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TEST REPORT

Report Number: 100236323-001
Project Number: G100236323

Report Issue Date: 11/13/2010

Product Name: CNAD4DO
FCCID: LHJCNAD4DO
ICID: 2807E-CNAD4DO
Standards: FCC Part 22 Subpart H
FCC Part 24 Subpart E
RSS-129 Issue 2
RSS-133 Issue 5
RSS-GEN Issue 2

Tested by:
Intertek Testing Services NA, Inc.
731 Enterprise Drive
Lexington, KY 40510

Client:
Continental Automotive Systems
21440 West Lake Cook Road
Deer Park, IL 60010

Report prepared by

Jason Centers, Senior Project Engineer

Report reviewed by

Bryan Taylor, Team Leader

TABLE OF CONTENTS

1 Introduction and Conclusion

The tests indicated in section 2 were performed on the product constructed as described in section 3. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test method, a list of the actual test equipment used, documentation photos, results and raw data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested complied with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

The INTERTEK-Lexington is located at 731 Enterprise Drive, Lexington Kentucky, 40510. The radiated emission test site is a 10-meter semi-anechoic chamber. The chamber meets the characteristics of CISPR 16-1 and ANSI C63.4. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters. The test site is listed with the FCC under registration number 485103. The test site is listed with Industry Canada under site number IC 2042M-1.

2 Test Summary

Page	Test full name	FCC Reference	IC Reference	Result
6	Conducted Output Power	§2.1046 §24.232(d)	RSS-129 (9.2.2) RSS-133 (4.1) RSS-133 (6.4)	Pass
9	Occupied Bandwidth	§2.1049, §22.917(b)(d), and §24.238(a)	RSS-GEN (4.6.1) RSS-133 (2.3)	Pass
11	Conducted Spurious Emissions	§2.1049, §2.1051, §22.917(a)(b), and § 24.238(a)(b)	RSS-129 (8.1.1), RSS-129 (9.3), RSS-129 (9.4), RSS-133 (6.5.1)	Pass
26	Radiated Output Power	§ 22.913(a) and § 24.232(c)	RSS-129 (9.1), RSS-133 (6.4)	Pass
28	Radiated Spurious Emissions (Transmitter)	§2.1053, §22.917(a)(b), and §24.238(a)(b)	RSS-129 (8.1.1), RSS-133 (6.5)	Pass
31	Frequency Stability	§2.1055, §22.355, and §24.235	RSS-129 (9.2.1), RSS-133 (6.3)	Pass
33	Receiver Spurious Emissions	§ 15.109	RSS-129 (10), RSS-Gen (7.2.3.2) RSS-129 (10)	Pass
37	AC Powerline Conducted Emissions	§ 15.107	RSS-Gen (7.2.2)	Pass

3 Description of Equipment Under Test

Equipment Under Test	
Manufacturer	Continental Automotive Systems
Model Number	CNAD4DO
ESN	0x80D66275
FCC Identifier	LHJCNAD4DO
IC Identifier	2807E-CNAD4DO
Receive Date	10/18/2010
Test Start Date	10/25/2010
Test End Date	11/19/2010
Device Received Condition	Good
Test Sample Type	Production
Frequency Band	824MHz - 849MHz (CDMA Cell Band) 1850MHz – 1910MHz (CDMA PCS Band)
Modulation Type	CDMA
Transmission Control	Base Station Simulator
Maximum Output Power (Conducted)	24.4 dBm (Cell Band) 24.7 dBm (PCS Band)
Test Channels	1013, 384, and 777 (CDMA Cell Band) 25, 600, and 1075 (CDMA PCS Band)
Antenna Type	Not Provided by Client
Operating Voltage	8-16VDC

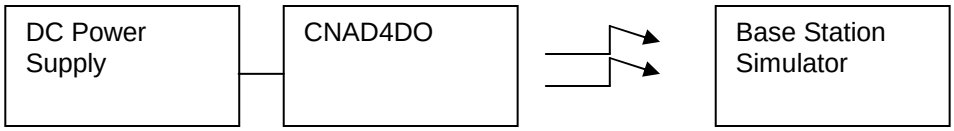
Description of Equipment Under Test
The CNAD4DO is CDMA capable device for use within automotive environment to provide wireless connectivity within a vehicle.

Operating modes of the EUT:

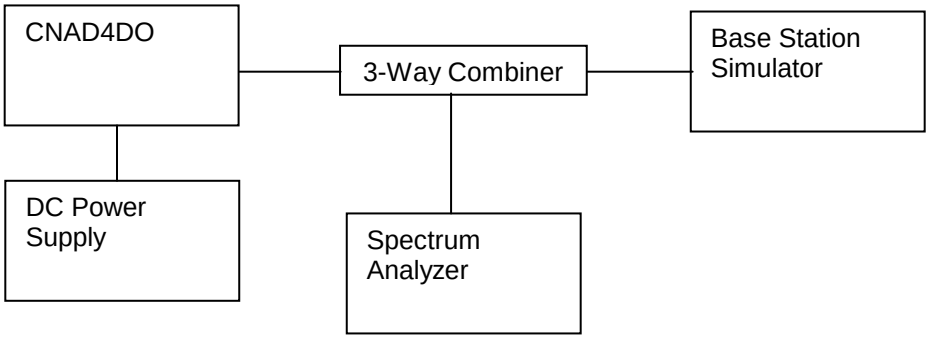
No.	Descriptions of EUT Exercising
1	Transmitting a CDMA signal
2	Receive / idle mode

3.1 System setup including cable interconnection details, support equipment and simplified block diagram

3.2 EUT Block Diagram:



Block Diagram for Radiated Tests



Block Diagram for Conducted Tests at the Antenna Port

3.3 Cables:

Cables					
Description	Length	Shielding	Ferrites	Connection	
				From	To
USB Cable	3 ft.	Yes	None	Laptop	EUT
Two Wire Power Cable	6 ft.	No	No	DC Power Supply	EUT

3.4 Support Equipment:

A laptop computer was used to connect to and configure the device over a USB connection. The CNAD4DO was tested in a stand alone configuration.

4 Conducted Output Power

4.1 Test Limits

§ 2.1046

For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in §2.1033(c)(8).

§ 24.232 (d)

Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

4.2 Test Procedure

The transmitter output was connected to a calibrated coaxial cable, the other end of which was connected to a Base Station Simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The EUT was placed into a call and the transmitter output was read off the base station simulator in dBm. The power output at the transmitter antenna port was determined by adding the value of the cable insertion loss to the base station simulator power reading. Tests were performed at three frequencies (low, middle, and high channels) and on the highest power levels, which can be setup on the transmitters.

The peak-to-average ratio (PAR) was measured using the Complementary Cumulative Distribution Function (CCDF) measurement function of the analyzer. The CCDF function measures the probability of a signal's instantaneous power to be a specified level above its average power.

4.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Base Station Simulator	GB4334835	Agilent	8960	12/31/2009	12/31/2010
Environmental Chamber	32692	Thermotron	SM-8C	1/29/2010	1/29/2011
Spectrum Analyzer	3099	Rohde & Schwarz	FSP7	8/27/2010	8/27/2011

4.4 Results:

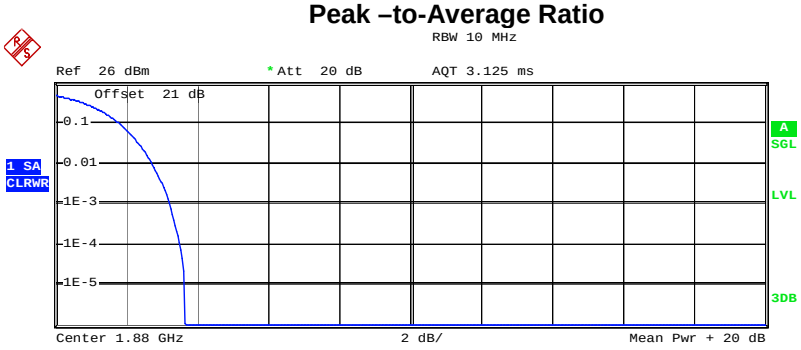
Conducted Output Power at Nominal Temperature

	CDMA Cell Band			CDMA PCS Band		
Configuration	Channel 1013	Channel 384	Channel 777	Channel 25	Channel 600	Channel 1175
RC1 SO2	24.2	24.1	24.1	24.1	23.6	24.5
RC3 SO2	24.2	24.1	24.1	24	23.7	24.4
RC4 SO9	24.2	24.1	24.05	24.1	23.4	24.5
RC1 SO55	24.2	24.1	24.1	24	23.6	24.4
RC3 SO55	**24.4**	24.2	24.27	24.1	23.7	**24.61**
RC2 SO9	24.3	24.1	24.1	24.1	23.6	24.4
RC3 SO32	24.3	24.1	24.1	24	23.7	24.5
1x EvDO Rev. 0 FTAP	24.3	24.2	24.1	24.1	23.7	24.4
1x EvDO Rev. 0 RTAP	24.3	24.1	24.1	24.1	23.7	24.4
1x EvDO Rev. A FTAP	24.4	24.2	24.1	24.1	23.8	24.4
1x EvDO Rev. A RTAP	24.4	24.2	24.2	24.1	23.4	24.4

Conducted Output Power vs Temperature

	CDMA Cell Band			CDMA PCS Band		
Temp	Channel 1013	Channel 384	Channel 777	Channel 25	Channel 600	Channel 1175
-30	23.7	23.9	24.07	24.1	23.8	24.7
20	**24.4**	24.2	24.27	24.1	23.7	24.61
60	23.8	24.07	23.94	24.3	24.05	**24.7**

Peak –to-Average Ratio



Complementary Cumulative Distribution Function (100000 samples)

	Trace 1
Mean	24.09 dBm
Peak	27.76 dBm
Crest	3.67 dB
10 %	1.84 dB
1 %	2.76 dB
.1 %	3.24 dB
.01 %	3.52 dB

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5 Occupied Bandwidth

5.1 Test Limits

§2.1049:

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

5.2 Test Procedure

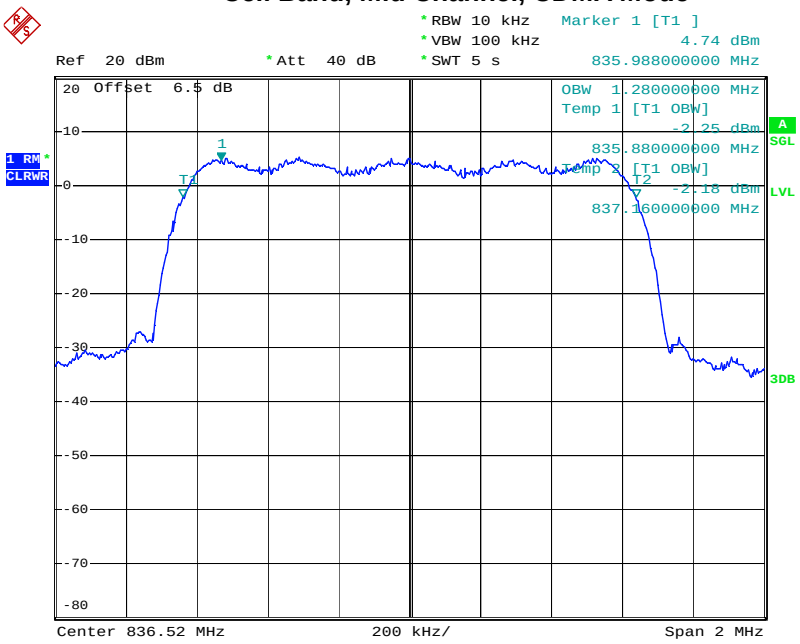
The EUT was connected to a spectrum analyzer using a calibrated coaxial cable and power divider. The EUT was placed into a call using base station simulator. The base station simulator was set to force the EUT to its maximum power setting. The occupied bandwidth function of the analyzer was used to automatically generate the occupied bandwidth plots below.

5.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3099	Rohde & Schwarz	FSP7	8/27/2010	8/27/2011
Base Station Simulator	GB4334835	Agilent	8960	12/31/2009	12/31/2010

5.4 Results:

Cell Band, Mid Channel, CDMA Mode



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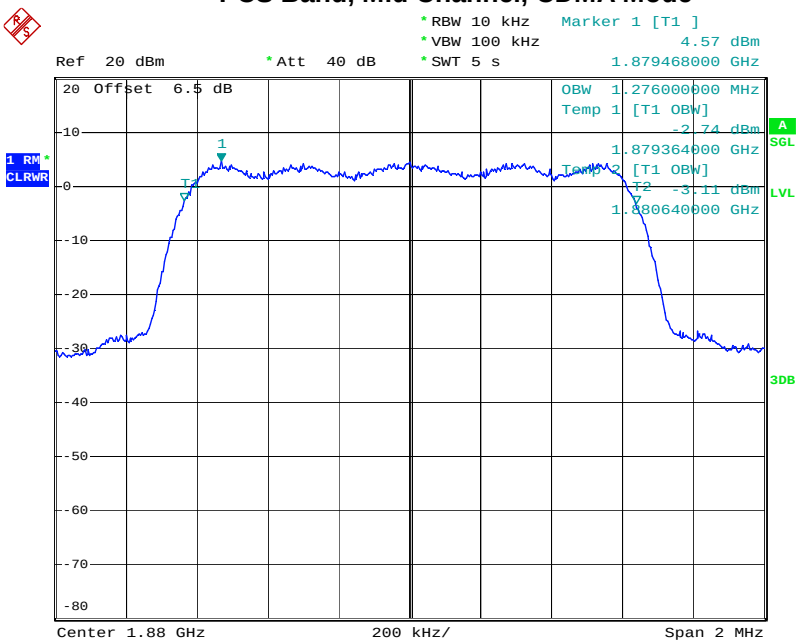
PCS Band, Mid Channel, CDMA Mode



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6 Conducted Spurious Emissions at Antenna Terminals

6.1 Test Limits

§ 2.1049

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

(h) Transmitters employing digital modulation techniques—when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user.

§ 2.1051

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§ 22.917

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

§ 24.238

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

6.2 Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The base station simulator was set to force the EUT to its maximum power setting. The resolution bandwidth of the spectrum analyzer was set at 100kHz or 1MHz depending on the transmit band. Sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

To show compliance with RSS-129 Section 8.1.1(1), the output of the CNAD4DO was adjusted to -13 dBm/1.23MHz and the mobile band was swept with a 30kHz RBW to show compliance with mask B and a 1MHz RBW to show compliance with mask C outside the range of the fundamental. The channel power function of the analyzer was used to show compliance at the transition points (1.385MHz offset from the carrier) of mask C. The channel power function was setup to center at the 1.385MHz offset from the carrier with a bandwidth of 1MHz. This function allows the use of a lower RBW while integrating the power over a 1MHz bandwidth at 1.385MHz offset from the carrier.

6.3 Test Equipment Used:

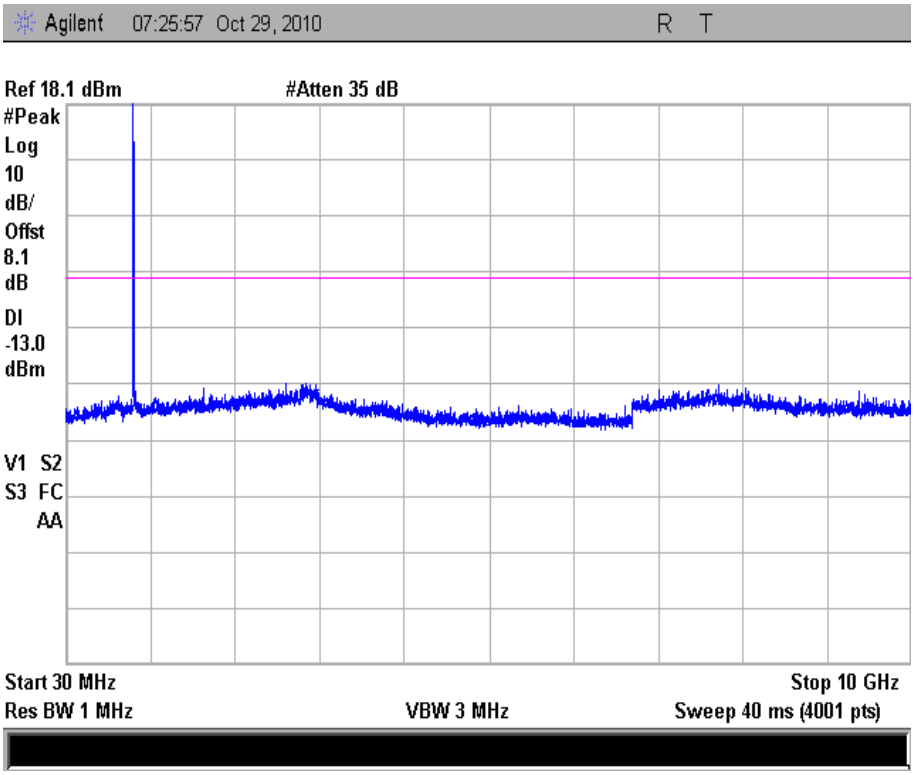
Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3099	Rohde & Schwarz	FSP7	8/27/2010	8/27/2011
EMC Analyzer	2142	HP	E7405	9/1/2010	9/1/2011
Base Station Simulator	GB4334835	Agilent	8960	12/31/2009	12/31/2010

6.4 Results:

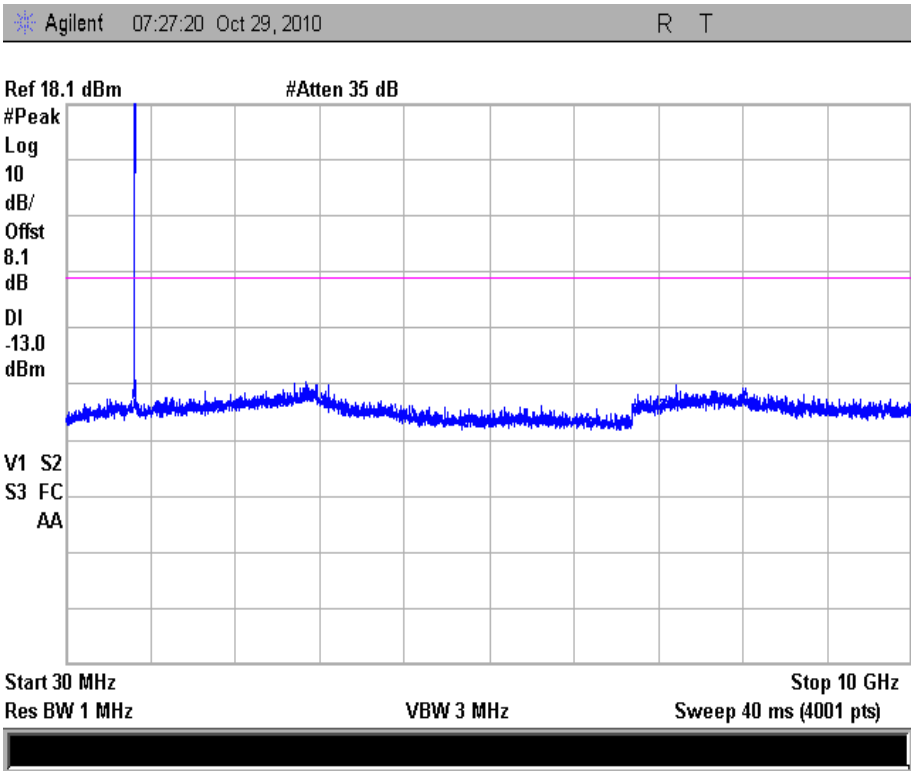
The following plots show that all spurious emissions are attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. Plots for emissions within 1MHz of the band edge as well as for emission outside of this range are shown. Plots for conducted emissions at the antenna port for RSS-129 section 8 and 9 are shown in below.

Plots for emissions more than 1MHz from the band edge:

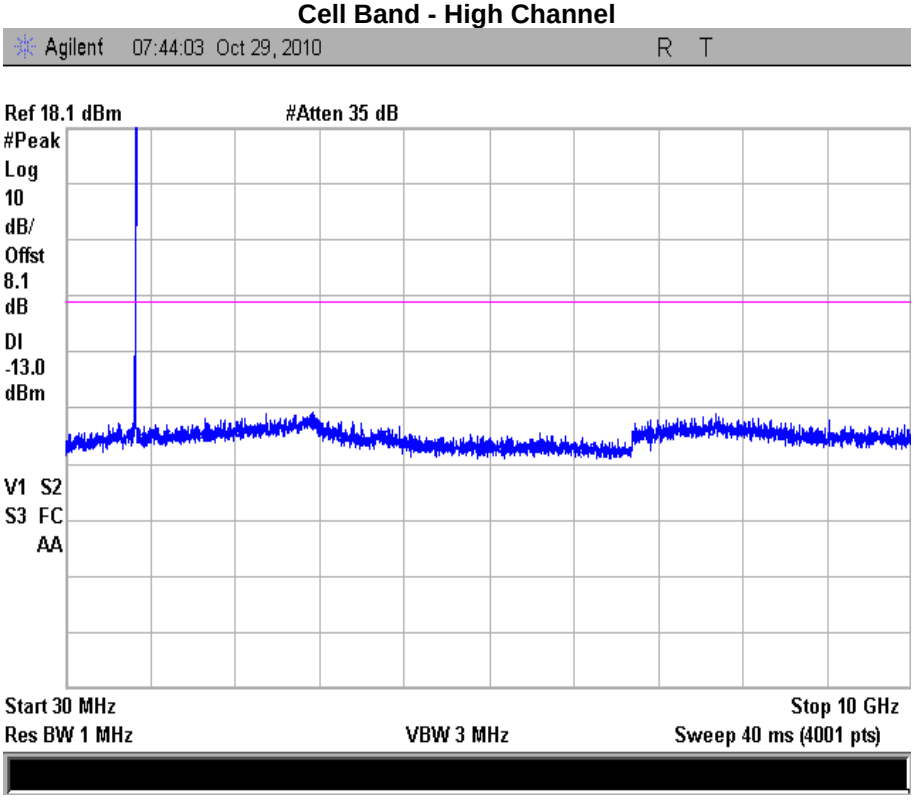
Cell Band - Low Channel



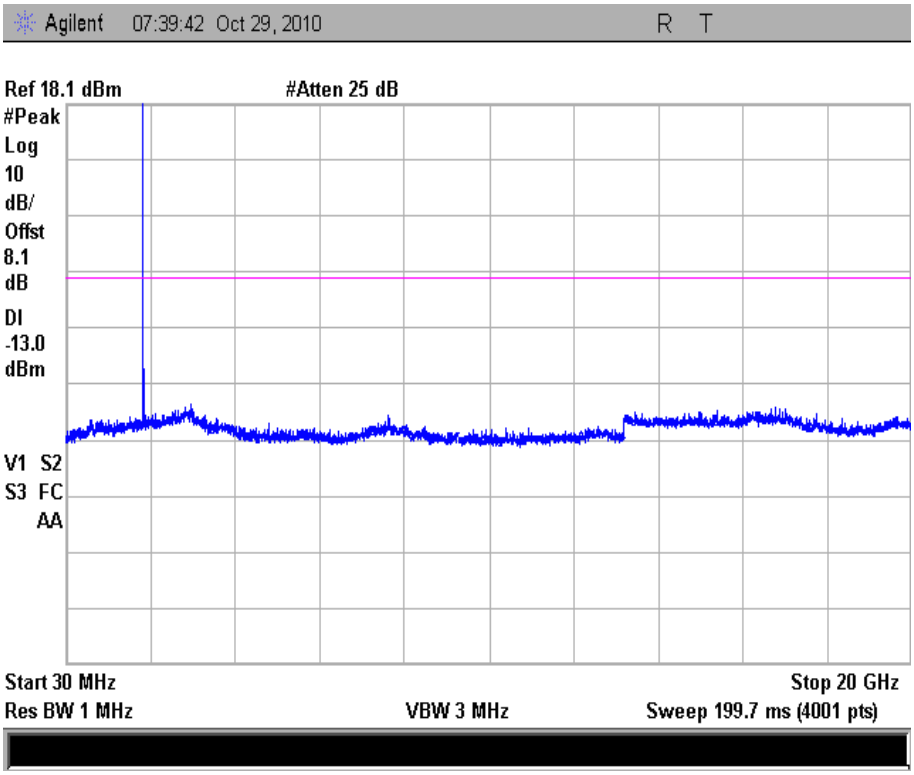
Cell Band – Mid Channel



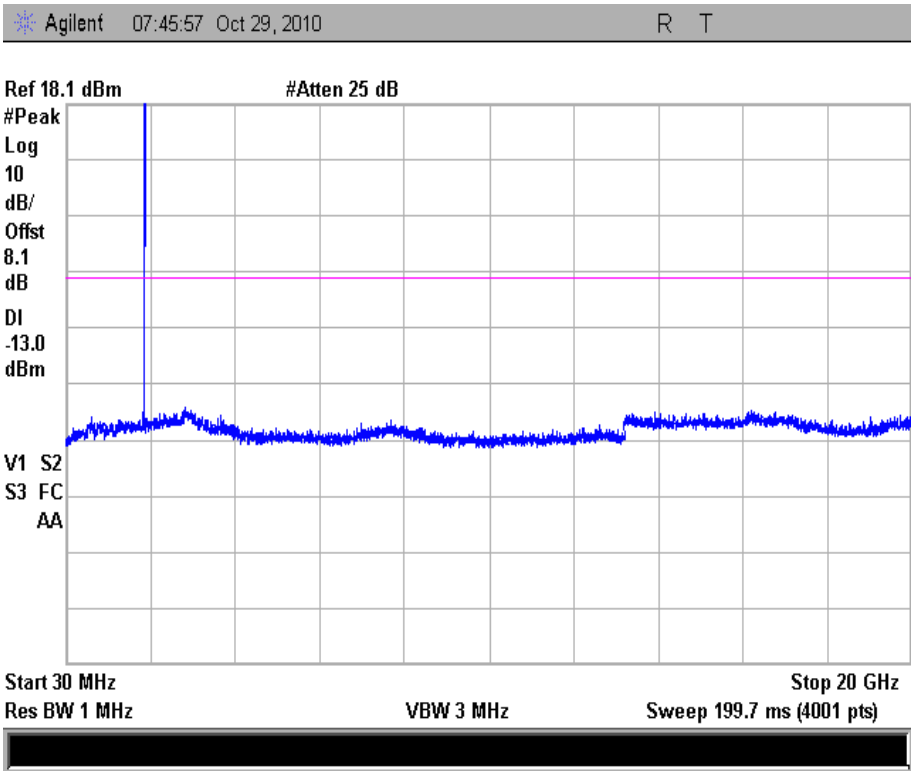
Cell Band - High Channel



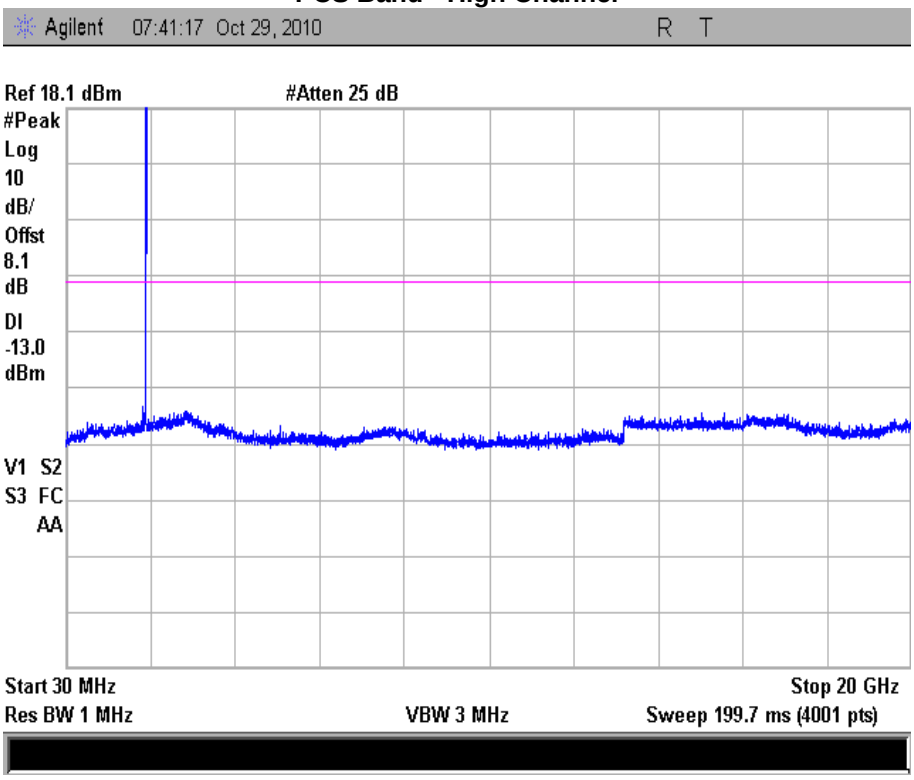
PCS Band - Low Channel



PCS Band – Mid Channel

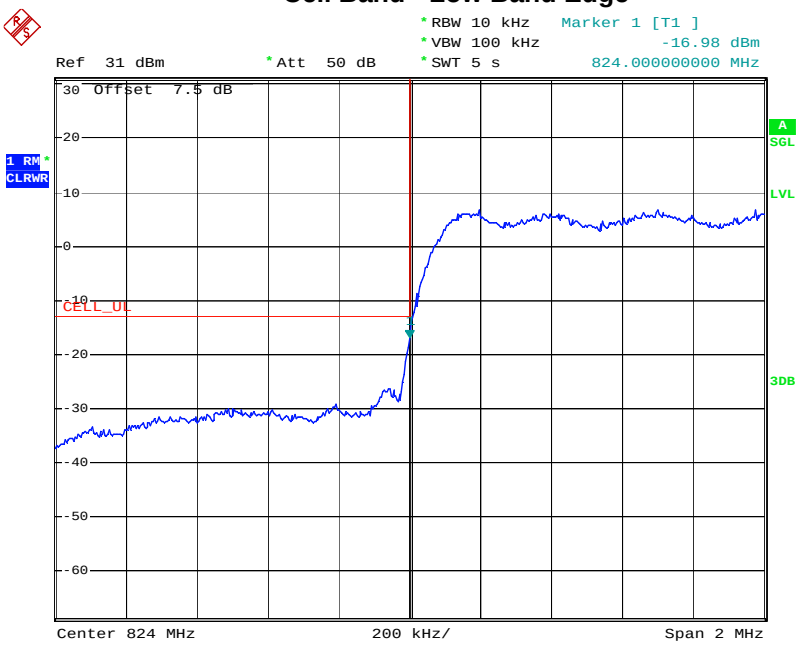


PCS Band - High Channel



Emissions within 1MHz of the band edge:

Cell Band - Low Band Edge



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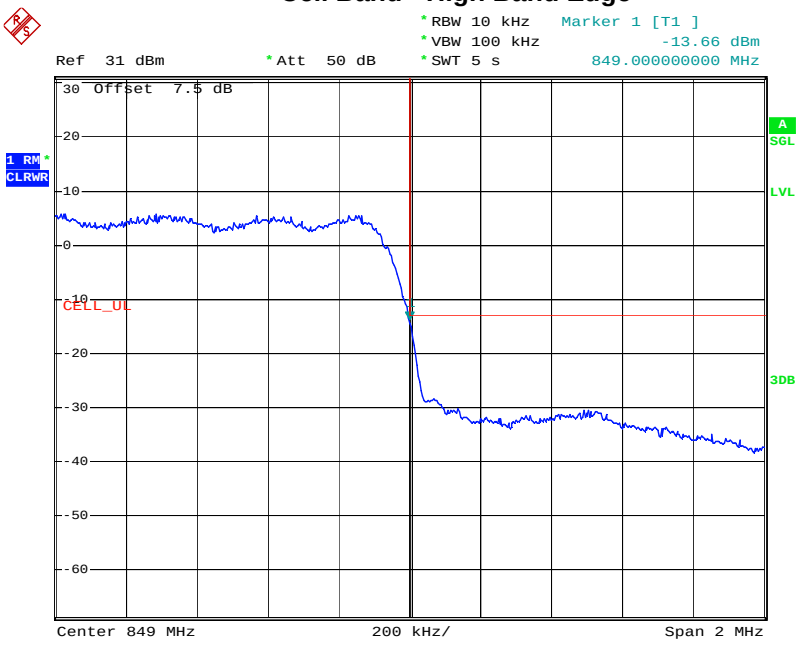
Cell Band - High Band Edge



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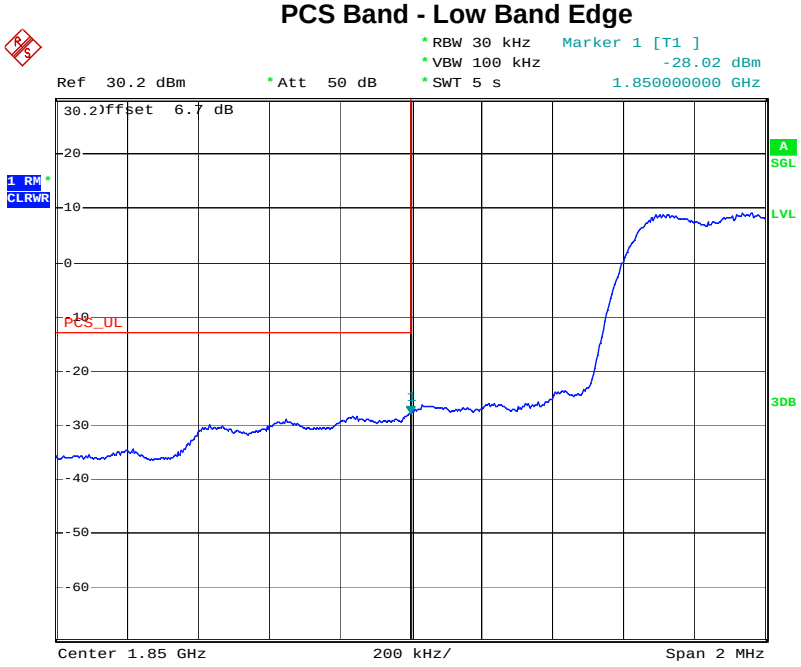
PCS Band - Low Band Edge



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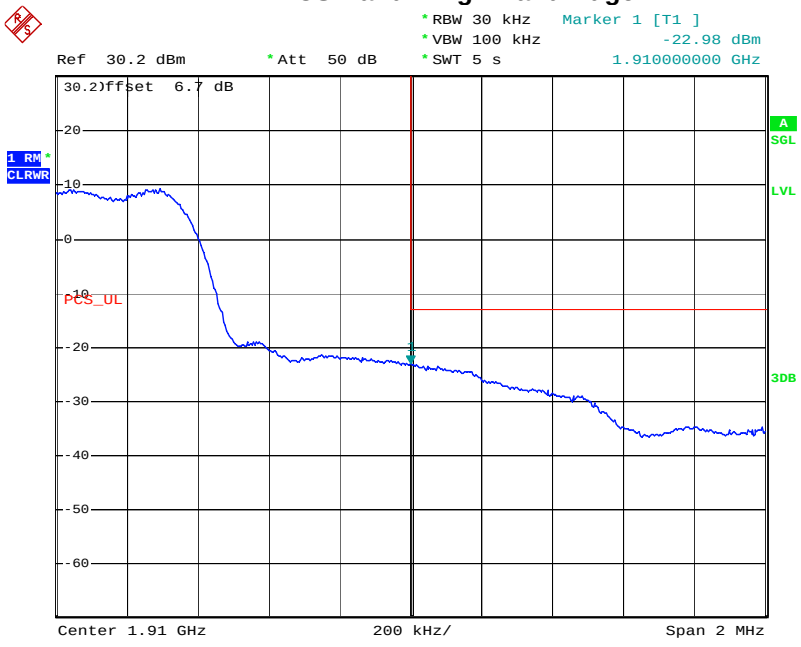
PCS Band - High Band Edge



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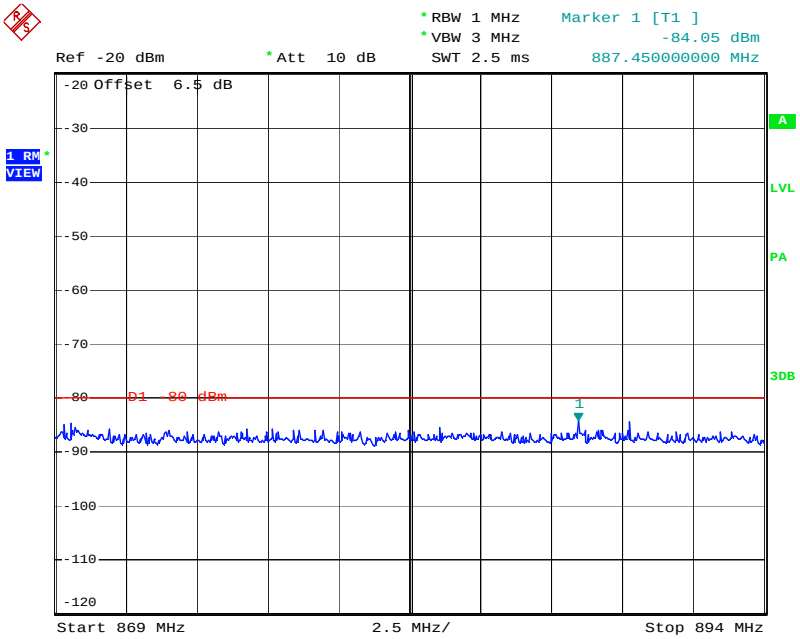
RSS-129 Emissions Tests

Mean Power of Emissions in Base Station Band – Low Channel



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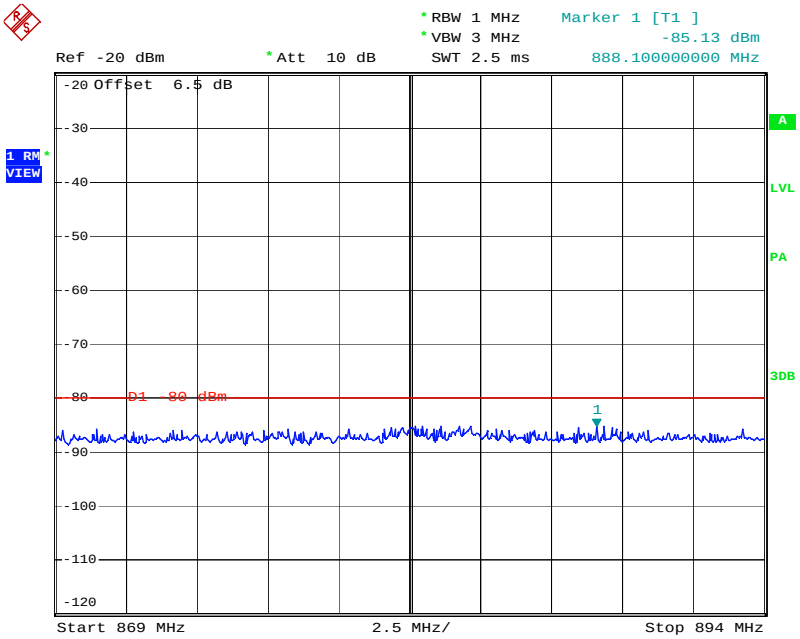
Mean Power of Emissions in Base Station Band – Mid Channel



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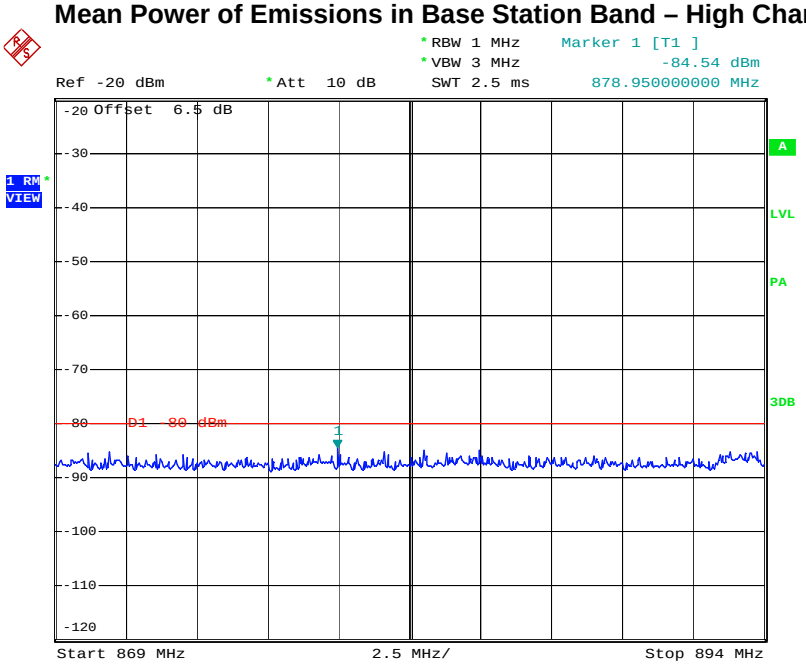
Mean Power of Emissions in Base Station Band – High Channel



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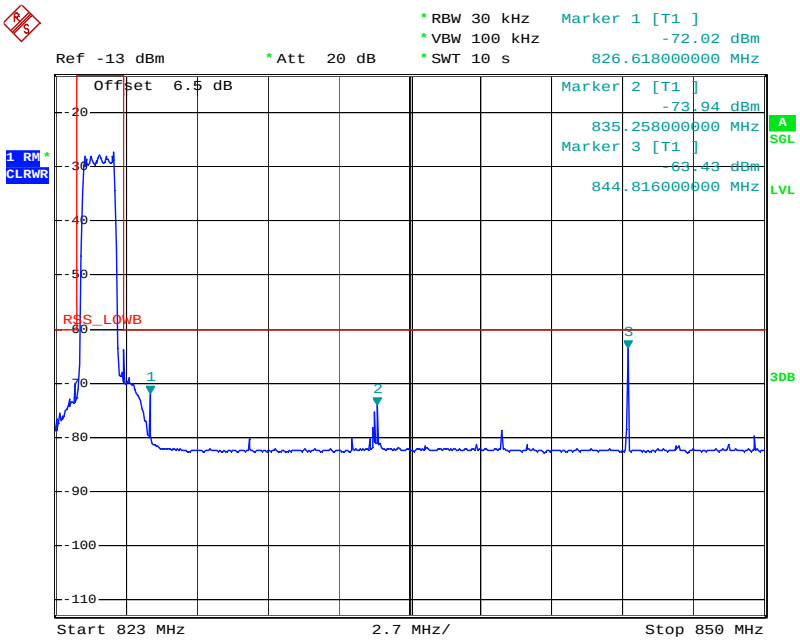
RSS-129 Section 8.1.1 Mobile Station Spurious Emissions When Transmitting – Low Channel, Mask B



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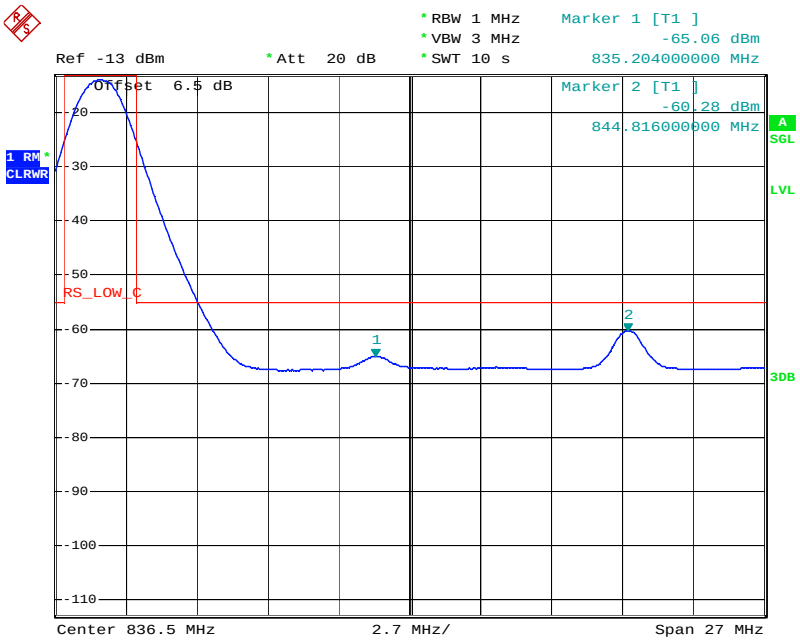
RSS-129 Section 8.1.1 Mobile Station Spurious Emissions When Transmitting – Low Channel, Mask C



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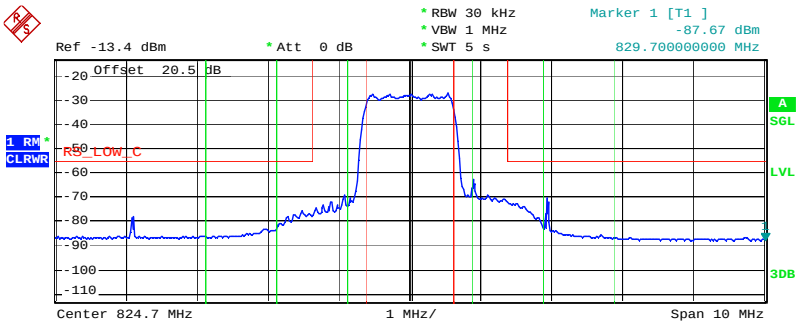
RSS-129 Section 8.1.1 Mobile Station Spurious Emissions When Transmitting – Low Channel, Power at 1.385 MHz and 2.385 MHz offset from carrier center frequency



Tx Channel			
Bandwidth	1.23 MHz	Power	-12.97 dBm
Adjacent Channel			
Bandwidth	1 MHz	Lower	-60.57 dBm
Spacing	1.385 MHz	Upper	-56.34 dBm
Alternate Channel			
Bandwidth	1 MHz	Lower	-70.45 dBm
Spacing	2.385 MHz	Upper	-67.36 dBm

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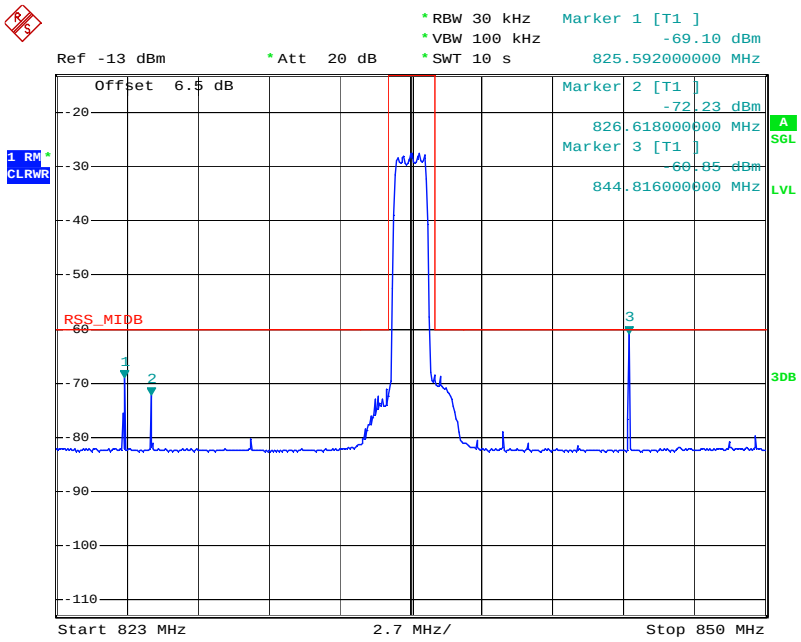
RSS-129 Section 8.1.1 Mobile Station Spurious Emissions When Transmitting – Mid Channel, Mask B



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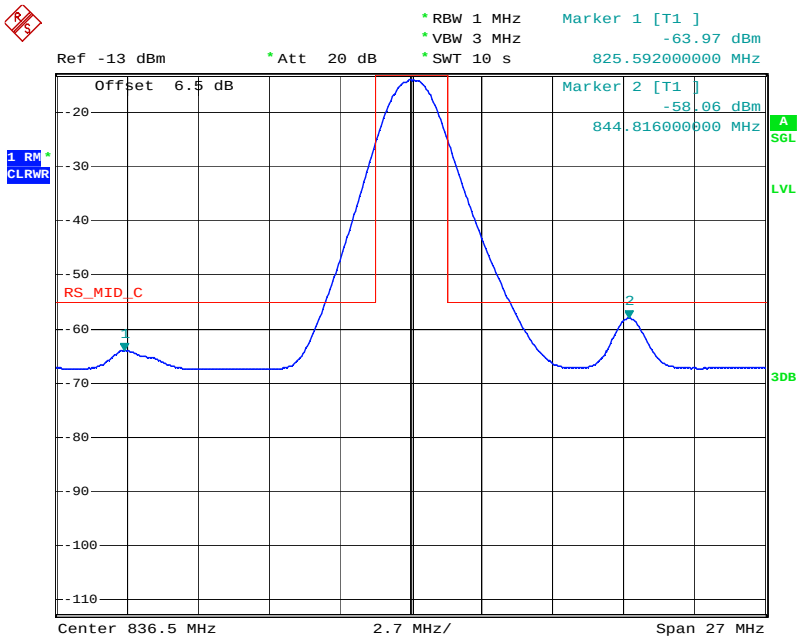
RSS-129 Section 8.1.1 Mobile Station Spurious Emissions When Transmitting – Mid Channel, Mask C



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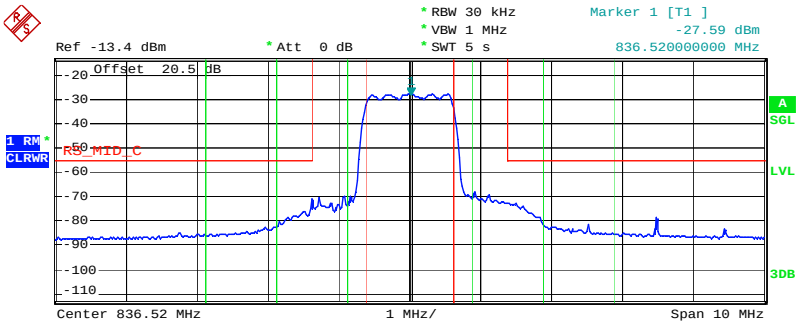
RSS-129 Section 8.1.1 Mobile Station Spurious Emissions When Transmitting – Mid Channel, Power at 1.385 MHz and 2.385 MHz offset from carrier center frequency



Tx Channel			
Bandwidth	1.23 MHz	Power	-13.04 dBm
Adjacent Channel			
Bandwidth	1 MHz	Lower	-59.84 dBm
Spacing	1.385 MHz	Upper	-57.74 dBm
Alternate Channel			
Bandwidth	1 MHz	Lower	-69.92 dBm
Spacing	2.385 MHz	Upper	-69.07 dBm

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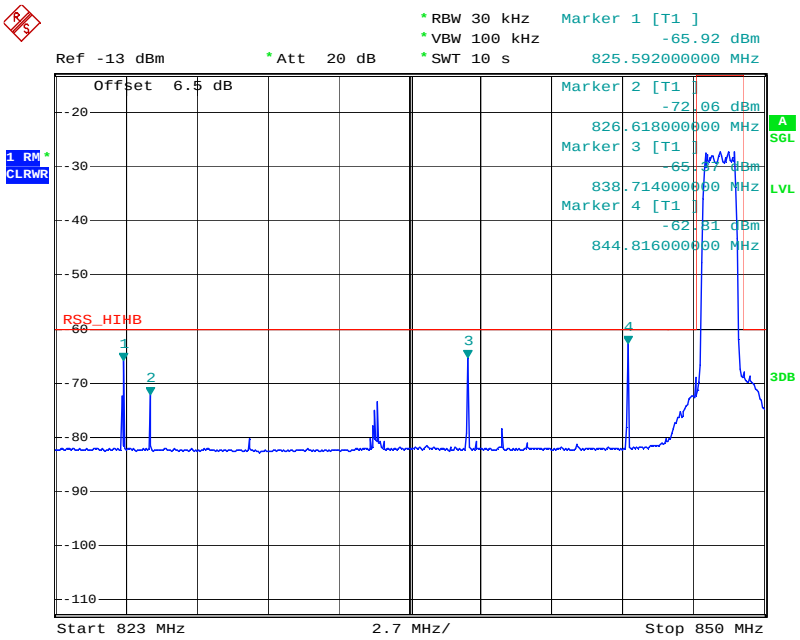
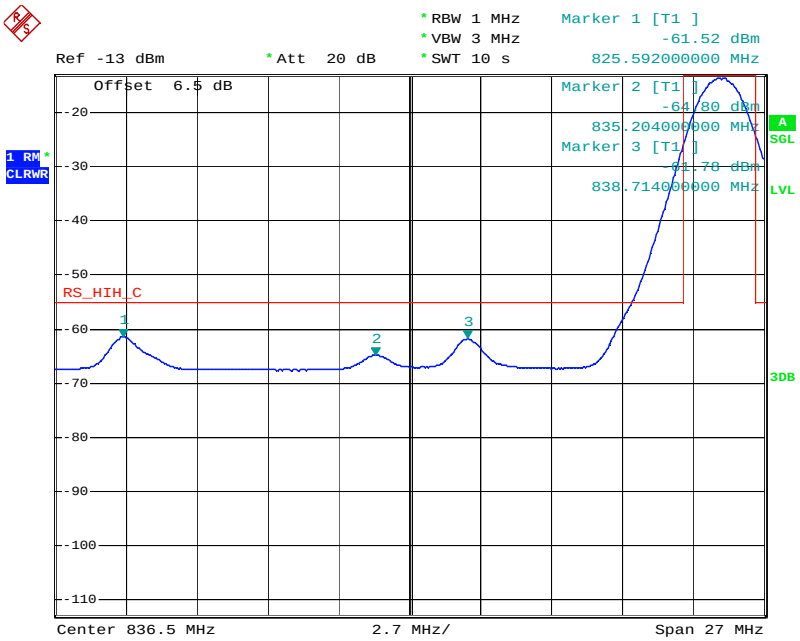
RSS-129 Section 8.1.1 Mobile Station Spurious Emissions When Transmitting – High Channel, Mask B



Date: 30.OCT.2010 12:36:10

RSS-129 Section 8.1.1 Mobile Station Spurious Emissions When Transmitting – High Channel, Mask C



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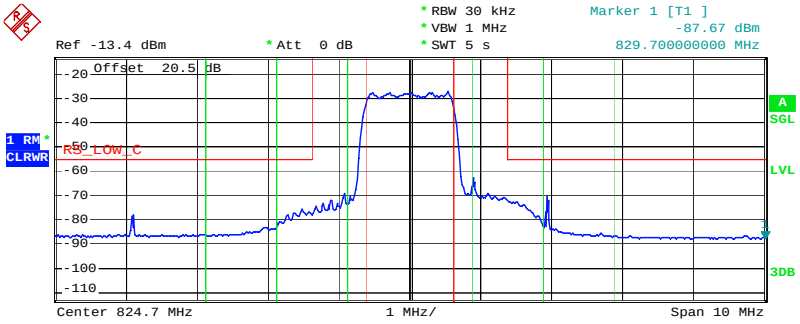
RSS-129 Section 8.1.1 Mobile Station Spurious Emissions When Transmitting – High Channel, Power at 1.385 MHz and 2.385 MHz offset from carrier center frequency



Tx Channel			
Bandwidth	1.23 MHz	Power	-12.97 dBm
Adjacent Channel			
Bandwidth	1 MHz	Lower	-60.57 dBm
Spacing	1.385 MHz	Upper	-56.34 dBm
Alternate Channel			
Bandwidth	1 MHz	Lower	-70.45 dBm
Spacing	2.385 MHz	Upper	-67.36 dBm

Date: 30.OCT.2010 15:32:00

Figure 6-1: Mobile Station Minimum Controlled Output Power – Low Channel

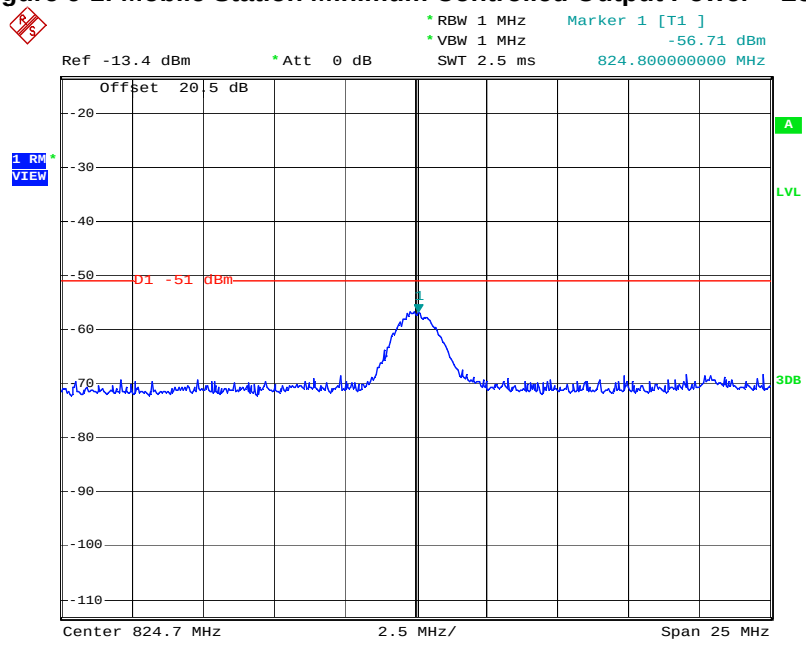


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Figure 6-2: Mobile Station Minimum Controlled Output Power – Mid Channel

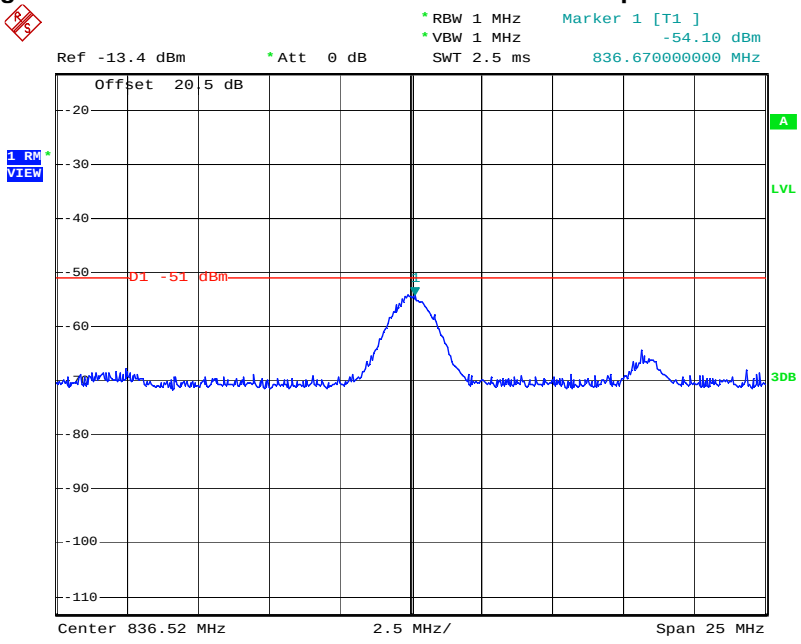

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Figure 6-3: Mobile Station Minimum Controlled Output Power – High Channel

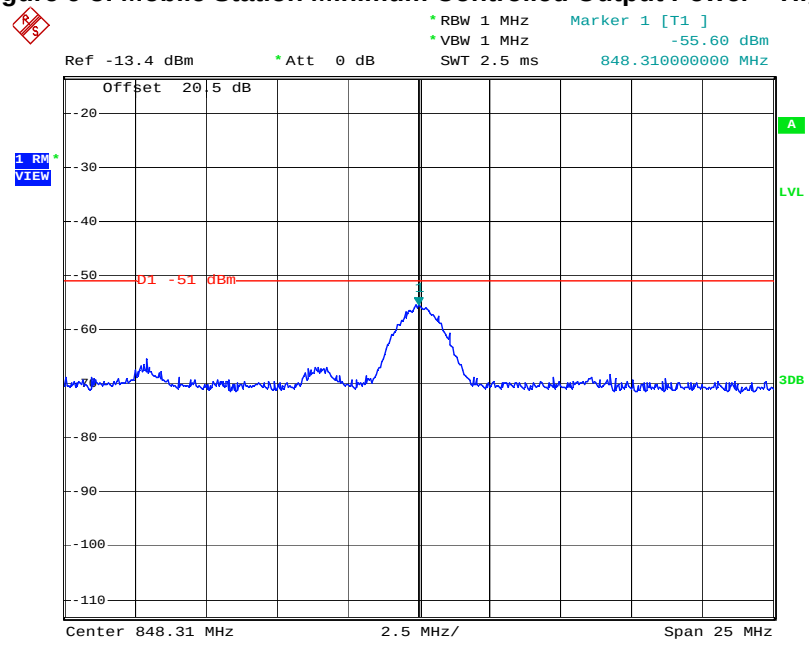

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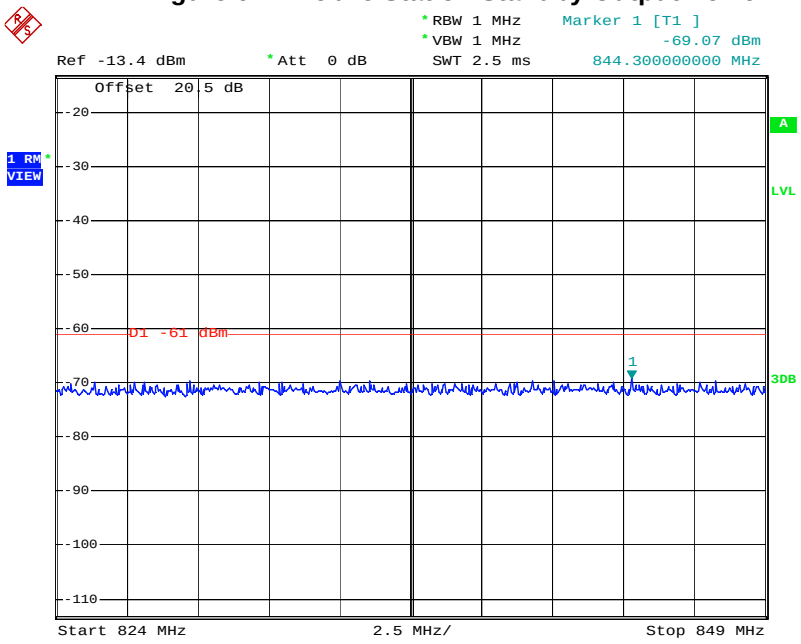
Figure 6-4: Mobile Station Standby Output Power



Date: 30.OCT.2010 15:10:53

7 Radiated Output Power

7.1 Test Limits

§ 22.913

The effective radiated power (ERP) of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.

(a) Maximum ERP. In general, the effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts.

§ 24.232

(c) Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

7.2 Test Procedure

The maximum antenna gain was calculated to satisfy the MPE requirements of §2.1091. The radiated output power was calculated by adding the maximum antenna gain to the maximum conducted output power measured in each band.

7.3 Test Equipment Used:

Description	Asset Number	Manufacturer	Model	Cal. Date	Cal. Due
Base Station Simulator	GB4334835	Agilent	8960	12/31/2009	12/31/2010

7.4 Results:

Cell Band:

Frequency	824.7	MHz
Limit	0.5498	mW/cm^2
Distance	20	cm
Power	24.4	dBm
TX Ant Gain	**10.01**	dBi
EIRP	34.41	dBm
ERP	**32.27**	dBm
Power Density	**0.5488**	mW/cm^2 at 20cm

PCS Band:

Frequency	1908.75	MHz
Limit	1	mW/cm^2
Distance	20	cm
Power	24.7	dBm
TX Ant Gain	**7.2**	dBi
EIRP	**31.9**	dBm
Power Density	**0.3081**	mW/cm^2 at 20cm

8 Radiated Spurious Emissions (Transmitter)

8.1 Test Limits

§ 2.1053

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

§ 22.917

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

§ 24.238

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

8.2 Test Procedure

The EUT was placed on a non-conductive turntable. The measurement antenna was placed at a distance of 3 meters from the EUT. The EUT was forced to transmit at its maximum output power setting. During the tests, the antenna height and EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.

The frequency range up to tenth harmonic was investigated in order to identify the spurious emission. Once the spurious emissions were identified, the power of the emission was determined using the substitution method described in TIA-603-C. The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and at the spurious emissions frequency.

8.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	6/29/2010	6/29/2011
Preamplifier	987410	Miteq	AFS44-00102000-30-10P-44	6/17/2010	6/17/2011
Preamplifier	SF456200904	Mini-Circuits	ZX60-3018G-S+	2/12/2010	2/12/2011
Biconnilog Antenna	00051864	ETS	3142C	12/21/2009	12/21/2010
Horn Antenna	6556	ETS	3115	8/9/2010	8/9/2011
Horn Antenna	1096	Antenna Research	DRG-118/A	7/8/2010	7/8/2011
System Controller	121701-1	Sunol Sciences	SC99V	Time of Use	Time of Use
High Pass Filter	3986-01 DC0408	Microwave Circuits, Inc.	H3G020G2	2/10/2010	2/10/2011
Base Station Simulator	GB4334835	Agilent	8960	12/31/2009	12/31/2010

8.4 Results:

All radiated spurious emissions were attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB which is equivalent to -13dBm. Each operational mode was investigated and the RC3/SO55 configuration yielded the highest measurement.

Worst Case Spurious Measurements

Radiated Spurious Emissions Measurement

Test Engineer: J. Centers
Test Date: 10/27/2010
Temp./Humidity/Pressure: 24C/40.8%/980.1mbar
Notes: Worse Case Mode - RC3/S055

			A	B	C	D	E	F
Band/Channel	Spurious Frequency (MHz)	Polarity	Device Reading (dBm)	Signal Generator Level (dBm)	Cable Loss (dB)	Tx Antenna Gain (dBd)	Limit (dBm)	Radiated Spurious Emission Level (dBm)
Cell Band/1013	3298.8	V	-63.29	-56.46	4.58	7.11	-13	-53.93
Cell Band/1013	3298.8	H	-61.93	-57.67	4.58	7.11	-13	-55.14
Cell Band/1013	4123.5	H	-61.59	-54.58	5.33	9.04	-13	-50.87
Cell Band/384	3346.08	H	-61.06	-57.24	4.63	7.03	-13	-54.85
Cell Band/384	3346.08	V	-62.96	-57.61	4.63	7.03	-13	-55.22
Cell Band/384	4182.6	H	-61.87	-54.41	5.19	9.10	-13	-50.50
Cell Band/777	3393.24	H	-62.22	-56.97	4.84	6.91	-13	-54.90
Cell Band/777	3393.24	V	-65.39	-58.96	4.84	6.91	-13	-56.89
Cell Band/777	4241.55	V	-65.22	-57.59	5	9.08	-13	-53.51
Cell Band/777	4241.55	H	-62.1	-54.59	5	9.08	-13	-50.51
PCS Band/25	3702.5	H	-50.4	-44.34	4.85	7.02	-13	-42.17
PCS Band/25	3702.5	V	-55.01	-48.41	4.85	7.02	-13	-46.24
PCS Band/25	5553.75	V	-65.06	-52.43	6.91	8.64	-13	-50.70
PCS Band/25	5553.75	H	-63.15	-48.65	6.91	8.64	-13	-46.92
PCS Band/600	3760	H	-49.87	-44.34	5.2	8.00	-13	-41.54
PCS Band/600	3760	V	-55.3	-47.99	5.2	8.00	-13	-45.19
PCS Band/600	5640	V	-64.9	-53.53	7.09	8.90	-13	-51.73
PCS Band/600	5640	H	-57.54	-44.82	7.09	8.90	-13	-43.02
PCS Band/1175	3817.5	V	-61.87	-54.29	5	8.55	-13	-50.74
PCS Band/1175	3817.5	H	-63.91	-56.6	5	8.55	-13	-53.05
PCS Band/1175	5726.25	V	-60.51	-48.12	7.06	9.36	-13	-45.82
PCS Band/1175	5726.25	H	-59.2	-46.06	7.06	9.36	-13	-43.76
								F=B-C+D

9 Frequency Stability

9.1 Test Limits

§ 2.1055, §22.355, §24.235

The frequency stability of the transmitter was required to maintain a ±2.5ppm tolerance.

9.2 Test Procedure

The equipment under test was connected to an external DC power supply and the RF output was connected to a Base Station Simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for that purpose. After the temperature stabilized for approximately 30 minutes, the frequency error was read from the base station simulator. At 20C the input voltage was varied from 85% to 115% and the frequency stability vs input voltage was recorded.

9.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Environmental Chamber	32692	Thermotron	SM-8C	1/29/2010	1/29/2011
Base Station Simulator	GB4334835	Agilent	8960	12/31/2009	12/31/2010

9.4 Results:

The tables below show the frequency stability data for both Cell and PCS Bands. In both cases the test sample met the ±2.5ppm limit.

Frequency Stability for Cell Band

Operating Freqeuncy: 836,520,000 Hz
Channel: 384
Reference Voltage: 13 VDC
Deviation Limit: 2.5 ppm
Notes: Frequency Stability in CDMA Cell Band

Voltage (%)	Power (VDC)	Temp (°C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100%	5	-30	6.2	0.0000007	0.0074
100%	5	-20	5.4	0.0000006	0.0065
100%	5	-10	2.8	0.0000003	0.0033
100%	5	0	4.4	0.0000005	0.0053
100%	5	10	2.3	0.0000003	0.0027
100%	5	20	2.6	0.0000003	0.0031
100%	5	30	3.8	0.0000005	0.0045
100%	5	40	2.7	0.0000003	0.0032
100%	5	50	3.1	0.0000004	0.0037
100%	5	60	2.1	0.0000003	0.0025
115%	16	20	3.2	0.0000004	0.0038
Batt. Endpoint	8	20	3.3	0.0000004	0.0039

Frequency Stability for PCS Band

Operating Freqeuncy: 1,880,000,000 Hz
Channel: 600
Reference Voltage: 13 VDC
Deviation Limit: 2.5 ppm
Notes: Frequency Stability in CDMA PCS Band

Voltage (%)	Power (VDC)	Temp (°C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100%	5	-30	13.9	0.0000007	0.0074
100%	5	-20	8	0.0000004	0.0043
100%	5	-10	6.8	0.0000004	0.0036
100%	5	0	6.8	0.0000004	0.0036
100%	5	10	6.9	0.0000004	0.0037
100%	5	20	5.8	0.0000003	0.0031
100%	5	30	4.2	0.0000002	0.0022
100%	5	40	4.1	0.0000002	0.0022
100%	5	50	6.2	0.0000003	0.0033
100%	5	60	3.9	0.0000002	0.0021
115%	16	20	4.1	0.0000002	0.0022
Batt. Endpoint	8	20	6.8	0.0000004	0.0036

10 Receiver Spurious Emissions

10.1 Test Limits

§ 15.109

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of emission (MHz)	Field strength (microvolts/meter)	Field strength (dBuV/m)
30–88	100	40
88–216	150	43.5
216–960	200	46
Above 960	500	54

10.2 Test Procedure

ANSI C63.4: 2003

10.3 Example of Field Strength Calculation Method:

The measured field strength was calculated by summing the readings taken from the spectrum analyzer with the appropriate correction factors associated with the antenna losses and cable losses. The calculation formula and sample calculations are listed below:

Formula:
FS = RA + AF + CF

FS = Field Strength in dBμV/m
RA = Receiver Amplitude in dBμV
AF = Antenna Factor in dB
CF = Cable Attenuation Factor in dB (Including preamplifier and filter attenuation)

Example Calculation:

RA = 19.48 dBμV
AF = 18.52 dB
CF = 0.78 dB

FS = 19.48 + 18.52 + 0.78 = 38.78 dBμV/m
Level in μV/m = Common Antilogarithm [(38.78 dBμV/m)/20] = 86.89 μV/m

10.4 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	6/29/2010	6/29/2011
Preamplifier	987410	Miteq	AFS44-00102000-30-10P-44	6/17/2010	6/17/2011
Preamplifier	SF456200904	Mini-Circuits	ZX60-3018G-S+	2/12/2010	2/12/2011
Biconnilog Antenna	00051864	ETS	3142C	12/21/2009	12/21/2010
Horn Antenna	6556	ETS	3115	8/9/2010	8/9/2011
System Controller	121701-1	Sunol Sciences	SC99V	Time of Use	Time of Use

10.5 Results:

All spurious emissions with the test sample in receive mode were below the limits specified in Part 15.109 for a class B digital device.

Maximized Quasi Peak Emissions

Radiated Emissions

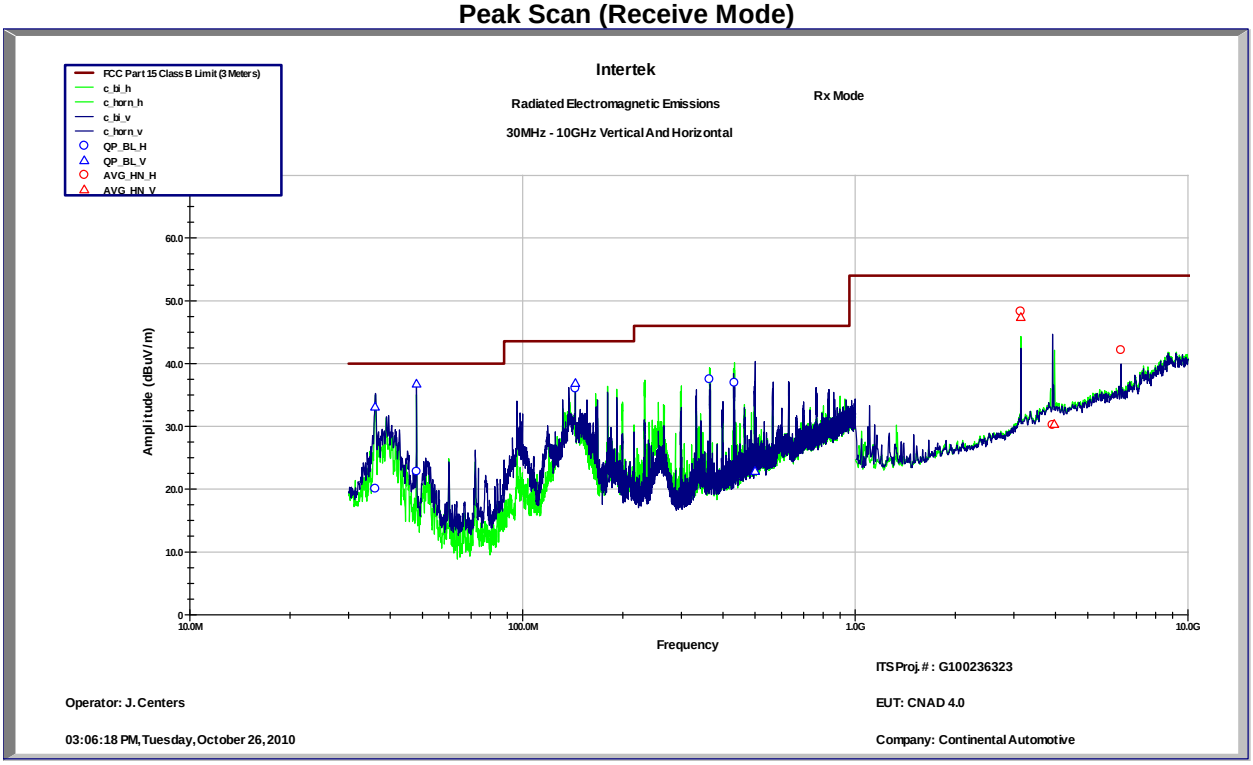
Test Engineer: J. Centers **Start Date:** 10/26/2010 **End Date:** 10/26/2010
Temperature: 24.2C **Humidity:** 41.80% **Pressure:** 978.6 mbar

Specification: FCC Part 15B **Test Limit:** 3m
Notes: Receiver Mode

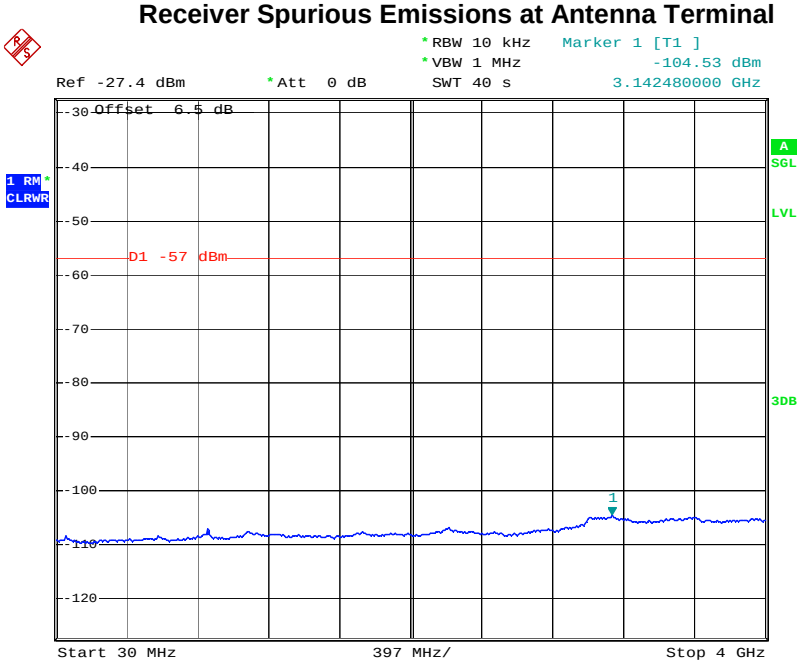
A	B	C	D	E	F	G	H	I	J	K
Frequency	Polarity (H/V)	Raw Reading (dBuV)	Cab. (dB)	Ant. (dB)	Corr. Reading. (dBuV/m)	Limit (dBuV/m)	Delta (dB)	RBW / Detector	Test Distance	Results
35.999 MHz	V	17.93	0.56	14.6	33.09	40	-6.91	120kHz	3m	**Compliant**
48.004 MHz	V	26.31	0.56	9.9	36.76	40	-3.24	120kHz	3m	**Compliant**
143.97 MHz	V	27.07	1.52	8.3	36.88	43.52	-6.64	120kHz	3m	**Compliant**
499.68 MHz	H	1.52	3.12	18.21	22.85	46.02	-23.17	120kHz	3m	**Compliant**
36.049 MHz	H	4.93	0.55	14.58	20.06	40	-19.94	120kHz	3m	**Compliant**
48.014 MHz	H	12.34	0.56	9.9	22.79	40	-17.21	120kHz	3m	**Compliant**
144.0 MHz	H	26.24	1.51	8.3	36.05	43.52	-7.47	120kHz	3m	**Compliant**
364.5 MHz	H	18.98	2.62	15.89	37.49	46.02	-8.53	120kHz	3m	**Compliant**
432.97 MHz	H	17.23	2.86	16.86	36.95	46.02	-9.07	120kHz	3m	**Compliant**
3.1413 GHz	H	47.8	-30.54	31.04	48.3	53.98	-5.68	120kHz	3m	**Compliant**
3.9139 GHz	H	26.87	-29.54	32.88	30.22	53.98	-23.76	120kHz	3m	**Compliant**
6.2824 GHz	H	34.27	-26.81	34.67	42.13	53.98	-11.85	120kHz	3m	**Compliant**
3.1411 GHz	V	46.87	-30.54	31.04	47.37	53.98	-6.61	120kHz	3m	**Compliant**
3.9634 GHz	V	26.69	-29.07	32.72	30.34	53.98	-23.64	120kHz	3m	**Compliant**

Calculations: F = C + D + E H = F - G

Peak Scan (Receive Mode)



Receiver Spurious Emissions at Antenna Terminal



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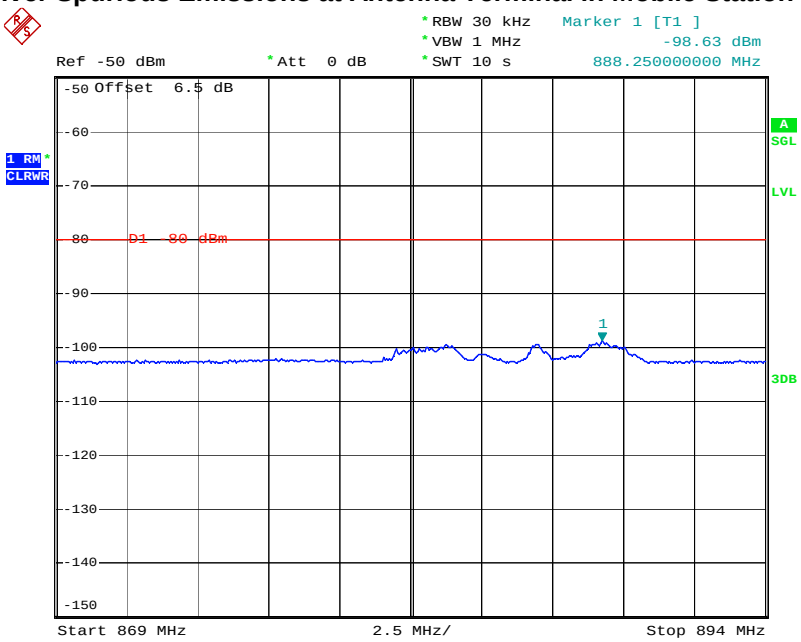
Receiver Spurious Emissions at Antenna Terminal in Mobile Station Receive Band



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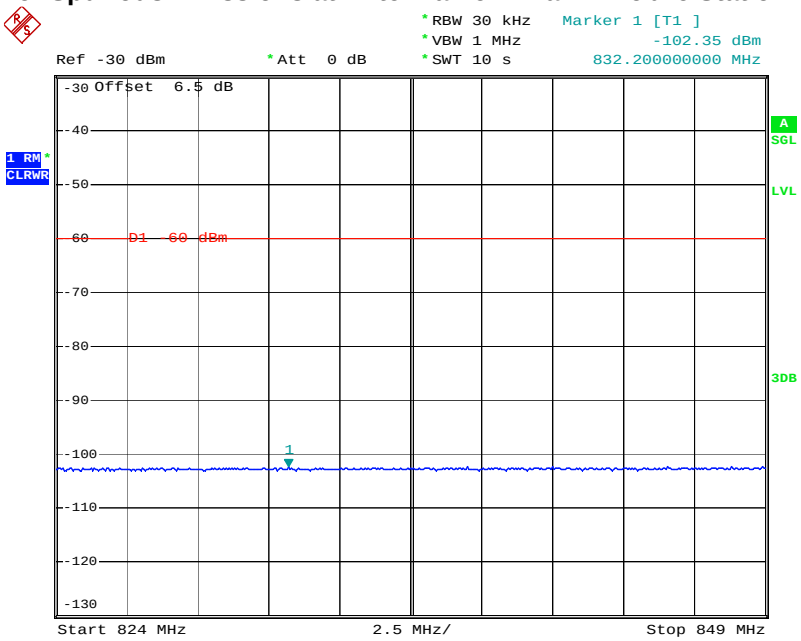
Receiver Spurious Emissions at Antenna Terminal in Mobile Station Transmit Band



Date: 30.OCT.2010 15:52:01

11 AC Powerline Conducted Emissions

11.1 Test Limits

§ 15.107

(a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

11.2 Test Procedure

ANSI C63.4: 2003

11.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	6/29/2010	6/29/2011
LISN	2509	Fischer Custom Communication	FCC-LISN-50-50-2M	6/04/2010	6/04/2011

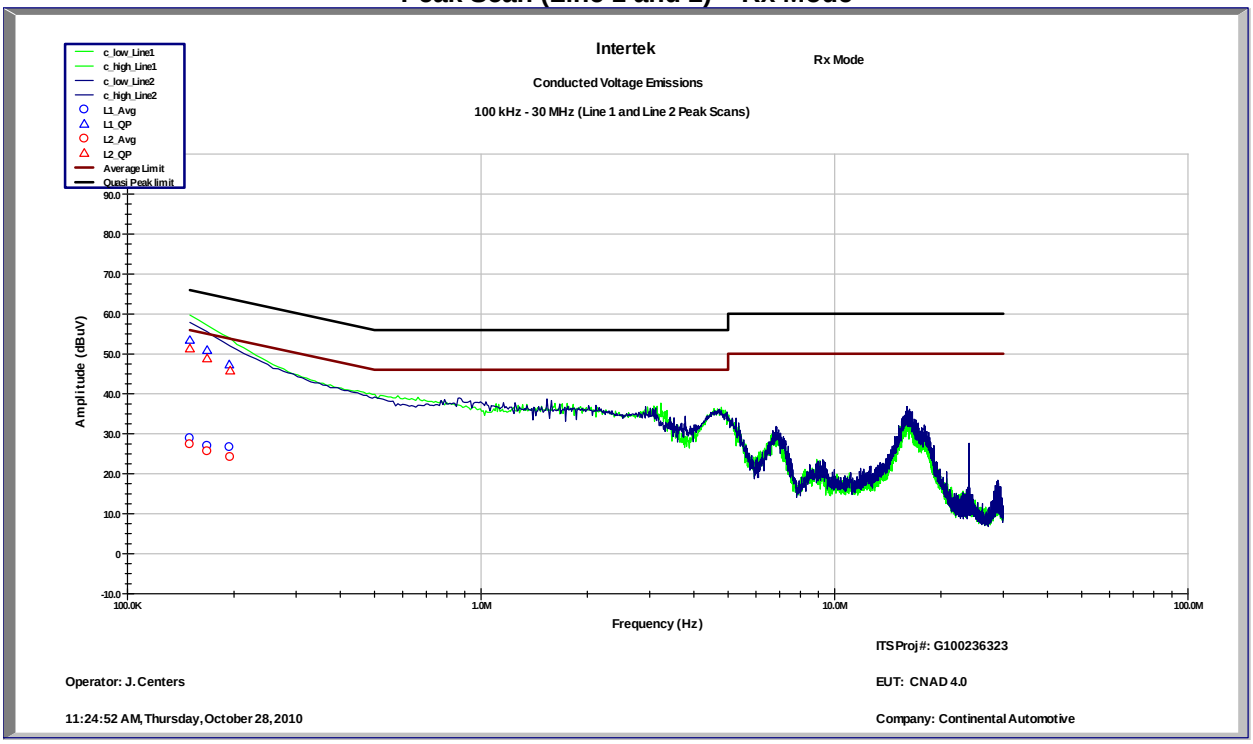
11.4 Results:

Quasi-Peak and Average Measurements – Rx Mode

Conducted Voltage Emissions on Power Lines								
Test Engineer:	J. Centers	**Start Date:**	10/28/2010	**End Date:**	10/28/2010			
Temperature:	22.1C	**Humidity:**	25.50%	**Pressure:**	985.4mbar			
Specification:	FCC Part 15B	**Test Limit:**	Class B	**RBW:**	9kHz			
Notes:	Receive Mode							

Line	Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Delta (dB)	Average (dBuV)	Average Limit (dBuV)	Average Delta (dB)	Results
L1	150.0 KHz	53.44	66	-12.56	28.83	56	-27.17	**Compliant**
L1	168.0 KHz	50.91	65.06	-14.15	26.96	55.06	-28.1	**Compliant**
L1	194.0 KHz	47.32	63.86	-16.55	26.65	53.86	-27.22	**Compliant**
L2	150.0 KHz	51.32	66	-14.68	27.36	56	-28.64	**Compliant**
L2	168.0 KHz	48.83	65.06	-16.23	25.62	55.06	-29.44	**Compliant**
L2	195.0 KHz	45.75	63.82	-18.07	24.2	53.82	-29.62	**Compliant**

Peak Scan (Line 1 and 2) – Rx Mode



12 Measurement Uncertainty

The measured value related to the corresponding limit will be used to decide whether the equipment meets the requirements.

The measurement uncertainty figures were calculated and correspond to a coverage factor of k = 2, providing a confidence level of respectively 95.45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian).

Measurement uncertainty Table

Parameter	Uncertainty	Notes
Radiated emissions, 30 to 1000 MHz	±3.9dB	
Radiated emissions, 1 to 18 GHz	±4.2dB	
Radiated emissions, 18 to 40 GHz	±4.3dB	
Power Port Conducted emissions, 150kHz to 30 MHz	±2.8dB	

13 Revision History

Revision Level	Date	Report Number	Notes
0	11/13/2010	100236323-001	Original Issue