Test Report Summary

FCC CFR 47, Part 90
Private Land Mobile Radio Service

Manufacturer: ADC Telecommunications

Name of Equipment: InterReach Fusion® Wideband

Model Number(s): FSN-W2-808519-1

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

Test Report Number: MN080519_SMR

Test Date(s): 9 May, 2008 (ETL)
1 May, 2008 (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.

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

Date: 19 May, 2008

Location:

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

ADC Telecommunications
5341 12th Ave E
Shakopee, MN 55379
Phone: (952) 403-8340
Fax: (952) 403-8858

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

Mark F. Miska
Compliance Engineer

EMC Emission – T E S T R E P O R T

Test Report File Number: MN080519_SMR **Date of Issue:** 19 May, 2008

Model Number(s): FSN-W2-808519-1

Product Name: InterReach Fusion® Wideband

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: 3150809MIN-003

Reference(s)

Total pages including Appendices: 110

1.0 TABLE OF CONTENTS

2.0 REVISION DESCRIPTION

Rev	Total Pages	Date	Description
A	110	19 May, 2008	Original Release

3.0 DOCUMENTATION

3.1 Test Regulations

90.213 Frequency stability
90.635 Limitations on power and antenna height
90.669 Emission limits

The emissions tests were performed according to the following regulations:

☐ FCC Part 22

☐ FCC Part 24

■ **FCC Part 90**

☐ IC RSS-131 Issue 2

Environmental Conditions in the lab:

ADC	**ETL**
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 – SMR – 806 to 824 and 851 to 869 MHz

3.4 Product Options:

None

3.5 EUT Specifications and Requirements:

Length: 11.13”
Width: 11.25”
Height: 2.13”
Weight: 5 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
Optical	< 3M	Ancillary Equip	Ancillary Equip

3.7 Power Requirements:

Voltage: 54 VDC
Amps: 1.1 A

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 #
Main Hub	FSN-W2-MH-1	None	
Expansion Hub	FSN-W1-EH-2	None	
Remote Access Unit	FSN-W2-808519-1	None	

3.12 Support Equipment

Description	Manufacturer	Model #	FCC ID #
Power Meter	HP	EPM-441A	
Signal Generator	Agilent	E4438C	

3.13 Deviations from Standard:

Modifications required to pass:

☐ As indicated on the data sheet(s)

■ **None**

Test Specification Deviations; Additions to or Exclusions from:

☐ As indicated in the Test Plan

■ **None**

3.14 General Remarks:

None.

3.15 Summary:

The requirements according to the technical regulations are

■ **met**

☐ not Met

The equipment under test does

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

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

4.0 TEST SET-UP DRAWINGS AND PHOTOS

Table of Contents; Section 1.0

4.1 Test Set-up Photo, Radiated Emissions

4.2 Test Set-up Photo, Radiated Emissions

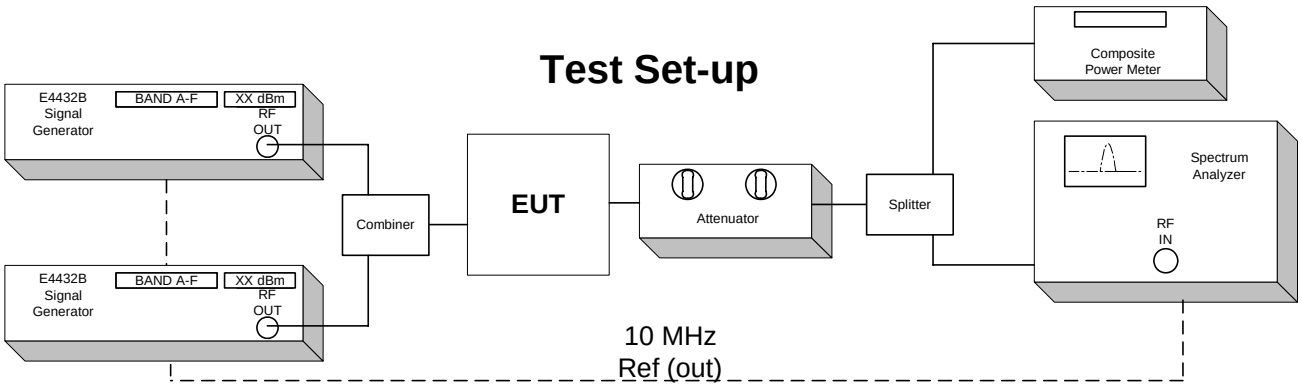
4.3 Test Set-up Drawings

Conducted and Radiated Emission Limits Test

Conducted Output Power Test

Inter-Modulation Test

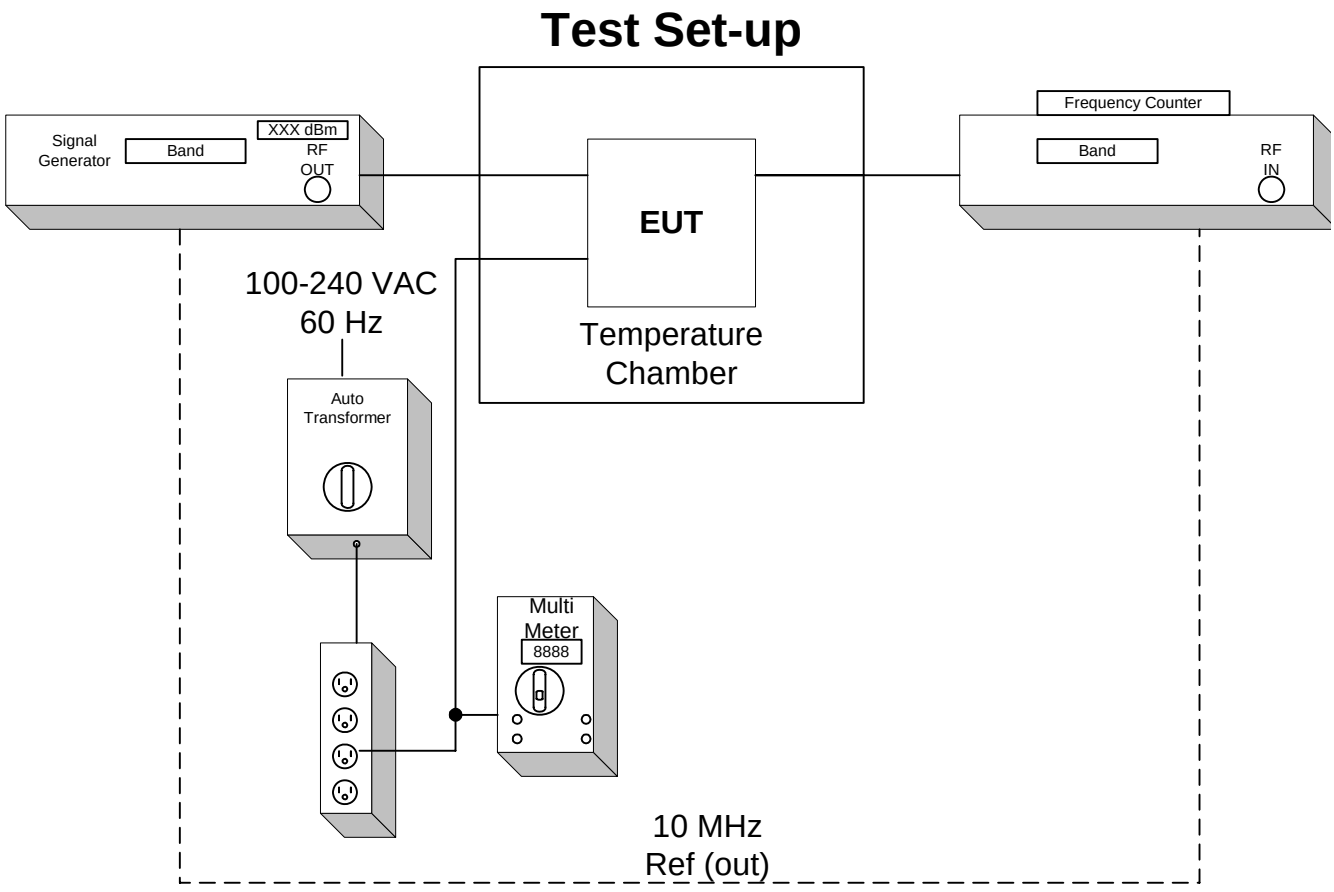
Occupied Bandwidth Modulation Test



Frequency Tolerance Test

The Main Hub and Expansion Hub EUT are specified for indoor use with temperature range of 0° to +45° C, and were tested within their range.

The Remote Access Unit EUT is specified for indoor use with temperature range of -25° to +45° C, and was tested with its range.



5.0 TEST RESULTS

5.1.1 90.635 Limitations on Power and Antenna Height

Test Summary:

- The requirements are: ■ **MET** □ NOT MET
- Minimum margin of compliance is 31.01 dB at 851.2 MHz (APCO25_CQPSK)

Test Location:

□ ETL (Oakdale, MN)

■ **ADC facility (Shakopee, MN)**

Test Distance:

□ 3 Meters

□ 10 Meters

■ **Conducted measurement**

Test Equipment (ADC):
1, 2, 6, 7, 13

Test Limit:
500 Watts or 57 dBm Limit

Test Data:
Conducted Output Power; Section 7.2

Test Engineer: Mark F. Miska
Date: 1 May, 2008

Table of Contents; Section 1.0

5.1.2 90.213 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 45º C and an input voltage range of 100 to 240 VAC.

Test Location:

□ ETL (Oakdale, MN)

■ **ADC facility (Shakopee, MN)**

Test Equipment (ADC):
3, 4, 5, 6, 9, 13

Test Limit:

MINIMUM FREQUENCY STABILITY
[Parts per million (ppm)]

Frequency range (MHz)	Fixed and base stations	Mobile stations	
		Over 2 watts output power	2 watts or less output power
Below 25	[1,2,3] 100	100	200
25–50	20	20	50
72–76	5	.....	50
150–174	[5,11] 5	[6] 5	[4,6] 50
220–222 [12]	0.1	1.5	1.5
421–512	[7,11,14] 2.5	[8] 5	[8] 5
806–821	[14] 1.5	2.5	2.5
821–824	[14] 1.0	1.5	1.5
851–866	1.5	2.5	2.5
866–869	1.0	1.5	1.5
896–901	[14] 0.1	1.5	1.5
902–928	2.5	2.5	2.5
902–928 [13]	2.5	2.5	2.5
929–930	1.5	.....	.....
935–940	0.1	1.5	1.5
1427–1435	[9] 300	300	300
Above 2450 [10]	.....	.....	.....

Test Data:
Frequency Stability; Section 7.3

Test Engineer: Mark F. Miska
Date: 1 May, 2008

Table of Contents; Section 1.0

5.1.3 90.669 Emission Limits

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:

□ ETL (Oakdale, MN)

■ **ADC facility (Shakopee, MN)**

Test Equipment (ADC):
1, 2, 6, 7, 13

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: Mark F. Miska
Date: 1 May, 2008
Date: 1 May, 2008
Date: 1 May, 2008

Table of Contents; Section 1.0

6.0 TEST EQUIPMENT

Table of Contents; Section 1.0

Number	Description	Manufacturer	Model	ADC Serial Number	Cal Due	Used
1	Spectrum Analyzer	HP	8563E	MC27690	7-18-08	☒
2	Power Meter	HP	EPM-441A	MC27670	10-9-08	☒
3	Multimeter	Fluke	87	MC17932	8-1-08	☒
4	Frequency Counter	HP	5347A	MC27548	1-16-09	☒
5	Temperature Chamber	Thermotron	SM-32C	MC18966	4-8-09	☒
6	Signal Generator	Agilent	E4437B	967974	1-15-10	☒
7	Signal Generator	Agilent	E4438C	1013210	2-9-09	☒
8	Attenuator	Huber Suhner	6810.17.A	N/A	CNR	☐
9	Variable Auto Transformer	Staco	1520CT	MC44655	CNR	☒
10	Digital Barometer	Fisher Scientific	02-403	MC50719	10-28-09	☒
11	Data Acquisition Unit	Fluke	Hydra	MC27549	10-8-08	☐
12	Attenuator	Aeroflex	49-30-33	N/A	CNR	☐
13	Attenuator	Aeroflex	86-30-12	N/A	CNR	☐
14	LNA	Lucix Corp	C020200L 1603	N/A	CNR	☐

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

Table of Contents; Section 1.0

Test Engineer: Mark F. Miska

7.1 Conducted Emission Limits Test

Table of Contents; Section 1.0
Back to Emission Limits; Section 5.1.3

The out of band emissions were measured directly from the EUT antenna output in the RX and TX path using a spectrum analyzer from 30 MHz to the 10th harmonic of the highest carrier frequency. Test signals used are APCO25_C4FM, APCO25_CQPSK, FM and iDEN. 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 APCO25_C4FM, APCO25_CQPSK, FM and iDEN signal at the upper and lower limits of the band.

The Main Hub and Expansion units 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 ≈ 0 dBm input to Main Hub in the TX Path.
Industry practice has generally set the input signal power level. Test signal used was ≈ -33 dBm input to RAU in the RX Path.
Industry practice has generally set the output signal power level.

Main Hub:	Expansion Hub:	Remote Access Unit (RAU):
Range: 100 - 240 VAC	Range: 100 - 240 VAC	Range: 54 VDC
Tested @: 120 VAC	Tested @: 120 VAC	Tested @: 54 VDC
Tested @: 0.4 A	Tested @: 0.9 A	Tested @: 1.1 A

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

System Power is limited by a limiting attenuation chip (ALC) in Wideband Main Hub with 30 dB of head room. Single channel operation, or multi-channel operation will not exceed nominal gain of the system.

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.

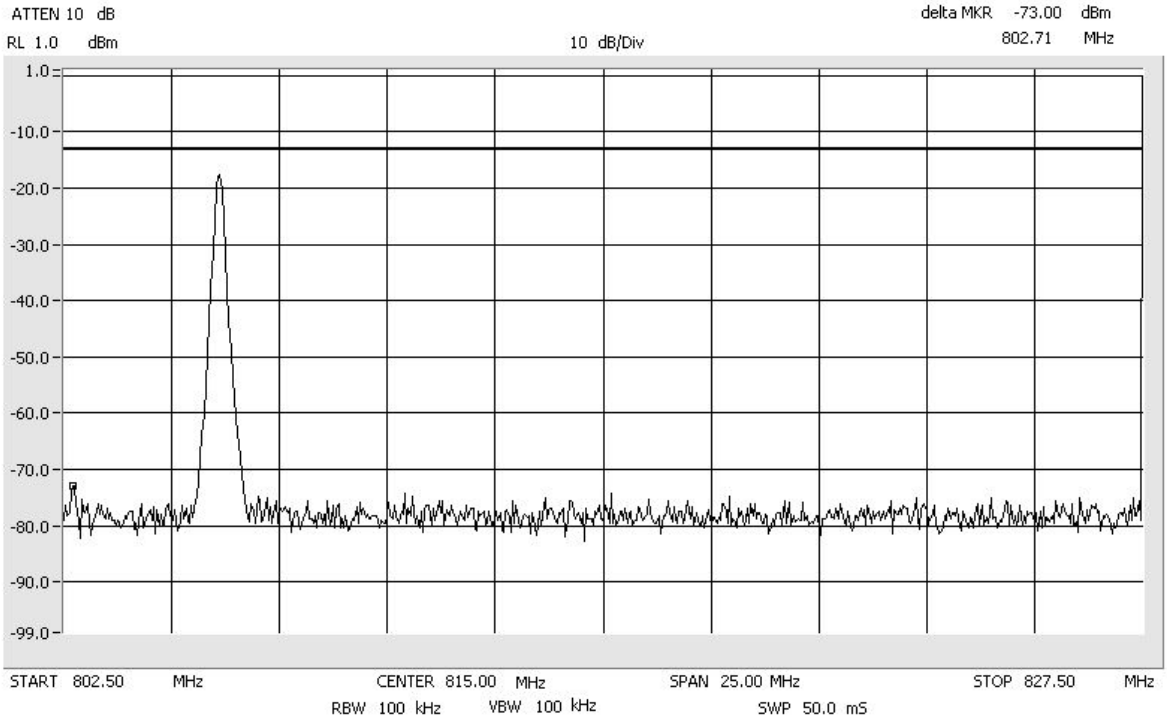
Internal to the electronics, the use of SAW filters provides for higher Q roll-off at band edges.

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 an optical link. The RF input is not changed in the RF output.

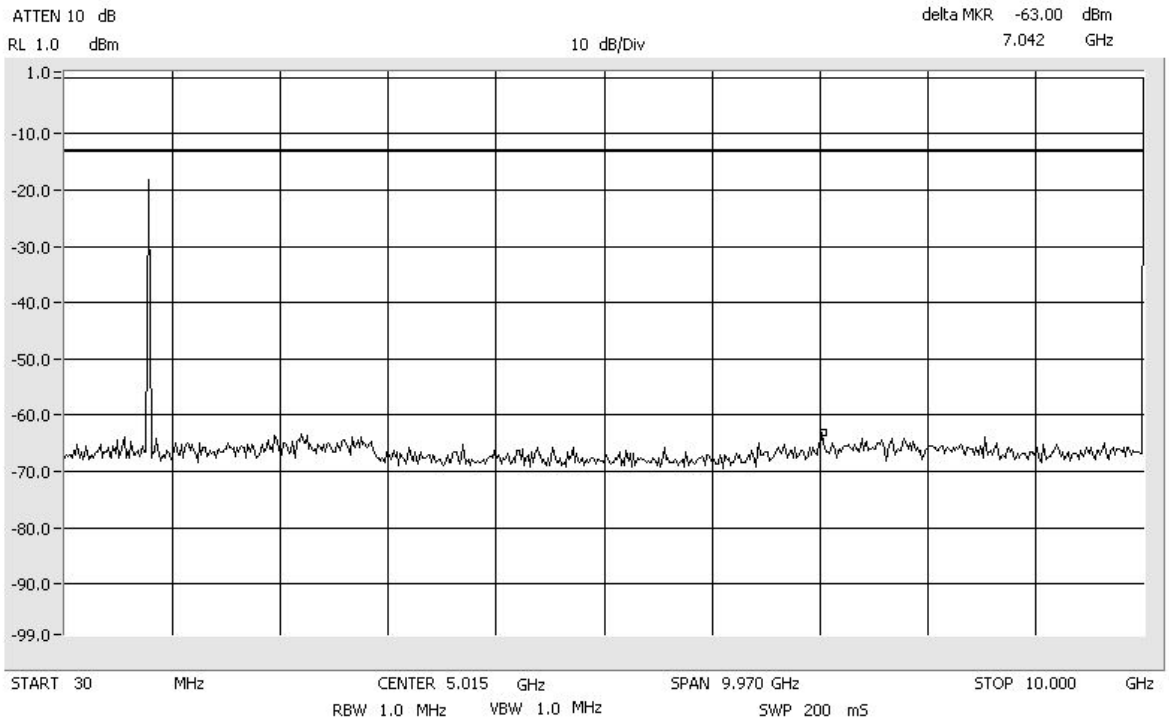
This is a constant gain device, so the setup controls the output. There is an overdrive and overpower limit control that prevents excess power.

Results:
Pass (See plots)

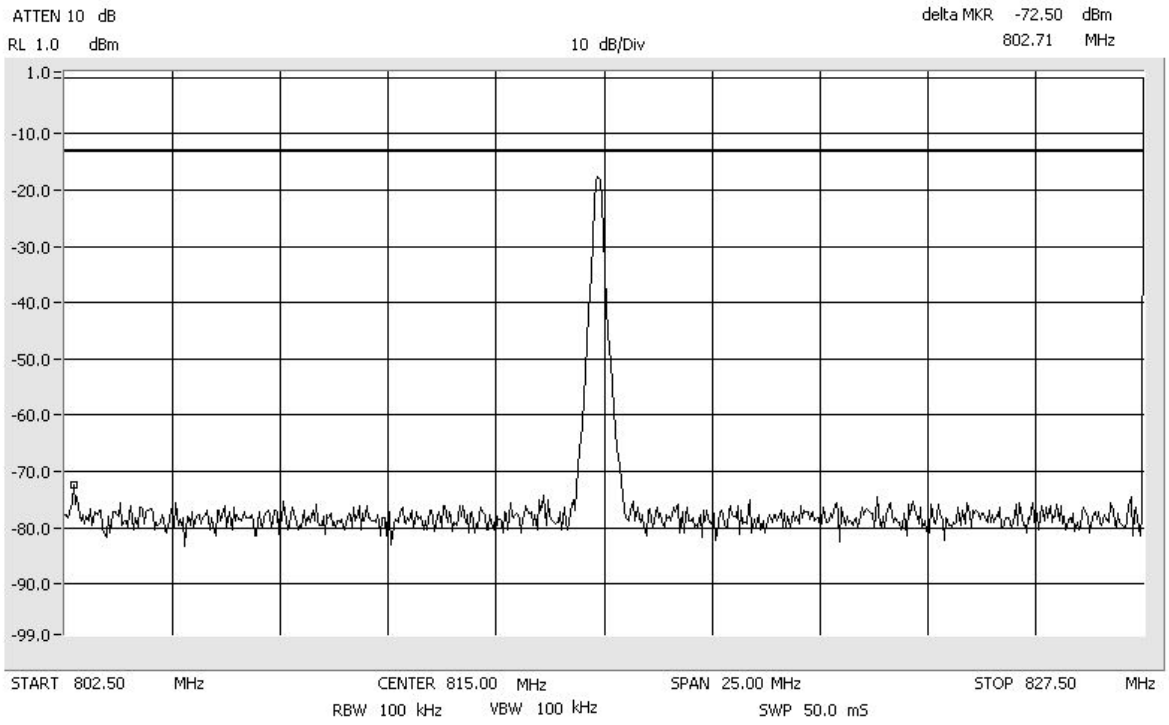
Conducted Emissions Low SMR_800_MHz
Center: 815 MHz Span: 25 MHz RBW/VBW: 100 kHz



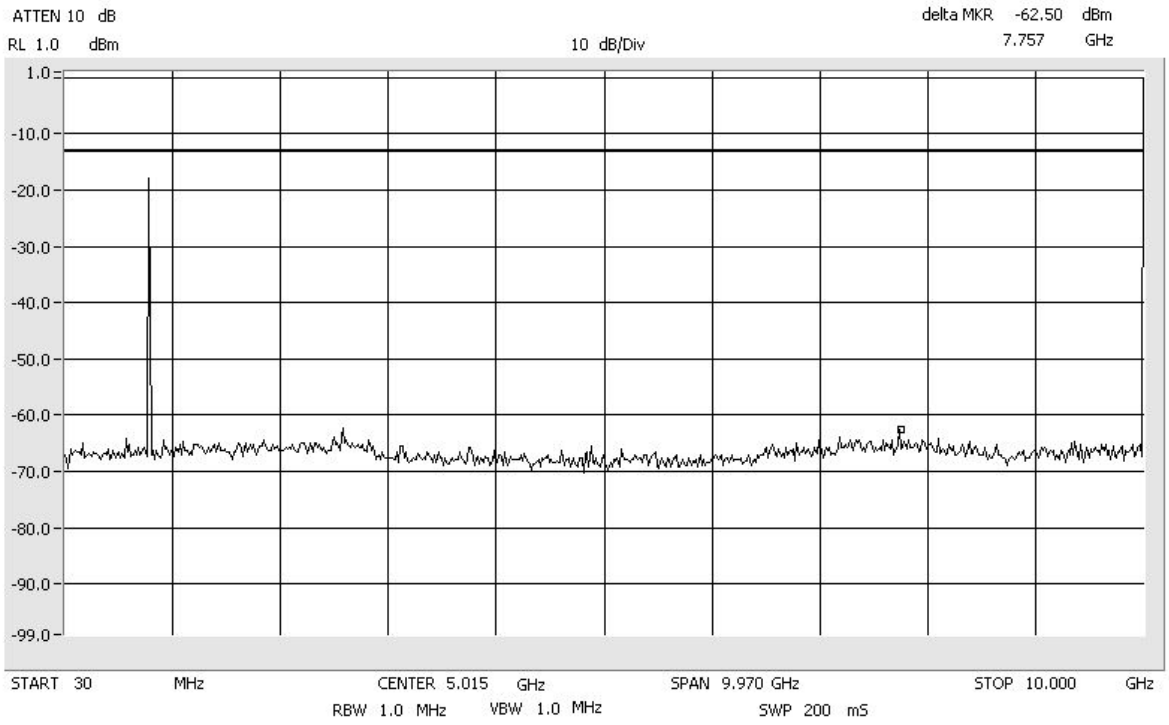
Conducted Emissions Low SMR_800_MHz
Span: 30 MHz to 10 GHz RBW/VBW: 1 MHz



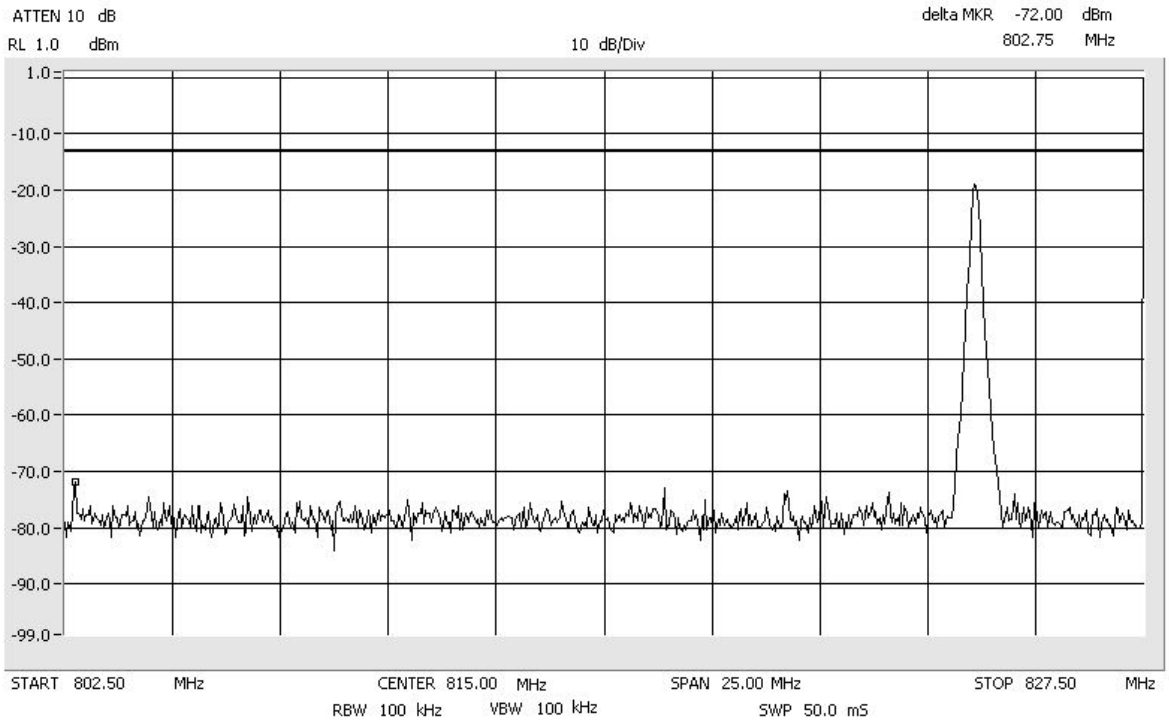
Conducted Emissions Mid SMR_800_MHz
Center: 815 MHz Span: 25 MHz RBW/VBW: 100 kHz



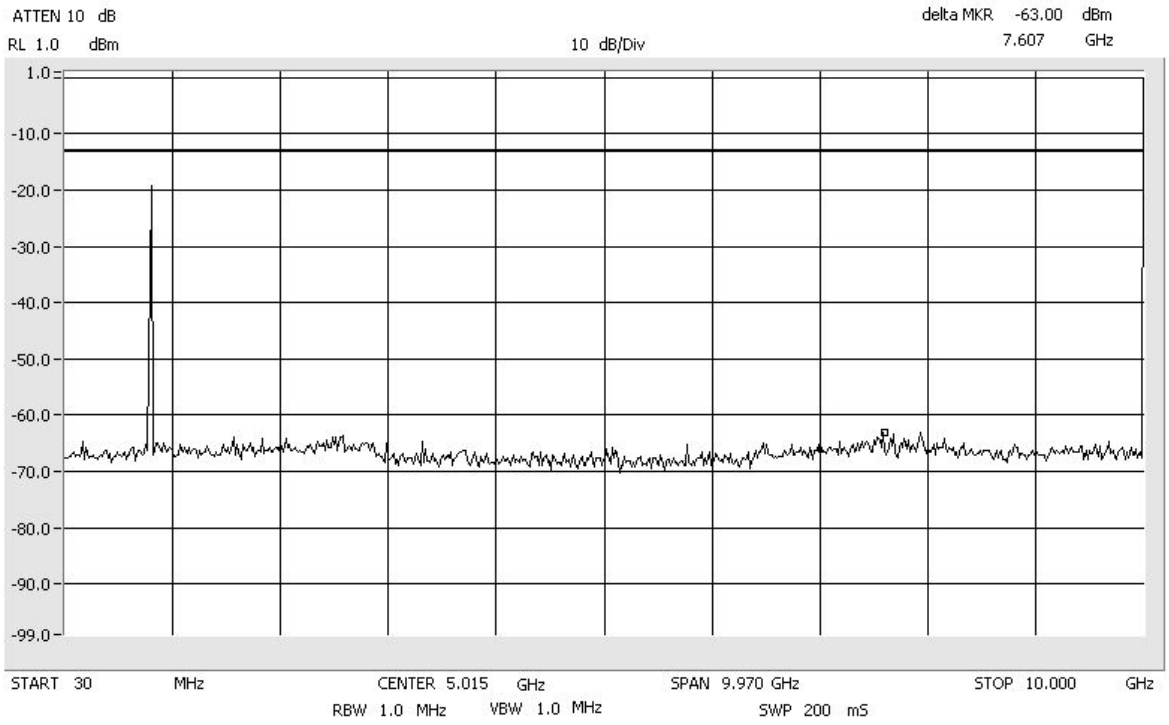
Conducted Emissions Mid SMR_800_MHz
Span: 30 MHz to 10 GHz RBW/VBW: 1 MHz



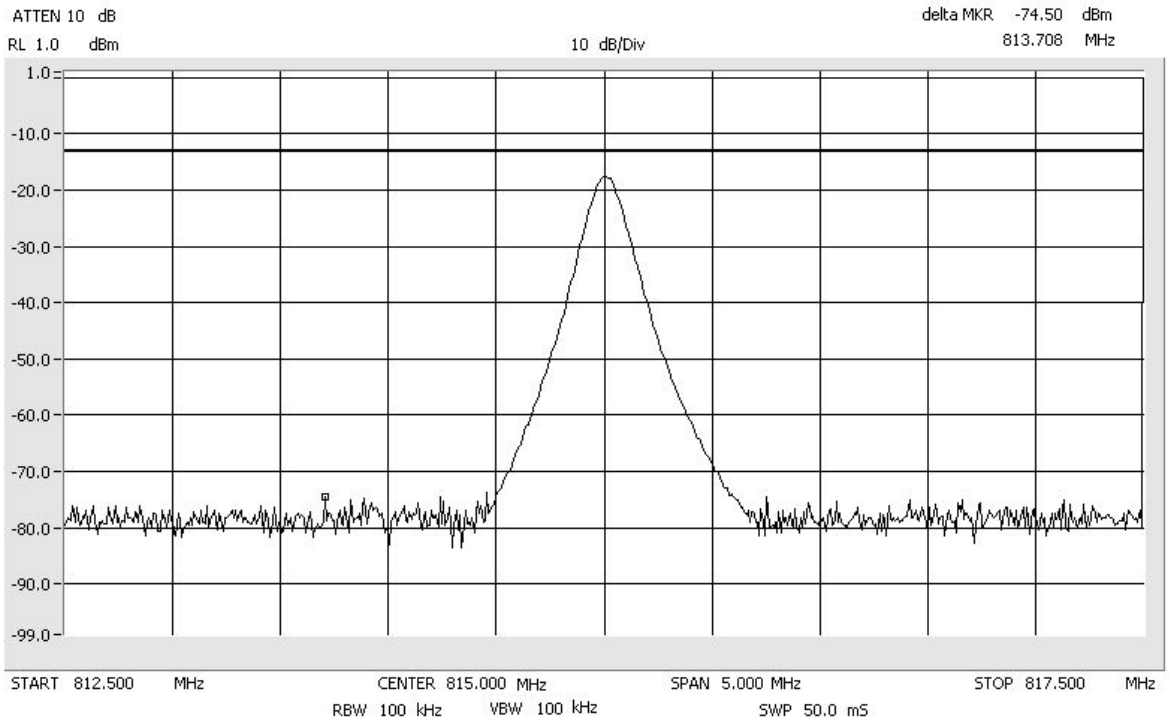
Conducted Emissions High SMR_800_MHz
Center: 815 MHz Span: 25 MHz RBW/VBW: 100 kHz



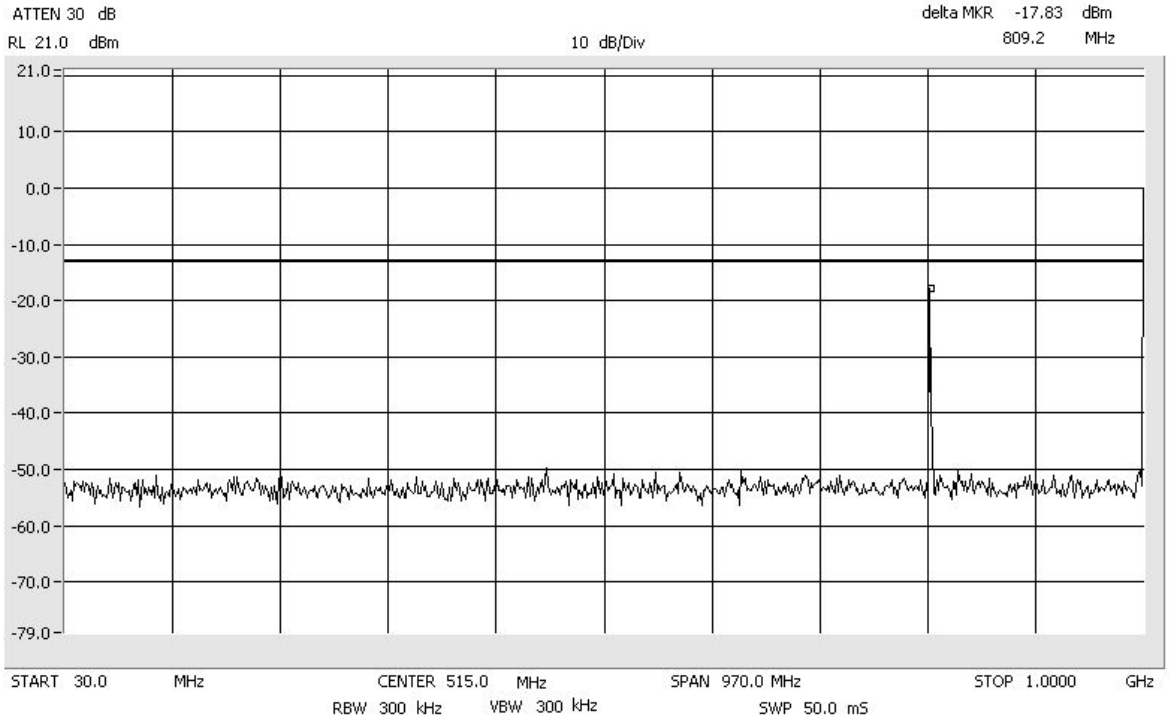
Conducted Emissions High SMR_800_MHz
Span: 30 MHz to 10 GHz RBW/VBW: 1 MHz



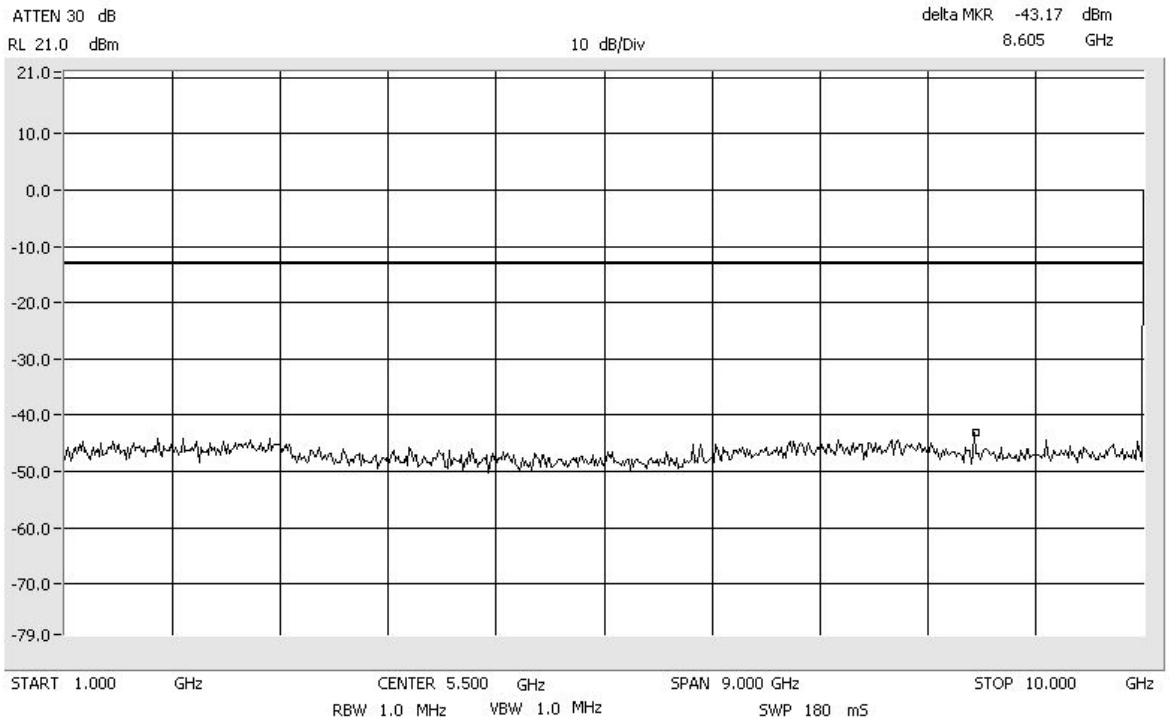
Conducted Emissions APCO25_C4FM SMR_800_MHz
Center: 815 MHz Span: 5 MHz RBW/VBW: 100 kHz



Conducted Emissions APCO25_C4FM SMR_800_MHz
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



Conducted Emissions APCO25_C4FM SMR_800_MHz
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



Conducted Emissions APCO25_CQPSK SMR_800_MHz
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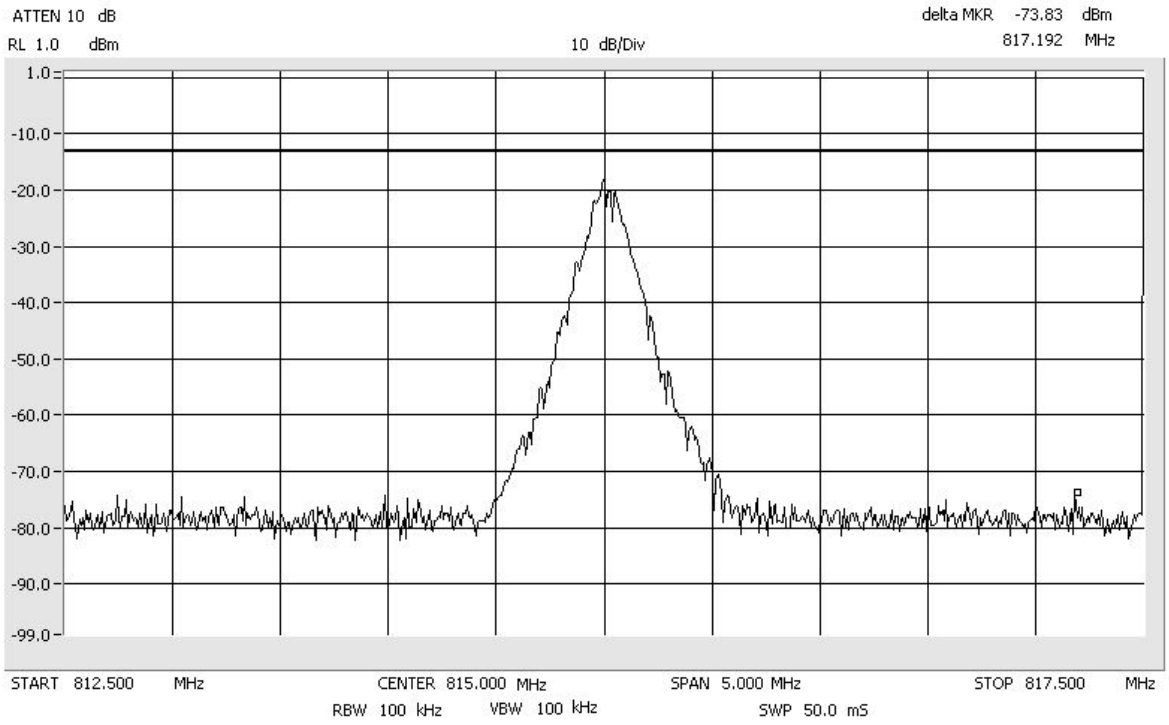
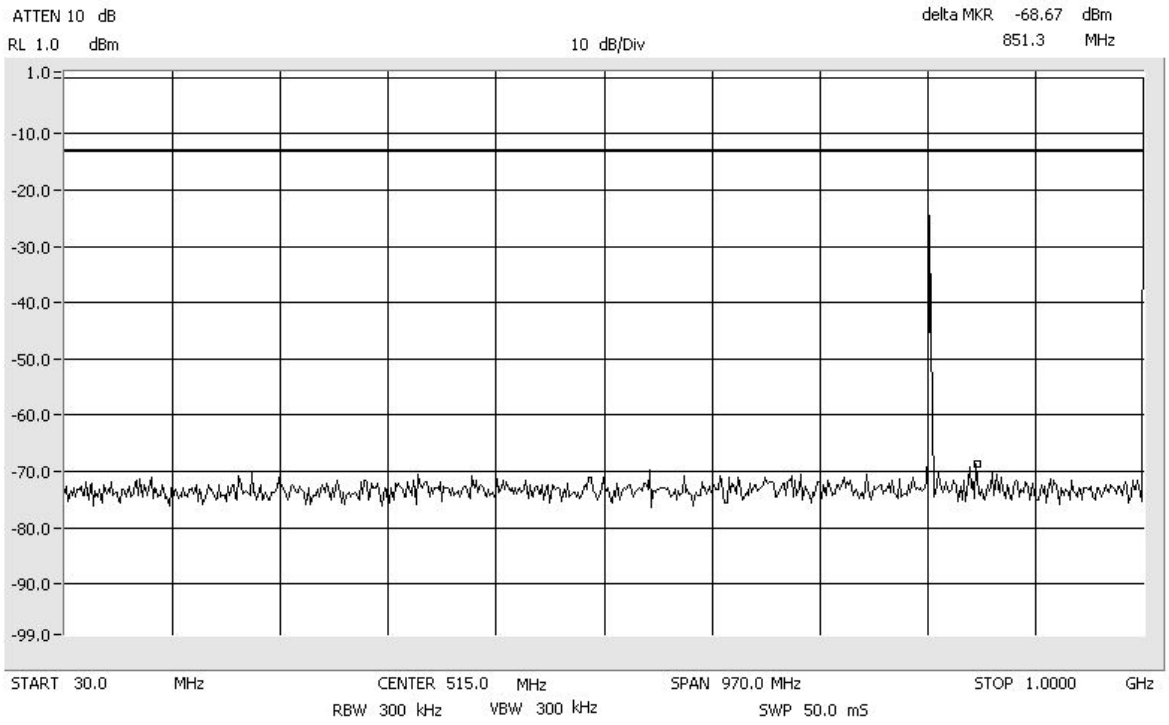
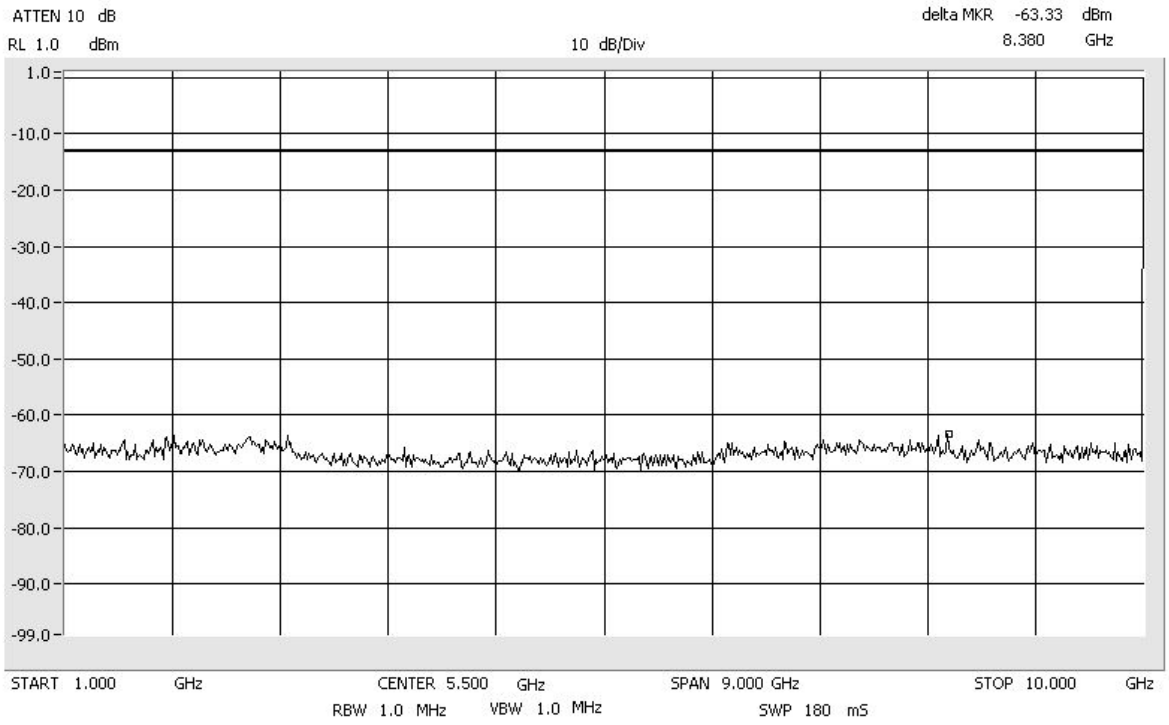


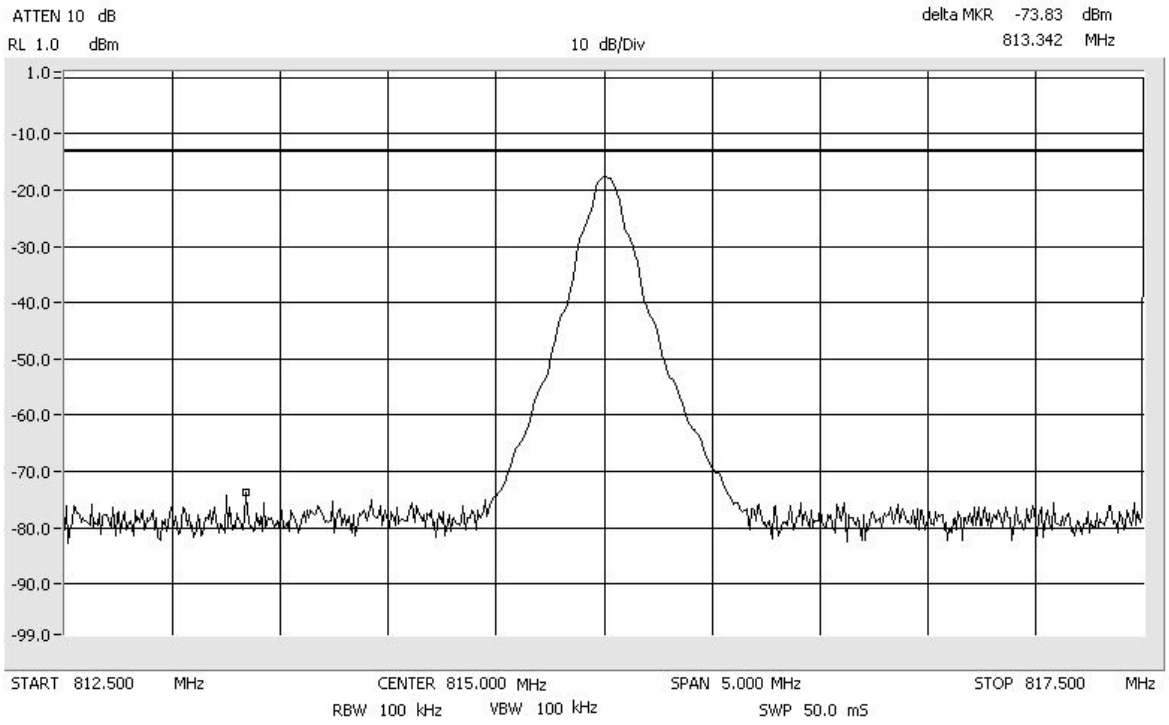
Conducted Emissions APCO25_CQPSK SMR_800_MHz
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



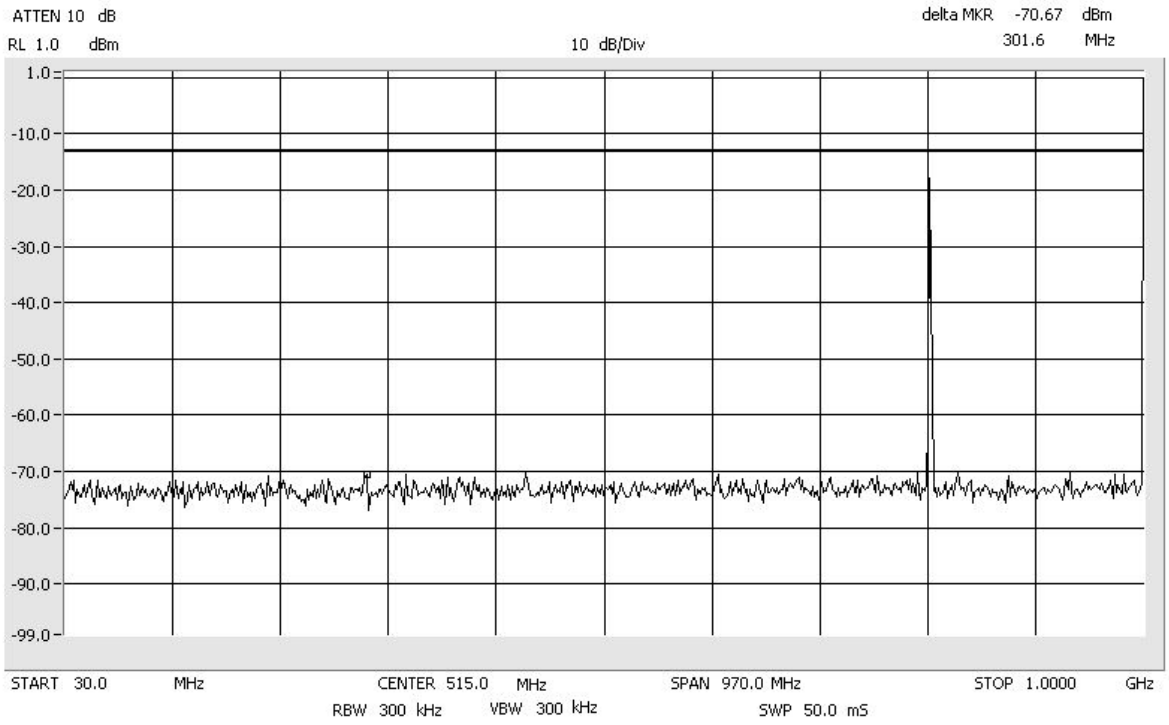
Conducted Emissions APCO25_CQPSK SMR_800_MHz
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



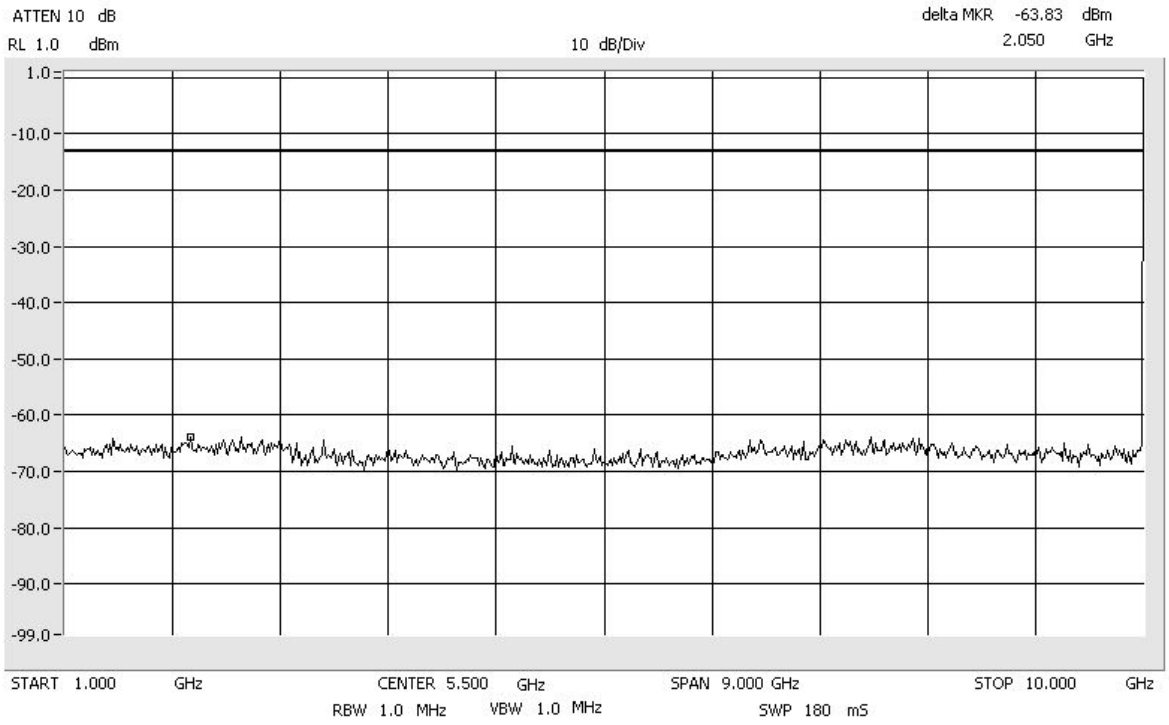
Conducted Emissions FM SMR_800_MHz
Center: 815 MHz Span: 5 MHz RBW/VBW: 100 kHz



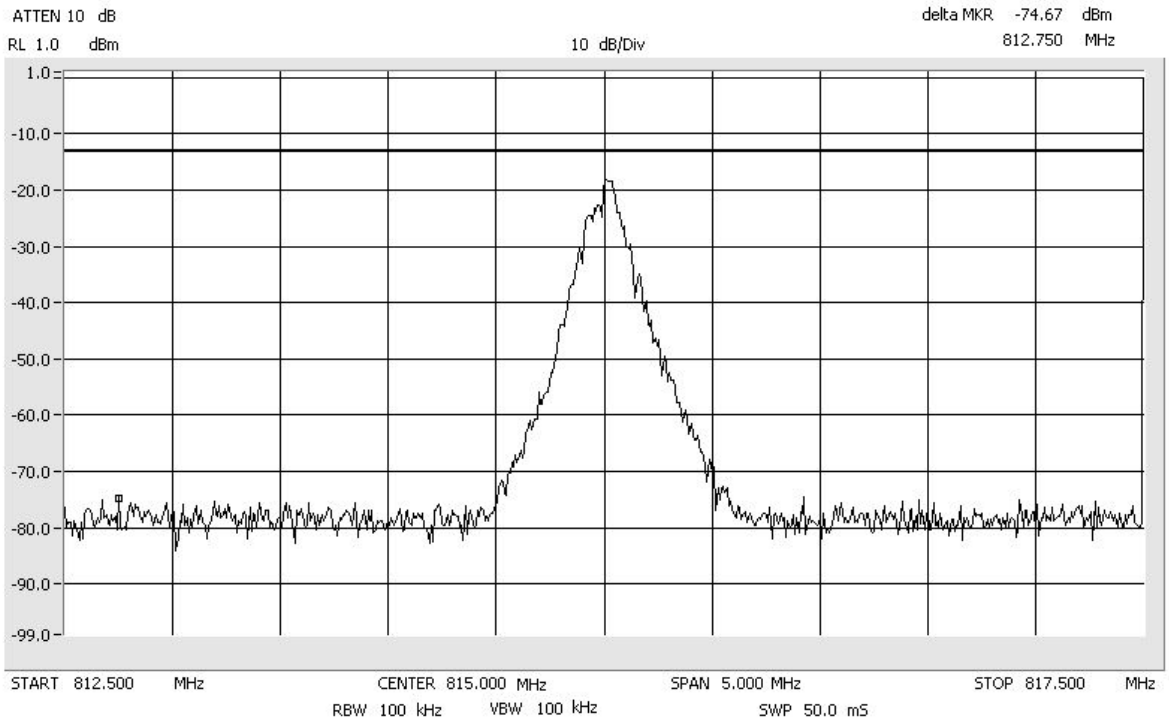
Conducted Emissions FM SMR_800_MHz
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



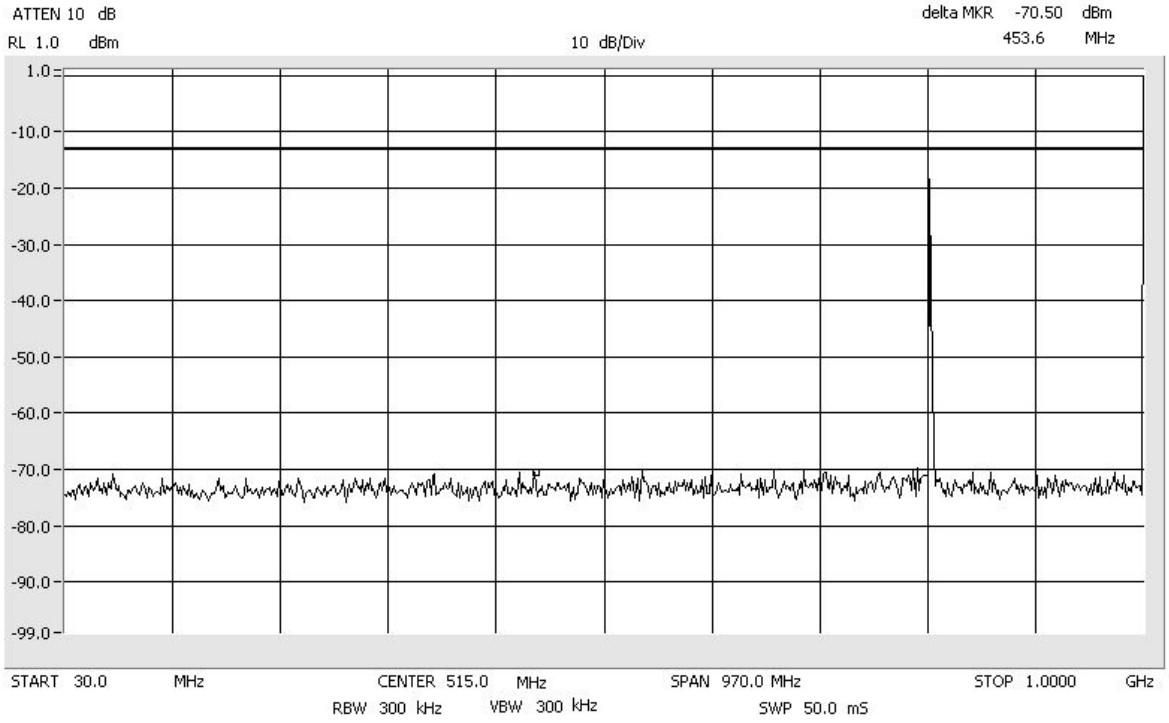
Conducted Emissions FM SMR_800_MHz
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



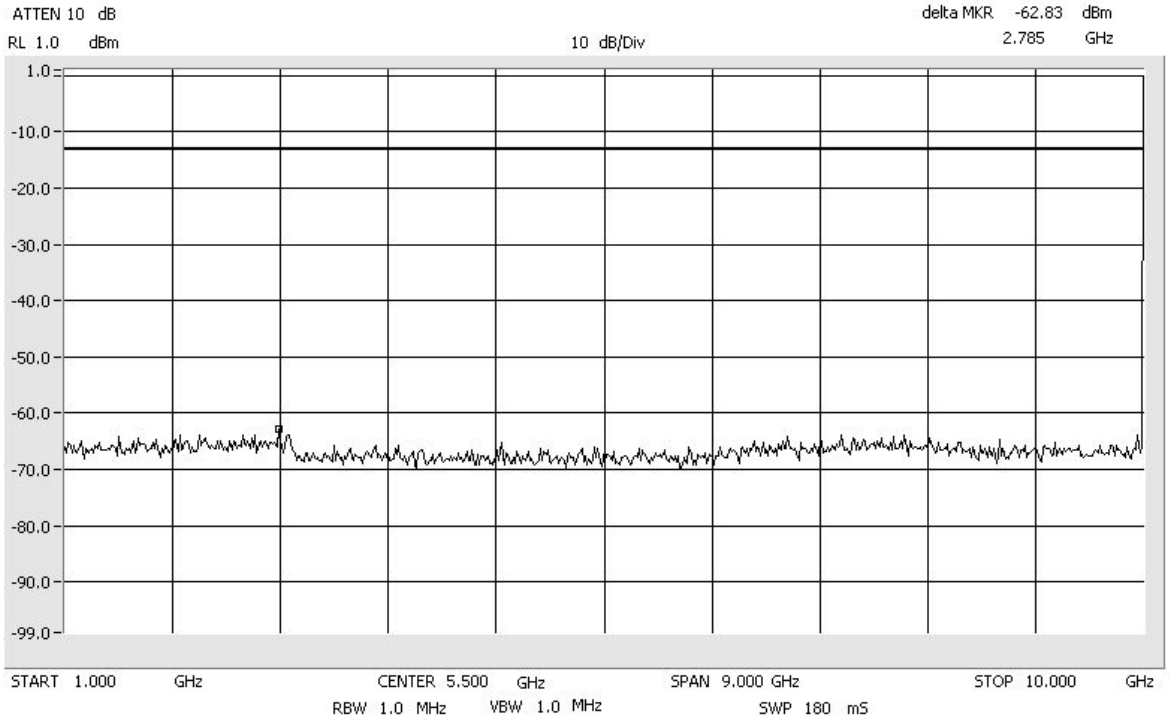
Conducted Emissions iDEN SMR_800_MHz
Center: 815 MHz Span: 5 MHz RBW/VBW: 100 kHz



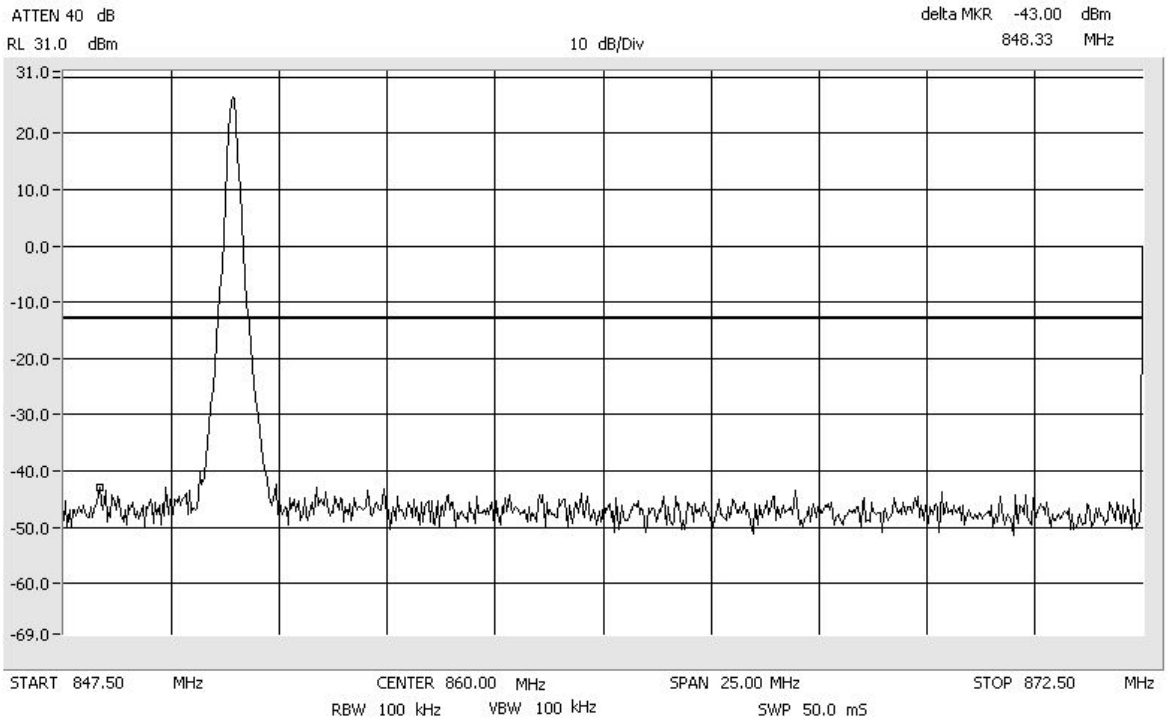
Conducted Emissions iDEN SMR_800_MHz
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



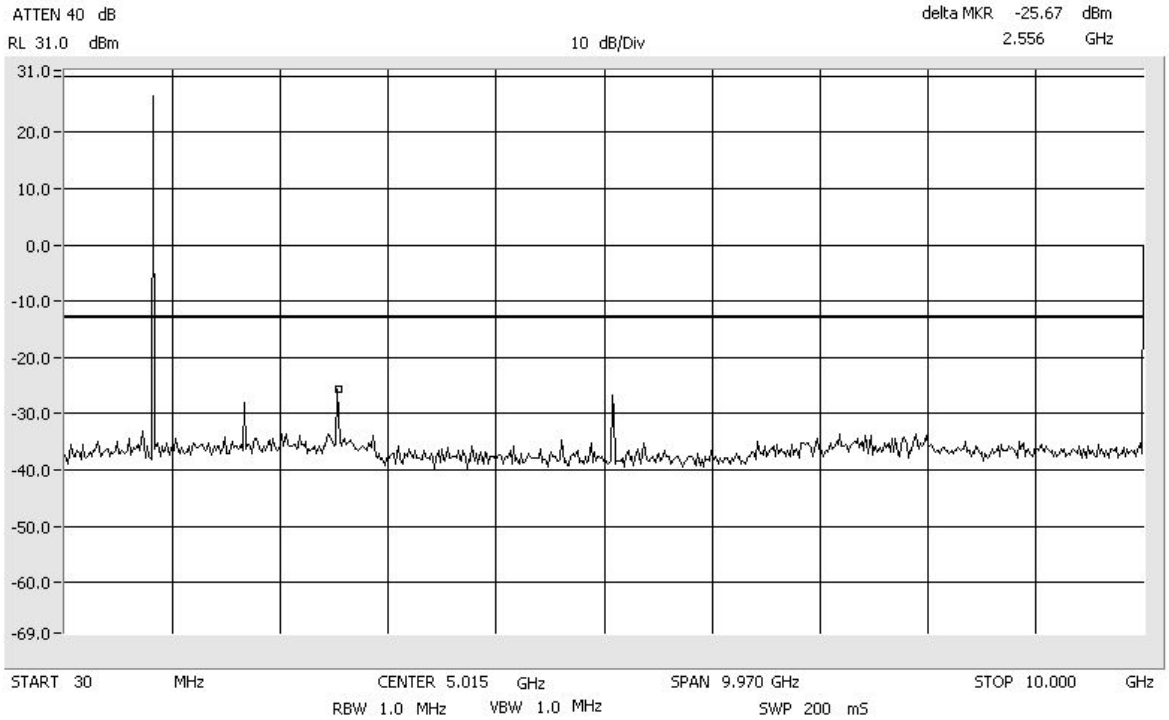
Conducted Emissions iDEN SMR_800_MHz
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



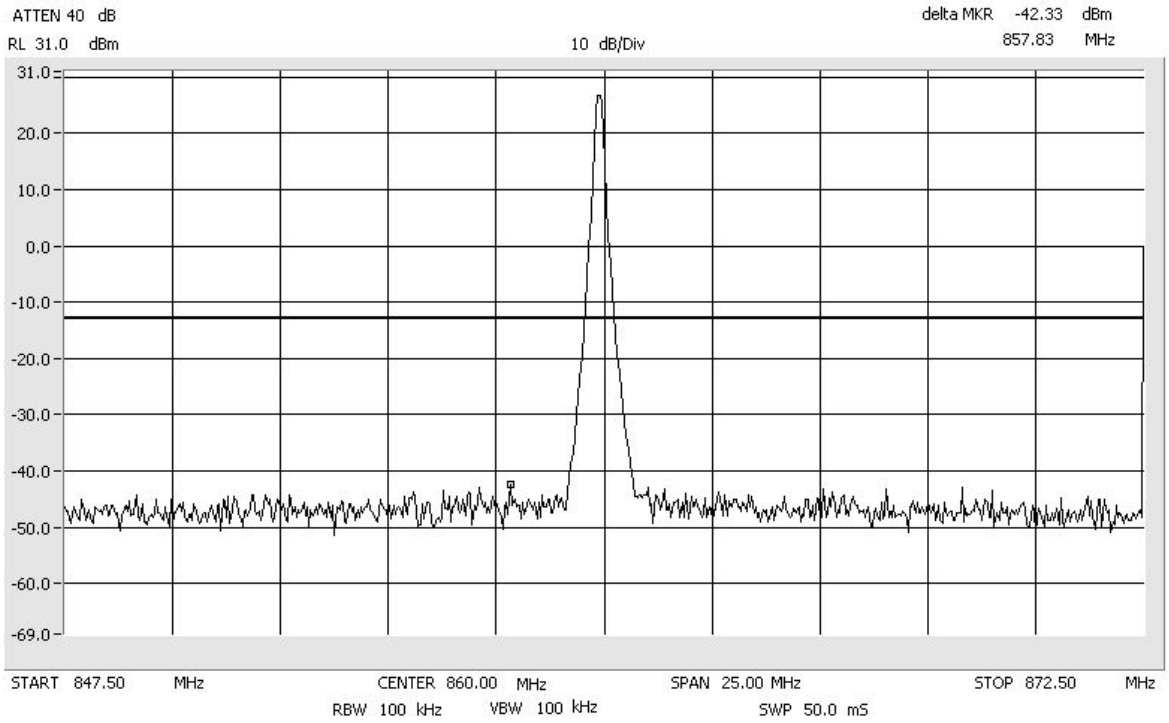
Conducted Emissions Low SMR_800_MHz
Center: 860 MHz Span: 25 MHz RBW/VBW: 100 kHz



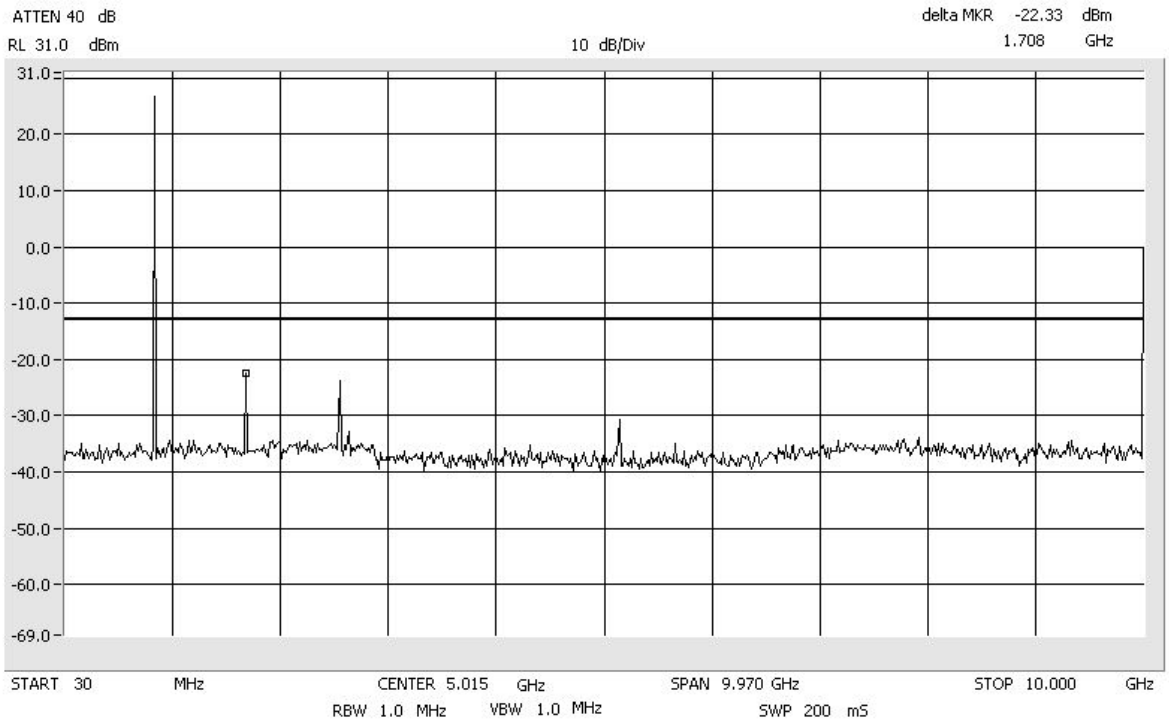
Conducted Emissions Low SMR_800_MHz
Span: 30 MHz to 10 GHz RBW/VBW: 1 MHz



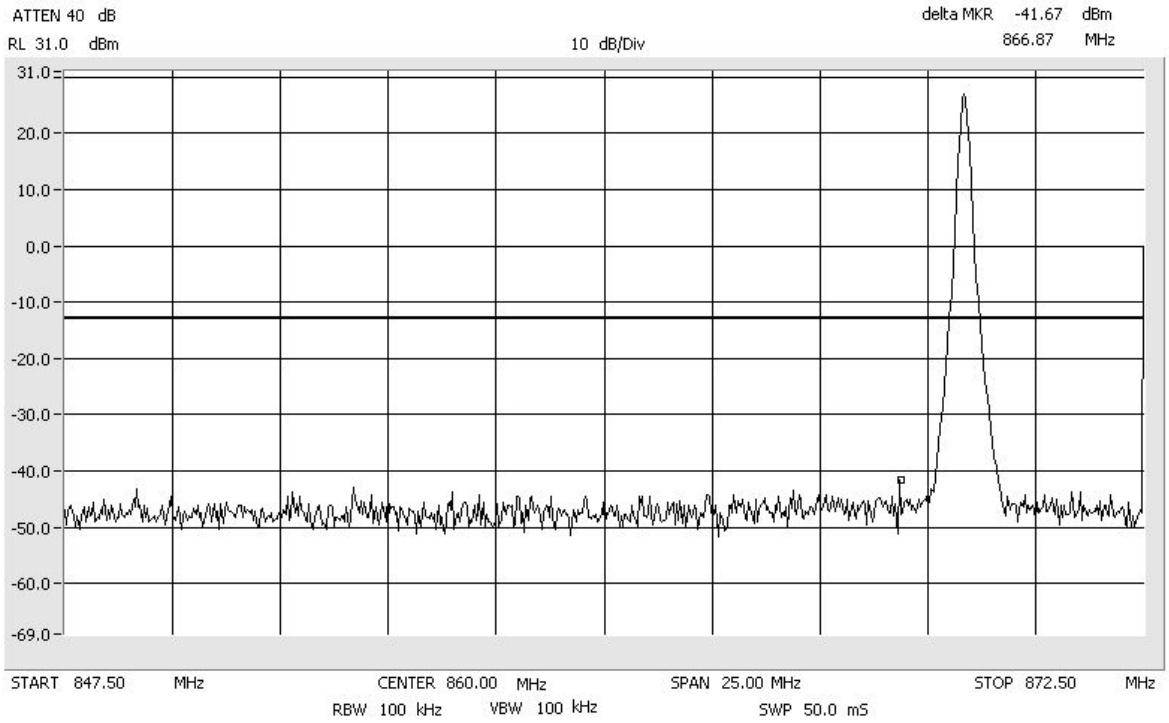
Conducted Emissions Mid SMR_800_MHz
Center: 860 MHz Span: 25 MHz RBW/VBW: 100 kHz



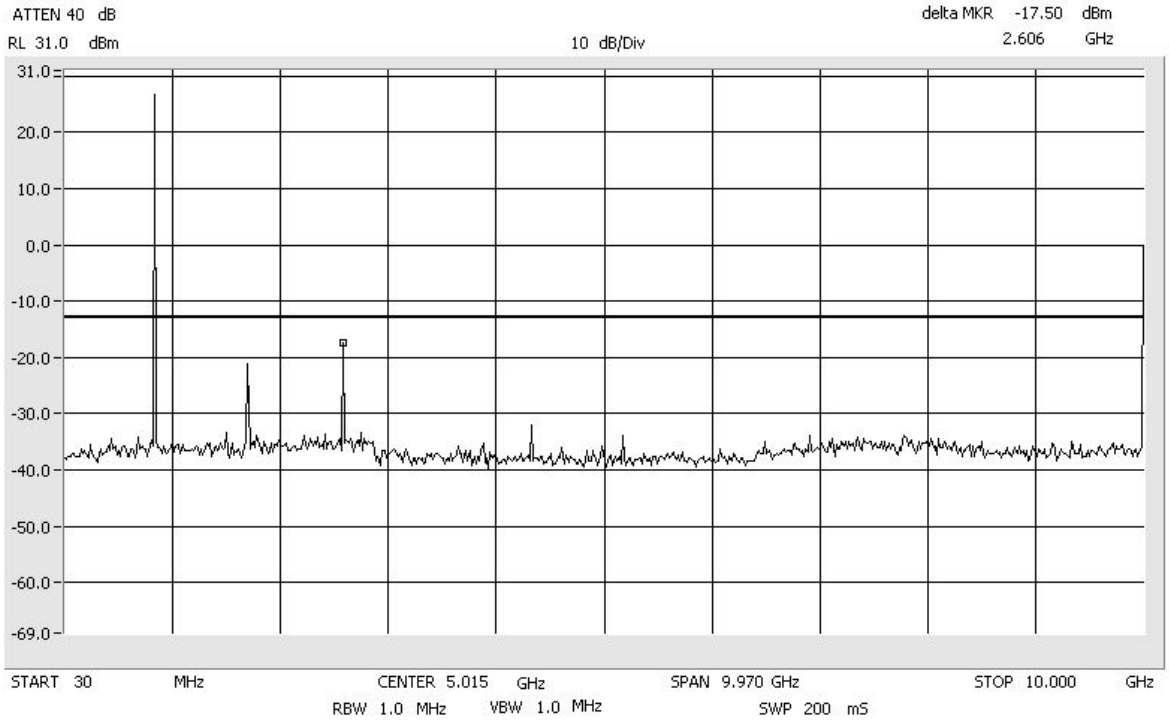
Conducted Emissions Mid SMR_800_MHz
Span: 30 MHz to 10 GHz RBW/VBW: 1 MHz



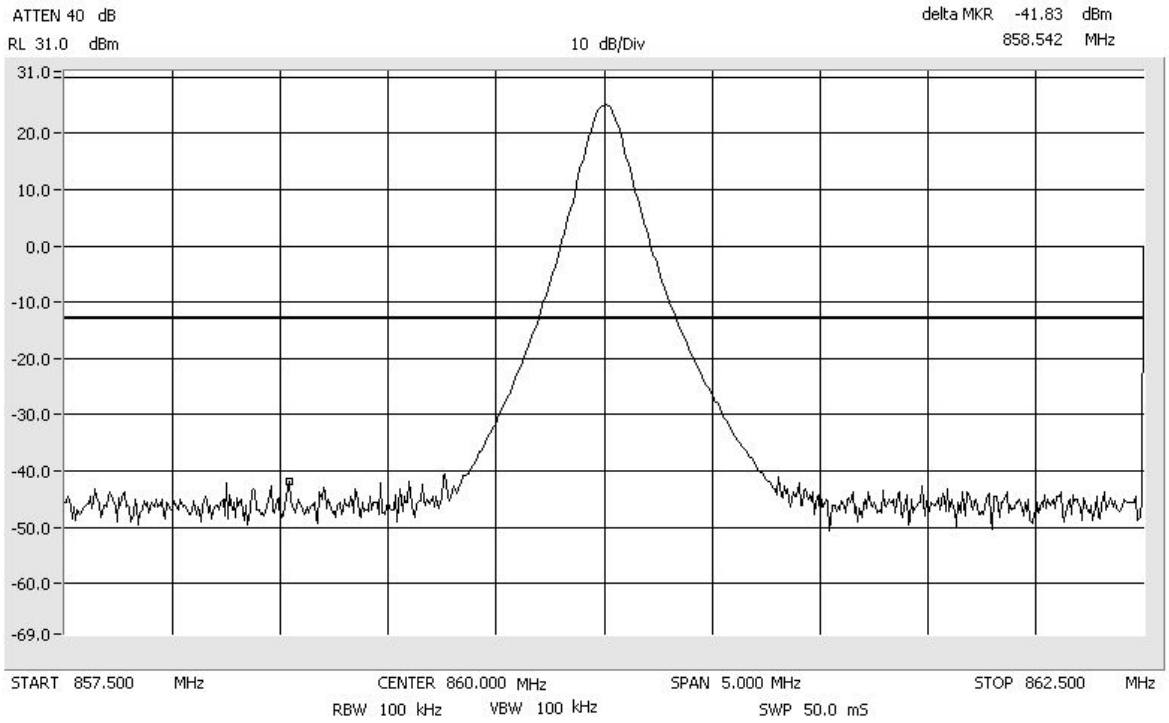
Conducted Emissions High SMR_800_MHz
Center: 860 MHz Span: 25 MHz RBW/VBW: 100 kHz



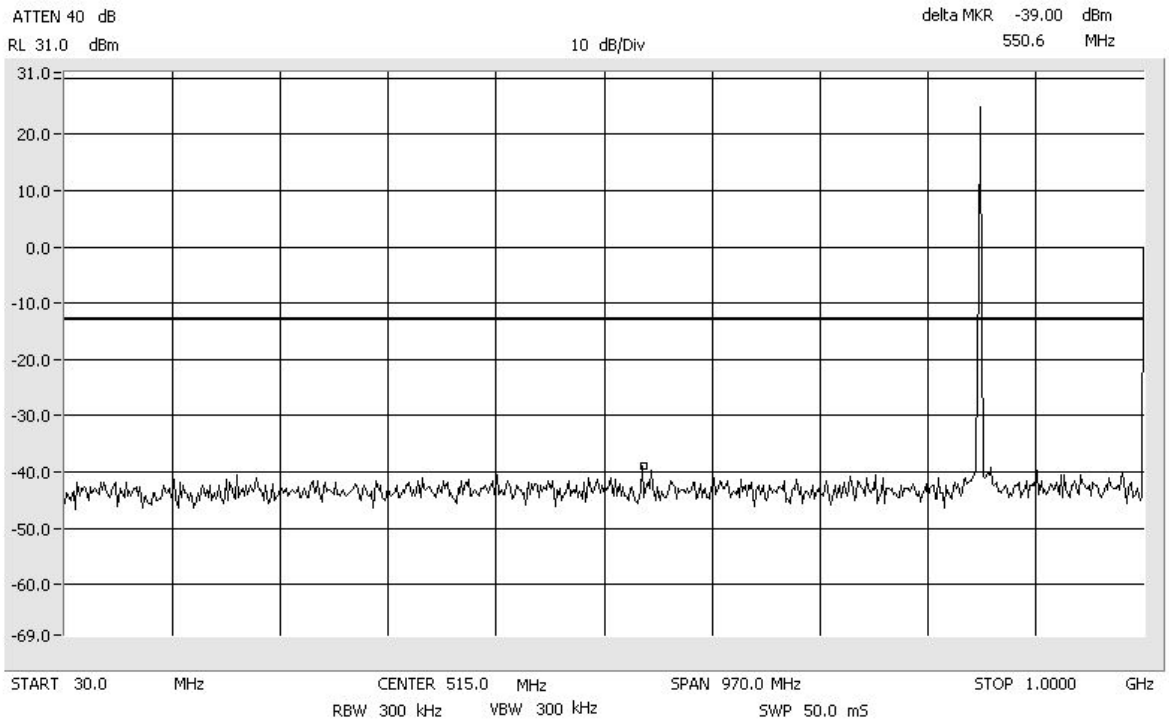
Conducted Emissions High SMR_800_MHz
Span: 30 MHz to 10 GHz RBW/VBW: 1 MHz



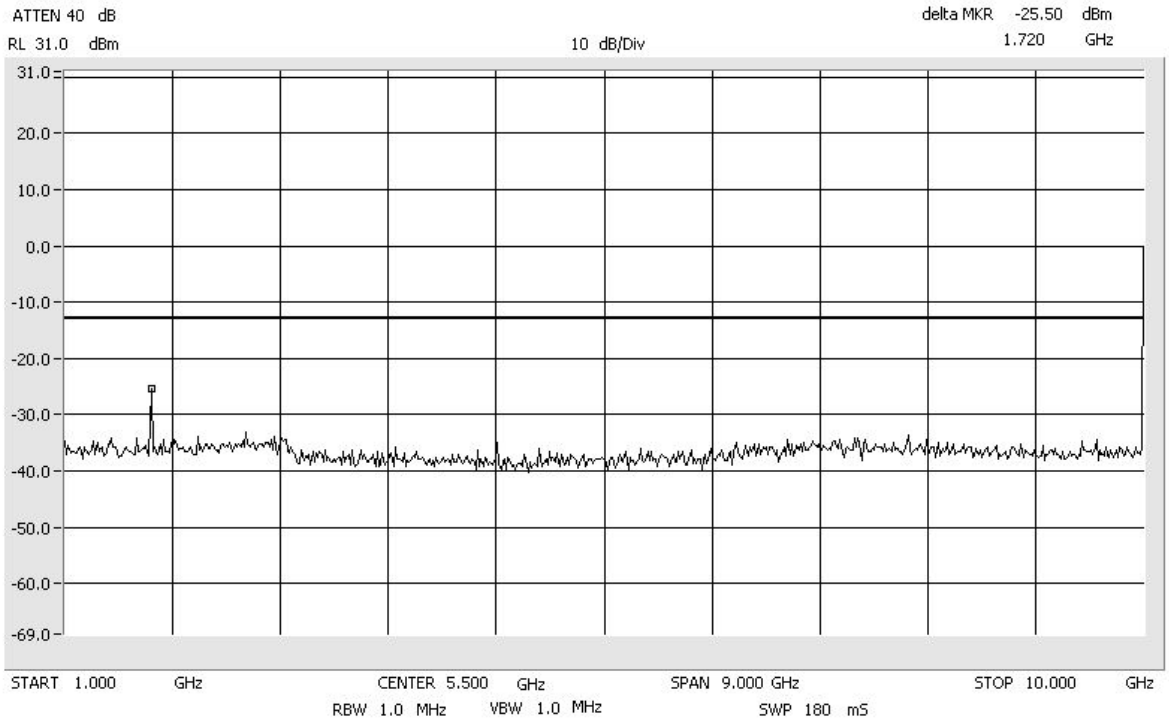
Conducted Emissions APCO25_C4FM SMR_800_MHz
Center: 860 MHz Span: 5 MHz RBW/VBW: 100 kHz



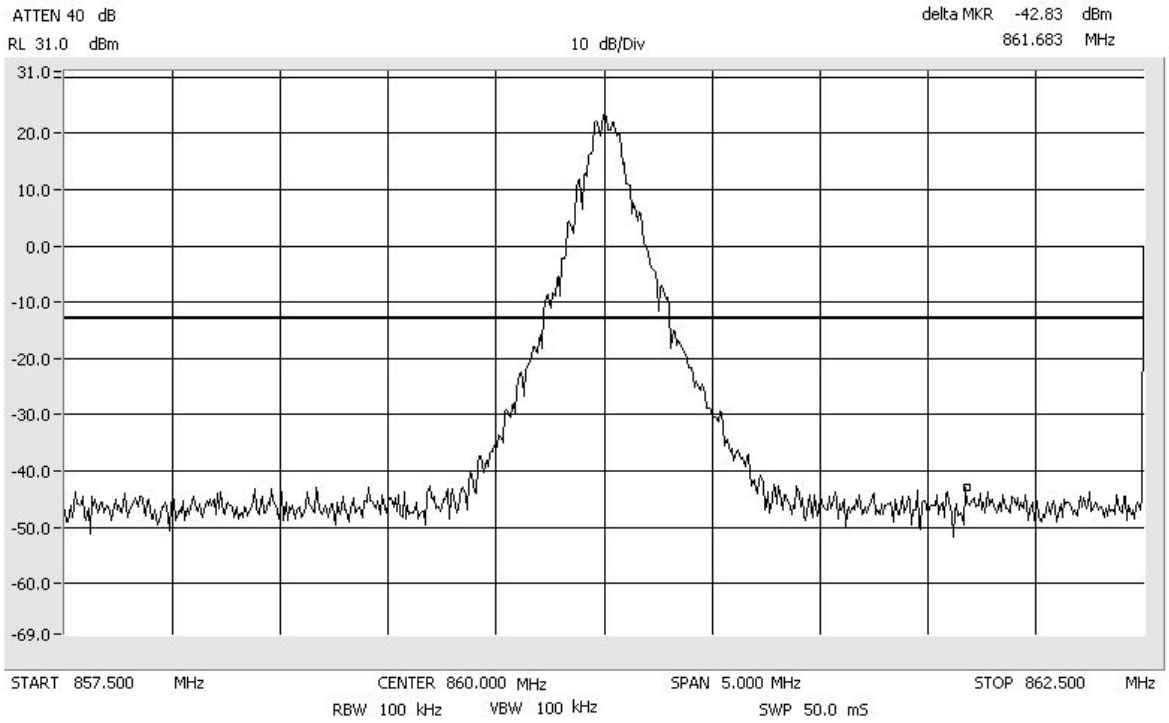
Conducted Emissions APCO25_C4FM SMR_800_MHz
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



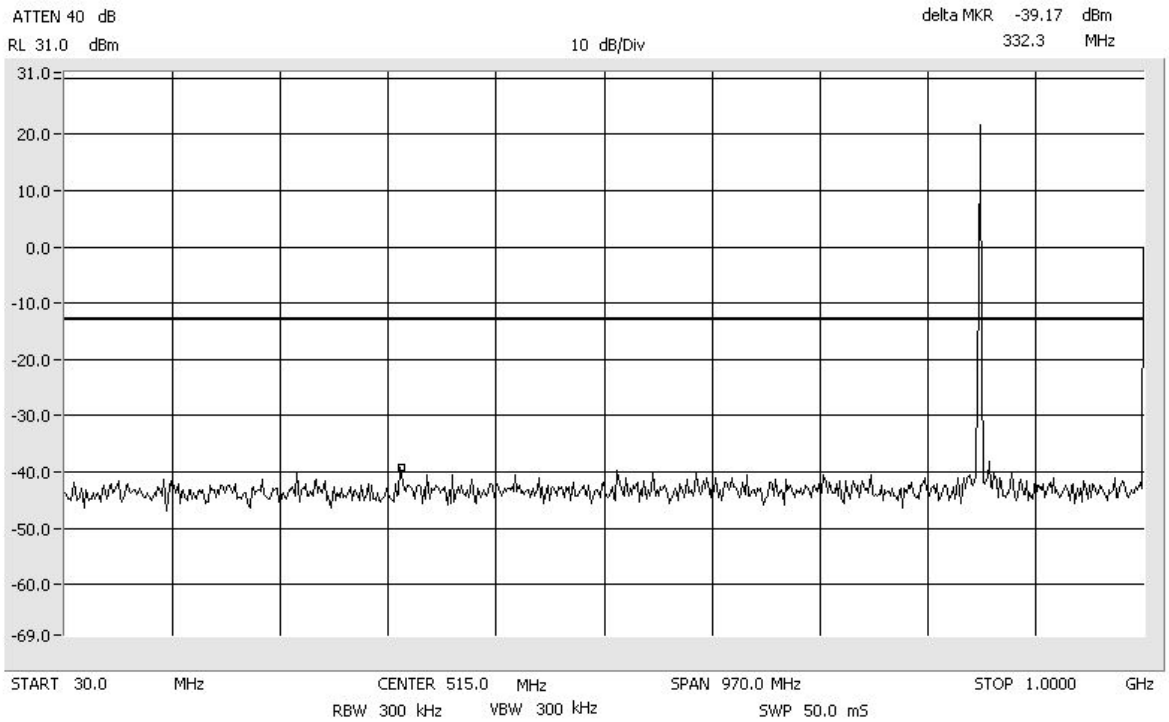
Conducted Emissions APCO25_C4FM SMR_800_MHz
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



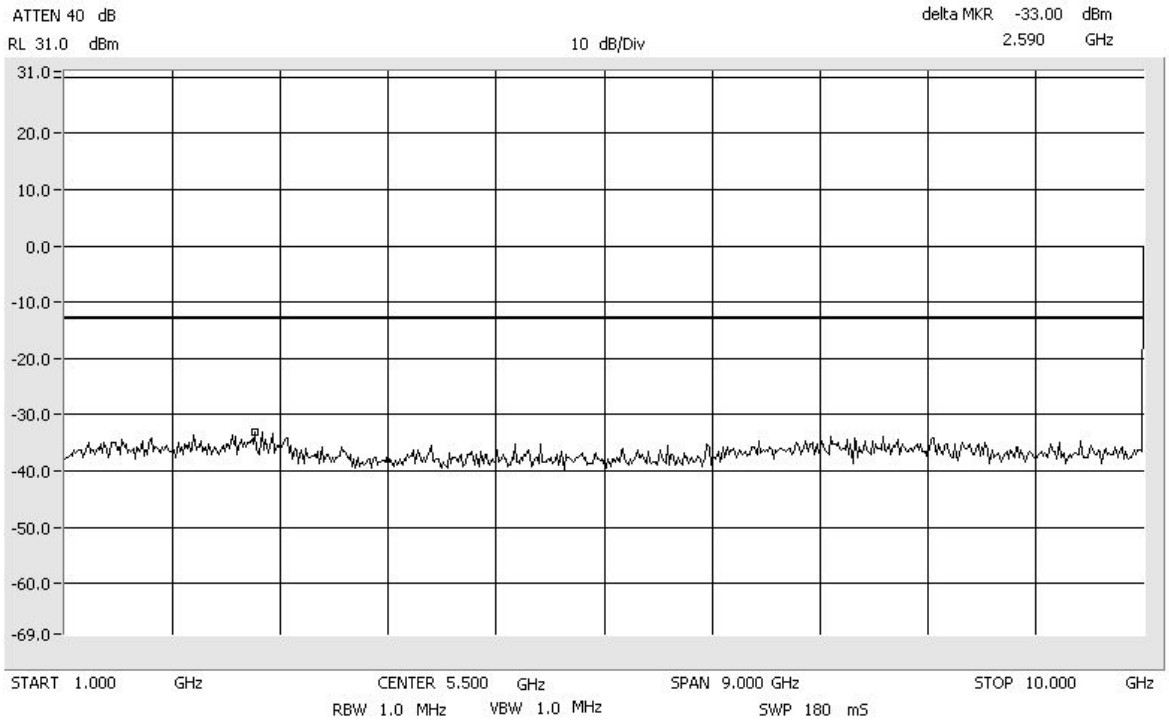
Conducted Emissions APCO25_CQPSK SMR_800_MHz
Center: 860 MHz Span: 5 MHz RBW/VBW: 100 kHz



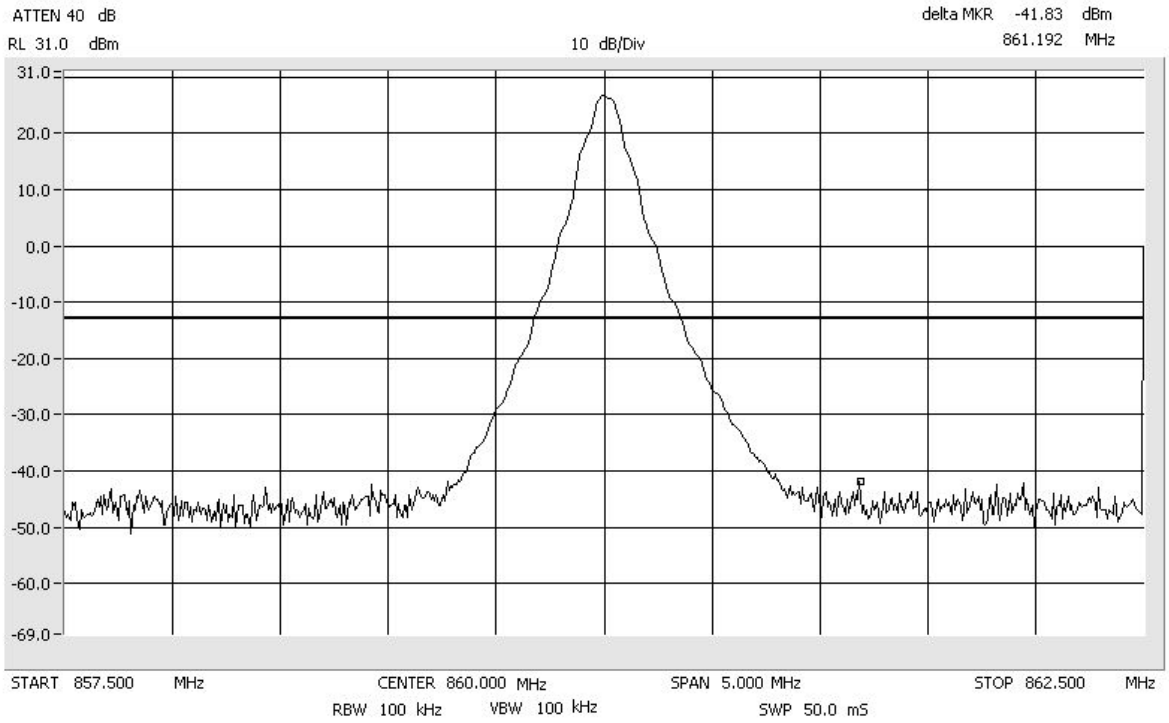
Conducted Emissions APCO25_CQPSK SMR_800_MHz
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



Conducted Emissions APCO25_CQPSK SMR_800_MHz
Span: 1 GHz to 10 GHz RBW/VBW: 1 MHz



Conducted Emissions FM SMR_800_MHz
Center: 860 MHz Span: 5 MHz RBW/VBW: 100 kHz



Conducted Emissions FM SMR_800_MHz
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz