



# Test Report Summary

## FCC CFR 47, Part 90

### Private Land Mobile Radio Service

**Manufacturer:** ADC Telecommunications

**Name of Equipment:** FlexWave™ URH – SMR

**Model Number(s):** FWU-D20000002110RU

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

**Test Report Number:** MN080325

**Test Date(s):** 19 March, 2008 (ETL)  
24 March, 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: 25 March, 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 12<sup>th</sup> 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:** MN080325    **Date of Issue:** 25 March, 2008

**Model Number(s):**                    FWU-D20000002110RU

**Product Name:**                      FlexWave™ URH – SMR

**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:**                3147567MIN-001  
**Reference(s)**

**Total pages including Appendices:**    69



## Table of Contents

1.0	Revision Description .....	4
2.0	Documentation .....	4
2.1	Test Regulations .....	4
2.2	Test Operation Mode .....	5
2.3	Configuration of the device under test: .....	5
2.4	Product Options: .....	5
2.5	EUT Specifications and Requirements: .....	5
2.6	Cables: .....	5
2.7	Power Requirements: .....	5
2.8	Typical Installation and/or Operating Environment: .....	5
2.9	Other Special Requirements: .....	5
2.10	EUT Software: .....	5
2.11	EUT System Components .....	6
2.12	Support Equipment.....	6
2.13	Deviations from standard: .....	6
2.14	General Remarks: .....	6
2.15	Summary: .....	6
3.0	<a href="#">Test set-Up drawings and Photos</a> .....	7
3.1	Test set-up photo, radiated emissions .....	7
3.2	Test set-up photo, radiated emissions .....	8
3.3	Test Set-up Drawings .....	9
4.0	Test Results .....	11
4.1.1	<a href="#">90.635 Limitations on power and antenna height</a> .....	11
4.1.2	<a href="#">90.213 Frequency stability</a> .....	12
4.1.3	<a href="#">90.669 Emission limits</a> .....	13
5.0	Test Equipment .....	14
6.0	<a href="#">Appendix A</a> .....	15
7.0	<a href="#">Appendix B</a> .....	54
8.0	<a href="#">Appendix C</a> .....	68



## 1.0 REVISION DESCRIPTION

Rev	Total Pages	Date	Description
A	69	25 March, 2008	Original Release

## 2.0 DOCUMENTATION

### 2.1 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**

Temperature: 22° C  
Relative Humidity: 23%  
Atmospheric Pressure: 98.8 kPa

##### **ETL**

15-35° C  
30-60%  
86-106 kPa

#### **Power Supply Utilized:**

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

## 2.2 Test Operation Mode

- Standby
- Test Program
- Practice Operation

### ■ Max composite in and out

## 2.3 Configuration of the device under test:

Normal Operation – SMR - 851 to 869 MHz

## 2.4 Product Options:

None

## 2.5 EUT Specifications and Requirements:

Length: 16.0"

Width: 17.0"

Height: 29.0"

Weight: 190 pounds

## 2.6 Cables:

Cable Type	Length	From	To
RF	> 3M	Ancillary Equip	EUT
RF	< 3M	EUT	50 Ohm Load
Power	< 3M	Power	Input Power
Fiber	> 3M	Ancillary Equip	EUT

## 2.7 Power Requirements:

Voltage: 120 VAC

Amps: 5.8 A

## 2.8 Typical Installation and/or Operating Environment:

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

## 2.9 Other Special Requirements:

None

## 2.10 EUT Software:

Revision Level: Version V.6 or greater

Description: Internet Explorer

### 2.11 EUT System Components

Description	Model #	Serial #	FCC ID #
URH	FWU-D20000002110RU	URH	

### 2.12 Support Equipment

Description	Manufacturer	Model #	FCC ID #
Power Meter	HP	EPM-441A	
Signal Generator	Agilent	E4438C	
Attenuator	Aeroflex	86-30-12	

### 2.13 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**

### 2.14 General Remarks:

None.

### 2.15 Summary:

The requirements according to the technical regulations are

■ **met**

- not Met

The equipment under test does

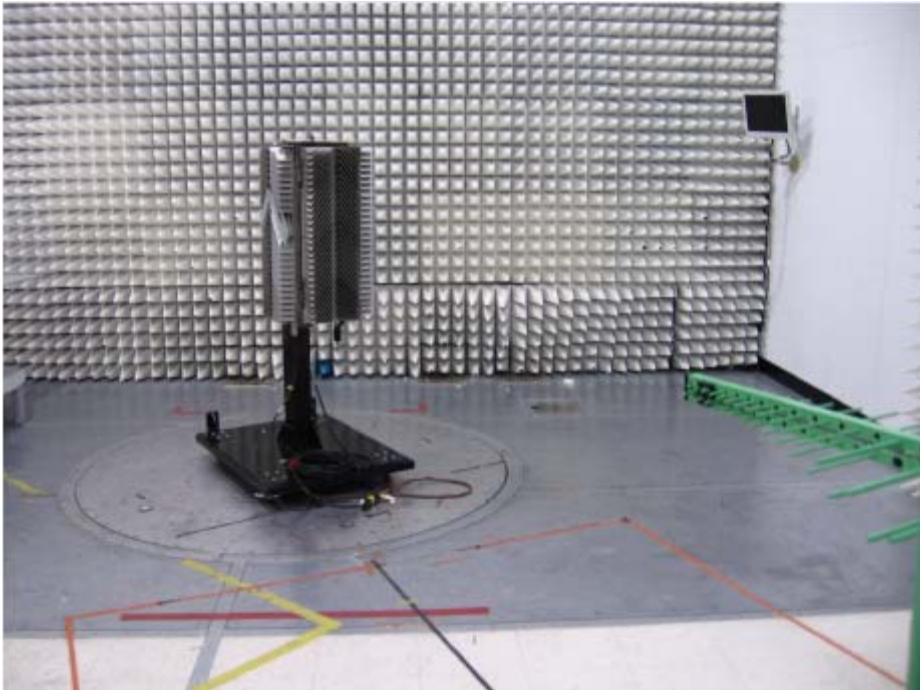
■ **fulfill the general approval requirements mentioned on page 4.**

- not fulfill the general approval requirements mentioned on page 4.

### 3.0 TEST SET-UP DRAWINGS AND PHOTOS

[Back to Table of Contents:](#)

#### 3.1 Test set-up photo, radiated emissions



### 3.2 Test set-up photo, radiated emissions





### 3.3 Test Set-up Drawings

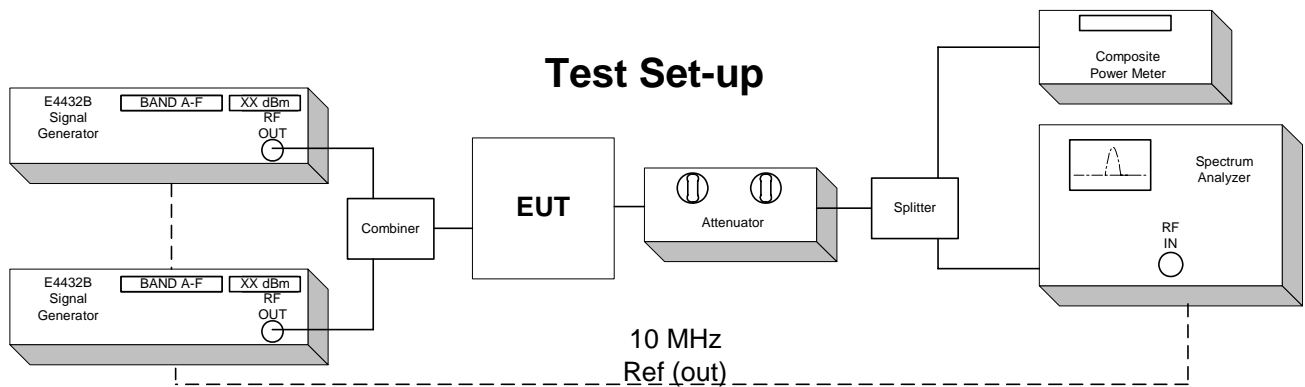
## Conducted and Radiated Emission Limits Test for ADC Inc

### Conducted Output Power Test for ADC Inc

### Inter-Modulation Test for ADC Inc

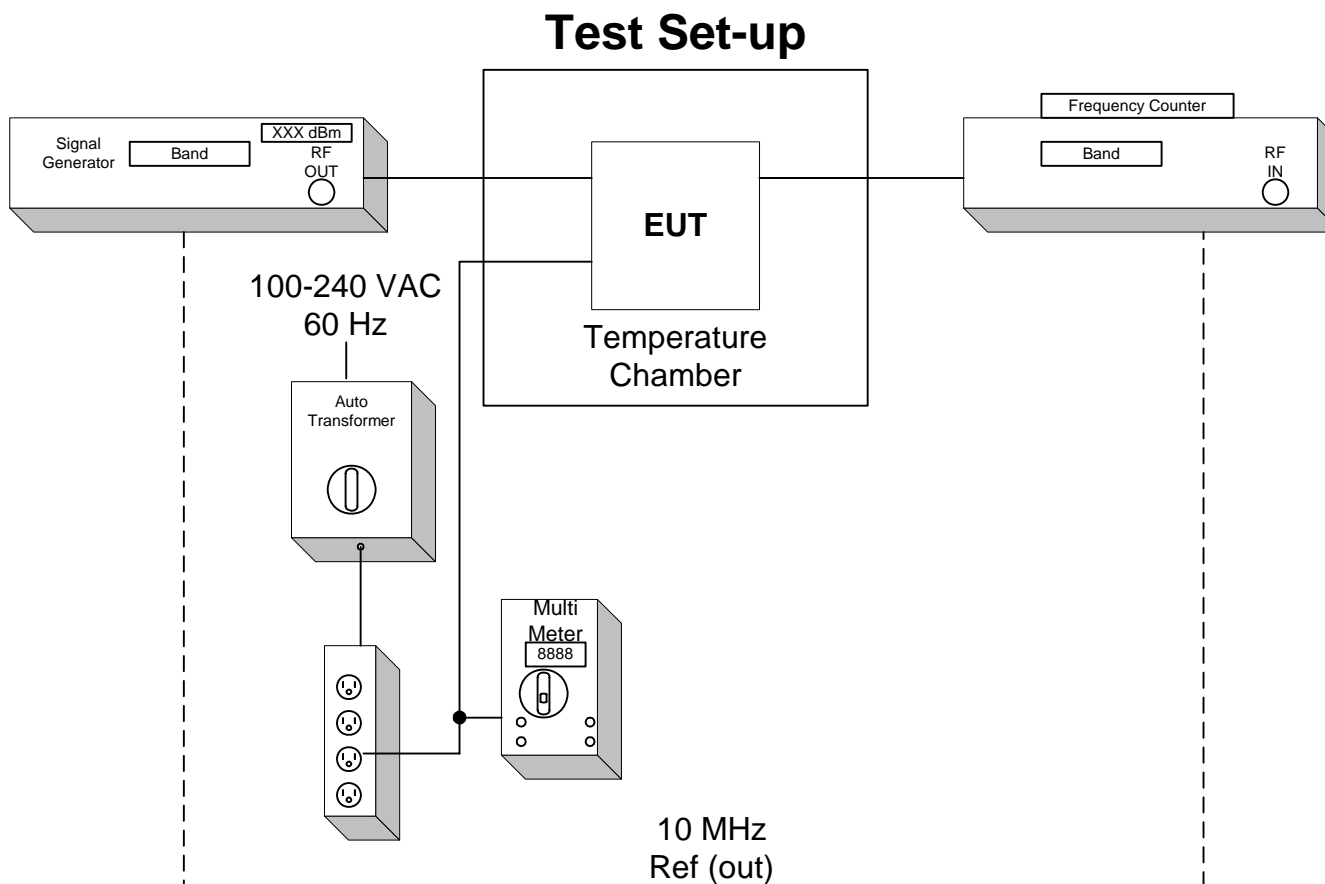
### Occupied Bandwidth Modulation Test for ADC Inc

## FlexWave™ URH – SMR Model Number FWU-D20000002110RU



# Frequency Tolerance Test for ADC Inc FlexWave™ URH – SMR Model Number FWU-D20000002110RU

EUT is specified for outdoor use with temperature range of -30° to +50° C, and was tested with its range.



## 4.0 TEST RESULTS

### 4.1.1 90.635 Limitations on power and antenna height

#### Test Summary:

- The requirements are:  **MET**  NOT MET
- Minimum margin of compliance is 16.31 dB at 868.8 MHz (FM)

#### 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:

[See page 29](#)

**Test Engineer:** Mark F. Miska

**Date:** 24 March, 2008

[Back to Table of Contents:](#)

#### 4.1.2 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 –30 to 50° 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 .....	<sup>1,2,3</sup> 100	100	200
25–50 .....	20	20	50
72–76 .....	5	.....	50
150–174 .....	<sup>5,11</sup> 5	<sup>6</sup> 5	<sup>4,6</sup> 50
220–222 <sup>12</sup> .....	0.1	1.5	1.5
421–512 .....	<sup>7,11,14</sup> 2.5	<sup>8</sup> 5	<sup>8</sup> 5
806–821 .....	<sup>14</sup> 1.5	2.5	2.5
821–824 .....	<sup>14</sup> 1.0	1.5	1.5
851–866 .....	1.5	2.5	2.5
866–869 .....	1.0	1.5	1.5
896–901 .....	<sup>14</sup> 0.1	1.5	1.5
902–928 .....	2.5	2.5	2.5
902–928 <sup>13</sup> .....	2.5	2.5	2.5
929–930 .....	1.5	.....	.....
935–940 .....	0.1	1.5	1.5
1427–1435 .....	<sup>9</sup> 300	300	300
Above 2450 <sup>10</sup> .....	.....	.....	.....

##### Test Data:

[See pages 53](#)

**Test Engineer:** Mark F. Miska

**Date:** 24 March, 2008

[Back to Table of Contents:](#)

#### 4.1.3 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  $43 + 10\log(P)$  dB, or  $-13$  dBm.

Outside of the carrier emissions bandwidth:

26 dB below the transmitter power

##### **Test Data:**

[Conducted Emissions](#), pages 16 – 28

[Intermodulation Test](#), pages 30 – 48

[Occupied Bandwidth](#), pages 49 – 52

Radiated Emissions, pages 54 – 67 ([Appendix B](#))

**Test Engineer:** Mark F. Miska

**Date:** 24 March, 2008

**Date:** 24 March, 2008

**Date:** 24 March, 2008

[Back to Table of Contents:](#)

## 5.0 TEST EQUIPMENT

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

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

6.0

## APPENDIX A

Test Data

[Back to Table of Contents:](#)

**Test Engineer:** Mark F. Miska

# Conducted Emission Limits Test for ADC Inc

## FlexWave™ URH - SMR

### Model Number FWU-D20000002110RU

[Back](#)

The out of band emissions were measured directly from the EUT antenna output with a spectrum analyzer from 30 MHz to the 10<sup>th</sup> harmonic of the highest carrier frequency. Test signals used are FM, iDEN, and CDMA. 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  
(19dBm - [43 + 10log(0.08W)])

Band edge compliance is also demonstrated using a FM, iDEN, and CDMA signal at the upper and lower limits of the band.

The Host unit connects directly to the BTS via coax. The Host unit does not connect to an antenna or amplifier, thus it is a Part 15 device and has been tested and is compliant as such. No FCC ID is necessary.

Industry practice has generally set the input signal power level. Test signal used was  $\approx$  -25 dBm input to DHU.  
Industry practice has generally set the output signal power level.

Universal Radio Head (URH):

Range: 100 - 240 VAC

Tested @: 120 VAC

Tested @: 5.8 A

Digital Host Unit (DHU):

Range: 21-60 VDC

Tested @: 48 VDC

Tested @: 4.55 A

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

The input to the host unit has a digital attenuation chip (ALC) to provide protection from overdrive with 5-10 millisecond attack time / 100 millisecond decay time and 31 dB of head room, such that single channel operation, or multi-channel operation will not exceed nominal gain of the system.

The frequency stability is derived by the BTS, base transceiver station. This product uses internal frequency stability to keep the signal inside our filter bandwidths. This means that the frequency can change, but the frequency that transmits is still at the original frequency. The remote system uses the data over the fiber optic path to phase/frequency lock to the host. The purpose is to frequency lock the up- and down-conversion local oscillators, and thereby eliminate any end-to-end frequency shift.

The spurious limitation is completed with the duplexer. The ALC also suppresses in-band spurious by preventing PA overdrive, while the duplexer suppresses out-of-band spurious. Internal to the electronics, the use of SAW filters provides for higher Q roll-off at band edges.

This equipment does not modulate the RF, so there is no modulation limiter. This equipment does not change the modulation of the RF or the occupied bandwidth of any channel. It transports the signal, as is, over an optical link. The RF input is not changed in the RF output.

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

Results:

Pass (See plots)



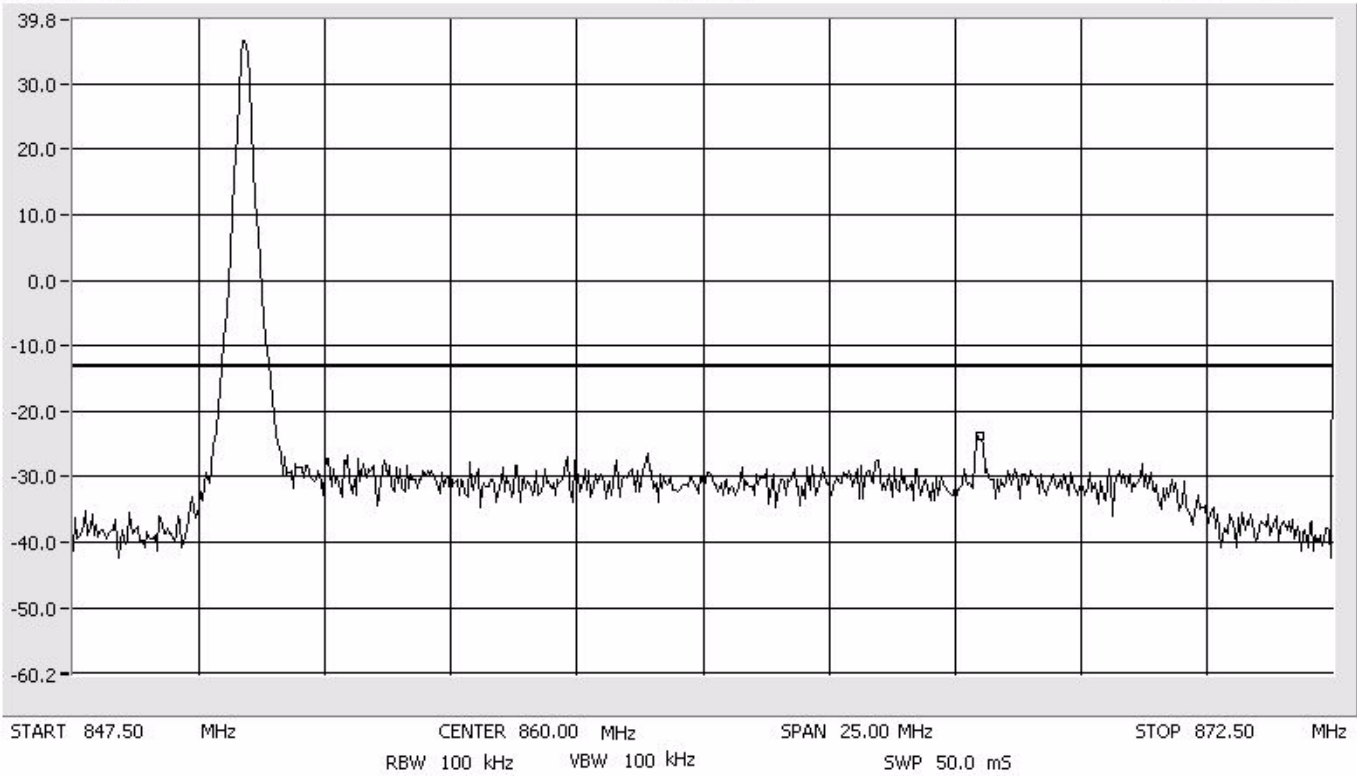
# Conducted Emissions Low SMR 800 MHz

Center: 860.0 MHz  
Span: 25 MHz  
RBW/VBW: 100 kHz

ATTEN 20 dB  
RL 39.8 dBm

delta MKR -23.70 dBm  
865.50 MHz

10 dB/Div



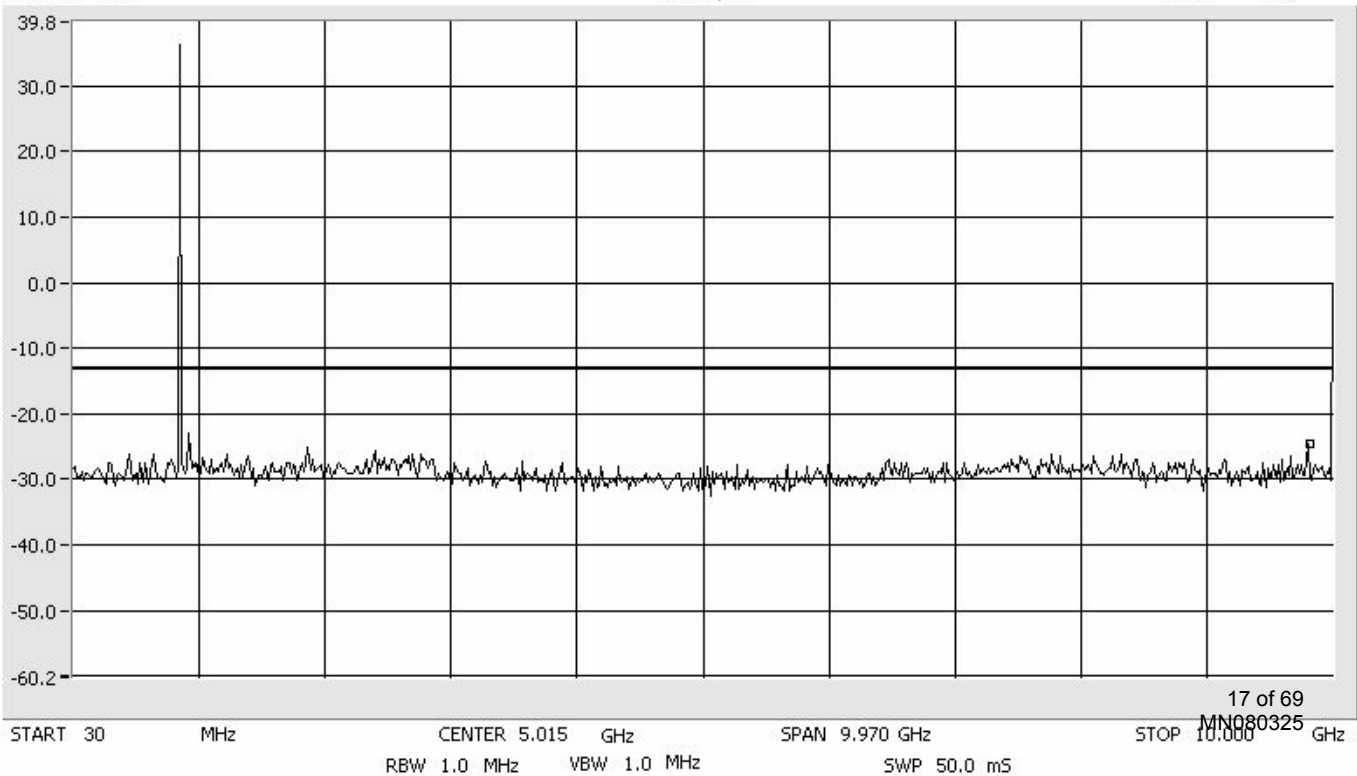
# Conducted Emissions Low SMR 800 MHz

Span: 30 MHz to 10 GHz  
RBW/VBW: 1 MHz

ATTEN 20 dB  
RL 39.8 dBm

delta MKR -24.53 dBm  
9.817 GHz

10 dB/Div



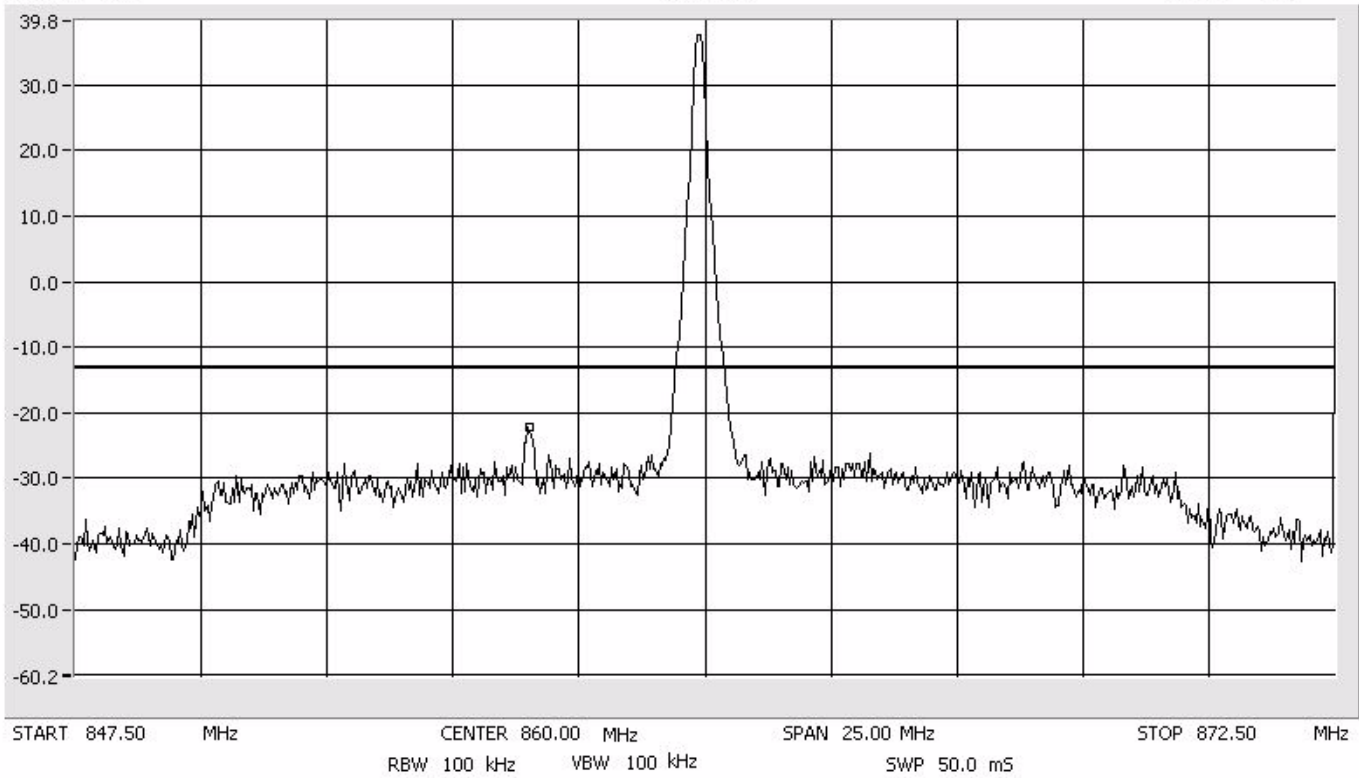
# Conducted Emissions Mid SMR 800 MHz

Center: 860.0 MHz  
Span: 25 MHz  
RBW/VBW: 100 kHz

ATTEN 20 dB  
RL 39.8 dBm

delta MKR -22.20 dBm  
856.50 MHz

10 dB/Div



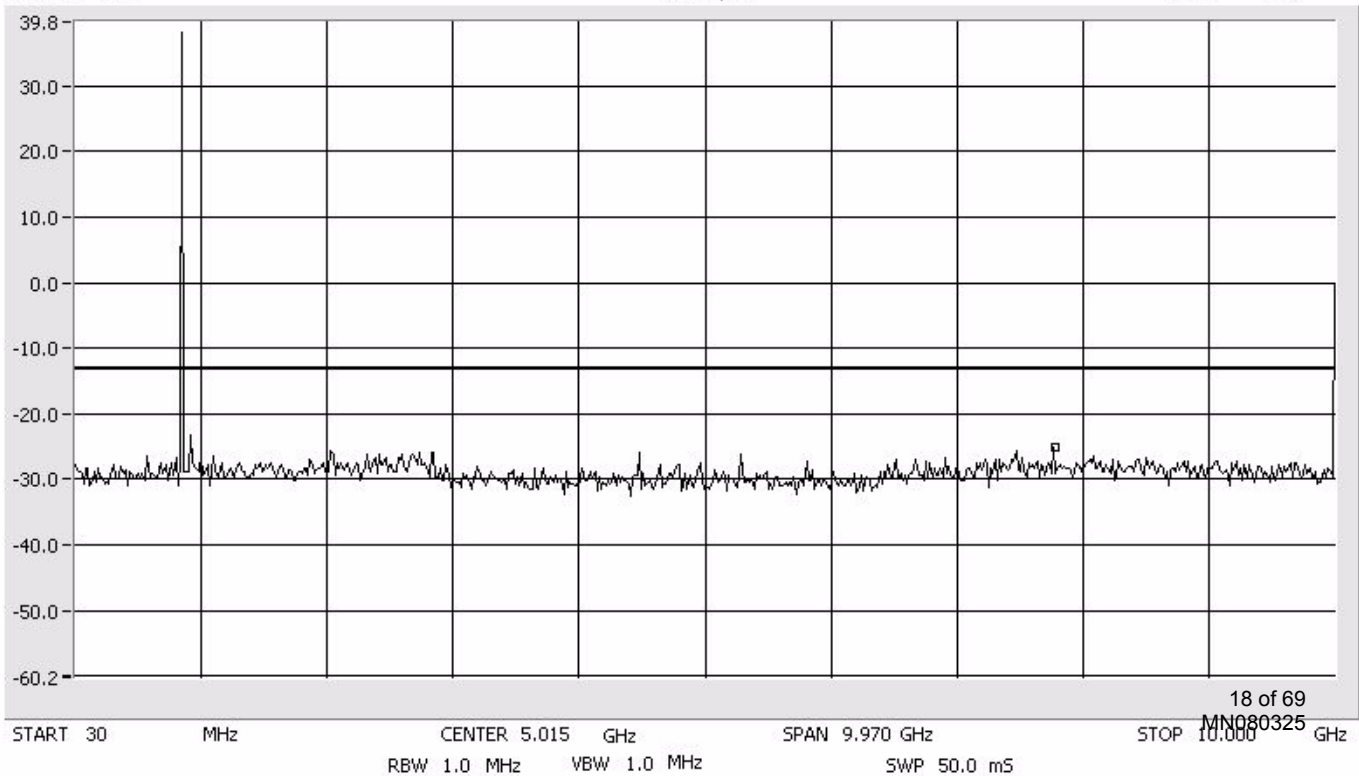
# Conducted Emissions Mid SMR 800 MHz

Span: 30 MHz to 10 GHz  
RBW/VBW: 1 MHz

ATTEN 20 dB  
RL 39.8 dBm

delta MKR -25.03 dBm  
7.790 GHz

10 dB/Div



# Conducted Emissions High SMR 800 MHz

Center: 860.0 MHz  
Span: 25 MHz  
RBW/VBW: 100 kHz

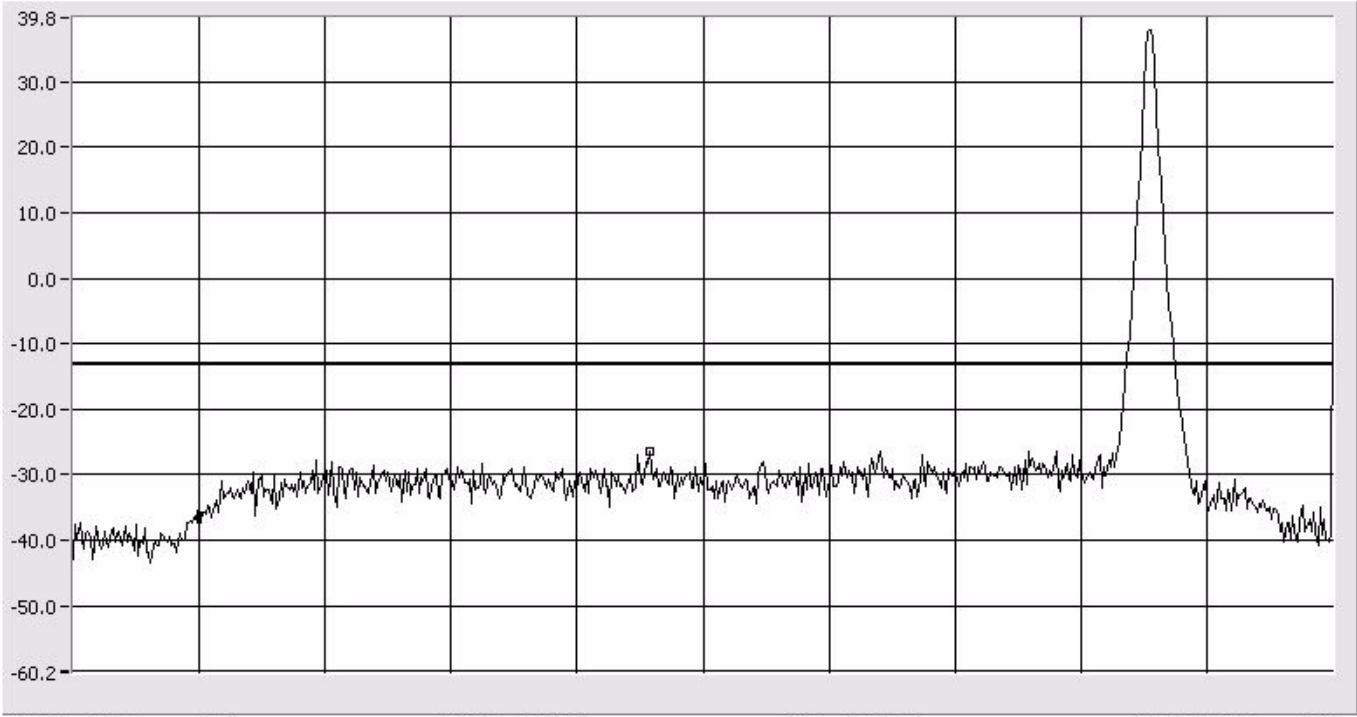
ATTEN 20 dB

delta MKR -26.37 dBm

RL 39.8 dBm

10 dB/Div

858.96 MHz



START 847.50 MHz CENTER 860.00 MHz SPAN 25.00 MHz STOP 872.50 MHz  
RBW 100 kHz VBW 100 kHz SWP 50.0 mS

# Conducted Emissions High SMR 800 MHz

Span: 30 MHz to 10 GHz  
RBW/VBW: 1 MHz

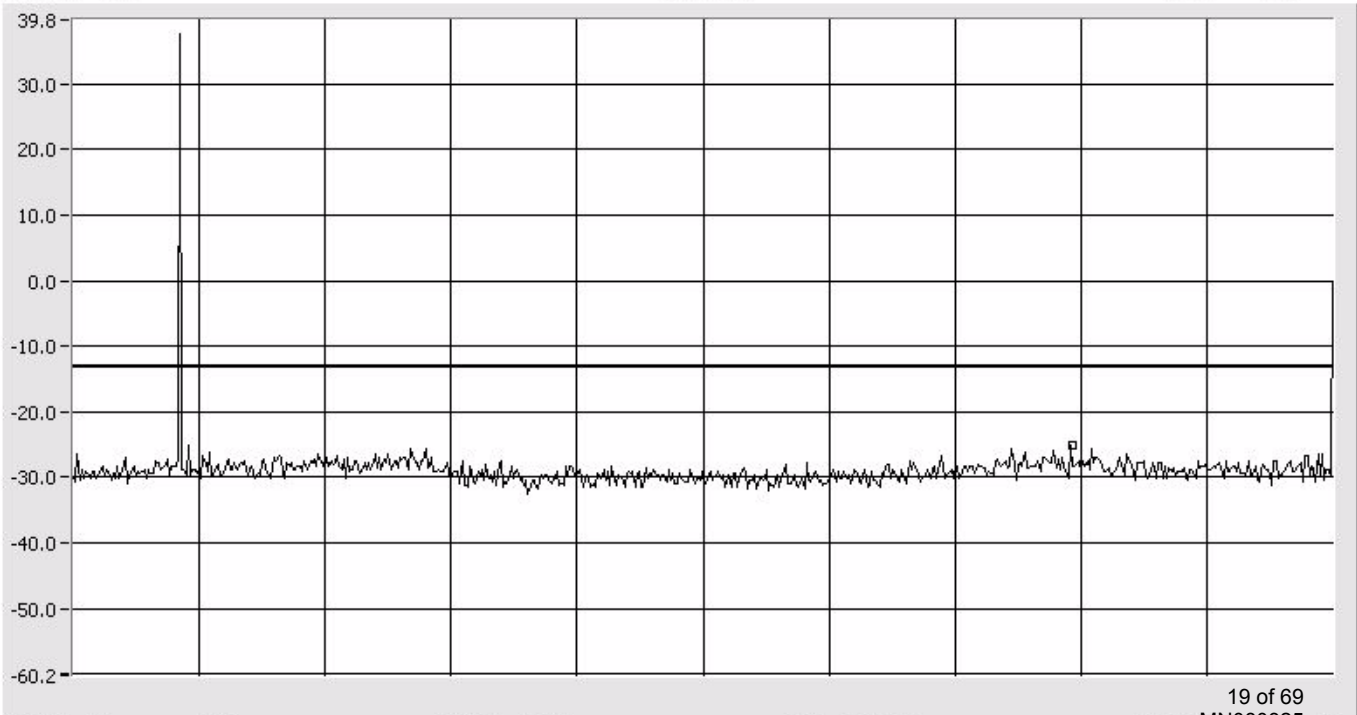
ATTEN 20 dB

delta MKR -25.20 dBm

RL 39.8 dBm

10 dB/Div

7.940 GHz



START 30 MHz CENTER 5.015 GHz SPAN 9.970 GHz STOP 10.000 GHz  
RBW 1.0 MHz VBW 1.0 MHz SWP 50.0 mS

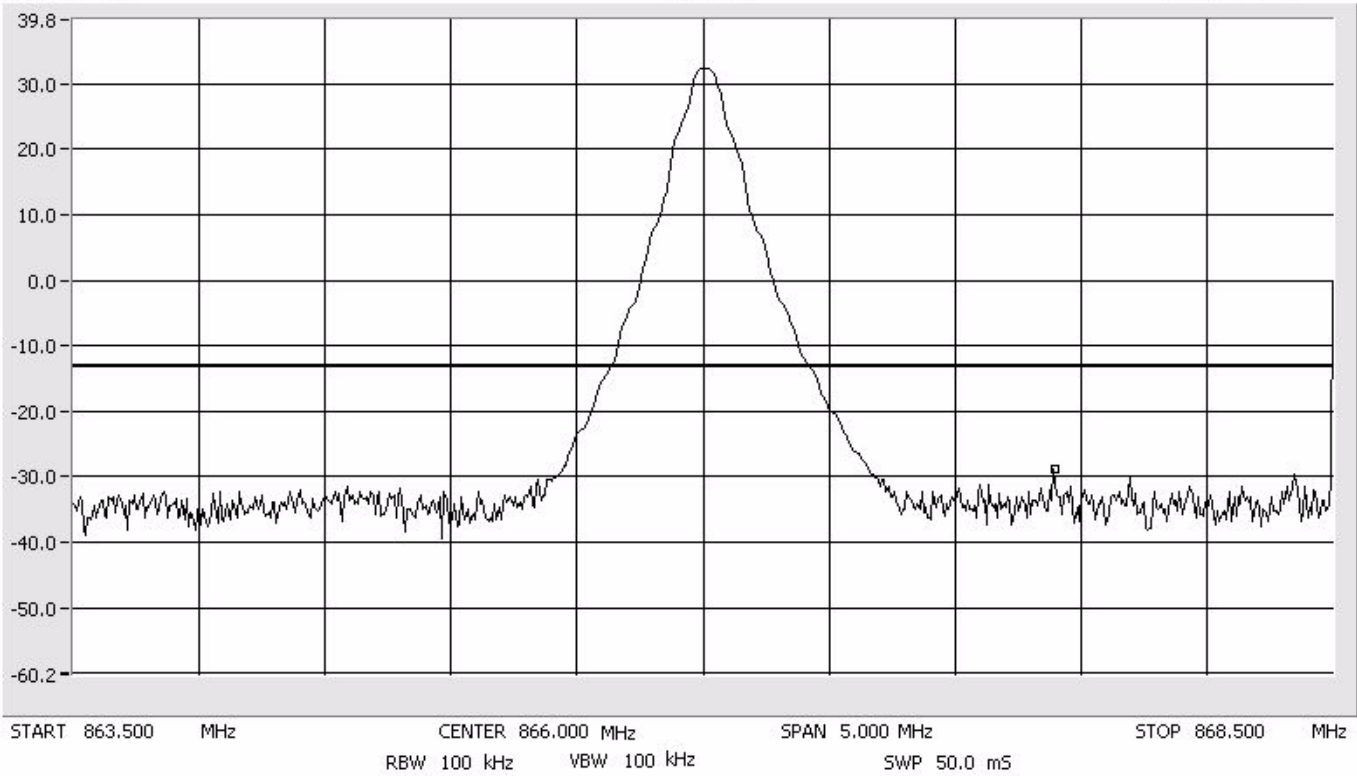
# Conducted Emissions FM SMR 800 MHz

Midband  
Span: 5 MHz  
RBW/VBW: 100 kHz

ATTEN 20 dB  
RL 39.8 dBm

delta MKR -28.70 dBm  
867.400 MHz

10 dB/Div



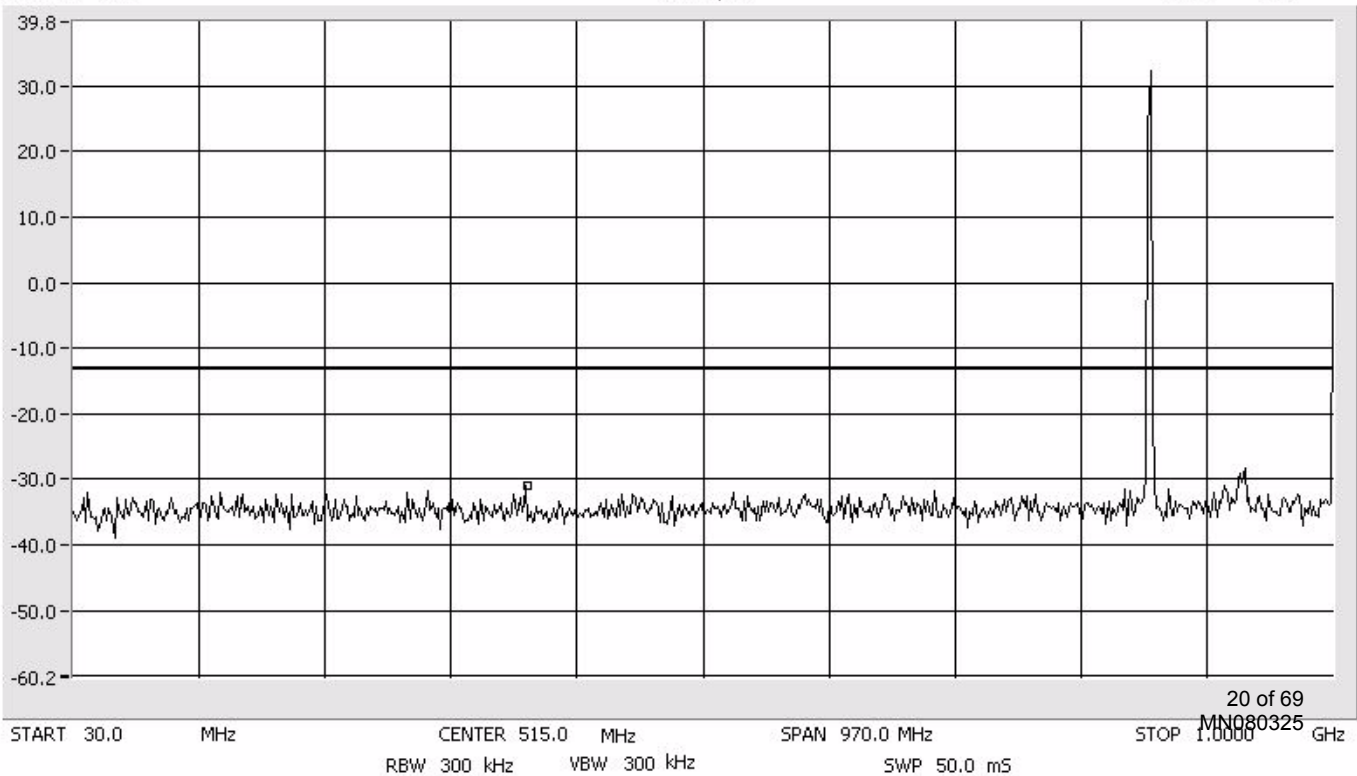
# Conducted Emissions FM SMR 800 MHz

Span: 30 MHz to 1 GHz  
RBW/VBW: 300 kHz

ATTEN 20 dB  
RL 39.8 dBm

delta MKR -31.03 dBm  
379.2 MHz

10 dB/Div



# Conducted Emissions FM SMR 800 MHz

1 GHz to 10 GHz  
RBW/VBW: 1 MHz

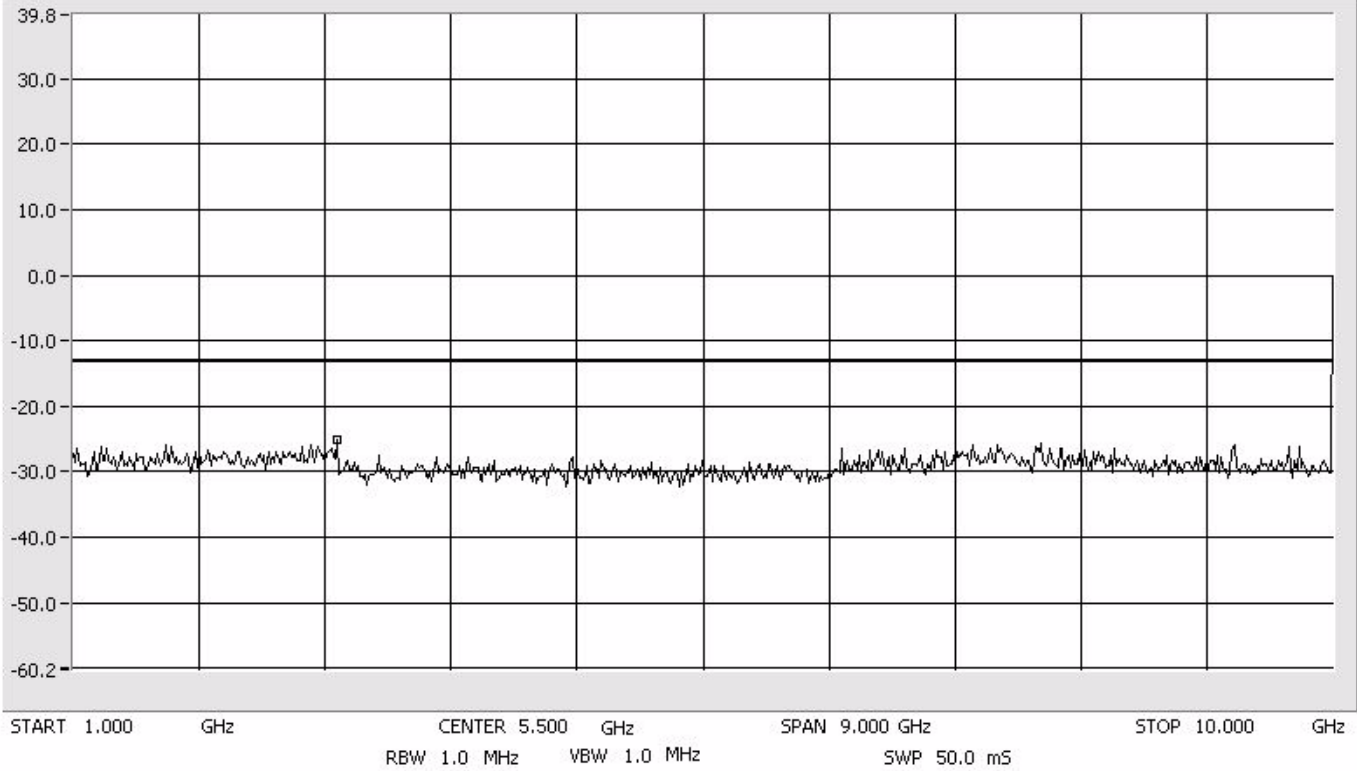
ATTEN 20 dB

delta MKR -25.03 dBm

RL 39.8 dBm

10 dB/Div

2.890 GHz



# Conducted Emissions iDEN SMR 800 MHz

Midband  
Span: 5 MHz  
RBW/VBW: 100 kHz

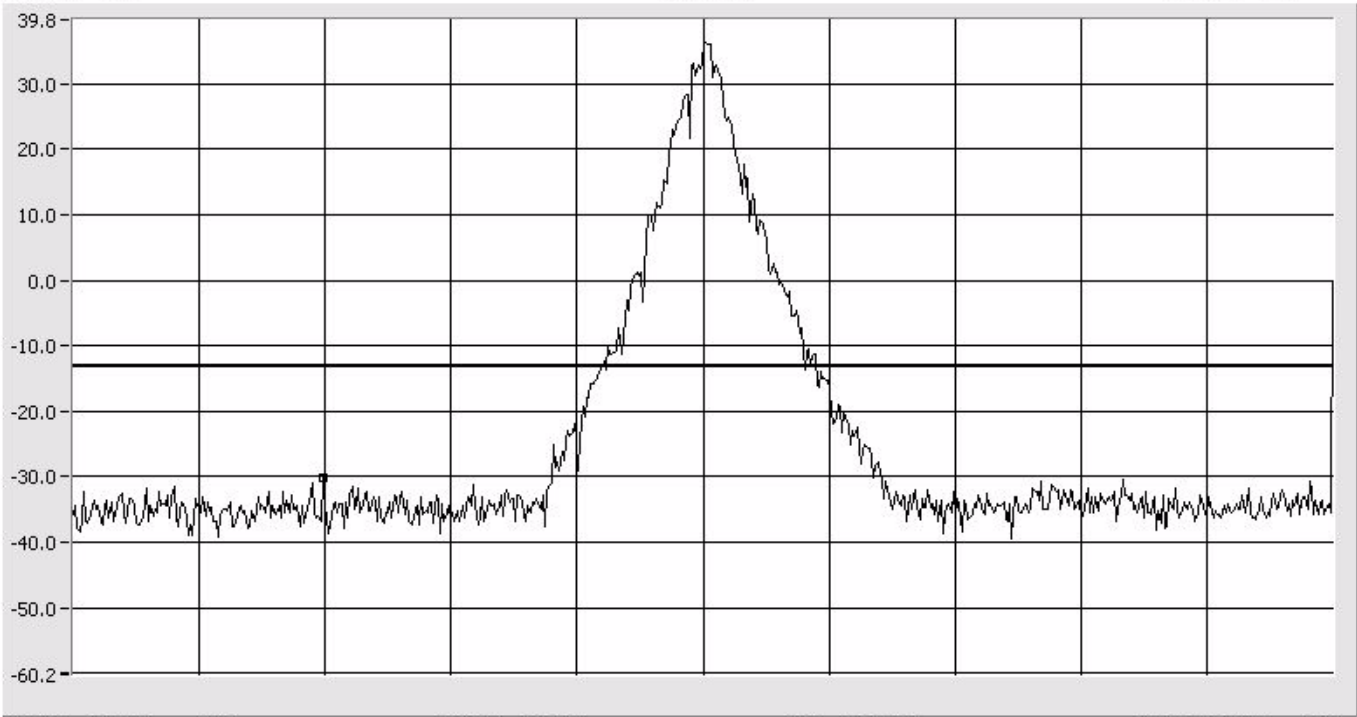
ATTEN 20 dB

delta MKR -30.03 dBm

RL 39.8 dBm

10 dB/Div

864.492 MHz



START 863.500 MHz CENTER 866.000 MHz SPAN 5.000 MHz STOP 868.500 MHz  
RBW 100 kHz VBW 100 kHz SWP 50.0 mS

# Conducted Emissions iDEN SMR 800 MHz

Span: 30 MHz to 1 GHz  
RBW/VBW: 300 kHz

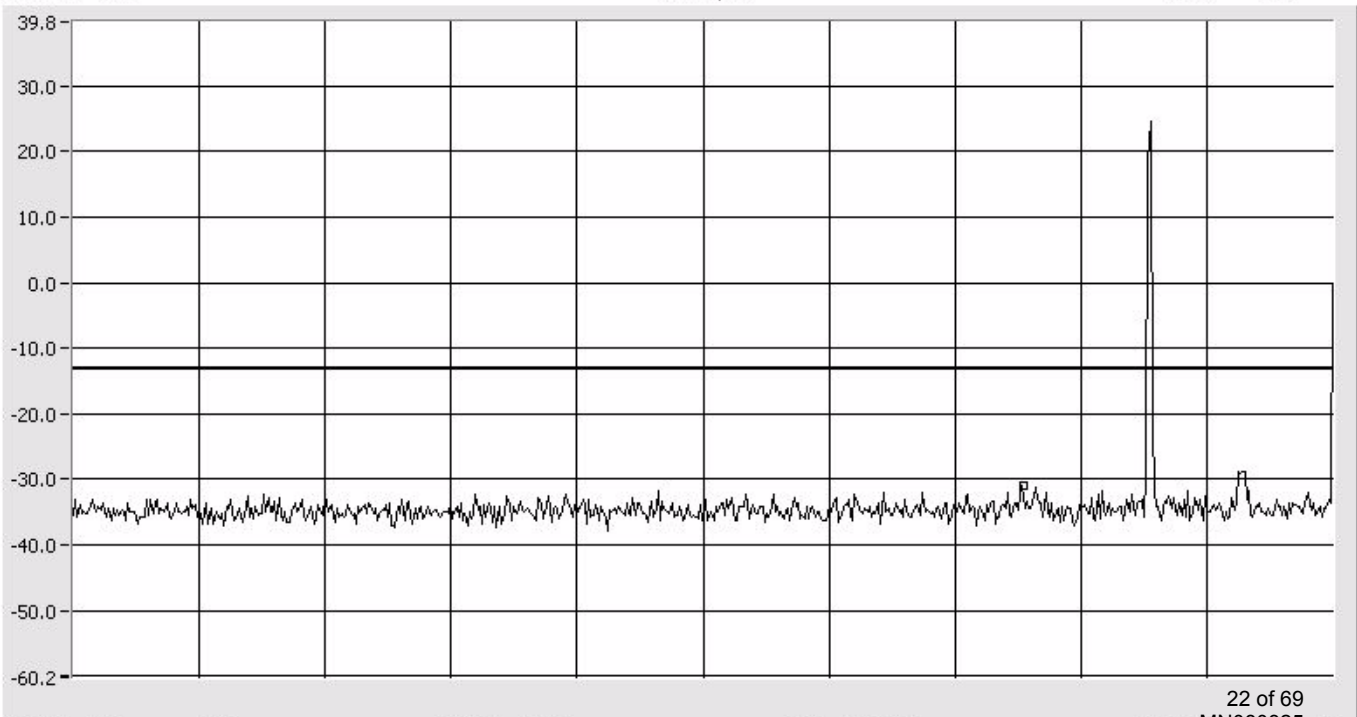
ATTEN 20 dB

delta MKR -31.03 dBm

RL 39.8 dBm

10 dB/Div

762.4 MHz



START 30.0 MHz CENTER 515.0 MHz SPAN 970.0 MHz STOP 1,000.0 GHz  
RBW 300 kHz VBW 300 kHz SWP 50.0 mS

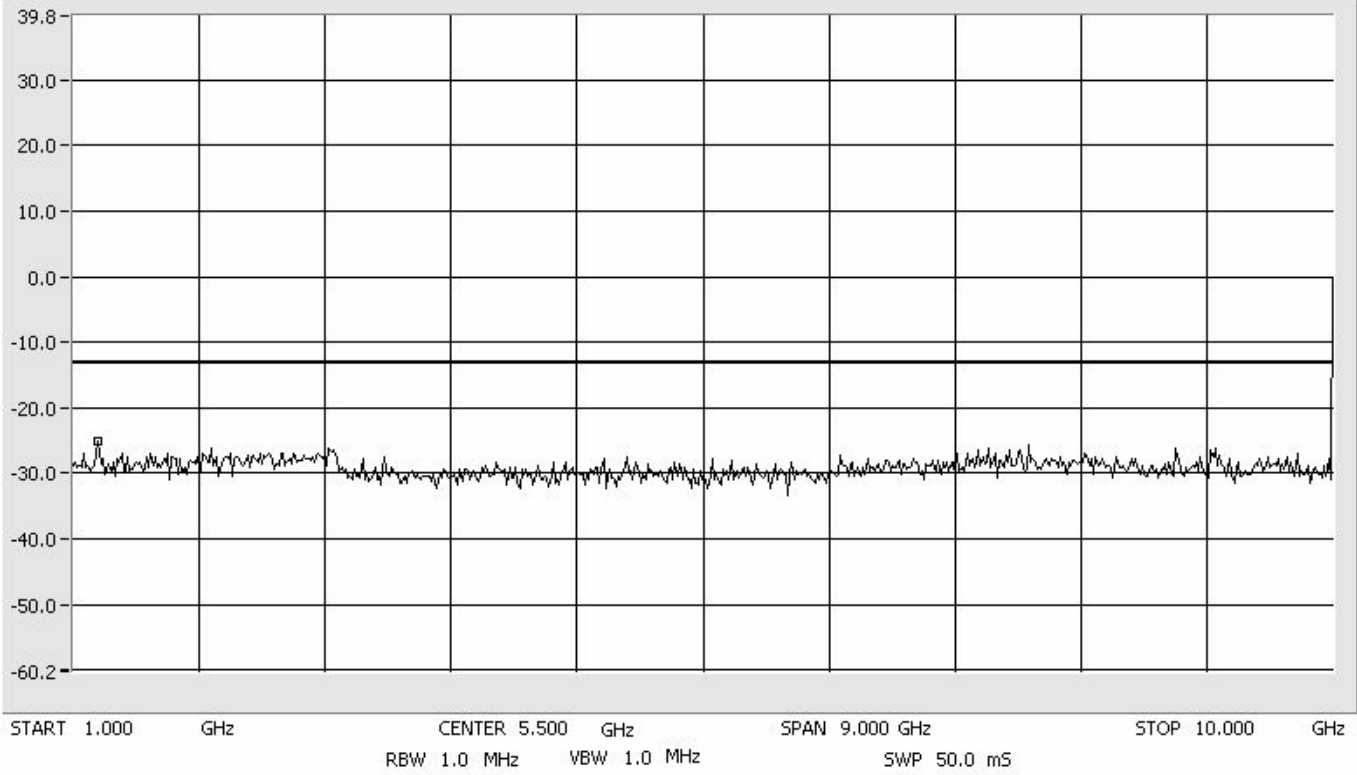
# Conducted Emissions iDEN SMR 800 MHz

1 GHz to 10 GHz  
RBW/VBW: 1 MHz

ATTEN 20 dB  
RL 39.8 dBm

10 dB/Div

delta MKR -25.20 dBm  
1.180 GHz



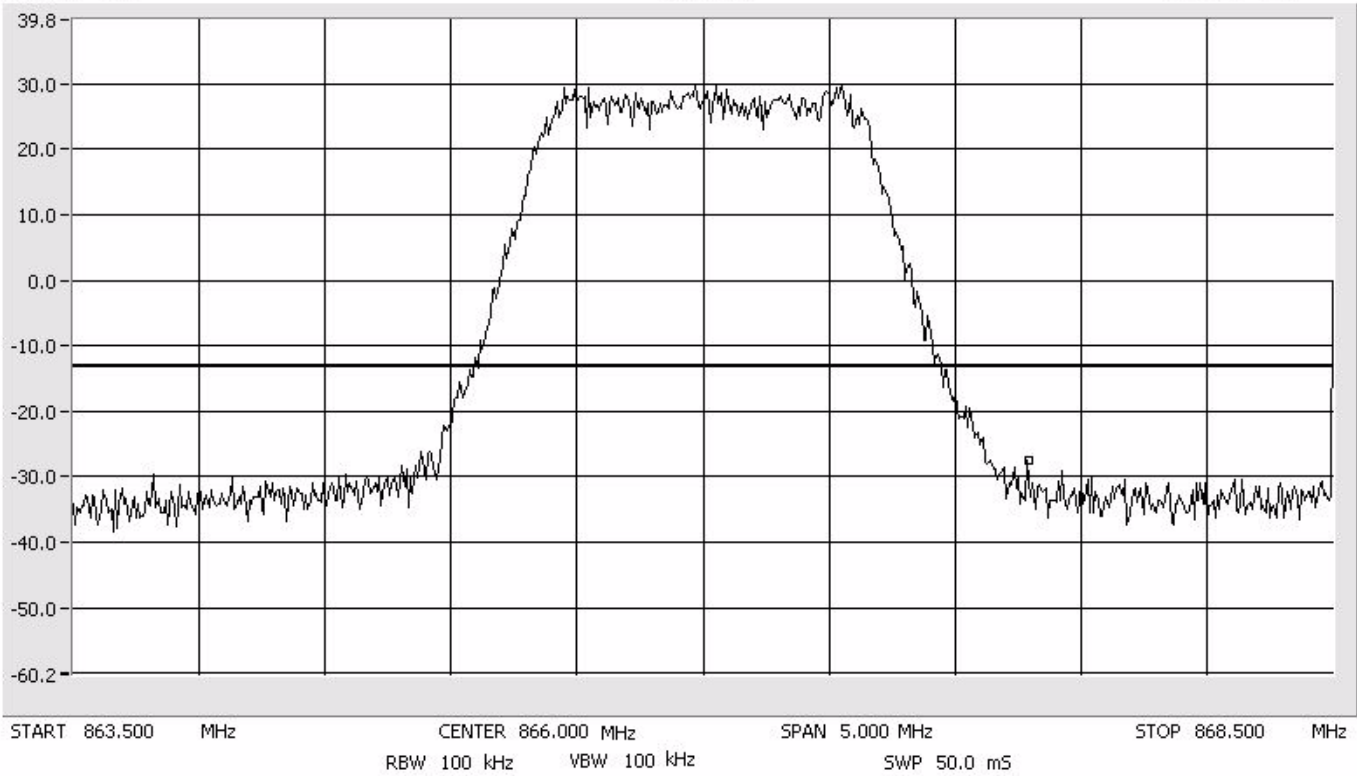
# Conducted Emissions CDMA SMR 800 MHz

Midband  
Span: 5 MHz  
RBW/VBW: 100 kHz

ATTEN 20 dB  
RL 39.8 dBm

delta MKR -27.37 dBm  
867.292 MHz

10 dB/Div



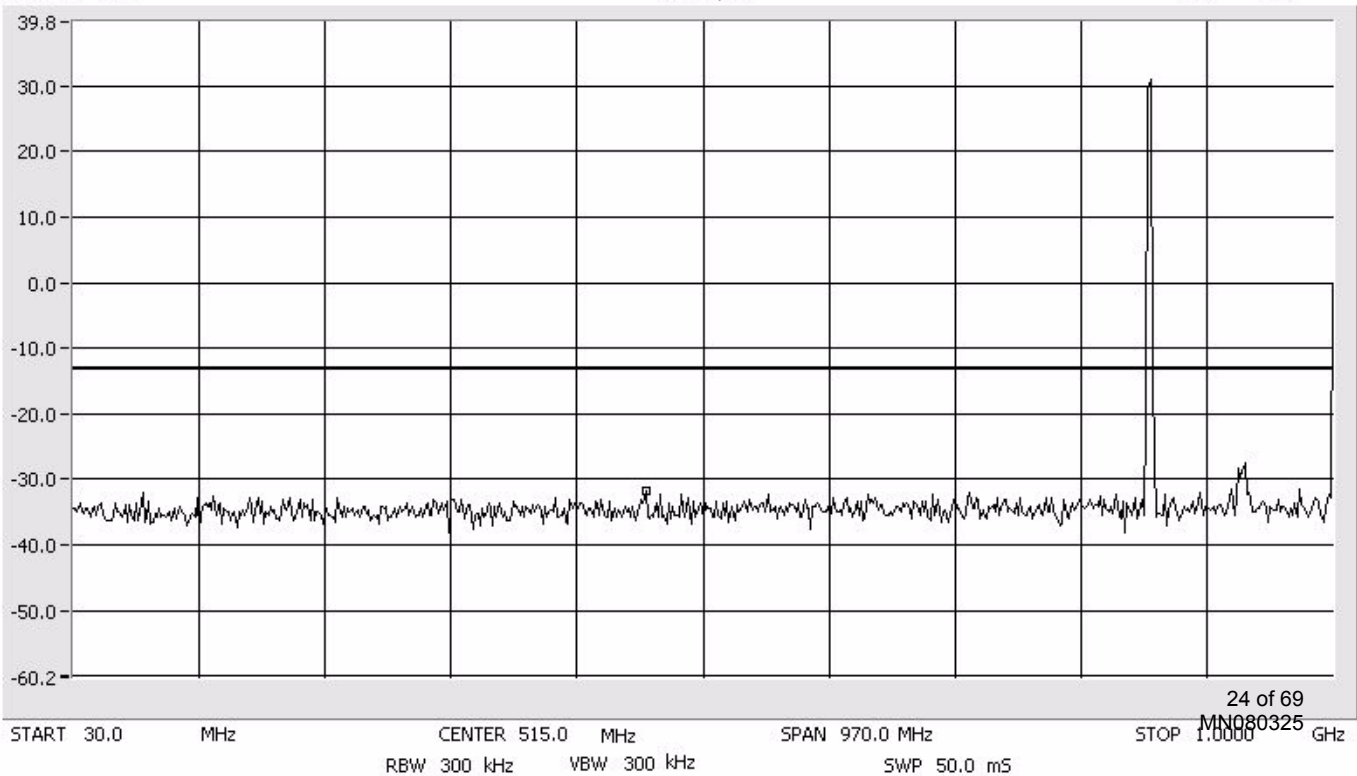
# Conducted Emissions CDMA SMR 800 MHz

Span: 30 MHz to 1 GHz  
RBW/VBW: 300 kHz

ATTEN 20 dB  
RL 39.8 dBm

delta MKR -31.87 dBm  
471.4 MHz

10 dB/Div





# Conducted Emissions CDMA SMR 800 MHz

1 GHz to 10 GHz  
RBW/VBW: 1 MHz

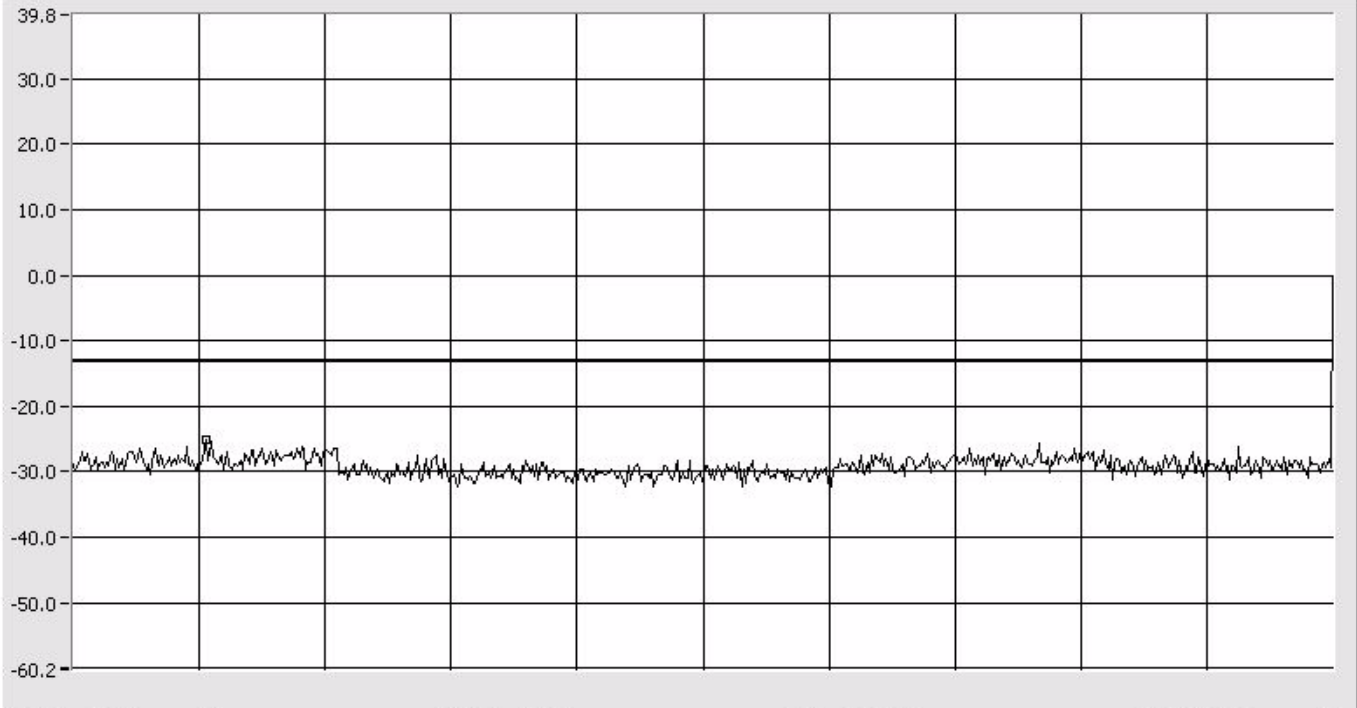
ATTEN 20 dB

delta MKR -25.20 dBm

RL 39.8 dBm

10 dB/Div

1.945 GHz



START 1.000 GHz      CENTER 5.500 GHz      SPAN 9.000 GHz      STOP 10.000 GHz  
RBW 1.0 MHz      VBW 1.0 MHz      SWP 50.0 mS

# Band Edge FM

Center: 851.04 MHz  
Span: 200 kHz  
RBW: 300 Hz  
VBW: 1 kHz

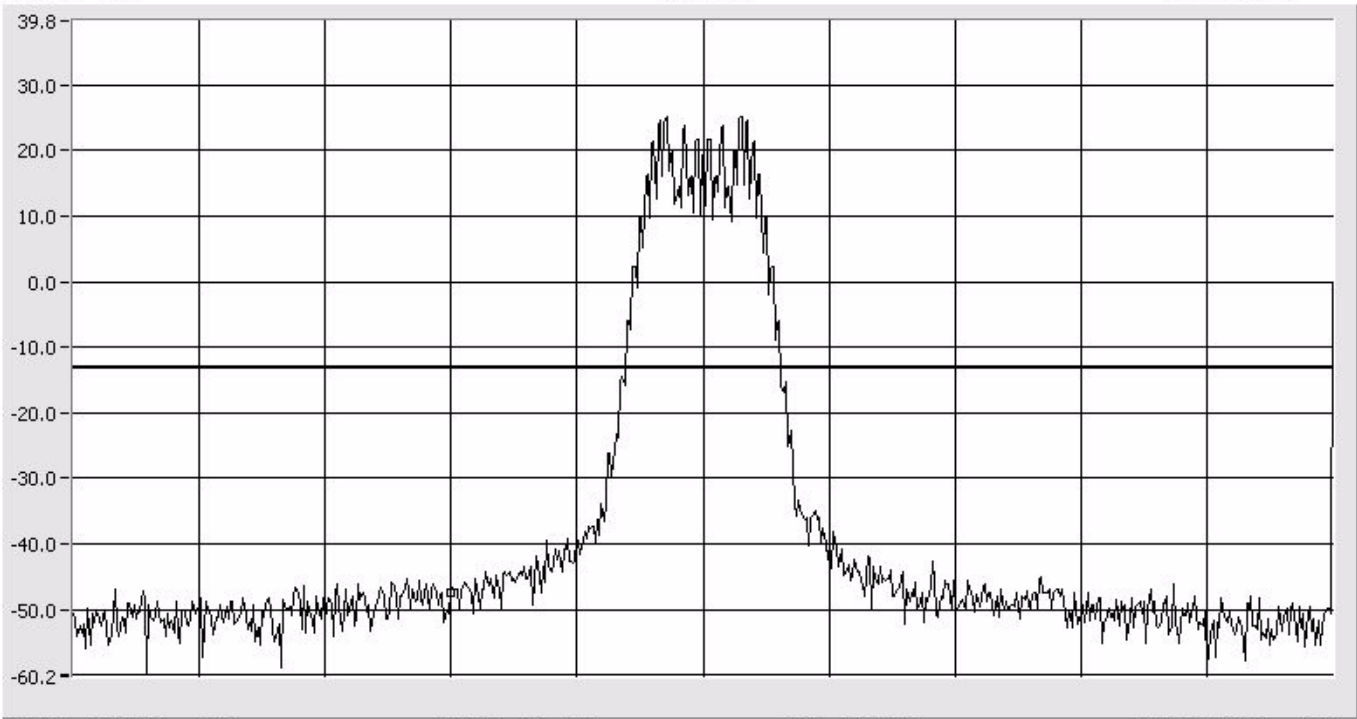
ATTEN 20 dB

delta MKR -47.53 dBm

RL 39.8 dBm

10 dB/Div

851.0000 MHz



START 850.9400 MHz CENTER 851.0400MHz SPAN 200.0 kHz STOP 851.1400 MHz  
RBW 300 Hz VBW 1.0 kHz SWP 5.60 Sec

# Band Edge FM

Center: 868.92 MHz  
Span: 200 kHz  
RBW: 300 Hz  
VBW: 1 kHz

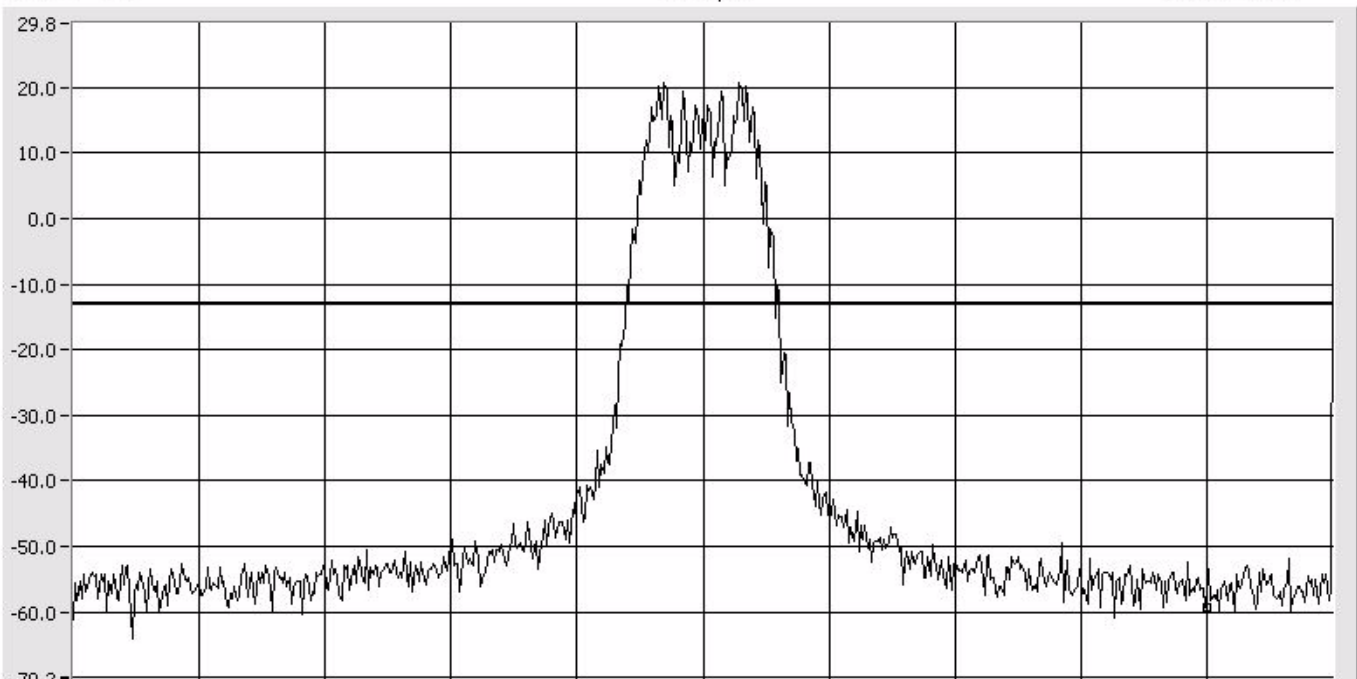
ATTEN 10 dB

delta MKR -59.20 dBm

RL 29.8 dBm

10 dB/Div

869.0000 MHz



START 868.8200 MHz CENTER 868.9200MHz SPAN 200.0 kHz STOP 869.0200 MHz  
RBW 300 Hz VBW 1.0 kHz SWP 5.60 Sec

26 of 69  
MN080325

# Band Edge iDEN

Center: 851.04  
Span: 200 kHz  
RBW: 300 Hz  
VBW: 1 kHz

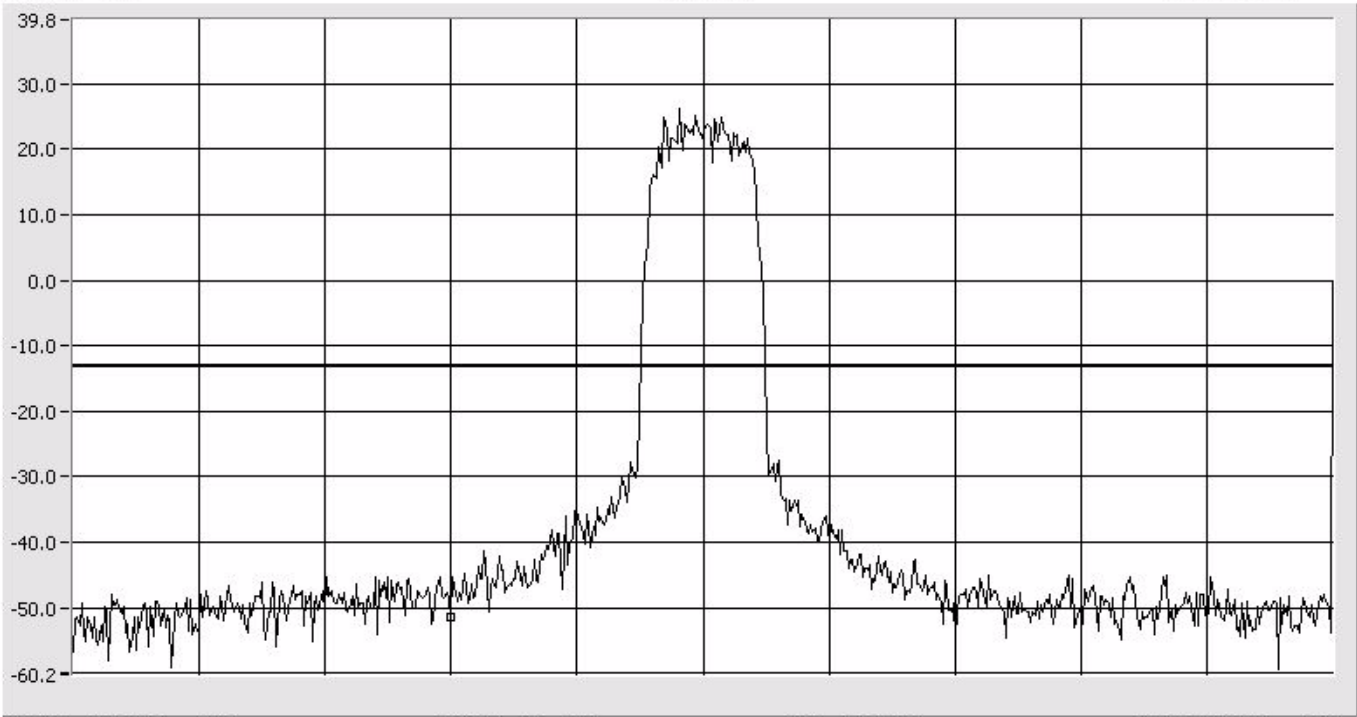
ATTEN 20 dB

delta MKR -51.37 dBm

RL 39.8 dBm

10 dB/Div

851.0000 MHz



START 850.9400 MHz

CENTER 851.0400MHz

SPAN 200.0 kHz

STOP 851.1400 MHz

RBW 300 Hz

VBW 1.0 kHz

SWP 5.60 Sec

# Band Edge iDEN

Center: 868.92 MHz  
Span: 200 kHz  
RBW: 300 Hz  
VBW: 1 kHz

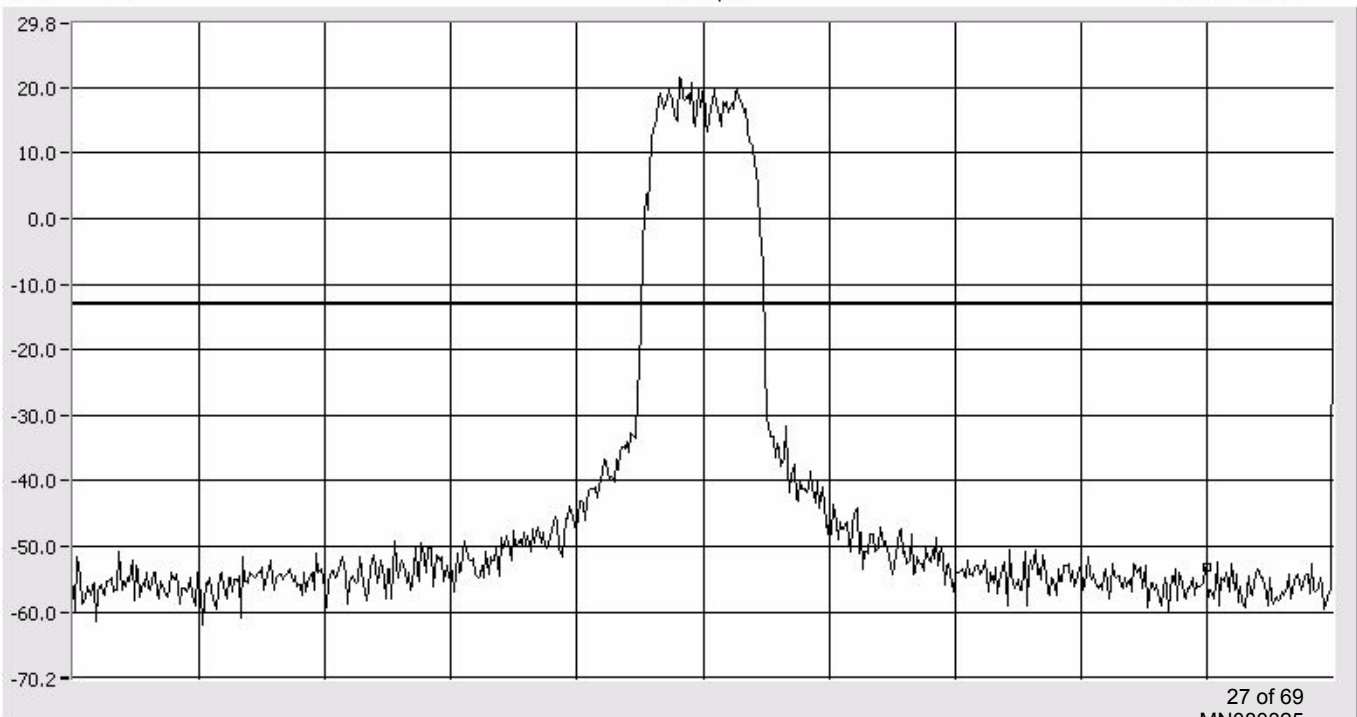
ATTEN 10 dB

delta MKR -53.20 dBm

RL 29.8 dBm

10 dB/Div

869.0000 MHz



START 868.8200 MHz

CENTER 868.9200MHz

SPAN 200.0 kHz

STOP 869.0200 MHz

RBW 300 Hz

VBW 1.0 kHz

SWP 5.60 Sec

27 of 69

MN080325

# Band Edge CDMA

Center: 851.73  
Span: 2 MHz  
RBW: 10 kHz  
VBW: 10 kHz

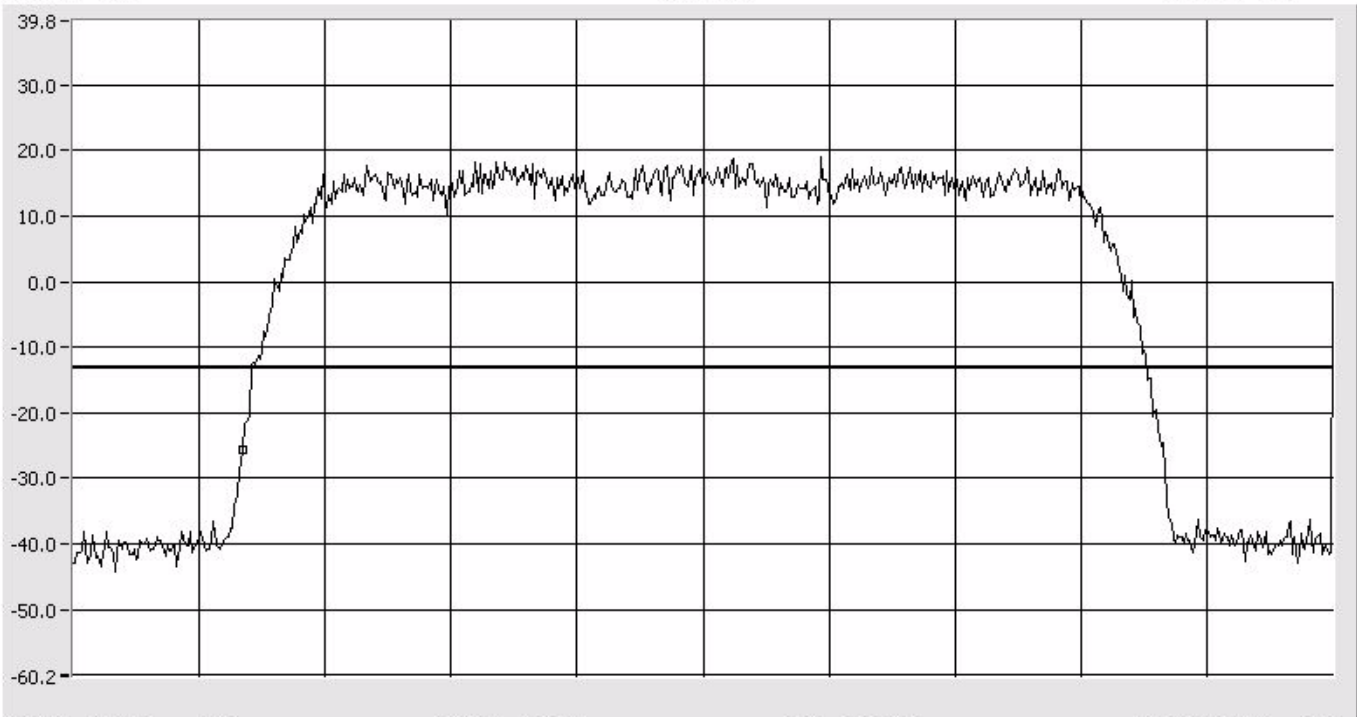
ATTEN 20 dB

delta MKR -25.53 dBm

RL 39.8 dBm

10 dB/Div

851.000 MHz



START 850.730 MHz CENTER 851.730 MHz SPAN 2.000 MHz STOP 852.730 MHz  
RBW 10 kHz VBW 1.0 kHz SWP 500 mS

# Band Edge CDMA

Center: 868.19 MHz  
Span: 2 MHz  
RBW: 10 kHz  
VBW: 10 kHz

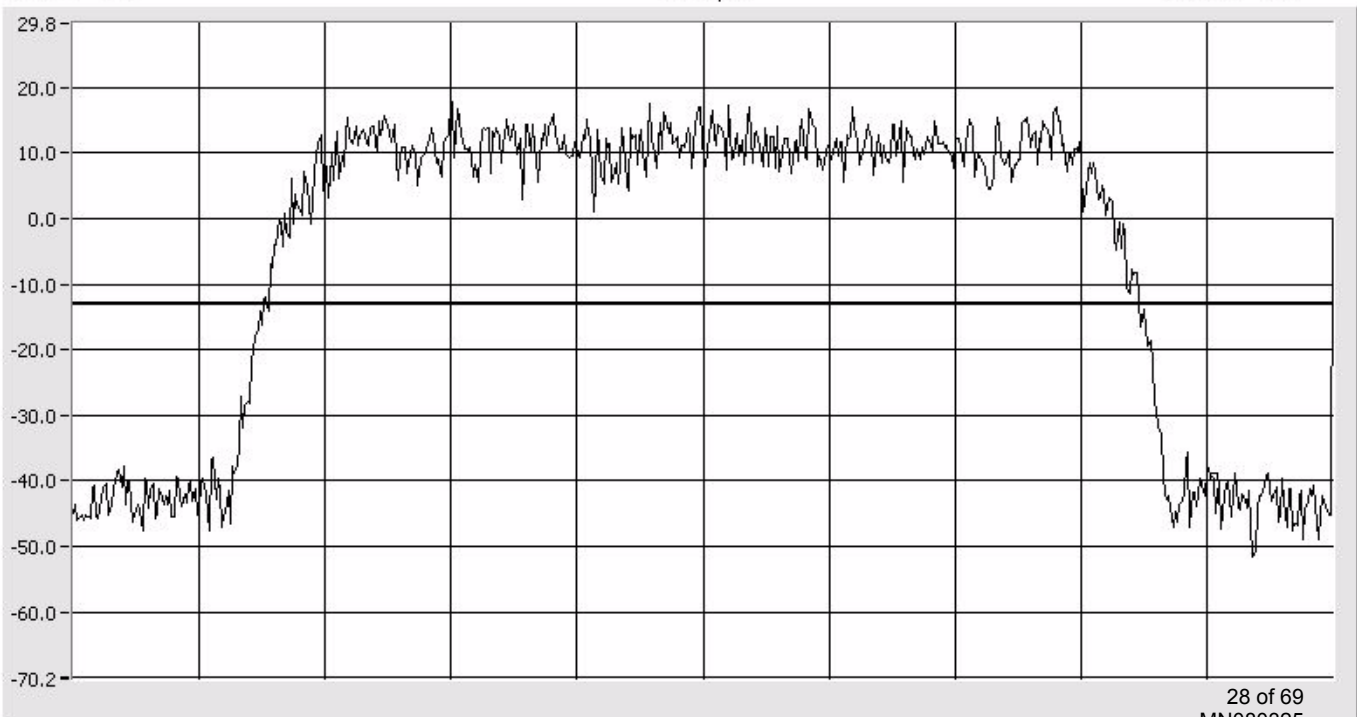
ATTEN 10 dB

delta MKR -39.37 dBm

RL 29.8 dBm

10 dB/Div

869.000 MHz



START 867.190 MHz CENTER 868.190 MHz SPAN 2.000 MHz STOP 869.190 MHz  
RBW 10 kHz VBW 10 kHz SWP 50.0 mS

**Conducted Output Power Test for ADC Inc  
FlexWave™ URH - SMR  
Model Number FWU-D20000002110RU**

[Back](#)

\*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 FM, iDEN, and CDMA 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. The power meter level was offset by 39.8 dB to compensate for attenuators and cable loss between the EUT and the power meter.

<u><b>FM</b></u>		<u><b>iDEN</b></u>	
	<b>11.72 Watts</b>		<b>10.47 Watts</b>
Carrier Frequency	Carrier Output	Carrier Frequency	Carrier Output
851.2 MHz	<u>38.86</u> dBm	851.2 MHz	<u>37.99</u> dBm
860.0 MHz	<u>40.23</u> dBm	860.0 MHz	<u>40.17</u> dBm
868.8 MHz	<u>40.69</u> dBm	868.8 MHz	<u>40.20</u> dBm
<u><b>CDMA</b></u>			
	<b>11.30 Watts</b>		
Carrier Frequency	Carrier Output		
851.75 MHz	<u>39.53</u> dBm		
860.0 MHz	<u>40.53</u> dBm		
868.25 MHz	<u>39.88</u> dBm		

**Intermodulation Test for ADC Inc**  
**FlexWave™ URH - SMR**  
**Model Number FWU-D20000002110RU**

[Back](#)

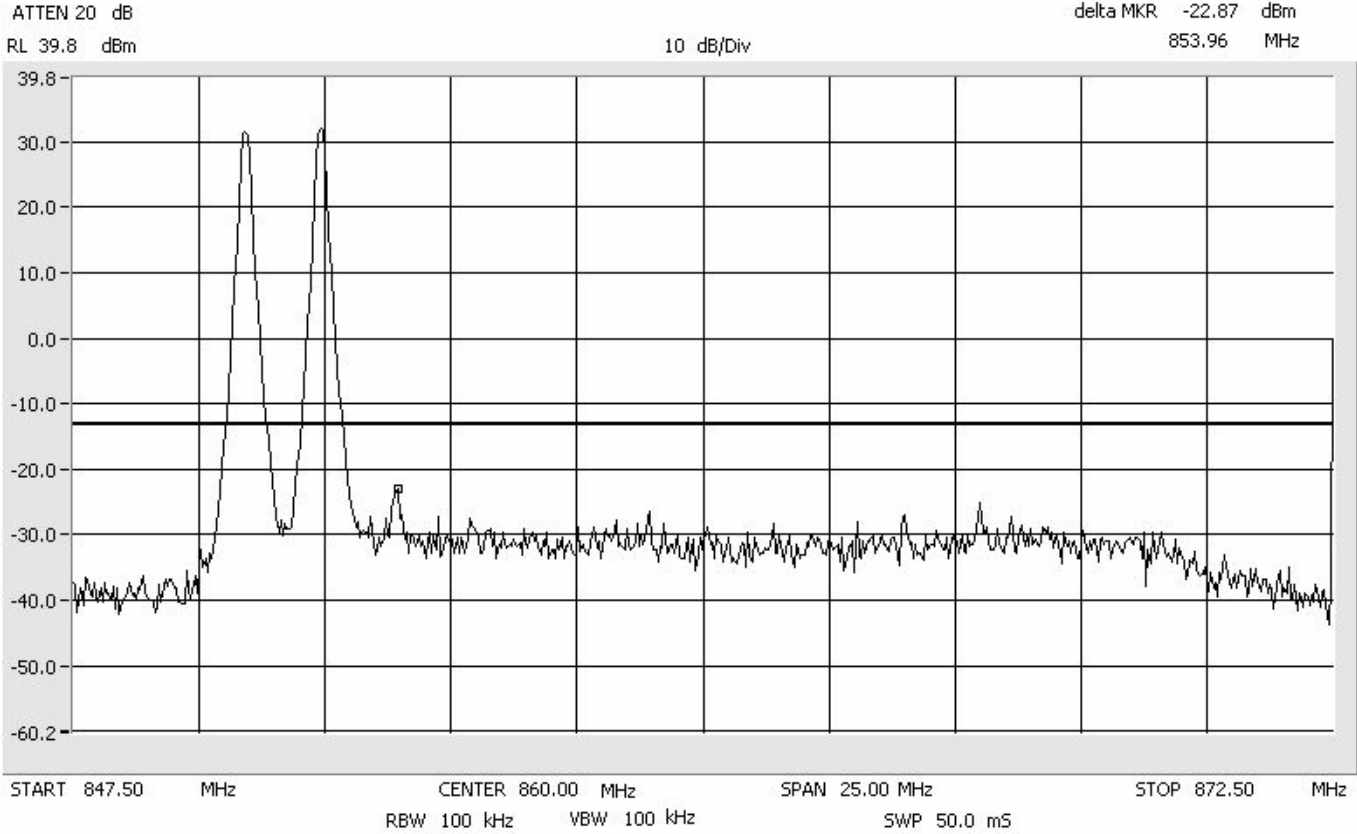
The inter-modulation products test was performed for the EUT. Three tests were performed with the modulation type. Test 1 was with 2 signals input to the EUT at lower end channels. Test 2 was with 2 signals input to the EUT at upper end channels. Test 3 was with 2 signals input to the EUT at upper and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

Results:  
(See Plots)

FM

# Intermodulation Close - Lower SMR 800 MHz

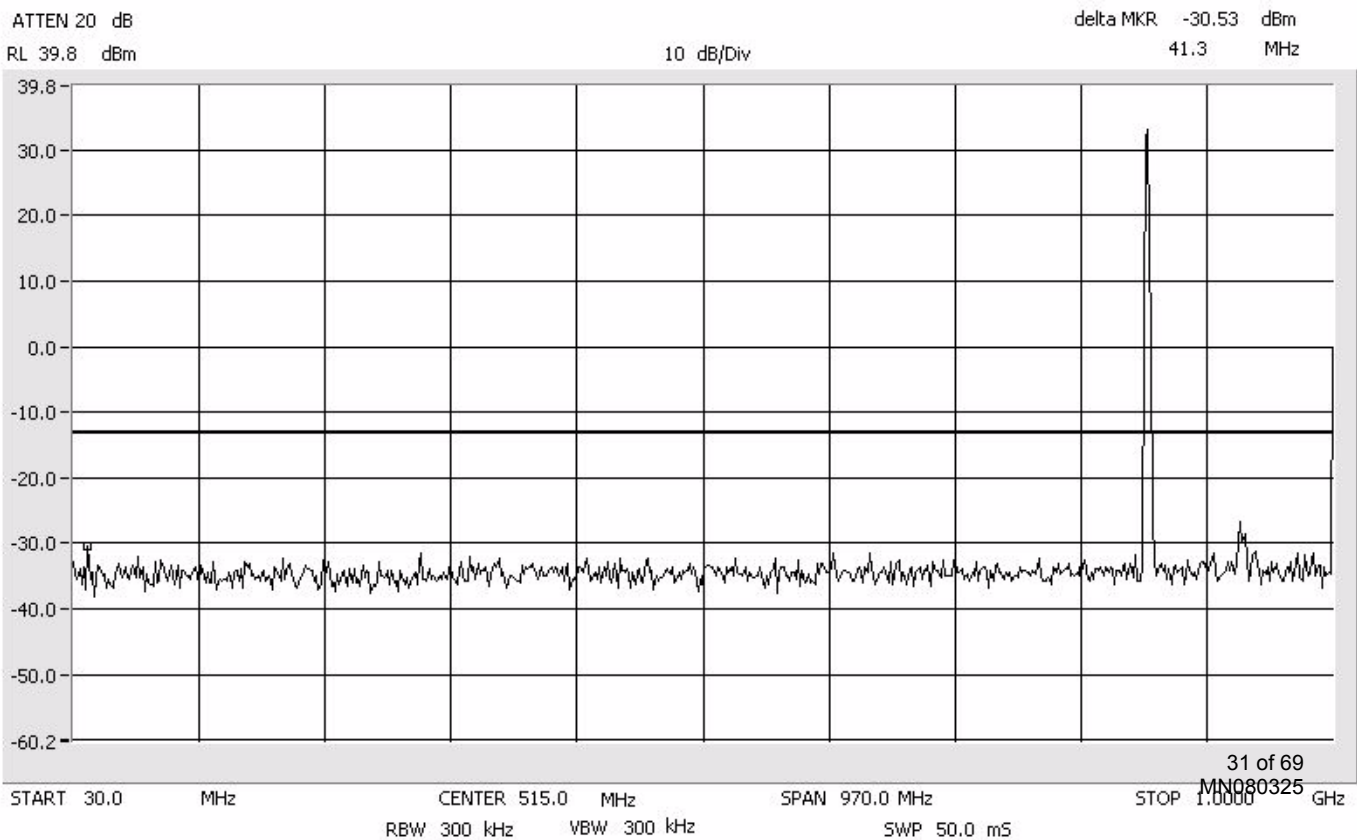
Center: 860.0 MHz  
Span: 25 MHz  
RBW/VBW: 100 kHz



FM

# Intermodulation Close - Lower SMR 800 MHz

Span: 30 MHz to 1 GHz  
RBW/VBW: 300 kHz



# Intermodulation Close - Lower SMR 800 MHz

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

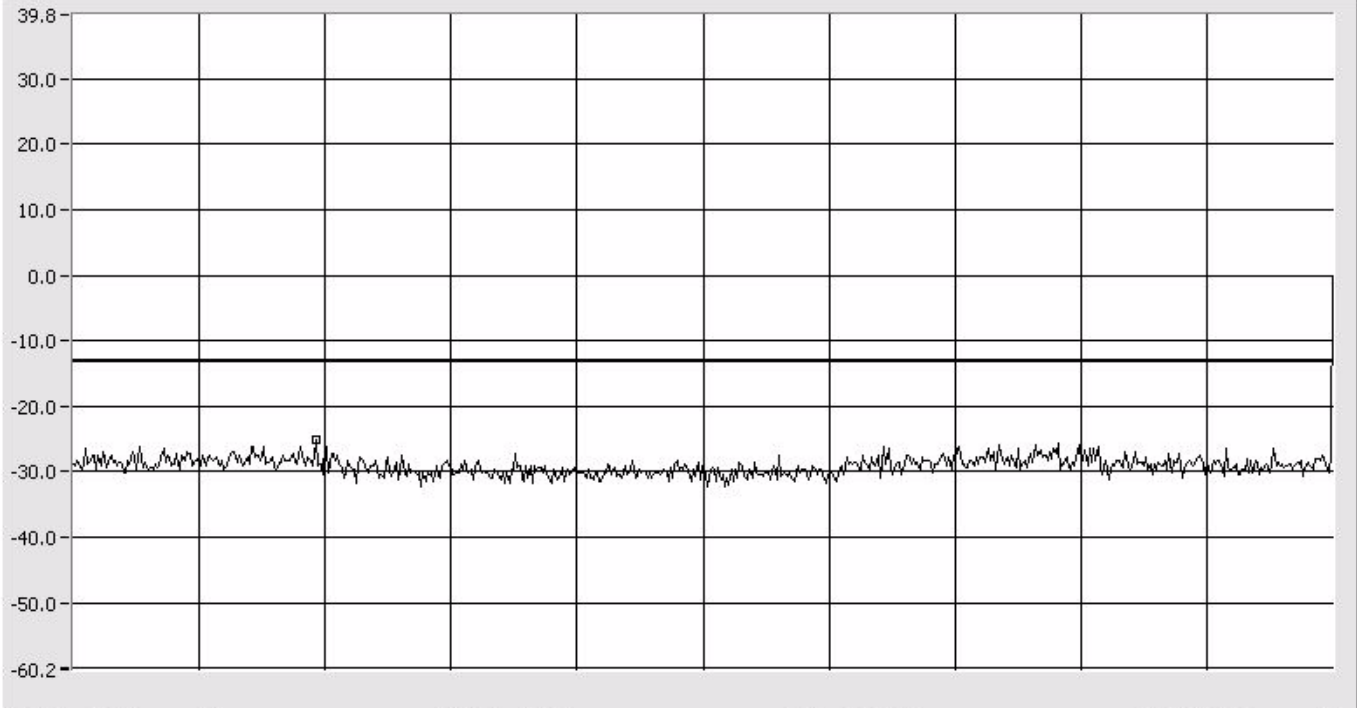
ATTEN 20 dB

delta MKR -25.03 dBm

RL 39.8 dBm

10 dB/Div

2.740 GHz



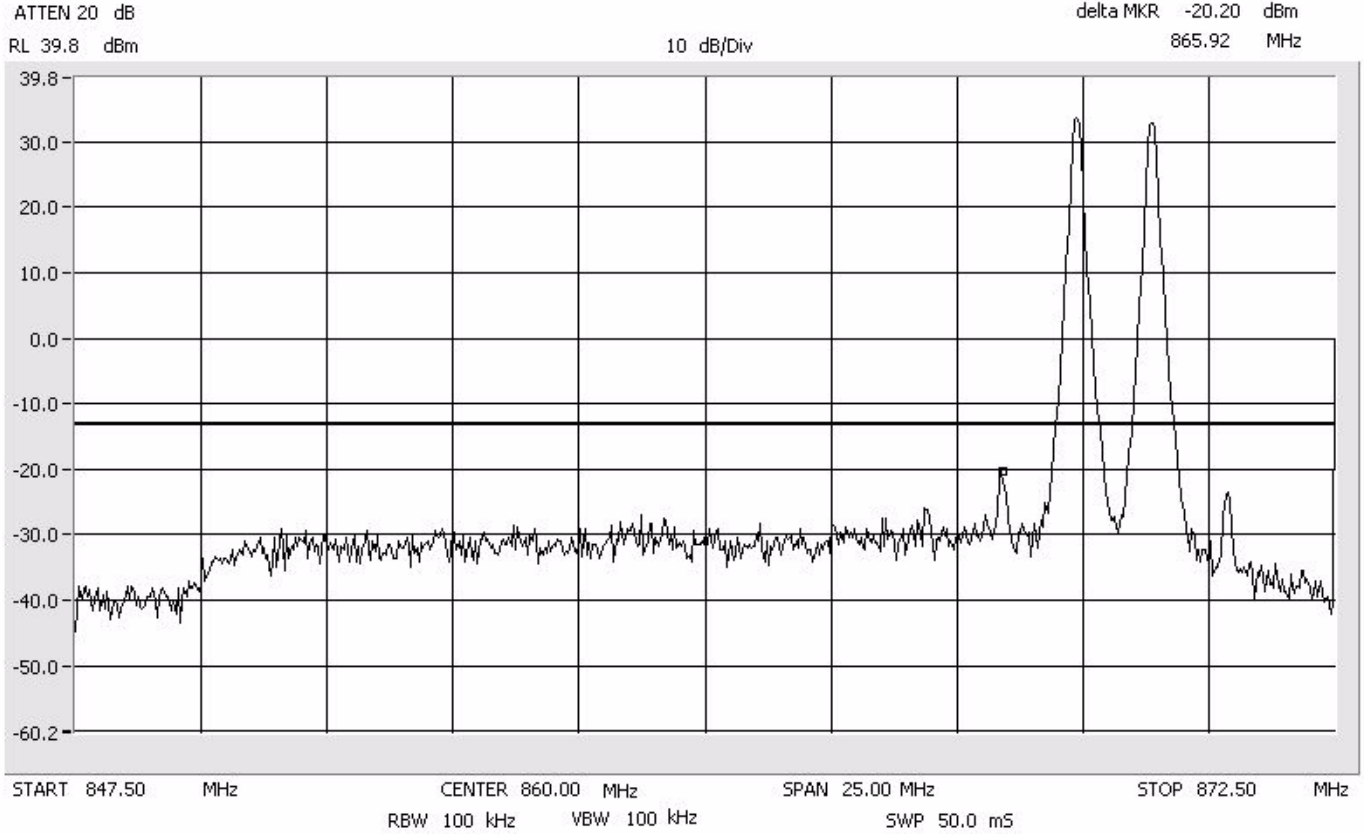
START 1.000 GHz      CENTER 5.500 GHz      SPAN 9.000 GHz      STOP 10.000 GHz  
RBW 1.0 MHz      VBW 1.0 MHz      SWP 50.0 mS



FM

# Intermodulation Close - Upper SMR 800 MHz

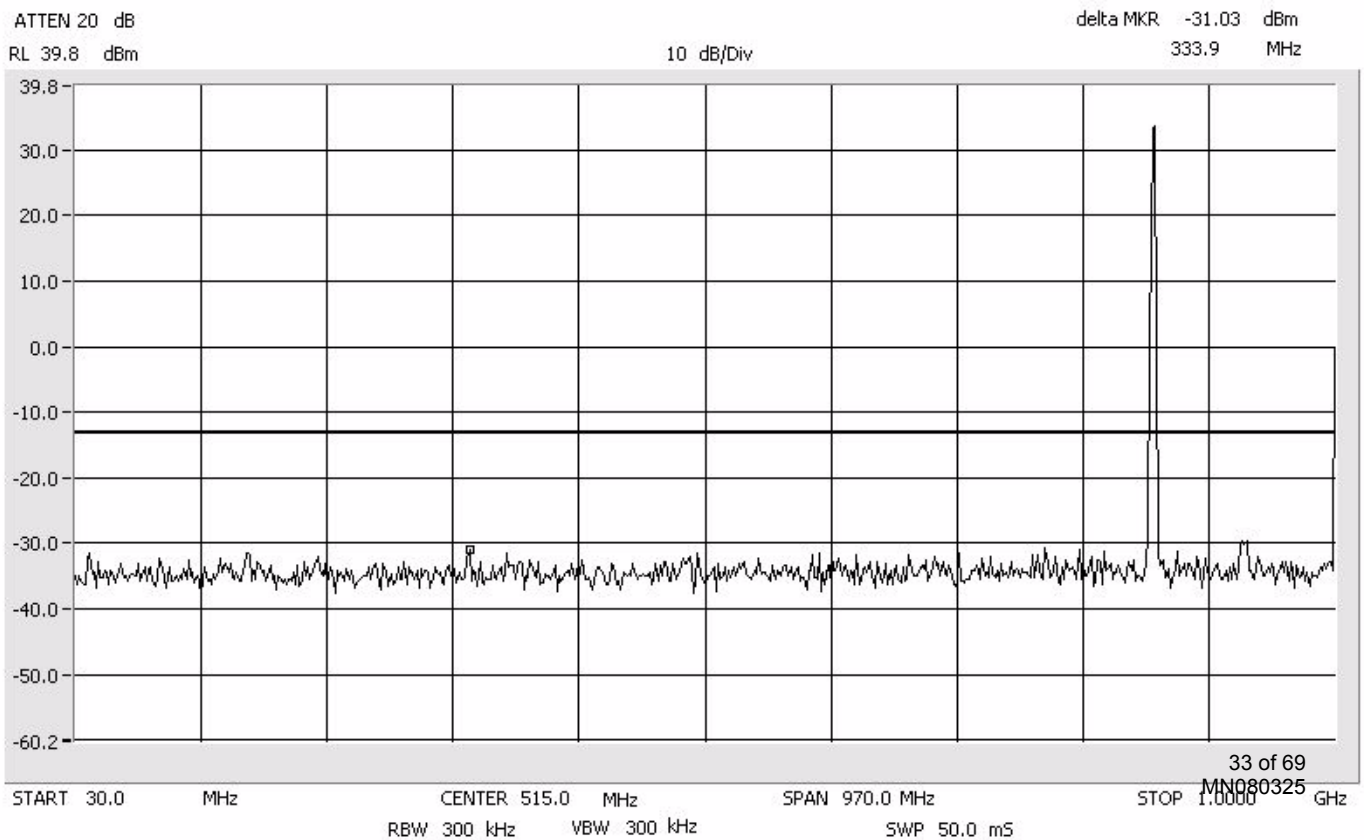
Center: 860.0 MHz  
Span: 25 MHz  
RBW/VBW: 100 kHz



FM

# Intermodulation Close - Upper SMR 800 MHz

Span: 30 MHz to 1 GHz  
RBW/VBW: 300 kHz



# Intermodulation Close - Upper SMR 800 MHz

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

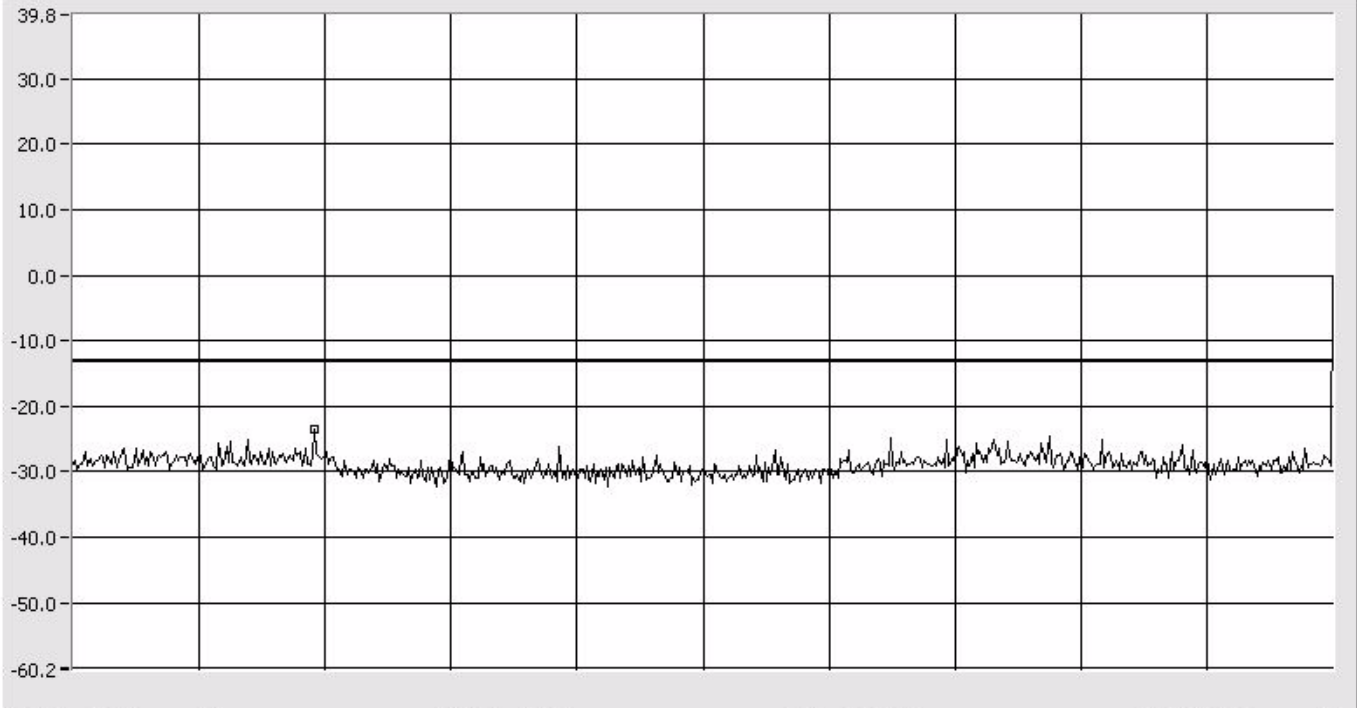
ATTEN 20 dB

delta MKR -23.53 dBm

RL 39.8 dBm

10 dB/Div

2.725 GHz



START 1.000 GHz      CENTER 5.500 GHz      SPAN 9.000 GHz      STOP 10.000 GHz  
RBW 1.0 MHz      VBW 1.0 MHz      SWP 50.0 mS

FM

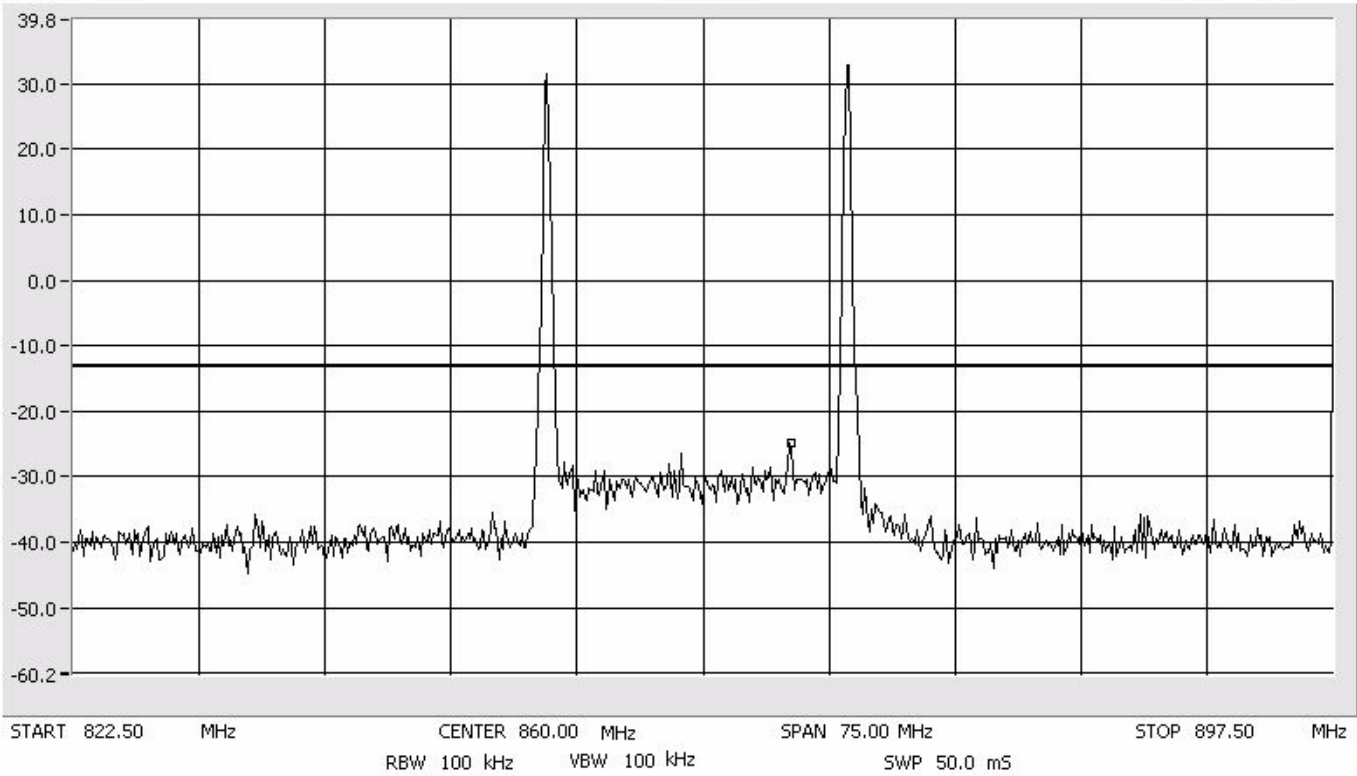
# Intermodulation Apart SMR 800 MHz

Center: 860.0 MHz  
Span: 75 MHz  
RBW/VBW: 100 kHz

ATTEN 20 dB  
RL 39.8 dBm

delta MKR -24.87 dBm  
865.25 MHz

10 dB/Div



FM

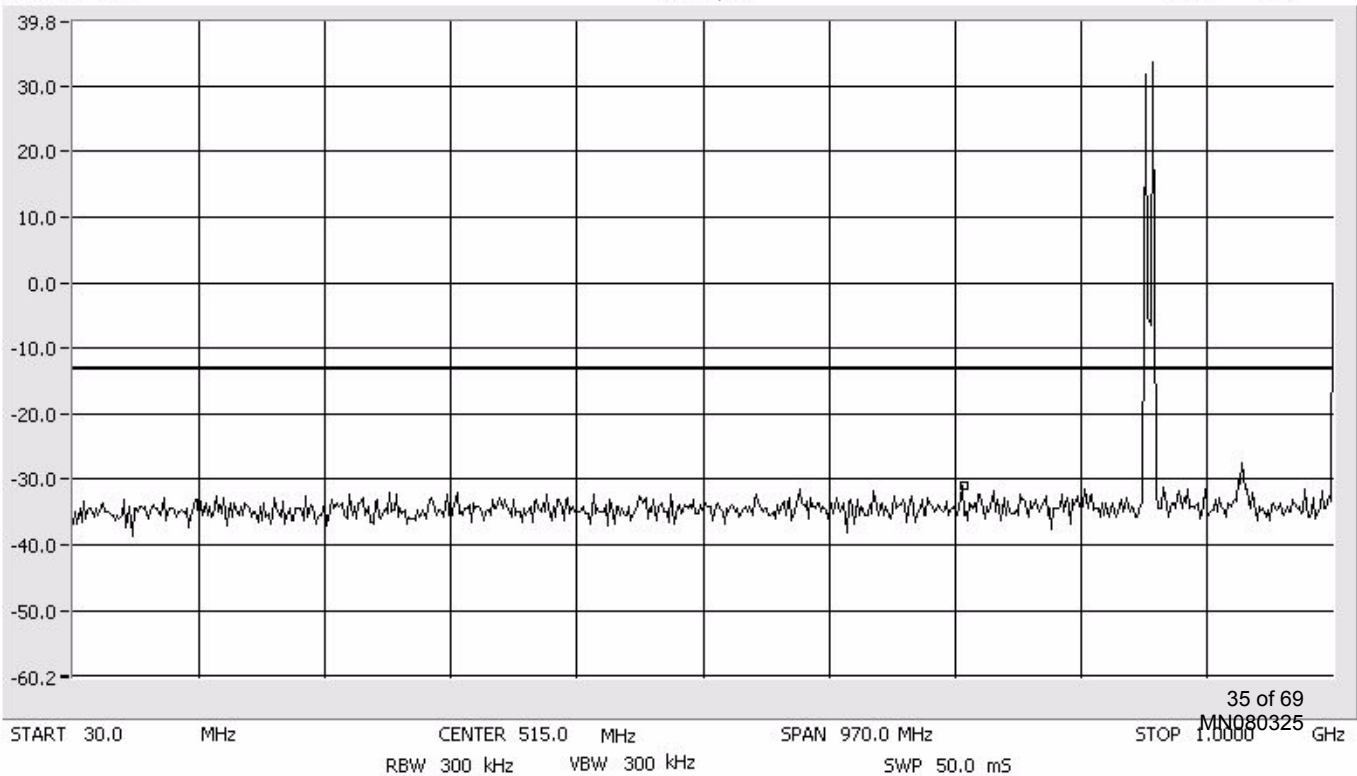
# Intermodulation Apart SMR 800 MHz

Span: 30 MHz to 1 GHz  
RBW/VBW: 300 kHz

ATTEN 20 dB  
RL 39.8 dBm

delta MKR -31.03 dBm  
715.5 MHz

10 dB/Div



# Intermodulation Apart SMR 800 MHz

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

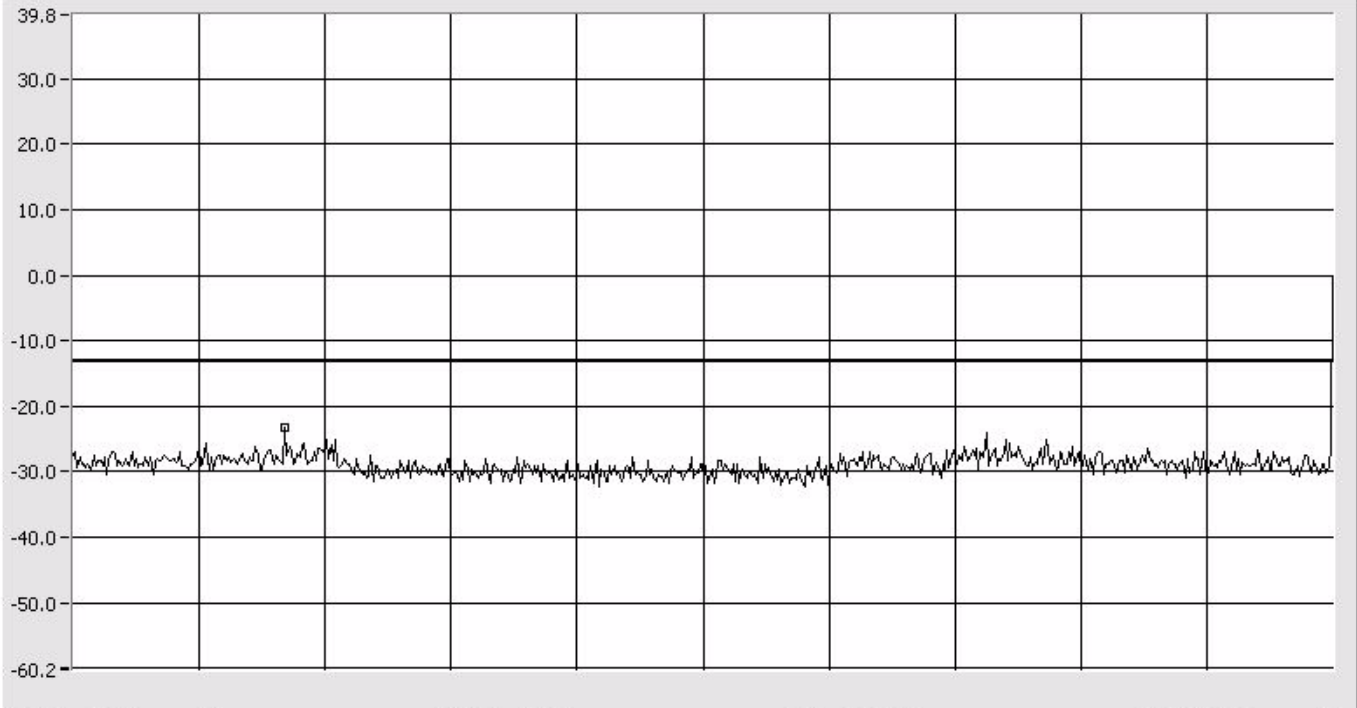
ATTEN 20 dB

delta MKR -23.20 dBm

RL 39.8 dBm

10 dB/Div

2.515 GHz

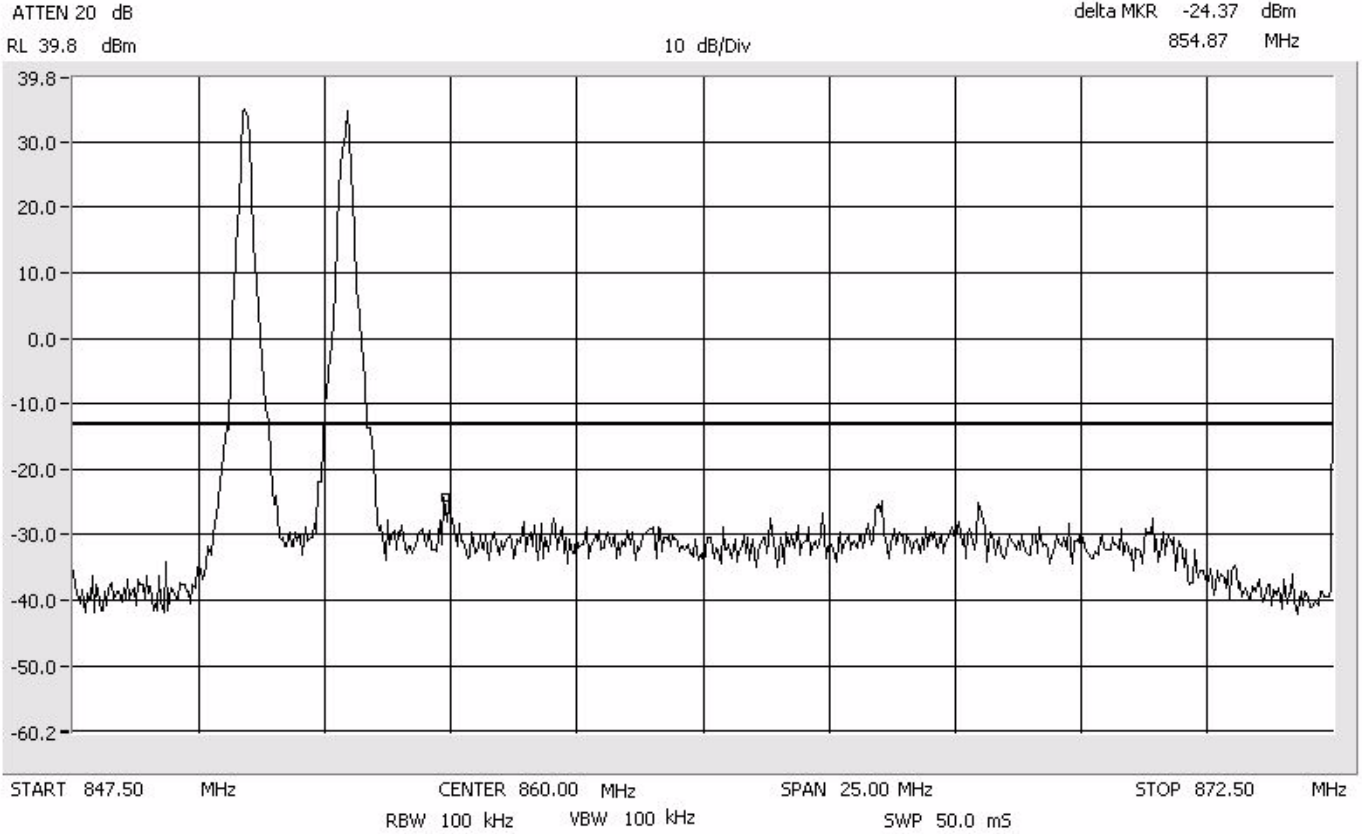


START 1.000 GHz      CENTER 5.500 GHz      SPAN 9.000 GHz      STOP 10.000 GHz  
RBW 1.0 MHz      VBW 1.0 MHz      SWP 50.0 mS

iDEN

# Intermodulation Close - Lower SMR 800 MHz

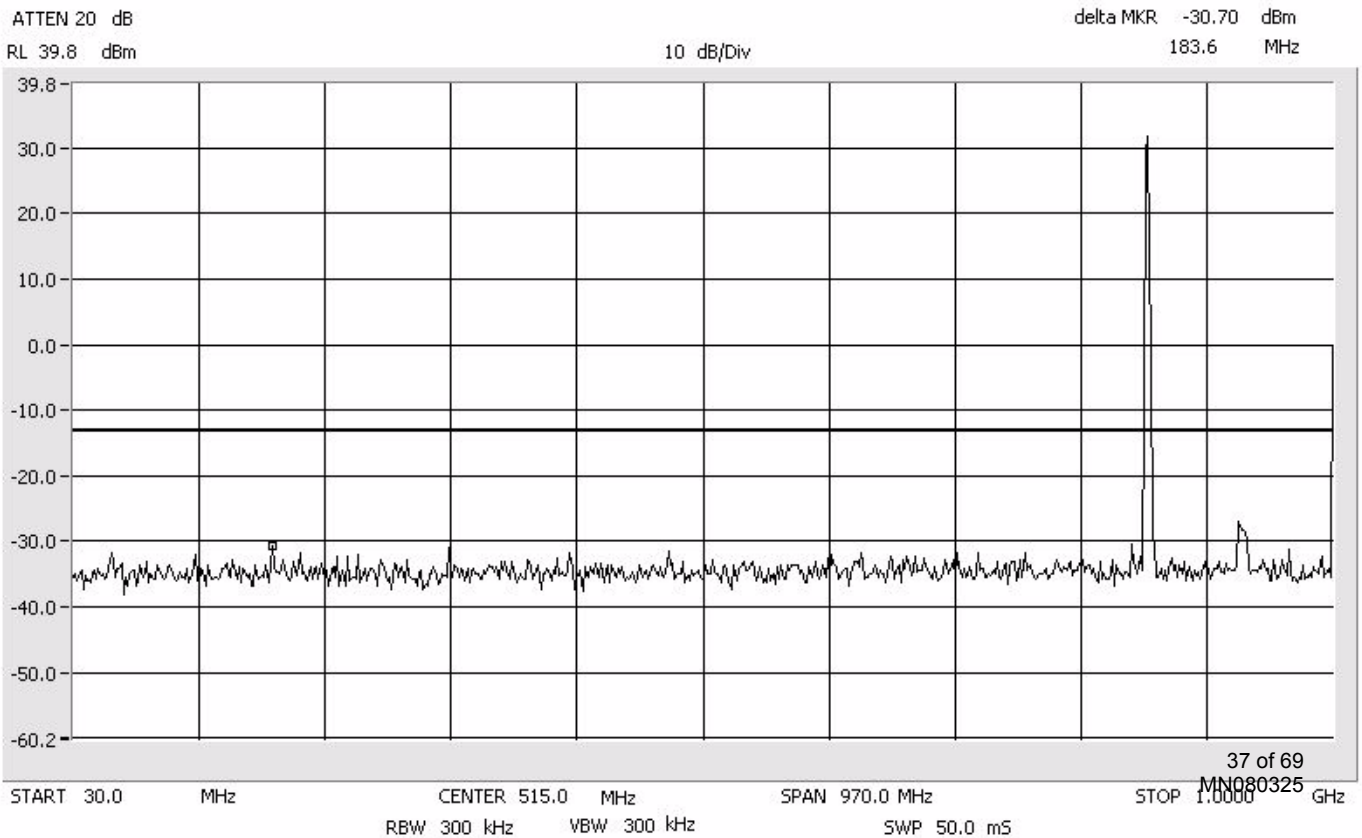
Center: 860.0 MHz  
Span: 25 MHz  
RBW/VBW: 100 kHz



iDEN

# Intermodulation Close - Lower SMR 800 MHz

Span: 30 MHz to 1 GHz  
RBW/VBW: 300 kHz



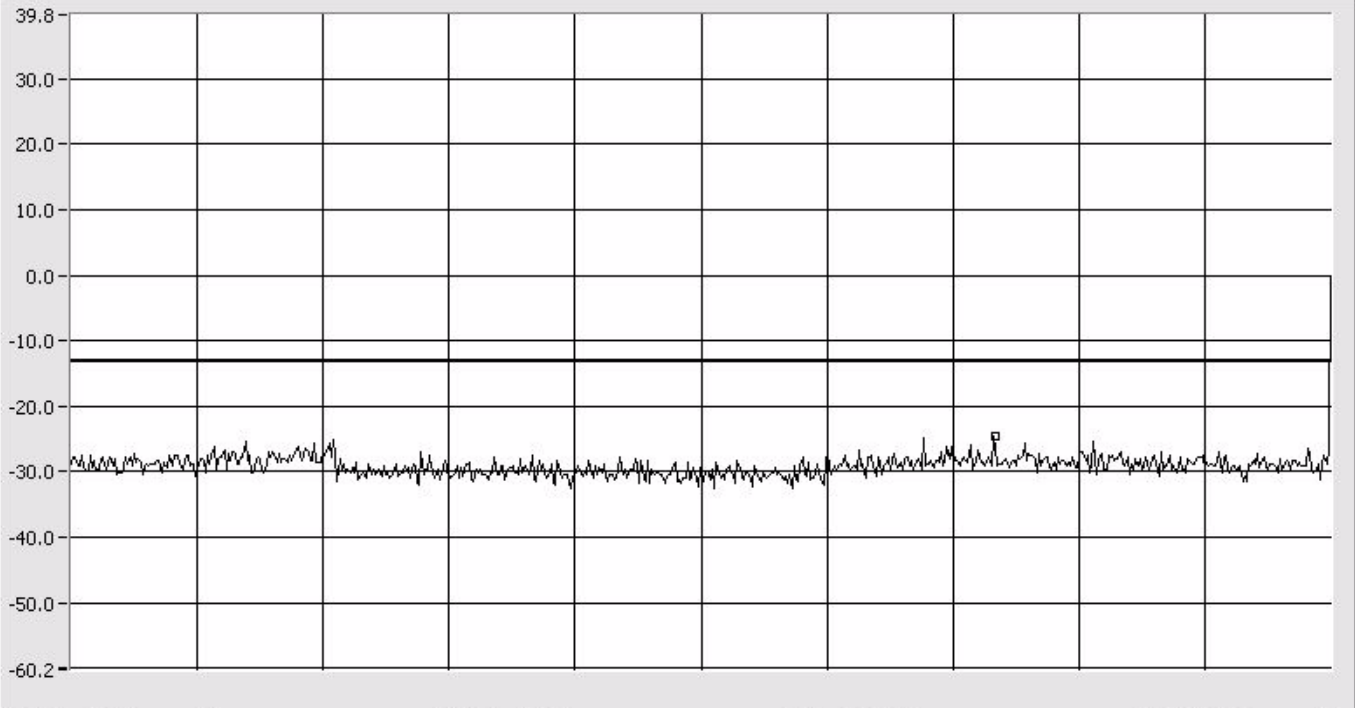
# Intermodulation Close - Lower SMR 800 MHz

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

ATTEN 20 dB  
RL 39.8 dBm

10 dB/Div

delta MKR -24.53 dBm  
7.600 GHz

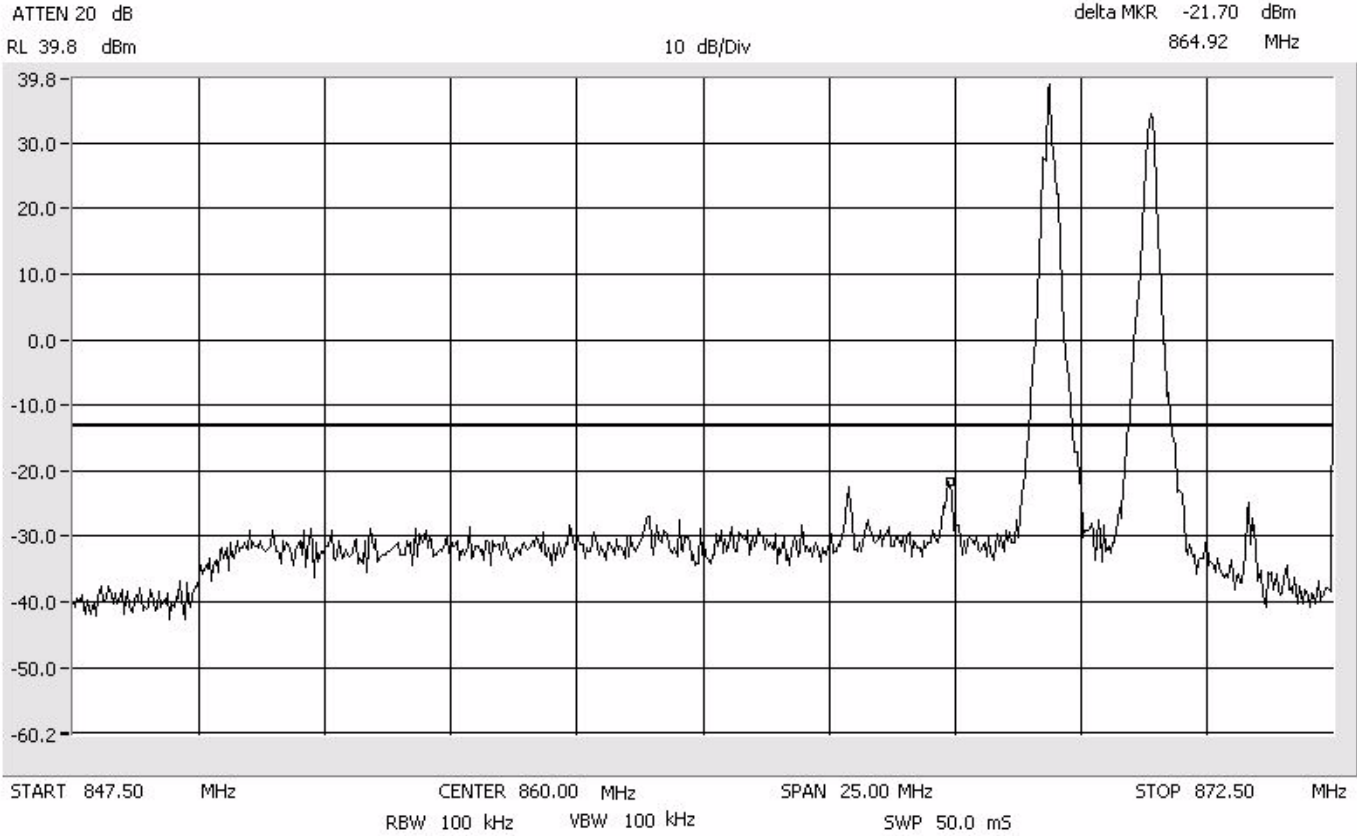


START 1.000 GHz      CENTER 5.500 GHz      SPAN 9.000 GHz      STOP 10.000 GHz  
RBW 1.0 MHz      VBW 1.0 MHz      SWP 50.0 mS

iDEN

# Intermodulation Close - Upper SMR 800 MHz

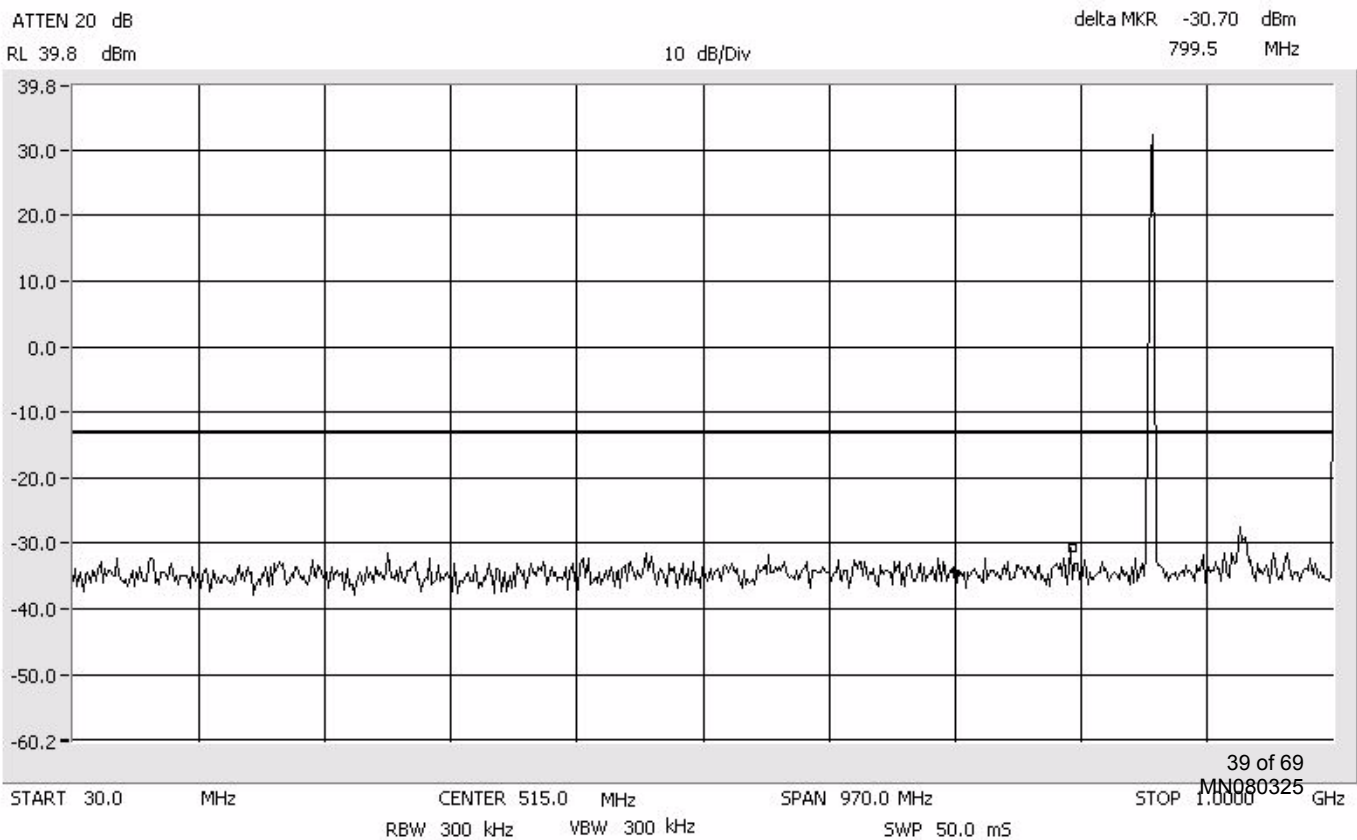
Center: 860.0 MHz  
Span: 25 MHz  
RBW/VBW: 100 kHz



iDEN

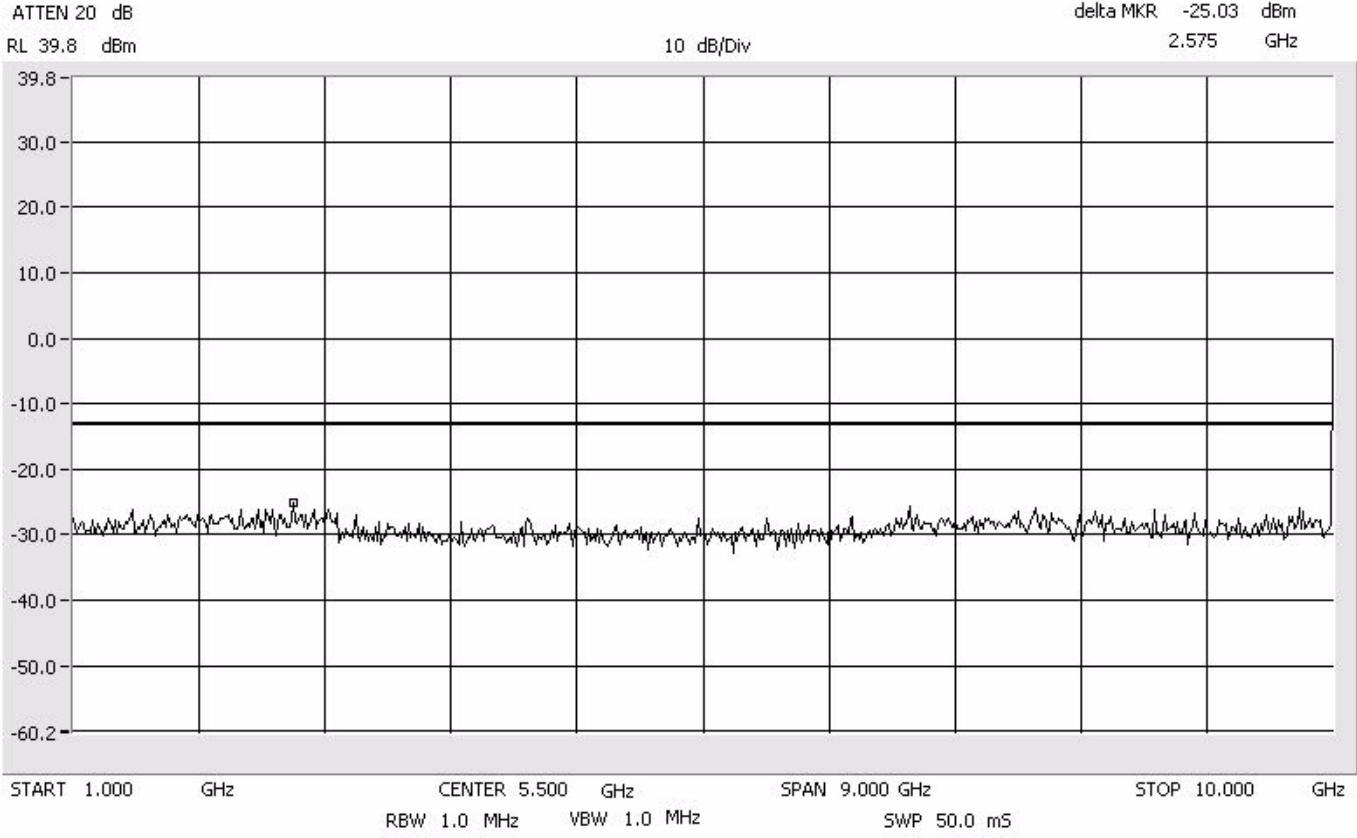
# Intermodulation Close - Upper SMR 800 MHz

Span: 30 MHz to 1 GHz  
RBW/VBW: 300 kHz



# Intermodulation Close - Upper SMR 800 MHz

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





iDEN

# Intermodulation Apart SMR 800 MHz

Center: 860.0 MHz  
Span: 75 MHz  
RBW/VBW: 100 kHz

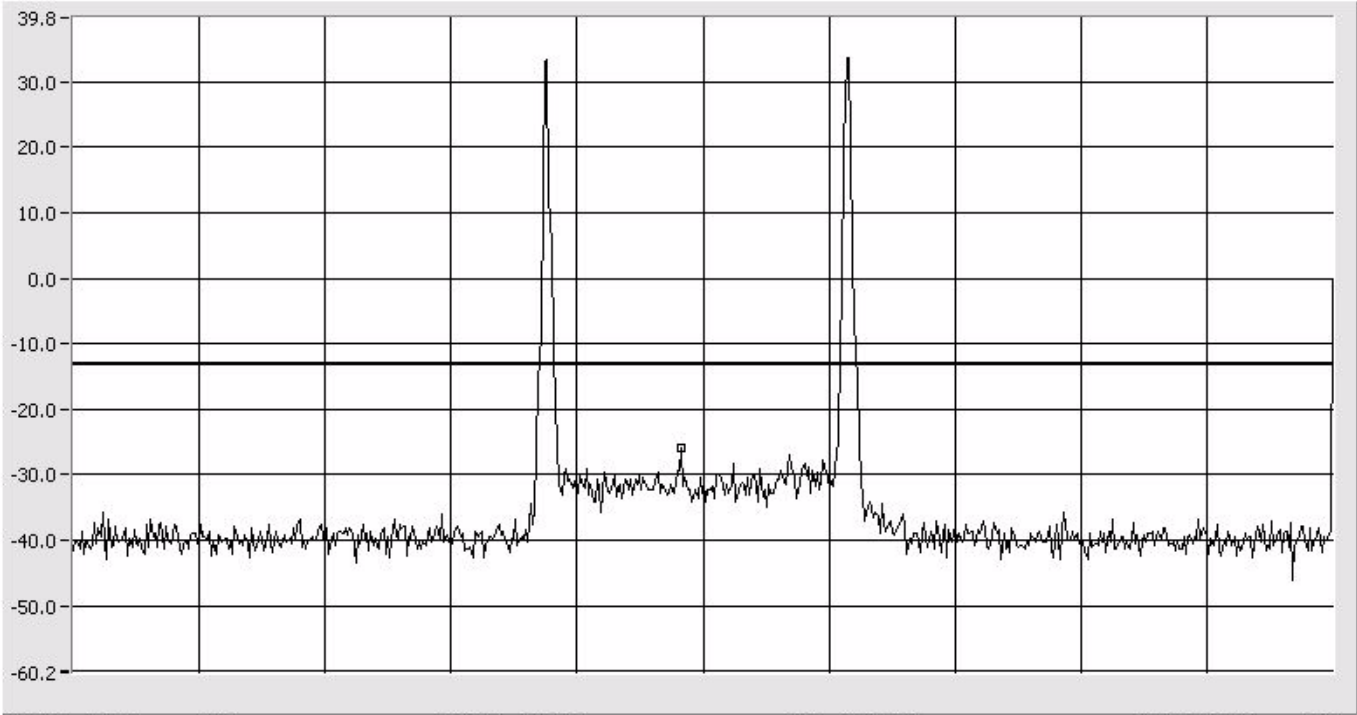
ATTEN 20 dB

delta MKR -25.87 dBm

RL 39.8 dBm

10 dB/Div

858.75 MHz



START 822.50 MHz CENTER 860.00 MHz SPAN 75.00 MHz STOP 897.50 MHz  
RBW 100 kHz VBW 100 kHz SWP 50.0 mS

iDEN

# Intermodulation Apart SMR 800 MHz

Span: 30 MHz to 1 GHz  
RBW/VBW: 300 kHz

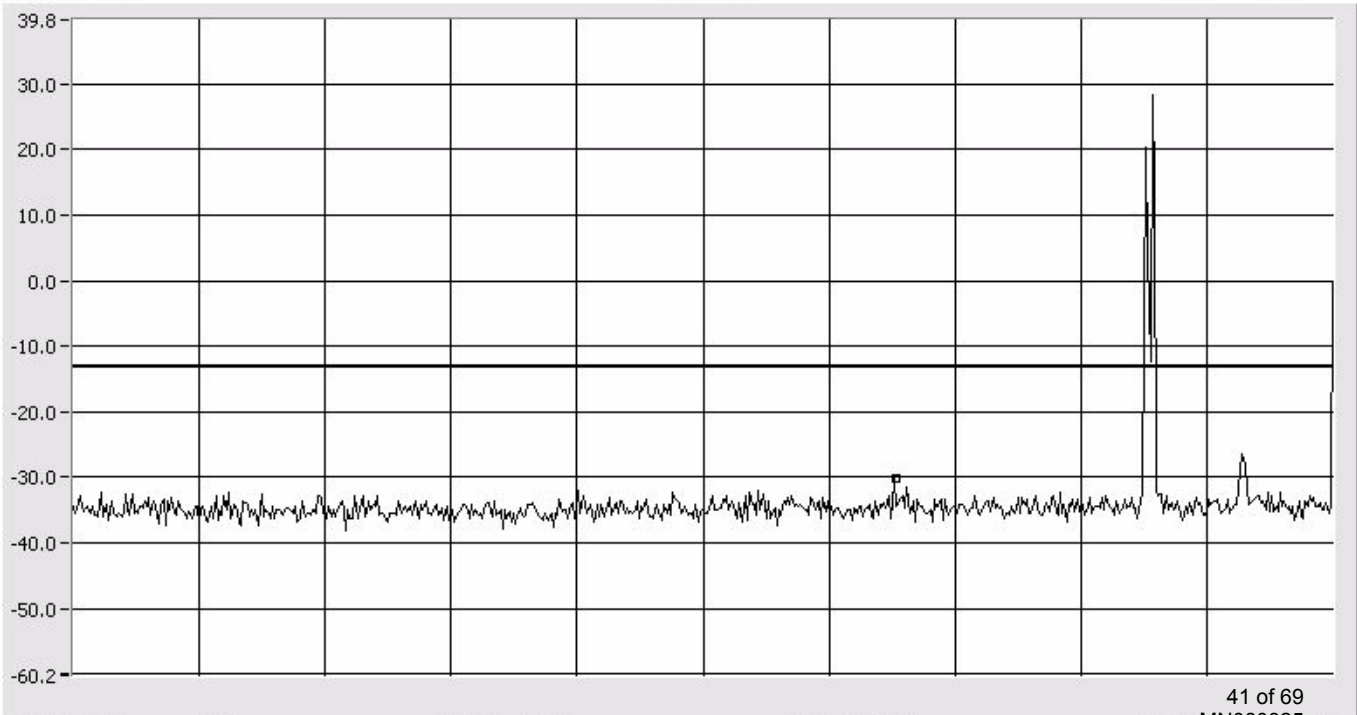
ATTEN 20 dB

delta MKR -30.20 dBm

RL 39.8 dBm

10 dB/Div

663.7 MHz



START 30.0 MHz CENTER 515.0 MHz SPAN 970.0 MHz STOP 1.000 GHz  
RBW 300 kHz VBW 300 kHz SWP 50.0 mS

# Intermodulation Apart SMR 800 MHz

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

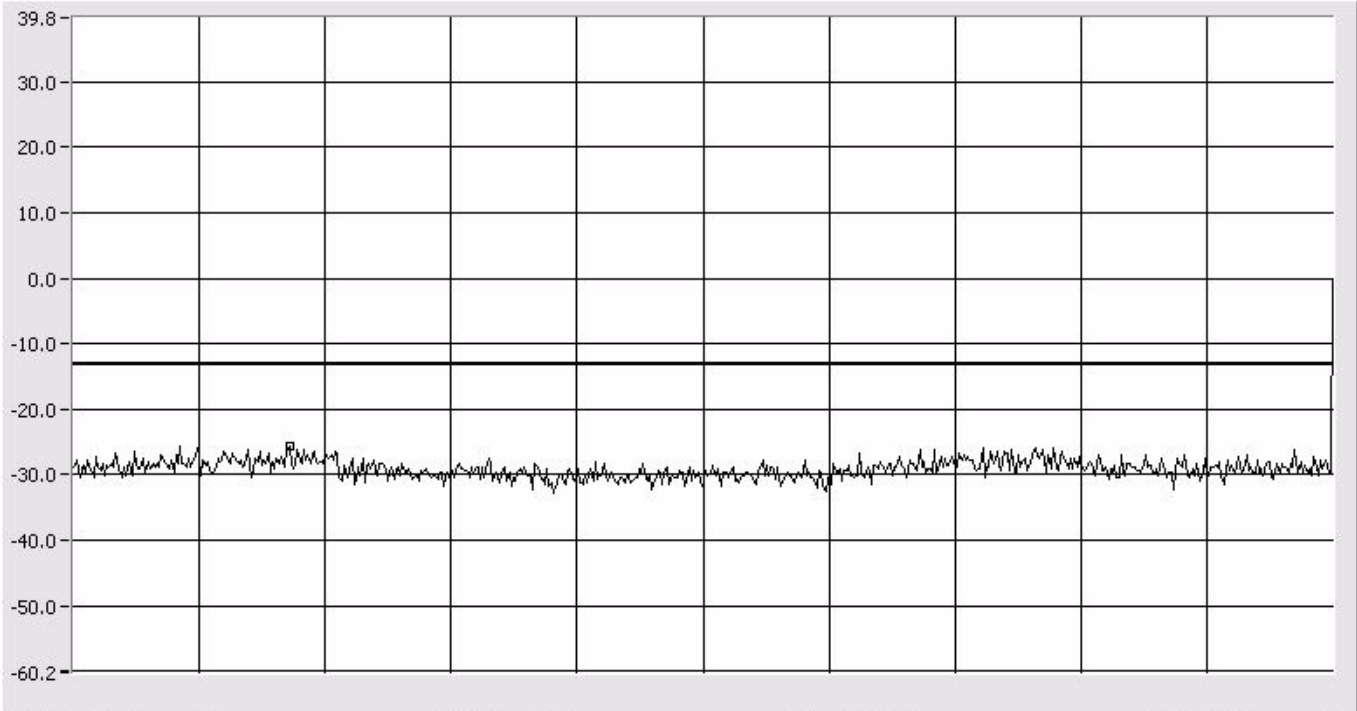
ATTEN 20 dB

delta MKR -25.53 dBm

RL 39.8 dBm

10 dB/Div

2.545 GHz

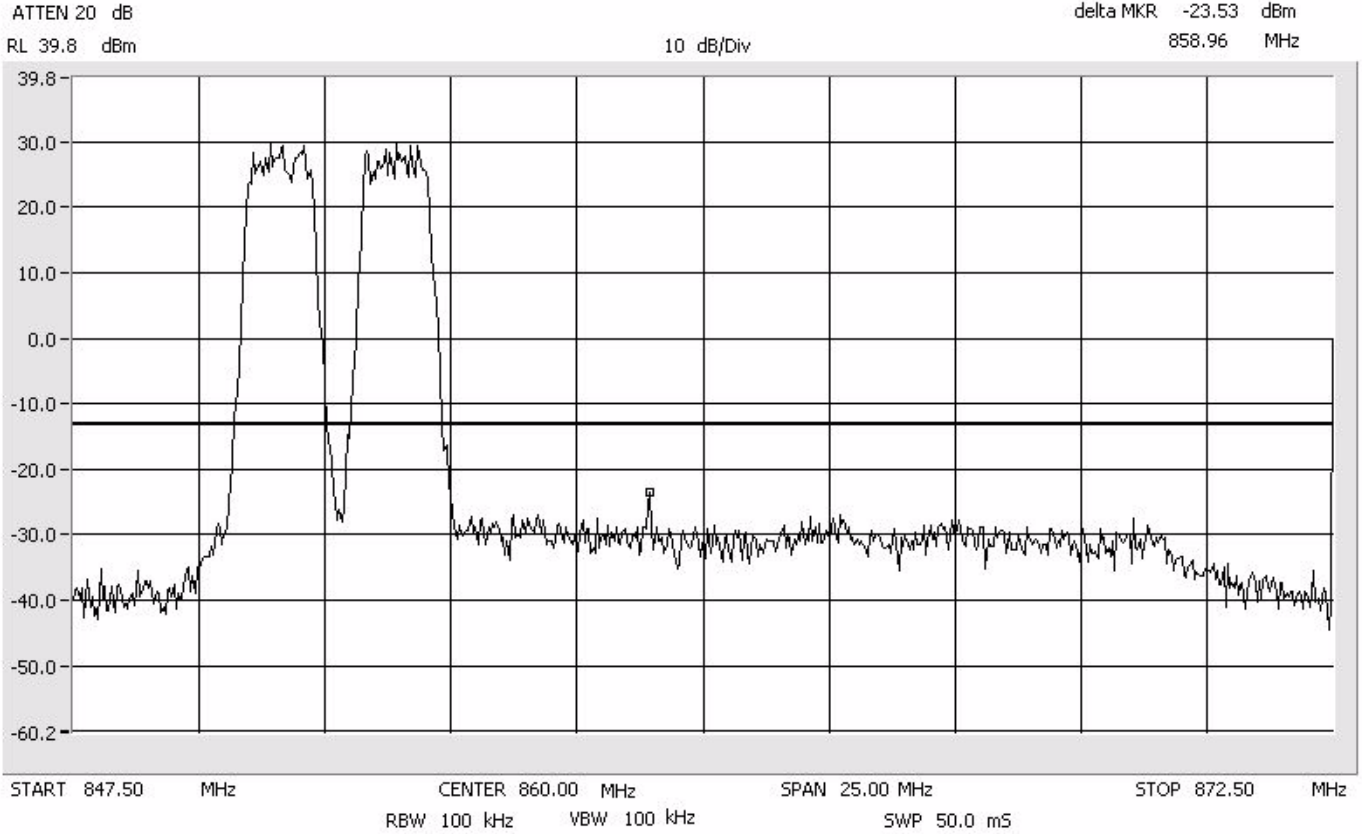


START 1.000 GHz      CENTER 5.500 GHz      SPAN 9.000 GHz      STOP 10.000 GHz  
RBW 1.0 MHz      VBW 1.0 MHz      SWP 50.0 mS

CDMA

# Intermodulation Close - Lower SMR 800 MHz

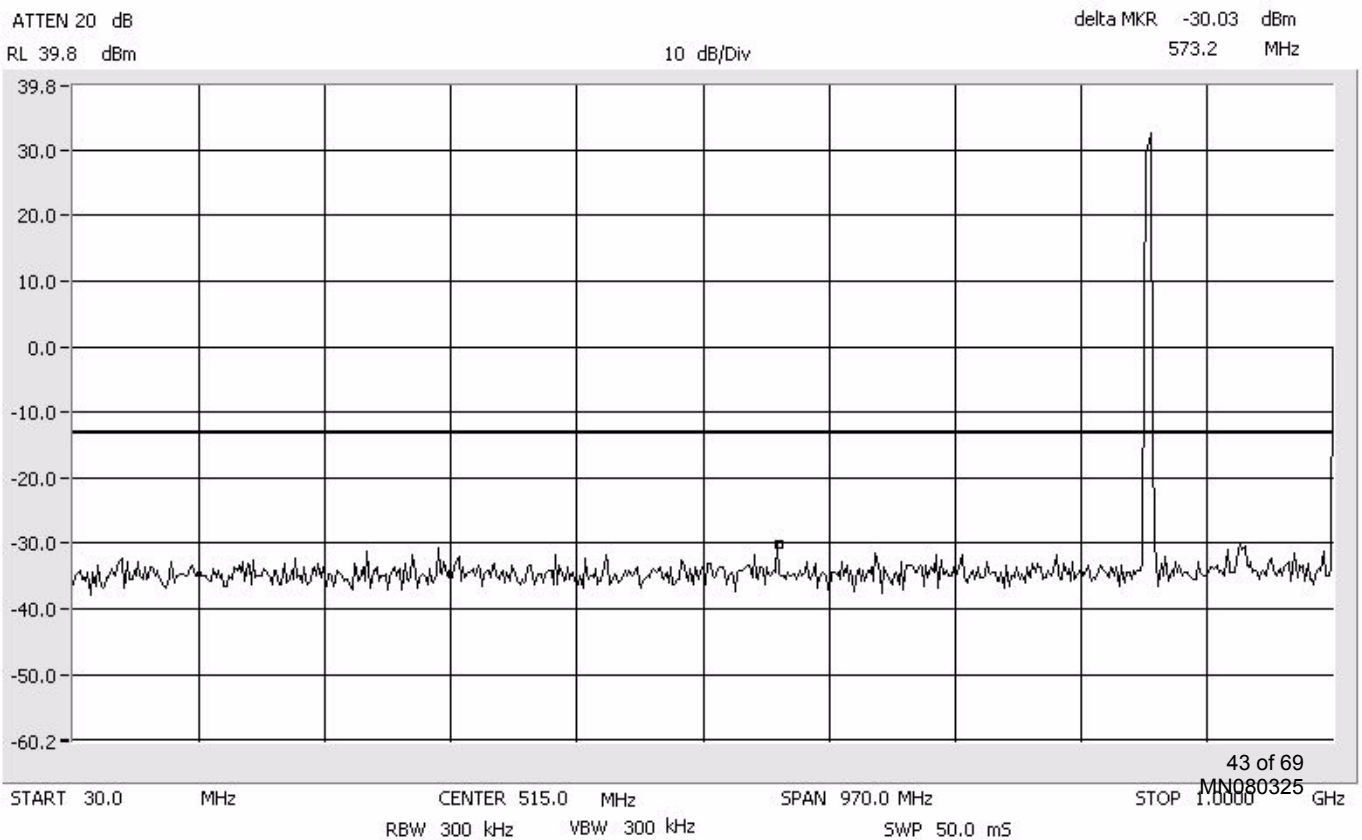
Center: 860.0 MHz  
Span: 25 MHz  
RBW/VBW: 100 kHz



CDMA

# Intermodulation Close - Lower SMR 800 MHz

Span: 30 MHz to 1 GHz  
RBW/VBW: 300 kHz



# Intermodulation Close - Lower SMR 800 MHz

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

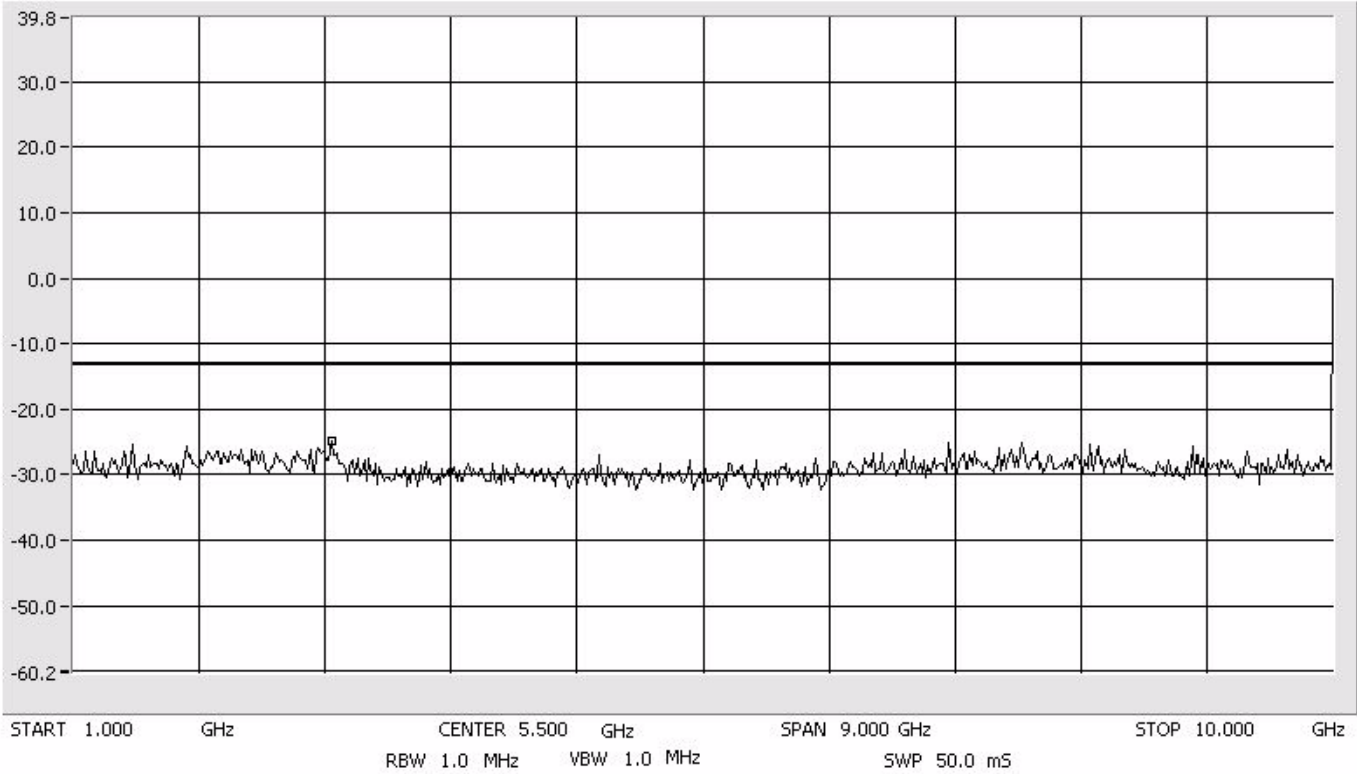
ATTEN 20 dB

delta MKR -24.87 dBm

RL 39.8 dBm

10 dB/Div

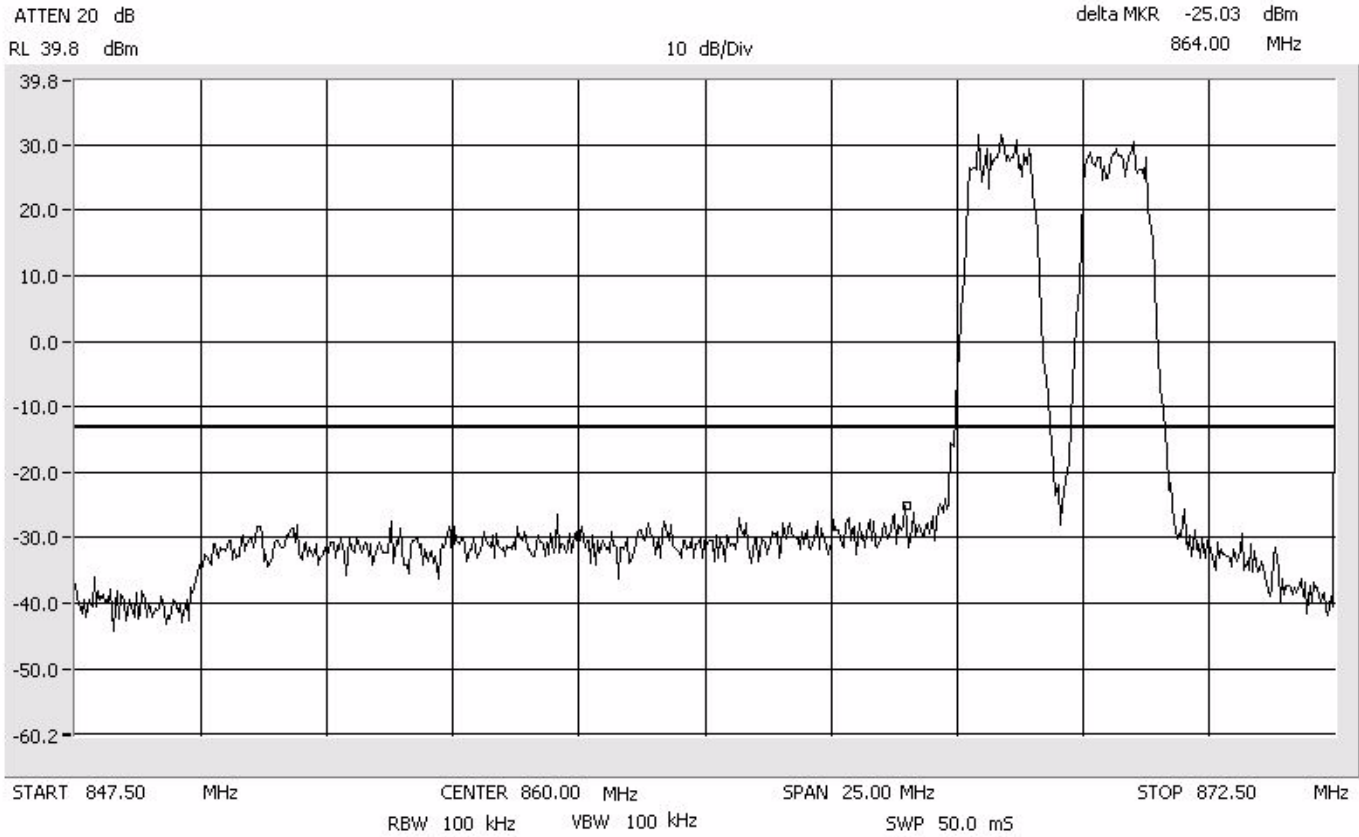
2.845 GHz



CDMA

# Intermodulation Close - Upper SMR 800 MHz

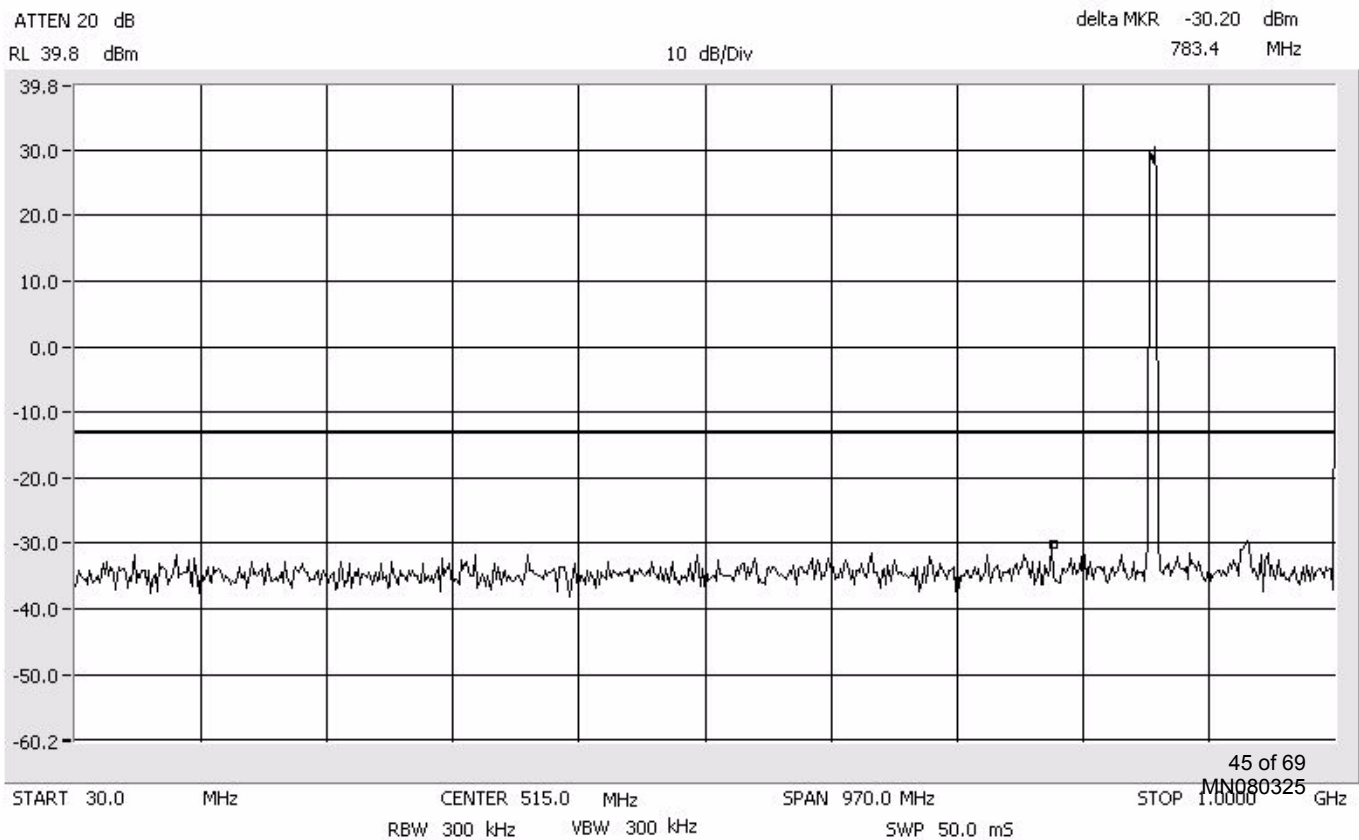
Center: 860.0 MHz  
Span: 25 MHz  
RBW/VBW: 100 kHz



CDMA

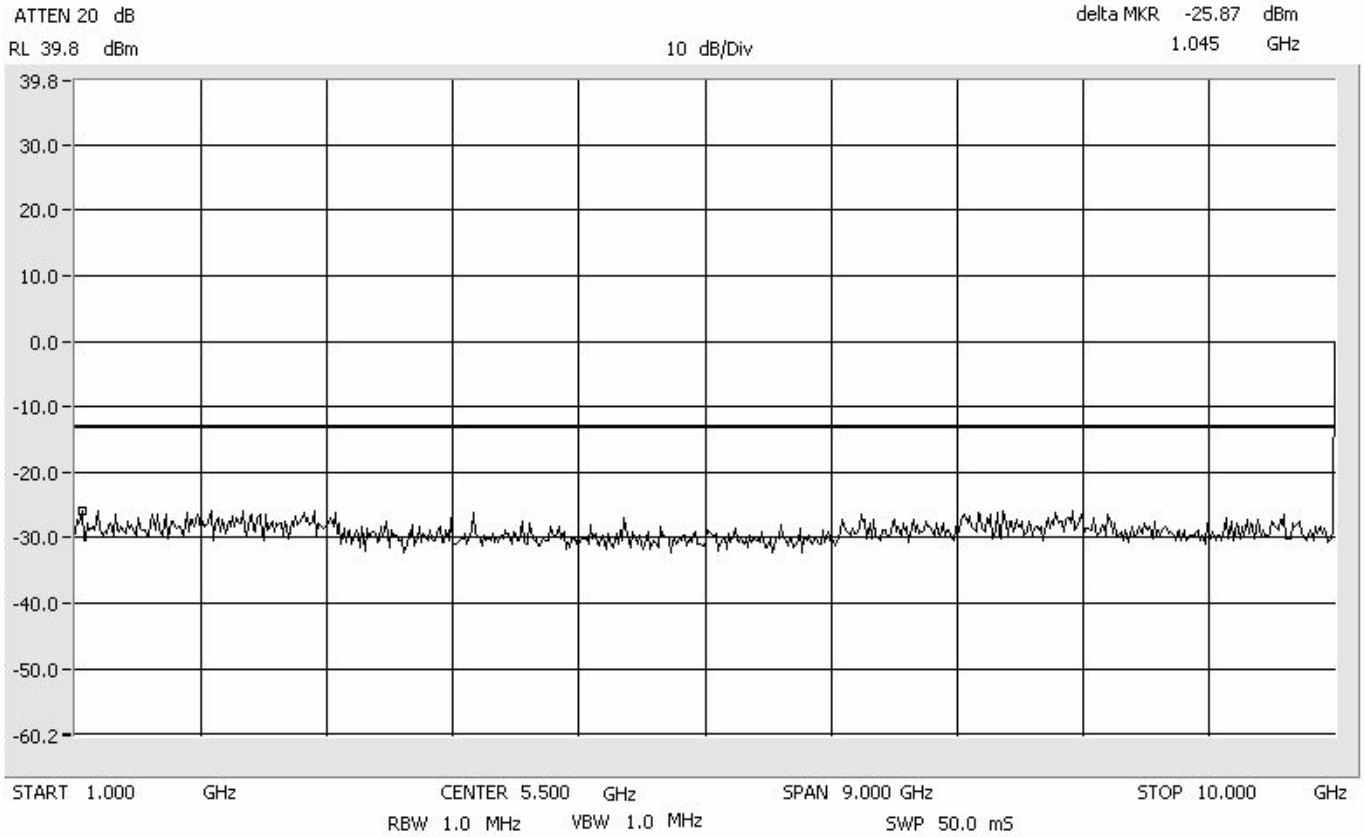
# Intermodulation Close - Upper SMR 800 MHz

Span: 30 MHz to 1 GHz  
RBW/VBW: 300 kHz



# Intermodulation Close - Upper SMR 800 MHz

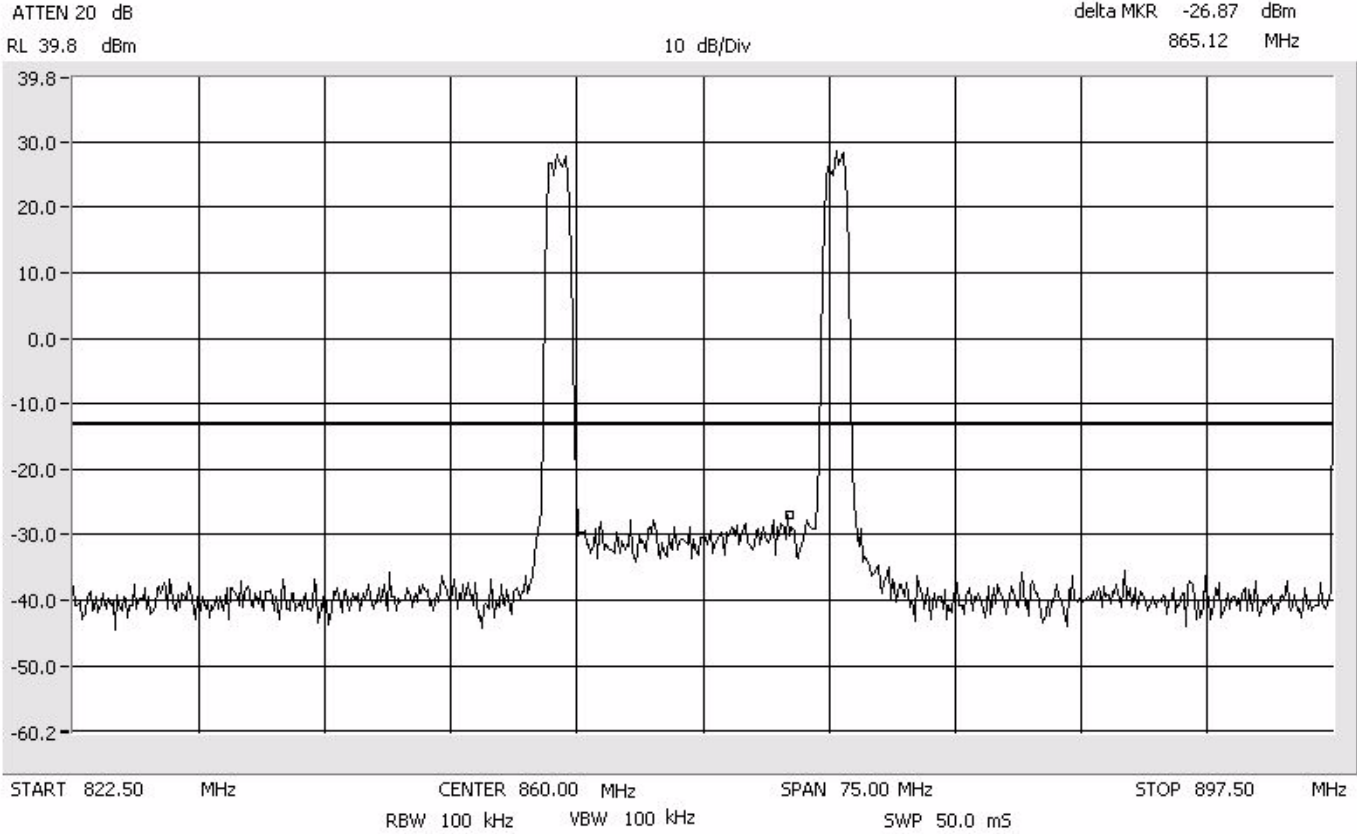
Span: 1 GHz to 10 GHz  
RBW/VBW: 1 MHz



CDMA

# Intermodulation Apart SMR 800 MHz

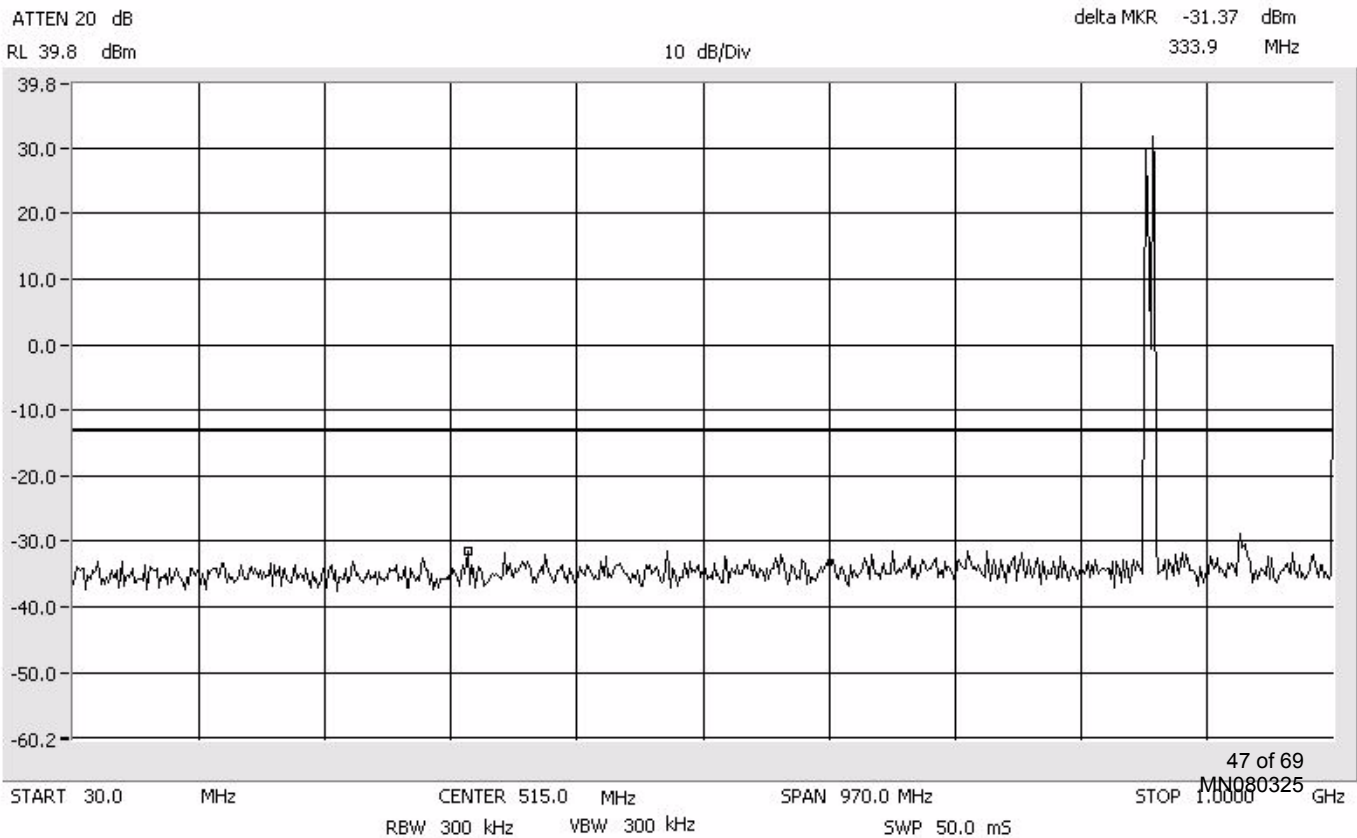
Center: 860.0 MHz  
Span: 75 MHz  
RBW/VBW: 100 kHz



CDMA

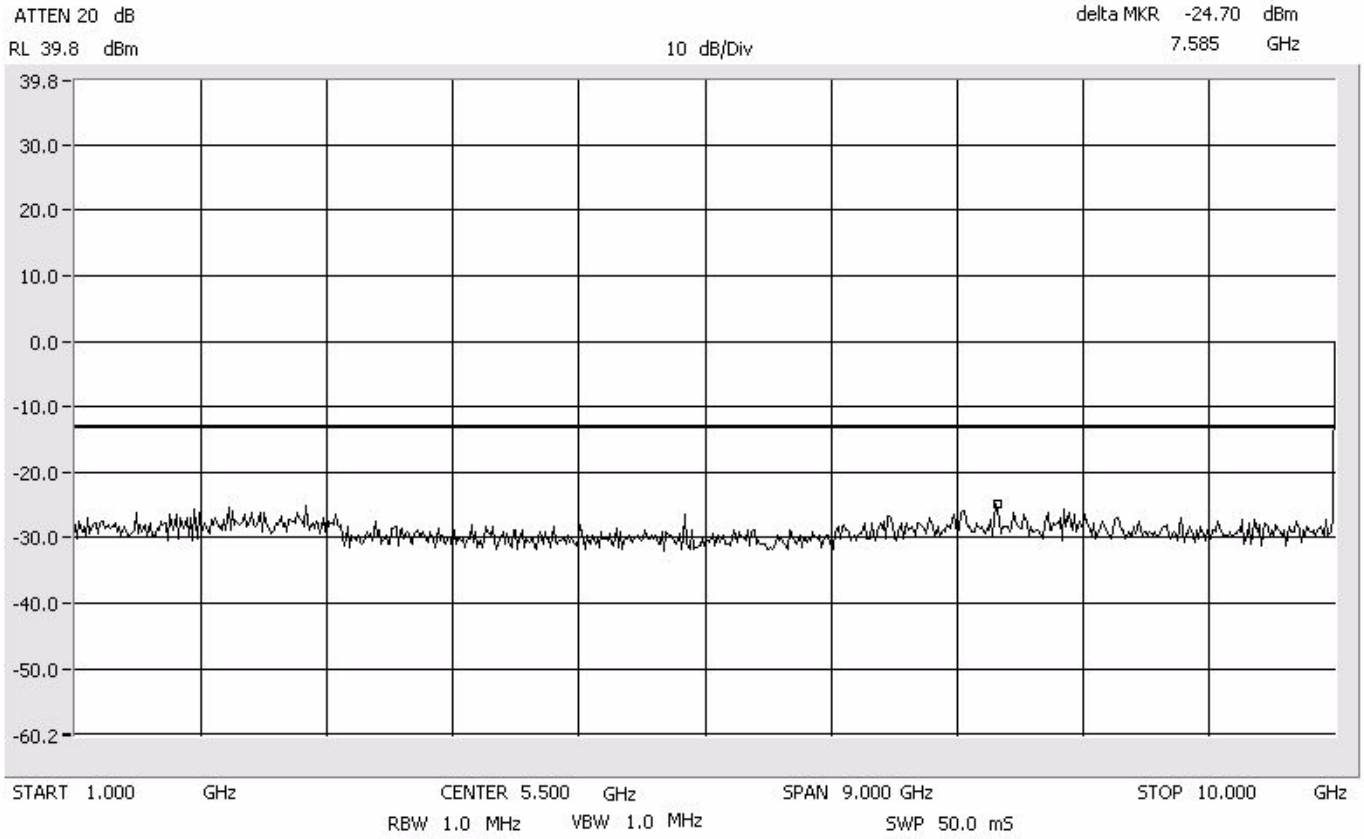
# Intermodulation Apart SMR 800 MHz

Span: 30 MHz to 1 GHz  
RBW/VBW: 300 kHz



# Intermodulation Apart SMR 800 MHz

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





**Occupied Bandwidth Modulation Test for ADC Inc**  
**FlexWave™ URH - SMR**  
**Model Number FWU-D20000002110RU**

[Back](#)

An input/output Occupied Bandwidth test was done with modulation types: FM, iDEN, and CDMA. 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.

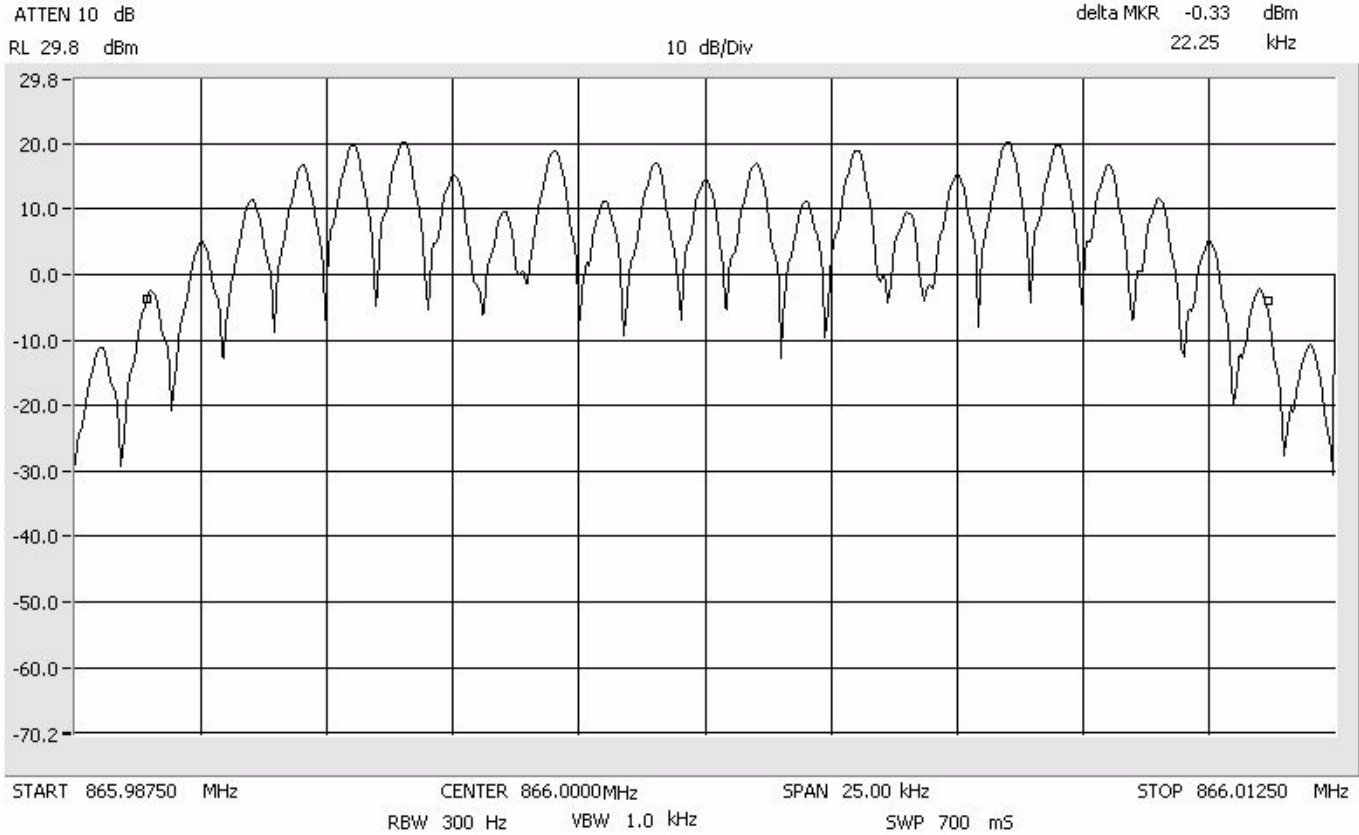
The resolution bandwidth is reduced to 1% of the estimated emission bandwidth and the video bandwidth is set to 3 times the resolution bandwidth. The markers are moved to the -20 dB points (from the previously established center frequency level) on either side of center frequency.

**Results:**

Pass (see plots)

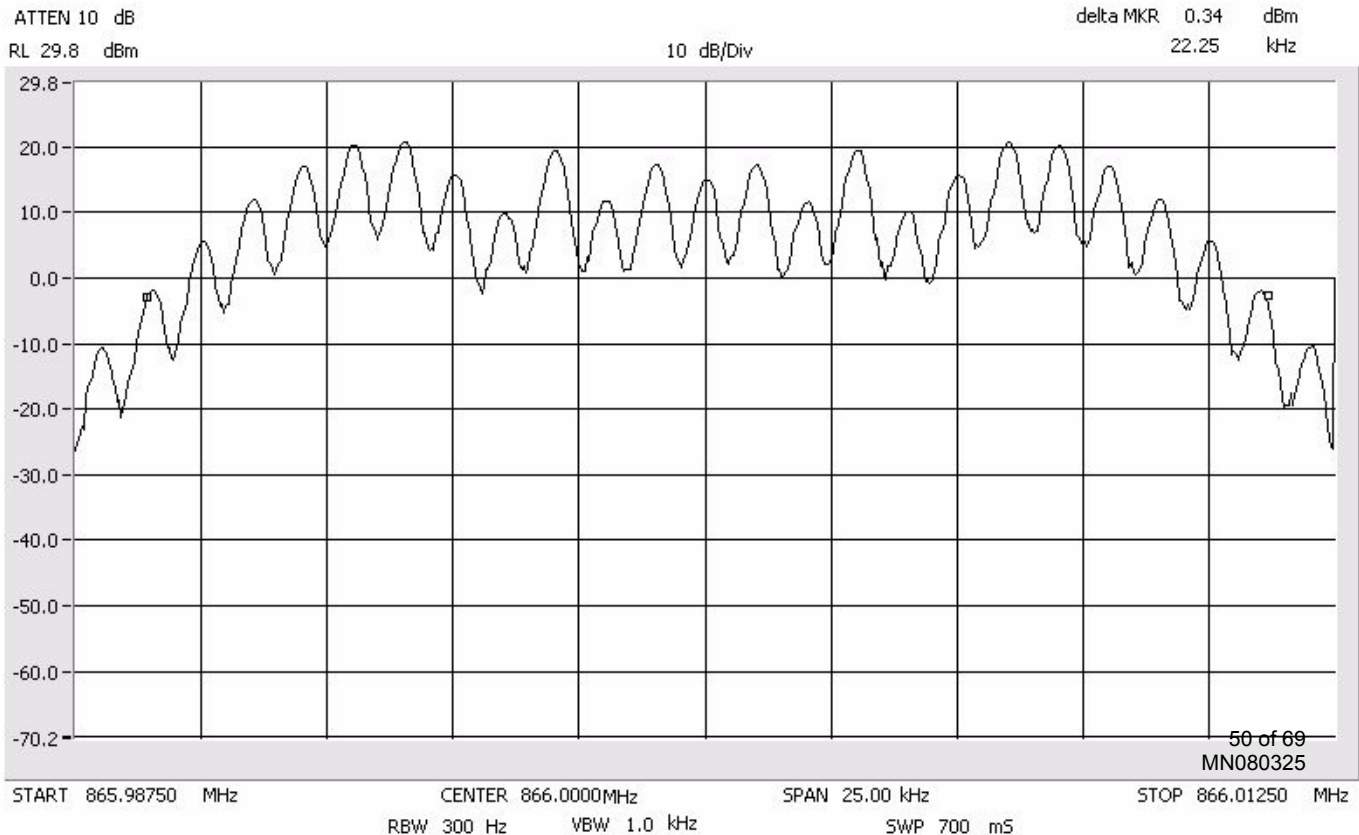
# Occupied Bandwidth FM Signal In

Span: 25 kHz  
RBW: 300 kHz  
VBW: 1.0 kHz



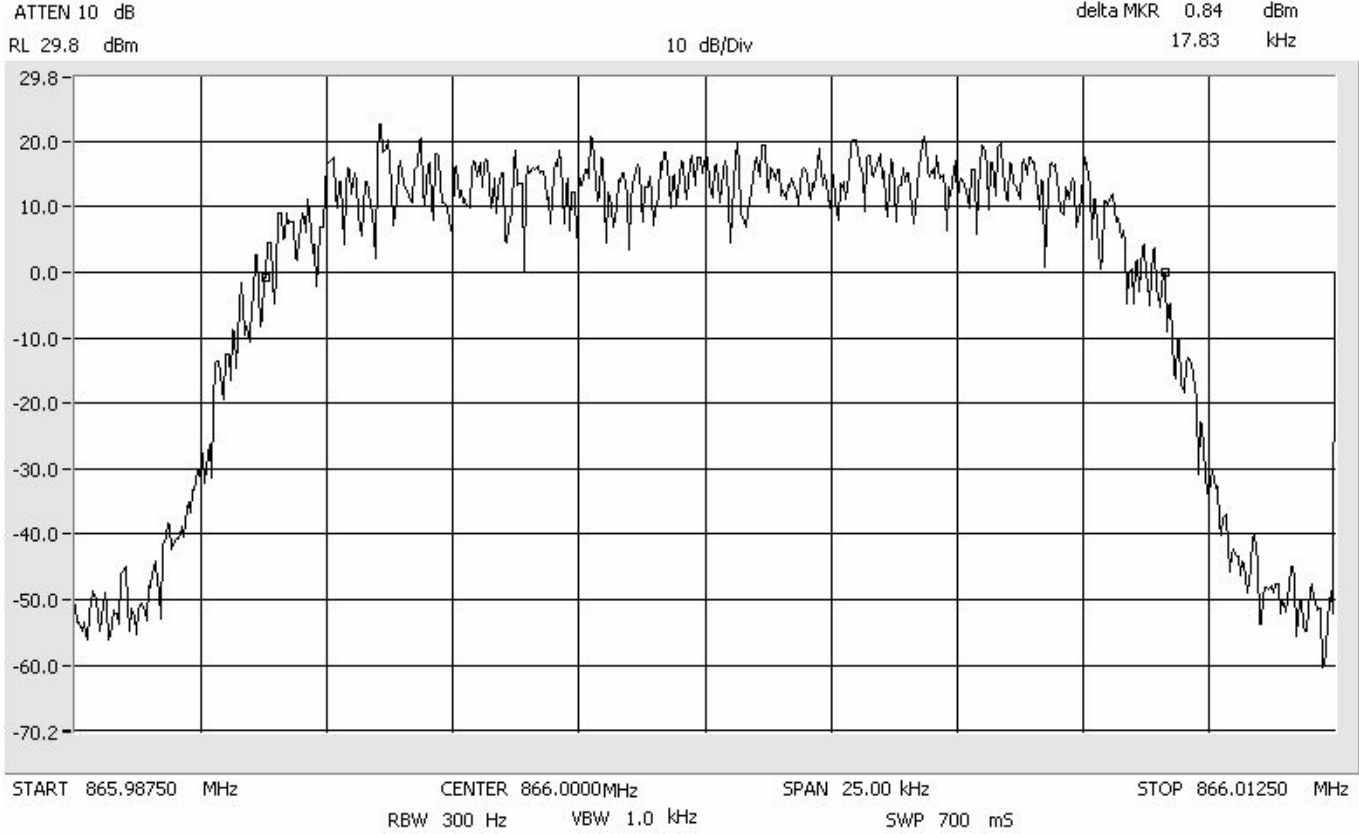
# Occupied Bandwidth FM Signal Out

Span: 25 kHz  
RBW: 300 kHz  
VBW: 1.0 kHz



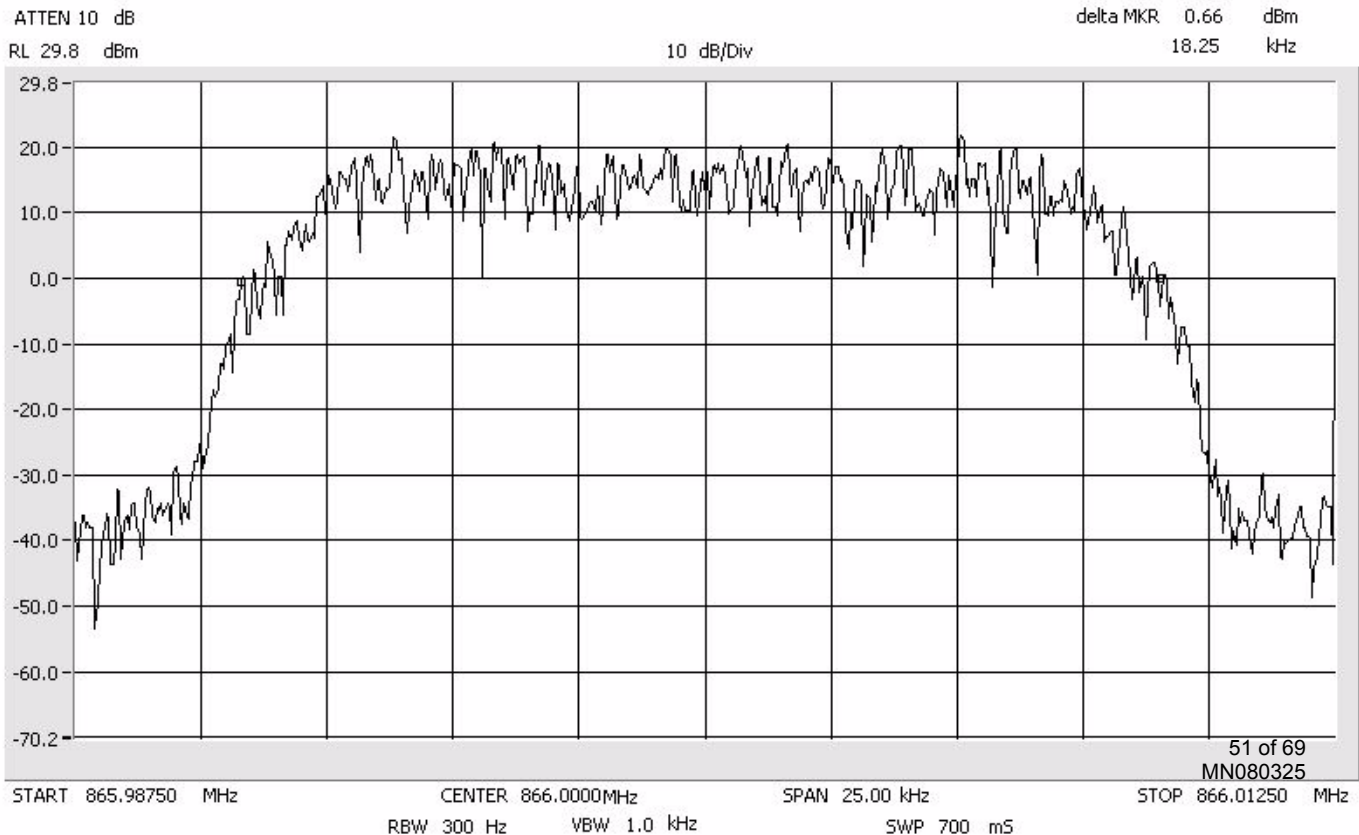
# Occupied Bandwidth iDEN Signal In

Span: 25 kHz  
RBW: 300 kHz  
VBW: 1.0 kHz



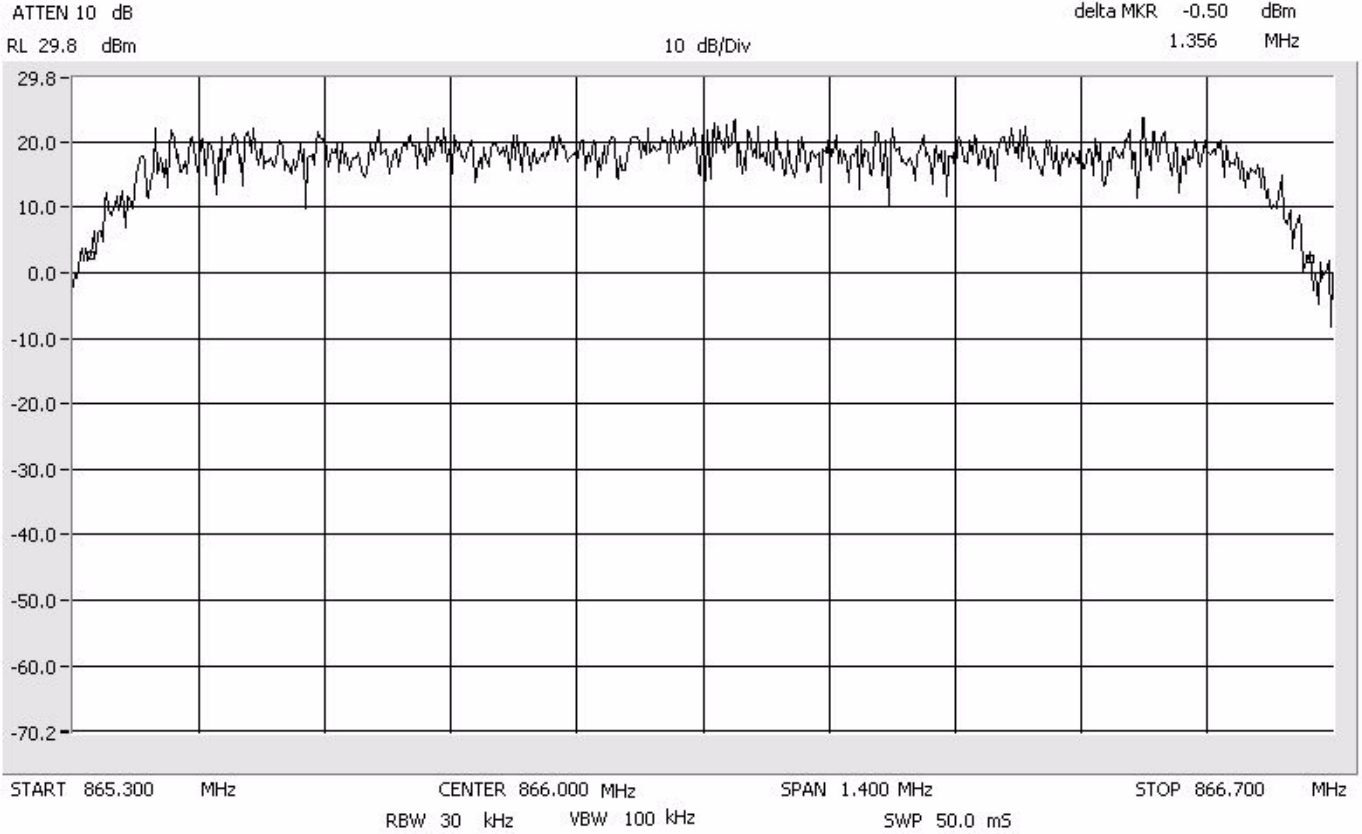
# Occupied Bandwidth iDEN Signal Out

Span: 25 kHz  
RBW: 300 kHz  
VBW: 1.0 kHz



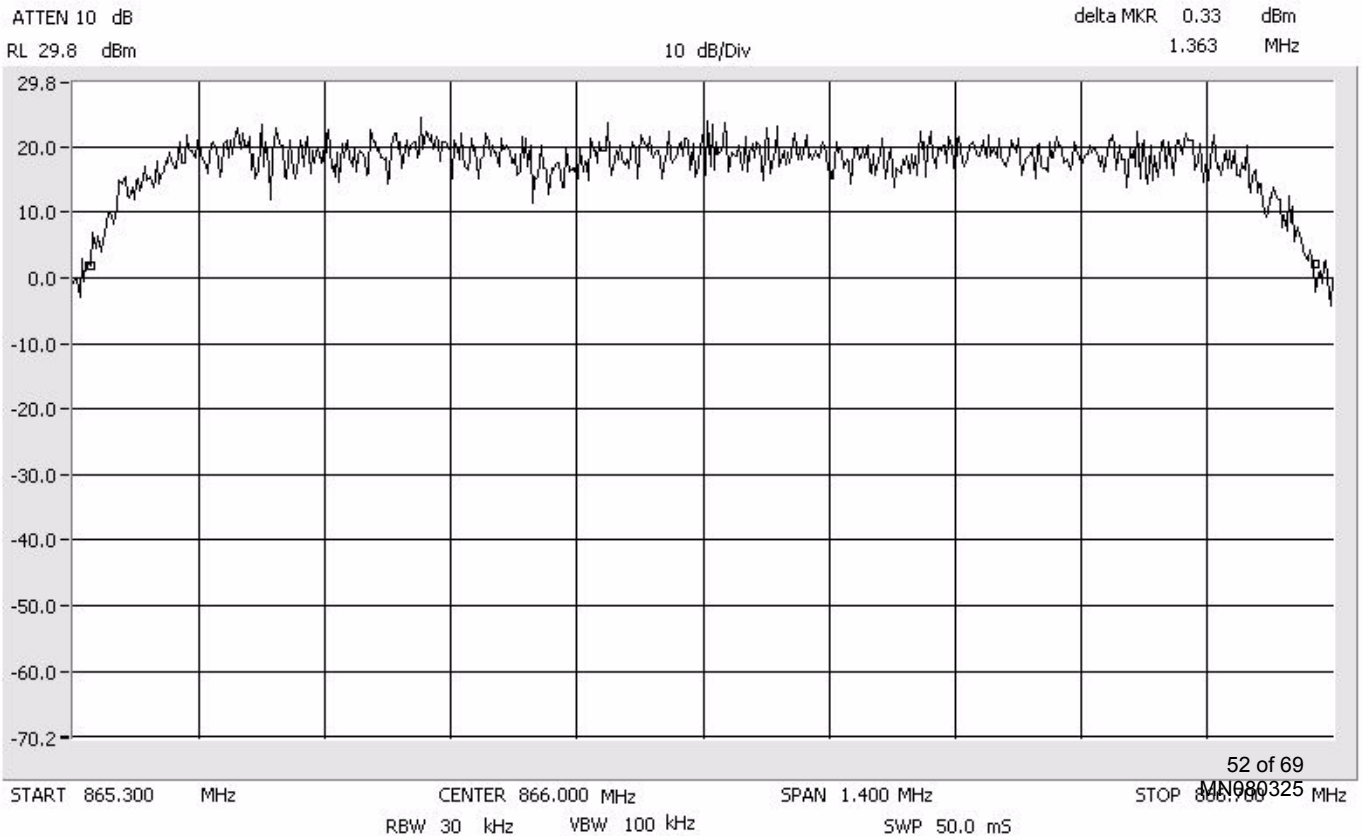
# Occupied Bandwidth CDMA Signal In

Span: 1.4 MHz  
RBW: 30 kHz  
VBW: 100 kHz



# Occupied Bandwidth CDMA Signal Out

Span: 1.4 MHz  
RBW: 30 kHz  
VBW: 100 kHz



**Frequency Tolerance Test for ADC Inc  
FlexWave™ URH - SMR  
Model Number FWU-D20000002110RU**

[Back](#)

**EUT SMR 800 MHz**

HOST	REMOTE			
Input Voltage	Input Voltage	Carrier Frequency	Measured Frequency	Meets Requirements?
21 VDC	100 VAC	851.200 MHz	851.200 MHz	Yes
48 VDC	170 VAC	851.200 MHz	851.200 MHz	Yes
60 VDC	240 VAC	851.200 MHz	851.200 MHz	Yes
21 VDC	100 VAC	860.000 MHz	860.000 MHz	Yes
48 VDC	170 VAC	860.000 MHz	860.000 MHz	Yes
60 VDC	240 VAC	860.000 MHz	860.000 MHz	Yes
21 VDC	100 VAC	868.800 MHz	868.800 MHz	Yes
48 VDC	170 VAC	868.800 MHz	868.800 MHz	Yes
60 VDC	240 VAC	868.800 MHz	868.800 MHz	Yes
Temperature		Carrier Frequency	Measured Frequency	Meets Requirements?
-30 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
50 Deg. C		851.200 MHz	851.200 MHz	Yes
-30 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
50 Deg. C		860.000 MHz	860.000 MHz	Yes
-30 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
50 Deg. C		868.800 MHz	868.800 MHz	Yes

Intertek Test Data

[Back to Test Data:](#)[Back to Table of Contents:](#)**Test Engineer:** Uri Spector**Date:** 19, March, 2008**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: 90706

IC Registration Number: 4359



## TEST DATA

Test Data Number: 3147567MIN-001  
Project Number: 3147567

Testing performed on the  
Flex Wave URH-SMR

To  
47 CFR, Part 90

For  
ADC Telecommunications Inc.

Test Performed by:  
Intertek Testing Services NA, Inc.  
7250 Hudson Blvd., Suite 100  
Oakdale, MN 55128

Test Authorized by:  
ADC Telecommunications Inc.  
5341 12<sup>th</sup> Avenue East  
Shakopee, MN 55379

Prepared by: Uri Spector  
Uri Spector

Date: March 19, 2008

Reviewed by: Simon Khazon  
Simon Khazon

Date: March 19, 2008



**TABLE OF CONTENTS**

- 1.0 DESCRIPTION OF THE SAMPLE (EUT) ..... 3**
- 2.0 TEST SUMMARY..... 4**
  - 2.1 Statement of the Measurement Uncertainty ..... 4
- 3.0 TEST RESULTS..... 5**
  - 3.1 Environmental conditions ..... 10
- 5.0 TEST EQUIPMENT..... 12**





## 1.0 DESCRIPTION OF THE SAMPLE (EUT)

<b>Model:</b>	Flex Wave URH-SMR
<b>Type of EUT:</b>	Optical Repeater
<b>Serial Number:</b>	N/A
<b>Company:</b>	ADC Telecommunications Inc.
<b>Customer:</b>	Mr. Mark Miska
<b>Address:</b>	1187 Park Place Shakopee, MN 55379
<b>Phone:</b>	952-403-8340
<b>Fax:</b>	952-403-8858
<b>Test Standards:</b>	<input type="checkbox"/> EN 55022:2006, Class <input type="checkbox"/> EN 55011:1998 + A1:1999 + A2:2002, Group, Class <input checked="" type="checkbox"/> 47 CFR, Part 90:2007 <input type="checkbox"/> 47 CFR, Part 15:2007, §15.109, Class <input type="checkbox"/> EN 55014-1:2000 + A1:2001 + A2:2002 <input type="checkbox"/> EN 61326-1:2006 <input type="checkbox"/> Class for Radiated and Conducted Emissions <input type="checkbox"/> EN 60601-1-2:2001 +A1:2006 <input type="checkbox"/> Class Radiated and Conducted Emissions <input type="checkbox"/> EN 61000-6-3:2001 <input type="checkbox"/> EN 61000-6-4:2001 <input type="checkbox"/> EN 61000-3-2:2006 <input type="checkbox"/> EN 61000-3-3:1995 +A1:2001 +A2:2006 <input type="checkbox"/> Other

## 2.0 TEST SUMMARY

Referring to the performance criteria and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards.

TEST STANDARD	TEST	RESULT
Part 90	Spurious Enclosure Radiated Emissions	Pass

### 2.1 Statement of the Measurement Uncertainty

**Note:** The measured result in this report is within the specification limits by more than the measurement uncertainty; the measured result indicates that the product tested complies with the specification limit.

The expanded uncertainty ( $k = 2$ ) for radiated emissions from 30 to 1000 MHz has been determined to be:  $\pm 4$  dB at 10m and  $\pm 5.4$  dB at 3m

The expanded uncertainty ( $k = 2$ ) for conducted emissions from 150 kHz to 30 MHz has been determined to be:  $\pm 2.6$  dB

General notes:

1. Test was performed with the EUT tuned to the frequency of 860MHz. Testing was performed in frequency range from 30MHz to 10GHz.
2. The Spurious Radiated Power limits of -13dBm was correlated with field strength reference level of 82.2dB $\mu$ V/m during field strength measurements at 3m measurement distance



### 3.0 TEST RESULTS

Table 1 shows detected Radiated Emissions. Emissions at fundamentals were excluded from the table. Graphs 1 to 18 show the EUT peak Radiated Emissions. No emissions were chosen for substitution measurements as the maximum emission is more than 20dB below the reference limit.



TILE Instrument Control System EMI Measurement Software

Radiated Emissions from 30MHz to 1GHz

Date: 3/19/2008

**Company:** ADC Telecommunications  
**Model:** URH-SMR  
**Test Engineer:** Uri Spector  
**Special Info:** 860MHz  
**Standard:** FCC Part 90  
**Test Site:** 3m Anechoic Chamber, 3m measurement distance  
**Note:** The table shows the worst case radiated emissions  
 Measurements were taken using a Peak detector

Table # 1

Frequency	Ant. Polarity	Peak Reading dBµV	Ant.Factor dB1/m	Total at 3m dBµV/m	QP Limit dBµV/m	Margin dB
37.273 MHz	V	27.7	16.7	44.4	82.2	-37.9
46.555 MHz	V	31.3	11.8	43.1	82.2	-39.2
87.167 MHz	V	40.8	9.7	50.5	82.2	-31.7
114.33 MHz	V	31.4	13.5	44.8	82.2	-37.4
276.53 MHz	V	25.8	15.1	40.9	82.2	-41.3
374.81 MHz	V	27.8	17.9	45.7	82.2	-36.5
399.05 MHz	V	20.5	18.5	39.0	82.2	-43.2
437.84 MHz	V	31.1	19.4	50.5	82.2	-31.7
500.18 MHz	V	27.2	20.2	47.4	82.2	-34.9
525.11 MHz	V	24.4	20.5	44.9	82.2	-37.3
583.99 MHz	V	23.6	21.5	45.1	82.2	-37.1
625.55 MHz	V	25.9	21.9	47.8	82.2	-34.4
645.64 MHz	V	22.4	22.0	44.4	82.2	-37.8
750.31 MHz	V	24.4	23.1	47.5	82.2	-34.7
829.53 MHz	V	19.5	24.0	43.5	82.2	-38.7
87.614 MHz	H	39.2	9.7	48.9	82.2	-33.3
131.04 MHz	H	33.0	13.5	46.5	82.2	-35.7
146.96 MHz	H	32.4	12.8	45.2	82.2	-37.0
374.81 MHz	H	32.5	17.9	50.4	82.2	-31.8
437.84 MHz	H	35.6	19.4	55.0	82.2	-27.2
450.31 MHz	H	27.1	19.3	46.4	82.2	-35.8
500.18 MHz	H	32.3	20.2	52.5	82.2	-29.7
525.11 MHz	H	27.1	20.5	47.6	82.2	-34.6
625.55 MHz	H	30.4	21.9	52.3	82.2	-29.9
645.64 MHz	H	24.1	22.0	46.1	82.2	-36.1
736.87 MHz	H	22.3	22.9	45.2	82.2	-37.0
750.31 MHz	H	30.5	23.1	53.6	82.2	-28.6
829.53 MHz	H	25.3	24.0	49.2	82.2	-33.0
874.8 MHz	H	29.7	24.3	54.0	82.2	-28.2
937.75 MHz	H	22.1	25.2	47.2	82.2	-35.0
944.83 MHz	H	19.8	25.2	45.0	82.2	-37.2



TILE Instrument Control System EMI Measurement Software

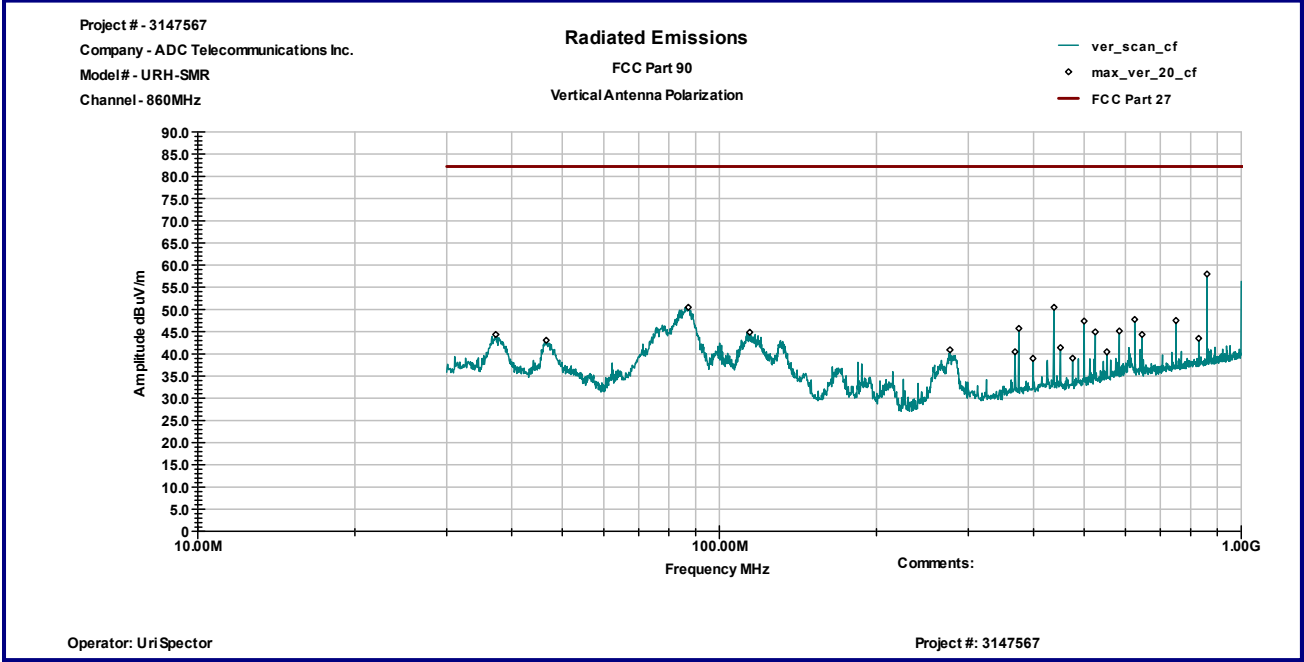
**Radiated Emissions from 1GHz to 10GHz**

**Date:** 03-19-2008

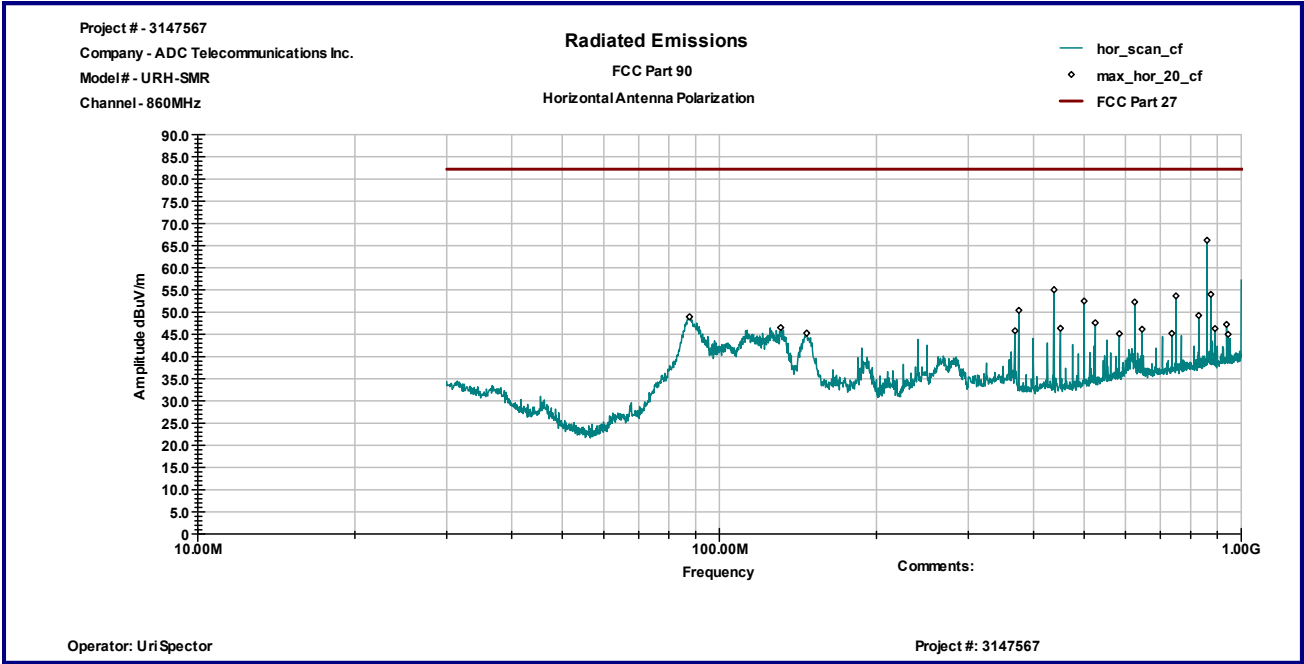
**Company:** ADC Telecommunications  
**Model:** URH-SMR  
**Test Engineer:** Uri Spector  
**Special Info:** 860MHz  
**Standard:** FCC Part 90  
**Test Site:** 3m Anechoic Chamber, 3m measurement distance  
**Note:** The table shows the worst case radiated emissions  
 All measurements were taken using a Peak detector

**Table # 2**

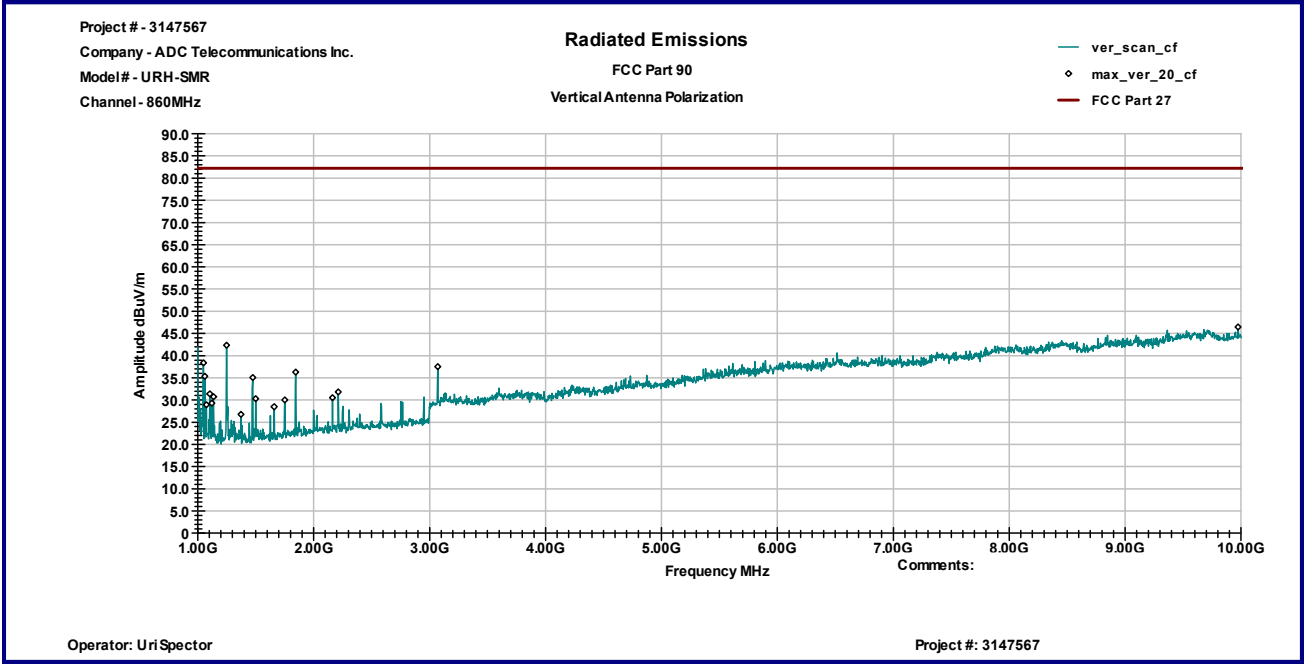
Frequency MHz	Antenna Polarity	Reading dBµV	Total C.F. dB1/m	Pre-Amp. Gain (dB)	Total at 3m dBµV/m	QP Limit dBµV/m	Margin dB
1.0504 GHz	V	50.6	27.5	39.8	38.4	82.2	-43.8
1.0612 GHz	V	47.5	27.6	39.8	35.4	82.2	-46.9
1.0756 GHz	V	41.1	27.6	39.7	28.9	82.2	-53.3
1.1044 GHz	V	43.4	27.7	39.7	31.4	82.2	-50.8
1.1224 GHz	V	41.2	27.8	39.7	29.3	82.2	-52.9
1.1368 GHz	V	42.6	27.8	39.7	30.7	82.2	-51.5
1.2484 GHz	V	53.8	28.1	39.6	42.3	82.2	-39.9
1.3744 GHz	V	37.7	28.5	39.5	26.8	82.2	-55.4
1.4752 GHz	V	45.6	28.8	39.4	35.1	82.2	-47.1
1.5004 GHz	V	40.8	28.9	39.4	30.3	82.2	-51.9
1.6588 GHz	V	37.9	29.7	39.2	28.5	82.2	-53.8
1.7524 GHz	V	38.8	30.2	39.0	30.0	82.2	-52.2
1.846 GHz	V	44.5	30.6	38.9	36.3	82.2	-45.9
2.1628 GHz	V	37.1	31.8	38.3	30.5	82.2	-51.7
2.2132 GHz	V	38.2	31.9	38.3	31.8	82.2	-50.4
3.07 GHz	V	41.3	34.1	37.9	37.5	82.2	-44.7
1.0108 GHz	H	50.5	27.4	39.8	38.2	82.2	-44.0
1.0468 GHz	H	55.9	27.5	39.8	43.7	82.2	-38.5
1.0612 GHz	H	50.4	27.6	39.8	38.2	82.2	-44.0
1.0756 GHz	H	44.4	27.6	39.7	32.3	82.2	-49.9
1.1044 GHz	H	49.0	27.7	39.7	37.0	82.2	-45.2
1.1224 GHz	H	43.1	27.8	39.7	31.2	82.2	-51.0
1.2484 GHz	H	56.3	28.1	39.6	44.9	82.2	-37.3
1.4752 GHz	H	48.7	28.8	39.4	38.1	82.2	-44.1
1.5004 GHz	H	43.1	28.9	39.4	32.7	82.2	-49.6
1.6588 GHz	H	40.0	29.7	39.2	30.5	82.2	-51.7
1.7524 GHz	H	40.7	30.2	39.0	31.9	82.2	-50.3
1.846 GHz	H	46.7	30.6	38.9	38.5	82.2	-43.7
2.2132 GHz	H	38.8	31.9	38.3	32.4	82.2	-49.8
2.2528 GHz	H	38.1	32.0	38.2	31.9	82.2	-50.3
2.7532 GHz	H	35.7	33.3	37.9	31.0	82.2	-51.2
2.7676 GHz	H	37.8	33.3	37.9	33.2	82.2	-49.0
2.9512 GHz	H	37.9	33.8	38.0	33.6	82.2	-48.6
3.07 GHz	H	40.1	34.1	37.9	36.3	82.2	-45.9
6.4864 GHz	H	36.8	42.4	36.3	42.8	82.2	-39.4



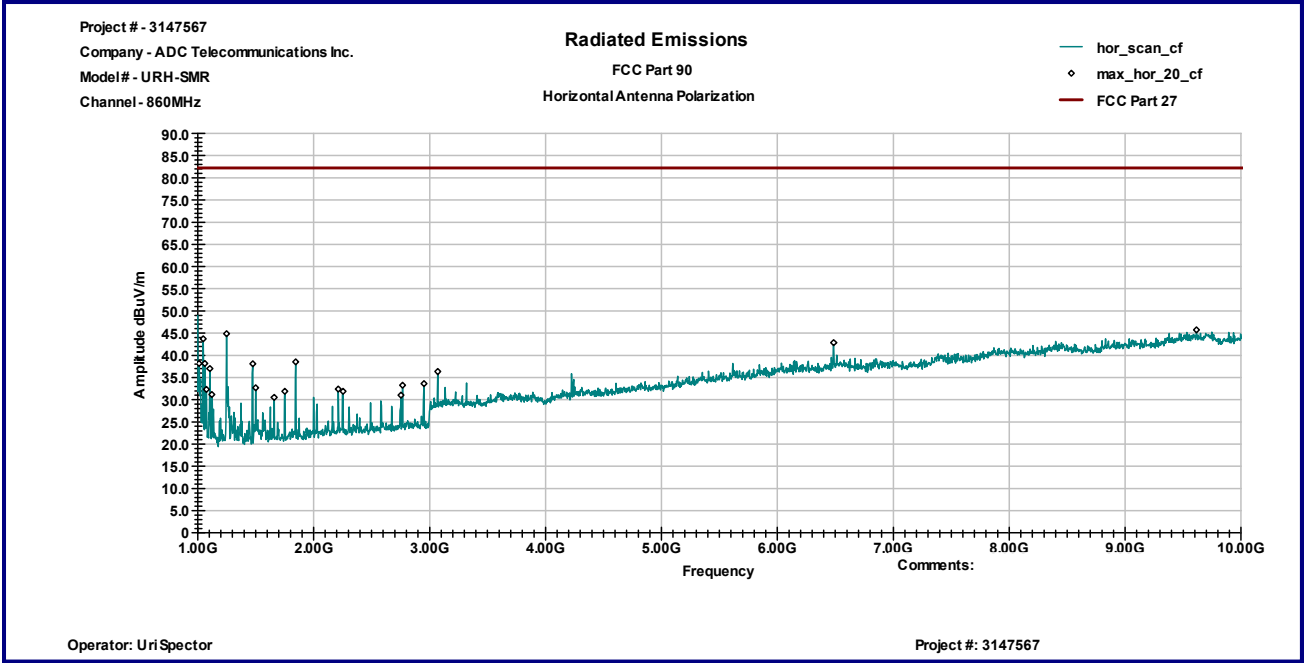
Graph 1



Graph 2



Graph 3



Graph 4



### 3.1 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

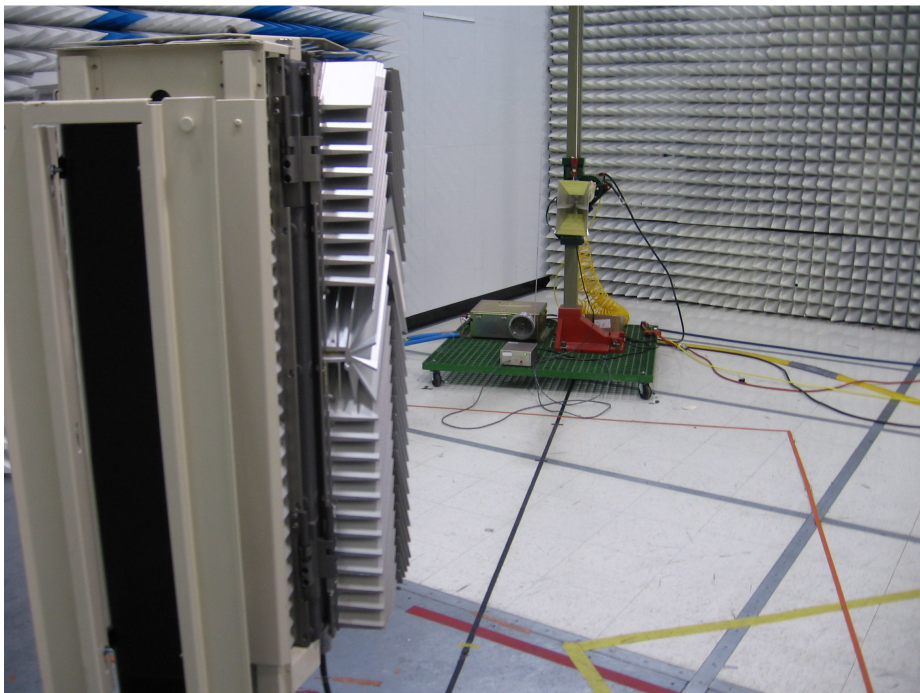
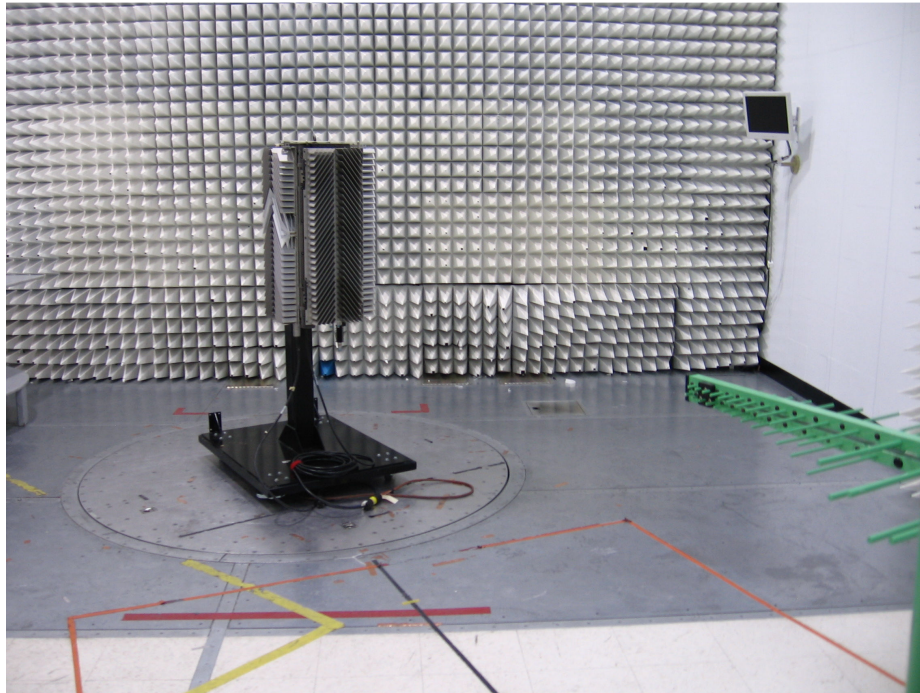
**Temperature:** 15-35 ° C

**Humidity:** 30-60 %

**Atmospheric pressure:** 86-106 kPa



4.0 PHOTOS



Test Setup Photos



## 5.0 TEST EQUIPMENT

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	CAL DUE	USED
Spectrum Analyzer	R & S	FSP 40	100024	08/23/2008	<input checked="" type="checkbox"/>
Spectrum Analyzer	R & S	ESCI	100358	04/27/2008	<input checked="" type="checkbox"/>
Bicono-Log Antenna	Schaffner-Chase	CBL 6112 B	2468	07/30/2008	<input checked="" type="checkbox"/>
Horn Antenna	EMCO	3115	9507-4513	02/13/2009	<input checked="" type="checkbox"/>
Pre-Amplifier	MITEQ	AMF-5D-00501800-28-13P	1122951	04/24/2008	<input checked="" type="checkbox"/>
System	TILE! Instrument Control		Ver. 3.4.K.29	VBU	<input checked="" type="checkbox"/>



**8.0**

**APPENDIX C**

Measurement Protocol

[Back to Table of Contents:](#)

# Measurement Protocol

## Environmental conditions of the lab, (ADC)

Temperature: 21 - 26° C

Relative Humidity: 21 - 24 %

Atmospheric Pressure: 97.8 - 100.0 kPa

## **Test Methodology:**

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

## **Measurement Uncertainty**

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

## **Justification**

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

## **Radiated Emissions**

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

Example:

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

## **Substitution Method**

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

## **Test Equipment**

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