Test Report Summary

FCC CFR 47, Part 90
Private Land Mobile Radio Service
FCC CFR 47, Part 27
Wireless Communications Service

Manufacturer: ADC Telecommunications

Name of Equipment: Spectrum 800 SMR/AWS Path1 SRAU

Model Number(s): SPT-S1-80AWS-1

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

Test Report Number: MN110617_800SMR_AWSP1 SRAU

Test Date(s): 1 June, 2011 (Intertek)
25 May, 2011 (ADC)
10 June, 2011 (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 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 90 and 27. The EUT fulfills the requirements of the Federal Communications Commission's CFR 47 Part 90 and 27.

Date: 17 June, 2011

Location:

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

ADC Telecommunications
1187 Park Place
Shakopee, MN 55379
Phone: (952) 403-8340
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:	MN110617_800SMR_AWSP1 SRAU
Date of Issue:	17 June, 2011
Model Number(s):	SPT-S1-80AWS-1
Product Name:	Spectrum 800 SMR/AWS Path1 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: **100381613MIN-003**

Reference(s)

Total pages including Appendices: 52

1.0 TABLE OF CONTENTS

2.0 REVISION DESCRIPTION

Rev	Total Pages	Date	Description
A	52	17 June, 2011	Original Release

3.0 DOCUMENTATION

3.1 Test Regulations

27.50 Power limits
27.53 Emission limits
27.54 Frequency stability

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	**Intertek**
Temperature: 24º C	15-35º C
Relative Humidity: 21%	30-60%
Atmospheric Pressure: 98.8 kPa	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 – 800 SMR – 851 to 869 MHz
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-S1-80AWS-1	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

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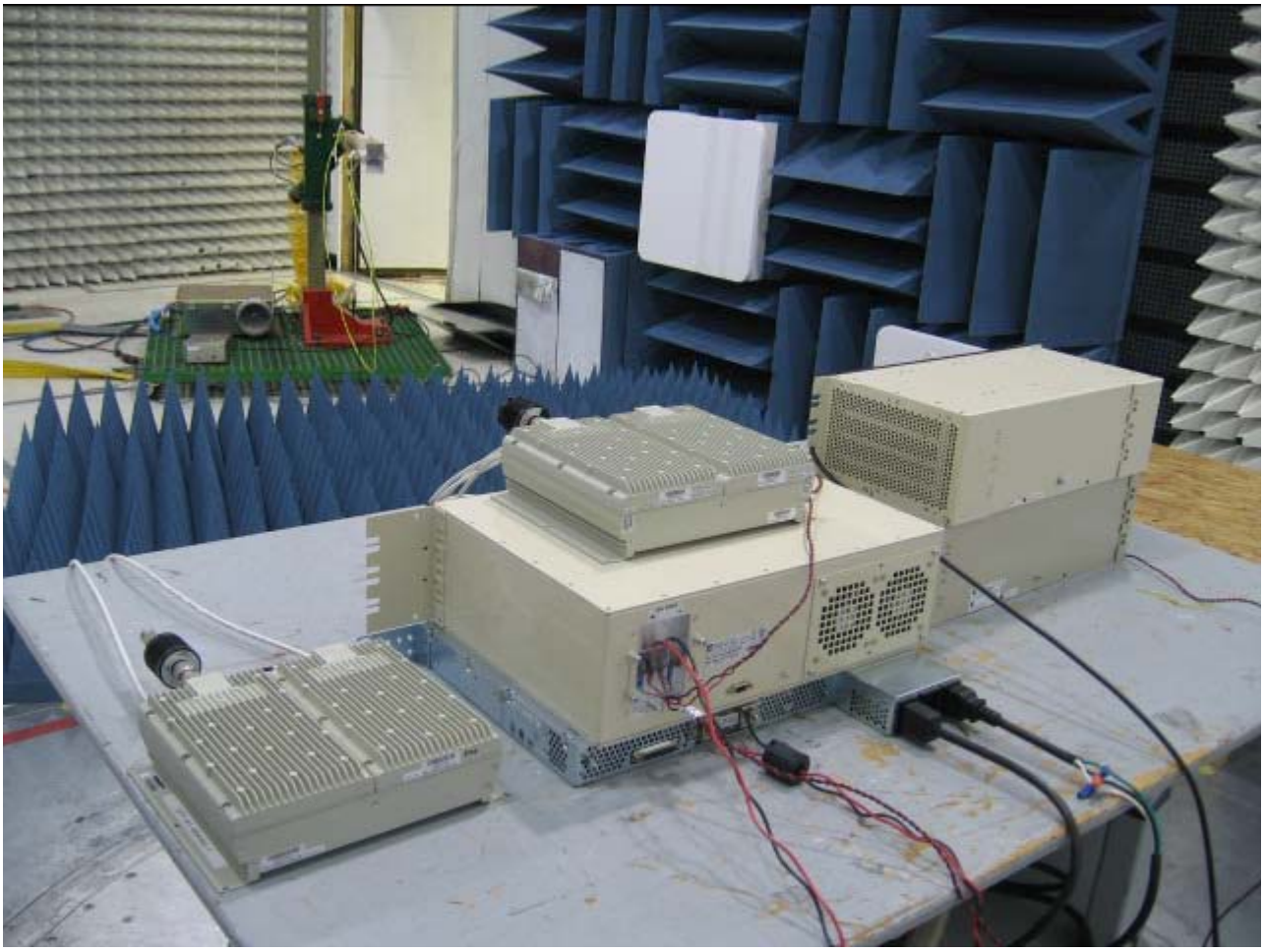
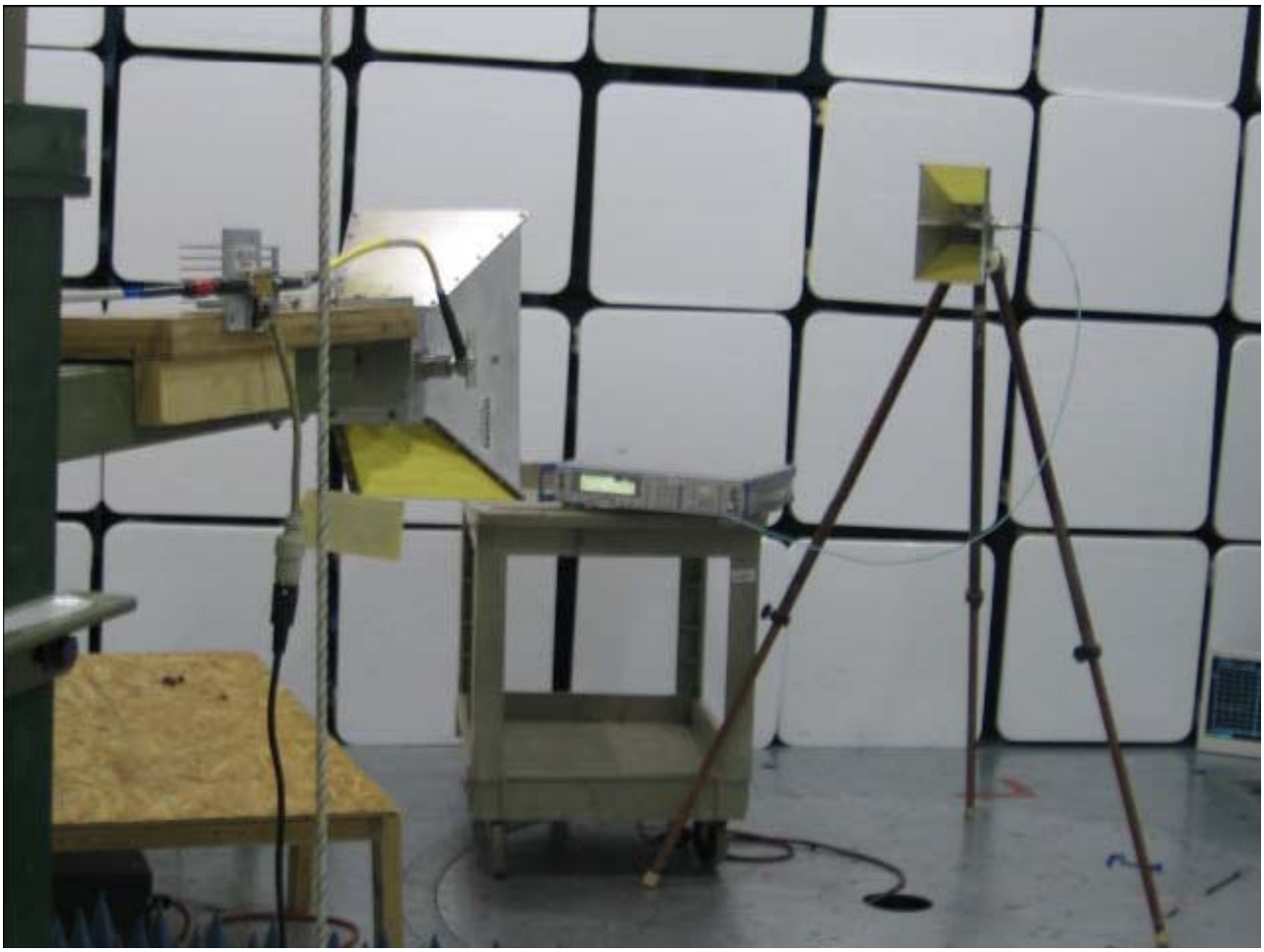
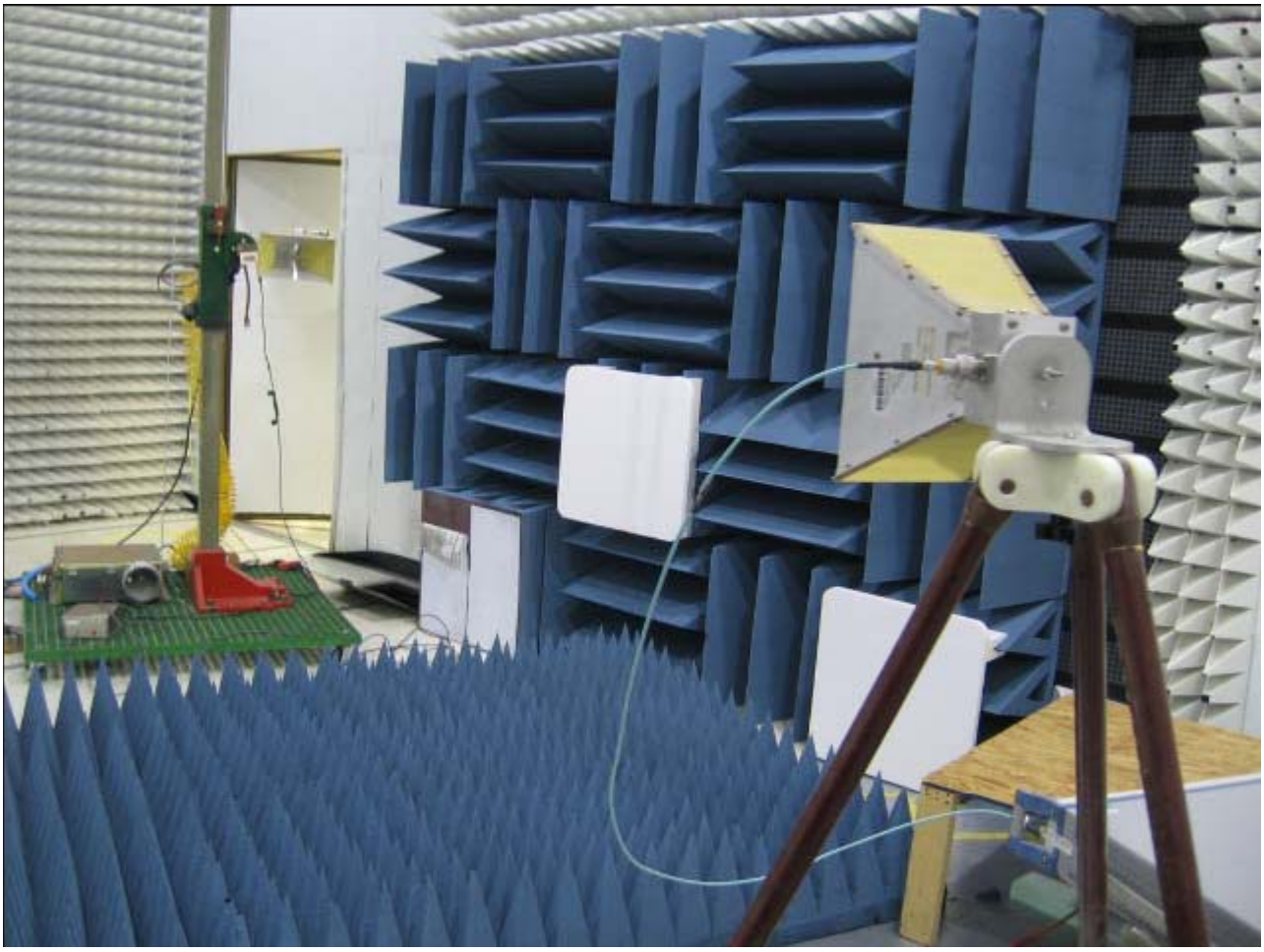
4.1 Test Set-up Photo, Radiated Emissions



4.2 Test Set-up Photo, Radiated Emissions





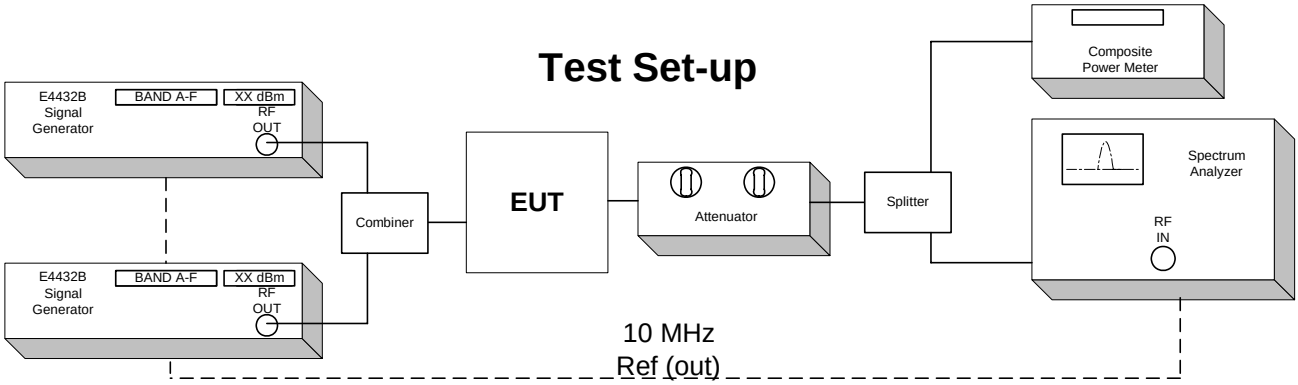
4.3 Test Set-up Drawings

Conducted and Radiated Emission Limits Test

Conducted Output Power Test

Inter-Modulation Test

Occupied Bandwidth Modulation Test

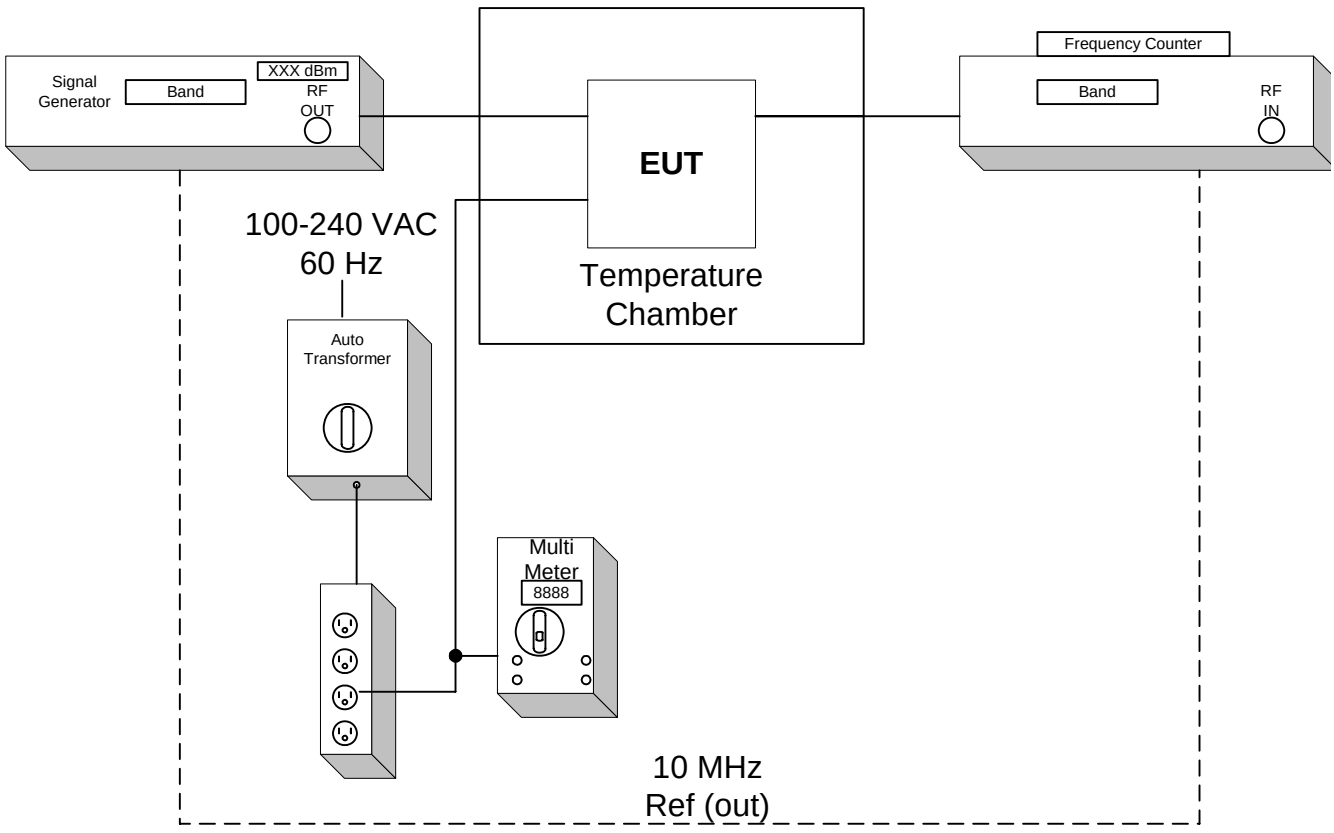


Frequency Tolerance Test

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.

Test Set-up



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 19.74 dB at 851.04 MHz (iDEN)
- Minimum margin of compliance is 26.95 dB at 851.04 MHz (APCO 25 C4FM)
- Minimum margin of compliance is 16.33 dB (Path 1) at 2112.5 MHz (W-CDMA)

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: 25 May, 2011
10 June, 2011

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 50º 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

Test Engineer: Joshua J. Wittman
Date: 25 May, 2011

Table of Contents; Section 1.0

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 + 10log(P) dB, or –13 dBm.

Outside of the carrier emissions bandwidth:
26 dB below the transmitter power

Test Data:
Conducted Emissions; Section 7.1
Intermodulation; Section 7.4
Occupied Bandwidth; Section 7.5
Radiated Emissions; (Appendix B)

Test Engineer: Joshua J. Wittman
Date: 10 June, 2011
Date: 25 May, 2011
Date: 25 May, 2011

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6.0 TEST EQUIPMENT

Table of Contents; Section 1.0

Number	Description	Manufacturer	Model	ADC TELECOMMUNICATIONS Serial Number	Cal Due	Used
1	Spectrum Analyzer	HP	8563E	MC27690	12-15-11	☒
2	Power Meter	HP	437B	MC27839	6-30-11	☒
3	Multimeter	Fluke	79	MC18758	6-15-11	☒
4	Frequency Counter	HP	5347A	MC27569	8-12-11	☒
5	Temperature Chamber	ESPEC	PSL-4G	MC10075	8-30-11	☒
6	Signal Generator	Aeroflex	3414	Aeroflex SN 341001/259	9-20-11	☒
7	Signal Generator	Aeroflex	3413	MC57947	6-30-11	☒
8	Variable Auto Transformer	Staco	1520CT	MC44655	CNR	☒
9	Digital Barometer	Fisher Scientific	02-403	MC50719	1-20-12	☒
10	Attenuator	Aeroflex	49-30-33	N/A	CNR	☒
11	Attenuator	Aeroflex	86-30-12	N/A	CNR	☒
12	RF Power Sensor	Agilent	8482H	MC27519	8-12-11	☒

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

7.0 APPENDIX A

Conducted Emissions Test Data

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Test Engineer: Joshua J. Wittman

7.1 Conducted Emission Limits Test

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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 iDEN, APCO 25 C4FM, & WCDMA. 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 iDEN, APCO 25 C4FM, & 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 ≈ -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.

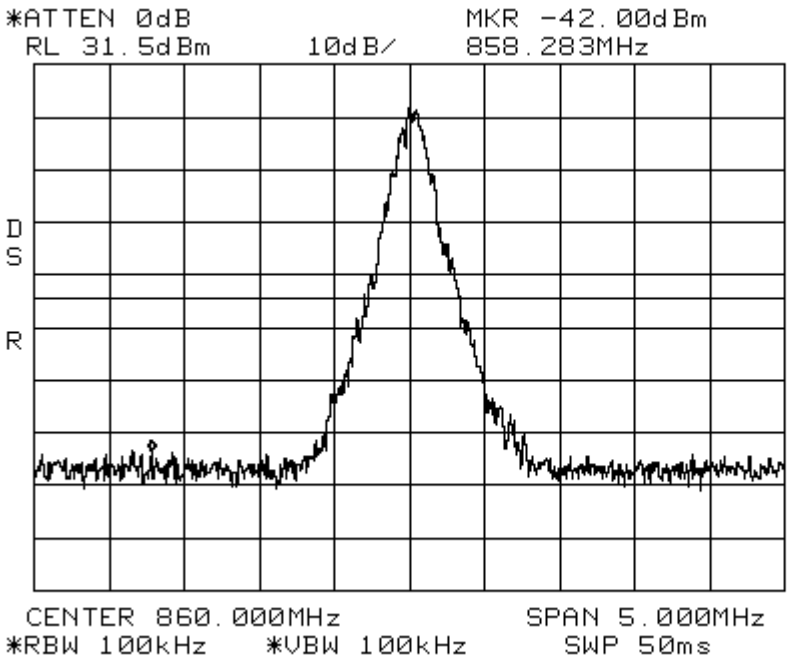
Internal to the electronics, the use of SAW filters provides for higher Q roll-off at band edges.

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.

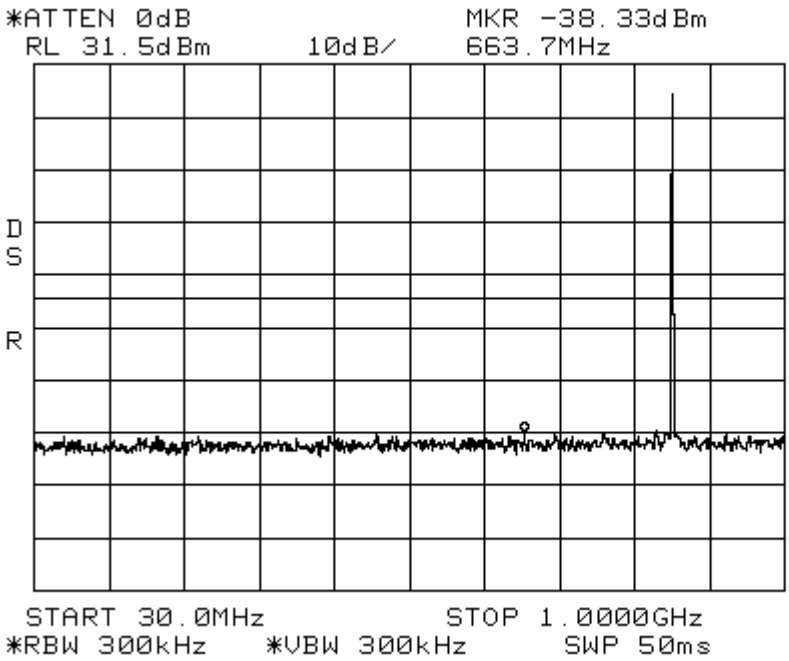
This is a constant gain device, so the setup controls the output. There is an overdrive and overpower limit control that prevents excess power.

Results:
Pass (See plots)

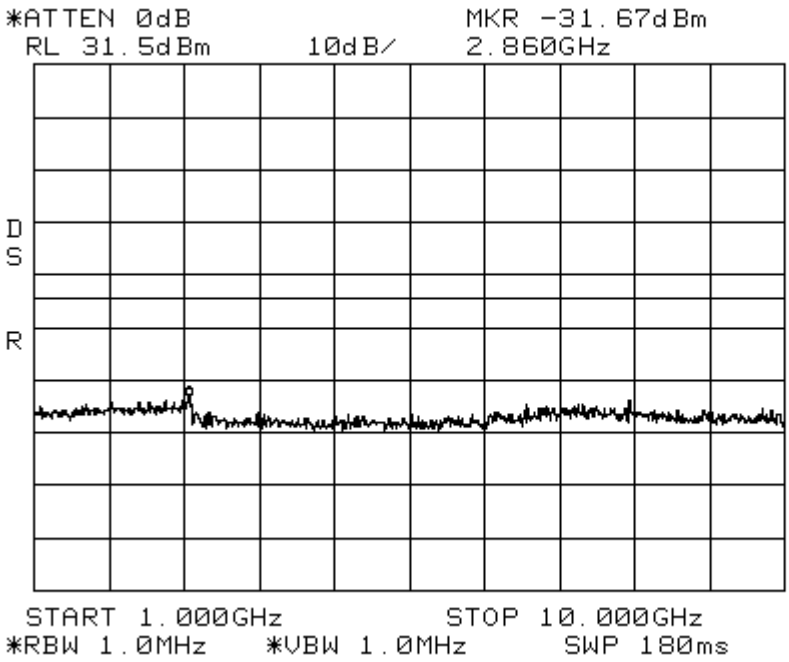
Conducted Emissions iDEN Spectrum 800 MHz SMR
Center: 860 MHz Span: 5 MHz RBW/VBW: 100 kHz



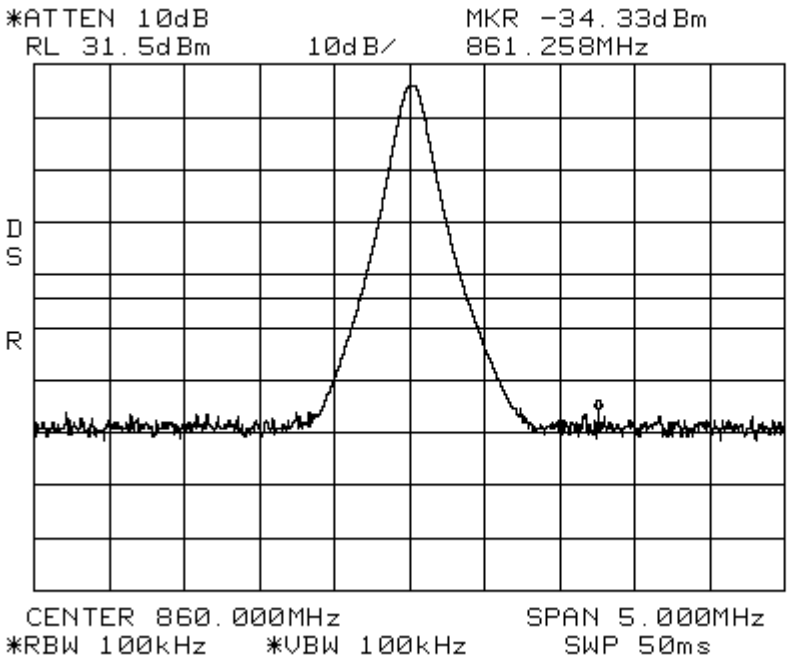
Conducted Emissions iDEN Spectrum 800 MHz SMR
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



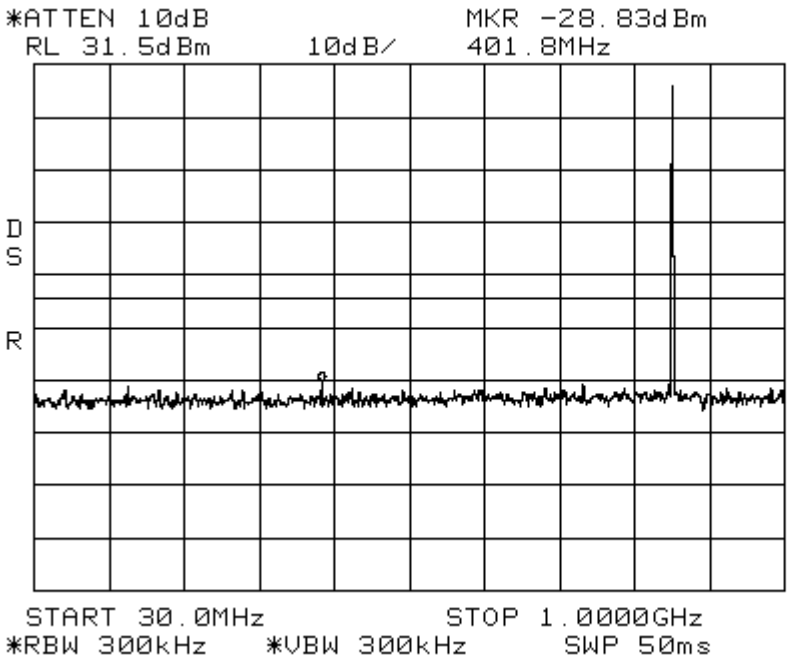
Conducted Emissions iDEN Spectrum 800 MHz SMR
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



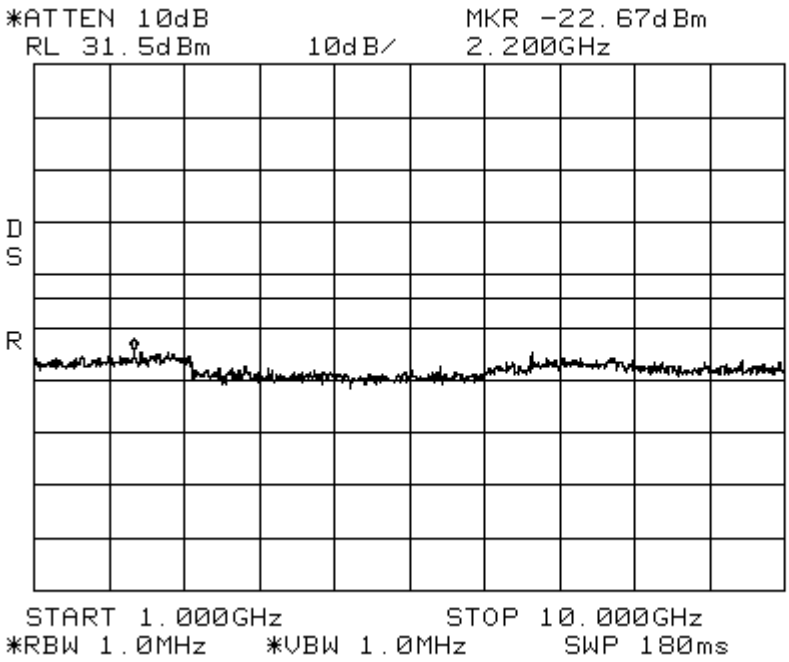
Conducted Emissions APCO 25 C4FM Spectrum 800 MHz SMR
Center: 860 MHz Span: 5 MHz RBW/VBW: 100 kHz



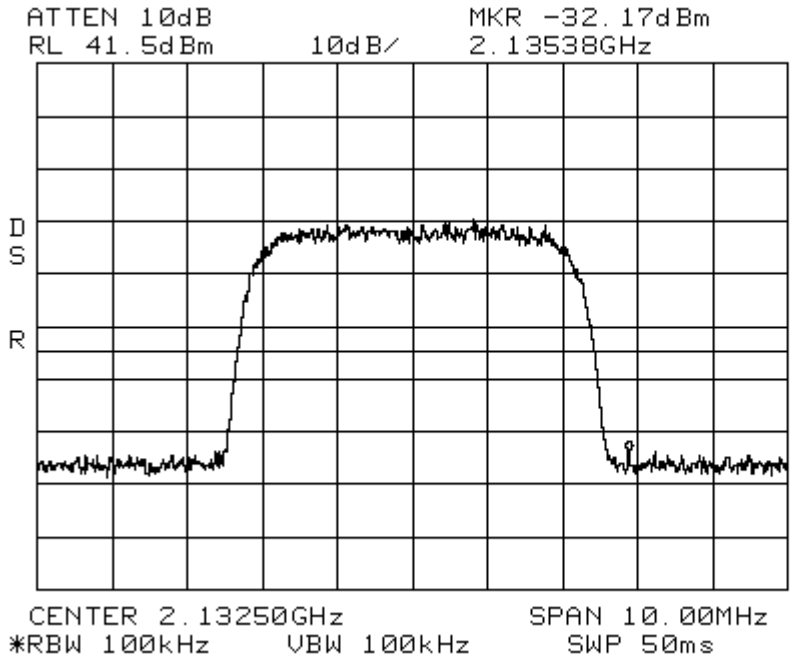
Conducted Emissions APCO 25 C4FM Spectrum 800 MHz SMR
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



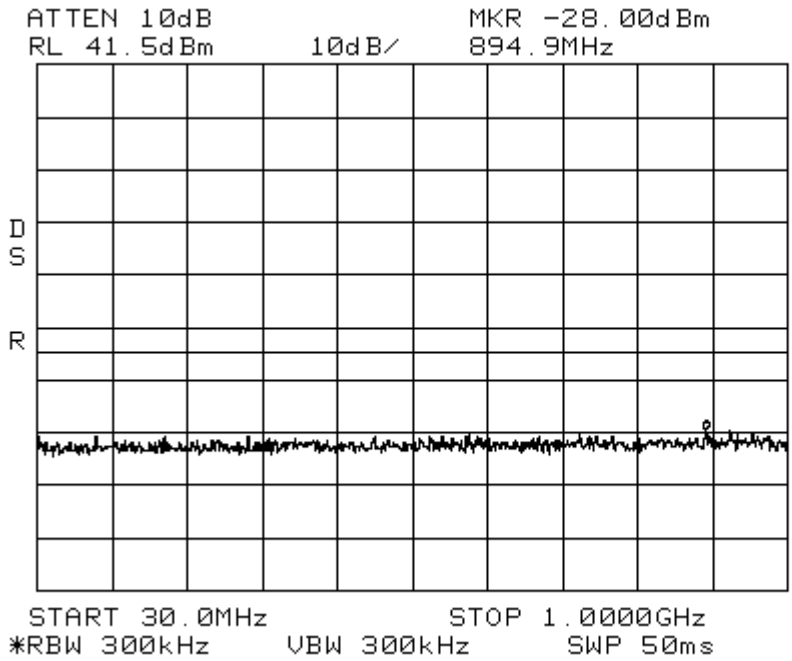
Conducted Emissions APCO 25 C4FM Spectrum 800 MHz SMR
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



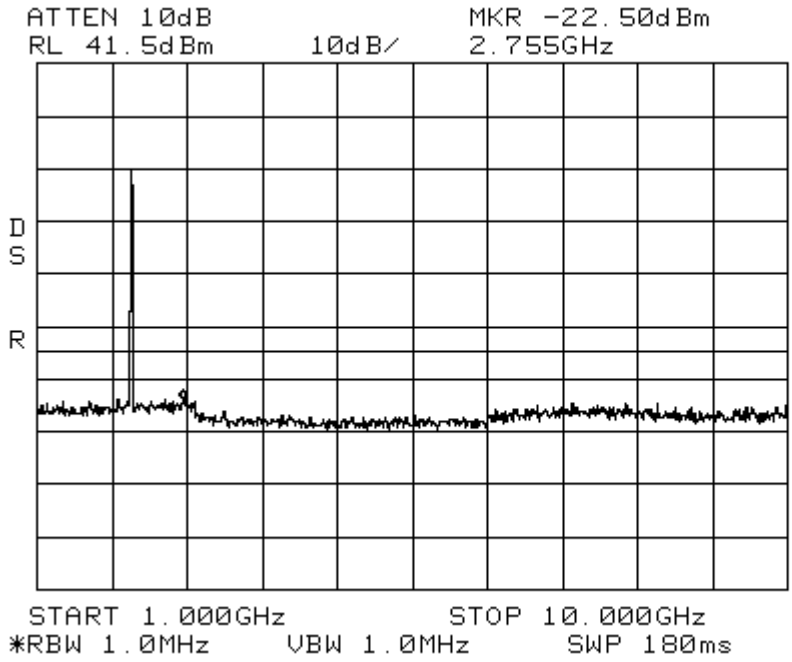
Conducted Emissions WCDMA Spectrum AWS Path 1
Center: 2132.5 MHz Span: 10 MHz RBW/VBW: 100 kHz



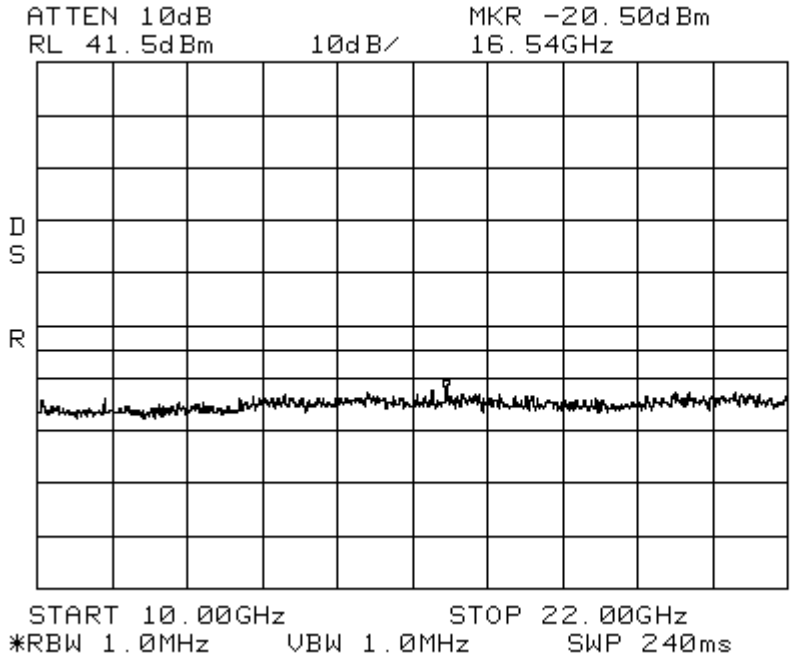
Conducted Emissions WCDMA Spectrum AWS Path 1
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



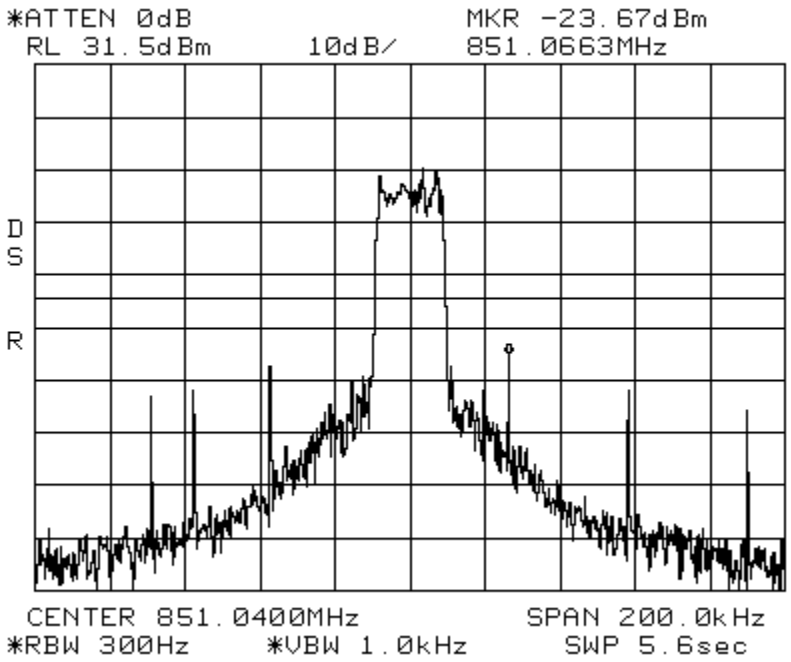
Conducted Emissions WCDMA Spectrum AWS Path 1
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



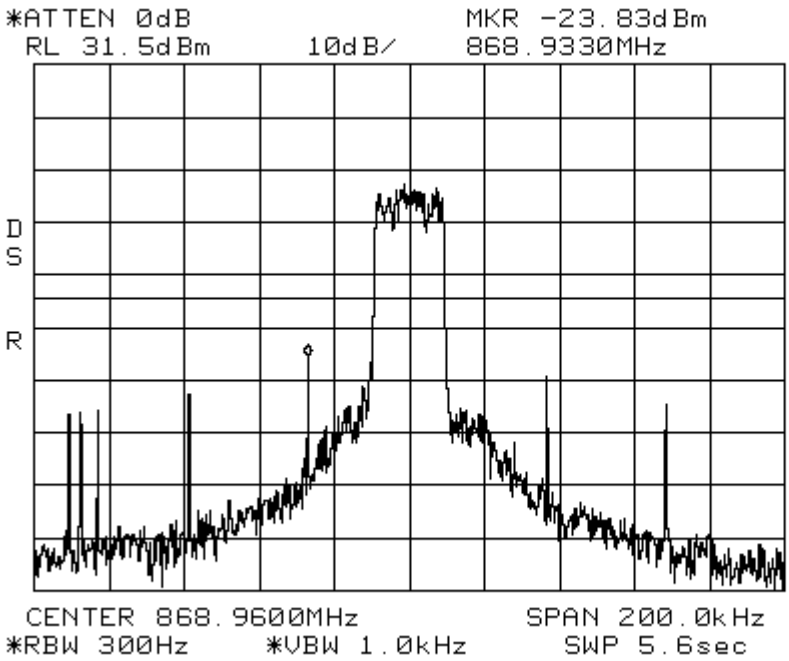
Conducted Emissions WCDMA Spectrum AWS Path 1
Span: 10 GHz to 22 GHz RBW/VBW: 1 MHz



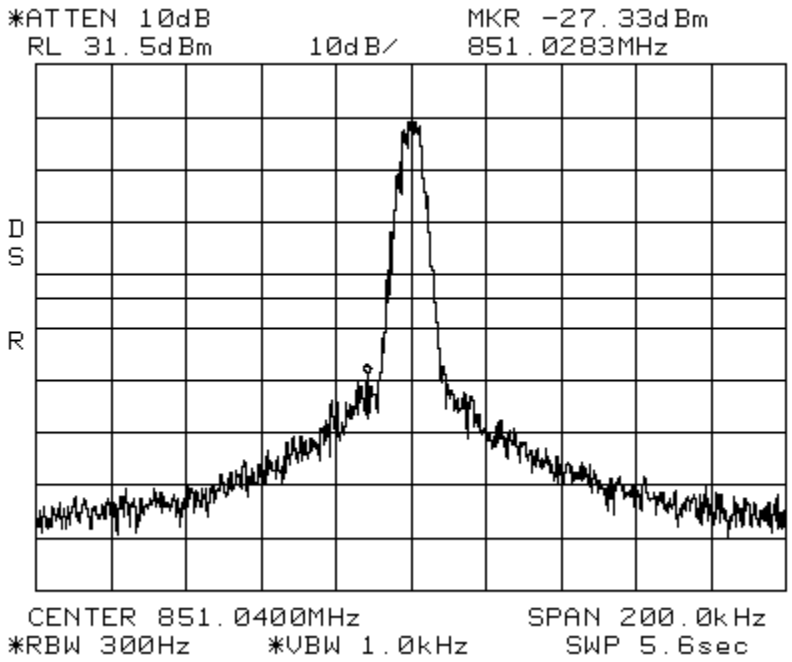
Band_Edge iDEN Spectrum 800 SMR
Center: 851.04 MHz Span: 200 kHz RBW: 300 Hz VBW: 1 kHz



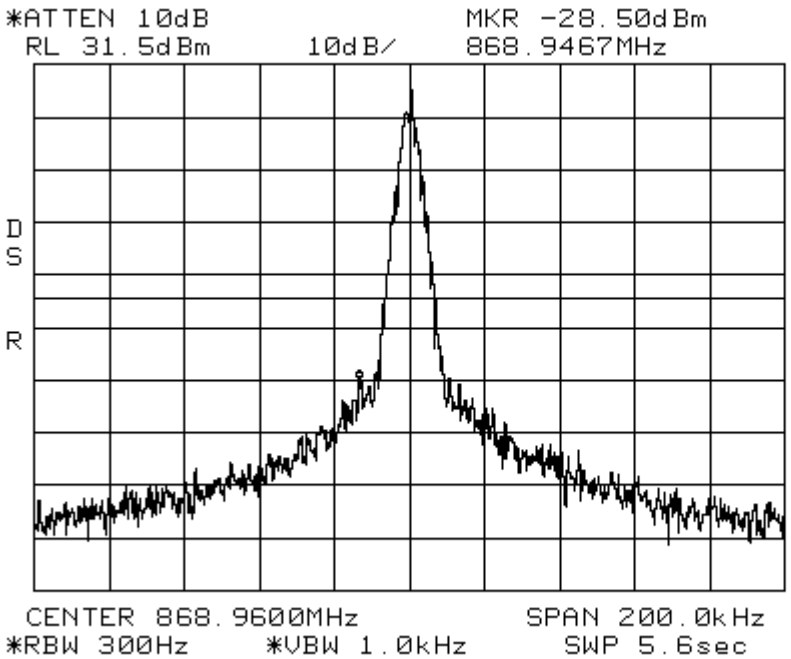
Band_Edge iDEN Spectrum 800 SMR
Center: 868.96 MHz Span: 200 kHz RBW: 300 Hz VBW: 1 kHz



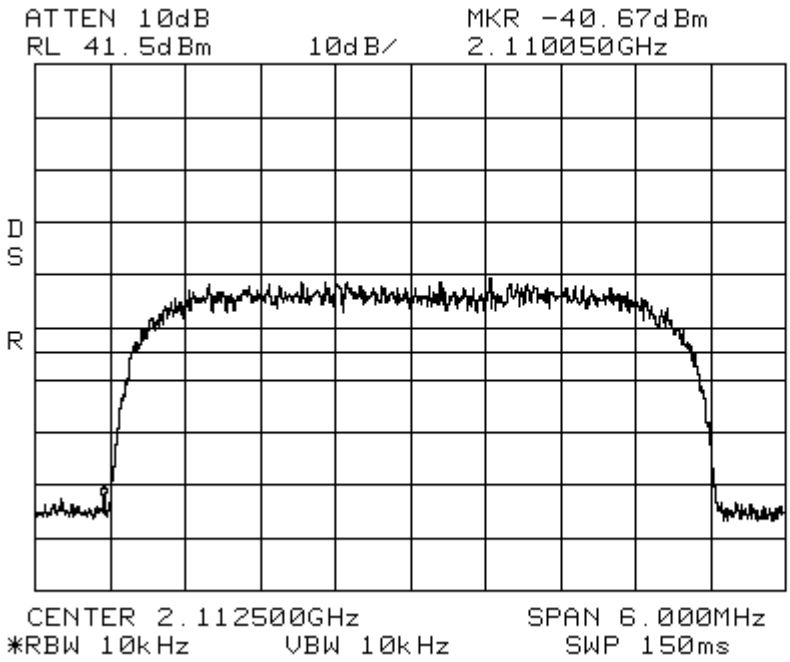
Band_Edge APCO 25 C4FM Spectrum 800 SMR
Center: 851..04 MHz Span: 200 kHz RBW: 300 Hz VBW: 1 kHz



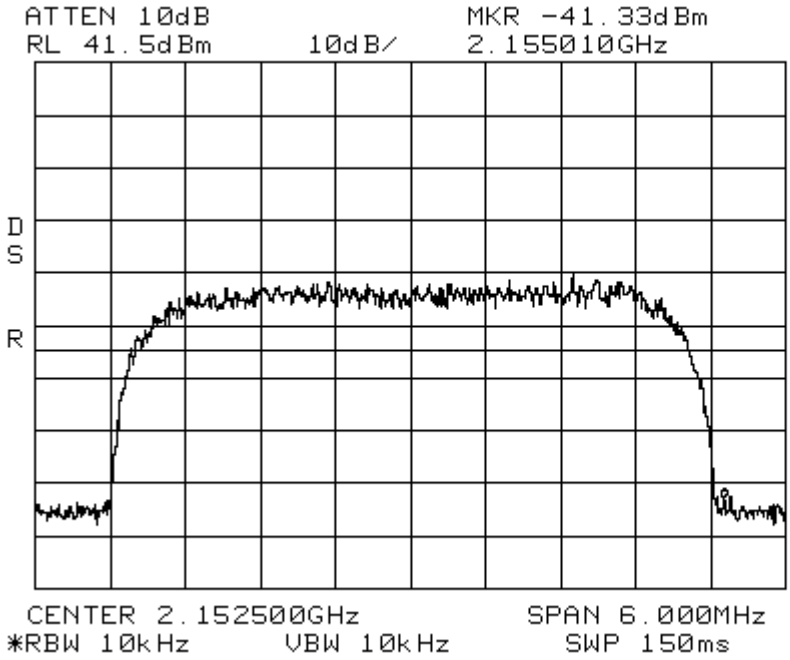
Band_Edge APCO 25 C4FM Spectrum 800 SMR
Center: 868.96 MHz Span: 200 kHz RBW: 300 Hz VBW: 1 kHz



Band_Edge WCDMA Spectrum AWS Path 1
Center: 2112.5 MHz Span: 6 MHz RBW: 10 kHz VBW: 10 kHz



Band_Edge WCDMA Spectrum AWS Path 1
Center: 2152.5 MHz Span: 6 MHz RBW: 10 kHz VBW: 10 kHz



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 iDEN, APCO 25 C4FM, & WCDMA 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.

800 SMR

iDEN	**0.09418 Watts**
Carrier Frequency	Carrier Output
851.04 MHz	19.74 dBm
860.00 MHz	18.56 dBm
868.96 MHz	18.78 dBm

800 SMR

APCO 25 C4FM	**0.49545 Watts**
Carrier Frequency	Carrier Output
851.04 MHz	26.95 dBm
860.00 MHz	26.75 dBm
868.96 MHz	26.73 dBm

AWS Path 1

WCDMA	**0.04295 Watts**
Carrier Frequency	Carrier Output
2112.5 MHz	16.33 dBm
2132.5 MHz	15.80 dBm
2152.5 MHz	15.77 dBm

7.3 Frequency Stability Test

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Back to Frequency Stability; Section 5.1.1

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

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

7.4 Intermodulation Test

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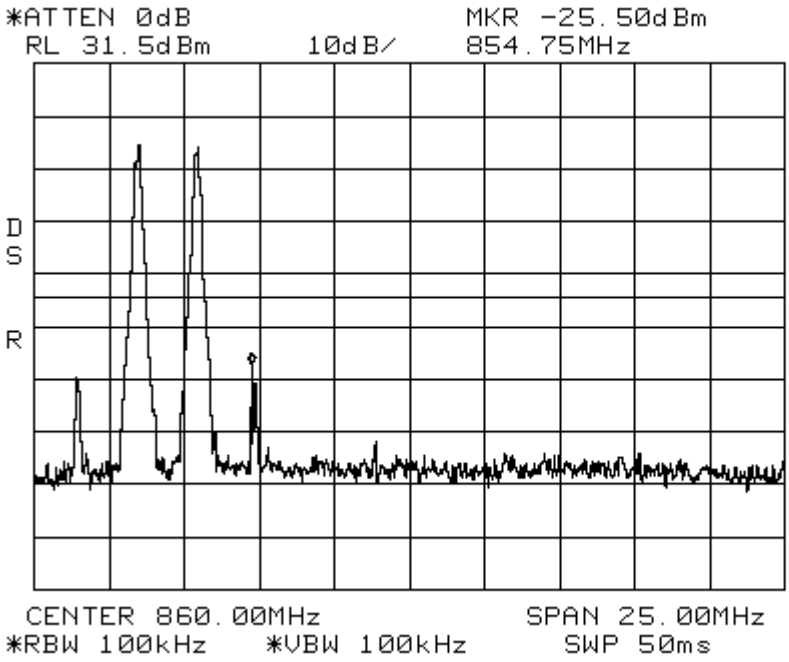
Back to Emission Limits; Section 5.1.3

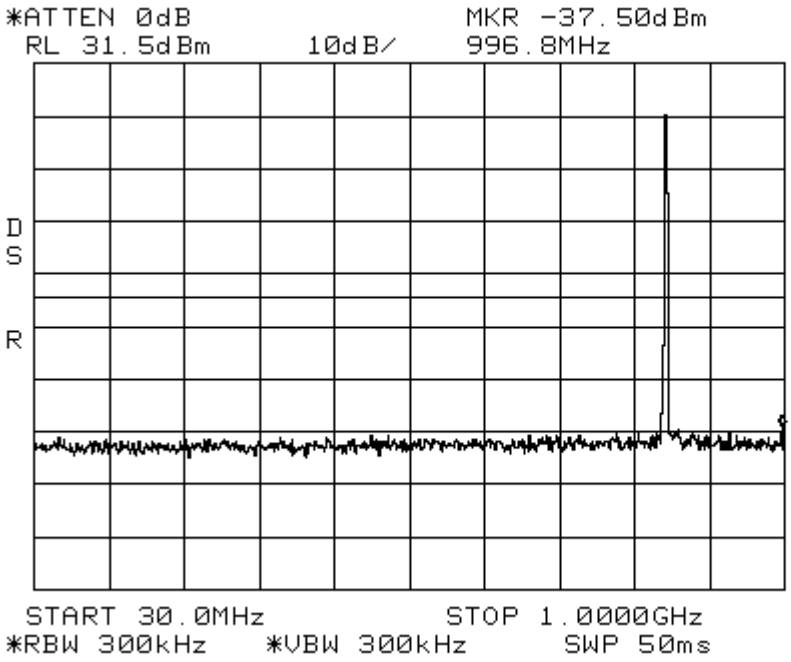
The inter-modulation products test was performed for the EUT. Three tests were preformed with the modulation type. Test 1 was with 2 signals input to the EUT at lower end channels. Test 2 was with 2 signals input to the EUT at upper end channels. Test 3 was with 2 signals input to the EUT at upper and lower end channels. The modulation types tested were iDEN, APCO 25 C4FM, WCDMA. 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)

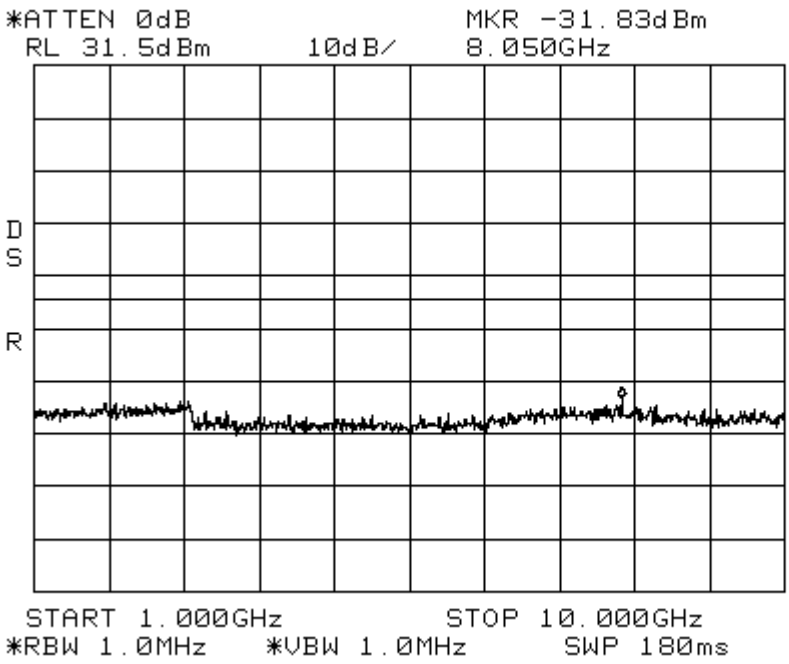
Intermodulation iDEN_Low Spectrum 800 MHz SMR
Center: 860 MHz Span: 25 MHz RBW/VBW: 100 kHz



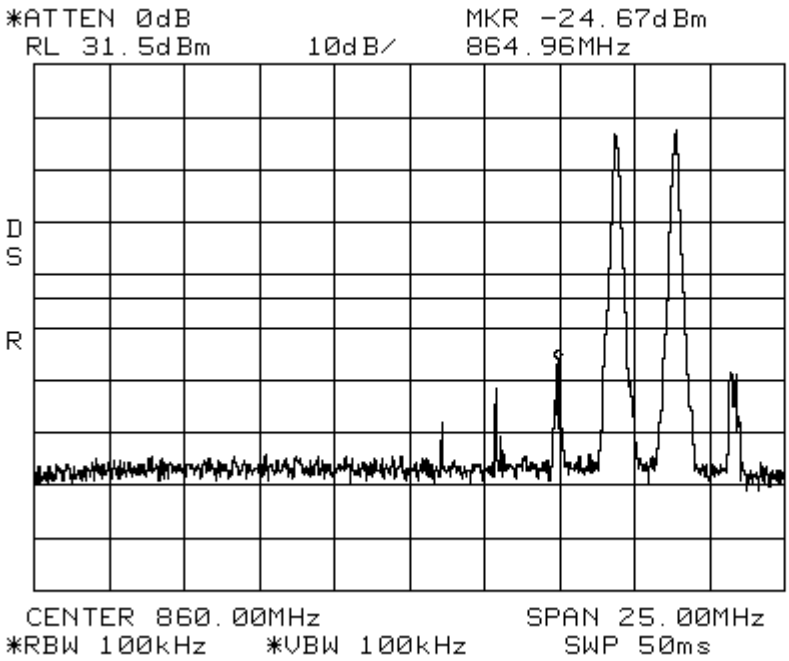
Intermodulation iDEN_Low Spectrum 800 MHz SMR
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



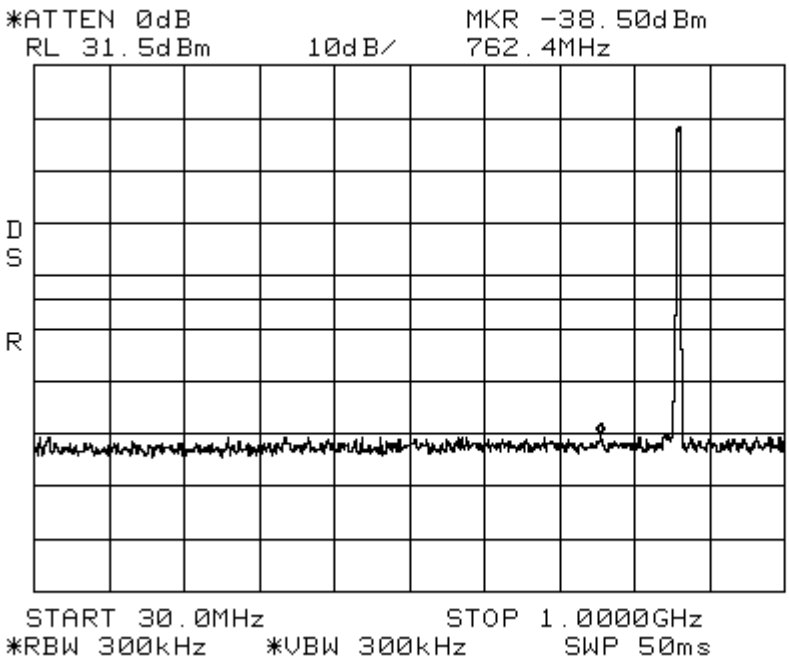
Intermodulation iDEN_Low Spectrum 800 MHz SMR
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



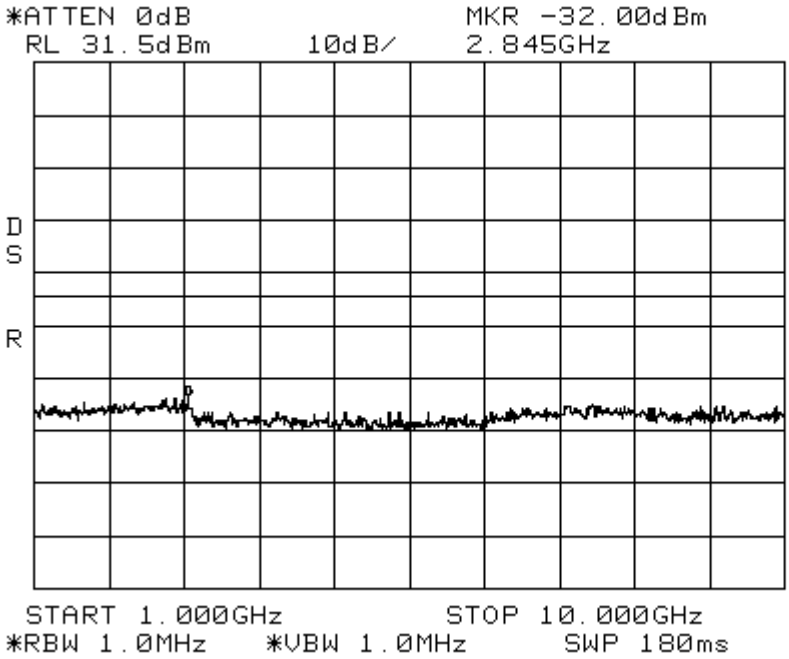
Intermodulation iDEN_High Spectrum 800 MHz SMR
Center: 860 MHz Span: 25 MHz RBW/VBW: 100 kHz



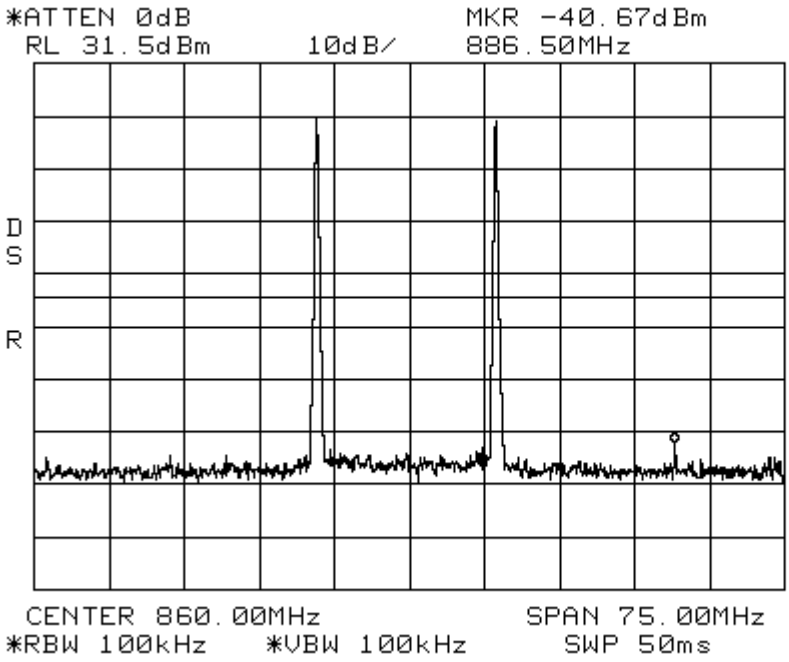
Intermodulation iDEN_High Spectrum 800 MHz SMR
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



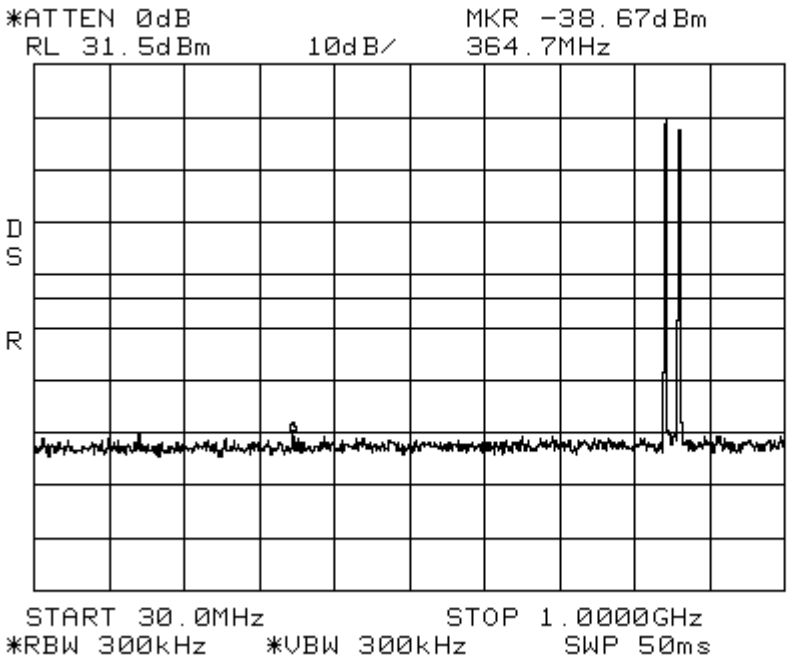
Intermodulation iDEN_High Spectrum 800 MHz SMR
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



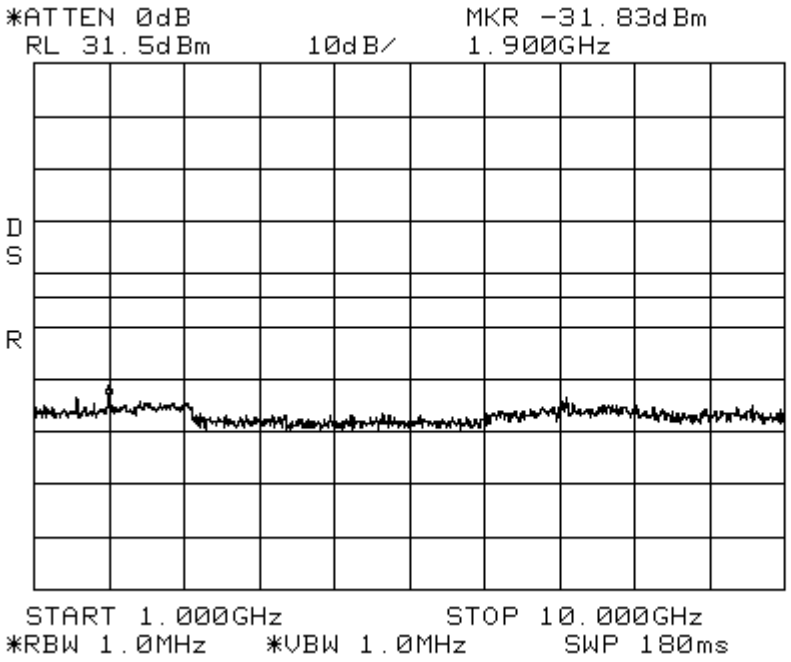
Intermodulation iDEN_Apart Spectrum 800 MHz SMR
Center: 860 MHz Span: 75 MHz RBW/VBW: 100 kHz



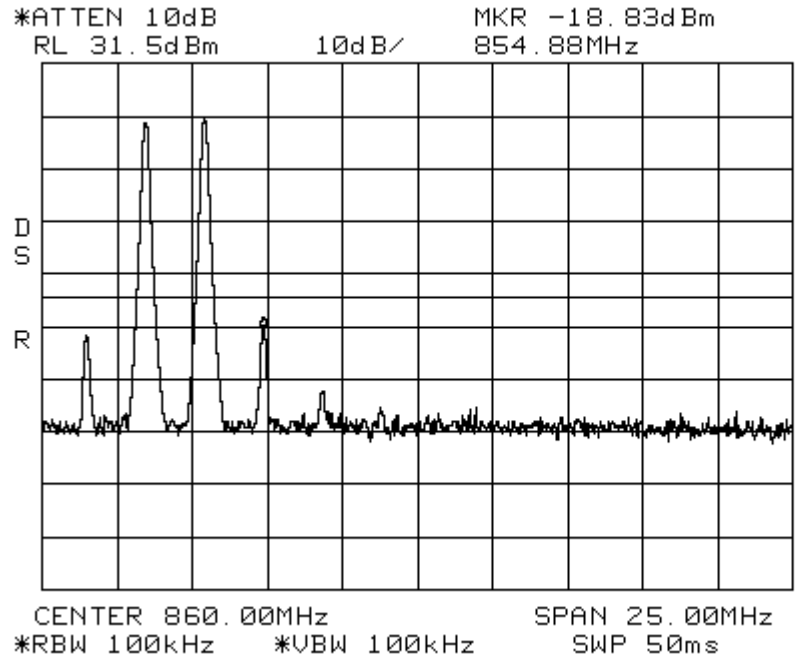
Intermodulation iDEN_Apart Spectrum 800 MHz SMR
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



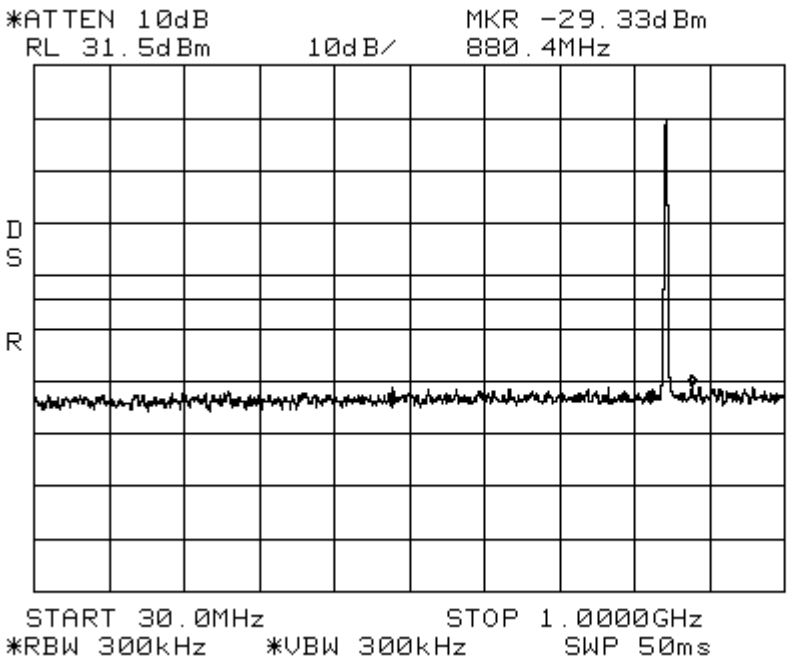
Intermodulation iDEN_Apart Spectrum 800 MHz SMR
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



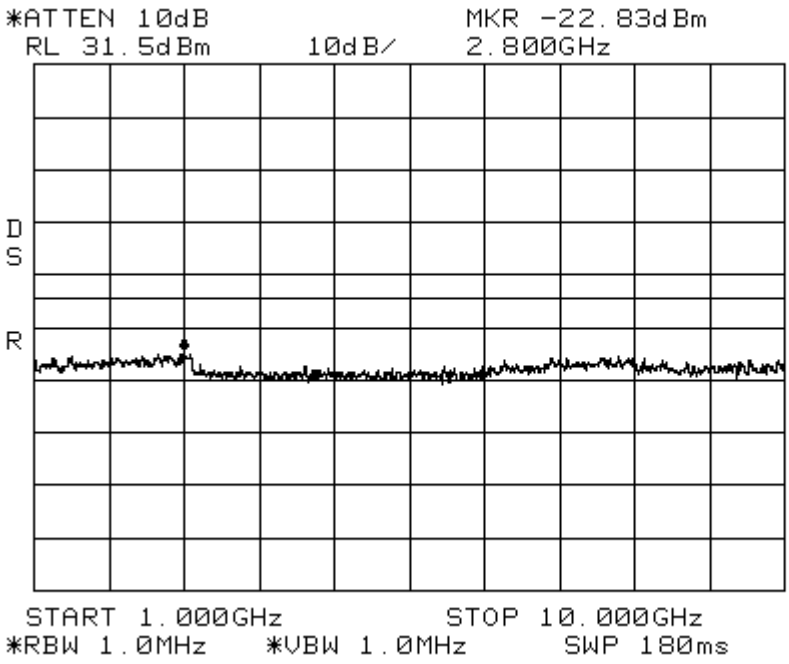
Intermodulation APCO 25 C4FM_Low Spectrum 800 MHz SMR
Center: 860 MHz Span: 25 MHz RBW/VBW: 100 kHz



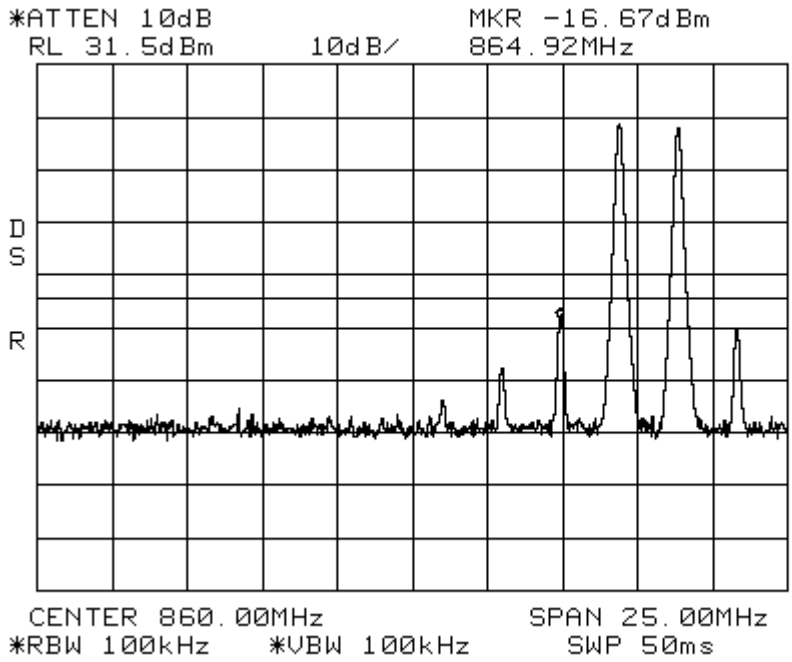
Intermodulation APCO 25 C4FM _Low Spectrum 800 MHz SMR
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



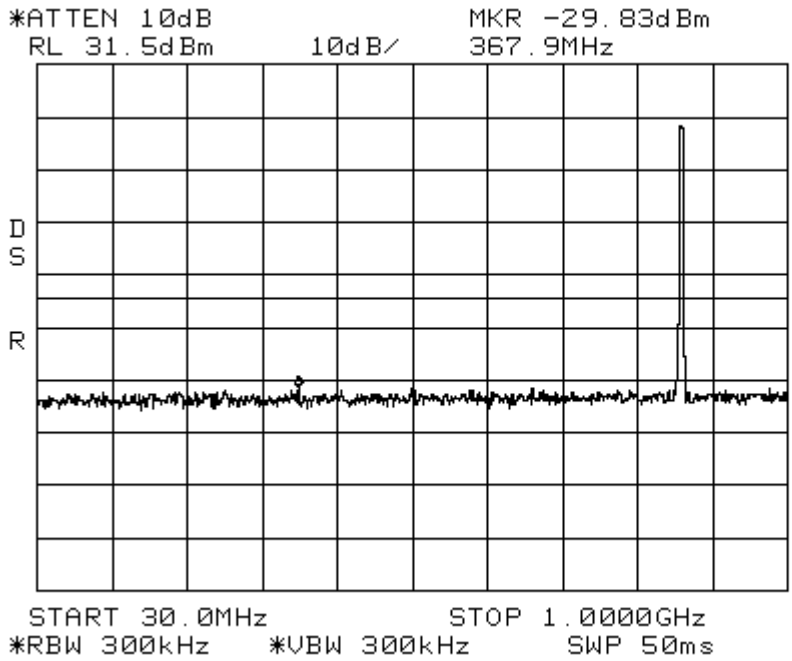
Intermodulation APCO 25 C4FM _Low Spectrum 800 MHz SMR
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



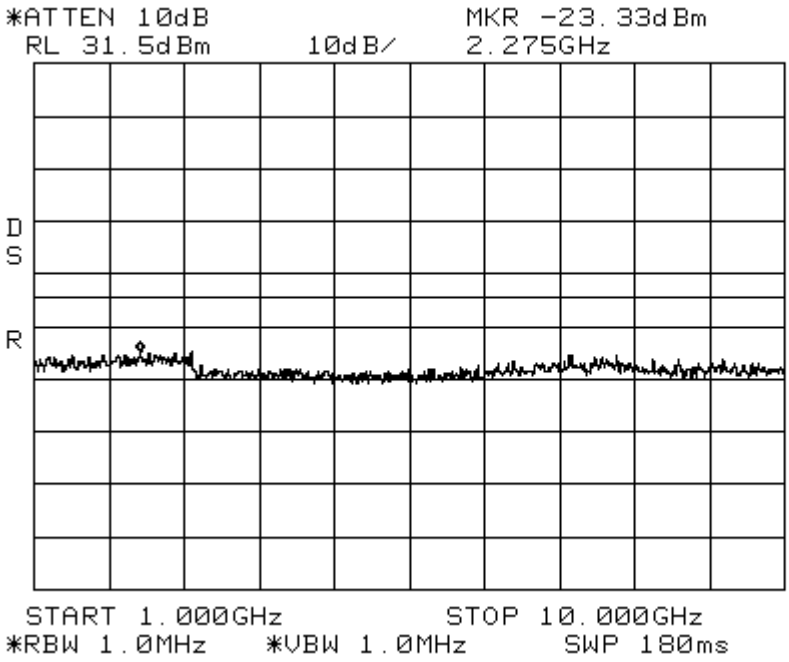
Intermodulation APCO 25 C4FM _High Spectrum 800 MHz SMR
Center: 860 MHz Span: 25 MHz RBW/VBW: 100 kHz



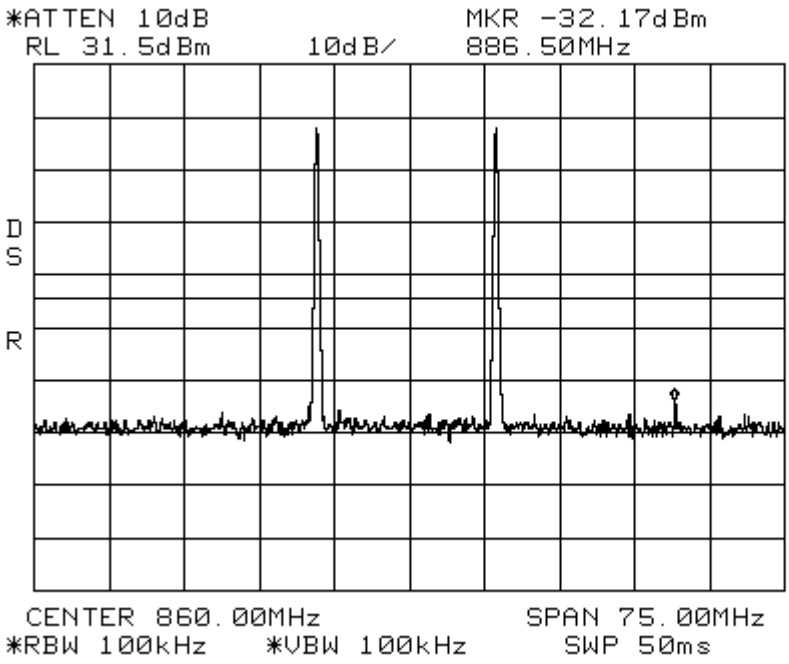
Intermodulation APCO 25 C4FM_High Spectrum 800 MHz SMR
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



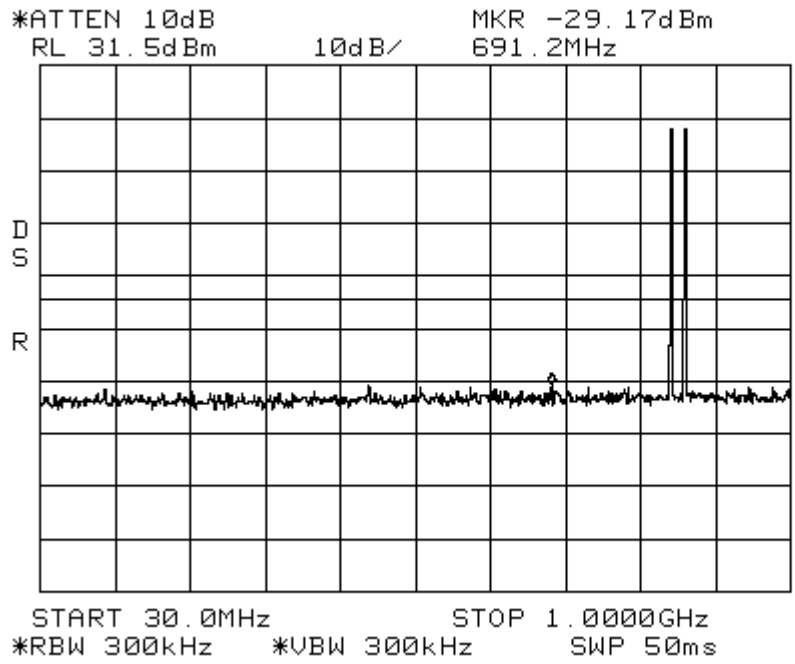
Intermodulation APCO 25 C4FM _High Spectrum 800 MHz SMR
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



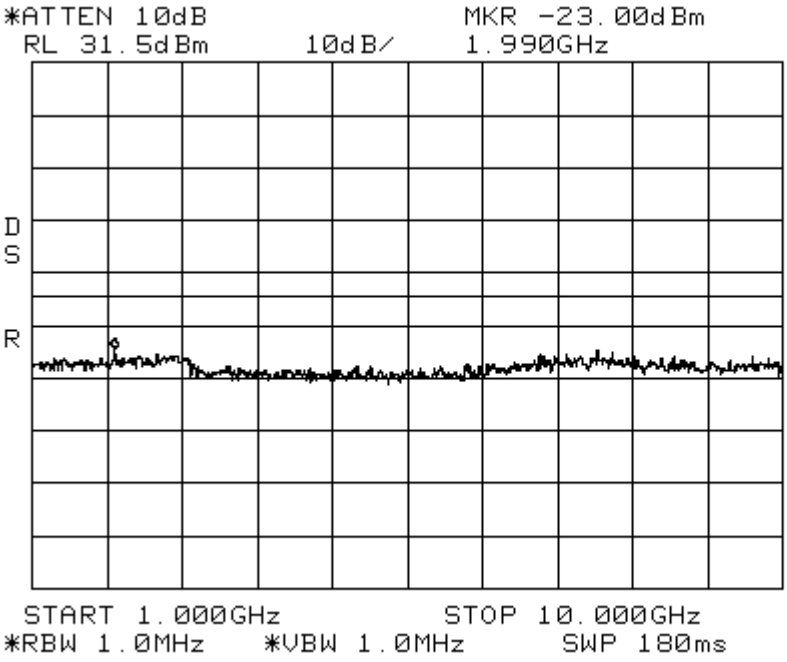
Intermodulation APCO 25 C4FM _Apart Spectrum 800 MHz SMR
Center: 860 MHz Span: 75 MHz RBW/VBW: 100 kHz



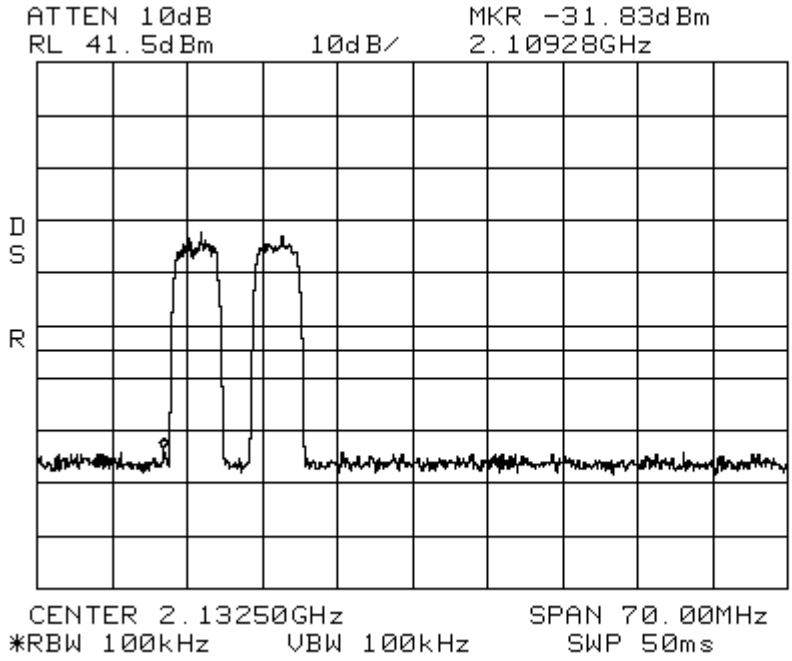
Intermodulation APCO 25 C4FM_Apart Spectrum 800 MHz SMR
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



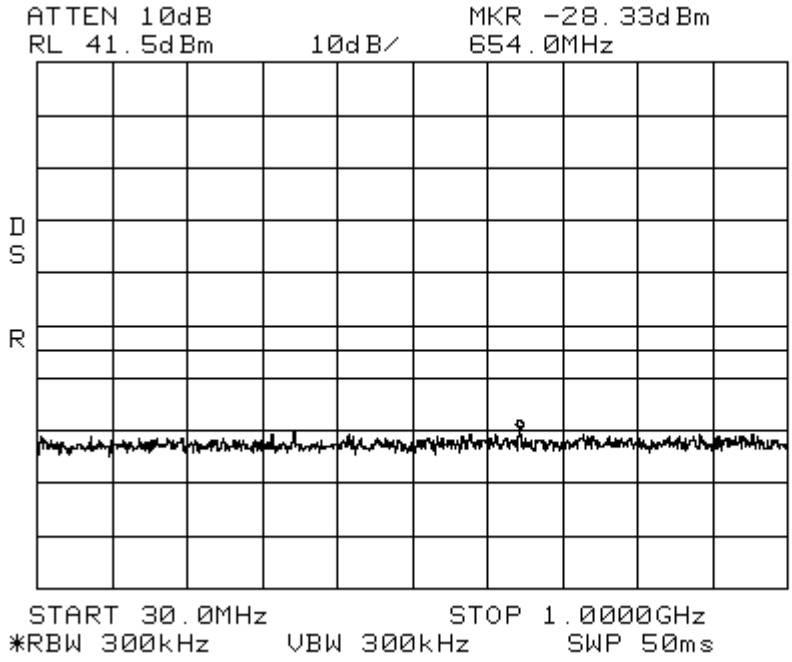
Intermodulation APCO 25 C4FM _Apart Spectrum 800 MHz SMR
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



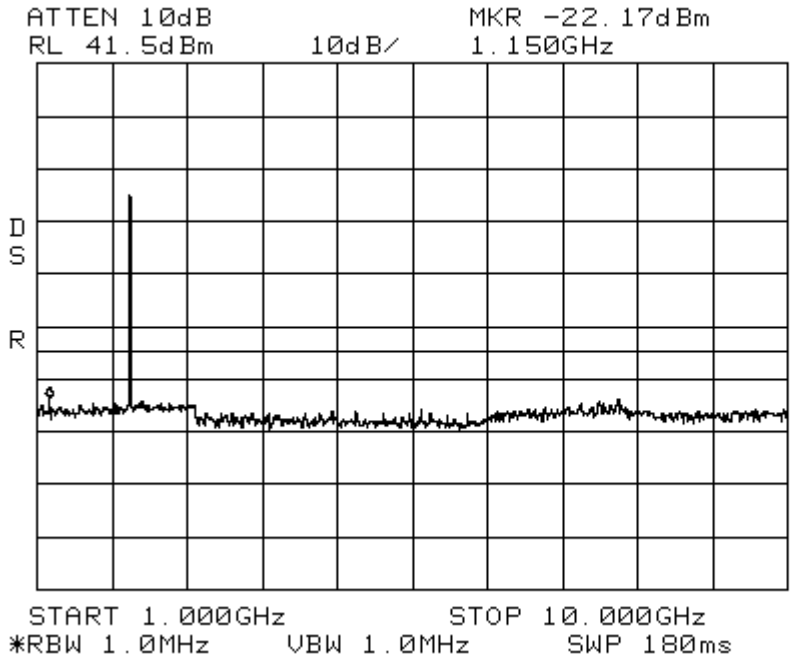
Intermodulation WCDMA_Low Spectrum AWS Path 1
Center: 2132.5 MHz Span: 70 MHz RBW/VBW: 100 kHz



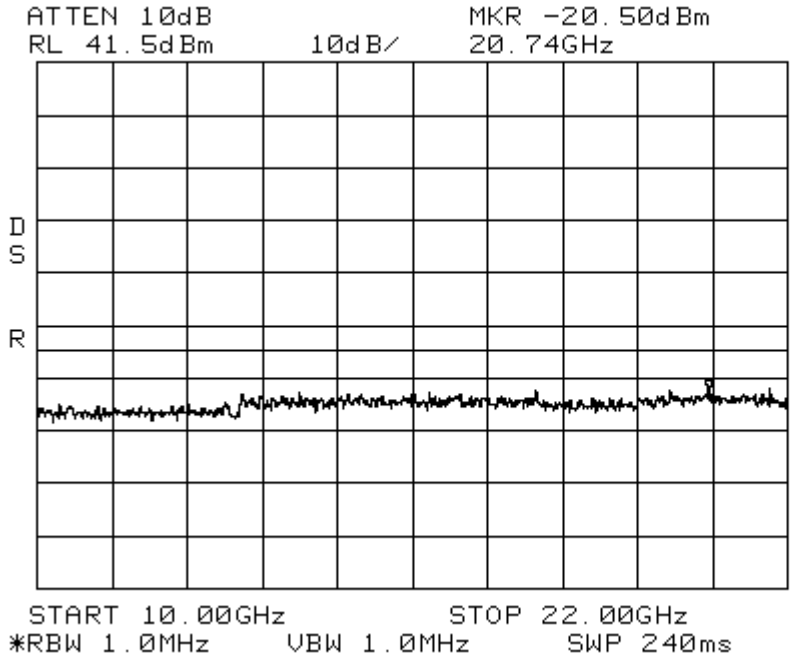
Intermodulation WCDMA_Low Spectrum AWS Path 1
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



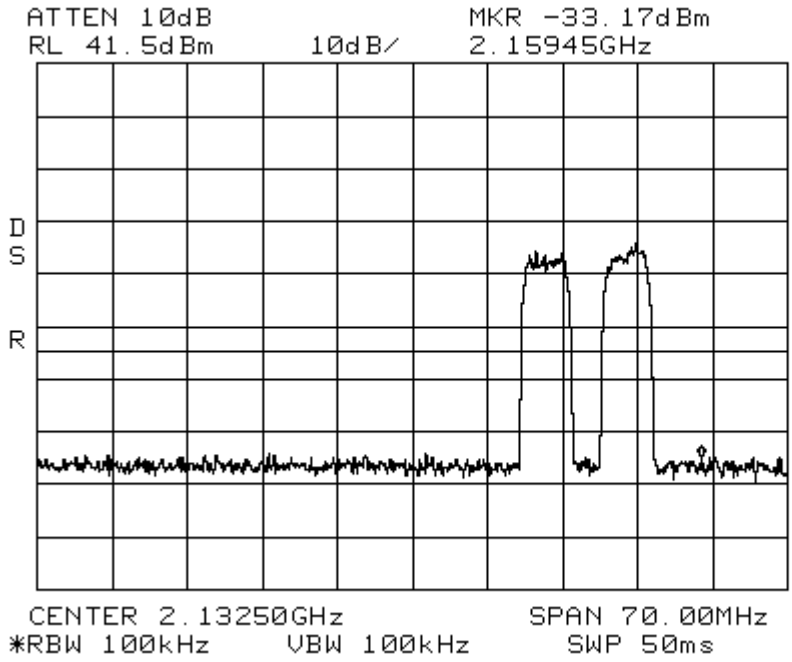
Intermodulation WCDMA_Low Spectrum AWS Path 1
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



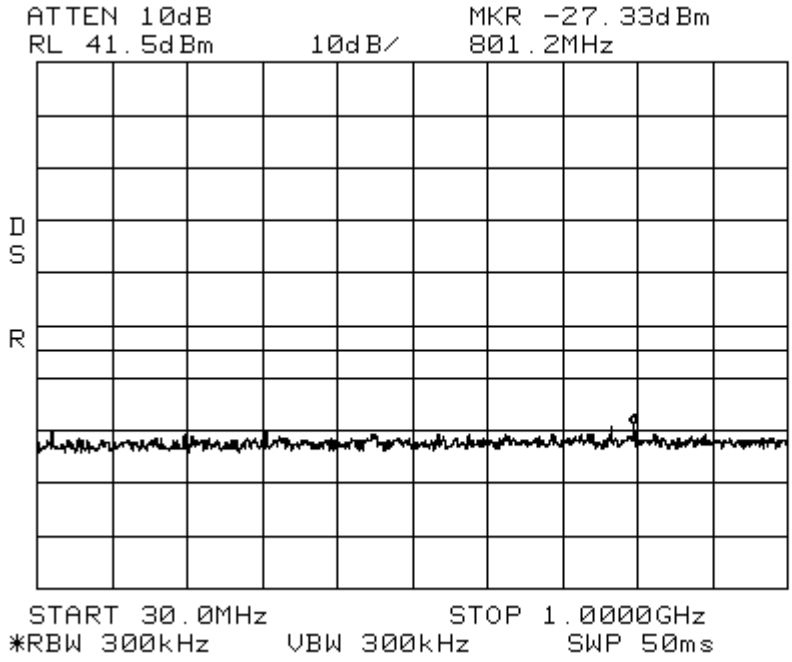
Intermodulation WCDMA_Low Spectrum AWS Path 1
Span: 10 GHz to 22 GHz RBW/VBW: 1 MHz



Intermodulation WCDMA_High Spectrum AWS Path 1
Center: 2132.5 MHz Span: 70 MHz RBW/VBW: 100 kHz

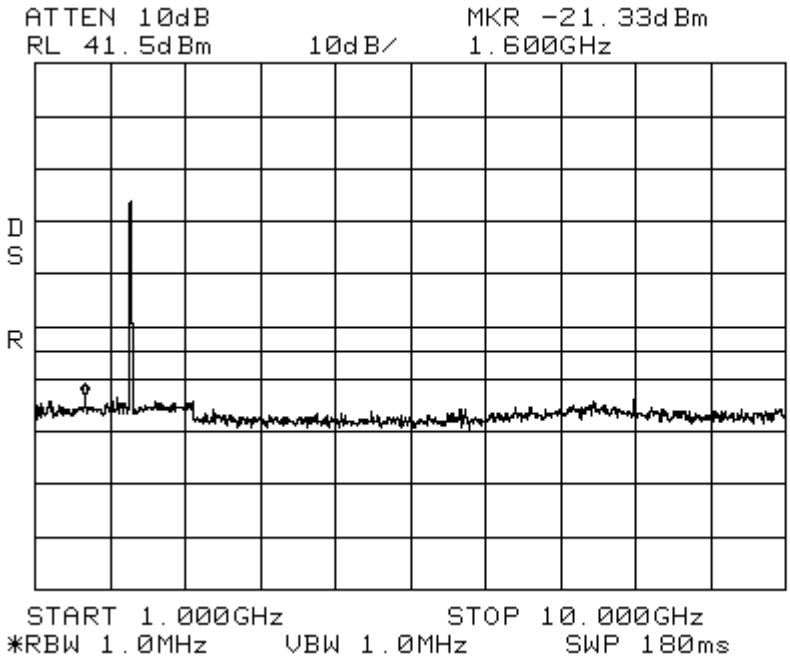


Intermodulation WCDMA_High Spectrum AWS Path 1
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



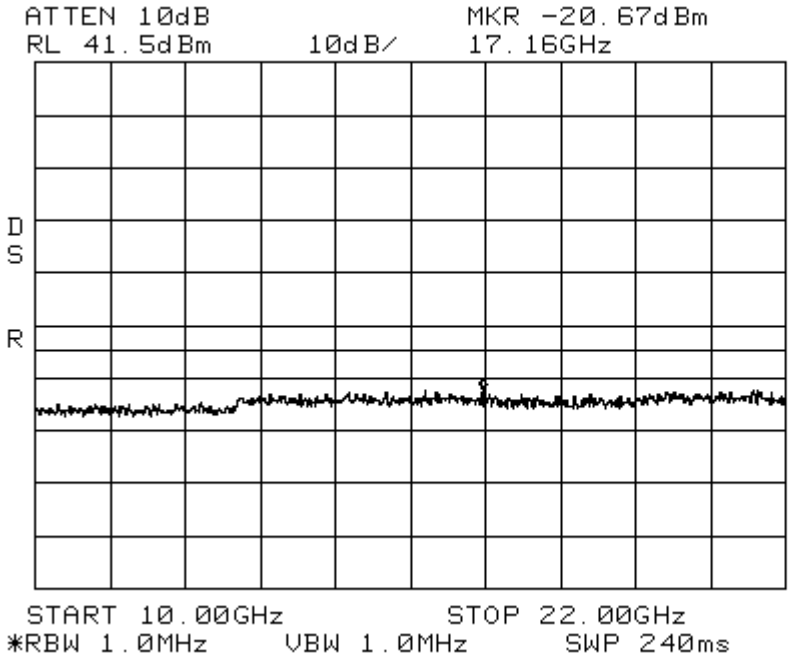
Intermodulation WCDMA_High Spectrum AWS Path 1

Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz

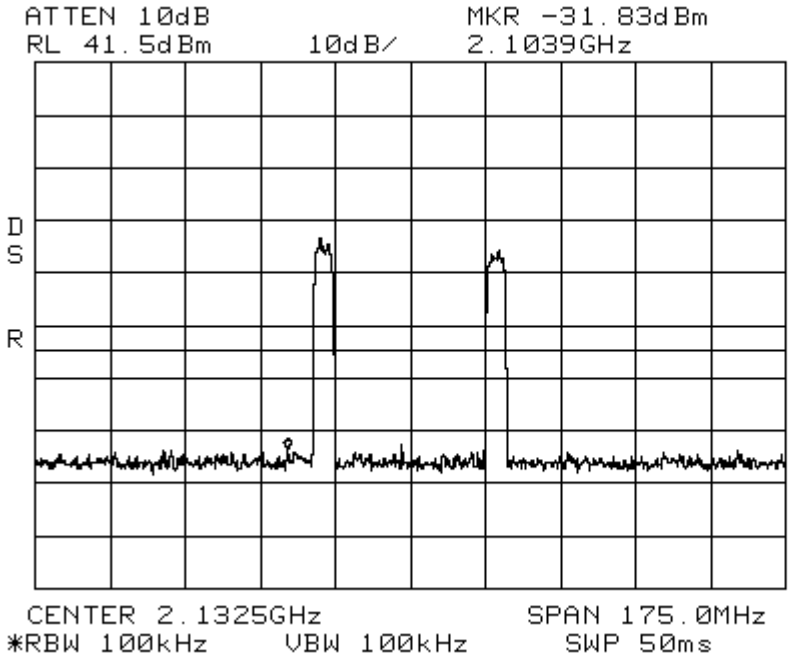


Intermodulation WCDMA_High Spectrum AWS Path 1

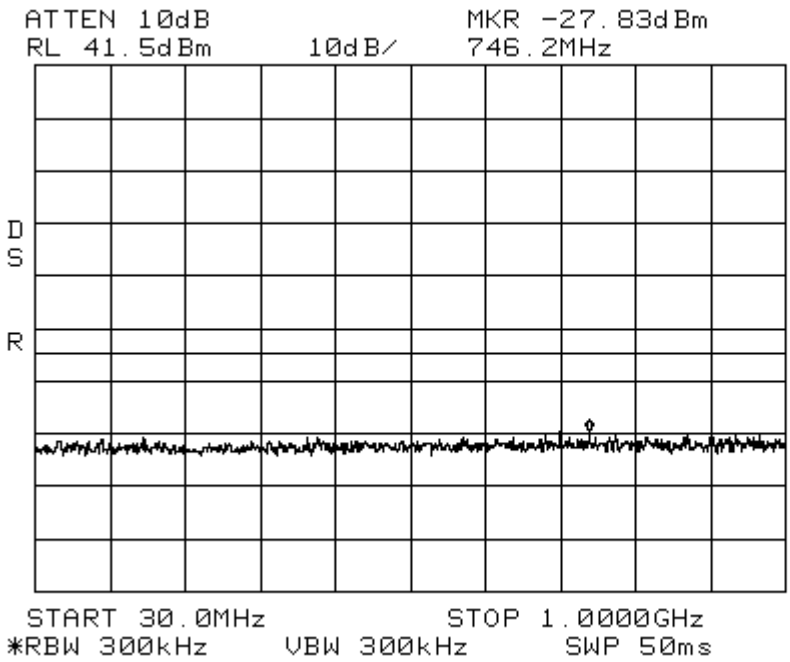
Span: 10 GHz to 22 GHz RBW/VBW: 1 MHz



Intermodulation WCDMA_Apart Spectrum AWS Path 1
Center: 2132.5 MHz Span: 175 MHz RBW/VBW: 100 kHz

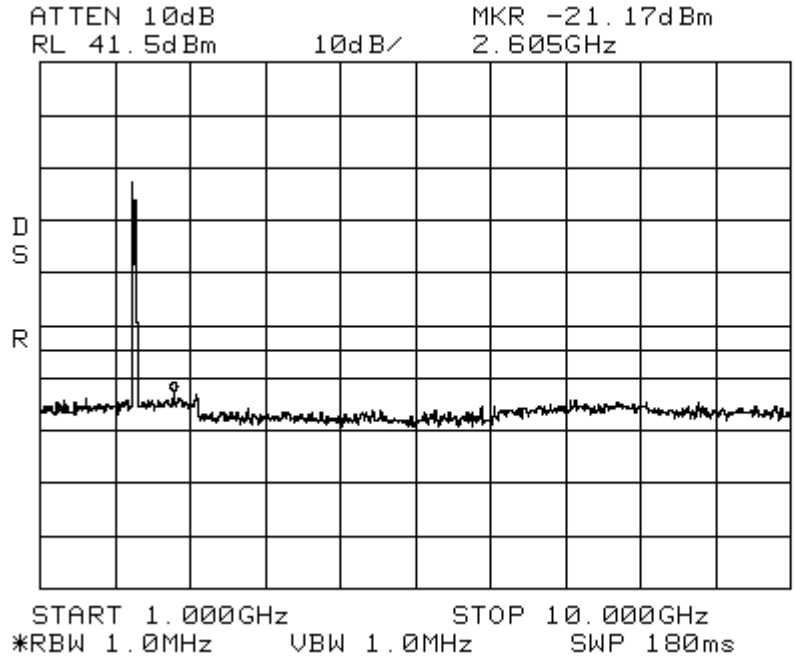


Intermodulation WCDMA_Apart Spectrum AWS Path 1
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



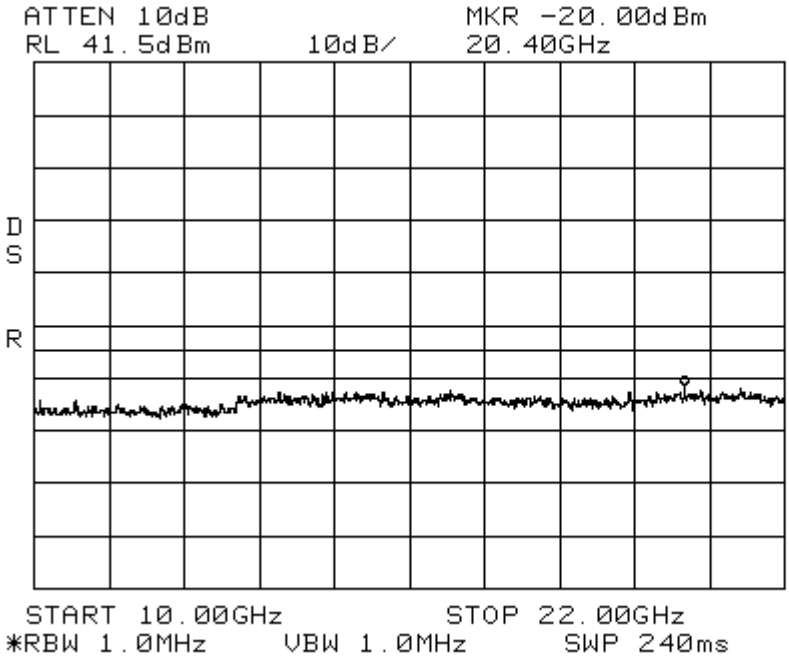
Intermodulation WCDMA_Apart Spectrum AWS Path 1

Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



Intermodulation WCDMA_Apart Spectrum AWS Path 1

Span: 10 GHz to 22 GHz RBW/VBW: 1 MHz



7.5 Occupied Bandwidth Modulation Test

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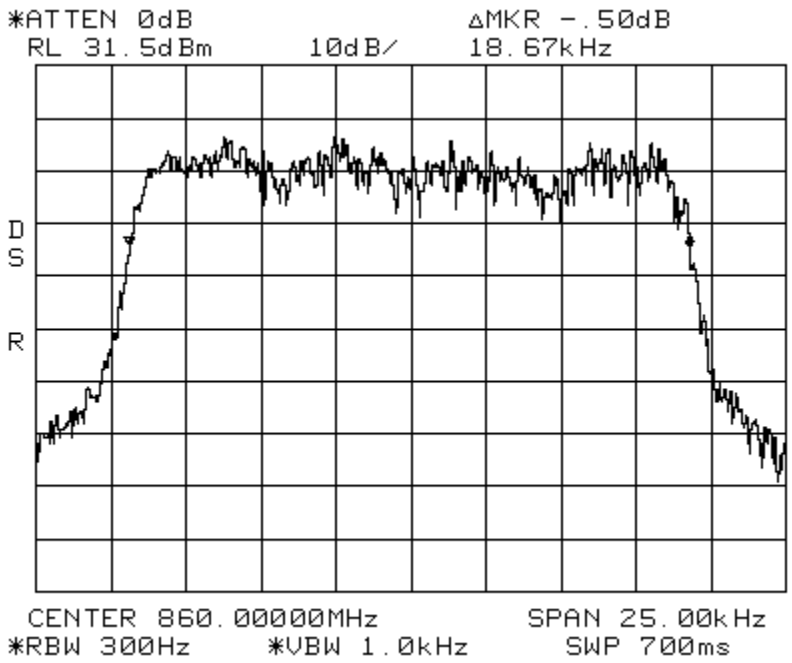
Back to Emission Limits; Section 5.1.3

An input/output Occupied Bandwidth test was done with modulation types: iDEN, APCO 25 C4FM, & WCDMA. 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.

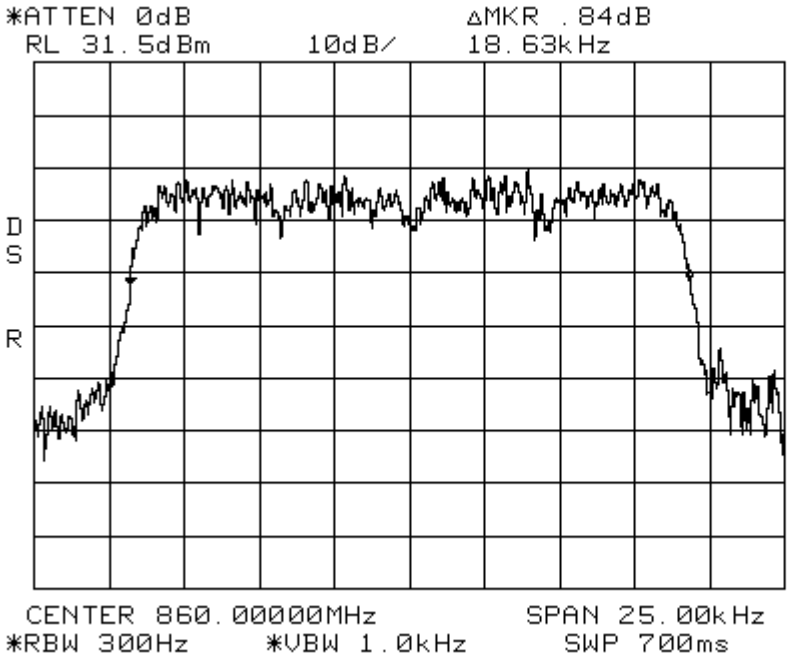
The resolution bandwidth is reduced to 1% of the estimated emission bandwidth and the video bandwidth is set to 3 times the resolution bandwidth. The markers are moved to the -20 dB points (from the previously established center frequency level) on either side of center frequency.

Results:
Pass (see plots)

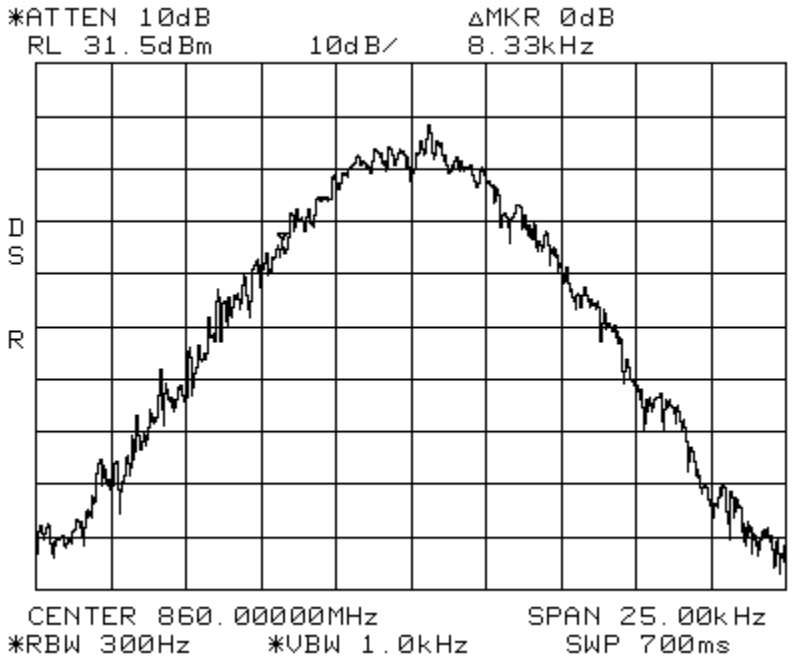
Occupied Bandwidth iDEN_Signal_In Spectrum 800 MHz SMR
Span: 25 kHz RBW: 300 Hz VBW: 1 kHz



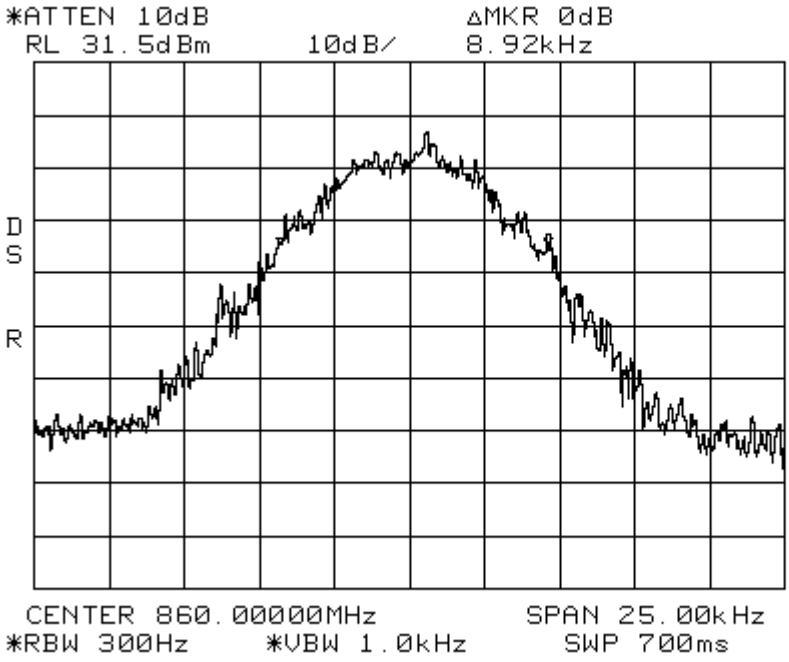
Occupied Bandwidth iDEN_Signal_Out Spectrum 800 MHz SMR
Span: 25 kHz RBW: 300 Hz VBW: 1 kHz



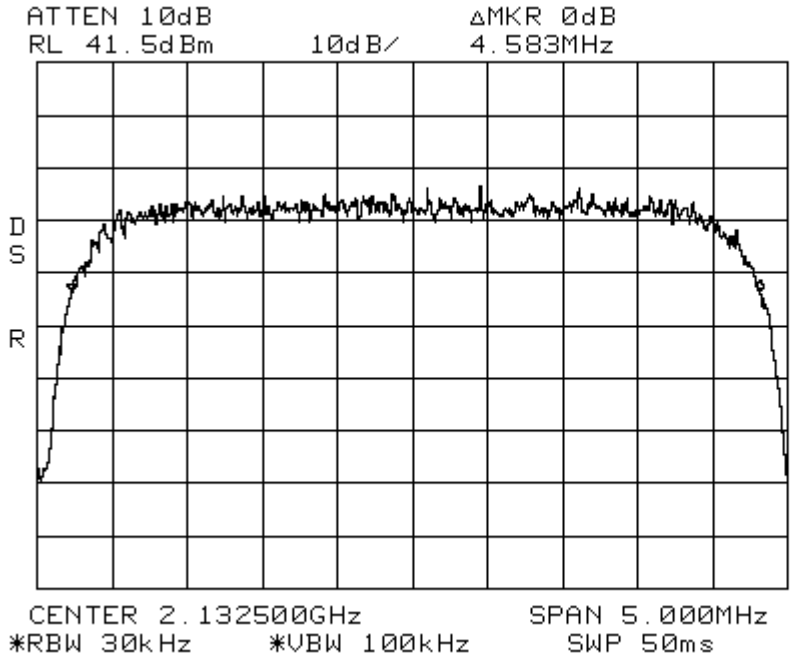
Occupied Bandwidth APCO 25 C4FM_Signal_In Spectrum 800 MHz SMR
Span: 25 kHz RBW: 300 Hz VBW: 1 kHz



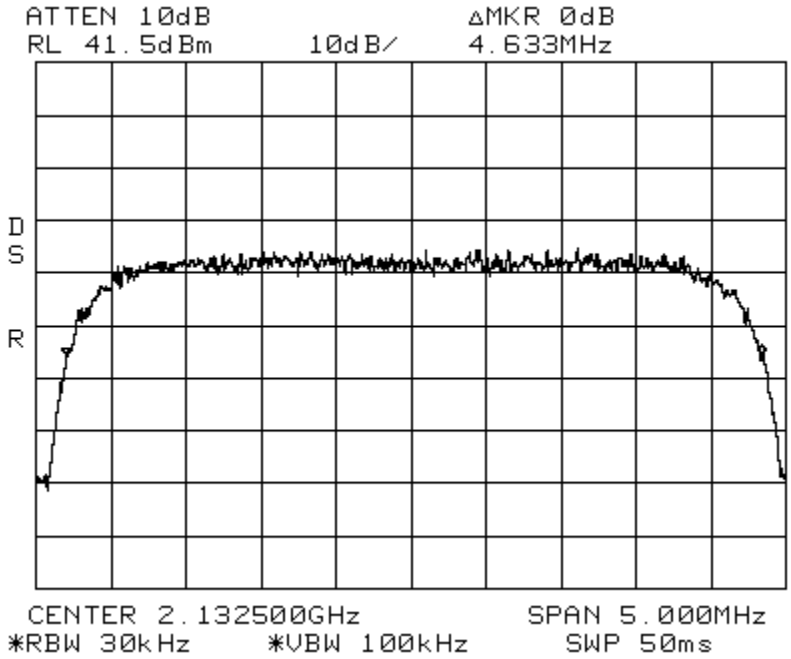
Occupied Bandwidth APCO 25 C4FM _Signal_Out Spectrum 800 MHz SMR
Span: 25 kHz RBW: 300 Hz VBW: 1 kHz



Occupied Bandwidth WCDMA_Signal_In Spectrum AWS Path 1
Span: 4.8 MHz RBW: 30 kHz VBW: 100 kHz



Occupied Bandwidth WCDMA_Signal_Out Spectrum AWS Path 1
Span: 4.8 MHz RBW: 30 kHz VBW: 100 kHz



8.0 APPENDIX B

Measurement Protocol

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Back to Emission Limits; Section 5.1.3

Measurement Protocol

Environmental conditions of the lab, (ADC)
Temperature: 24º C
Relative Humidity: 21 %
Atmospheric Pressure: 98.8 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 place directly on the turntable/ground plane. Interface cable 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.

9.0 APPENDIX C

Radiated Emissions Test Data

Table of Contents; Section 1.0

Document Name: 100381613MIN-003

Test Engineer: Richard Blonigen **Date:** April 27, 2011

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

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

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

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

FCC Registration Number: 0007355381
IC Registration Number: 4359A