



Test Report Summary

FCC CFR 47, Part 24

Subpart E Broadband PCS

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_PCS

Test Date(s): 7 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 24.

It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.

All testing was done in accordance with the Federal Communications Commission's CFR 47 Part 24 and the EUT fulfills the requirements of the Federal Communications Commission's CFR 47 Part 24.

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_PCS **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-002
Reference(s)

Total pages including Appendices: 110



1.0 TABLE OF CONTENTS

1.0	Table of Contents	3
2.0	Revision Description	4
3.0	Documentation	4
3.1	Test Regulations	4
3.2	Test Operation Mode	5
3.3	Configuration of the Device Under Test:	5
3.4	Product Options:	5
3.5	EUT Specifications and Requirements:	5
3.6	Cables:	5
3.7	Power Requirements:	5
3.8	Typical Installation and/or Operating Environment:	5
3.9	Other Special Requirements:	5
3.10	EUT Software:	5
3.11	EUT System Components	6
3.12	Support Equipment.....	6
3.13	Deviations from Standard:	6
3.14	General Remarks:	6
3.15	Summary:	6
4.0	Test Set-Up Drawings and Photos	7
4.1	Test Set-up Photo, Radiated Emissions.....	7
4.2	Test Set-up Photo, Radiated Emissions.....	8
4.3	Test Set-up Drawings	9
5.0	Test Results	11
5.1.1	24.232 Power and Antenna Height Limits.....	11
5.1.2	24.235 Frequency Stability	12
5.1.3	24.238 Emission Limits for Broadband PCS Equipment	13
6.0	Test Equipment	14
7.0	Appendix A	15
7.1	Conducted Emission Limits Test	16
7.2	Conducted Output Power Test.....	47
7.3	Frequency Tolerance Test.....	48
7.4	Intermodulation Test	50
7.5	Occupied Bandwidth Modulation Test	99
8.0	Appendix B	108
9.0	Appendix C	110



2.0 REVISION DESCRIPTION

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

3.0 DOCUMENTATION

3.1 Test Regulations

- 24.232 Power and antenna height limits
- 24.235 Frequency stability
- 24.238 Emission limits for Broadband PCS equipment

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: 24° C
Relative Humidity: 21%
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

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 – PCS - 1850 to 1910 MHz and 1930 to 1990 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



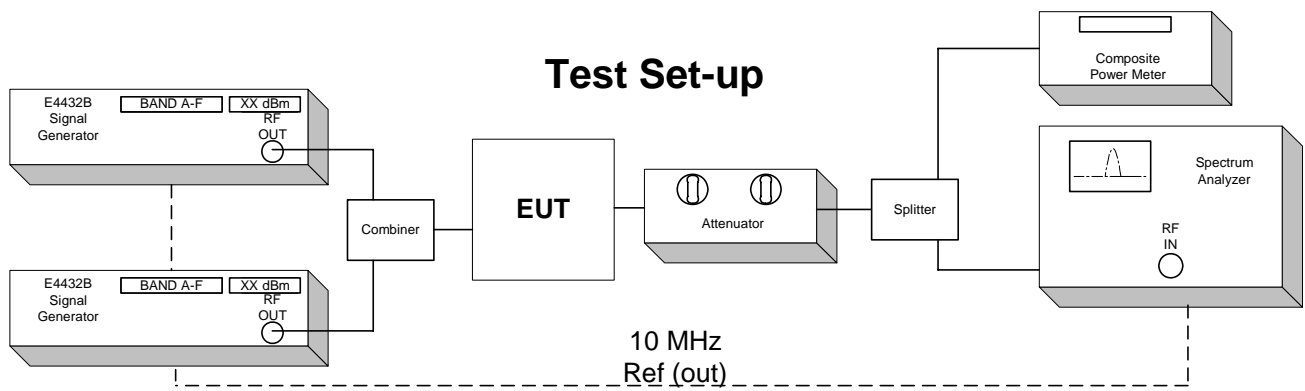
4.3 Test Set-up Drawings

Conducted and Radiated Emission Limits Test

Conducted Output Power Test

Inter-Modulation Test

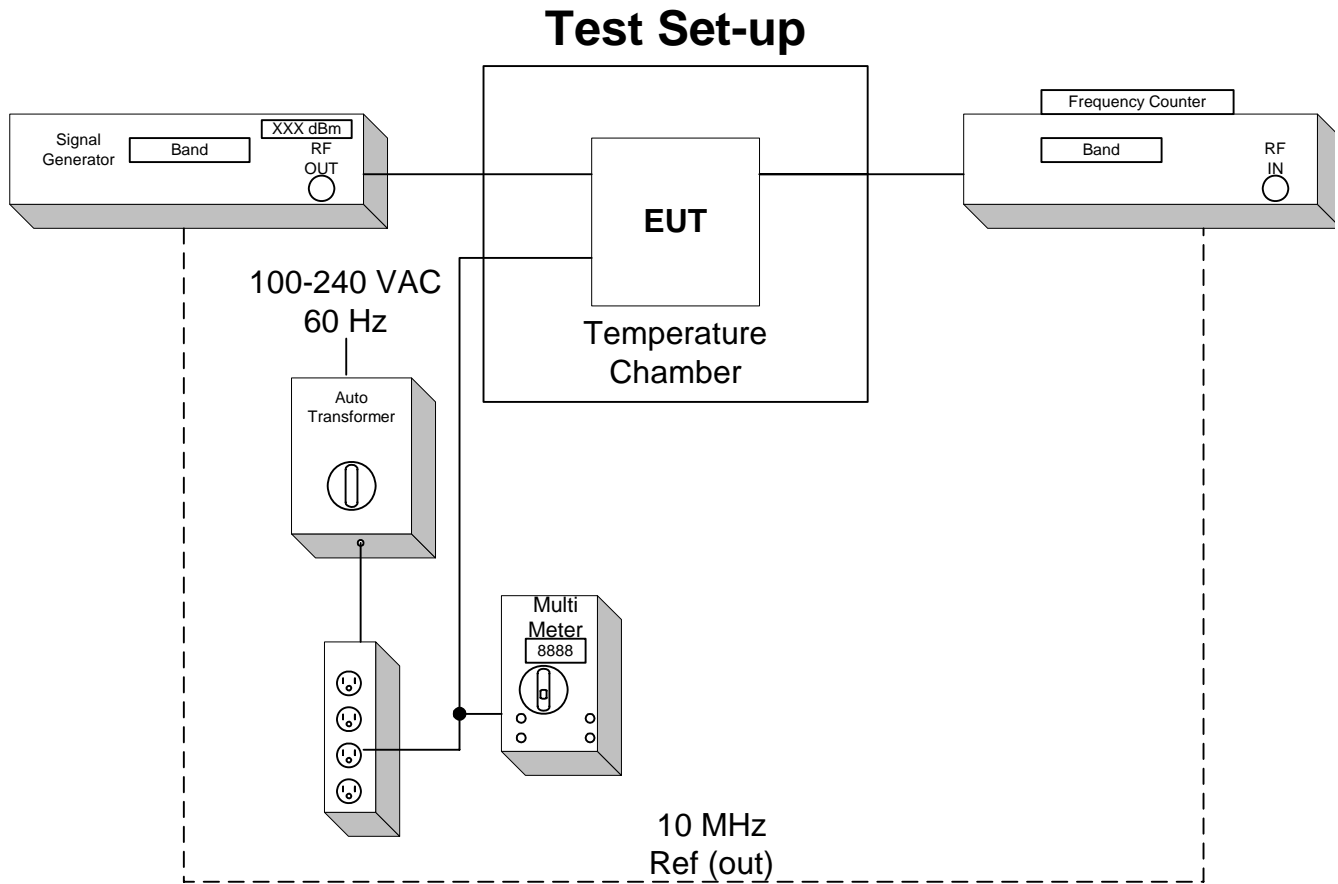
Occupied Bandwidth Modulation Test



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 24.232 Power and Antenna Height Limits

Test Summary:

- The requirements are: **MET** NOT MET
- Minimum margin of compliance is 25.36 dB at 860.0 MHz (CDMA2000)

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:

100 Watts or 50 dBm Limit

Test Data:

[Conducted Output Power; Section 7.2](#)

[Table of Contents; Section 1.0](#)

Test Engineer: Mark F. Miska

Date: 1 May, 2008

5.1.2 24.235 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 45° 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:

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

Test Data:

[Frequency Stability; Section 7.3](#)

[Table of Contents; Section 1.0](#)

Test Engineer: Mark F. Miska

Date: 1 May, 2008

5.1.3 24.238 Emission Limits for Broadband PCS Equipment

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; Section 7.1](#)

[Intermodulation; Section 7.4](#)

[Occupied Bandwidth; Section 7.5](#)

Radiated Emissions; ([Appendix B](#))

[Table of Contents; Section 1.0](#)

Test Engineer: Mark F. Miska

Date: 1 May, 2008

Date: 1 May, 2008

Date: 1 May, 2008

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	<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	4-8-09	<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 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.

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 CDMA2000, EDGE, GSM and 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 CDMA2000, EDGE, GSM and WCDMA 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.

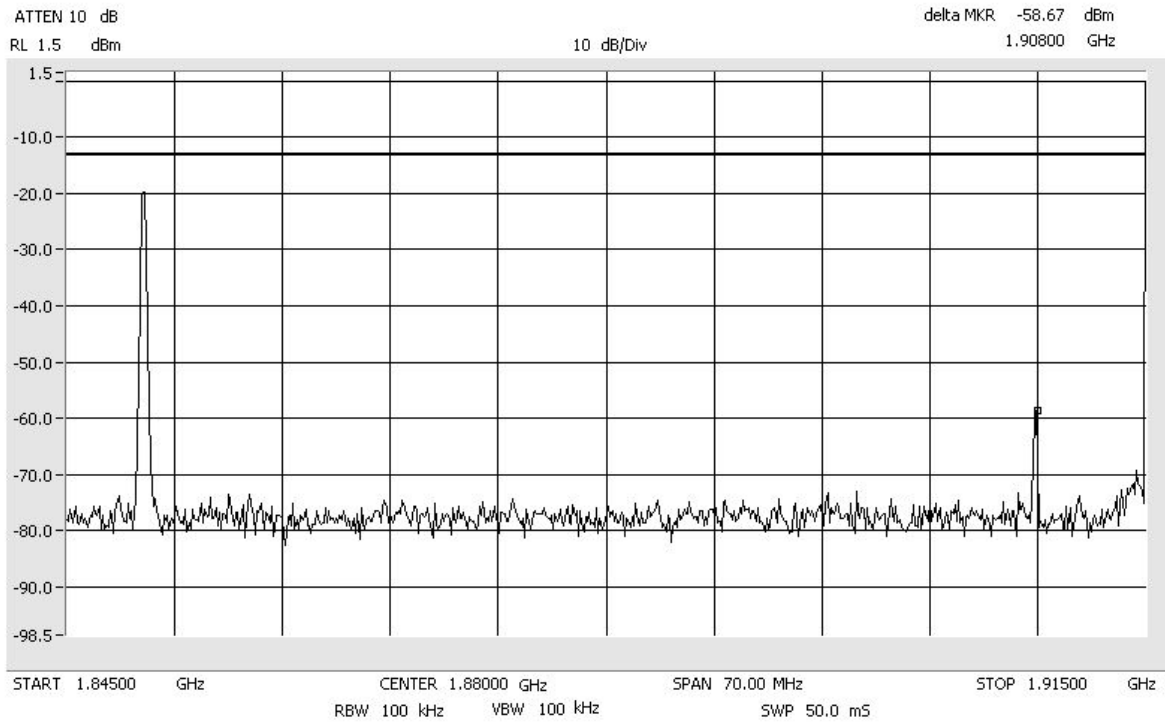
Internal to the electronics, the use of SAW filters provides for higher Q roll-off at band edges.

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.

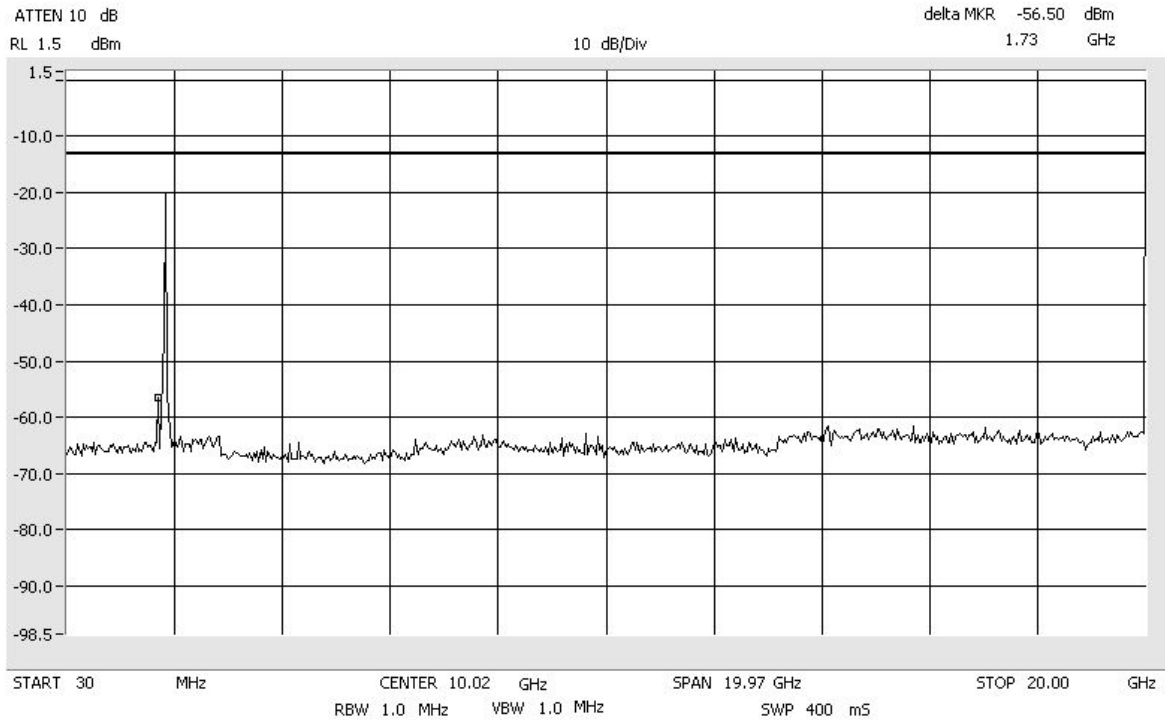
This is a constant gain device, so the setup controls the output. There is an overdrive and overpower limit control that prevents excess power.

Results:
Pass (See plots)

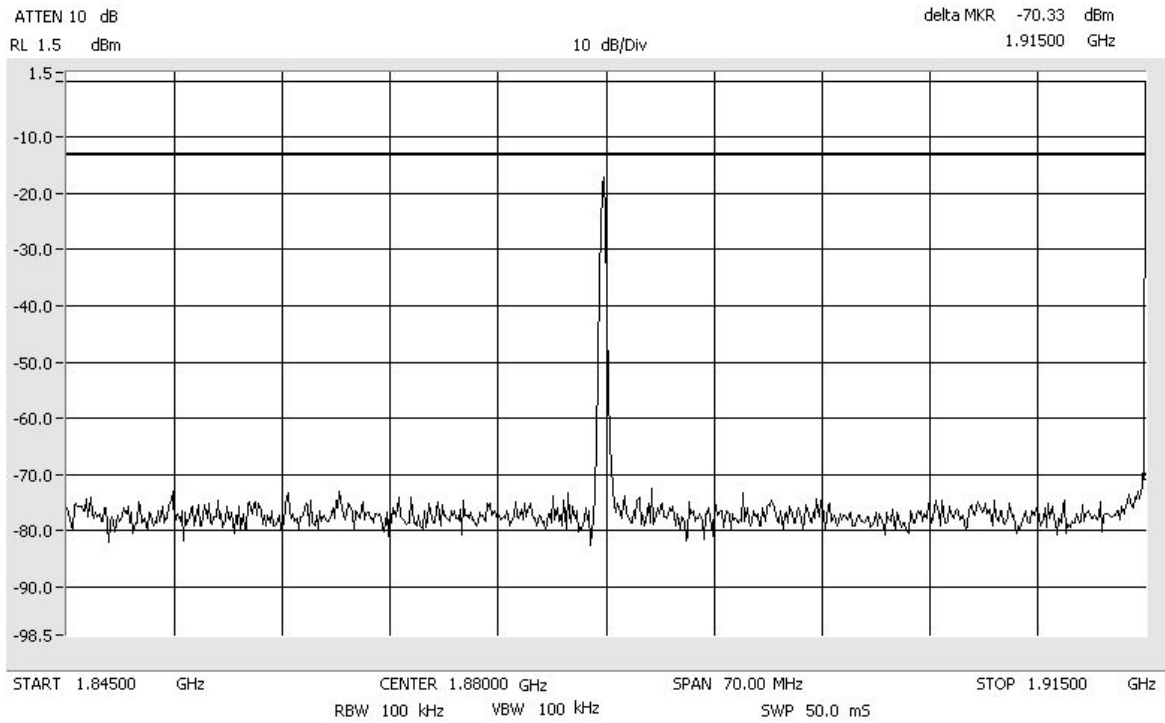
Conducted Emissions Low PCS
Center: 1880 MHz Span: 70 MHz RBW/VBW: 100 kHz



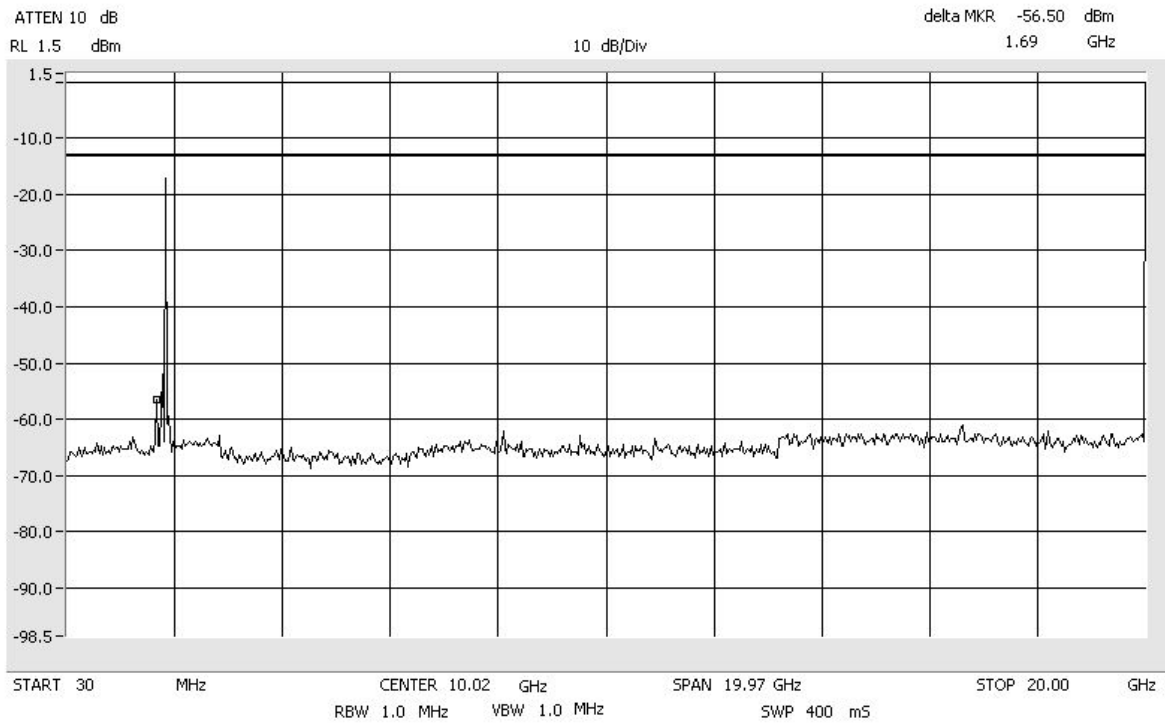
Conducted Emissions Low PCS
Span: 30 MHz to 20 GHz RBW/VBW: 1 MHz



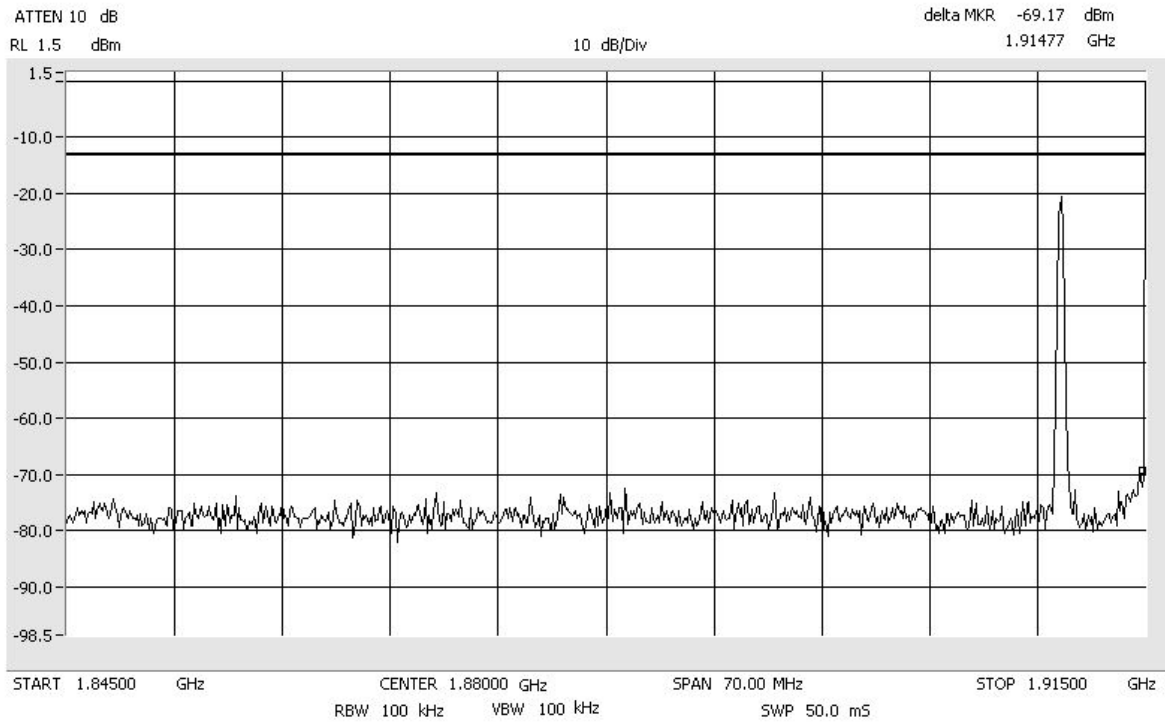
Conducted Emissions Mid PCS
Center: 1880 MHz Span: 70 MHz RBW/VBW: 100 kHz



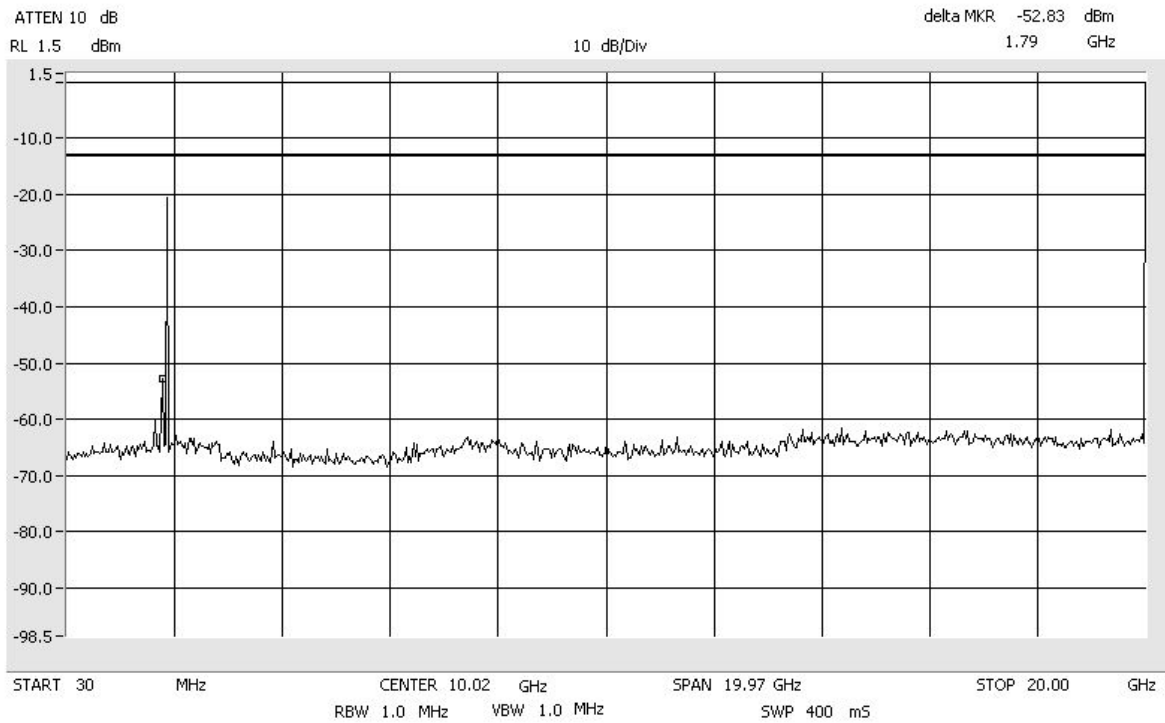
Conducted Emissions Mid PCS
Span: 30 MHz to 20 GHz RBW/VBW: 1 MHz



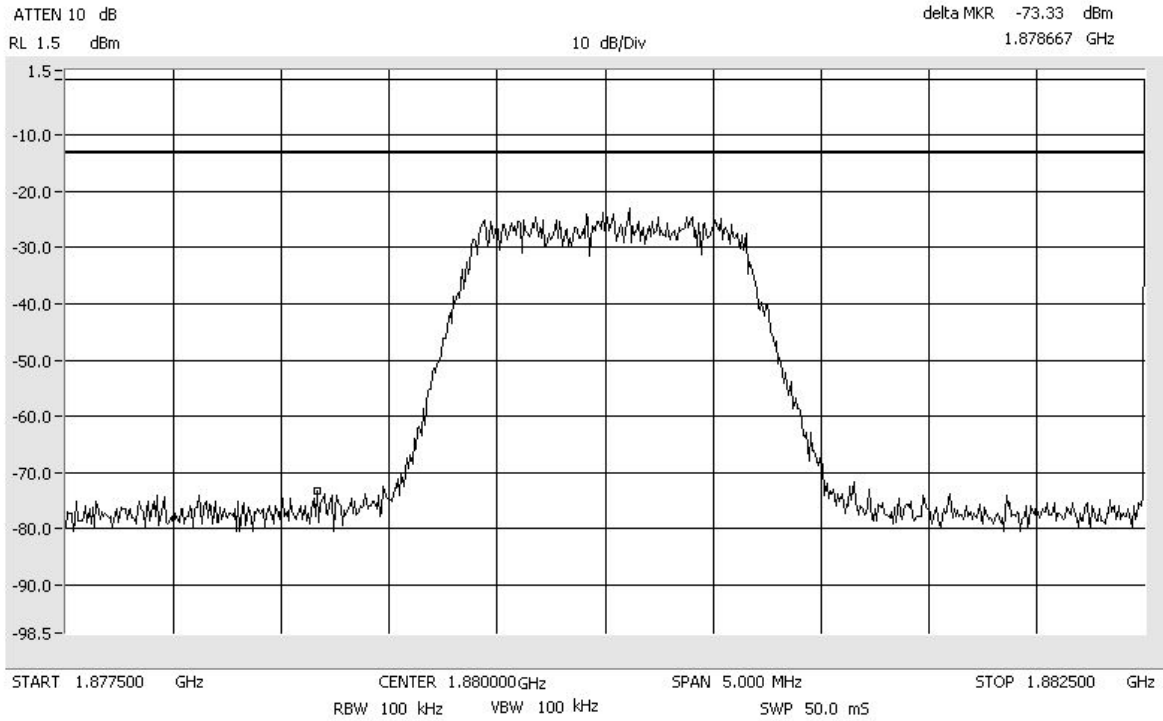
Conducted Emissions High PCS
Center: 1880 MHz Span: 70 MHz RBW/VBW: 100 kHz



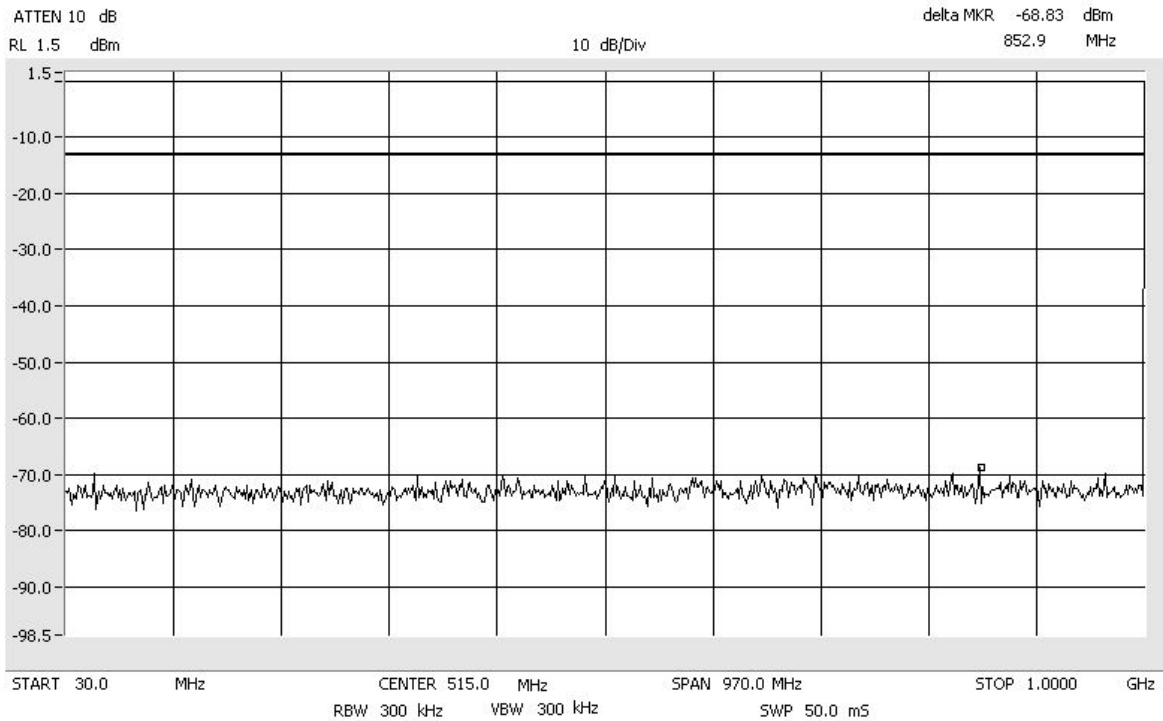
Conducted Emissions High PCS
Span: 30 MHz to 20 GHz RBW/VBW: 1 MHz



Conducted Emissions CDMA2000 PCS
Center: 1880 MHz Span: 5 MHz RBW/VBW: 100 kHz

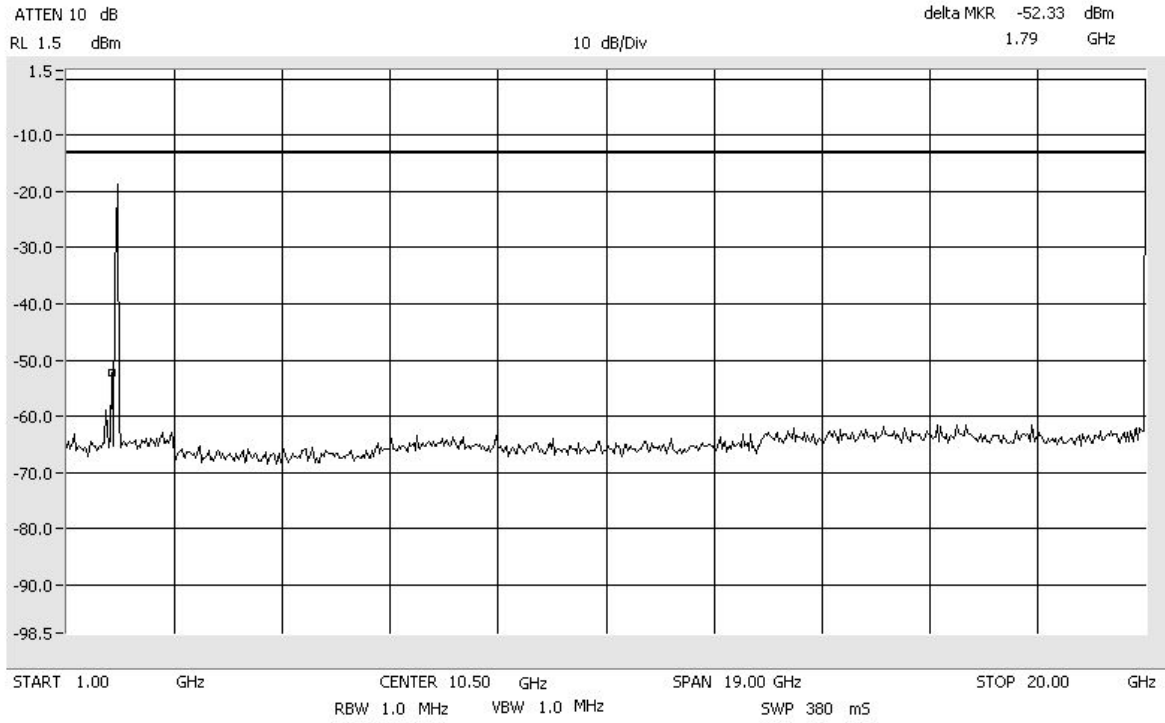


Conducted Emissions CDMA2000 PCS
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz

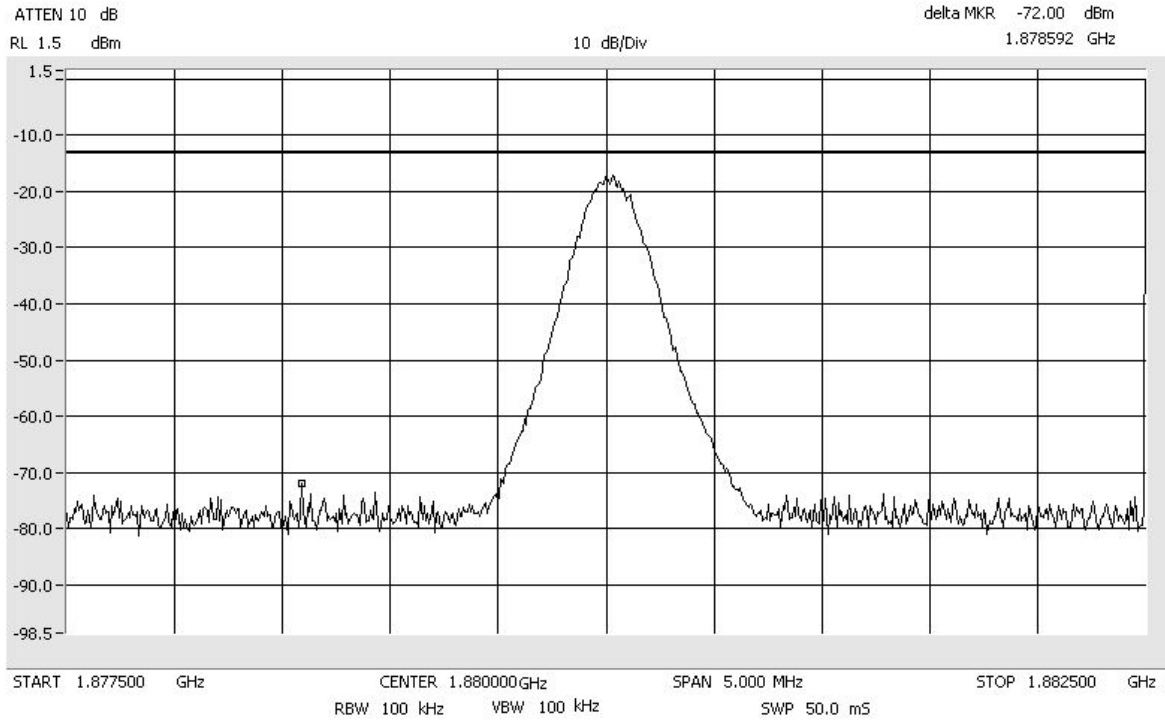


Conducted Emissions
Span: 1 GHz to 20 GHz

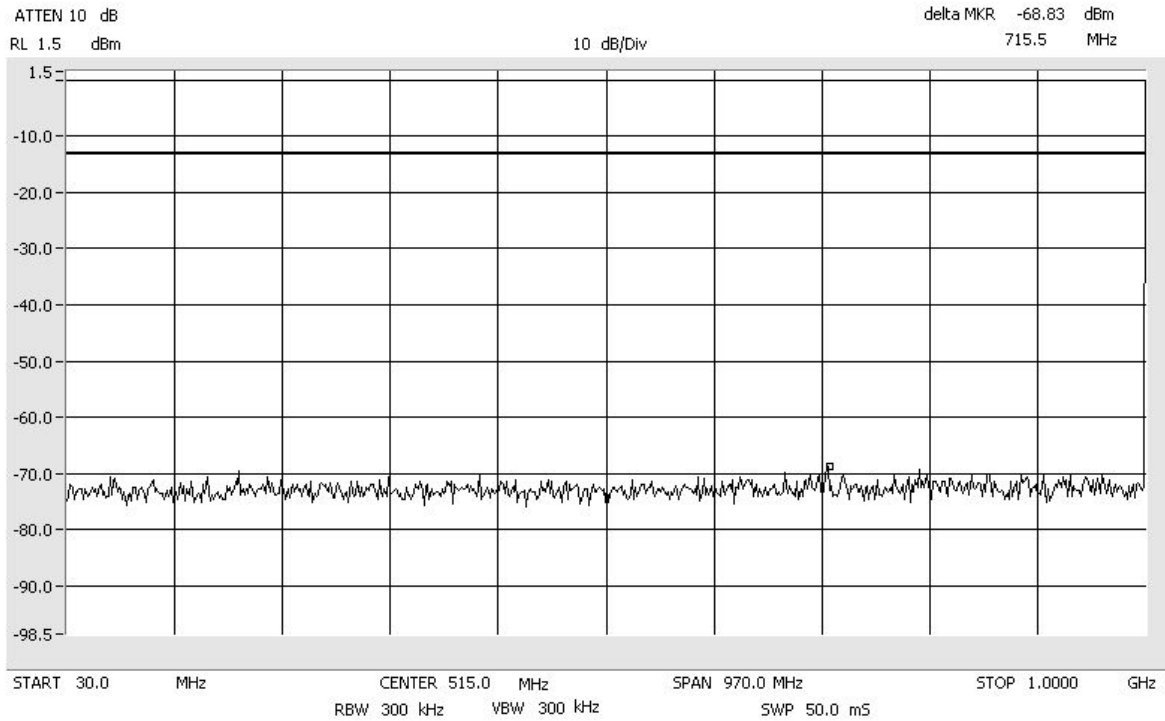
CDMA2000 PCS
RBW/VBW: 1 MHz



Conducted Emissions EDGE PCS
Center: 1880 MHz Span: 5 MHz RBW/VBW: 100 kHz

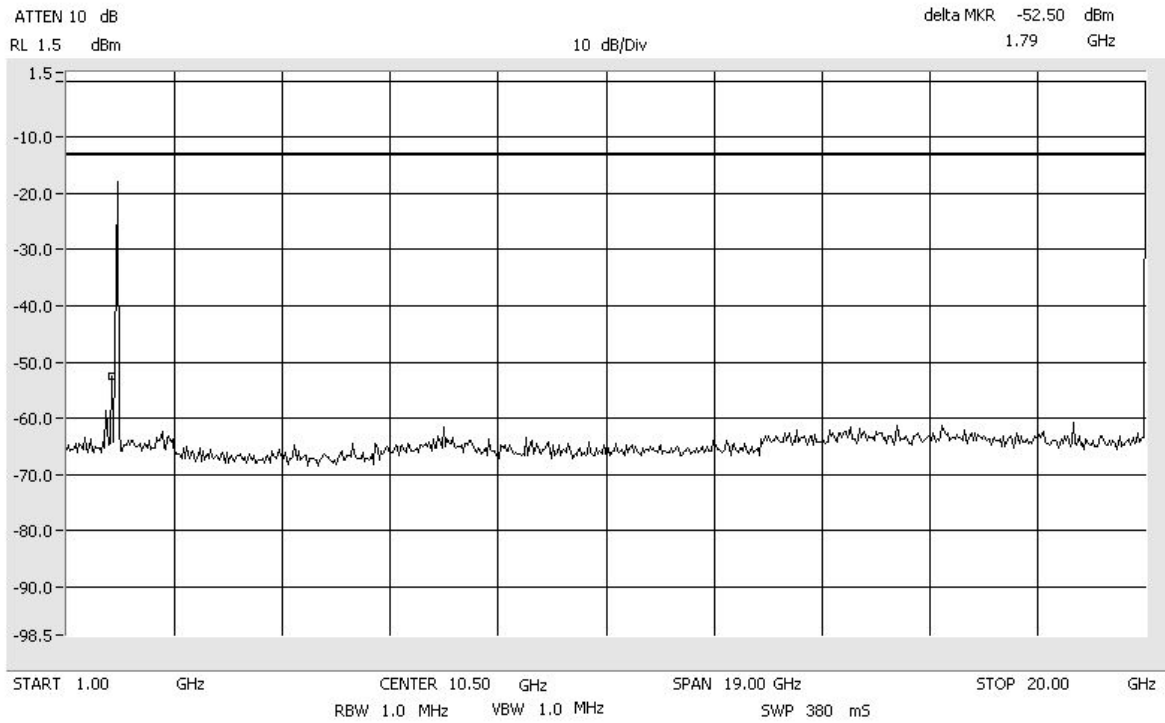


Conducted Emissions EDGE PCS
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz

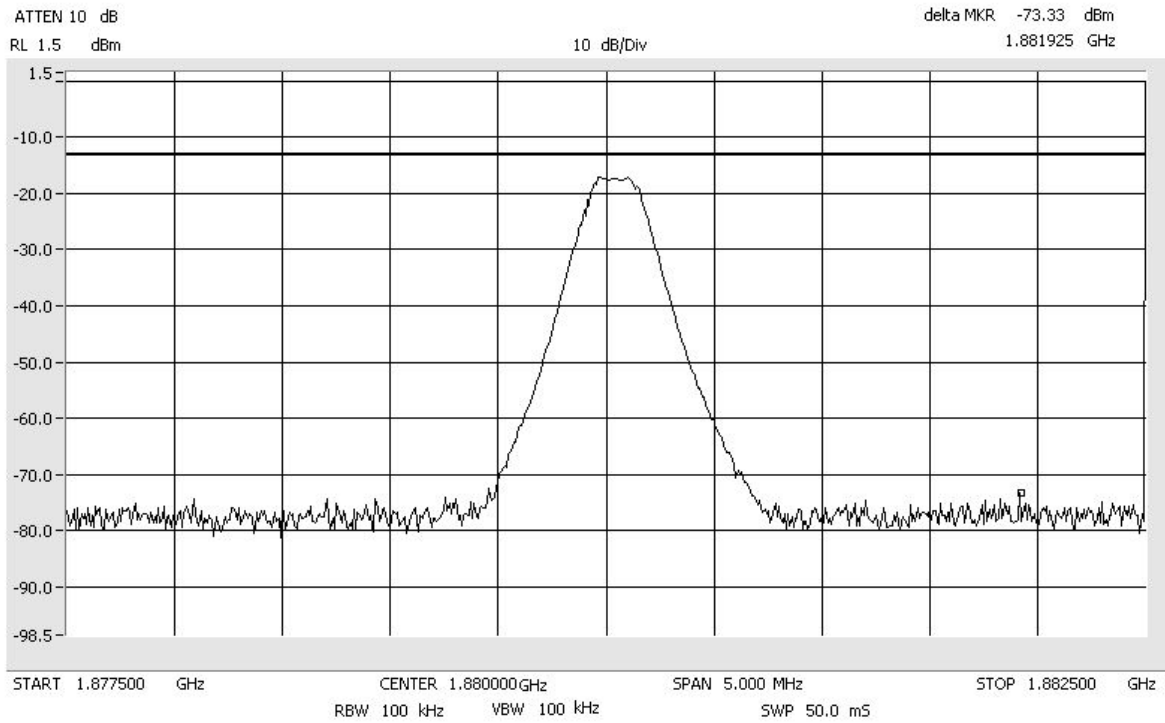


Conducted Emissions
Span: 1 GHz to 20 GHz

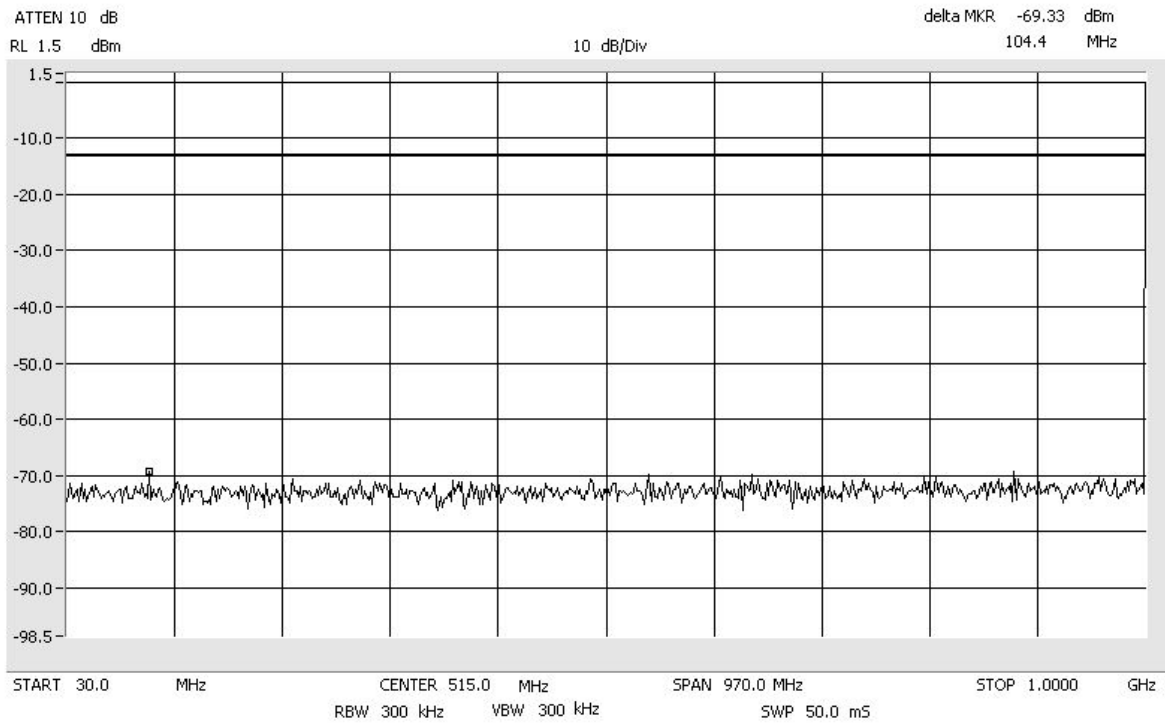
EDGE PCS
RBW/VBW: 1 MHz



Conducted Emissions GSM PCS
Center: 1880 MHz Span: 5 MHz RBW/VBW: 100 kHz

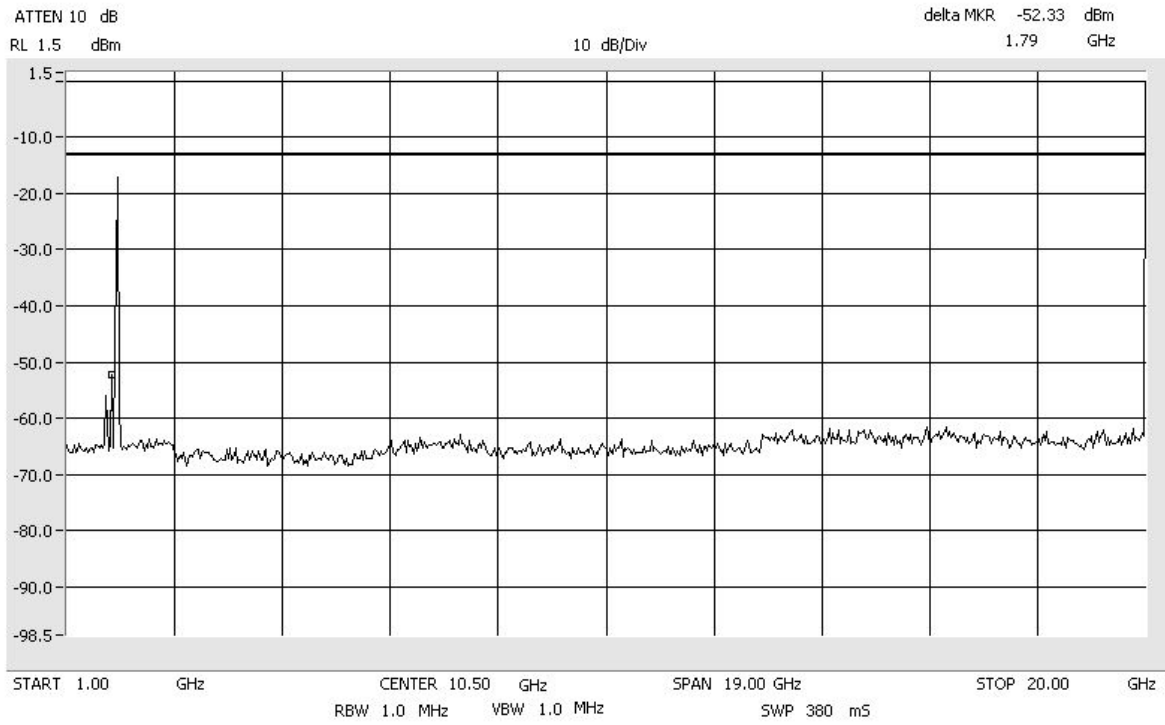


Conducted Emissions GSM PCS
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz

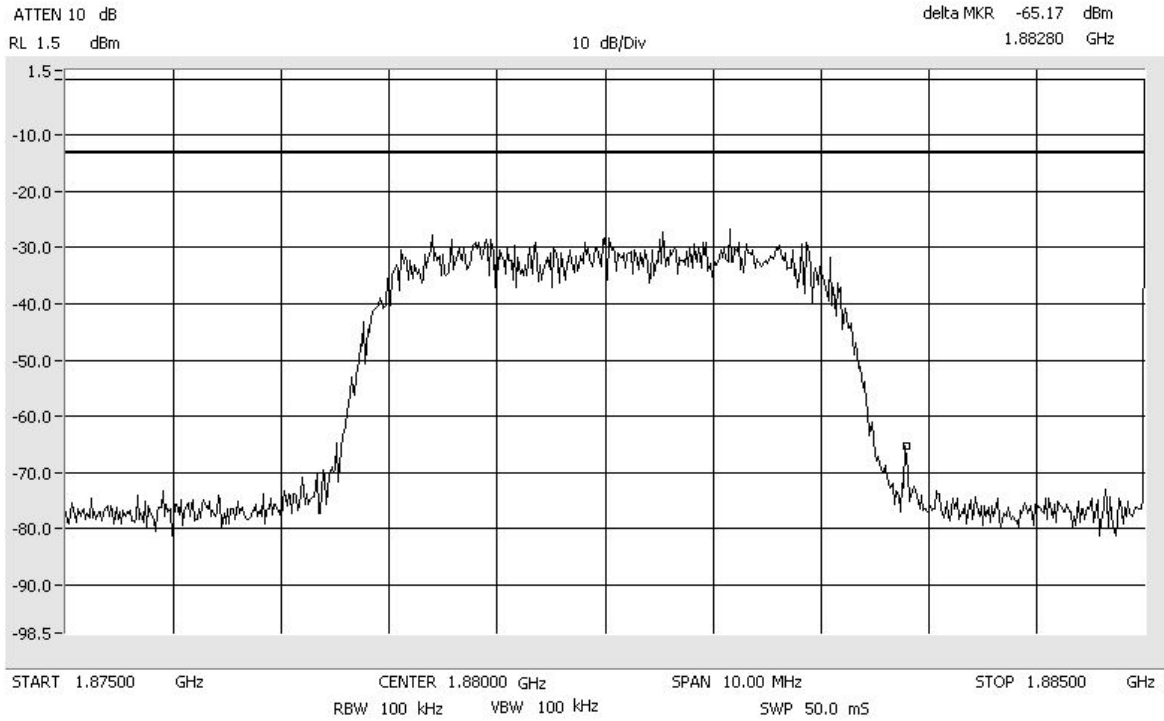


Conducted Emissions
Span: 1 GHz to 20 GHz

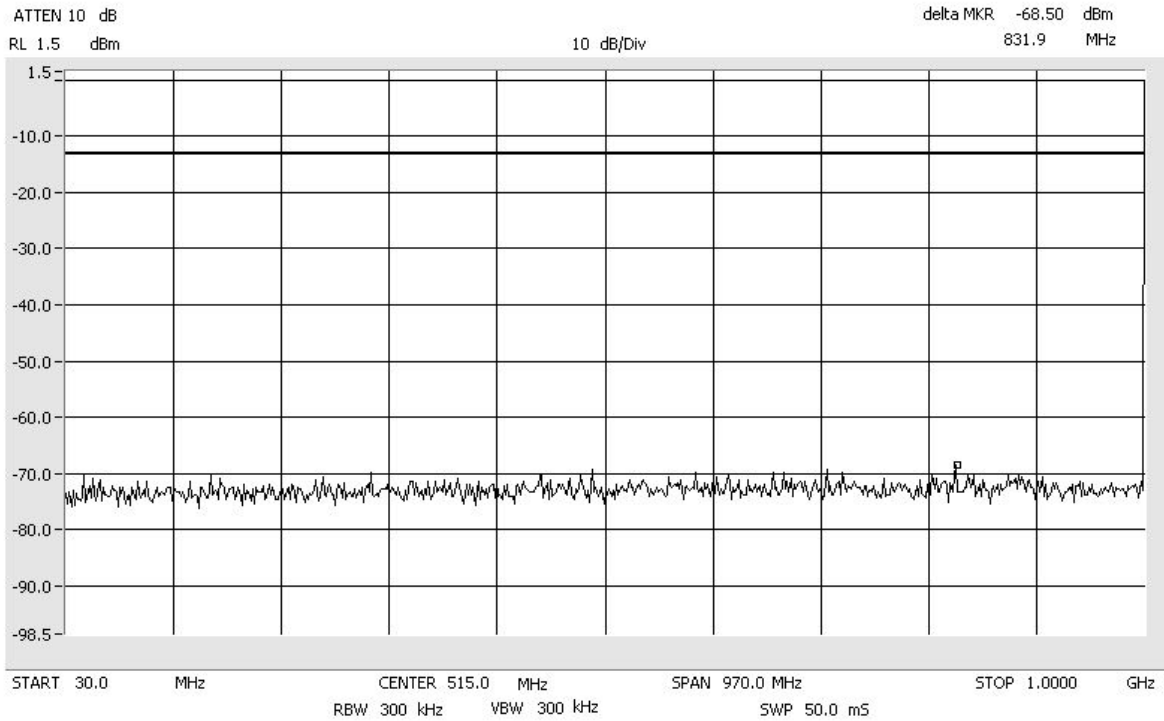
GSM PCS
RBW/VBW: 1 MHz



Conducted Emissions WCDMA PCS
 Center: 1880 MHz Span: 10 MHz RBW/VBW: 100 kHz



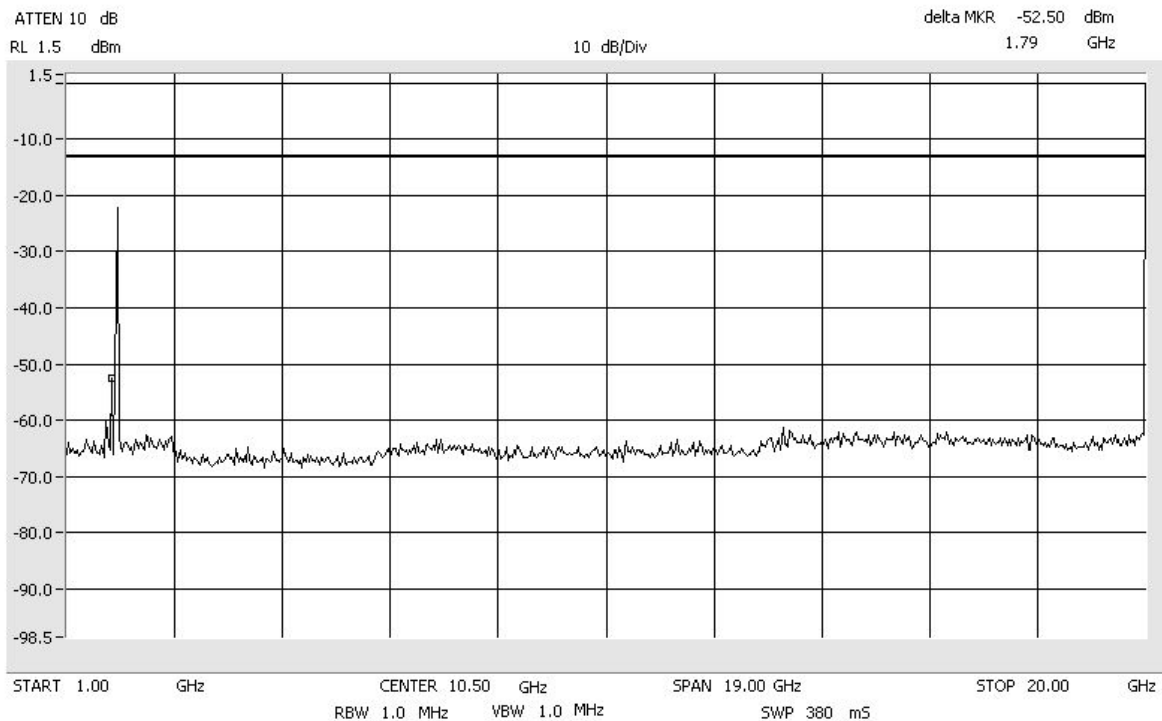
Conducted Emissions WCDMA PCS
 Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



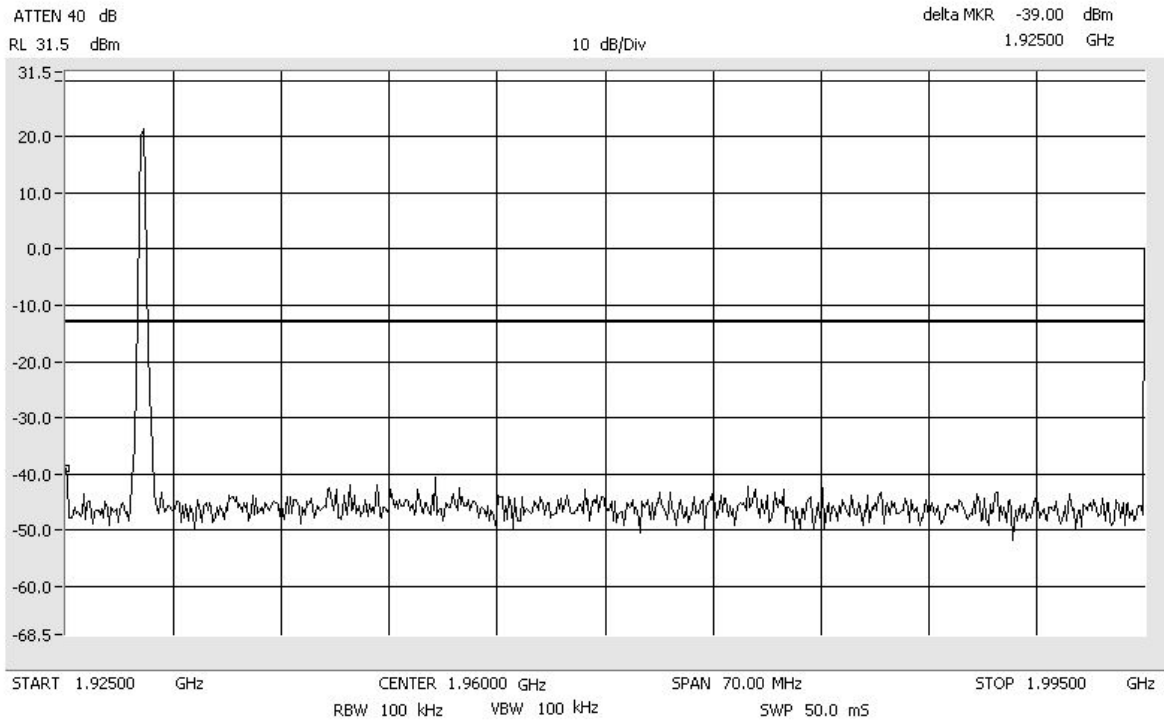
Conducted Emissions
Span: 1 GHz to 20 GHz

WCDMA
RBW/VBW: 1 MHz

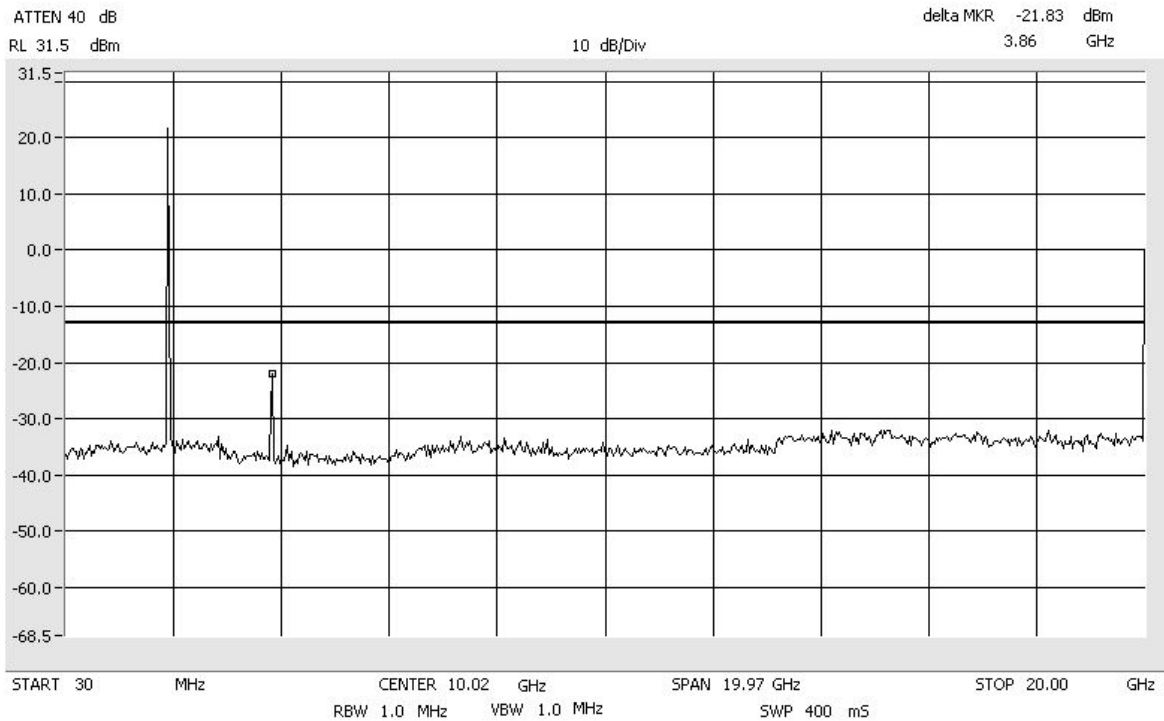
PCS



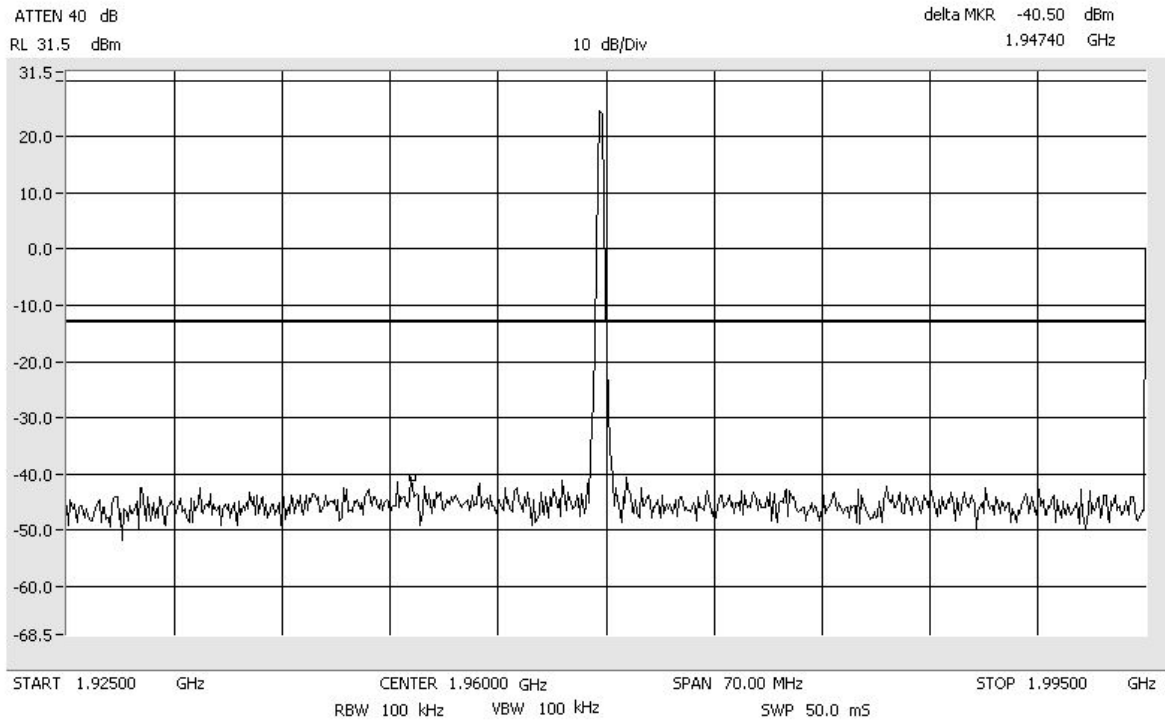
Conducted Emissions Low PCS
Center: 1960 MHz Span: 70 MHz RBW/VBW: 100 kHz



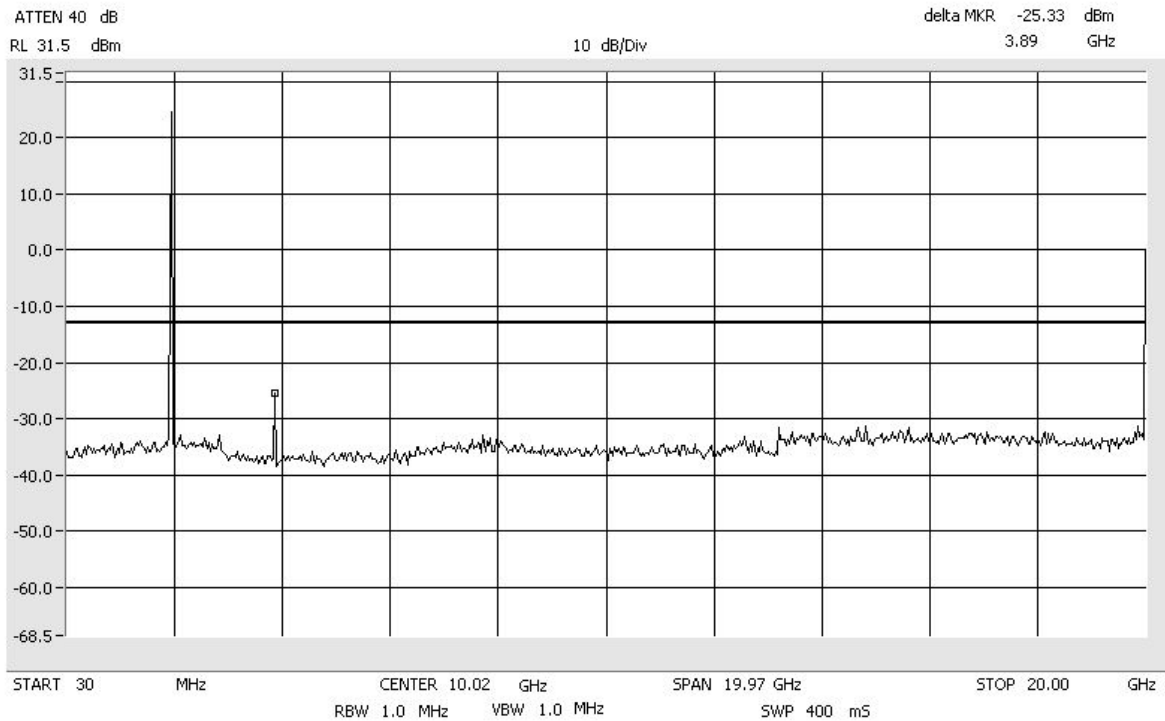
Conducted Emissions Low PCS
Span: 30 MHz to 20 GHz RBW/VBW: 1 MHz



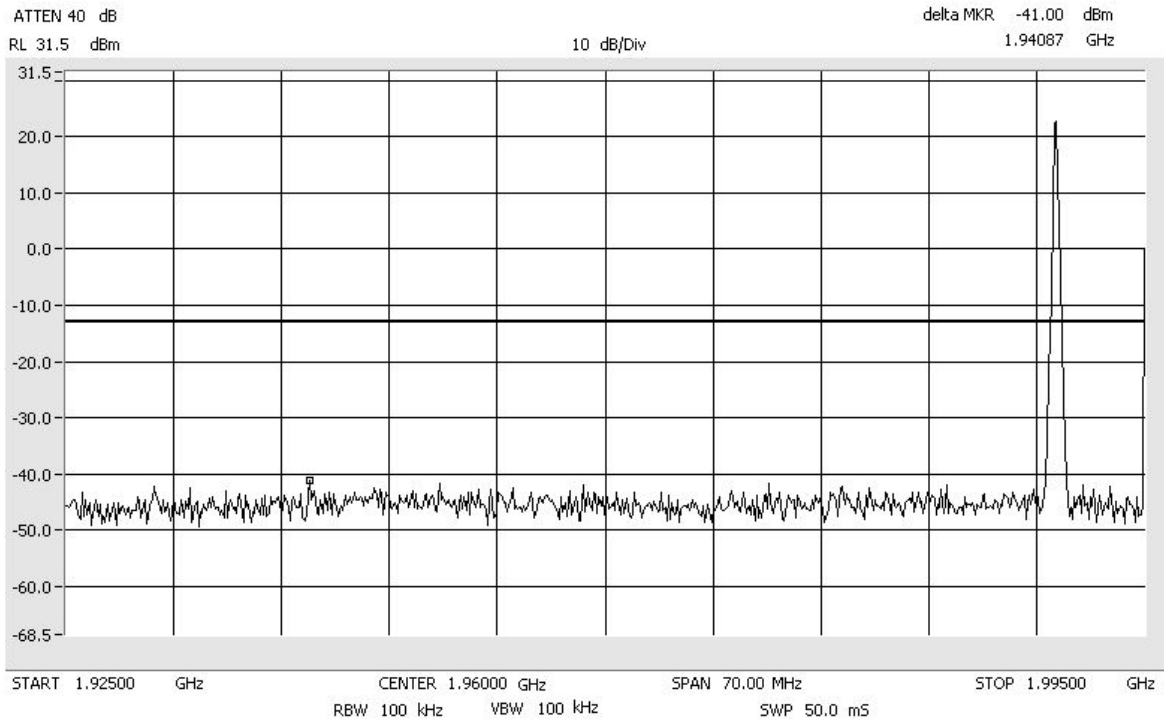
Conducted Emissions Mid PCS
Center: 1960 MHz Span: 70 MHz RBW/VBW: 100 kHz



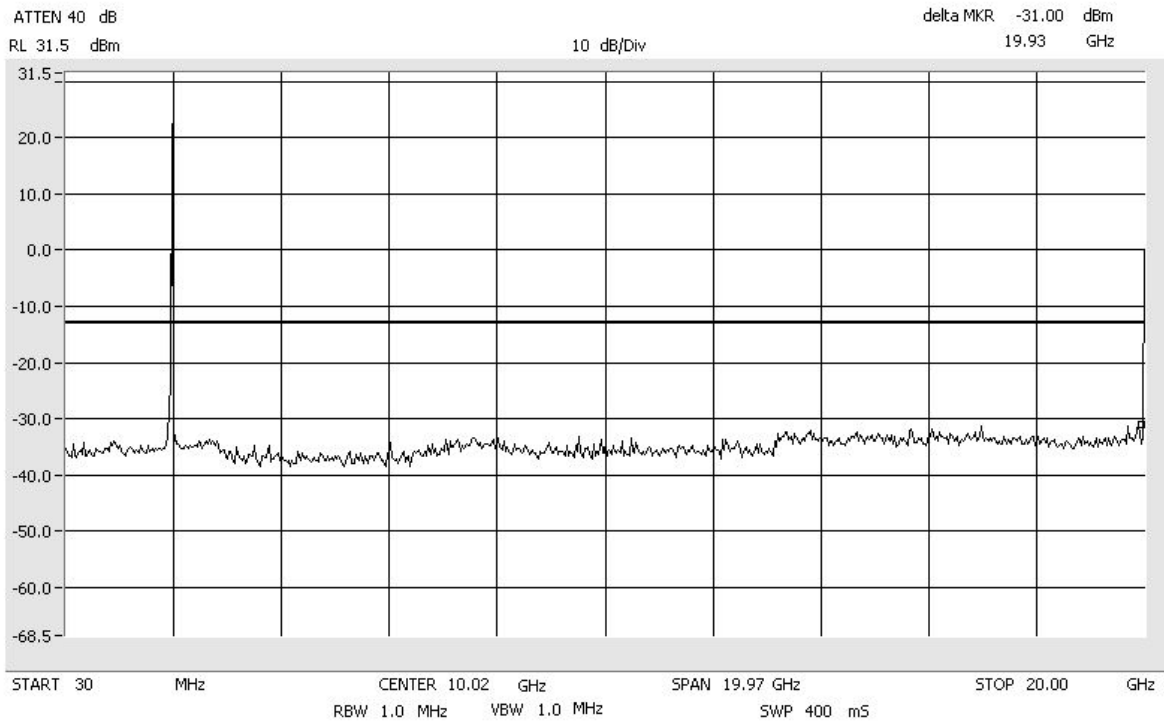
Conducted Emissions Mid PCS
Span: 30 MHz to 20 GHz RBW/VBW: 1 MHz



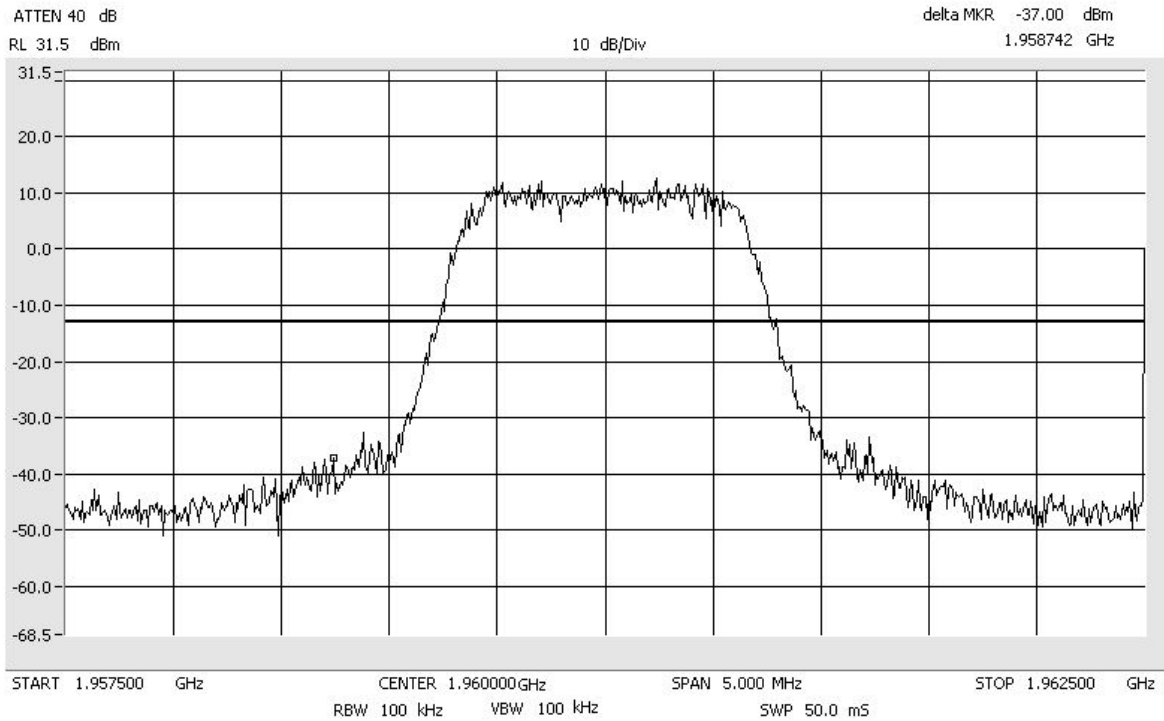
Conducted Emissions High PCS
Center: 1960 MHz Span: 70 MHz RBW/VBW: 100 kHz



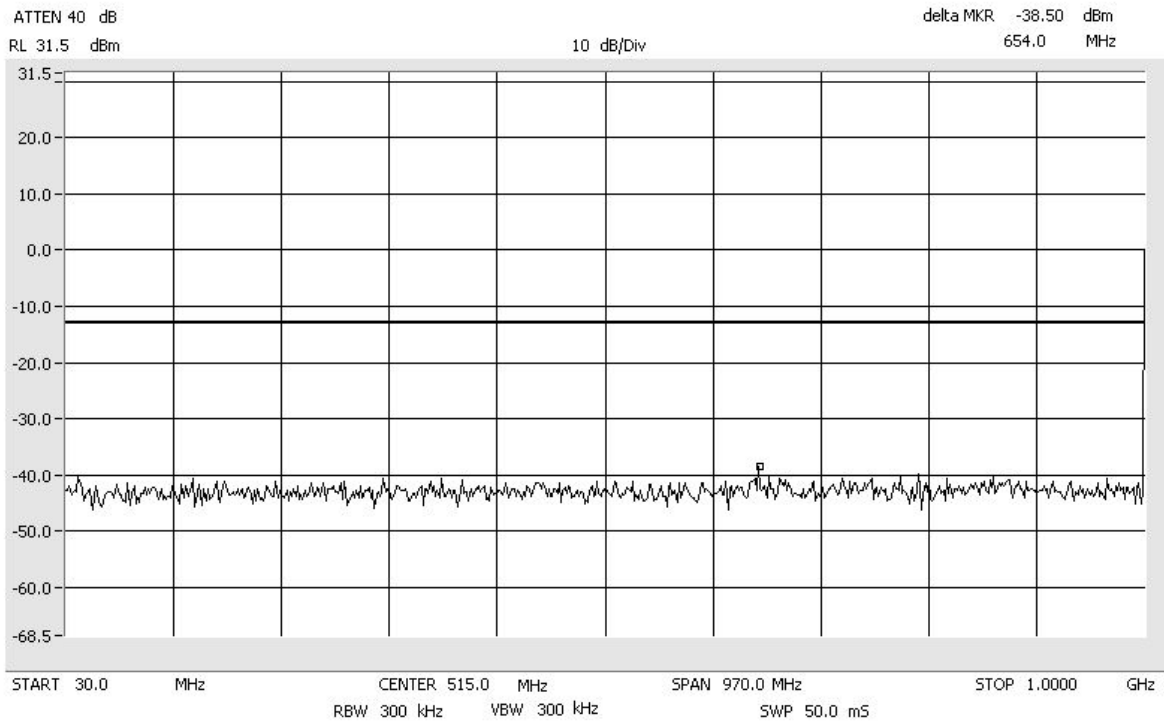
Conducted Emissions High PCS
Span: 30 MHz to 20 GHz RBW/VBW: 1 MHz



Conducted Emissions CDMA2000 PCS
Center: 1960 MHz Span: 5 MHz RBW/VBW: 100 kHz



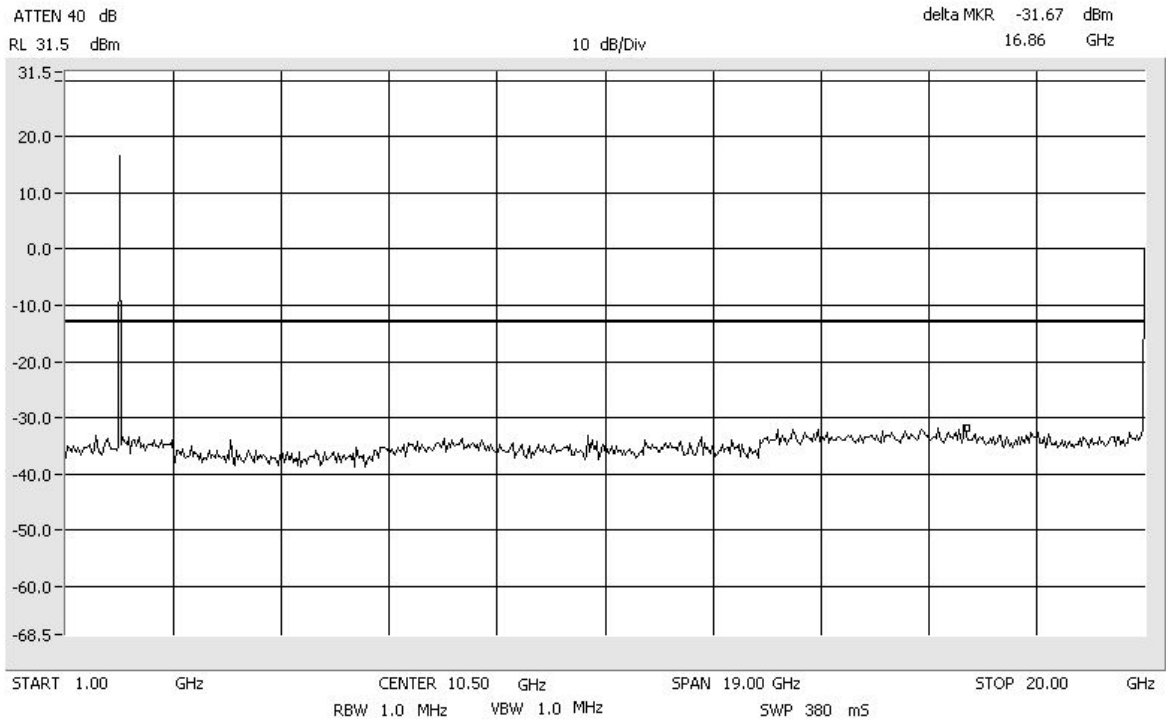
Conducted Emissions CDMA2000 PCS
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz



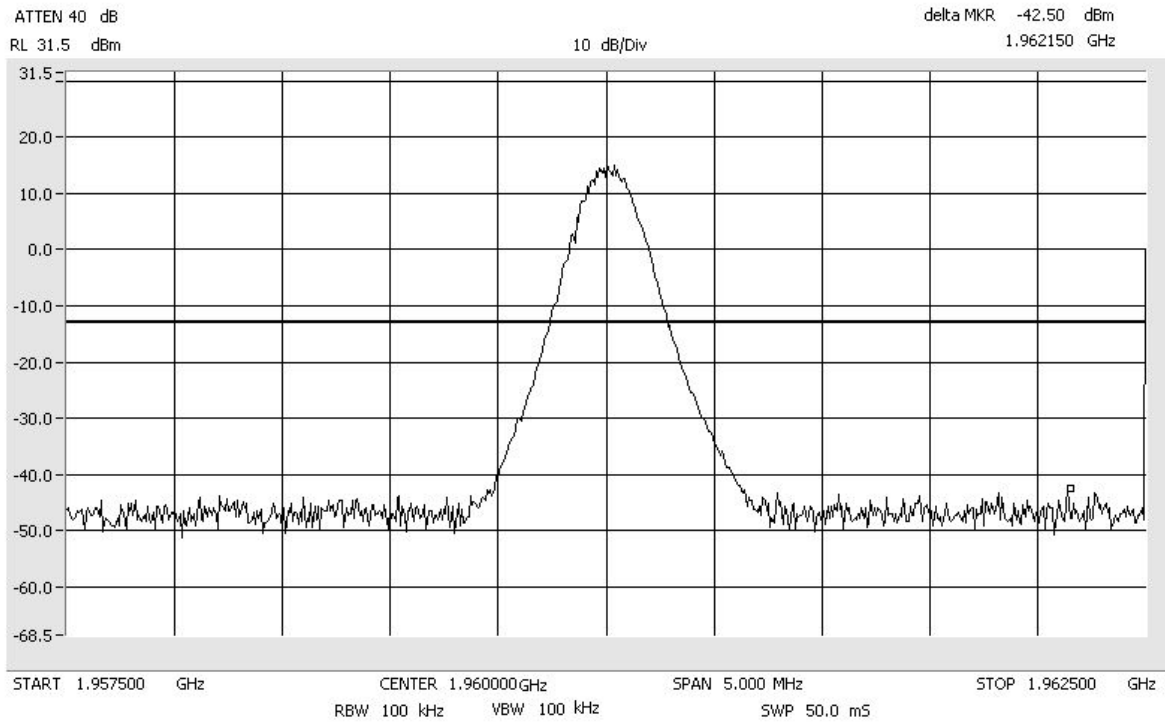
Conducted Emissions
Span: 1 GHz to 20 GHz

CDMA2000
RBW/VBW: 1 MHz

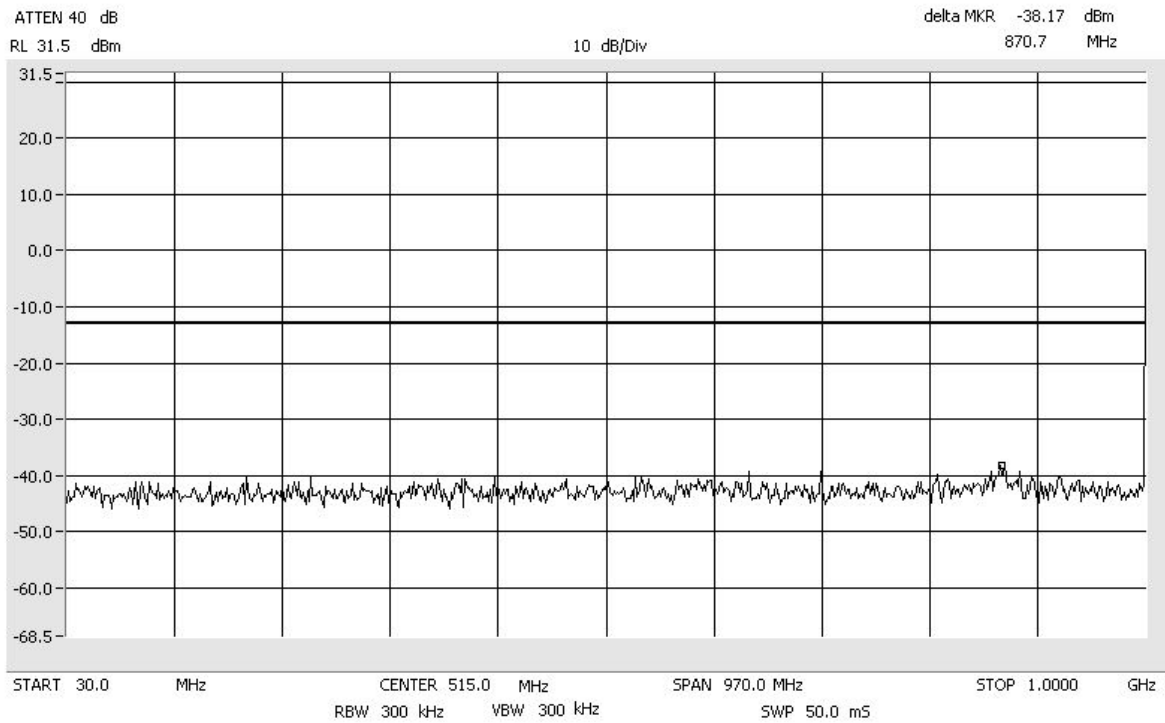
PCS



Conducted Emissions EDGE PCS
Center: 1960 MHz Span: 5 MHz RBW/VBW: 100 kHz

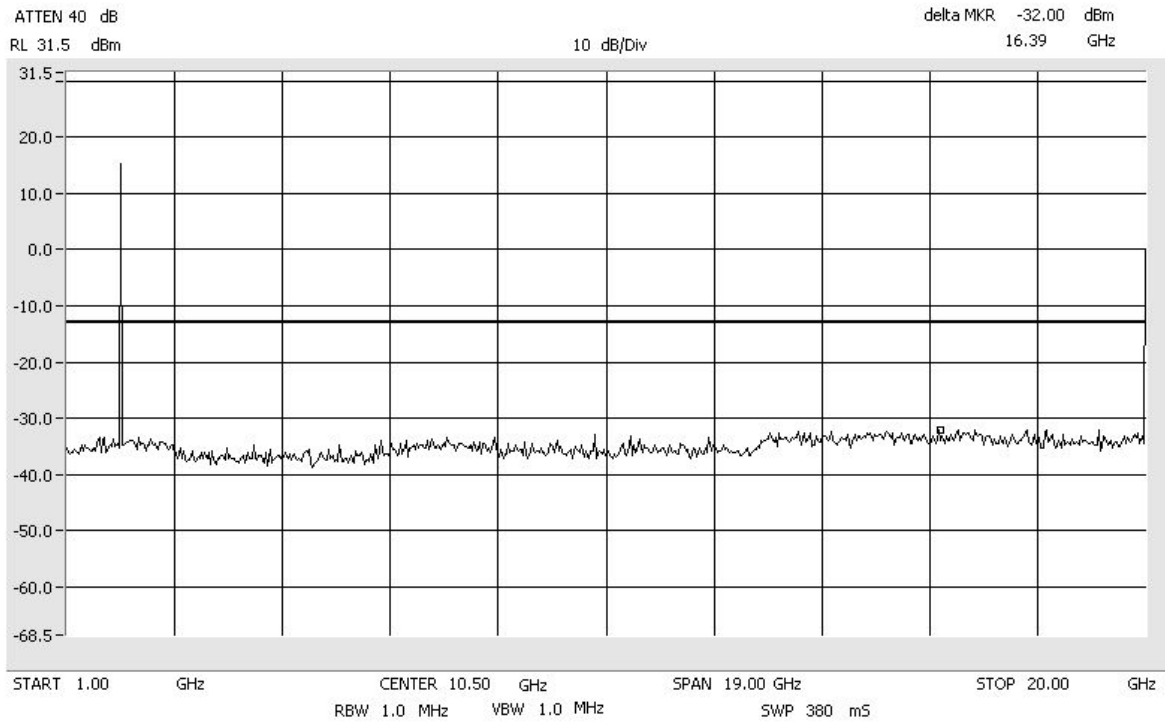


Conducted Emissions EDGE PCS
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz

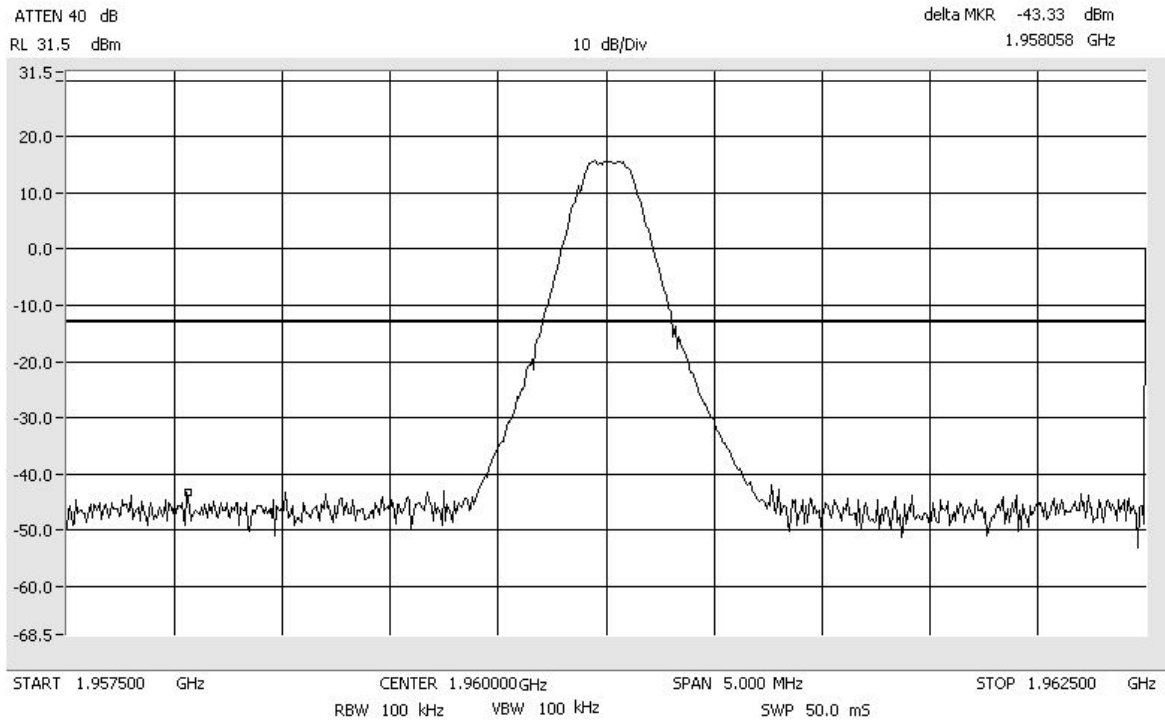


Conducted Emissions
Span: 1 GHz to 20 GHz

EDGE PCS
RBW/VBW: 1 MHz



Conducted Emissions GSM PCS
Center: 1960 MHz Span: 5 MHz RBW/VBW: 100 kHz



Conducted Emissions GSM PCS
Span: 30 MHz to 1 GHz RBW/VBW: 300 kHz

