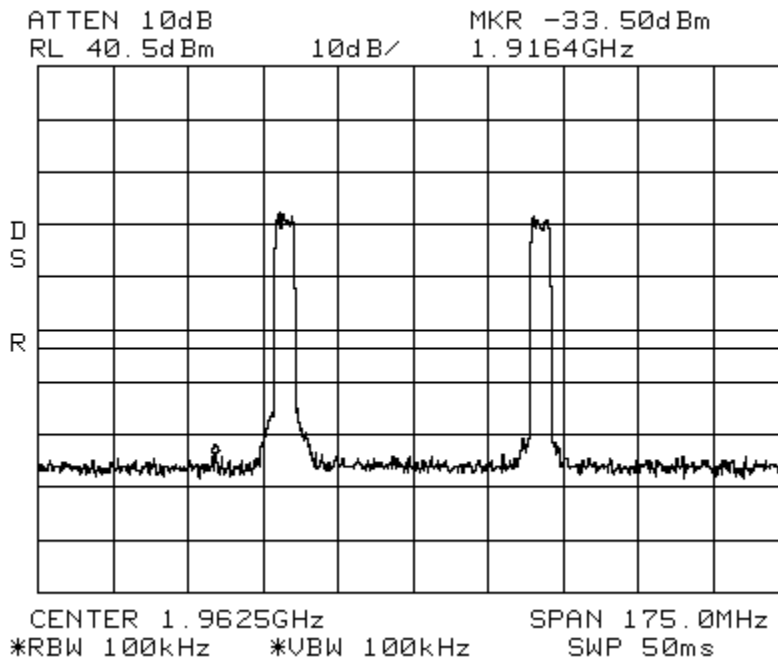
Intermodulation LTE 5 MHz Channel Bandwidth _High Spectrum PCS
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



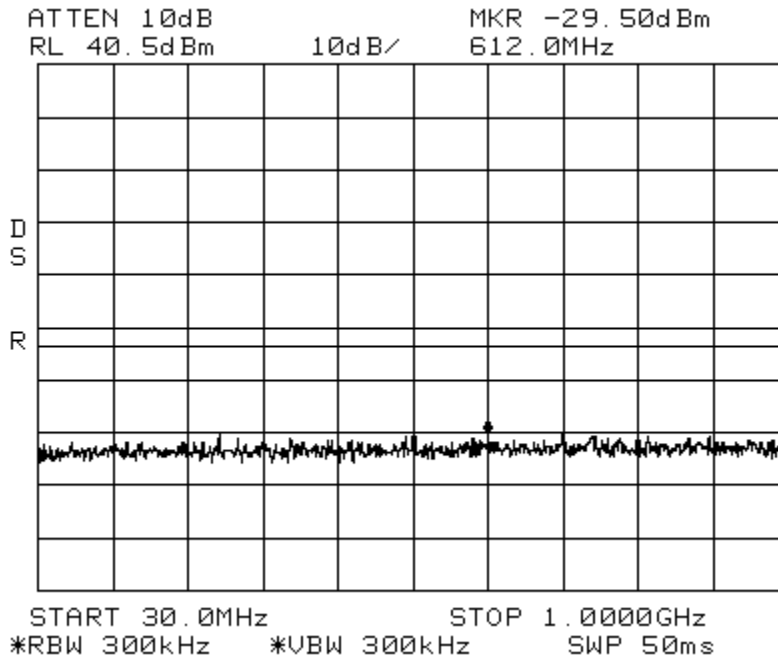
Intermodulation LTE 5 MHz Channel Bandwidth _High Spectrum PCS
Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



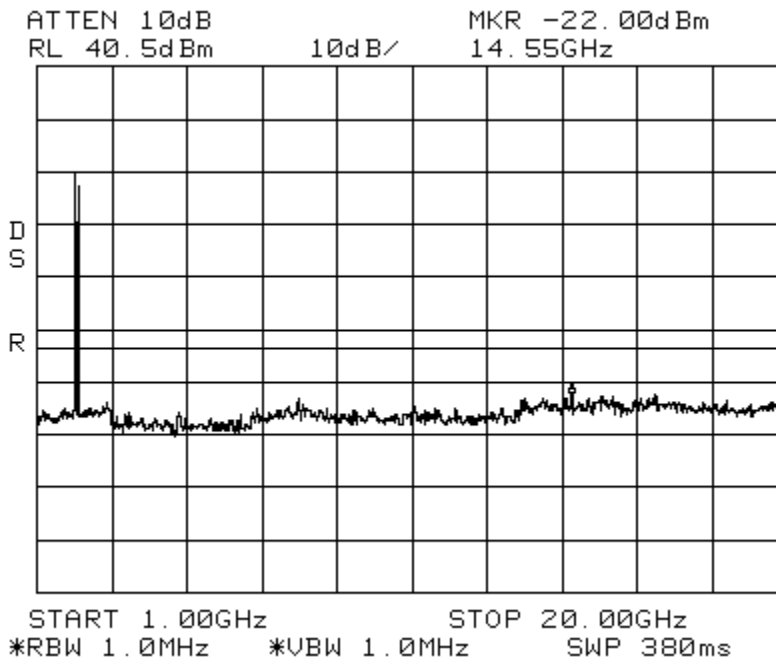
Intermodulation LTE 5 MHz Channel Bandwidth _Apart Spectrum PCS
Center: 1962.5 MHz Span: 175 MHz RBW/VBW: 100 kHz



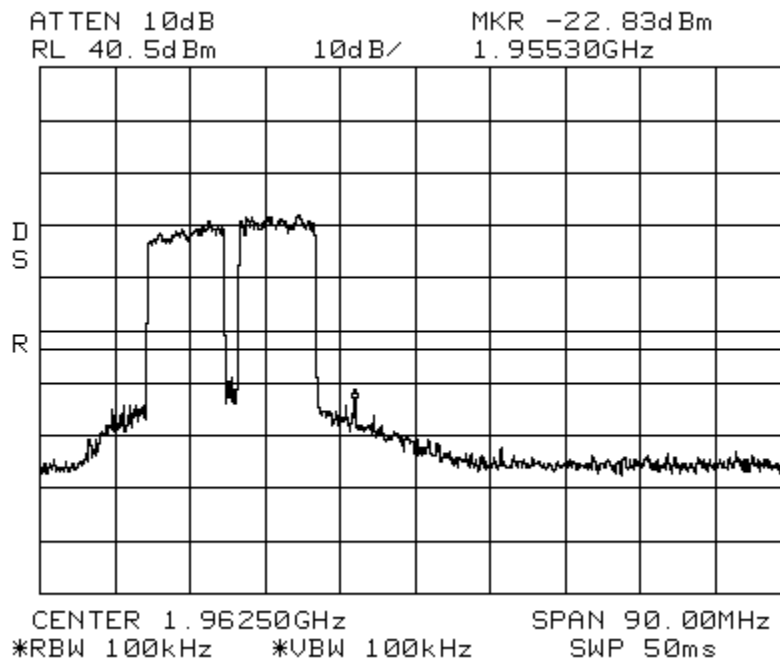
Intermodulation LTE 5 MHz Channel Bandwidth _Apart Spectrum PCS
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



Intermodulation LTE 5 MHz Channel Bandwidth _Apart Spectrum PCS
 Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz

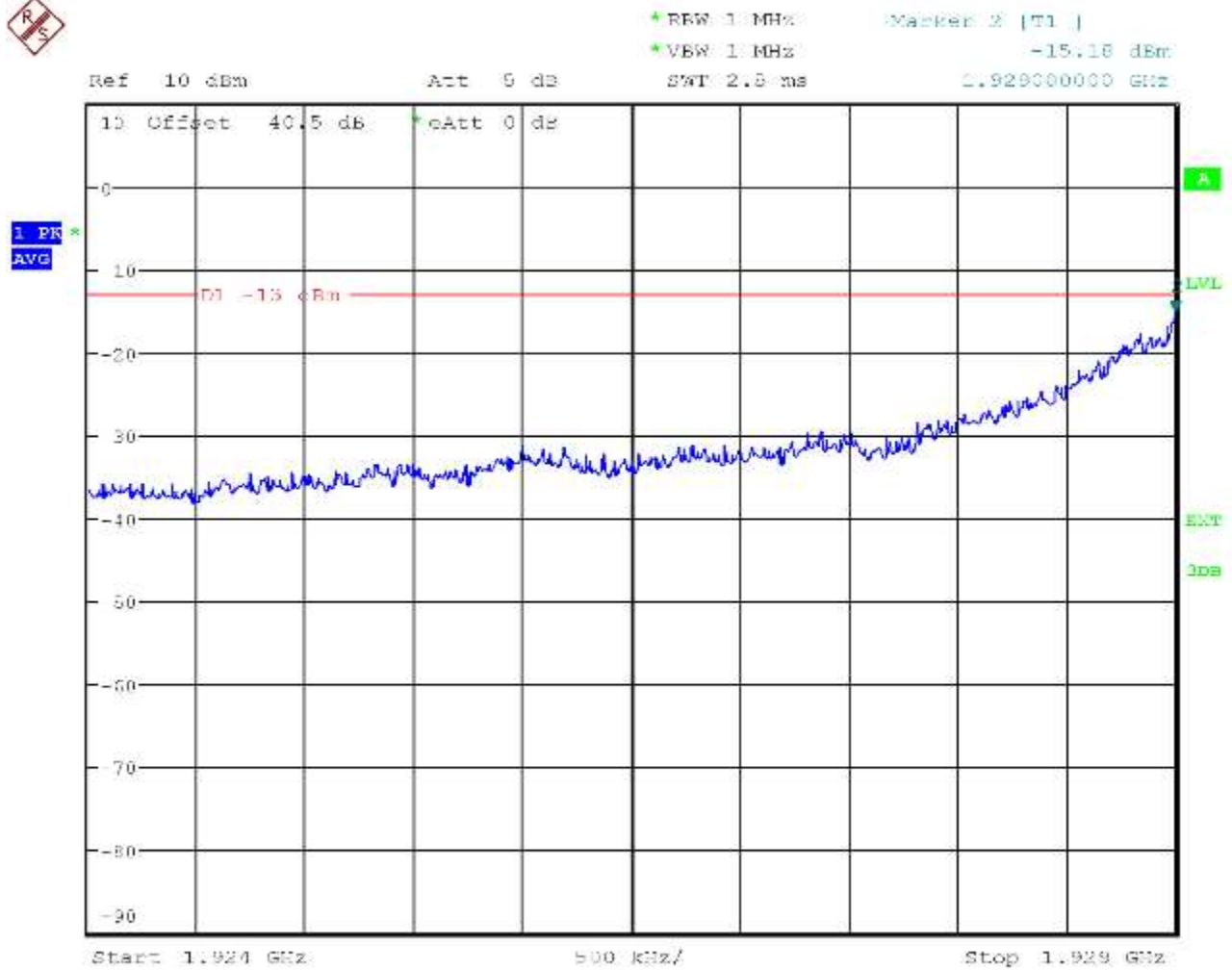


Intermodulation LTE 10 MHz Channel Bandwidth_**Low** Spectrum PCS
Center: 1962.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



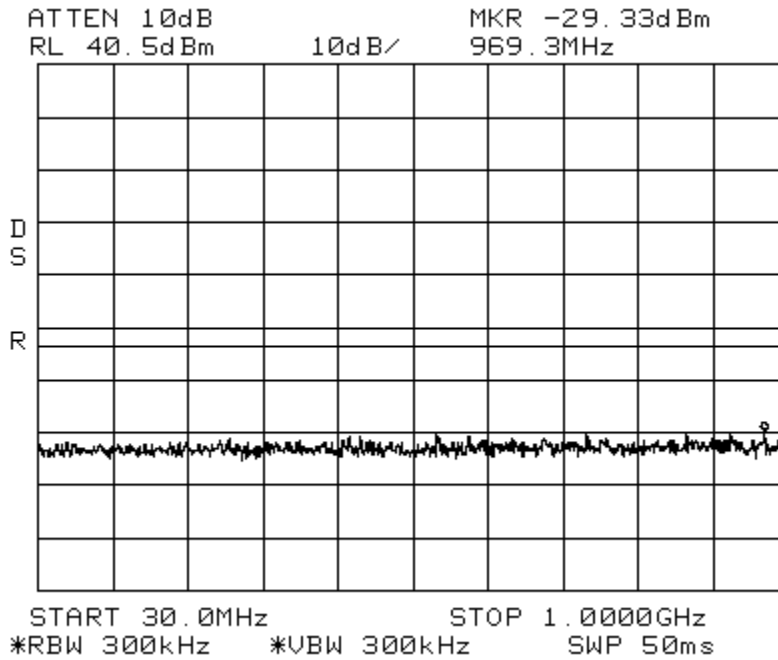
Intermodulation LTE 10 MHz Channel Bandwidth _Low
 Start: 1924 MHz Stop: 1929 MHz

Spectrum PCS
 RBW/VBW: 1 MHz

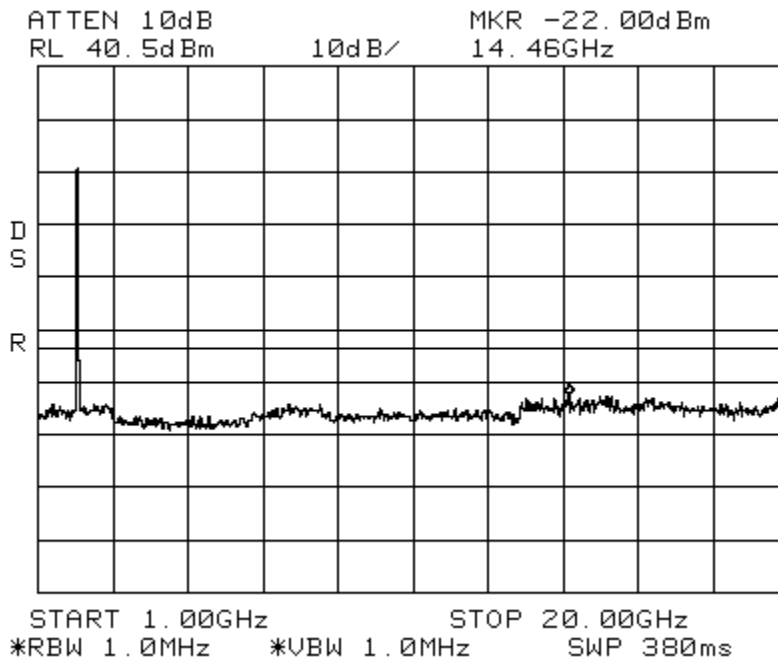


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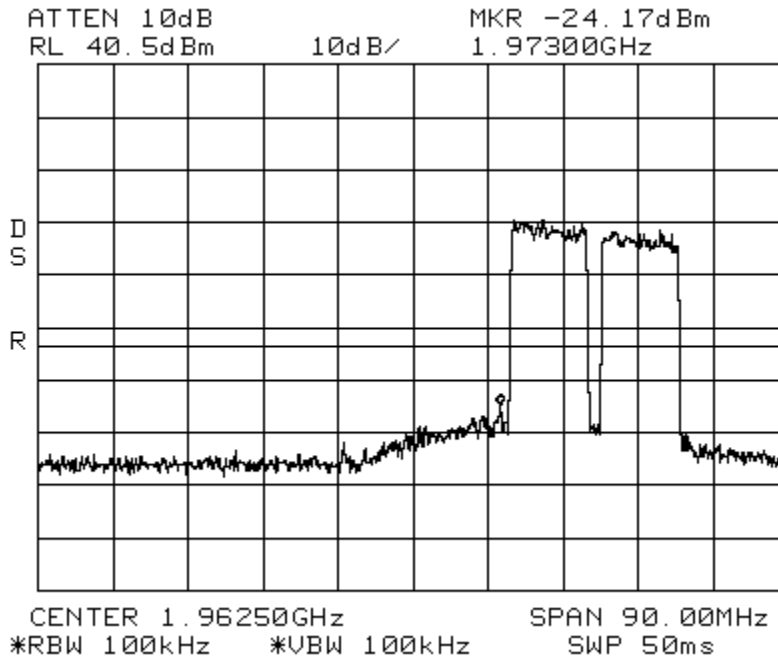
Intermodulation LTE 10 MHz Channel Bandwidth _Low Spectrum PCS
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



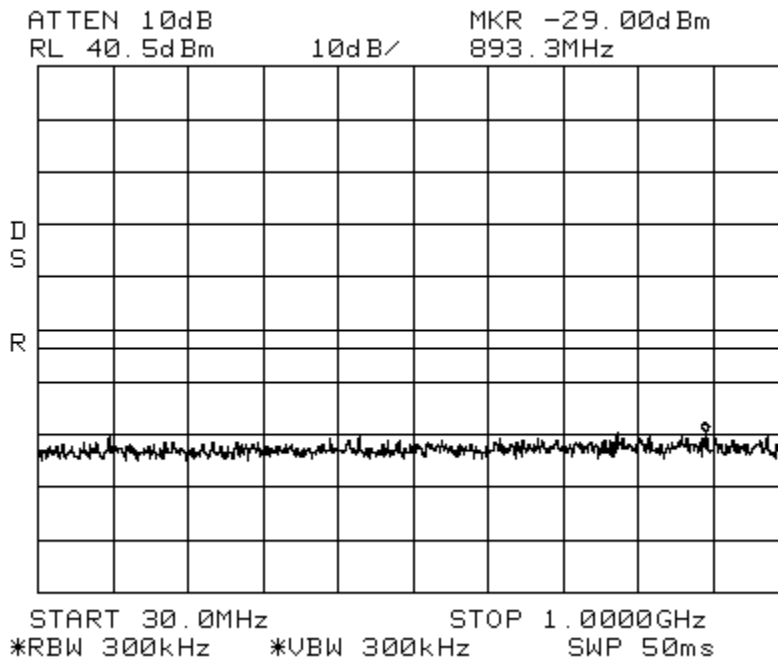
Intermodulation LTE 10 MHz Channel Bandwidth _Low Spectrum PCS
 Span: 1 GHz to 20GHz RBW/VBW: 1 MHz



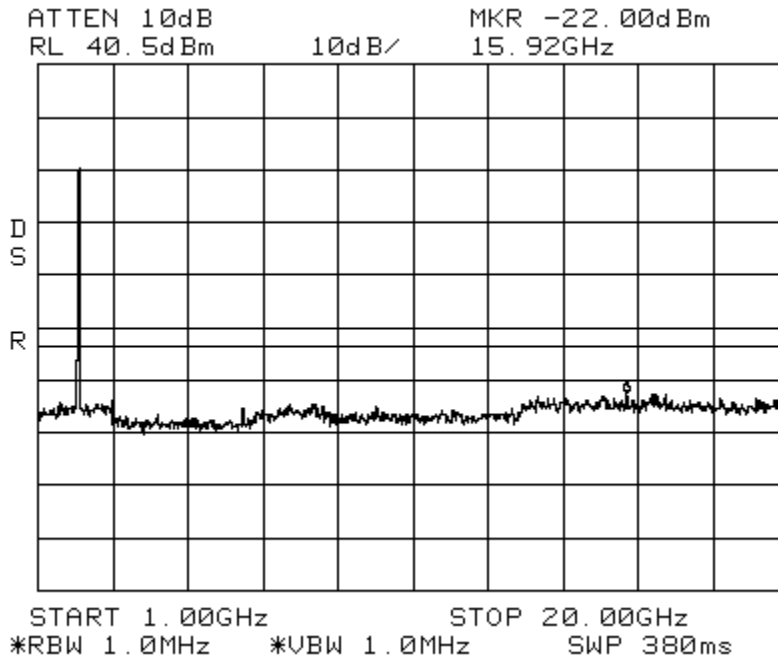
Intermodulation LTE 10 MHz Channel Bandwidth _High Spectrum PCS
Center: 1962.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



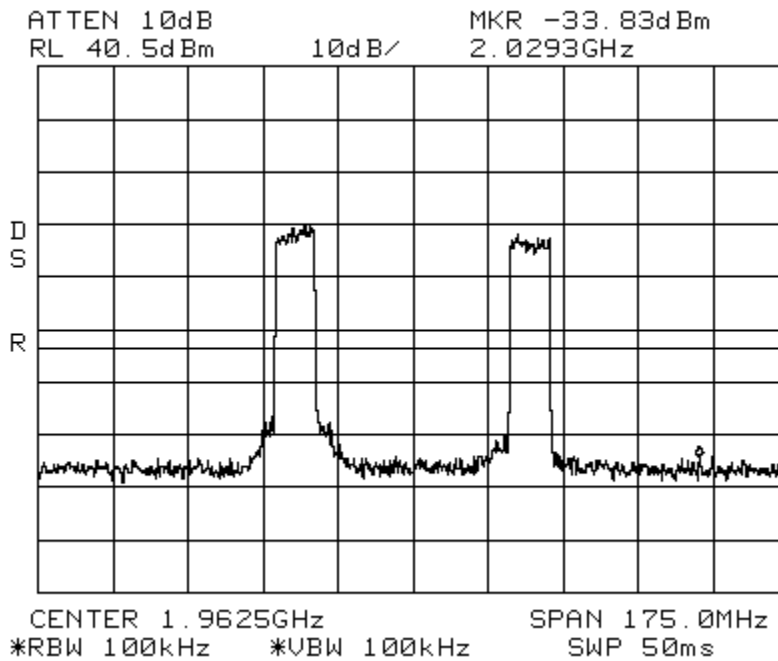
Intermodulation LTE 10 MHz Channel Bandwidth _High Spectrum PCS
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



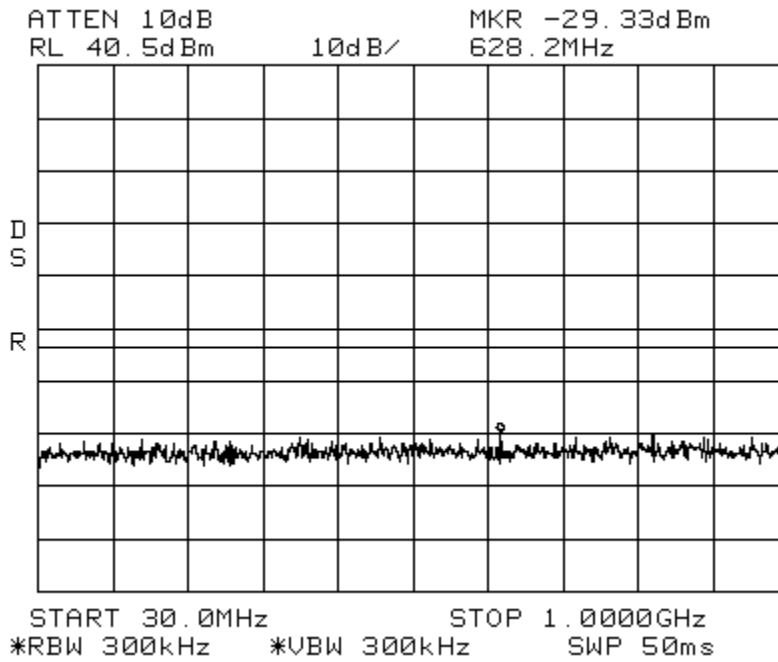
Intermodulation LTE 10 MHz Channel Bandwidth _High Spectrum PCS
 Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



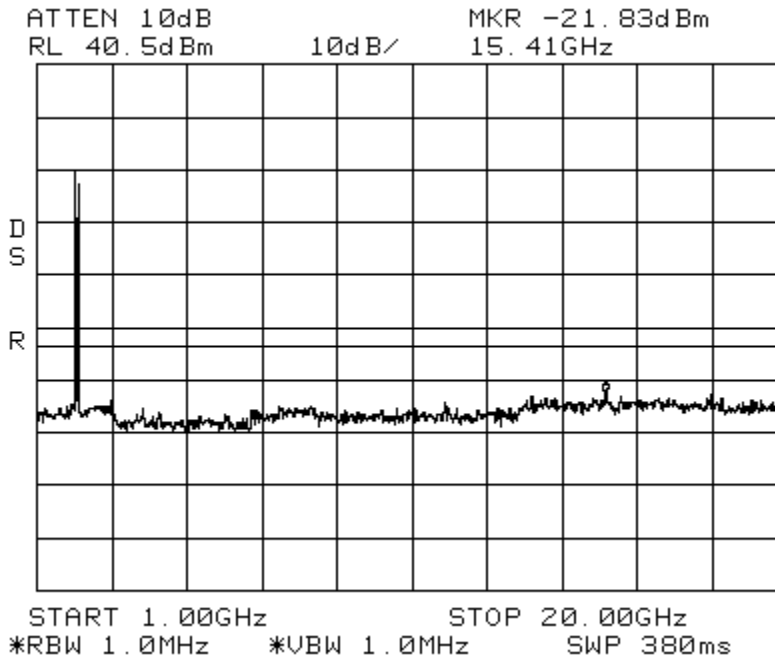
Intermodulation LTE 10 MHz Channel Bandwidth _Apart Spectrum PCS
 Center: 1962.5 MHz Span: 175 MHz RBW/VBW: 100 kHz



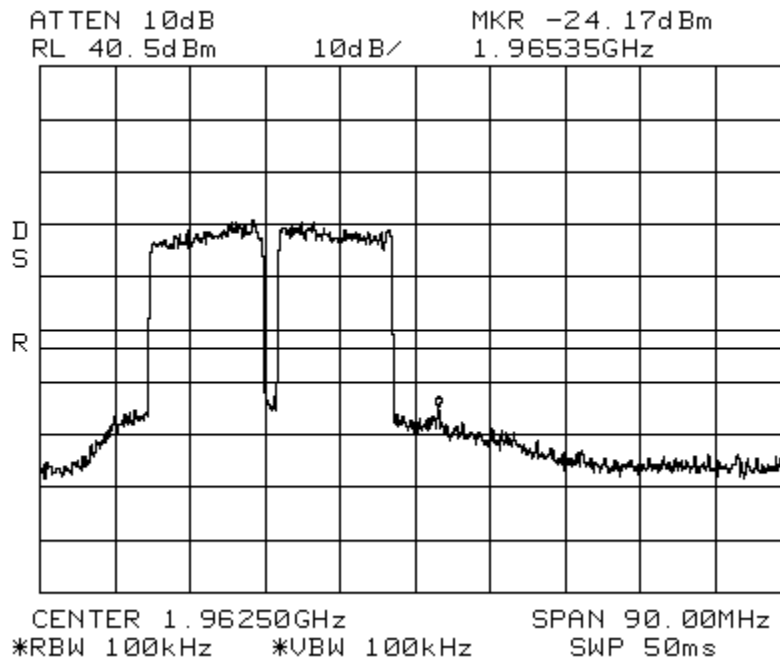
Intermodulation LTE 10 MHz Channel Bandwidth _Apart Spectrum PCS
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



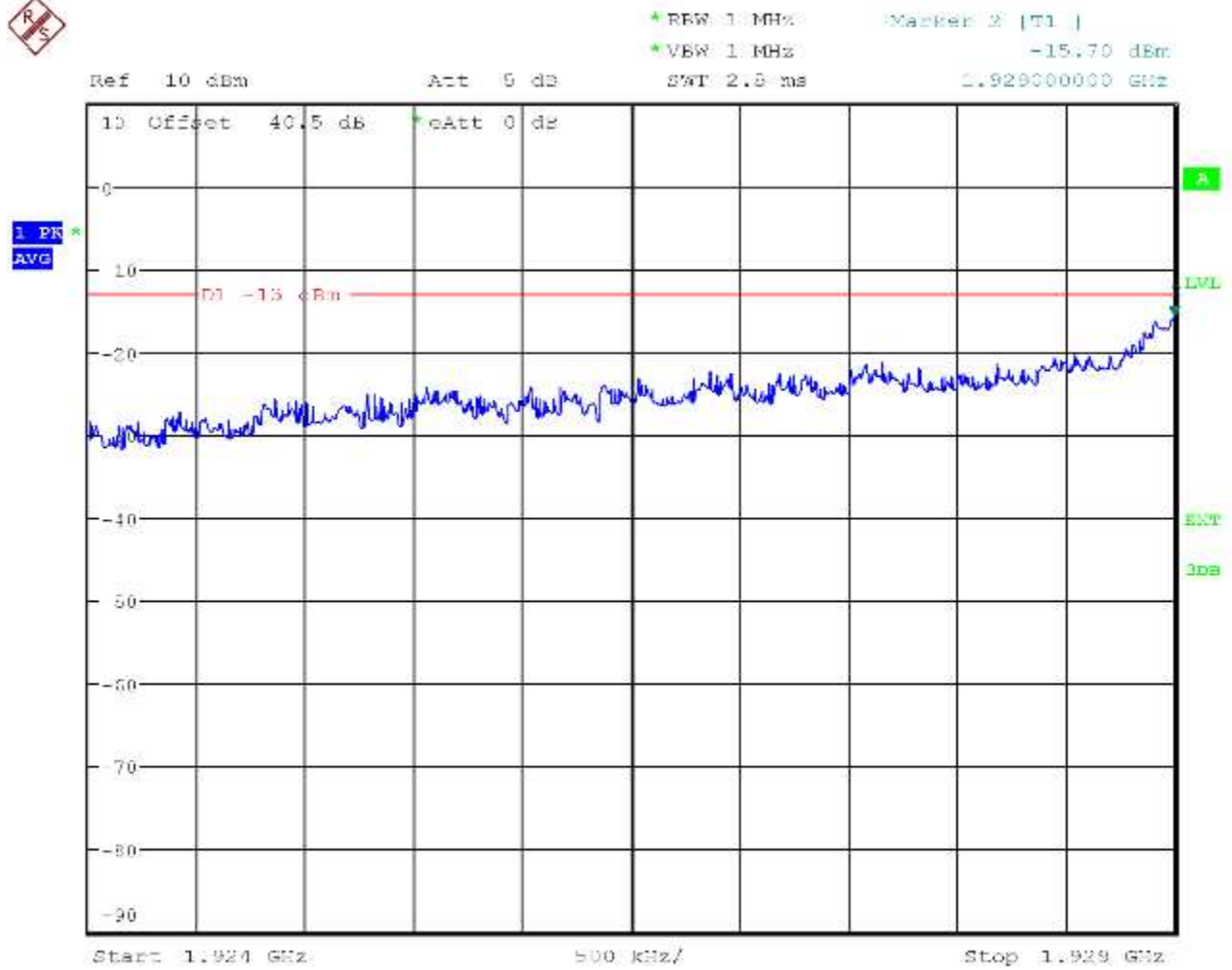
Intermodulation LTE 10 MHz Channel Bandwidth _Apart Spectrum PCS
 Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



Intermodulation LTE 15 MHz Channel Bandwidth_ **Low** Spectrum PCS
Center: 1962.5 MHz Span: 90 MHz RBW/VBW: 100 kHz

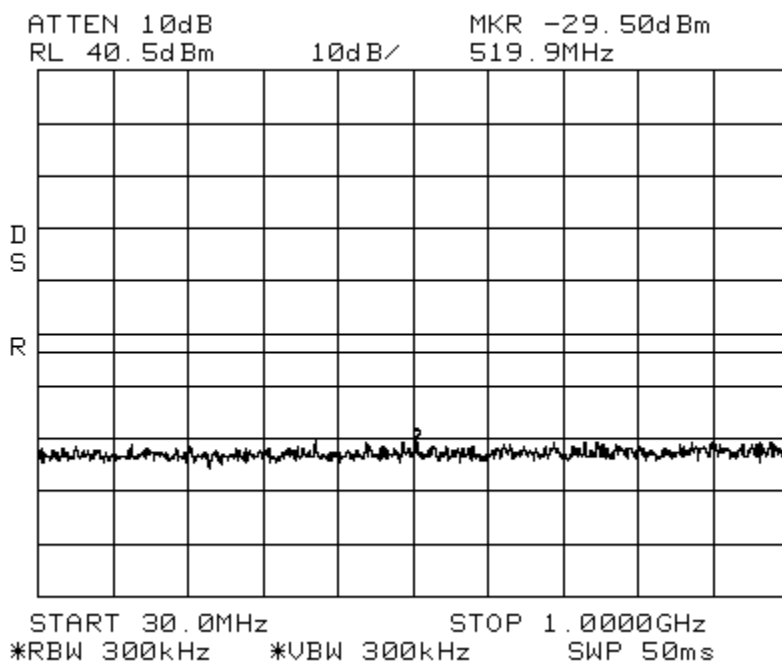


Intermodulation LTE 15 MHz Channel Bandwidth _Low Spectrum PCS
 Start: 1924 MHz Stop: 1929 MHz RBW/VBW: 1 MHz

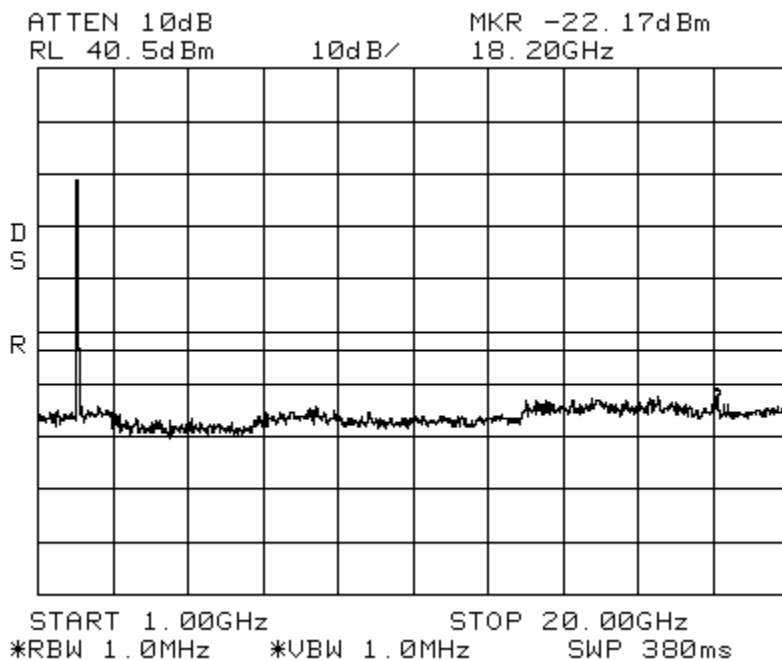


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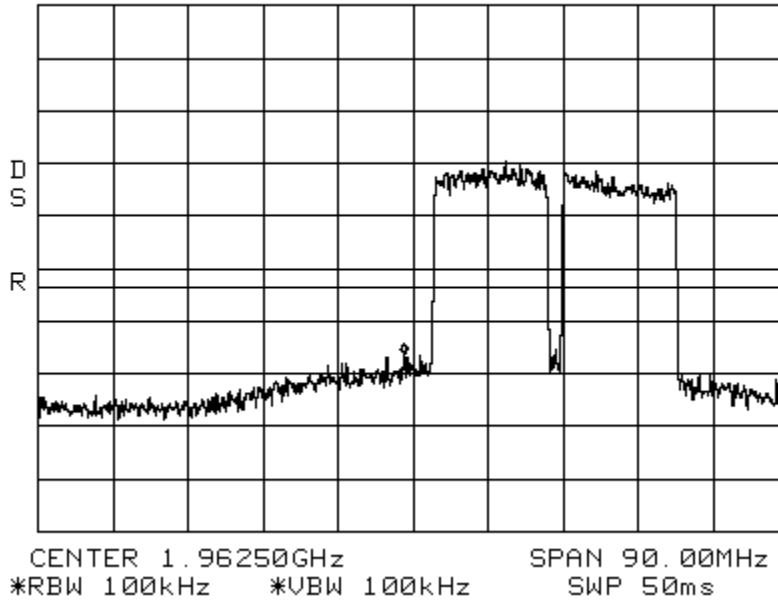
Intermodulation LTE 15 MHz Channel Bandwidth _Low Spectrum PCS
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



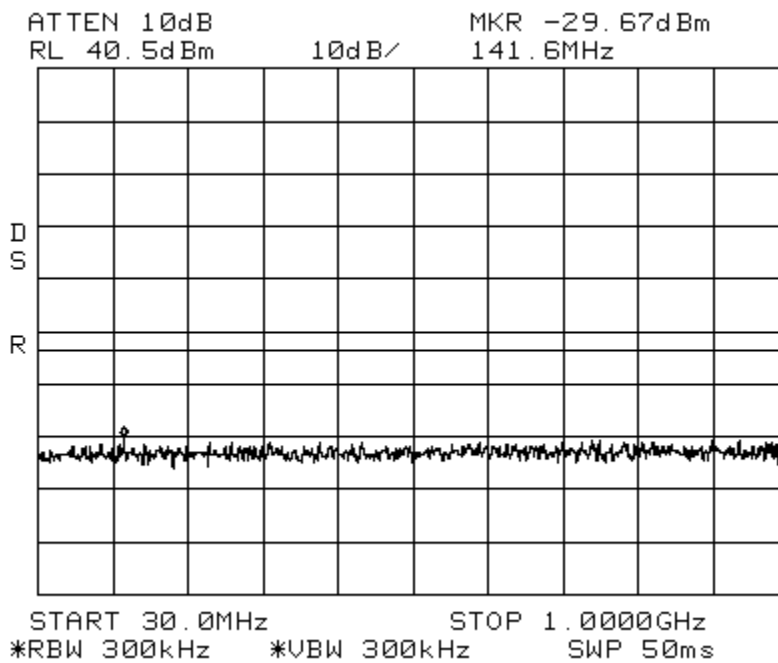
Intermodulation LTE 15 MHz Channel Bandwidth _Low Spectrum PCS
 Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



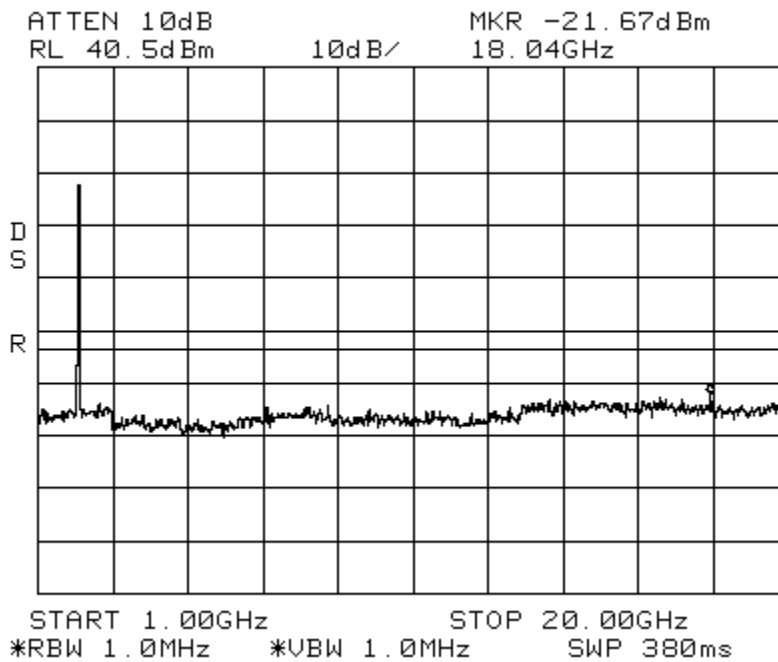
Intermodulation LTE 15 MHz Channel Bandwidth _High Spectrum PCS
Center: 1962.5 MHz Span: 90 MHz RBW/VBW: 100 kHz
ATTEN 10dB MKR -25.83dBm
RL 40.5dBm 10dB/ 1.96145GHz



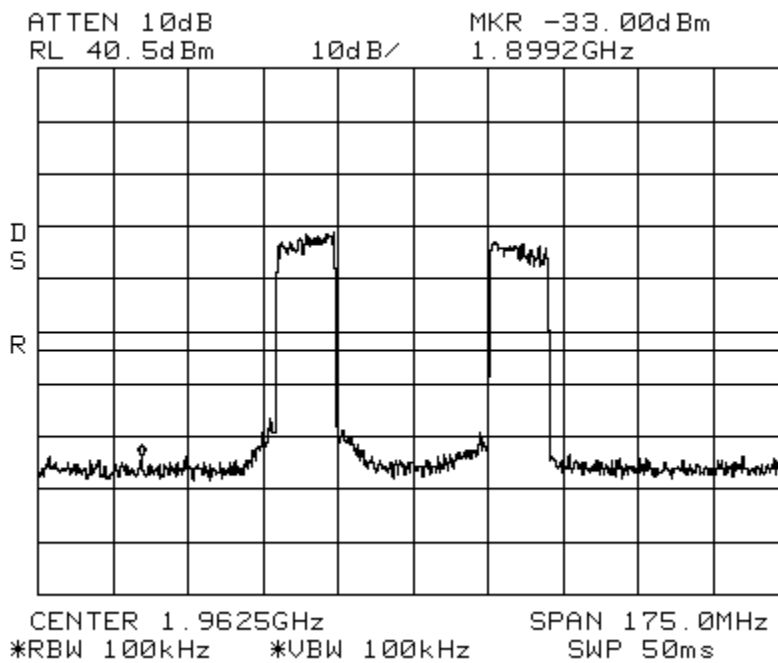
Intermodulation LTE 15 MHz Channel Bandwidth _High Spectrum PCS
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



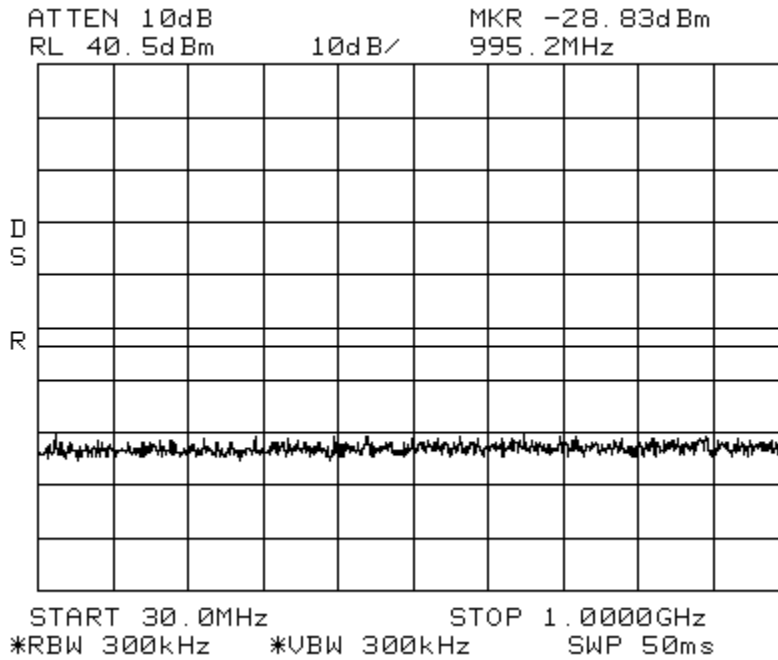
Intermodulation LTE 15 MHz Channel Bandwidth _High Spectrum PCS
 Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



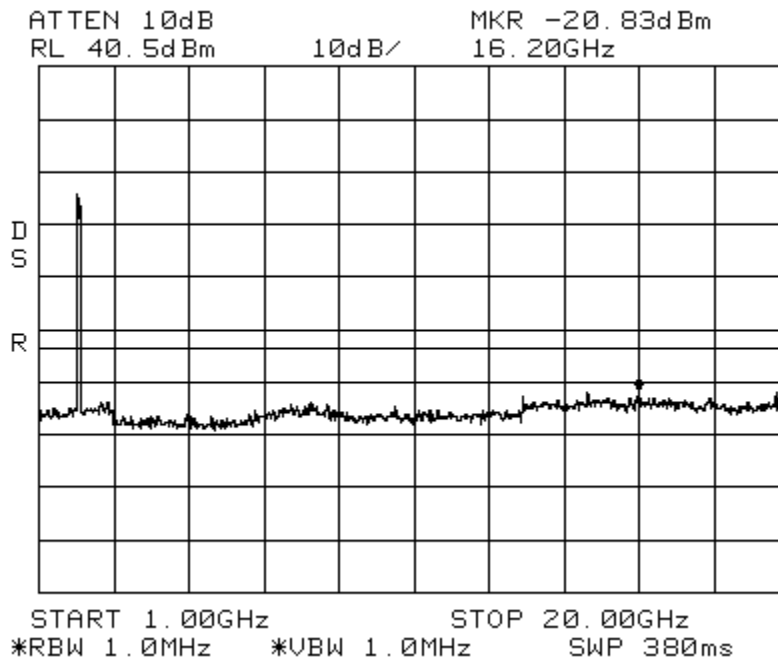
Intermodulation LTE 15 MHz Channel Bandwidth _Apart Spectrum PCS
 Center: 1962.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



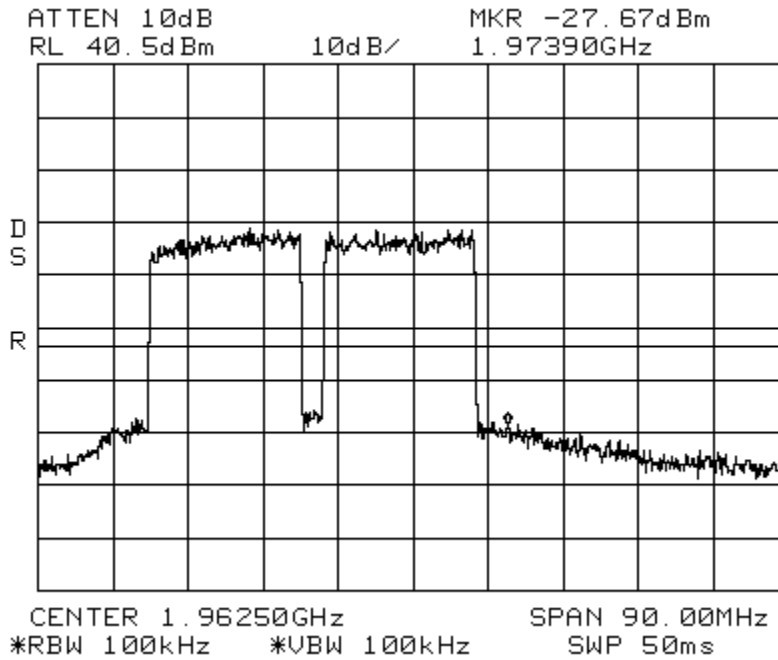
Intermodulation LTE 15 MHz Channel Bandwidth _Apart Spectrum PCS
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



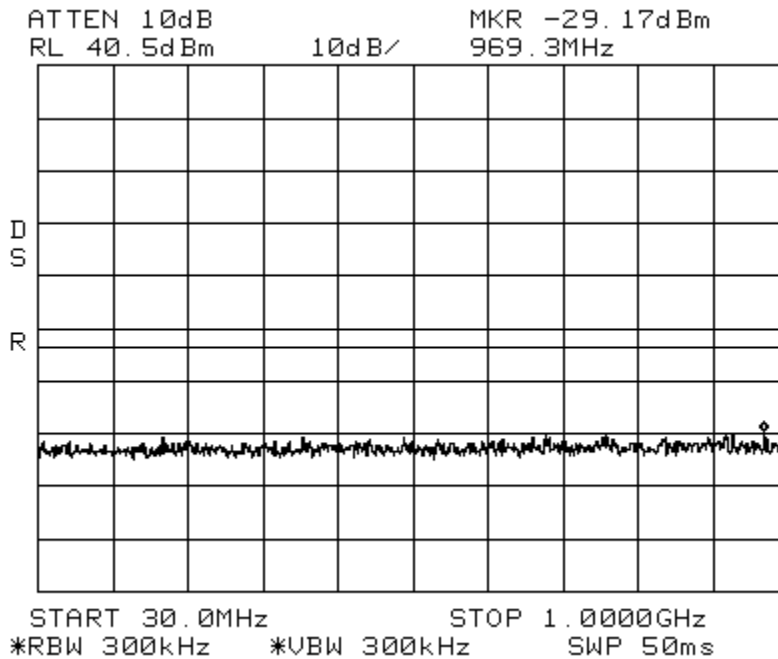
Intermodulation LTE 15 MHz Channel Bandwidth _Apart Spectrum PCS
 Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



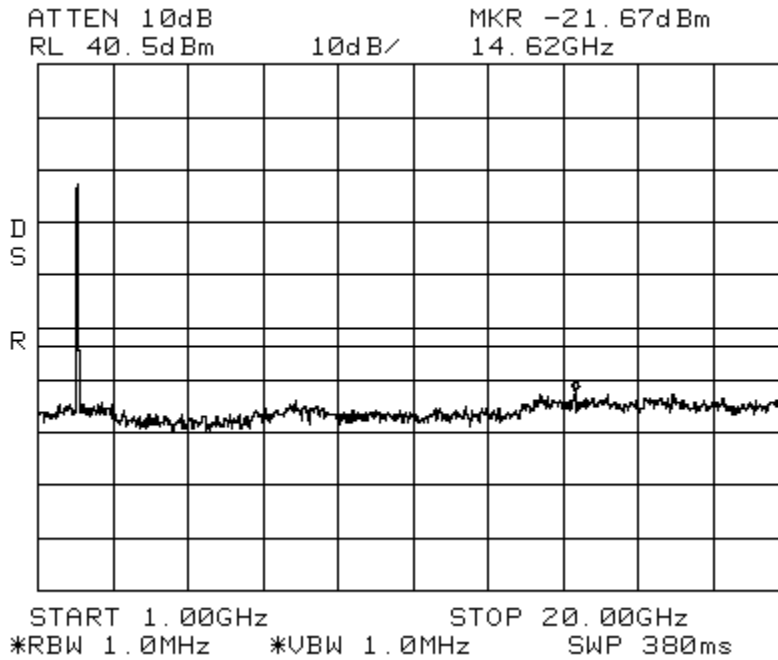
Intermodulation LTE 20 MHz Channel Bandwidth **_Low** Spectrum PCS
Center: 1962.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



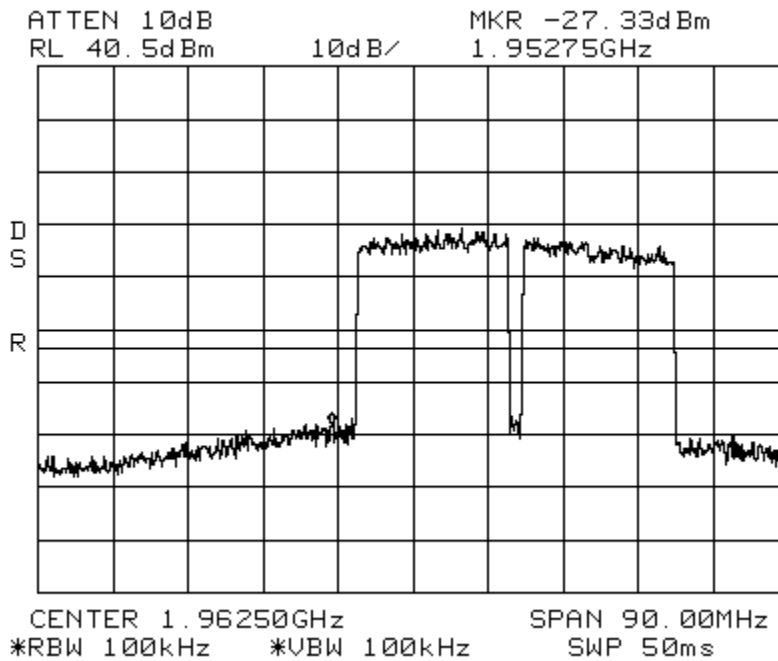
Intermodulation LTE 20 MHz Channel Bandwidth **_Low** Spectrum PCS
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



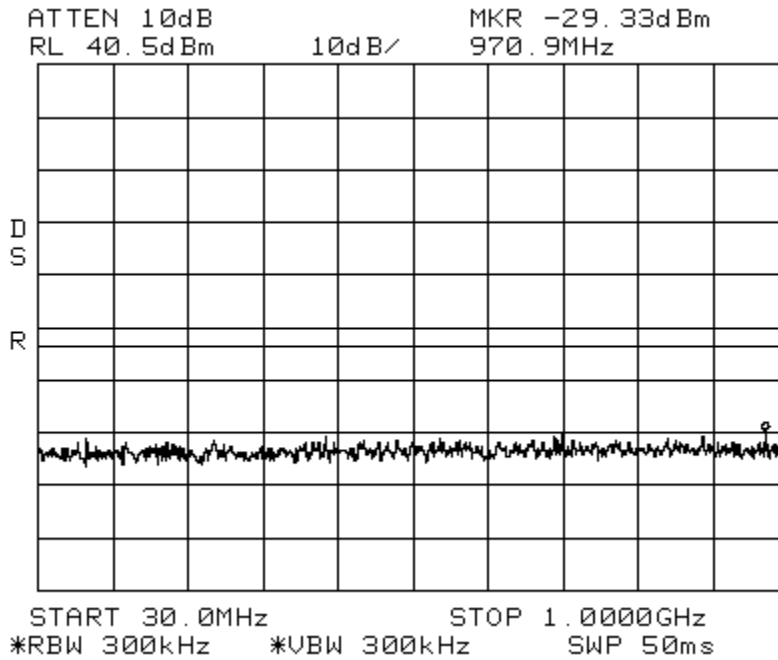
Intermodulation LTE 20 MHz Channel Bandwidth _Low Spectrum PCS
 Span: 1 GHz to 20GHz RBW/VBW: 1 MHz



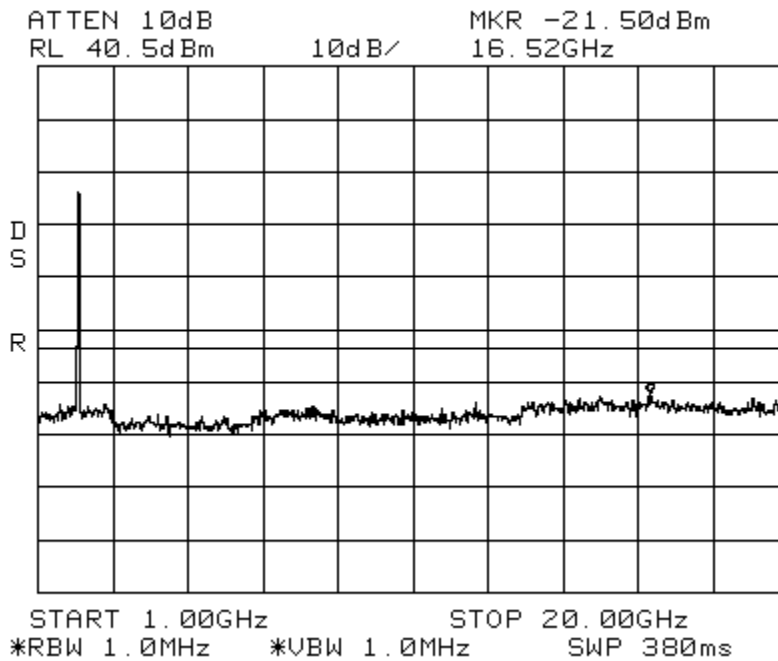
Intermodulation LTE 20 MHz Channel Bandwidth _High Spectrum PCS
 Center: 1962.5 MHz Span: 90 MHz RBW/VBW: 100 kHz



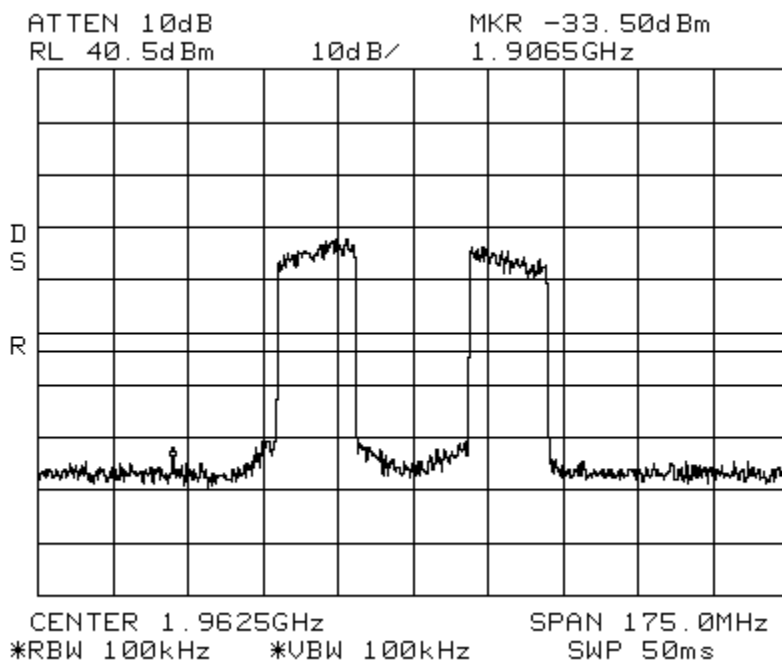
Intermodulation LTE 20 MHz Channel Bandwidth _High Spectrum PCS
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



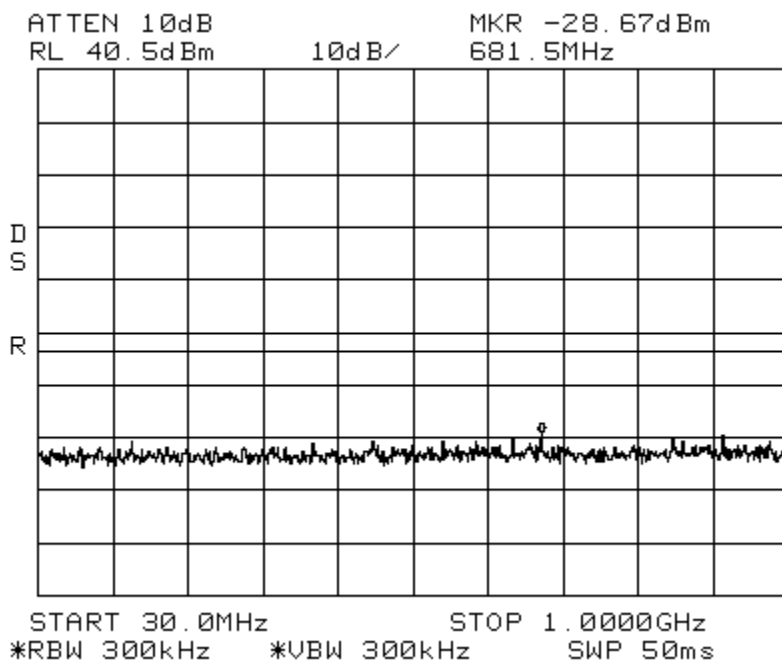
Intermodulation LTE 20 MHz Channel Bandwidth _High Spectrum PCS
 Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



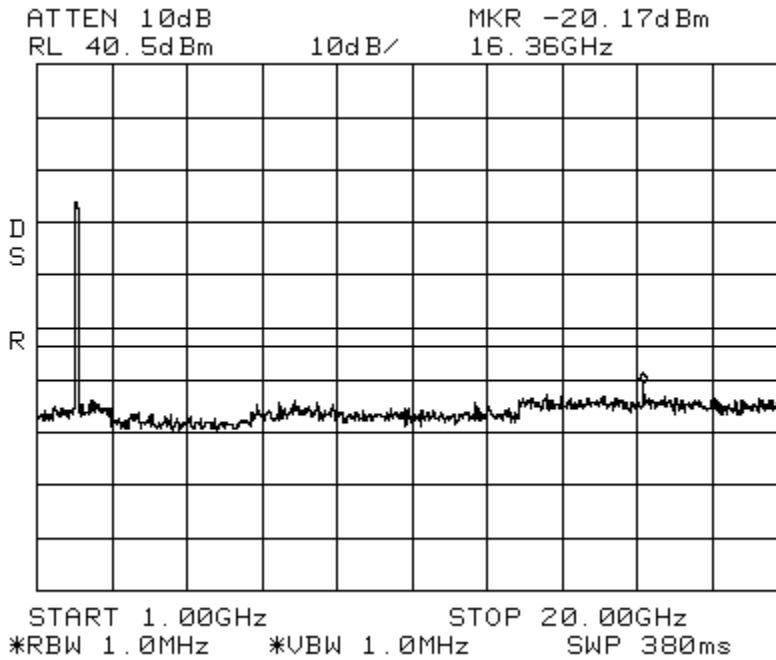
Intermodulation LTE 20 MHz Channel Bandwidth _Apart Spectrum PCS
Center: 1962.5 MHz Span: 175 MHz RBW/VBW: 100 kHz



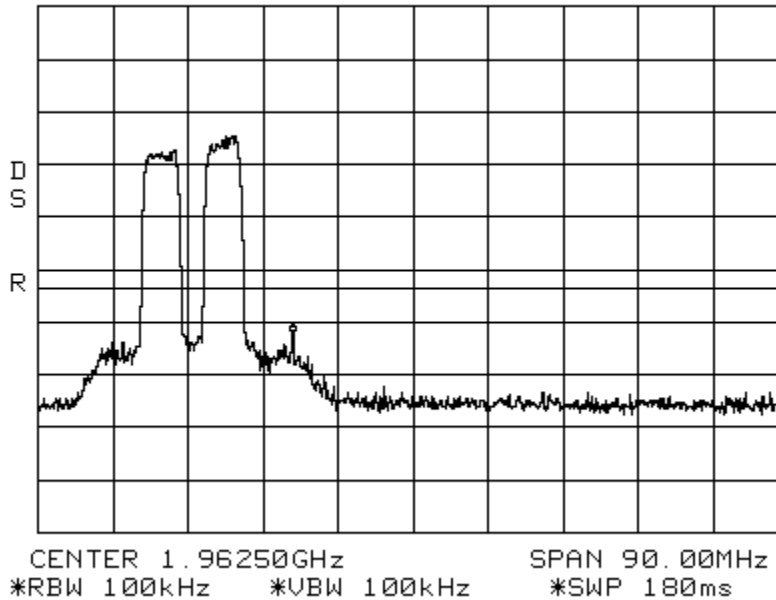
Intermodulation LTE 20 MHz Channel Bandwidth _Apart Spectrum PCS
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



Intermodulation LTE 20 MHz Channel Bandwidth_Apart Spectrum PCS
 Span: 1 GHz to 20 GHz RBW/VBW: 1 MHz



Intermodulation WCDMA_Low Spectrum PCS
 Center: 1962.5 MHz Span: 90 MHz RBW/VBW: 100 kHz
 ATTEN 10dB MKR -21.83dBm
 RL 40.5dBm 10dB/ 1.94810GHz

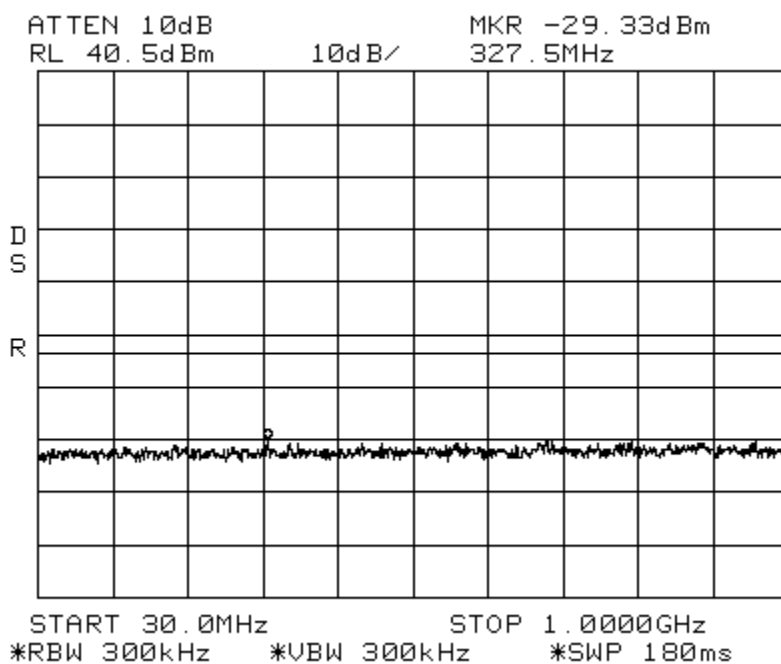


Intermodulation
Span: 30 MHz to 1 GHz

WCDMA_Low

Spectrum PCS

RBW/VBW: 300 kHz

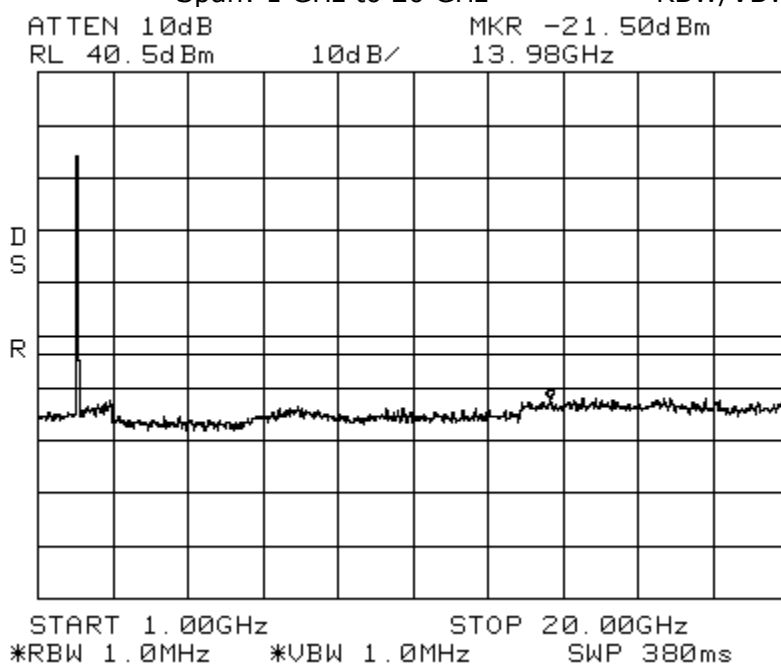


Intermodulation
Span: 1 GHz to 20 GHz

WCDMA_Low

Spectrum PCS

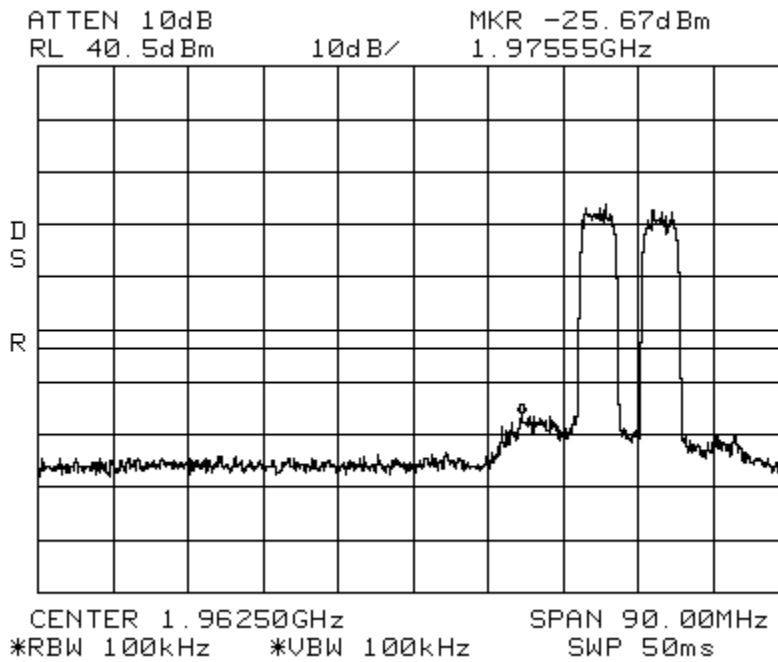
RBW/VBW: 1 MHz



Intermodulation
Center: 1962.5 MHz

WCDMA_High
Span: 90 MHz

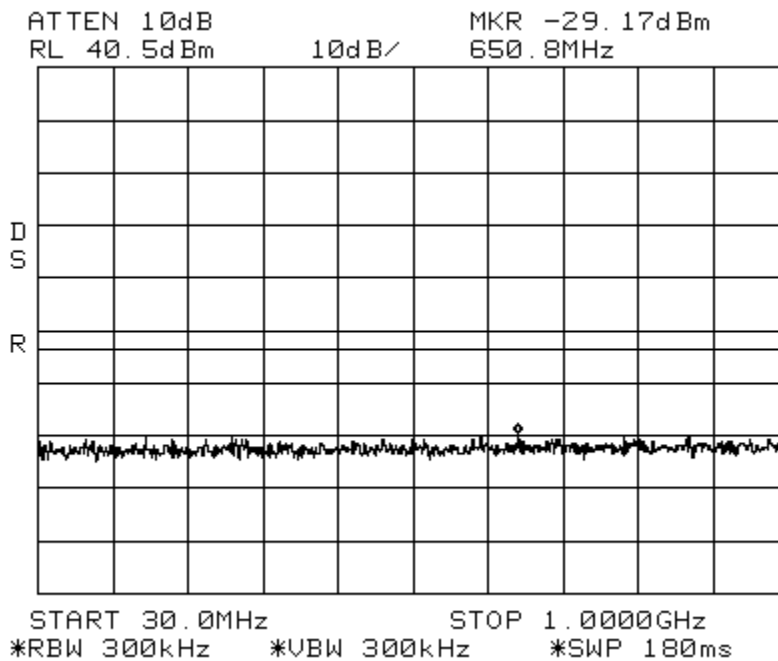
Spectrum PCS
RBW/VBW: 100 kHz



Intermodulation
Span: 30 MHz to 1 GHz

WCDMA_High
RBW/VBW: 300 kHz

Spectrum PCS



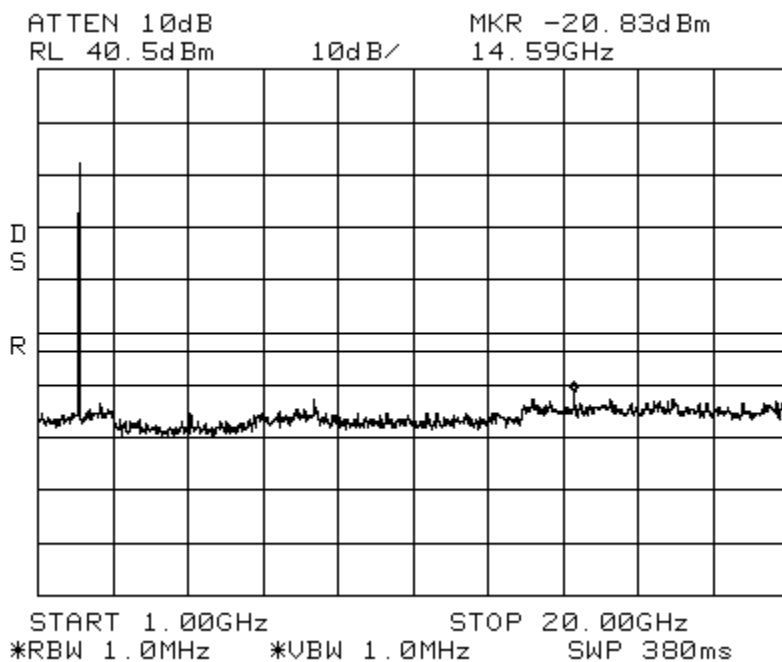
Intermodulation

WCDMA_High

Spectrum PCS

Span: 1 GHz to 20 GHz

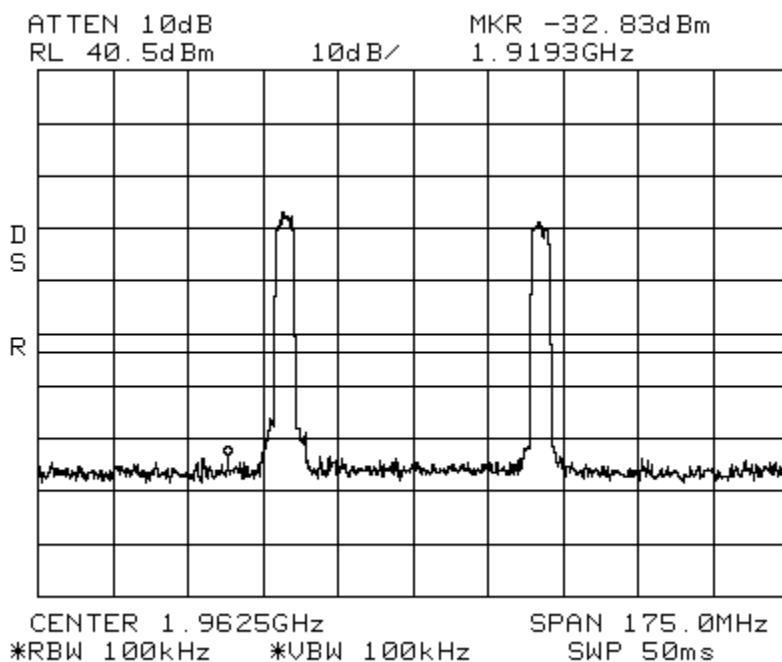
RBW/VBW: 1 MHz



Intermodulation
Center: 1962.5 MHz

WCDMA_Apart
Span: 175 MHz

Spectrum PCS
RBW/VBW: 100 kHz



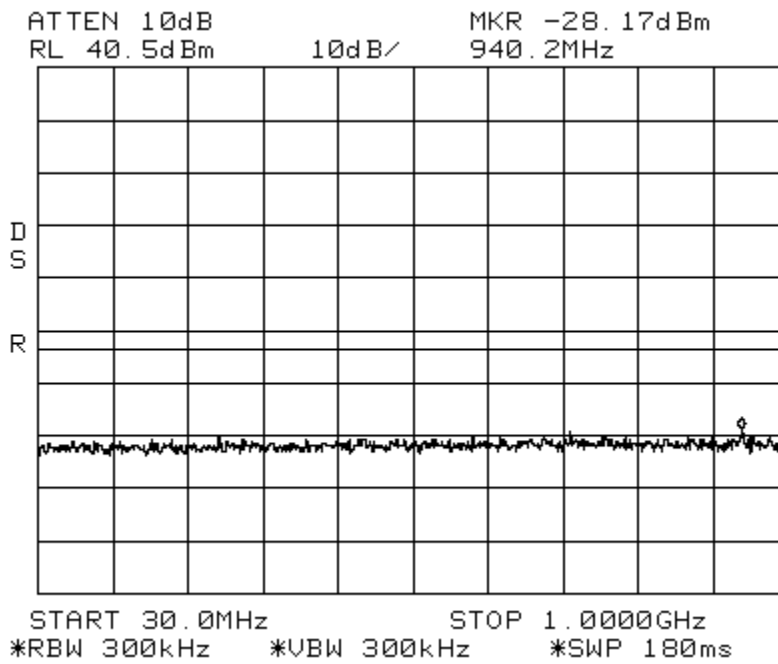
Intermodulation

WCDMA_Apart

Spectrum PCS

Span: 30 MHz to 1 GHz

RBW/VBW: 300 kHz



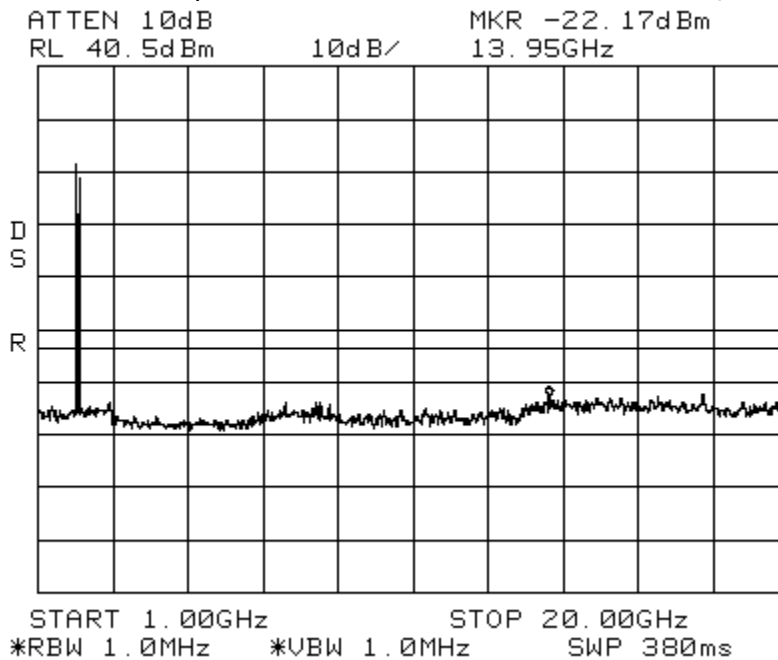
Intermodulation

WCDMA_Apart

Spectrum PCS

Span: 1 GHz to 20 GHz

RBW/VBW: 1 MHz

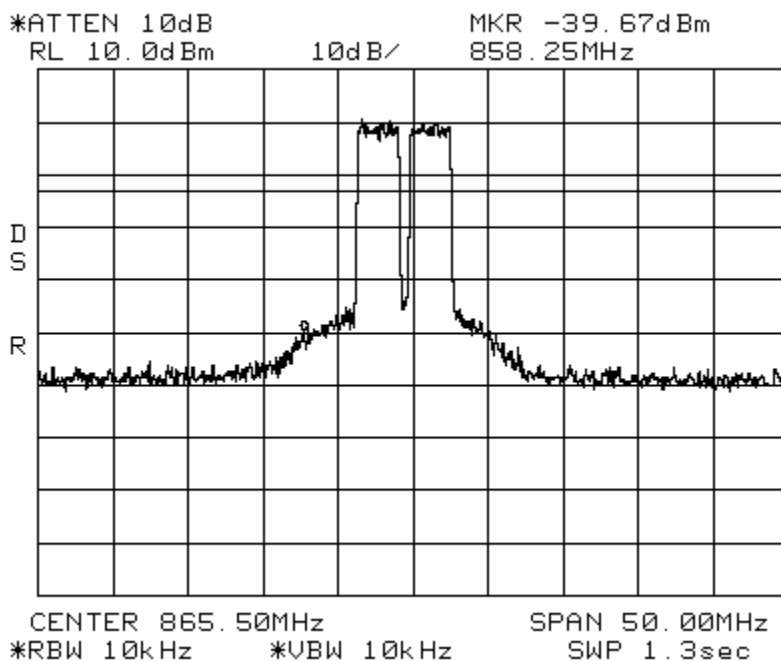


90.219(d)

Intermodulation
Center: 865.5 MHz

LTE 3MHz Low
Span: 50 MHz

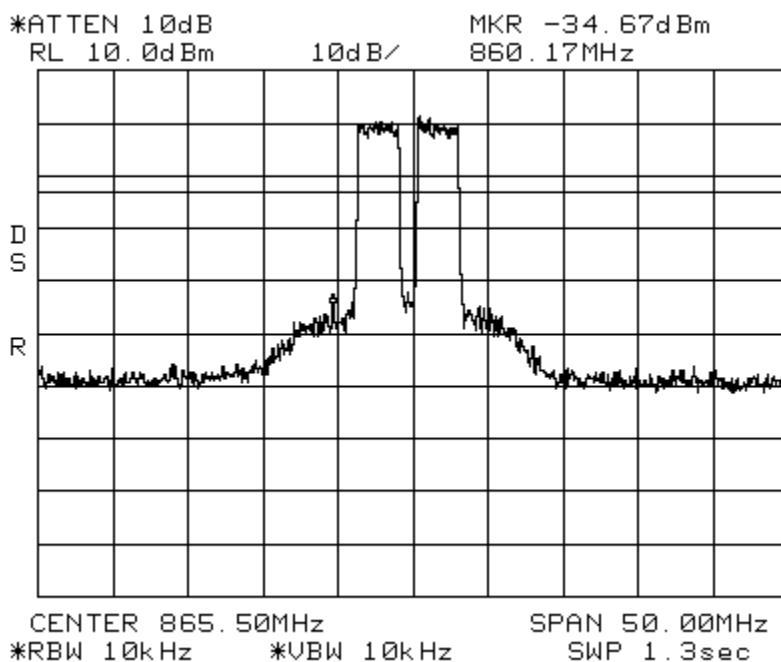
Spectrum 800 MHz SMR
RBW/VBW: 10 kHz



Intermodulation
Center: 865.5 MHz

LTE 3MHz Apart
Span: 50 MHz

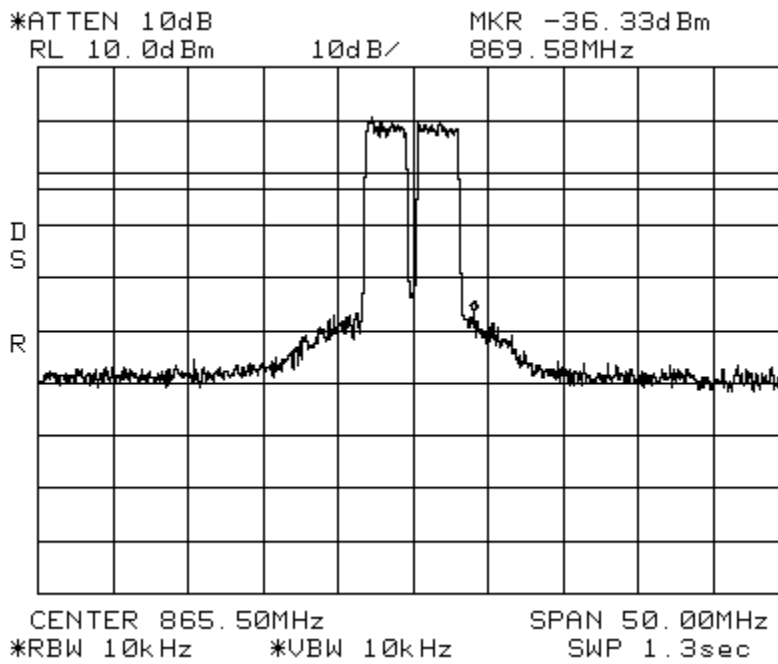
Spectrum 800 MHz SMR
RBW/VBW: 10 kHz



Intermodulation
Center: 860 MHz

LTE 3MHz High
Span: 50 MHz

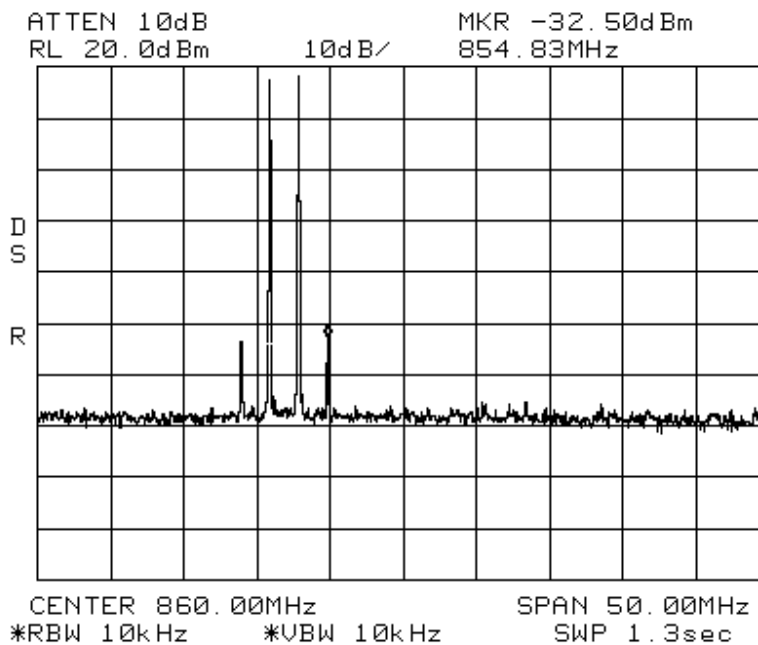
Spectrum 800 MHz SMR
RBW/VBW: 10 kHz



Intermodulation
Center: 860 MHz

APCO 25 C4 FM Low
Span: 50 MHz

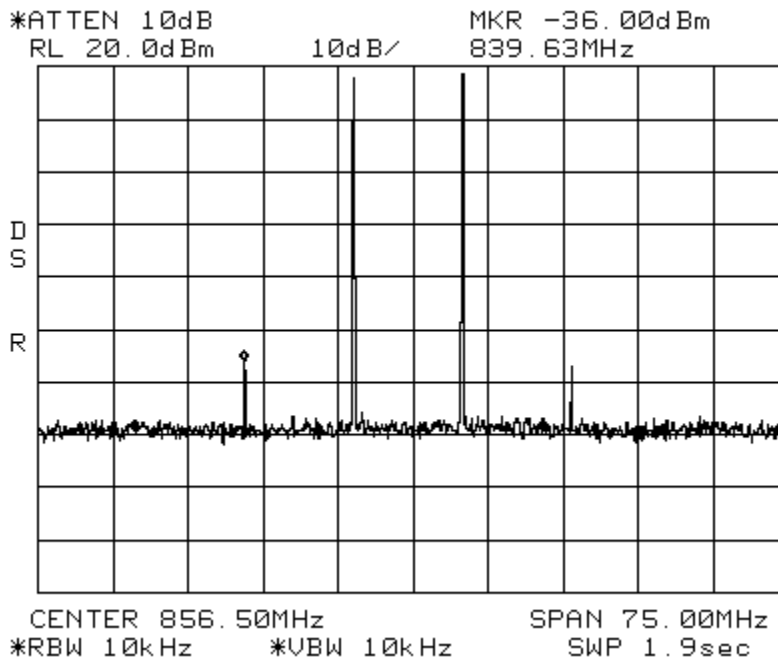
Spectrum 800 MHz SMR
RBW/VBW: 10 kHz



Intermodulation
Center: 856.5MHz

APCO 25 C4 FM Apart
Span: 75 MHz

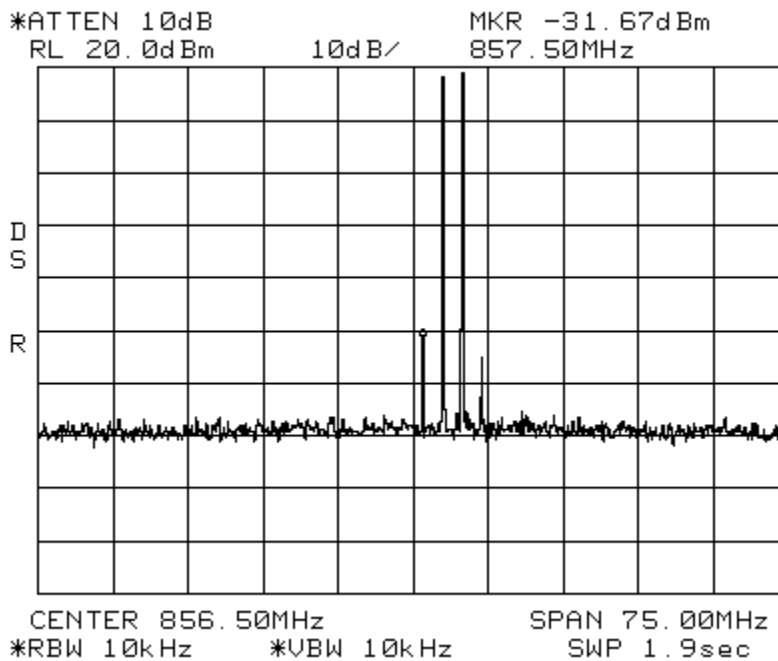
Spectrum 800 MHz SMR
RBW/VBW: 10 kHz



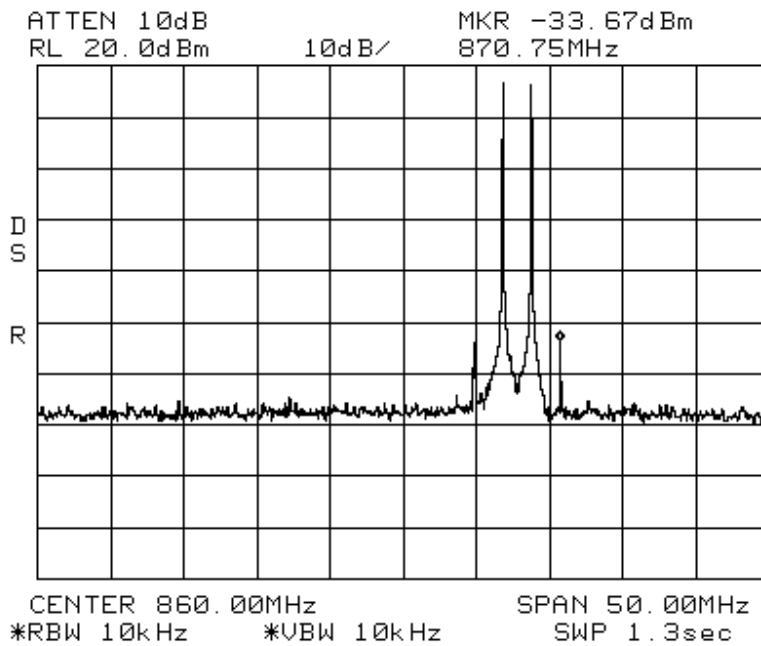
Intermodulation
Center: 856.5 MHz

APCO 25 C4 FM High
Span: 75 MHz

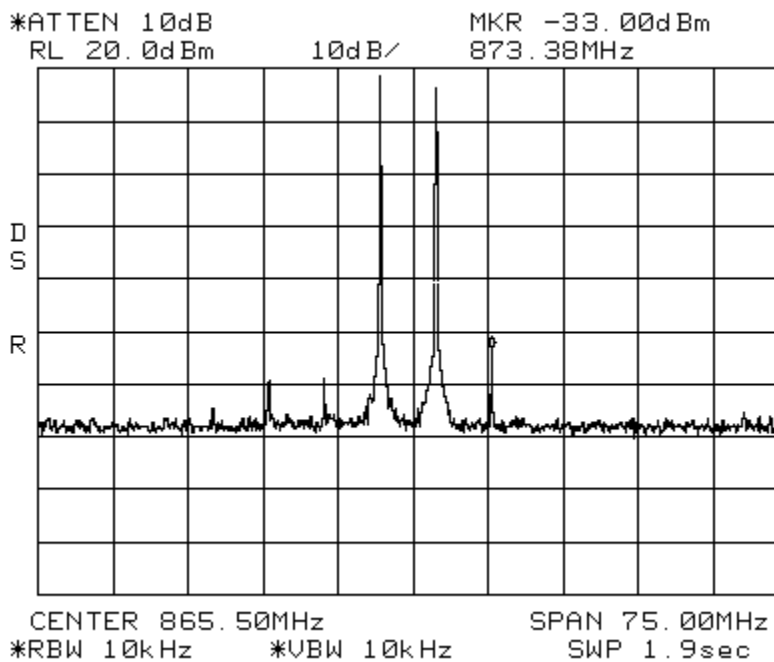
Spectrum 800 MHz SMR
RBW/VBW: 10 kHz



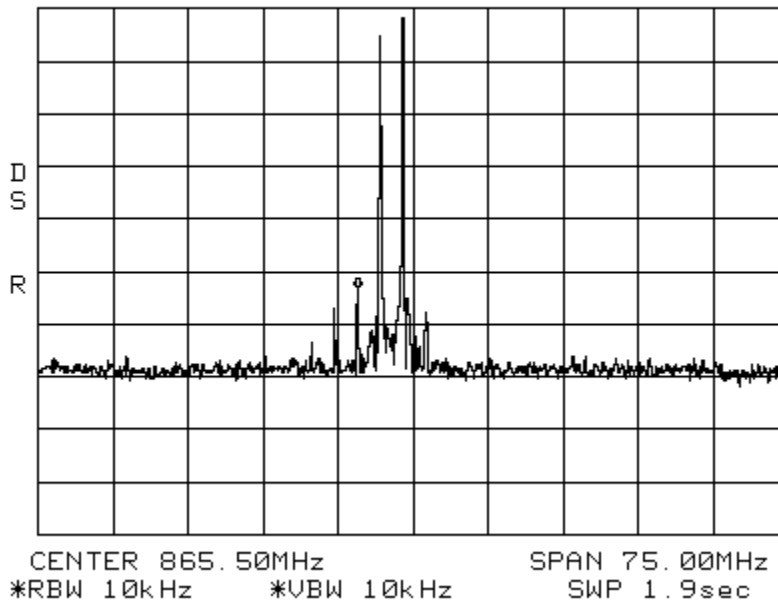
Intermodulation iDEN High Spectrum 800 MHz SMR
Center: 860 MHz Span: 50 MHz RBW/VBW: 10 kHz



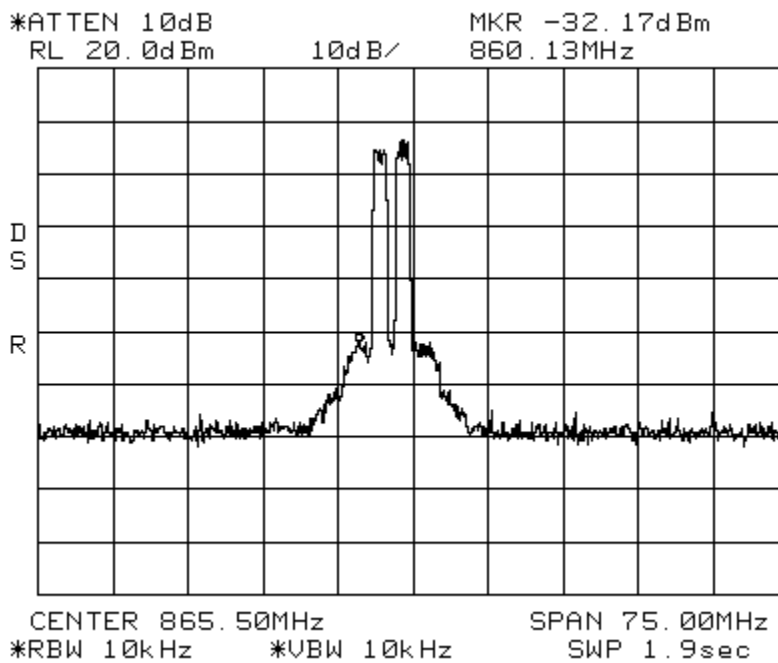
Intermodulation iDEN Apart Spectrum 800 MHz SMR
Center: 865.5 MHz Span: 75 MHz RBW/VBW: 10 kHz



Intermodulation iDEN Low Spectrum 800 MHz SMR
Center: 865.5 MHz Span: 75 MHz RBW/VBW: 10 kHz
*ATTEN 10dB MKR -33.17dBm
RL 20.0dBm 10dB/ 860.00MHz



Intermodulation CDMA Low Spectrum 800 MHz SMR
Center: 865.5 MHz Span: 75 MHz RBW/VBW: 10 kHz



Intermodulation

CDMA Apart

Spectrum 800 MHz SMR

Center: 865.5 MHz

Span: 75 MHz

RBW/VBW: 10 kHz

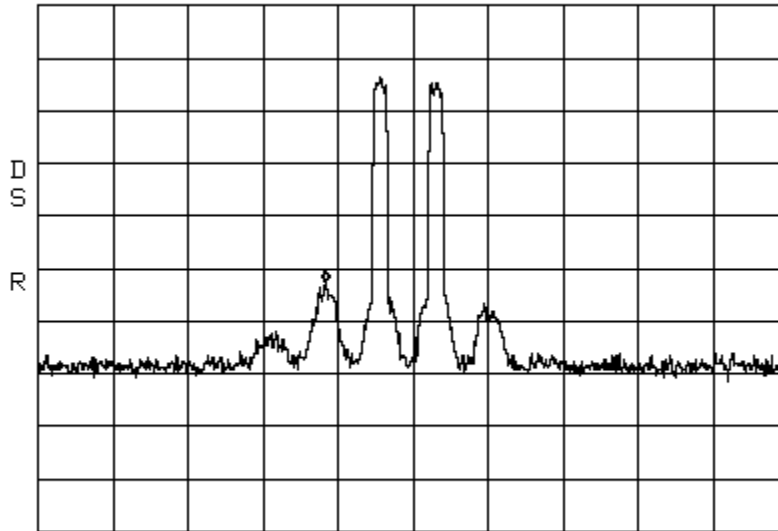
*ATTEN 10dB

MKR -32.50dBm

RL 20.0dBm

10dB/

856.75MHz



CENTER 865.50MHz

SPAN 75.00MHz

*RBW 10kHz

*VBW 10kHz

SWP 1.9sec

Intermodulation

CDMA High

Spectrum 800 MHz SMR

Center: 860 MHz

Span: 75 MHz

RBW/VBW: 10 kHz

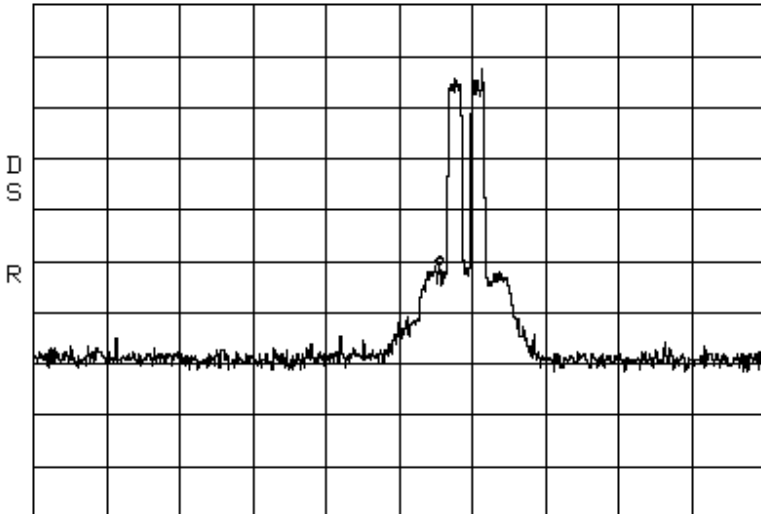
ATTEN 10dB

MKR -30.83dBm

RL 20.0dBm

10dB/

864.13MHz



CENTER 860.00MHz

SPAN 75.00MHz

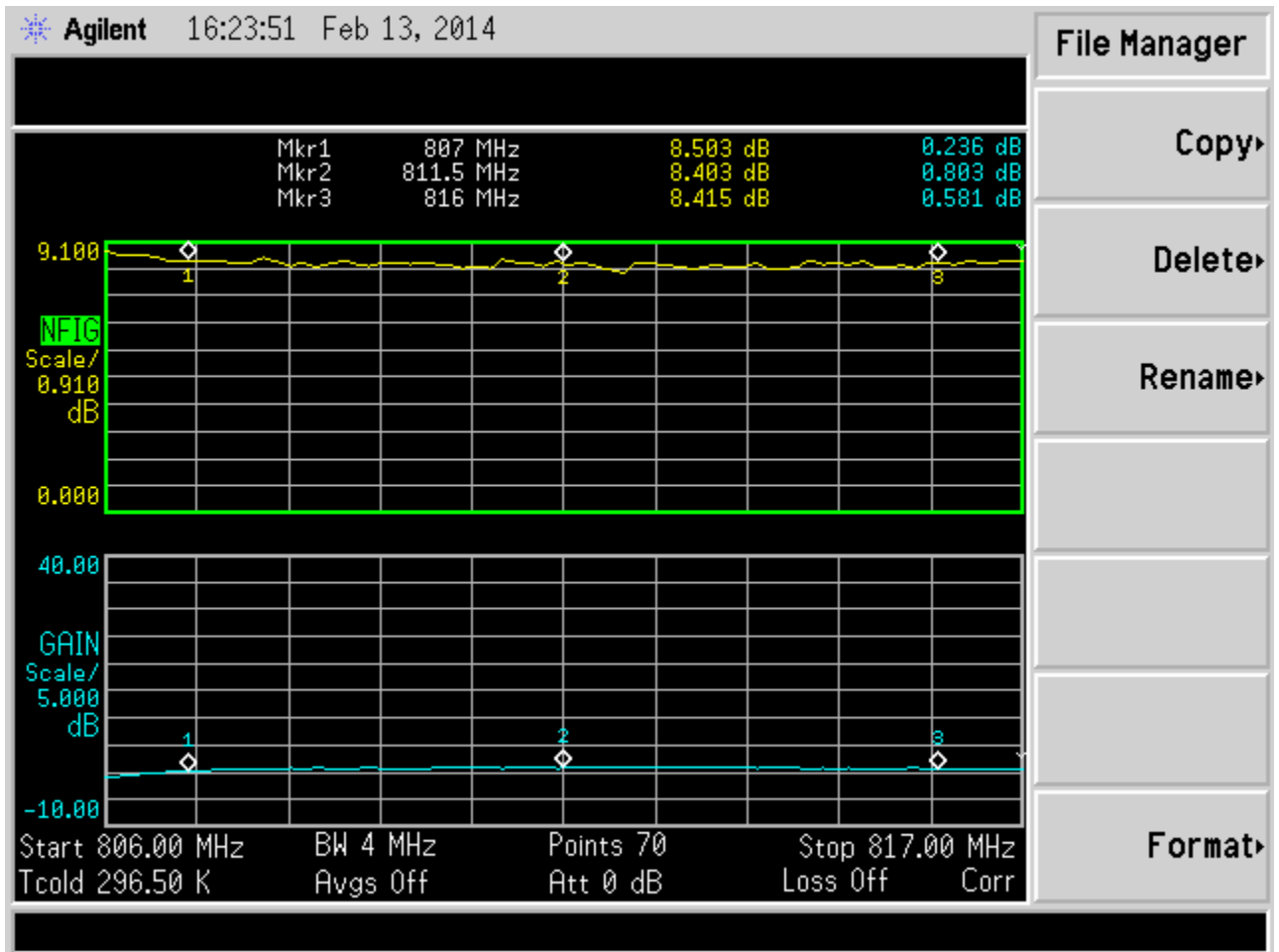
*RBW 10kHz

*VBW 10kHz

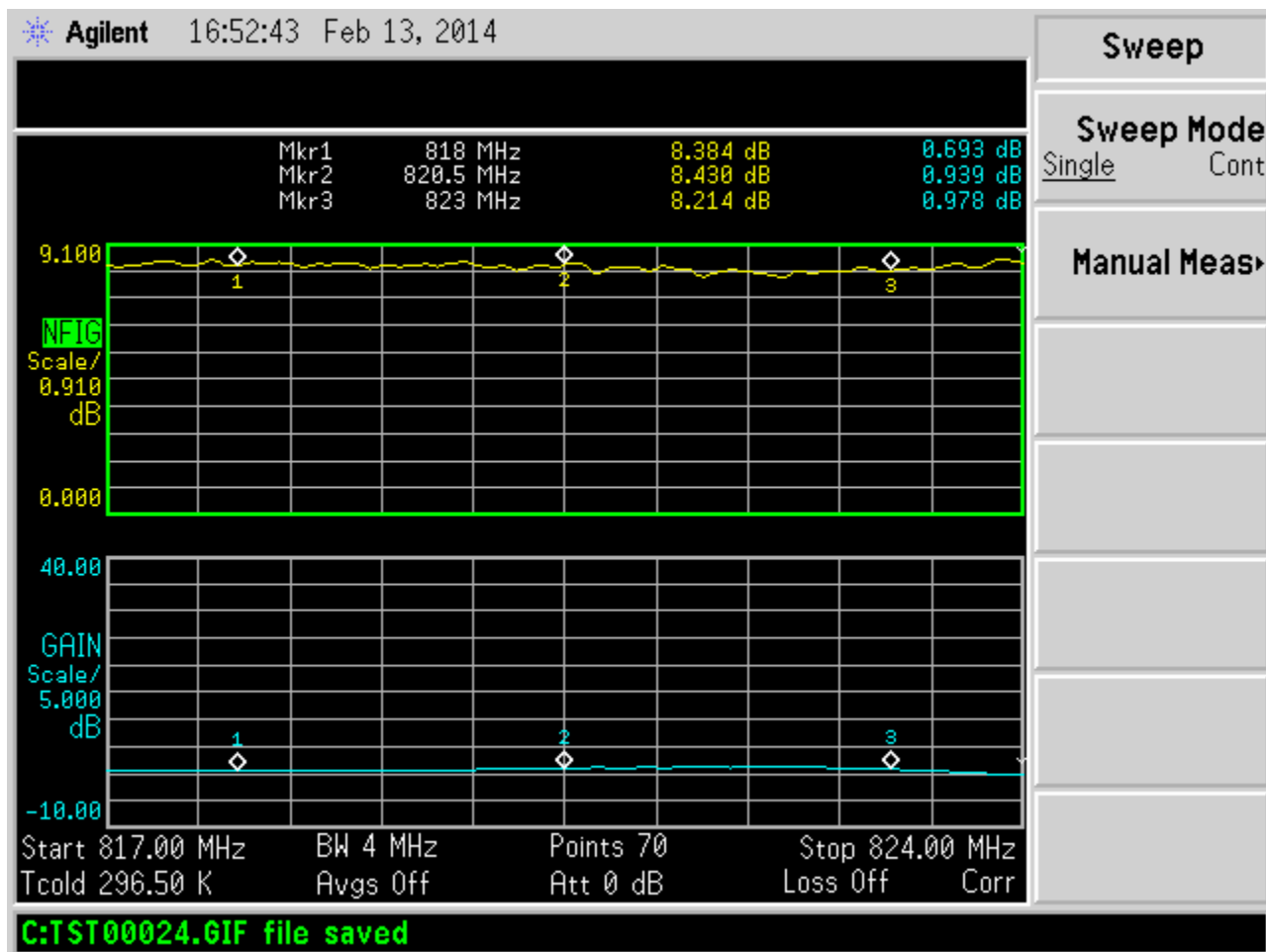
SWP 1.9sec

90.219(e)(2)

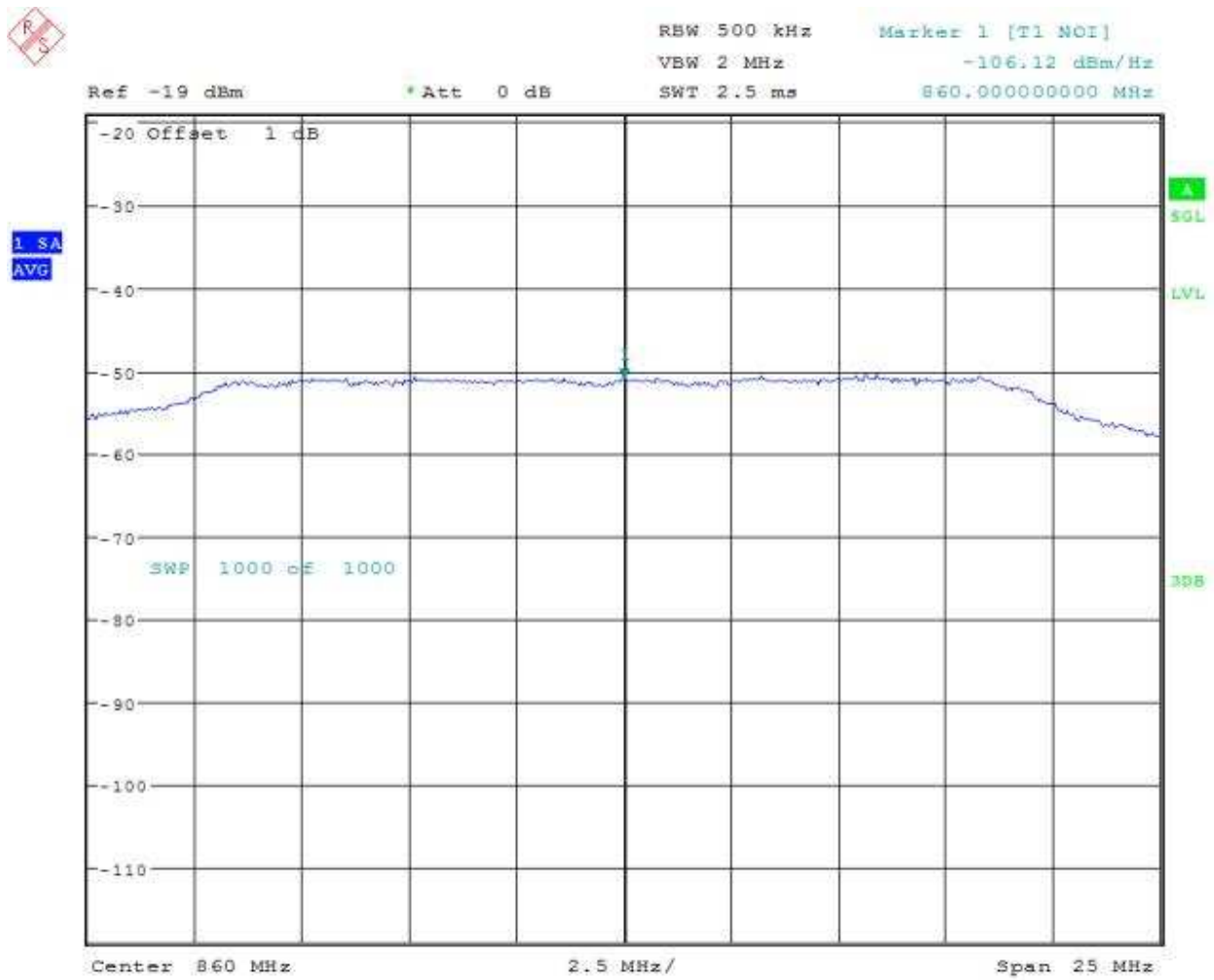
Uplink



Noise Figure at 811.5MHz = 8.403dB



Noise Figure at 820.5MHz = 8.430dB



Date: 26.FEB.2014 17:49:16

Downlink Noise Floor = -106.12 dBm/Hz

5.5 FCC 90.213 & 24.235 – Frequency Stability

Test Summary:

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

Test Methods Used:

TIA-603-C 2004, ANSI C63.4-2003, FCC 90.213 & 24.235

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: 10/16/12 & 6/21/12

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	87	MC18742	9-26-14	☒
4	Frequency Counter	HP	5347A	MC27548	6-30-14	☒
5	Temperature Chamber	Thermotron	SM-32C	MC18966	3-27-14	☒
6	Signal Generator	Aeroflex	3413	MC57947	6-26-14	☒
9	Digital Barometer	Fisher Scientific	02-403	MC50719	3-4-14	☒
11	Attenuator	Aeroflex	86-30-12	N/A	CNR	☒
12	RF Power Sensor	HP	8482A	MC48773	6-30-14	☒

Environmental Conditions in the lab:

Temperature: 23° C

Relative Humidity: 22%

Atmospheric Pressure: 99.7 kPa

Test Results:

Host/DRU	IFEU	RAU			
Input Voltage	Input Voltage	Input Voltage	Carrier Frequency	Measured Frequency	Meets Requirements?
100 VAC	54VDC	54 VDC	851.200 MHz	851.200 MHz	Yes
170 VAC	54VDC	54 VDC	851.200 MHz	851.200 MHz	Yes
240 VAC	54VDC	54 VDC	851.200 MHz	851.200 MHz	Yes
100 VAC	54VDC	54 VDC	860.000 MHz	860.000 MHz	Yes
170 VAC	54VDC	54 VDC	860.000 MHz	860.000 MHz	Yes
240 VAC	54VDC	54 VDC	860.000 MHz	860.000 MHz	Yes
100 VAC	54VDC	54 VDC	868.800 MHz	868.800 MHz	Yes
170 VAC	54VDC	54 VDC	868.800 MHz	868.800 MHz	Yes
240 VAC	54VDC	54 VDC	868.800 MHz	868.800 MHz	Yes
Temperature			Carrier Frequency	Measured Frequency	Meets Requirements?
-25 Deg. C			851.200 MHz	851.200 MHz	Yes
-20 Deg. C			851.200 MHz	851.200 MHz	Yes
-10 Deg. C			851.200 MHz	851.200 MHz	Yes
0 Deg. C			851.200 MHz	851.200 MHz	Yes
10 Deg. C			851.200 MHz	851.200 MHz	Yes
20 Deg. C			851.200 MHz	851.200 MHz	Yes
30 Deg. C			851.200 MHz	851.200 MHz	Yes
40 Deg. C			851.200 MHz	851.200 MHz	Yes
45 Deg. C			851.200 MHz	851.200 MHz	Yes
50 Deg. C			851.200 MHz	851.200 MHz	Yes
-25 Deg. C			860.000 MHz	860.000 MHz	Yes
-20 Deg. C			860.000 MHz	860.000 MHz	Yes
-10 Deg. C			860.000 MHz	860.000 MHz	Yes
0 Deg. C			860.000 MHz	860.000 MHz	Yes
10 Deg. C			860.000 MHz	860.000 MHz	Yes
20 Deg. C			860.000 MHz	860.000 MHz	Yes
30 Deg. C			860.000 MHz	860.000 MHz	Yes
40 Deg. C			860.000 MHz	860.000 MHz	Yes
45 Deg. C			860.000 MHz	860.000 MHz	Yes
50 Deg. C			860.000 MHz	860.000 MHz	Yes
-25 Deg. C			868.800 MHz	868.800 MHz	Yes
-20 Deg. C			868.800 MHz	868.800 MHz	Yes
-10 Deg. C			868.800 MHz	868.800 MHz	Yes
0 Deg. C			868.800 MHz	868.800 MHz	Yes
10 Deg. C			868.800 MHz	868.800 MHz	Yes
20 Deg. C			868.800 MHz	868.800 MHz	Yes
30 Deg. C			868.800 MHz	868.800 MHz	Yes
40 Deg. C			868.800 MHz	868.800 MHz	Yes
45 Deg. C			868.800 MHz	868.800 MHz	Yes
50 Deg. C			868.800 MHz	868.800 MHz	Yes

Host/DRU	IFEU	RAU			
Input Voltage	Input Voltage	Input Voltage	Carrier Frequency	Measured Frequency	Meets Requirements?
100 VAC	54VDC	54 VDC	1930.200 MHz	1930.200 MHz	Yes
170 VAC	54VDC	54 VDC	1930.200 MHz	1930.200 MHz	Yes
240 VAC	54VDC	54 VDC	1930.200 MHz	1930.200 MHz	Yes
100 VAC	54VDC	54 VDC	1962.500 MHz	1962.500 MHz	Yes
170 VAC	54VDC	54 VDC	1962.500 MHz	1962.500 MHz	Yes
240 VAC	54VDC	54 VDC	1962.500 MHz	1962.500 MHz	Yes
100 VAC	54VDC	54 VDC	1994.800 MHz	1994.800 MHz	Yes
170 VAC	54VDC	54 VDC	1994.800 MHz	1994.800 MHz	Yes
240 VAC	54VDC	54 VDC	1994.800 MHz	1994.800 MHz	Yes
Temperature			Carrier Frequency	Measured Frequency	Meets Requirements?
-25 Deg. C			1930.200 MHz	1930.200 MHz	Yes
-20 Deg. C			1930.200 MHz	1930.200 MHz	Yes
-10 Deg. C			1930.200 MHz	1930.200 MHz	Yes
0 Deg. C			1930.200 MHz	1930.200 MHz	Yes
10 Deg. C			1930.200 MHz	1930.200 MHz	Yes
20 Deg. C			1930.200 MHz	1930.200 MHz	Yes
30 Deg. C			1930.200 MHz	1930.200 MHz	Yes
40 Deg. C			1930.200 MHz	1930.200 MHz	Yes
45 Deg. C			1930.200 MHz	1930.200 MHz	Yes
50 Deg. C			1930.200 MHz	1930.200 MHz	Yes
-25 Deg. C			1962.500 MHz	1962.500 MHz	Yes
-20 Deg. C			1962.500 MHz	1962.500 MHz	Yes
-10 Deg. C			1962.500 MHz	1962.500 MHz	Yes
0 Deg. C			1962.500 MHz	1962.500 MHz	Yes
10 Deg. C			1962.500 MHz	1962.500 MHz	Yes
20 Deg. C			1962.500 MHz	1962.500 MHz	Yes
30 Deg. C			1962.500 MHz	1962.500 MHz	Yes
40 Deg. C			1962.500 MHz	1962.500 MHz	Yes
45 Deg. C			1962.500 MHz	1962.500 MHz	Yes
50 Deg. C			1962.500 MHz	1962.500 MHz	Yes
-25 Deg. C			1994.800 MHz	1994.800 MHz	Yes
-20 Deg. C			1994.800 MHz	1994.800 MHz	Yes
-10 Deg. C			1994.800 MHz	1994.800 MHz	Yes
0 Deg. C			1994.800 MHz	1994.800 MHz	Yes
10 Deg. C			1994.800 MHz	1994.800 MHz	Yes
20 Deg. C			1994.800 MHz	1994.800 MHz	Yes
30 Deg. C			1994.800 MHz	1994.800 MHz	Yes
40 Deg. C			1994.800 MHz	1994.800 MHz	Yes
45 Deg. C			1994.800 MHz	1994.800 MHz	Yes
50 Deg. C			1994.800 MHz	1994.800 MHz	Yes

Measurement Protocol

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

Measurement Protocol

Environmental conditions of the lab, (ADC)

Temperature: 25° C

Relative Humidity: 30 %

Atmospheric Pressure: 98.2 kPa

Test Methodology:

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

Measurement Uncertainty

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

Justification

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

Radiated Emissions

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

Example:

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

Substitution Method

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

Test Equipment

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

Radiated Emissions Test Data

[Table of Contents; Section 1.0](#)Document Name: **101358077MIN-001****Test Engineer:** Simon Khazon**Date:** October 22, 2013**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