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CERTIFICATION TEST REPORT

Applicant: U-Blox
12626 High Bluff Drive, Suite 200
San Diego, CA 92130

Equipment Under Test (EUT): CDMA 1xRTT Module
Model: LISA-C200

FCC ID: XU9-LISAC200
IC ID: 8694A-LISAC200

In Accordance With: FCC Part 22, Subpart H
RSS-132, Issue 2 September 2005

FCC Part 24 Subpart E
RSS 133 Issue 5 February 2009
RSS GEN Issue 3 December 2010

Tested By: Nemko USA Inc.
2210 Faraday Avenue, Suite 150
Carlsbad, CA 92008

Date: April 11, 2012
Report Number: 2012 04203246 FCC
Project Number: 10222569
Nex Number: 203246
Total Number of Pages: 54

Section 1: Summary of Test Results

General

All measurements are traceable to national standards

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC rules parts CFR47 Part 2 and 24 subpart E for the United States and RSS132 Issue 2, RSS133 Issue 5, and RSS-Gen Issue 3 for Canada. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC and IC.

The assessment summary is as follows:

Apparatus Assessed:	CDMA 1xRTT Module
Model:	LISA-C200
Serial:	A10000157EFF5A, A10000157EFF49
Specifications:	FCC Part 22, Subpart H Industry Canada RSS-132, Issue 2, September 2005 FCC Part 2, Part 24 Subpart E RSS 133 Issue 5, February 2009 RSS-GEN Issue 3 December 2010
Date Received in Laboratory:	March 19, 2012
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None

1.1 Report Release History

REVISION	DATE	COMMENTS
-	APRIL 11, 2012	Prepared By: Andreas Gillmeier
-	APRIL 11, 2012	Initial Release: Alan Laudani

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

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TESTED BY:



Date: APRIL 11, 2012

Andreas Gillmeier, Sr. EMC Wireless Engineer

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Section 2: Equipment Under Test

2.1 Product Identification

The Equipment Under Test was identified as follows:

Sample No.	Description	Serial No.
LISA-C200	CDMA 1xRTT Module, LISA-C200	A10000157EFF5A, A10000157EFF49

2.2 Technical Specifications of the EUT

Manufacturer:	U-Blox
Transmit Frequency:	Cellular Band: 824.70 to 848.31 MHz PCS Band: 1851.25 to 1908.75 MHz
Rated Power:	Cellular Band: 0.348 W PCS Band: 0.256 W
Modulation:	CDMA
Emission Designator:	Cellular Band: 1M36F9W PCS Band: 1M36F9W
Antenna:	taoglas Part No. TG.09.0113 1.0 (Cell)/ 2.8 (PCS) dBi penta-band cellular hinged SMA(M) monopole
Antenna Connector:	SMA
Power Source:	3.4 – 4.3 V DC from host (supplied by 115V AC).

Section 3: Test Conditions

3.1 Test Environment

All tests were performed under the following environmental conditions:

Temperature range : 19-24 °C
Humidity range : 25-35 %
Pressure range : 101.2 kPa
Power supply range : N/A

3.2 Test Equipment

Nemko ID	Device	Manufacturer	Model	Serial Number	Cal Date	Cal Due Date
835	Spectrum Analyzer	Rohde & Schwarz	RHDFSEK	829058/005	Jul. 22, 2011	Jul. 22, 2012
911	Spectrum Analyzer	Agilent	E4440A	US41421266	Oct. 27, 2011	Oct. 27, 2012
E1017	9kHz to 7GHz Spectrum Analyzer	Rohde & Schwarz	FSP7	839337/0022	3/8/2012	3/8/2013
E1018	9kHz to 7GHz Spectrum Analyzer	Rohde & Schwarz	FSP7	835363/0003	2/23/2012	2/23/2013
E1026	EMI Test Receiver 9kHz to 7GHz	Rohde & Schwarz	ESCI 7	100800	6/1/2011	6/1/2012
Customer furnished	Radio Communications Tester	Rohde & Schwarz	CMU200	117618	Verified with E1017	Verified with E1017
E1020	Two Line V-Network	Rohde & Schwarz	ENV216	101044	4/4/2011	4/4/2012
384	LISN	Solar	9348-50-R-24-BNC	941716	9/26/2011	9/26/2012
128	Antenna, Bicon	EMCO	3104	2882	3/21/2011	3/21/2013
110	Antenna, LPA	Electrometrics	LPA-25	1217	Apr. 01, 2011	Apr. 01, 2013
752	Antenna, DRWG	EMCO	3115	4943	Dec. 02, 2010	Dec. 02, 2012
836	Signal Generator	Agilent	E8254A	US41140229	3/7/2012	3/7/2013
NA	10 dB Attenuator	Narda	768-10	05109	Verified with 835	Verified with 835
901	Preamplifier	Sonoma	310 N	130607	Oct. 27, 2011	Oct. 27, 2012
317	Preamplifier	HP	8449A	2749A00167	5/16/2011	5/16/2012
941	Power Meter	Agilent	E4418B	MY40510887	Aug. 22, 2011	Aug. 22, 2012
814	Multimeter	Fluke	111	78130063	10/17/2011	10/17/2012
N149	Environmental Chamber	Cincinnati Sub-Zero	ZPHS-32-2-2-H/AC	ZP0552665	Apr. 29, 2011	Apr. 29, 2012

Registrations of the 10m Semi-anechoic chamber are on file with the Federal Communications Commission and with Industry Canada under Site Number 2040B-3.

Section 4: Observations

- 4.1 Modifications Performed During Assessment
None
- 4.2 Record Of Technical Judgments
No technical judgments were made during the assessment.
- 4.3 EUT Parameters Affecting Compliance
The user of the apparatus could not alter parameters that would affect compliance.
- 4.4 Test Deleted
No Tests were deleted from this assessment.
- 4.5 Additional Observations
There were no additional observations made during this assessment.

Section 5: Results Summary

5.1 Test Result summary table

FCC Part 2 Subpart J: Frequency Allocations and Radio Treaty Matters; General Rules and Regulations. Equipment Authorization Procedures.

FCC CFR 47 Part 24 Subpart E – Personal Communications Services – Broadband PCS
RSS-GEN Issue 3 (December 2010) – General requirements and information for the Certification of Radiocommunication Equipment
RSS-132, Issue 2 September 2005-- Cellular Telephones Employing New Technologies Operating in the Bands 824-849 MHz and 869-894 MHz
RSS-133 Issue 5 (February 2009) – 2 GHz Personal Communications Services

The column headed “Required” indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N No: not applicable / not relevant

Y Yes: Mandatory i.e. the apparatus shall conform to these test.

N/T Not Tested, mandatory but not assessed. (See section 4.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

FCC Part 2 Part 22/24	RSS Paragraph RSS-GEN/RSS-133	Test/Requirement Description	Required	Result
15.207 (A)	RSS-GEN 7.2.4	Power line conducted emissions	Y	COMPLIES
2.1046/24.232	RSS-133 6.4	RF Power Output	Y	COMPLIES
22.913	4.8/6.4	RF Power Output	Y	COMPLIES
2.1049/24.238	RSS-132/4.4	Occupied Bandwidth	Y	COMPLIES
22.917(D)	4.6.1/6.5	Occupied Bandwidth	Y	COMPLIES
2.1051/24.238	RSS-133 6.5.1	Spurious Emissions at antenna Terminals	Y	COMPLIES
22.917(B)	4.9/6.5	Spurious Emissions at antenna Terminals	Y	COMPLIES
2.1053/24.238	RSS-132/4.5	Field Strength of Spurious Emissions	Y	COMPLIES
22.917(B)	RSS-133 4.2/6.5	Field Strength of Spurious Emissions	Y	COMPLIES
2.1055/24.235	RSS-133 6.3	Frequency Stability	Y	COMPLIES
22.355	4.7/6.3	Frequency Stability	Y	COMPLIES
	RSS-132/4.3	Receiver Spurious	Y	COMPLIES
	RSS-132/4.6			
	RSS-133 6.7			
	4.10/6.6			

Appendix A: Test Results

A1. Powerline conducted emissions

15.207(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator 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 μ H/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 boundary between the frequency ranges.

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

*Decreases with the logarithm of the frequency.

Conditions:

Model:	LISA-C200	Temperature:	19°C
Date:	March 20, 2012	Humidity:	33%
Modification State:	None	Tester:	Andreas Gillmeier
		Laboratory:	Nemko

Test Results: EUT complies

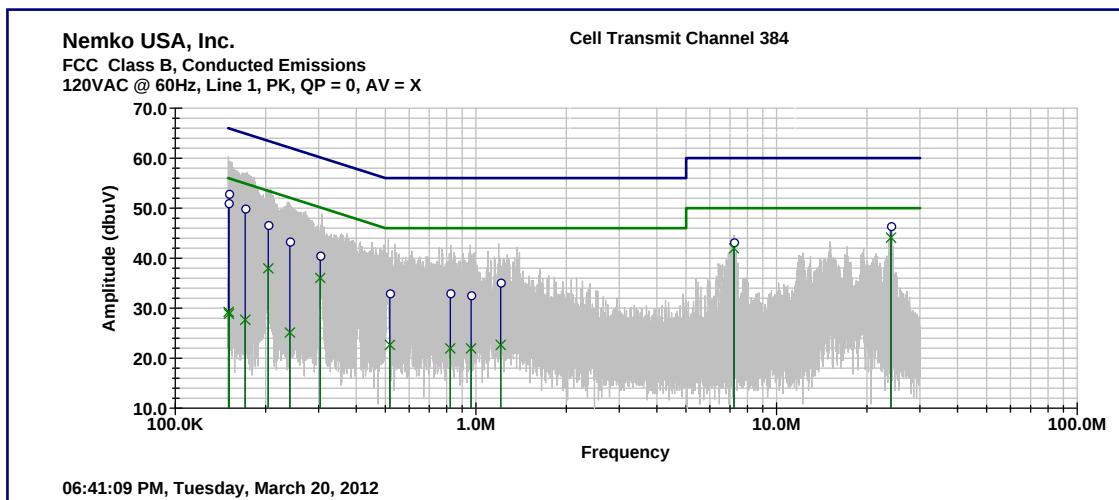
See attached plots

Additional Observations:

- Measurement was done on host's AC power supply
- EUT was tested using the following modes: Low channel TX, Mid channel TX, High channel TX and Receive Test Mode for each band. Only the worst case for each band is reported.
- Green limit line is Average limit and blue limit line is Quasi-peak limit.
- o represents final quasi peak measurements while x represent final average measurements.
- Instrumentation settings are 9kHz RBW/30kHz VBW for Average measurements and 120kHz RBW/300kHz VBW for Quasi-Peak measurements.

Cell band worst case TX: channel 384

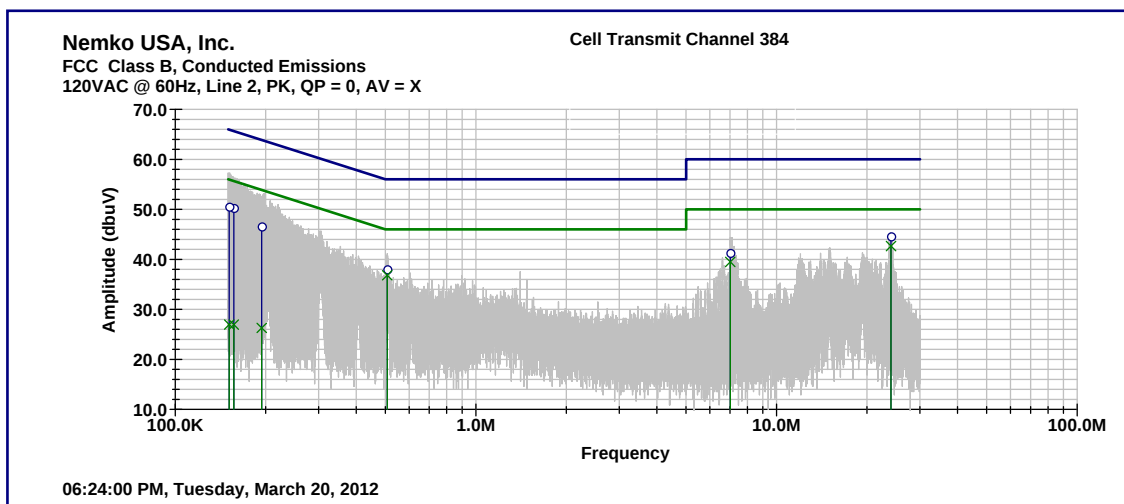
Line 1:



Frequency (kHz)	Measured		Limit		Margin	
	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
150.504	51.0	29.2	66.0	56.0	-15.0	-26.7
150.925	52.9	28.8	65.9	55.9	-13.1	-27.1
171.024	49.9	27.7	64.9	54.9	-15.0	-27.3
203.959	46.6	38.0	63.4	53.4	-16.8	-15.5
240.580	43.3	25.1	62.1	52.1	-18.7	-26.9
303.626	40.5	36.0	60.1	50.1	-19.6	-14.1
517.376	33.0	22.7	56.0	46.0	-23.0	-23.3
821.347	33.0	22.0	56.0	46.0	-23.0	-24.1
963.422	32.6	22.0	56.0	46.0	-23.4	-24.1
1208.680	35.1	22.6	56.0	46.0	-20.9	-23.4
7215.370	43.2	42.0	60.0	50.0	-16.8	-8.0
24001.000	46.4	44.1	60.0	50.0	-13.6	-5.9

Cell band worst case TX: channel 384

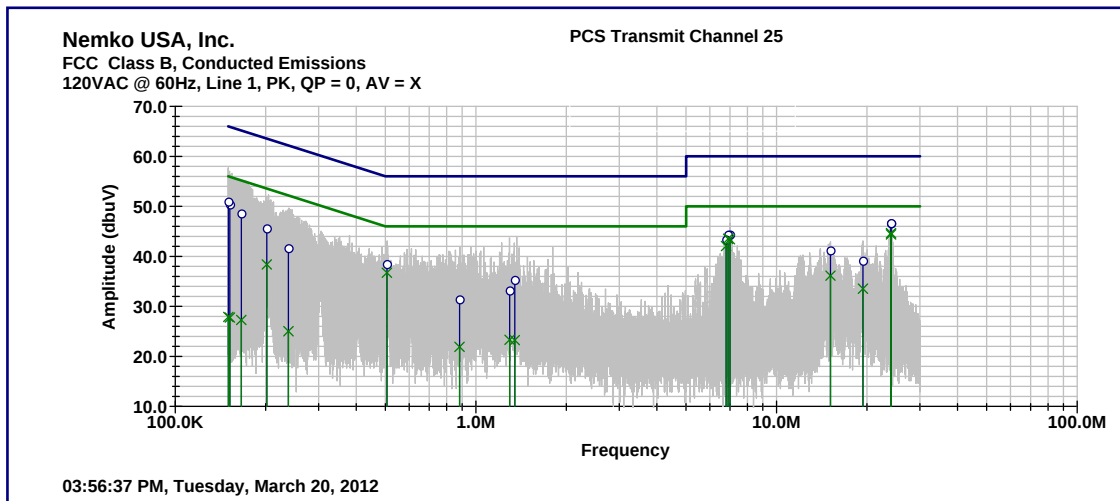
Line 2 (N):



Frequency (kHz)	Measured		Limit		Margin	
	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
151.203	50.5	27.0	65.9	55.9	-15.4	-29.0
156.514	50.3	26.9	65.6	55.6	-15.4	-28.7
193.970	46.6	26.3	63.9	53.9	-17.3	-27.6
506.921	38.0	36.8	56.0	46.0	-18.0	-9.2
7012.110	41.3	39.5	60.0	50.0	-18.7	-10.5
24001.900	44.6	42.7	60.0	50.0	-15.4	-7.3

PCS band worst case TX: channel 25

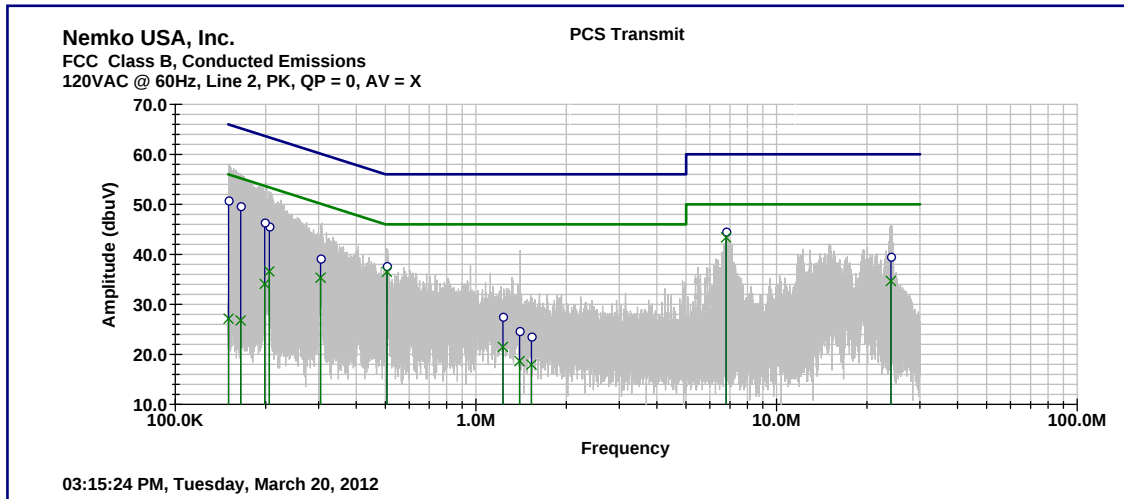
Line 1:



Frequency (kHz)	Measured		Limit		Margin	
	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
150.174	51.0	27.9	66.0	56.0	-15.0	-28.1
151.945	50.4	27.8	65.9	55.9	-15.5	-28.1
165.856	48.6	27.3	65.2	55.2	-16.6	-27.9
201.562	45.6	38.4	63.5	53.5	-18.0	-15.2
238.016	41.6	25.0	62.2	52.2	-20.5	-27.1
505.613	38.5	36.7	56.0	46.0	-17.5	-9.3
881.972	31.4	21.9	56.0	46.0	-24.6	-24.1
1294.890	33.2	23.3	56.0	46.0	-22.8	-22.7
1346.580	35.3	23.2	56.0	46.0	-20.7	-22.8
6792.830	43.4	42.1	60.0	50.0	-16.6	-7.9
6892.800	44.3	43.5	60.0	50.0	-15.7	-6.5
6994.520	44.3	43.4	60.0	50.0	-15.7	-6.6
15102.600	41.2	36.1	60.0	50.0	-18.8	-13.9
19369.500	39.1	33.5	60.0	50.0	-20.9	-16.5
23999.300	46.7	44.6	60.0	50.0	-13.3	-5.4
24000.900	46.6	44.4	60.0	50.0	-13.4	-5.6

PCS band worst case TX: channel 25

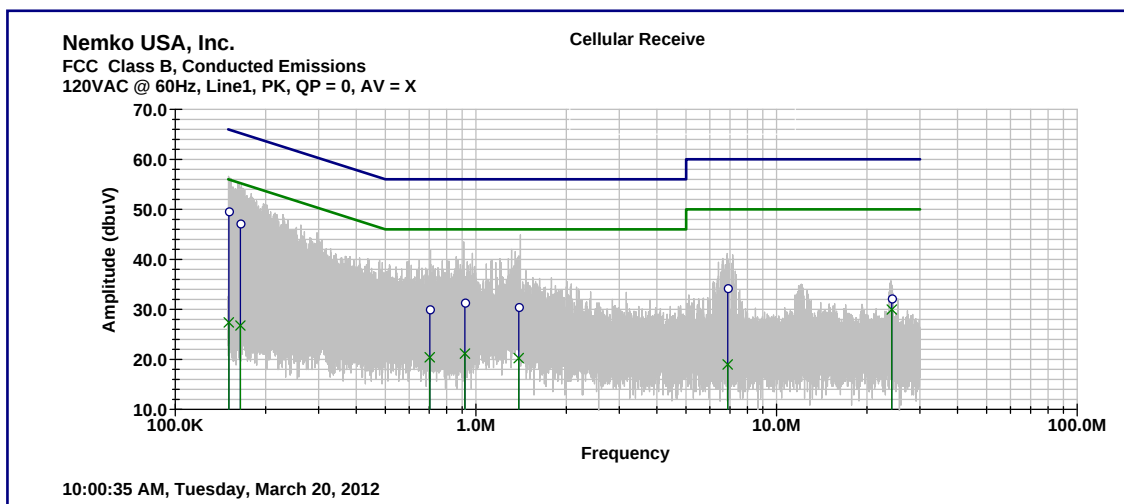
Line 2 (N):



Frequency (kHz)	Measured		Limit		Margin	
	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
150.397	50.8	27.1	66.0	56.0	-15.2	-28.9
165.052	49.7	26.8	65.2	55.2	-15.6	-28.4
198.471	46.4	34.1	63.7	53.7	-17.3	-19.6
205.586	45.6	36.6	63.4	53.4	-17.8	-16.8
304.341	39.2	35.3	60.1	50.1	-20.9	-14.8
505.558	37.7	36.5	56.0	46.0	-18.3	-9.5
1229.690	27.5	21.5	56.0	46.0	-28.5	-24.5
1396.870	24.7	18.6	56.0	46.0	-31.3	-27.4
1530.370	23.6	17.9	56.0	46.0	-32.4	-28.1
6791.780	44.6	43.4	60.0	50.0	-15.4	-6.6
23993.200	39.5	34.7	60.0	50.0	-20.5	-15.3

Cell band RX

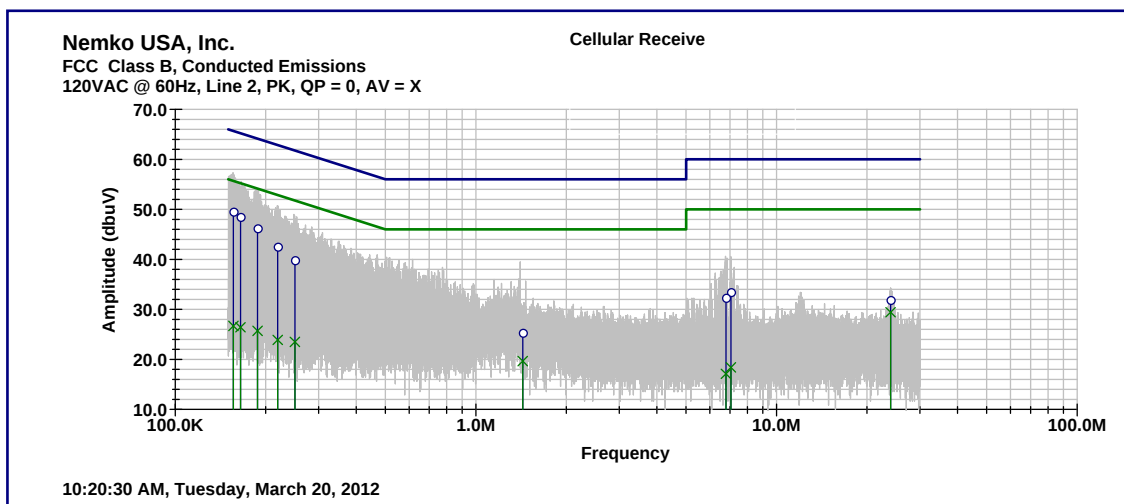
Line 1:



Frequency (kHz)	Measured		Limit		Margin	
	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
150.749	49.6	27.4	66.0	56.0	-16.3	-28.6
164.769	47.2	26.8	65.2	55.2	-18.0	-28.5
702.321	30.0	20.4	56.0	46.0	-26.0	-25.6
919.458	31.4	21.2	56.0	46.0	-24.6	-24.9
1387.820	30.5	20.2	56.0	46.0	-25.5	-25.8
6875.270	34.2	19.0	60.0	50.0	-25.8	-31.0
24158.000	32.2	30.0	60.0	50.0	-27.8	-20.0

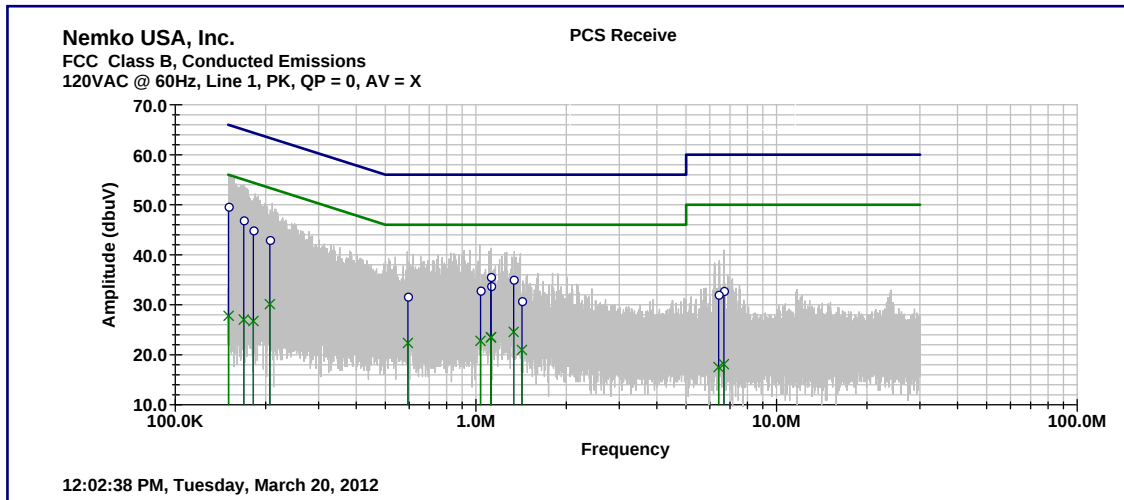
Cell band RX

Line 2 (N):



Frequency (kHz)	Measured		Limit		Margin	
	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
156.166	49.5	26.7	65.7	55.7	-16.1	-29.0
164.858	48.5	26.4	65.2	55.2	-16.7	-28.8
187.817	46.2	25.7	64.1	54.1	-17.9	-28.4
219.279	42.5	23.9	62.8	52.8	-20.3	-29.0
250.115	39.8	23.5	61.8	51.8	-21.9	-28.3
1430.710	25.3	19.6	56.0	46.0	-30.7	-26.4
6784.910	32.3	17.1	60.0	50.0	-27.7	-32.9
7043.090	33.5	18.4	60.0	50.0	-26.5	-31.6
23920.800	31.9	29.4	60.0	50.0	-28.1	-20.6

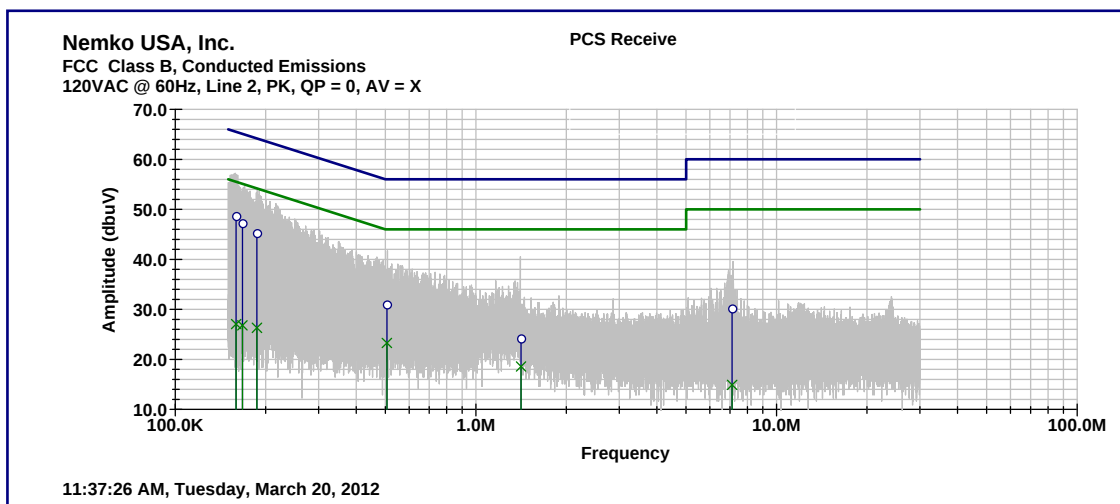
PCS band RX



Frequency (kHz)	Measured		Limit		Margin	
	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
150.580	49.6	27.8	66.0	56.0	-16.4	-28.2
169.009	46.9	27.0	65.0	55.0	-18.1	-28.0
181.990	44.9	26.7	64.4	54.4	-19.5	-27.7
206.392	43.0	30.1	63.3	53.3	-20.4	-23.2
594.046	31.6	22.4	56.0	46.0	-24.4	-23.6
1036.060	32.8	22.8	56.0	46.0	-23.2	-23.2
1120.980	35.6	23.4	56.0	46.0	-20.4	-22.6
1123.410	33.7	23.5	56.0	46.0	-22.3	-22.5
1335.730	35.0	24.6	56.0	46.0	-21.0	-21.4
1422.650	30.7	20.9	56.0	46.0	-25.3	-25.1
6410.940	32.0	17.5	60.0	50.0	-28.0	-32.5
6675.670	32.8	18.1	60.0	50.0	-27.2	-31.9

Cell band RX

Line 2 (N):



Frequency (kHz)	Measured		Limit		Margin	
	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
159.479	48.7	27.0	65.5	55.5	-16.8	-28.5
167.356	47.2	26.8	65.1	55.1	-17.9	-28.3
186.969	45.3	26.3	64.2	54.2	-18.9	-27.9
505.546	31.0	23.3	56.0	46.0	-25.0	-22.7
1412.300	24.2	18.6	56.0	46.0	-31.8	-27.4
7114.630	30.2	14.9	60.0	50.0	-29.8	-35.1

A2. RF Power Output

Para. No. : FCC 2.1046 & RSS-GEN 4.8

§ 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. However, for those systems operating in areas more than 72 km (45 miles) from international borders that:

(2) Extend coverage on a secondary basis into cellular unserved areas, as those areas are defined in §22.949, the ERP of base transmitters and cellular repeaters of such systems must not exceed 1000 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232.

(b) Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

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

(d) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

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4.4 Transmitter Output Power

The transmitter output power shall not exceed the limits given in SRSP-503.

NOTE: From SRSP-503 issue 7, Feb 2008:

5.1.3 The maximum EIRP shall be 11.5 watts for mobile stations.

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6.4 Transmitter Output Power

The average equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510.

NOTE: From SRSP-510 issue 5, Feb 2009:

5.1.2 Mobile Stations

Mobile stations and hand-held portables are limited to 2 watts maximum e.i.r.p. The equipment shall employ means to limit the power to the minimum necessary for successful communication.

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

Conditions:

Model:	LISA-C200	Temperature:	24°C
Date:	April 04, 2012	Humidity:	33%
Modification State:	None	Tester:	Andreas Gillmeier
		Laboratory:	Nemko

Observations:

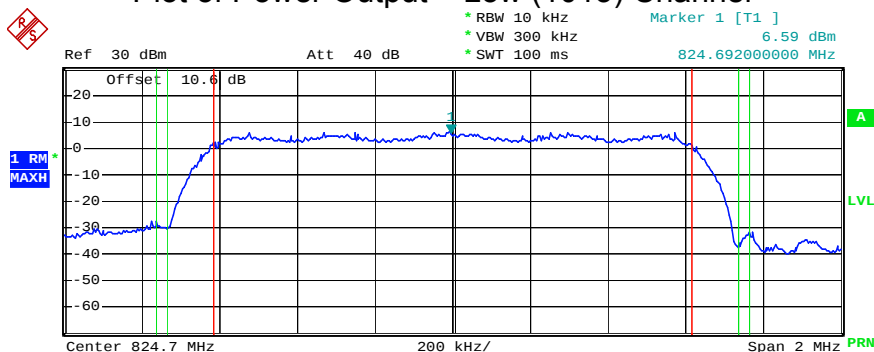
- Input voltage varied from 3.4 to 4.3 VDC
- Cellular macro of standard used in spectrum analyzer for conducted power measurement. 10.6 dB offset measured prior to test.
- PCS macro of standard used in spectrum analyzer for conducted power measurement. 10.7 dB offset measured prior to test.
- Peak, max hold used for Peak output power with RBW > EBW.

Test Results: Complies

Carrier Frequency (MHz)	Channel	Voltage Nom +/- 15% VDC	Output Power (dBm)	Output Power (W)
824.70	1013	3.4	24.30	
		3.9	24.28	
		4.3	24.43	0.277
836.52	384	3.4	24.63	
		3.9	25.41	0.348
		4.3	24.87	
848.31	777	3.4	24.90	
		3.9	24.97	0.314
		4.3	24.96	

Carrier Frequency (MHz)	Channel	Voltage Nom +/- 15% VDC	Output Power (dBm)	Output Power (W)	Peak Output Power (dBm)	Peak to Average Ratio (dB)
1851.25	25	3.4	23.73			
		3.9	23.83			
		4.3	24.08	0.256	25.24	1.05
1880.00	600	3.4	23.23			
		3.9	23.40			
		4.3	23.43	0.221	24.85	1.06
1908.75	1175	3.4	23.64			
		3.9	24.03	0.253	24.92	1.04
		4.3	23.61			

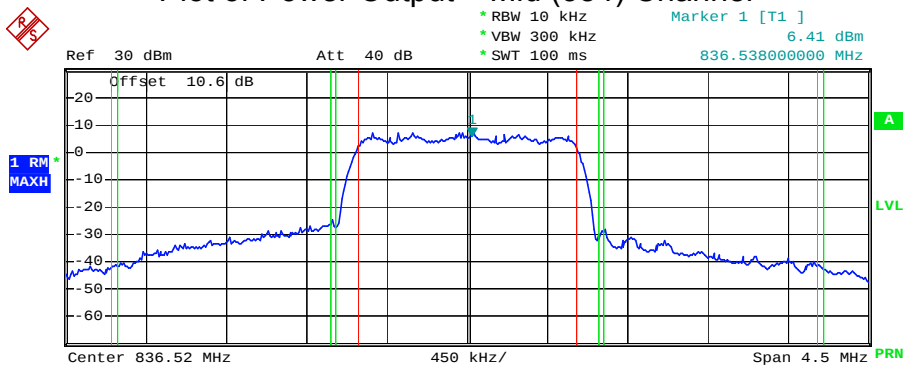
Plot of Power Output – Low (1013) Channel



Tx Channel		CDMA IS95A FWD	
Bandwidth	1.2288 MHz	Power	24.43 dBm
Adjacent Channel		Lower	-49.47 dB
Bandwidth	30 kHz	Upper	-53.82 dB
Spacing	750 kHz		
Alternate Channel		Lower	----
Bandwidth	30 kHz	Upper	----
Spacing	1.98 MHz		

Date: 4.APR.2012 02:23:55

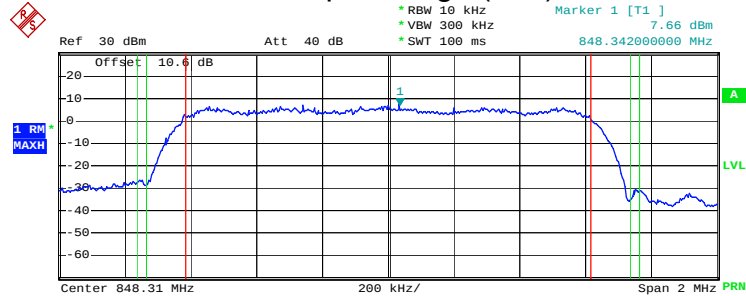
Plot of Power Output – Mid (384) Channel



Tx Channel		CDMA IS95A FWD	
Bandwidth	1.2288 MHz	Power	25.41 dBm
Adjacent Channel		Lower	-47.15 dB
Bandwidth	30 kHz	Upper	-50.29 dB
Spacing	750 kHz		
Alternate Channel		Lower	-62.61 dB
Bandwidth	30 kHz	Upper	-62.36 dB
Spacing	1.98 MHz		

Date: 1.JAN.1997 01:49:23

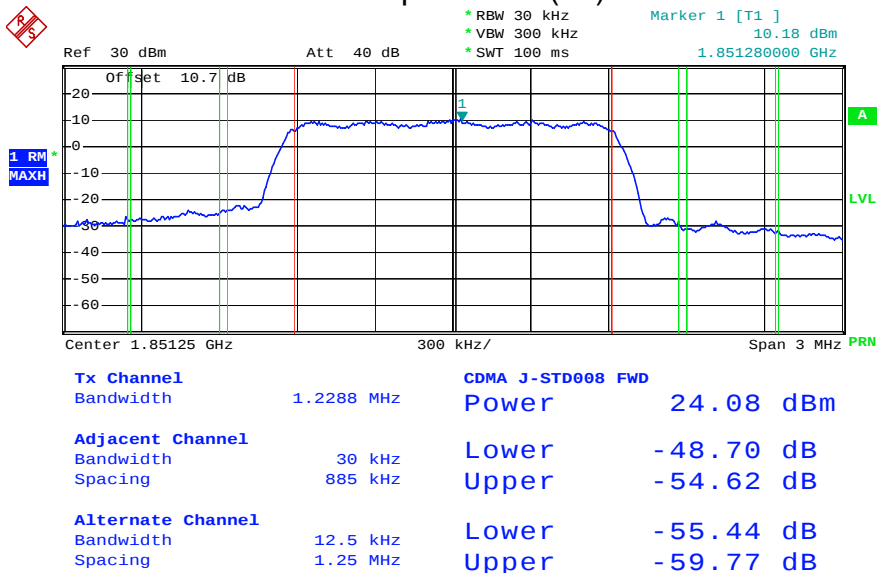
Plot of Power Output – High (777) Channel



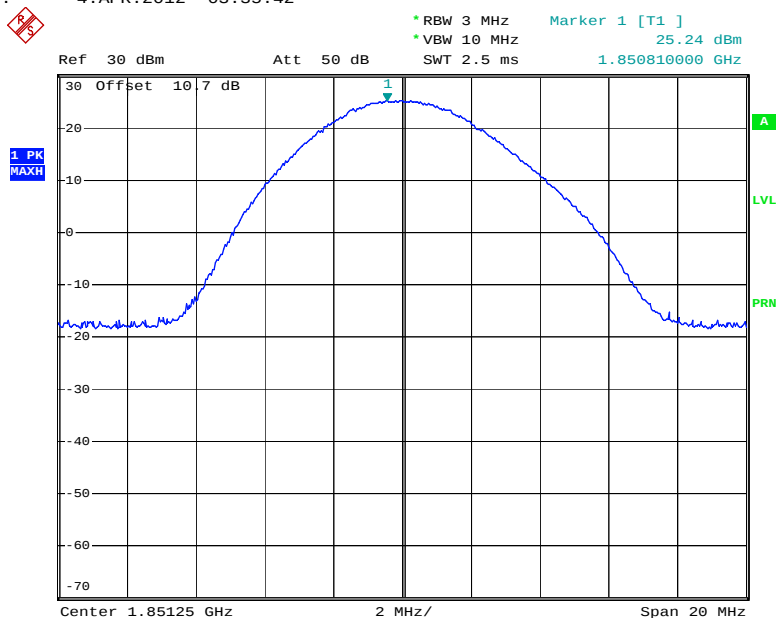
Tx Channel		CDMA IS95A FWD	
Bandwidth	1.2288 MHz	Power	24.97 dBm
Adjacent Channel		Lower	-48.01 dB
Bandwidth	30 kHz	Upper	-52.42 dB
Spacing	750 kHz		
Alternate Channel		Lower	-----
Bandwidth	30 kHz	Upper	-----
Spacing	1.98 MHz		

Date: 4.APR.2012 02:30:31

Plot of Power Output – Low (25) Channel

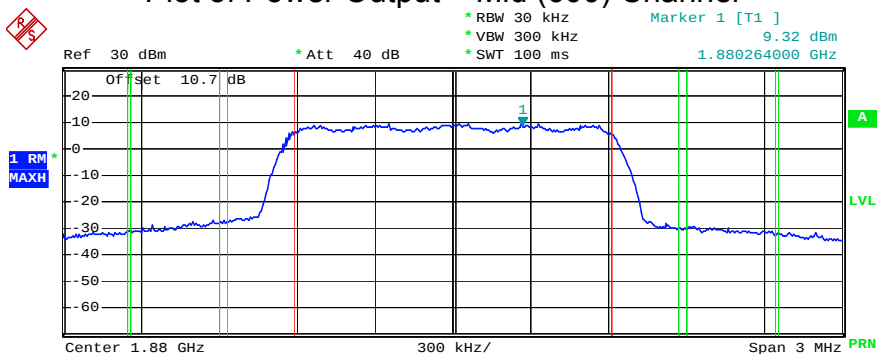


Date: 4.APR.2012 03:35:42



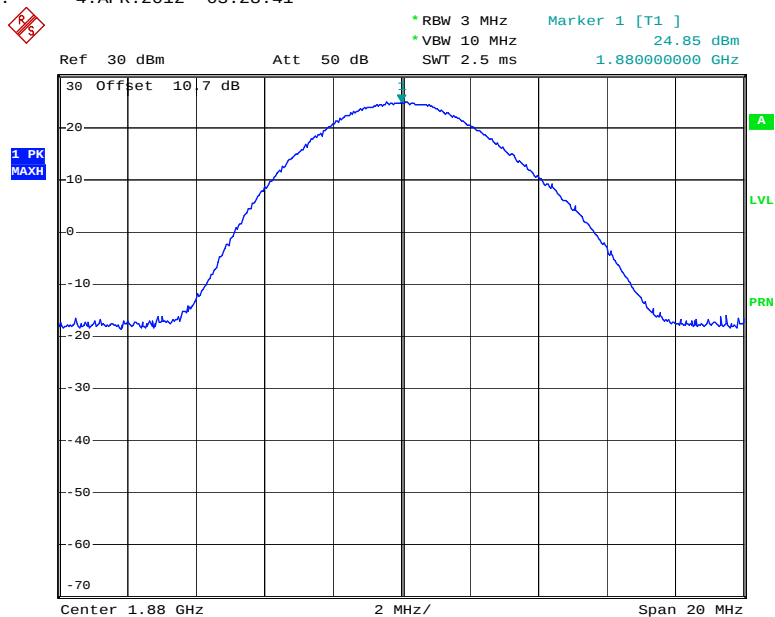
Date: 4.APR.2012 03:44:02

Plot of Power Output – Mid (600) Channel



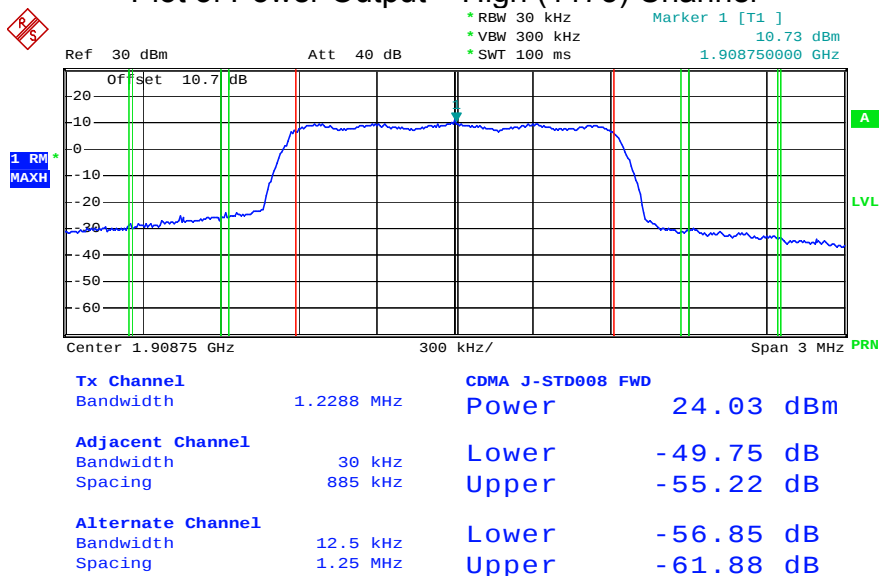
Tx Channel		CDMA J-STD008 FWD	
Bandwidth	1.2288 MHz	Power	23.43 dBm
Adjacent Channel		Lower	-51.42 dB
Bandwidth	30 kHz	Upper	-53.77 dB
Spacing	885 kHz		
Alternate Channel		Lower	-58.77 dB
Bandwidth	12.5 kHz	Upper	-59.33 dB
Spacing	1.25 MHz		

Date: 4.APR.2012 03:28:41

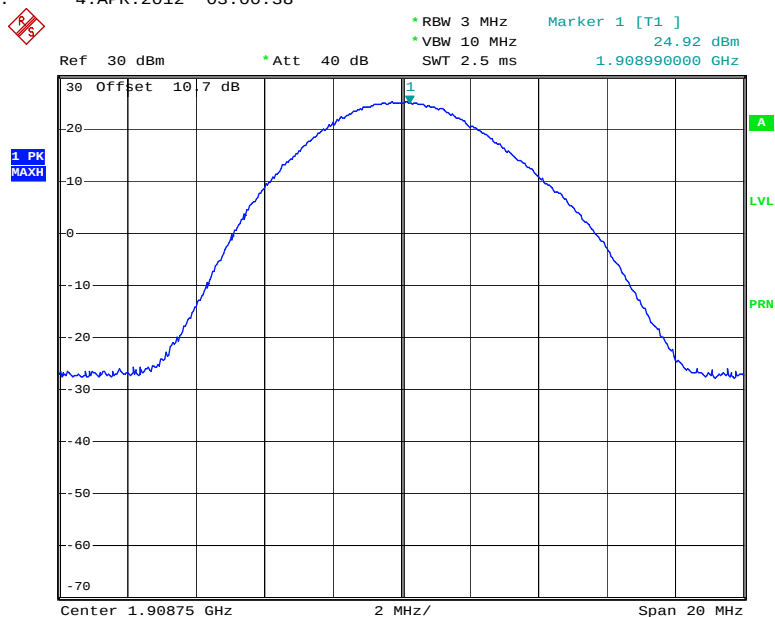


Date: 4.APR.2012 03:31:13

Plot of Power Output – High (1175) Channel



Date: 4.APR.2012 03:00:38



Date: 4.APR.2012 03:13:35

A3. Occupied Bandwidth

Para. No.: 2.1049 and RSS-GEN 4.6

Part 22.917

(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

(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.

RSS-GEN 4.6.1 Occupied Bandwidth

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

The span between the two recorded frequencies is the occupied bandwidth.

Conditions:

Model:	LISA-C200	Temperature:	24°C
Date:	April 04, 2012	Humidity:	34%
Modification State:	None	Tester:	Andreas Gillmeier
		Laboratory:	Nemko

Observations: None

Test Results: Complies

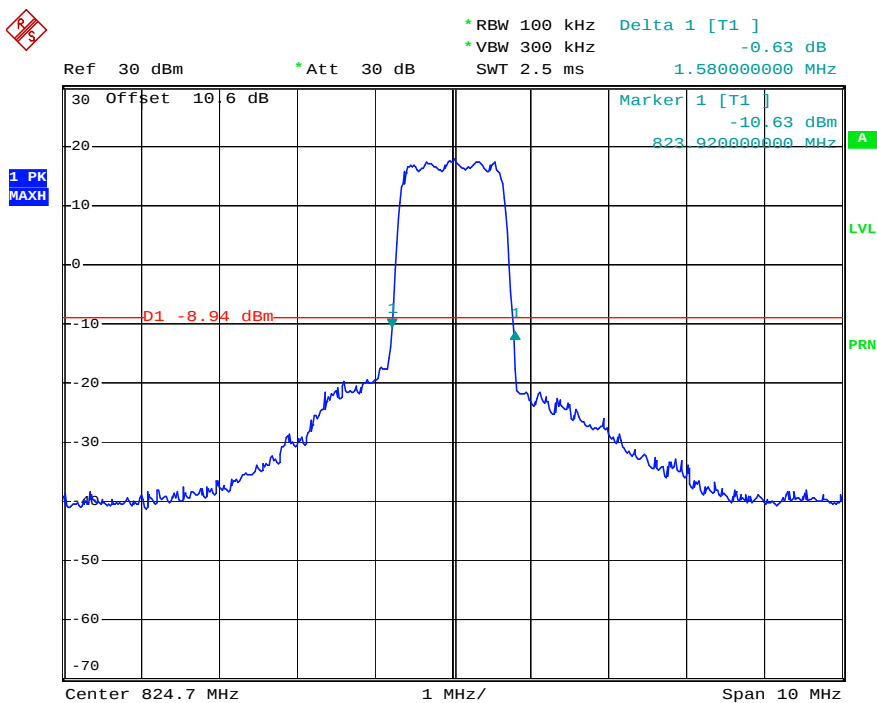
FCC ID: XU9-LISAC200
IC: 8649A-LISAC200

Report Number: 2012 04203246 FCC

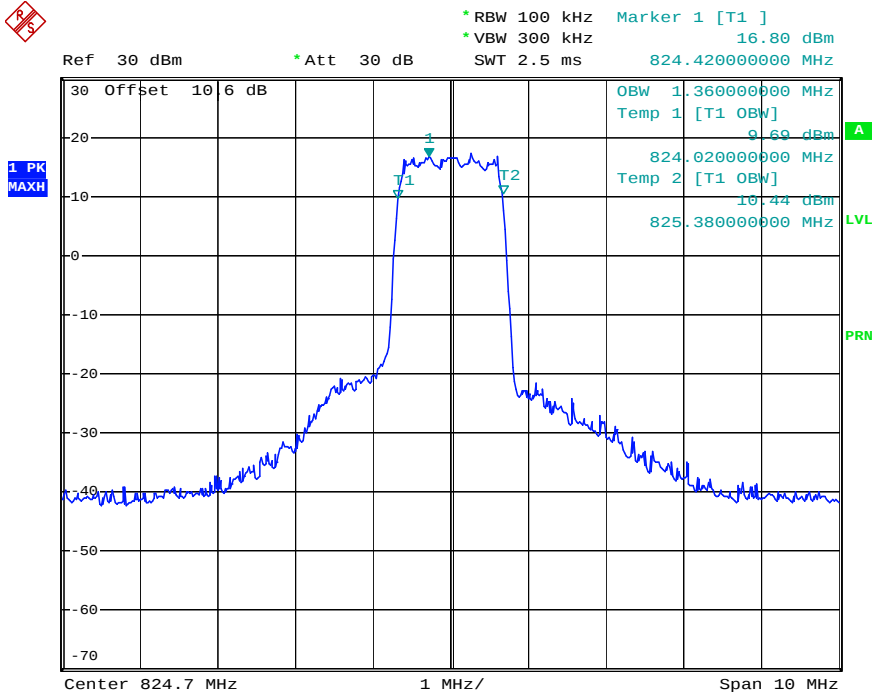
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Test Data:

Frequency	26 dB Bandwidth	99% Bandwidth
824.70 MHz	1.58 MHz	1.36 MHz
836.52 MHz	1.58 MHz	1.36 MHz
848.31 MHz	1.58 MHz	1.35 MHz
1851.25 MHz	1.55 MHz	1.35 MHz
1880.00 MHz	1.55 MHz	1.36 MHz
1908.75 MHz	1.55 MHz	1.35 MHz

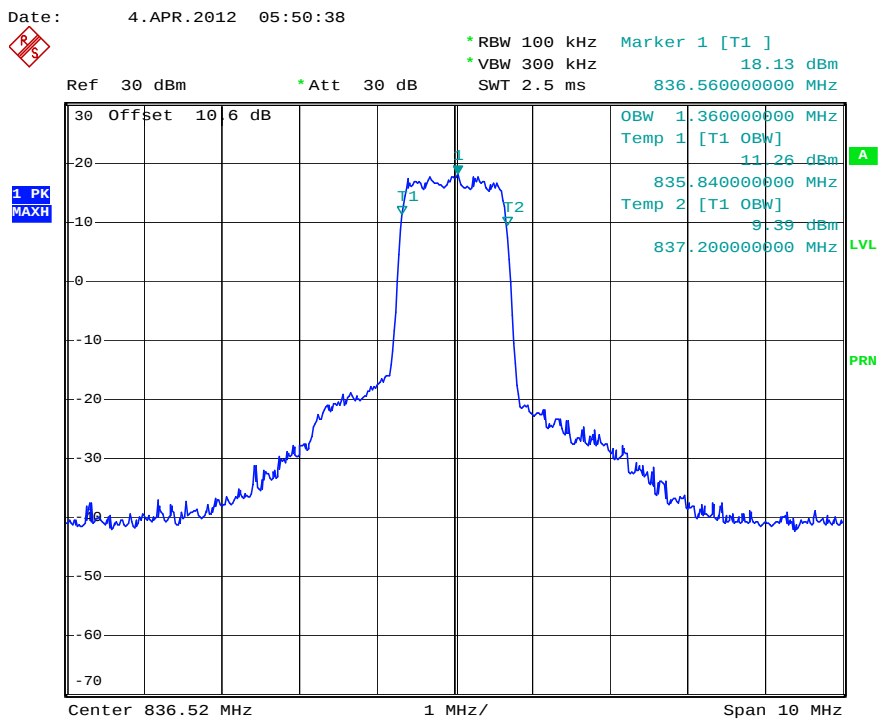
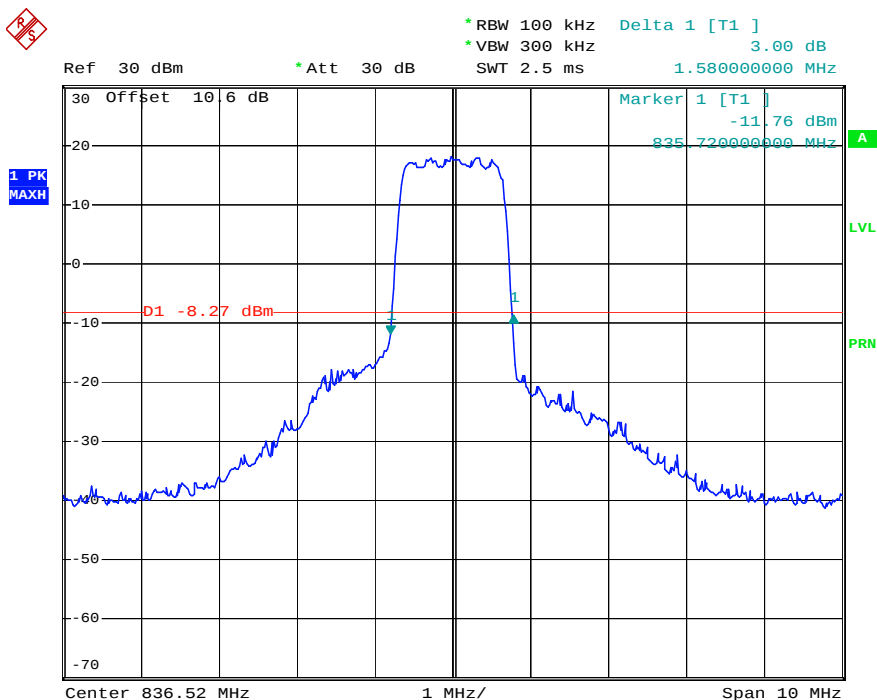


Date: 4. APR. 2012 05:40:23



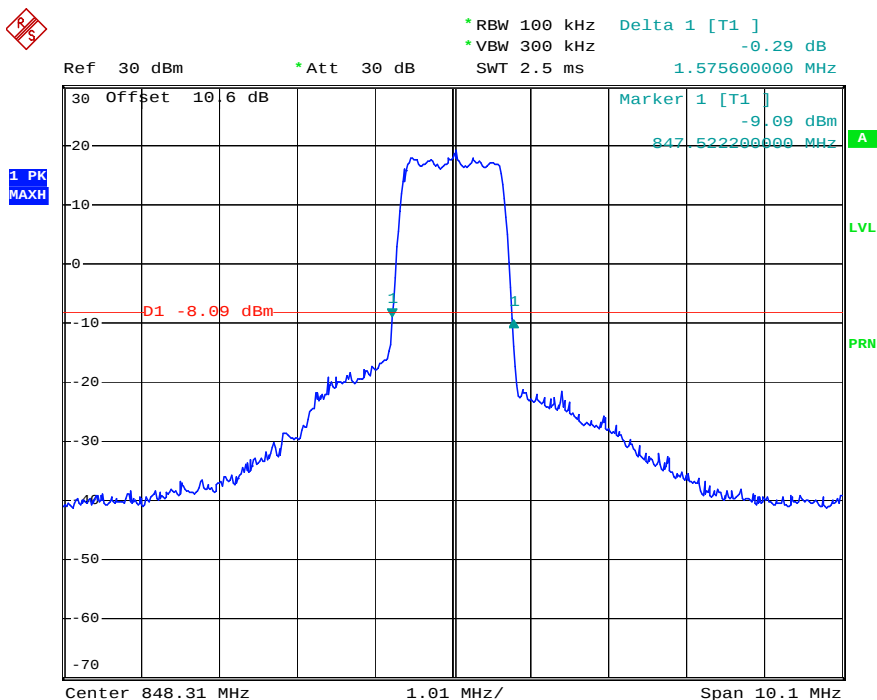
Date: 4.APR.2012 05:41:43

Cellular Band Frequency Low Channel (1013) – 824.70 MHz

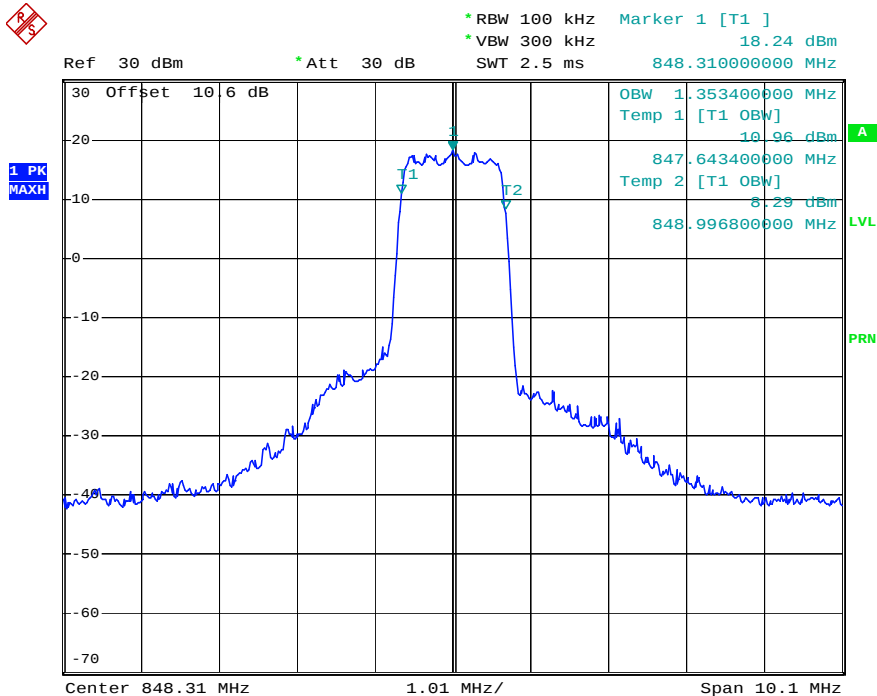


Date: 4.APR.2012 05:47:12

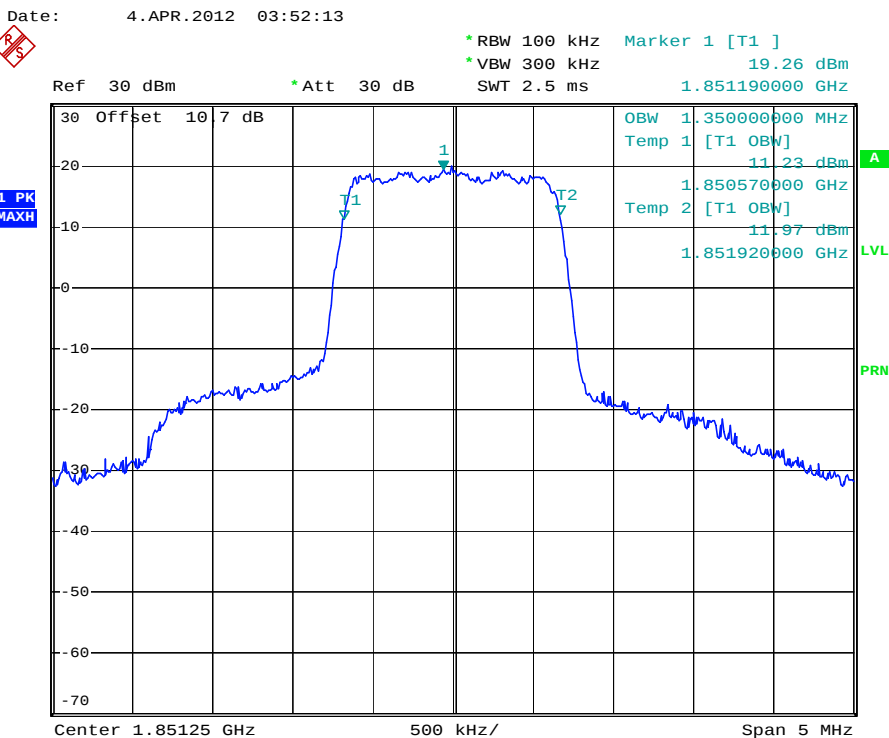
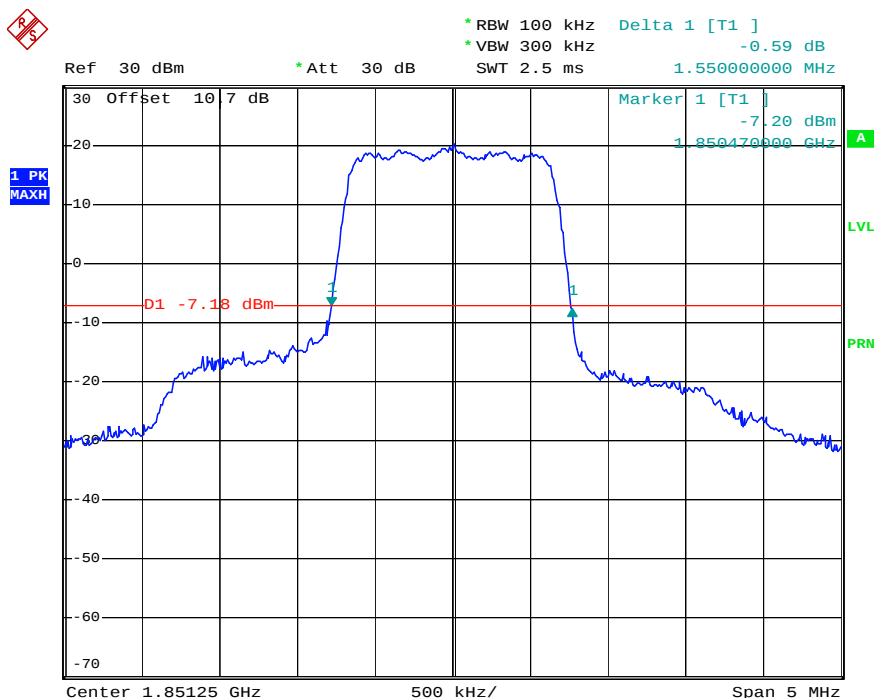
Cellular Band Frequency Mid Channel (384) – 836.52 MHz



Date: 4.APR.2012 05:59:20

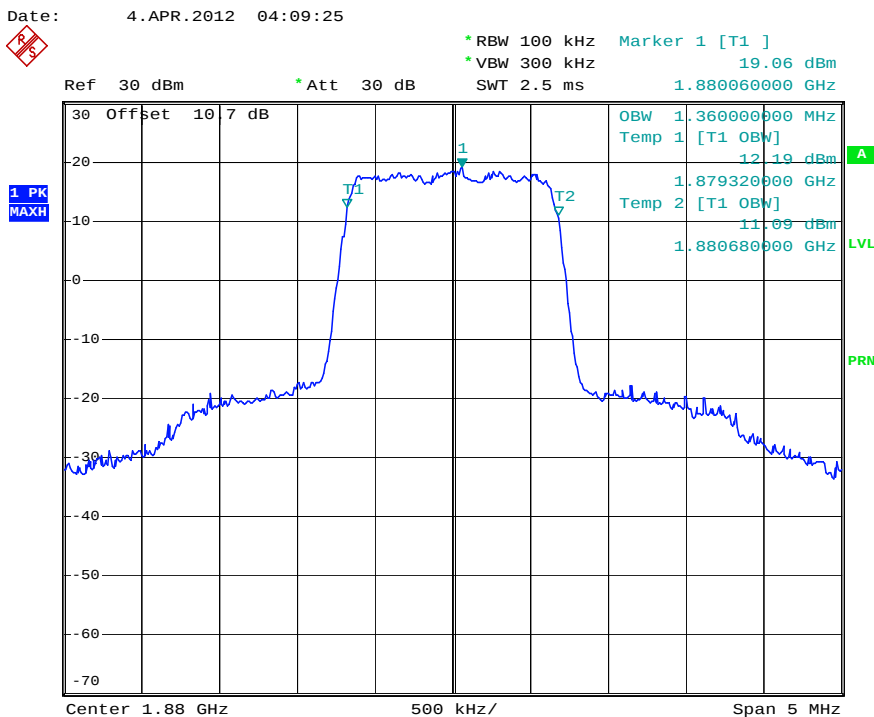
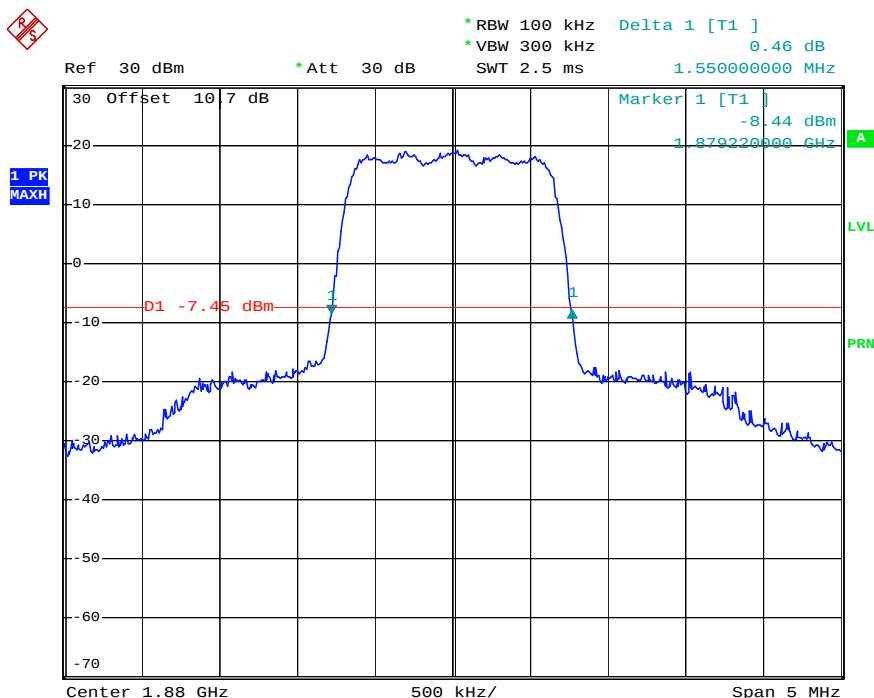


Date: 4.APR.2012 06:00:40



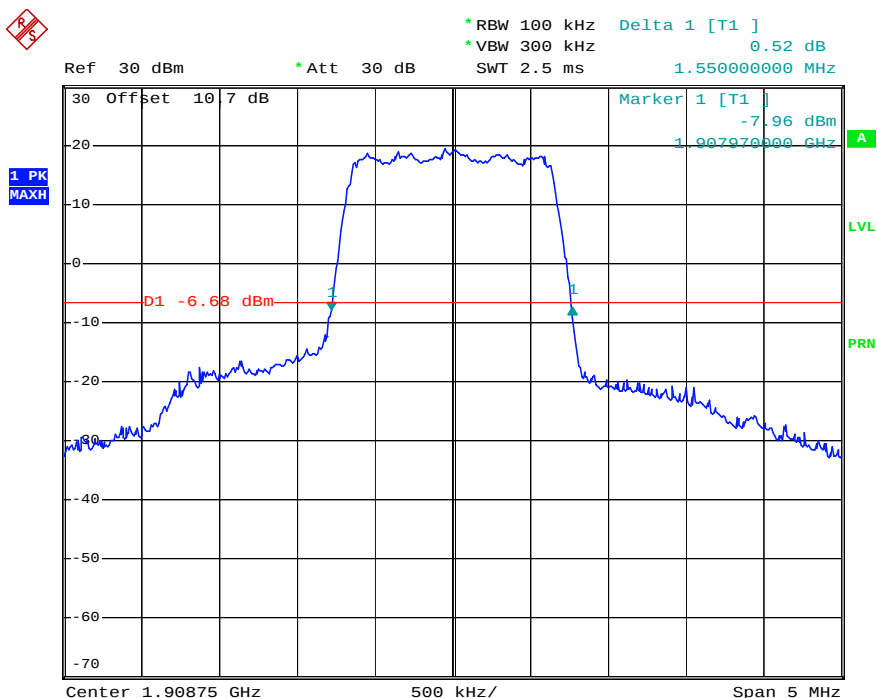
Date: 4.APR.2012 04:02:04

PCS Band Frequency Low Channel (25) – 1851.25 MHz

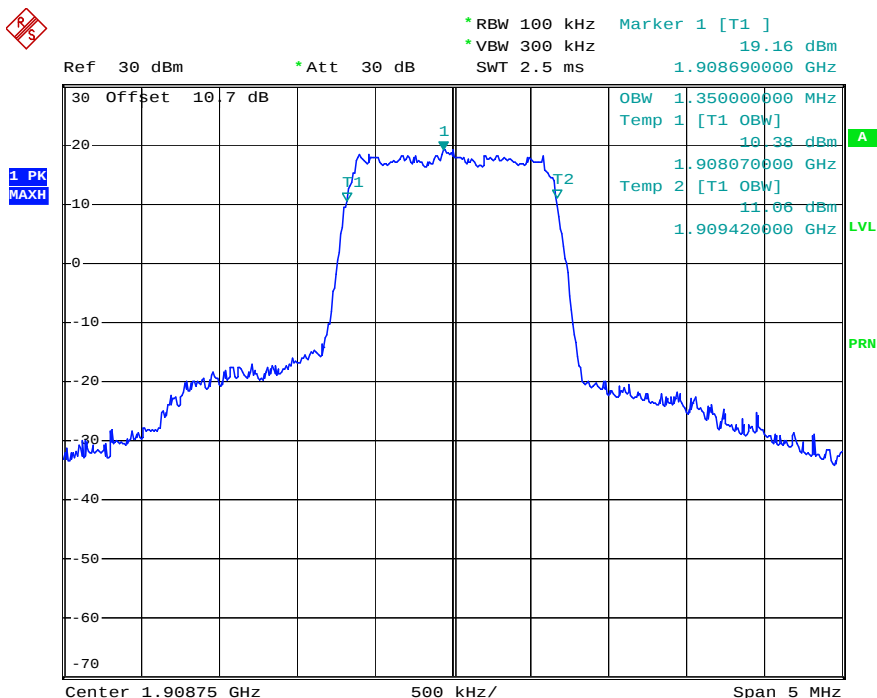


Date: 4.APR.2012 04:05:45

PCS Band Frequency Mid Channel (600) – 1880.00 MHz



Date: 4.APR.2012 04:13:17



Date: 4.APR.2012 04:16:52

PCS Band Frequency High Channel (1175) – 1908.75 MHz

A4. Spurious Emissions At Antenna Terminals

Para. No.: FCC 2.1051 & RSS-GEN 4.9

Part 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.

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).

RSS 132 4.5 Transmitter Unwanted Emissions

RSS 133 6.5 Transmitter Unwanted Emissions

6.5.1 Out-of-Block Emissions (Mobile and Base Stations)

(a) Mobile stations shall comply with subsection (i) below. Base stations shall comply with either subsection (i) or subsection (ii).

(i) In the first 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in watts) by at least $43 + 10 \log_{10}(P)$, dB.

Conditions:

Model:	LISA-C200	Temperature:	20 – 22 °C
Date:	March 21 – April 10, 2012	Humidity:	25 -35 %
Modification State:	None	Tester:	Andreas Gillmeier
		Laboratory:	Nemko

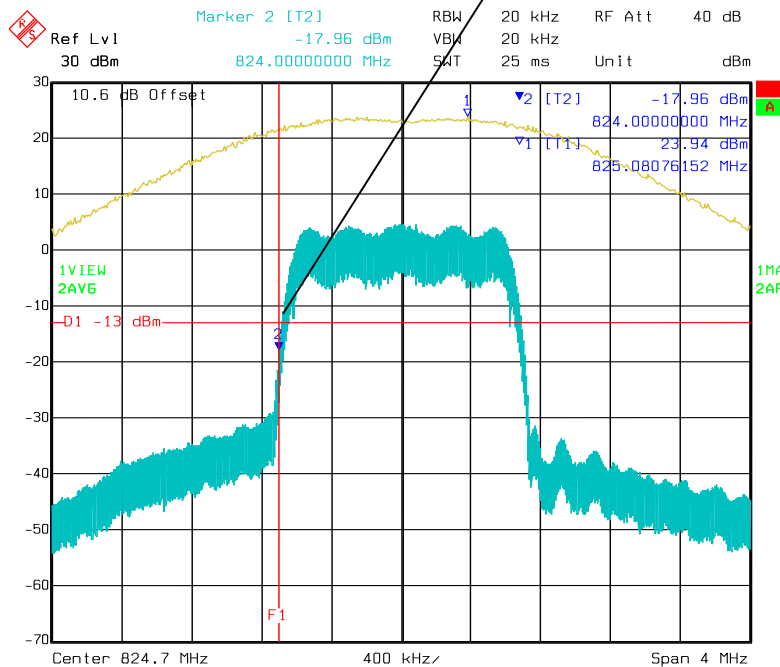
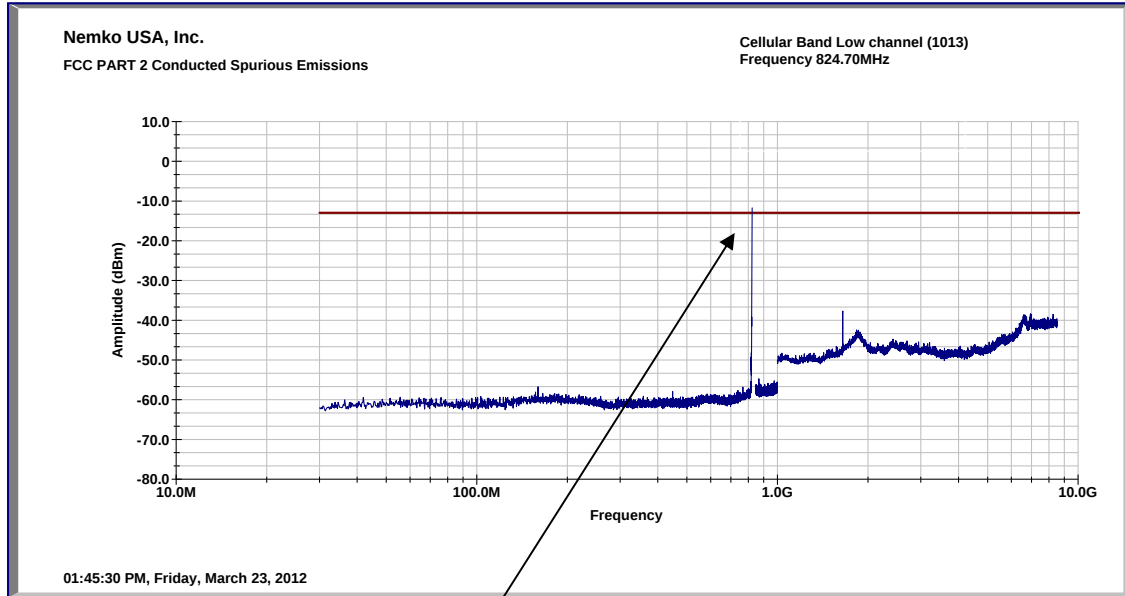
Observations:

1. Video (100 sample) averaging was used to demonstrate compliance within the band edges. RBW > 1 % of emission bandwidth.
2. 1 MHz RBW, 3 MHz VBW, Max Hold is used outside the band.
3. Screenshots below demonstrate compliance at band edges. Plots show compliance from 30 MHz to 10 x Transmit Frequencies.

Test Results: Complies

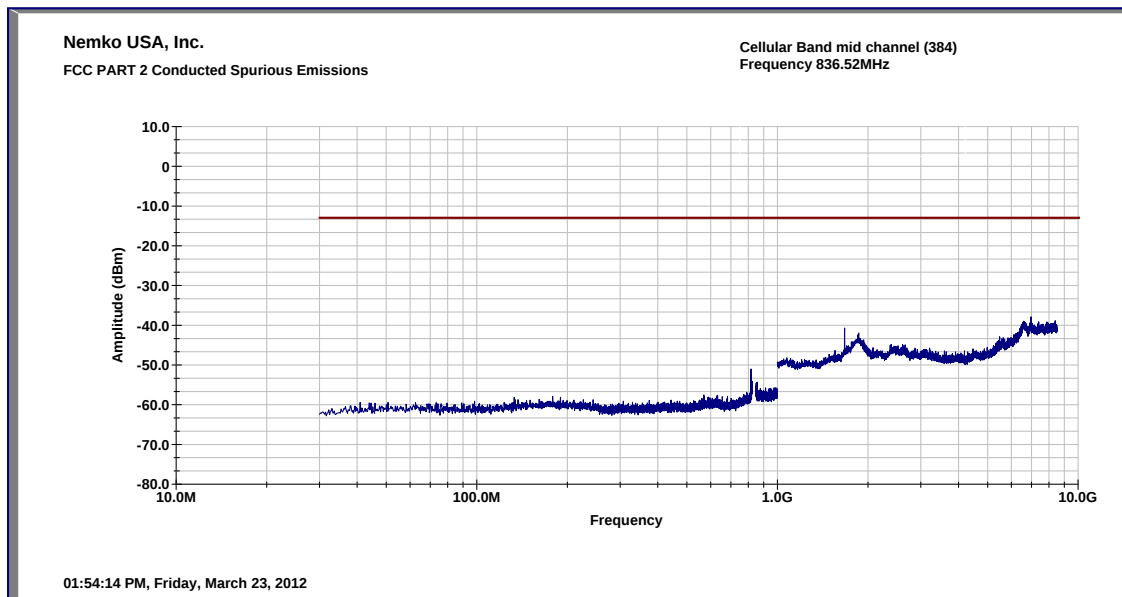
Test Data: See attached graphs.

Channel 1013 Spurious Emissions – Cellular Band Low Channel

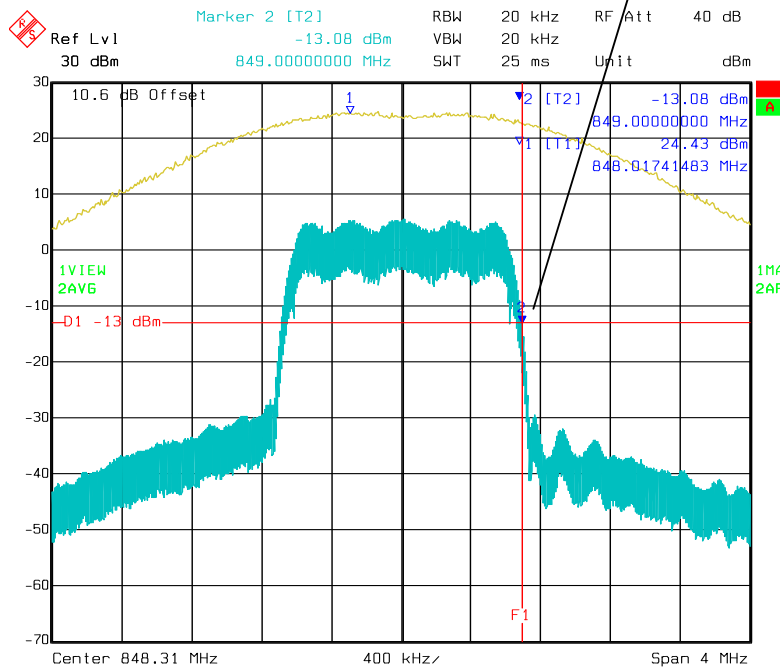
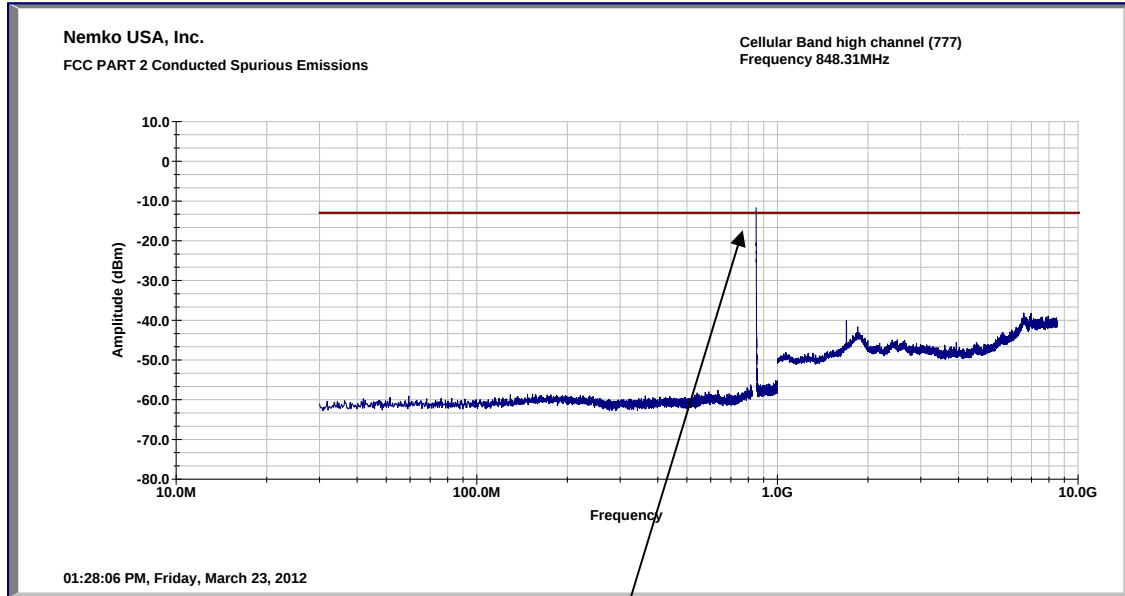


Date: 10.APR.2012 07:50:50

Channel Band 384 Spurious Emissions – Cellular Band Mid Channel

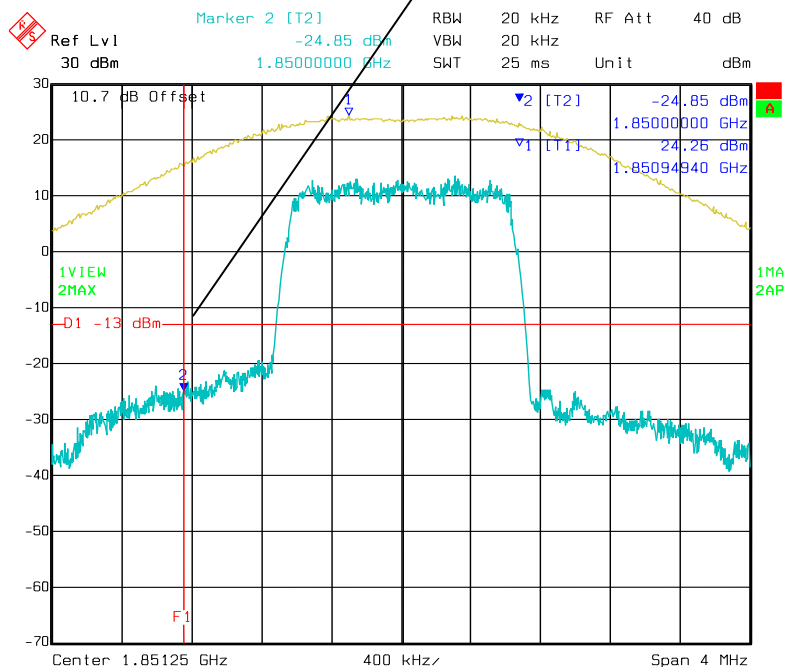
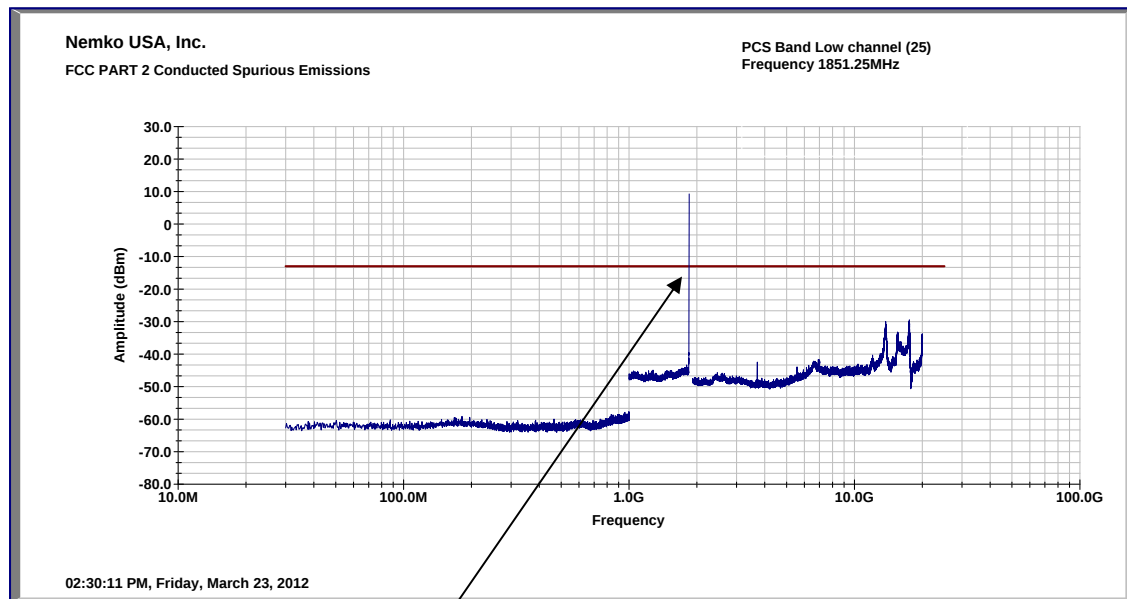


Channel 777 Spurious Emissions – Cellular Band High Channel



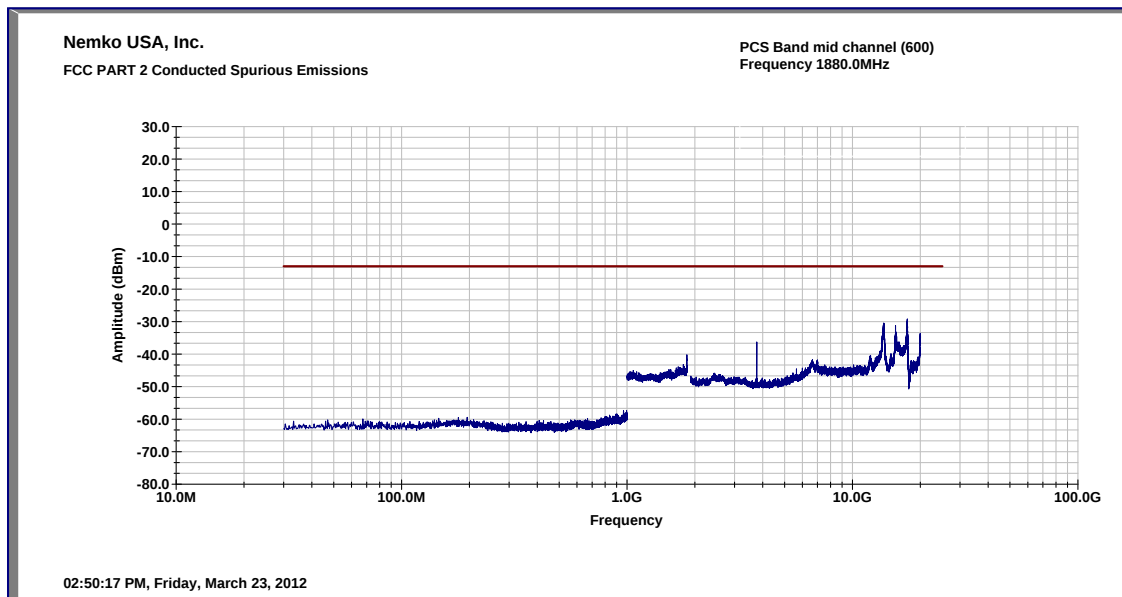
Date: 10.APR.2012 07:58:22

Channel 25 Spurious Emissions – PCS Band Low Channel

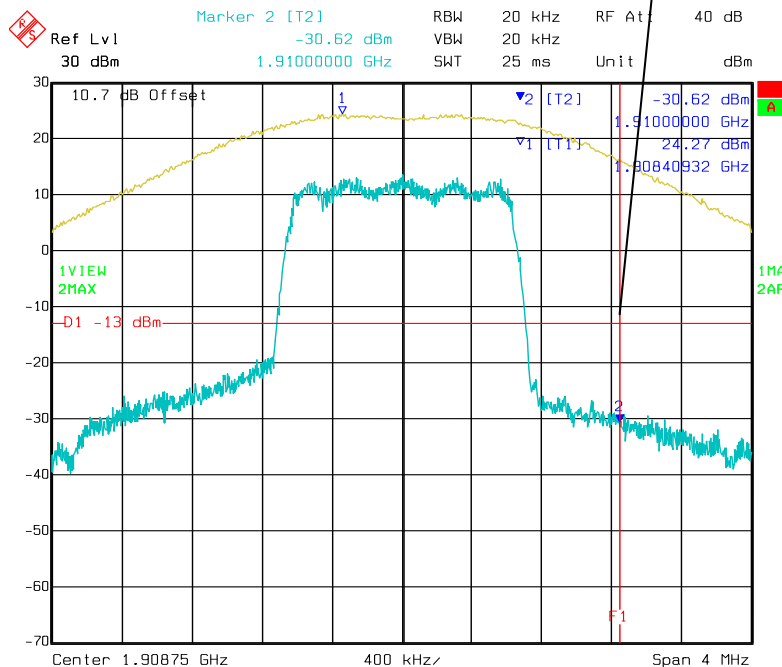
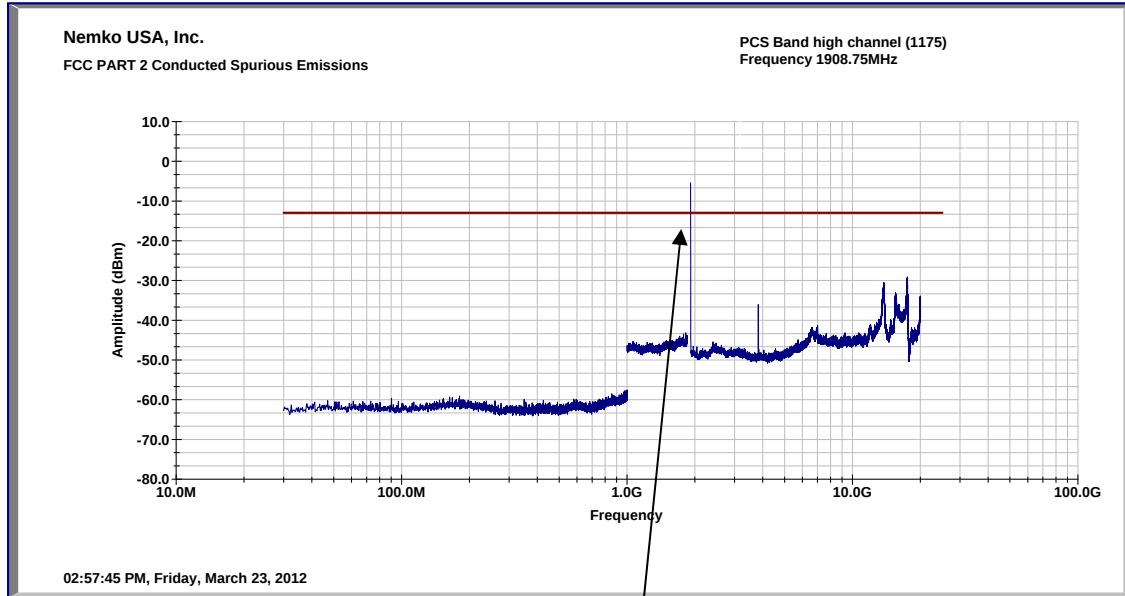


Date: 10.APR.2012 08:06:26

Channel 600 Spurious Emissions - PCS Band Mid Channel



Channel 1175 Spurious Emissions – PCS Band High Channel



Date: 10.APR.2012 08:15:07

A5. Field strength of Spurious Emissions

Para. No.: FCC 2.1053 & RSS-GEN 6.5.2

Minimum Standard is part 22

Minimum Standard is part 24.236 and 24.238 for FCC see description of Spurious emission above

RSS-133 4.9 Transmitter Unwanted Emissions

The measurement method shall be described in the test report. The same parameter, peak power or average power, used for the transmitter output power measurement shall be used for unwanted emission measurements.

The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate or carrier frequency), or from 30 MHz, whichever is the lower, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

Unless otherwise specified, compliance with the emission limits shall be demonstrated using a CISPR quasi-peak detector and the related measurement bandwidth for emissions below 1000 MHz and, an average detector with a minimum resolution bandwidth of 1 MHz for emissions above 1 GHz.

RSS 132 and

RSS 133 6.5 Field Receiver Spurious Emissions

If a radiated measurement is made, all spurious emissions shall comply with the limits of the following table. The resolution bandwidth of the spectrum analyzer shall be 100 kHz for spurious emissions measurements below 1.0 GHz, and 1.0 MHz for measurements above 1.0 GHz.

Spurious Frequency (MHz)	Field Strength (microvolts/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960	500

For CDMA and FM, 960 to 1610 is 500 $\mu\text{V/m}$ at 3 meters and above 1610 is 1000 $\mu\text{V/m}$.

Conditions:

Model:	LISA-C200	Temperature:	20 – 21 °C
Date:	March 21 - 22, 2012	Humidity:	33 – 35 %
Modification State:	None	Tester:	Andreas Gillmeier
		Laboratory:	Nemko

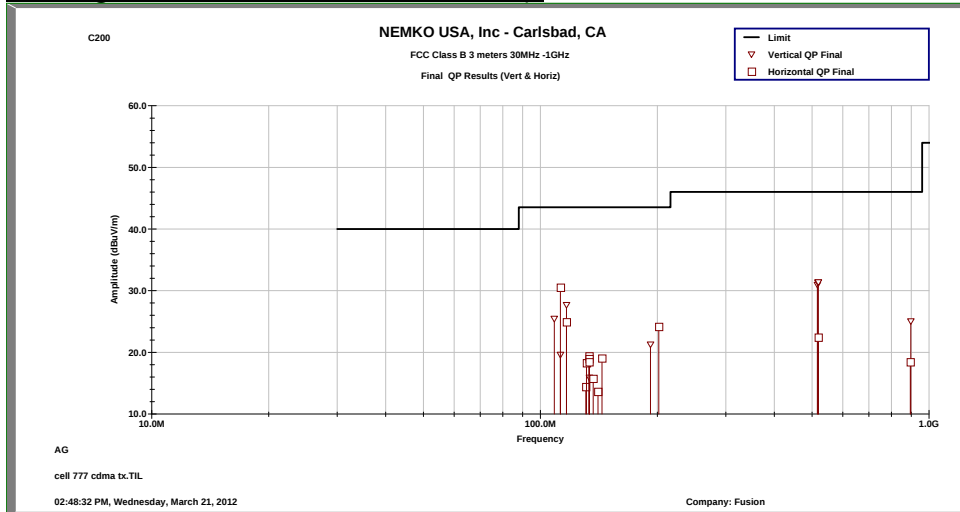
Observations:

No Emissions were noted or measured above 3rd harmonic of the transmitter frequency, however the emission's range was searched up to and including the 10th Harmonic.

Test Results: Passed

Test Data:

TX CDMA Cell band ch 777 30-1000 MHz spurious emissions (worst case of low, mid and high channel tested in Cell band):



Vertical:

Frequency	QP		Final	Final	Limit	Limit	QP	dBm	Ant.	EUT
MHz	Measured	Adjustments	Result	Result	dBuV/m	dBm	Margin	Margin	Ht.	Rotation
	dBuV	dB/m	dBuV/m	dBm			dB	dB	cm	degrees
108.54	47.0	-21.5	25.4	-69.8	43.5	-13	-18.1	-56.8	111	131
112.632	40.5	-20.9	19.6	-75.6	43.5	-13	-23.9	-62.6	110	9
116.73	48.0	-20.3	27.7	-67.5	43.5	-13	-15.8	-54.5	111	189
133.667	34.3	-18.4	15.9	-79.3	43.5	-13	-27.6	-66.3	111	9
192.032	36.4	-15.1	21.3	-73.9	43.5	-13	-22.2	-60.9	111	145
516.259	45.0	-14.0	31.0	-64.2	46.0	-13	-15.1	-51.2	109	93
517.609	45.3	-14.0	31.3	-63.9	46.0	-13	-14.7	-50.9	111	11
518.943	45.3	-14.0	31.4	-63.8	46.0	-13	-14.7	-50.8	111	4
897.906	29.0	-4.0	25.0	-70.2	46.0	-13	-21.0	-57.2	111	198

Horizontal:

Frequency	QP		Final	Final	Limit	Limit	QP	dBm	Ant.	EUT
MHz	Measured	Adjustments	Result	Result	dBuV/m	dBm	Margin	Margin	Ht.	Rotation
	dBuV	dB/m	dBuV/m	dBm			dB	dB	cm	degrees
112.639	51.4	-20.9	30.5	-64.7	43.5	-13	-13.0	-51.7	257	56
116.724	45.2	-20.3	24.9	-70.3	43.5	-13	-18.6	-57.3	390	206
130.940	32.9	-18.5	14.4	-80.8	43.5	-13	-29.1	-67.8	389	349
131.419	36.8	-18.5	18.3	-76.9	43.5	-13	-25.3	-63.9	389	356
133.494	37.8	-18.4	19.4	-75.8	43.5	-13	-24.1	-62.8	389	360
133.547	37.3	-18.4	19.0	-76.2	43.5	-13	-24.6	-63.2	389	360
133.583	36.8	-18.4	18.4	-76.8	43.5	-13	-25.1	-63.8	389	360
136.676	33.9	-18.2	15.7	-79.5	43.5	-13	-27.8	-66.5	390	360
140.639	31.5	-17.9	13.6	-81.6	43.5	-13	-29.9	-68.6	389	361
143.976	36.8	-17.8	19.0	-76.2	43.5	-13	-24.5	-63.2	389	361
201.723	43.9	-19.8	24.2	-71.0	43.5	-13	-19.4	-58.0	110	33
518.942	36.4	-14.0	22.4	-72.8	46.0	-13	-23.6	-59.8	111	247
895.124	22.6	-4.1	18.4	-76.8	46.0	-13	-27.6	-63.8	112	349

TX CDMA PCS band 30-1000 MHz spurious emissions:

No emissions found within 20 dB of the limits from 30 MHz to 1000 MHz.
Results QP - 95.26 dbm/ dBμV/m = dBm

Example: $A = RR + CL + AF$

A = Amplitude dBμV/m

RR = Receiver Reading dBμV

CL = cable loss dB

AF = antenna factor dB/m

Example Frequency = 3817.5 MHz

72.3 dBμV (spectrum analyzer reading)

+10.6 dB (cable loss @ frequency)

82.9 dBμV

+31.1 dB/m (antenna factor @ frequency)

114.0 dBμV/m

-36.4 dB amplifier gain

77.6 dBμV/m

-95.26 dbm/ dBμV/m

-17.7 dBm Final adjusted value

FCC ID: XU9-LISAC200
IC: 8649A-LISAC200

Report Number: 2012 04203246 FCC

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TX CDMA Cell and PCS band: 1 - 20 GHz spurious emissions:

Radiated Emissions Data

Job # : 10222569
NEX #: 203246

Date : 3/22/12
Time : 1:45pm
Staff : AG

Page 1 of 1

Client Name :	Fusion Wireless
EUT Name :	CDMA 1xRTT Module
EUT Model # :	LISA C200
EUT Serial # :	A10000157EFF5A
EUT Config. :	CDMA TX

EUT Voltage :	120
EUT Frequency :	60
Phase:	1

Distance < 1000 MHz:	<u>3 m</u>
Distance > 1000 MHz:	<u>3 m</u>

Specification :	CFR47 Part 22		
Loop Ant. #:	NA		
Bicon Ant. #:	NA	Temp. (°C) :	20
Log Ant. #:	NA	Humidity (%) :	35
DRG Ant. #	752	Spec Analyzer #:	911
Cable LF#:	NA	Analyzer Display #:	911
Cable HF#:	WCC	Quasi-Peak Detector #:	NA
Preamp LF#:	NA		
Preamp HF#	317		

Peak	RBW: 1 MHz
	Video Bandwidth 3 MHz

Measurements below 1 GHz are Quasi-Peak values, unless otherwise stated.
Measurements above 1 GHz are Average values, unless otherwise stated.

[illegible]

FCC ID: XU9-LISAC200
IC: 8649A-LISAC200

Report Number: 2012 04203246 FCC

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Substitution Method For Radiated Emissions

Client Name :	<u>Fusion</u>	Date :	<u>3/22/2012</u>
EUT Name :	<u>CDMA 1XRTT Module</u>	Time :	<u>1000</u>
EUT Model # :	<u>Lisa C200</u>	Staff :	<u>AG</u>
EUT Serial # :	<u>A10000157EFF5A</u>		
EUT Config. :	<u>CDMA Tx</u>		
Specification :	<u>FCC Part 24</u>		
Log Ant.RX#:	<u>NA</u>	Temp. (deg. C) :	<u>20</u>
Dipole Ant TX#:	<u>NA</u>	Humidity (%) :	<u>35</u>
DRG Ant. RX #	<u>529</u>	Location:	<u>10mWC</u>
DRG Ant. TX #	<u>752</u>	Distance:	<u>3m</u>
Cable RX#:	<u>WCC</u>		
Preamp#:	<u>357</u>	Peak Bandwidth < 1 GHz:	<u>RBW-100kHz, VBW-300kHz</u>
Spec An. #:	<u>911</u>	Peak Bandwidth > 1 GHz:	<u>RBW-1MHz, VBW-1MHz</u>

target Frequency mHz	level dBuV/m	Horn Gain dBi	cable loss dB	Signal Generator dBm	Total (EIRP) dBm	Spec dBm	Margin dBm
3702.0	66.1	9.87	3.7	-29.70	-23.53	-13	-10.5
3760.0	65.8	9.88	3.7	-30.00	-23.82	-13	-10.8
3817.5	72.3	9.88	3.7	-23.50	-17.32	-13	-4.3

Frequency Stability

Para. No.: FCC 2.1055 & RSS-GEN 4.7

24.235 Frequency stability

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

RSS 132

The carrier frequency shall not depart from the reference frequency in excess of ± 2.5 ppm for mobile stations and ± 1.5 ppm for base stations.

RSS 133

6.3 Frequency Stability

The carrier frequency shall not depart from the reference frequency, in excess of ± 2.5 ppm for mobile Stations.

Conditions:

Model:	LISA-C200	Temperature:	23°C
Date:	April 03 - 05, 2012	Humidity:	30 – 34 %
Modification State:	None	Tester:	Andreas Gillmeier
		Laboratory:	Nemko

Observations:

Test Results: Passed

Frequency Stability data:

Channel Frequency	384 836.52	Cellular band MHz		
Voltage Volt	Temp. °C	Peak Power dBm	Frequency Error HZ	Frequency Error (PPM)
3.4	20	24.63	-25	-0.0299
3.9		25.41	-30	-0.0359
4.3		24.87	-24	-0.0287
3.9	0		33	0.0394
3.9	10		-44	-0.0526
3.9	30		-26	-0.0311
3.9	40		-27	-0.0323
3.9	50		-27	-0.0323
3.9	-10		43	0.0514
3.9	-20		-32	-0.0383
3.9	-30		-42	-0.0502

Channel Frequency	25 1851.25	PCS band MHz		
Voltage Volt	Temp. °C	Peak Power dBm	Frequency Error HZ	Frequency Error (PPM)
3.4	20	23.73	-58	-0.0313
3.9		23.83	-50	-0.0270
4.3		24.08	46	0.0248
3.9	0		-45	-0.0243
3.9	10		-46	-0.0248
3.9	30		55	0.0297
3.9	40		53	0.0286
3.9	50		57	0.0308
3.9	-10		45	0.0243
3.9	-20		-44	-0.0238
3.9	-30		40	0.0216

Frequency Stability over low voltage conditions

Date:	5-Apr-12			
Mode:	CDMA 800		CDMA 1900	
Channel:	384	836.52MHz	25	1851.25 MHz

Voltage	Frequency Error	Frequency Error	Frequency Error	Frequency Error
Volt DC	Hz	(PPM)	Hz	(PPM)
2.55Vdc			EUT turns OFF	
2.60Vdc			86	0.046
2.65Vdc	EUT turns OFF		-101	-0.055
2.70Vdc	-42	-0.050	-95	-0.051
2.75Vdc	-32	-0.038	88	0.048
2.80Vdc	32	0.038	-73	-0.039
2.85Vdc	-36	-0.043	85	0.046
2.90Vdc	-23	-0.027	78	0.042
2.95Vdc	-24	-0.029	75	0.041
3.00Vdc	-26	-0.031	93	0.050
3.10Vdc	23	0.027	-67	-0.036
3.20Vdc	26	0.031	-71	-0.038
3.30Vdc	23	0.027	-63	-0.034
3.40Vdc	-47	-0.056	-73	-0.039
3.50Vdc	-31	-0.037	-64	-0.035
3.60Vdc	23	0.027	-71	-0.038
3.70Vdc	-47	-0.056	-84	-0.045
3.80Vdc	-38	-0.045	-70	-0.038

A6. Receiver Spurious

Para. No.: RSS-GEN 4.10

RSS 132

4.6 Receiver Spurious Emissions

Receiver spurious emissions shall comply with the limits specified in RSS-Gen.

RSS 133

6.6 Receiver Spurious Emissions

Receiver spurious emissions shall comply with the limits specified in RSS-Gen.

4.10 Receiver Spurious Emissions

The receiver shall be operated in the normal receive mode near the mid-point of the band over which the receiver is designed to operate.

Unless otherwise specified in the applicable RSS, the radiated emission measurement is the standard measurement method (with the device's antenna in place) to measure receiver spurious emissions.

Radiated emission measurements are to be performed using a calibrated open-area test site. As an alternative, the conducted measurement method may be used when the antenna is detachable. In such a case, the receiver spurious signal may be measured at the antenna port.

6. Receiver Spurious Emission Standard

The following receiver spurious emission limits shall be complied with: (b) If a conducted measurement is made, no spurious output signals appearing at the antenna terminals shall exceed 2 nanowatts per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5 nanowatts above 1 GHz.

Model:	LISA-C200	Temperature:	21°C
Date:	March 23, 2012	Humidity:	33%
Modification State:	None	Tester:	Andreas Gillmeier
		Laboratory:	Nemko

Observations:

Selecting receive versus frequency (high, mid or low) did not result in any noticeable differences.

Test Results: Complies

Test Data: See attached plots.

Direct conducted measurement

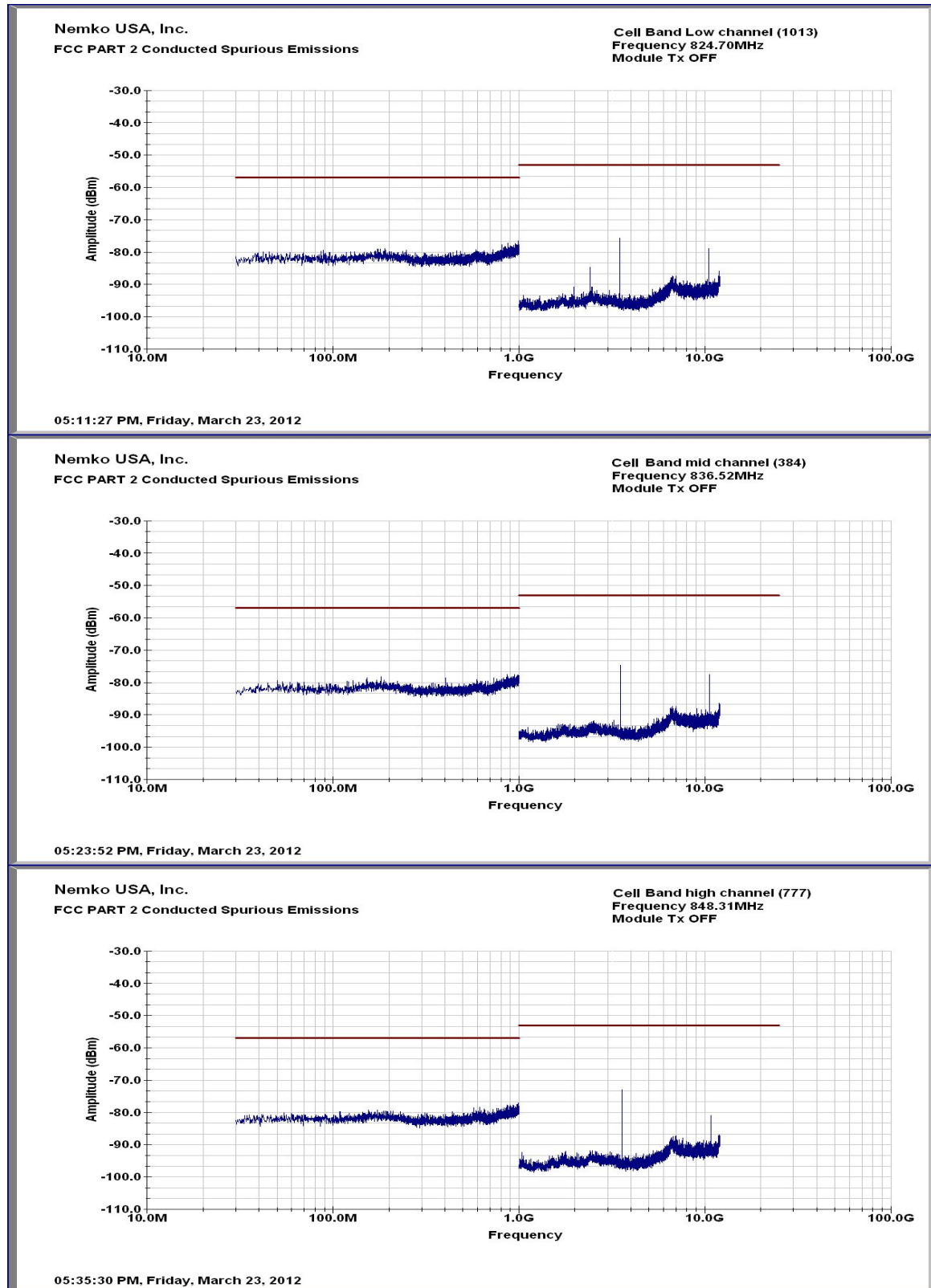
No emissions evident within 20 dB of the conducted Limits.

RBW 5 kHz, VBW 20 kHz, max hold peak.

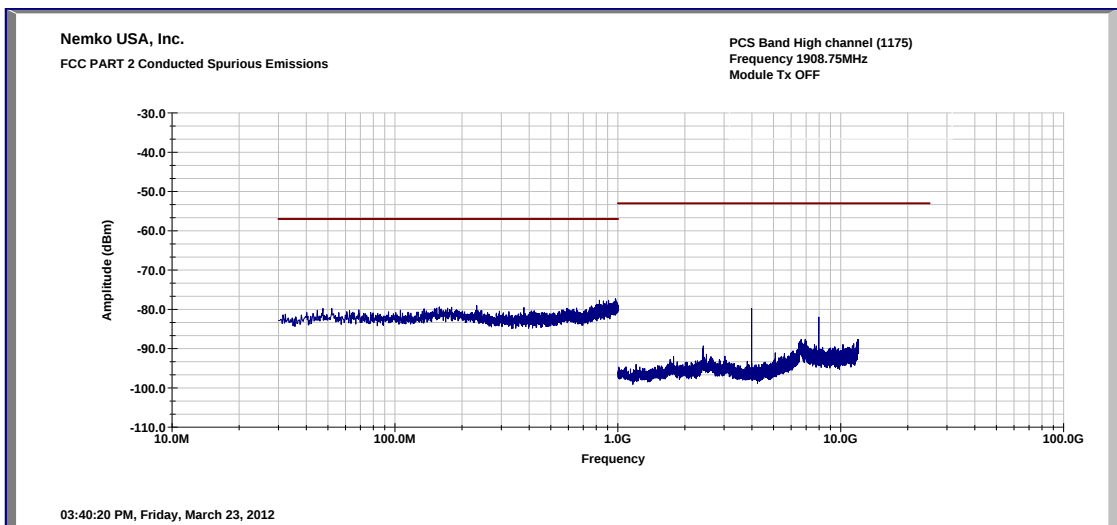
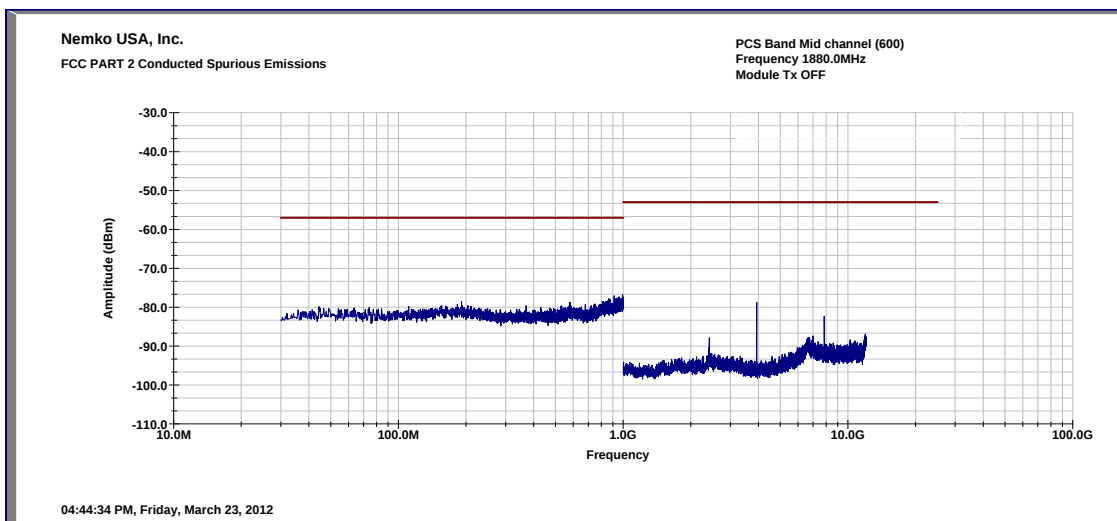
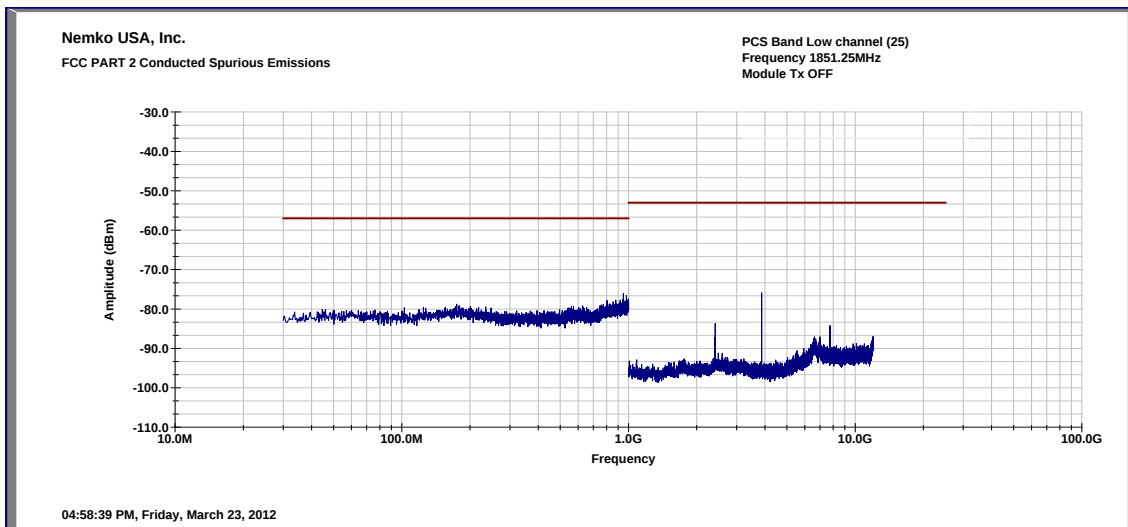
Limit

2 nanowatts = -57dBm

5 nanowatts = -53 dBm

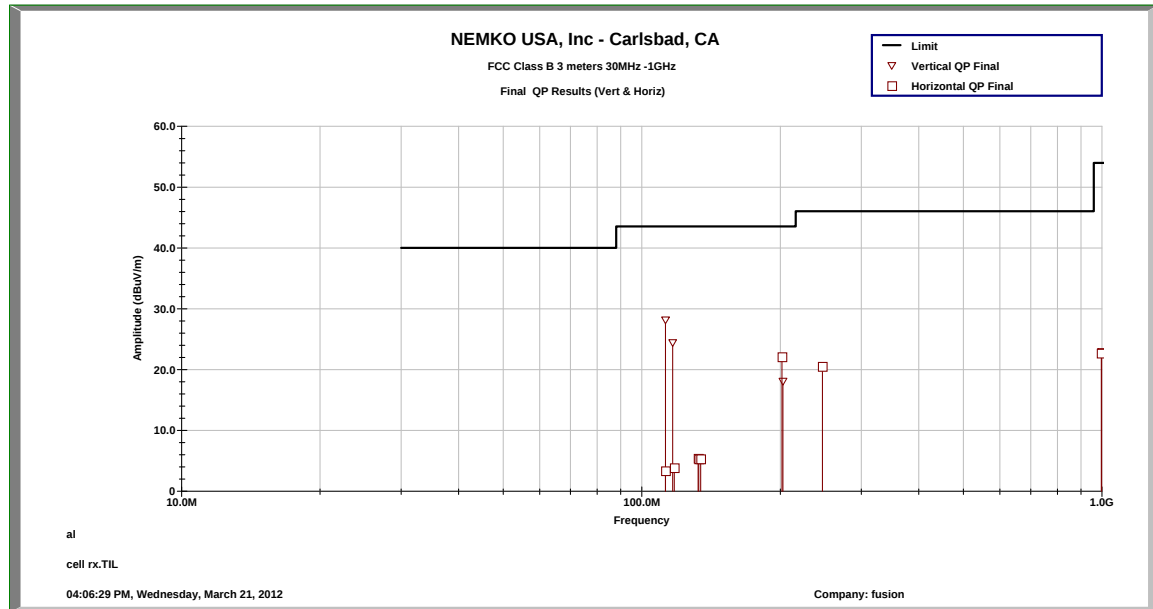


Cellular Band: Low, Mid and High channels



PCS Band: Low, Mid and High channels

RX CDMA Cell band 30-1000 MHz spurious emissions:



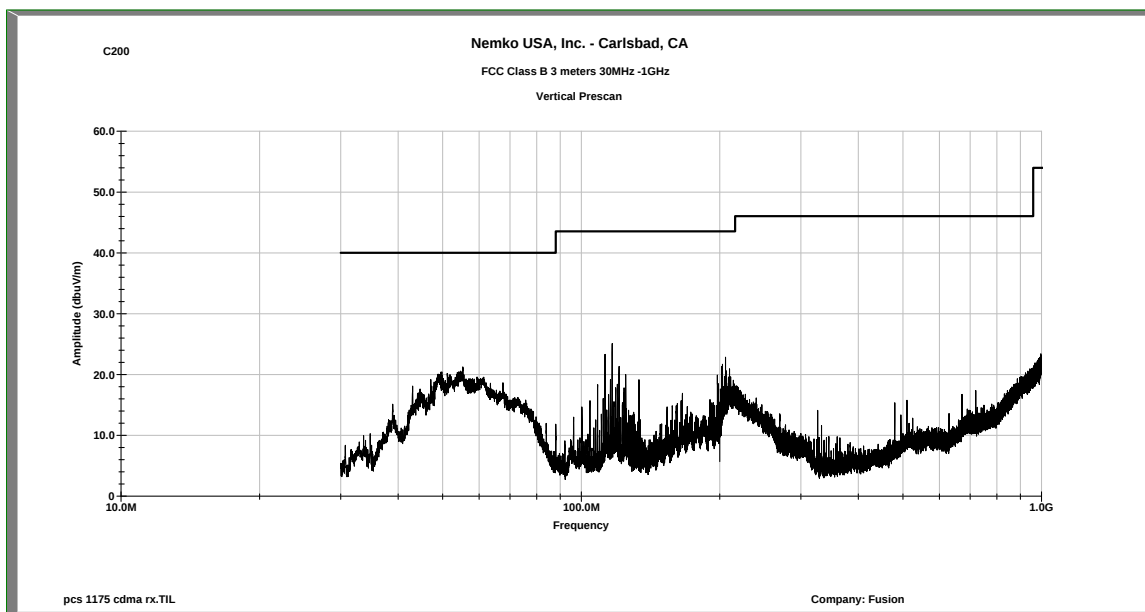
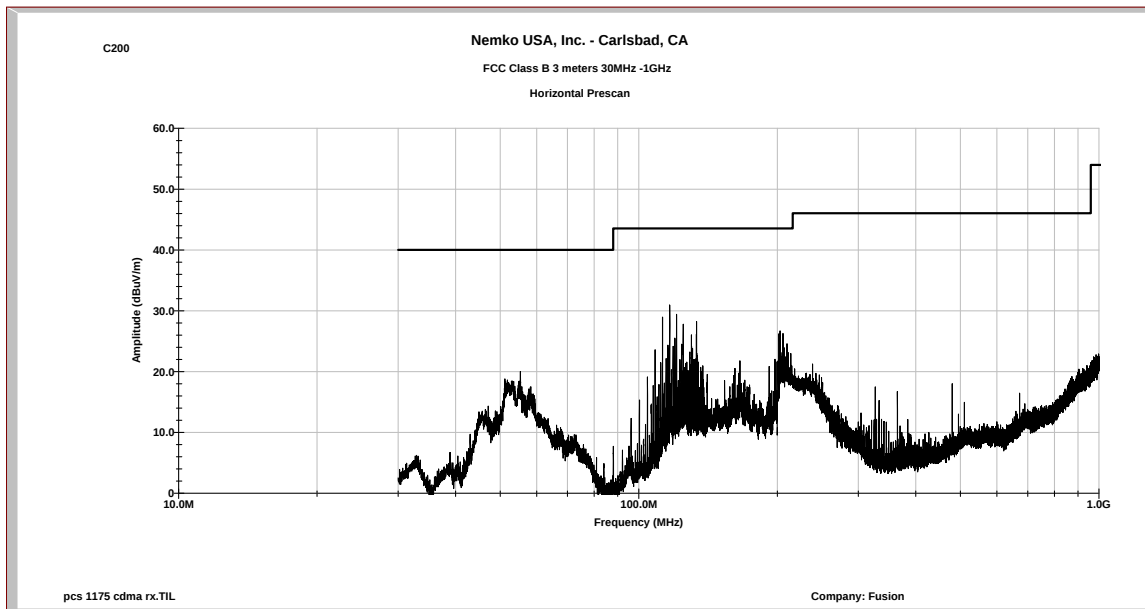
Horizontal:

Frequency MHz	QP Measured dBuV	Adjustments dB/m	Final Result dBuV/m	Limit dBuV/m	QP Margin dB	Ant. Ht. cm	EUT Rotation degrees
112.642	24.2	-20.9	3.3	43.5	-40.2	111	4
117.684	24.0	-20.2	3.8	43.5	-39.7	111	0
132.53	23.8	-18.4	5.4	43.5	-38.1	112	0
133.012	23.7	-18.4	5.3	43.5	-38.2	110	-1
134.359	23.6	-18.3	5.3	43.5	-38.2	111	-1
201.711	41.8	-19.8	22.1	43.5	-21.4	111	358
246.787	40.1	-19.6	20.5	46.0	-25.5	111	361
996.221	21.8	0.9	22.7	54.0	-31.3	111	360

Vertical:

Frequency MHz	QP Measured dBuV	Adjustments dB/m	Final Result dBuV/m	Limit dBuV/m	QP Margin dB	Ant. Ht. cm	EUT Rotation degrees
112.634	49.1	-20.9	28.2	43.5	-15.3	113	178
116.746	44.7	-20.3	24.4	43.5	-19.1	111	11
202.729	37.8	-19.8	18.1	43.5	-25.4	213	274
998.181	22.0	0.9	23.0	54.0	-31.0	111	350

RX CDMA PCS band 30-1000 MHz spurious emissions (peak detector prescan):



No emissions could be measured in RX for Cell or PCS band from 1-10 GHz.