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TEST REPORT

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Report Issue Date: 6/3/13

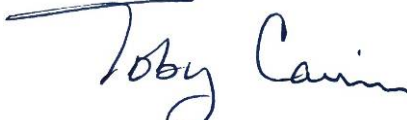
Product Name: CDMA M2M IP Router
FCCID: XIA-NWL11

Standards: FCC Part 22 Subpart H
FCC Part 24 Subpart E


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

Client:
NetComm
18-20 Orion Road
Lane Cove N.S.W. , Australia 2066

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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	Result
6	Conducted Output Power	§2.1046 §24.232(d)	Pass
9	Occupied Bandwidth	§2.1049, §22.917(b)(d), and §24.238(a)	Pass
12	Conducted Spurious Emissions	§2.1049, §2.1051, §22.917(a)(b), and § 24.238(a)(b)	Pass
24	Radiated Output Power	§ 22.913(a) and § 24.232(c)	Pass
26	Radiated Spurious Emissions (Transmitter)	§2.1053, §22.917(a)(b), and §24.238(a)(b)	Pass
31	Frequency Stability	§2.1055, §22.355, and §24.235	Pass

3 Description of Equipment Under Test

Equipment Under Test	
Manufacturer	NetComm
Model Number	NWL-11
Serial Number	Not Labeled
FCC Identifier	XIA-NWL11
Receive Date	5/3/13
Test Start Date	5/3/13
Test End Date	5/15/13
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)	(Cell Band) – 24.02 dBm (PCS Band) – 23.52 dBm
Test Channels	1013, 384, and 777 (CDMA Cell Band) 25, 600, and 1075 (CDMA PCS Band)
Antenna Type	Internal & External
Operating Voltage	120VAC

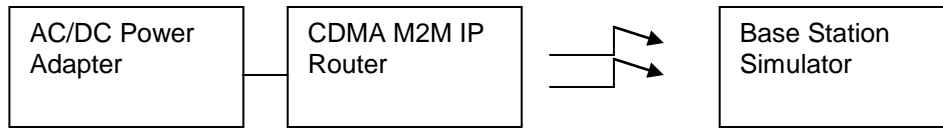
Description of Equipment Under Test
The NWL-11 is M2M IP Router.

Operating modes of the EUT:

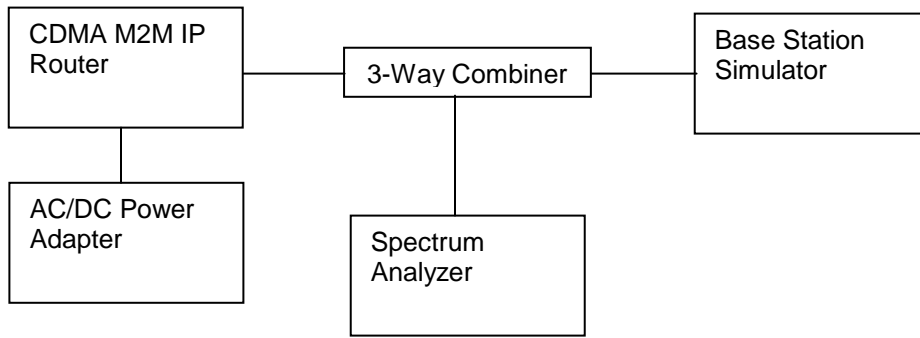
No.	Descriptions of EUT Exercising
1	Transmitting a CDMA signal

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
Cat 6 Ethernet Cable	10ft	No	No	Ethernet	Switch
Power Adapter Cable	5ft	No	No	Power Adapter	EUT

3.4 Support Equipment:

No support equipment was used during the evaluation. The CDMA M2M IP Router 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	100401	Rohde & Schwarz	CMU 200	8/2/2012	8/2/2013
Spectrum Analyzer	3099	Rohde & Schwarz	FSP7	9/11/2012	9/11/2013

4.4 Results:**Conducted Output Power at Nominal Temperature**

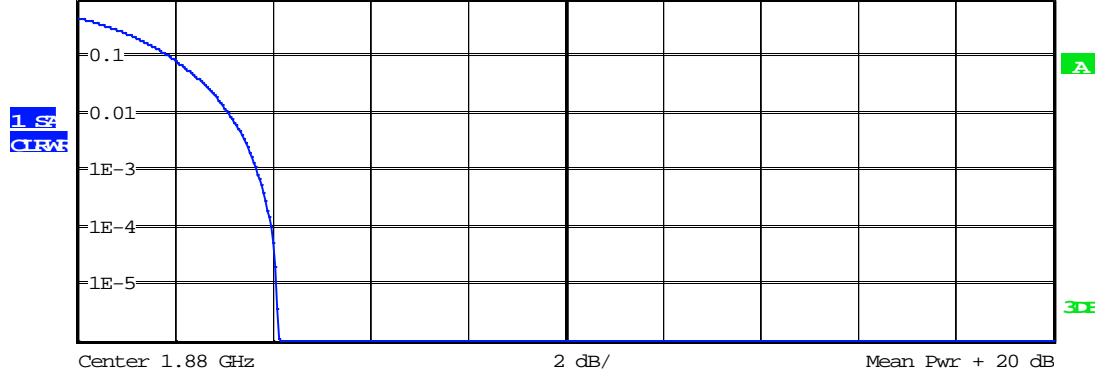
Configuration	CDMA Cell Band			CDMA PCS Band		
	Channel 1013	Channel 384	Channel 777	Channel 25	Channel 600	Channel 1175
RC1 SO2	23.82	23.95	23.60	23.46	23.10	23.03
RC1 SO55	23.77	24.01	23.65	23.18	23.06	23.27
RC3 SO32	23.83	23.98	23.48	23.51	23.20	23.02
1x EvDO Rev. 0 FTAP	23.54	23.71	23.37	23.50	23.39	23.24
1x EvDO Rev. 0 RTAP	23.68	23.74	23.71	23.50	23.39	23.11
1x EvDO Rev. A FTAP	23.59	24.02	23.92	23.42	23.34	23.52
1x EvDO Rev. A RTAP	22.52	22.72	22.44	23.21	23.22	22.78

Peak-to-Average Ratio

REBW 10 MHz



Ref 30 dBm *Att 60 dB AQT 3.125 ms



Complementary Cumulative Distribution Function (100000 samples)

Trace 1

Mean 16.42 dBm

Peak 20.54 dBm

Crest 4.12 dB

10 % 1.92 dB

1 % 3.12 dB

.1 % 3.72 dB

.01 % 4.00 dB

Date: 7.MAY.2013 16:24:28

Limit = 13dB

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	9/11/2012	9/11/2013
Base Station Simulator	100401	Rohde & Schwarz	CMU 200	8/2/2012	8/2/2013

5.4 Results:

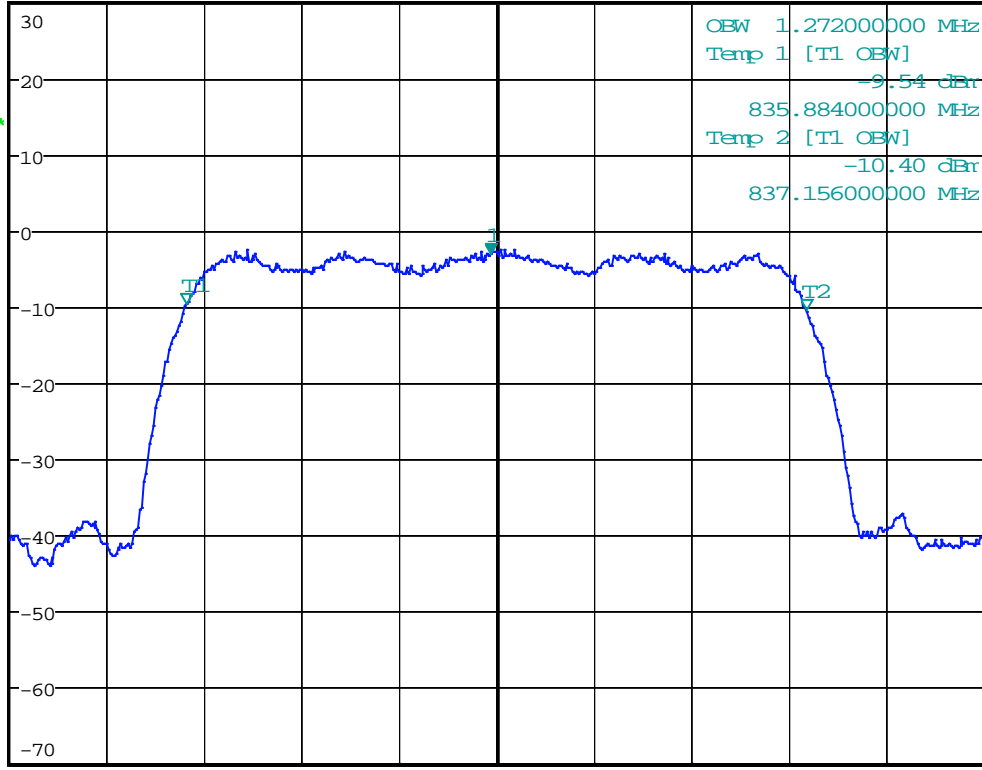


*RBW 10 kHz Marker 1 [T1]
*VBW 100 kHz -3.06 dBm
*SWI 5 s 836.508000000 MHz

Ref 30 dBm

*Att 45 dB

1 RB*
CURVE



Center 836.52 MHz

200 kHz/

Span 2 MHz

Date: 7.MAY.2013 16:42:25

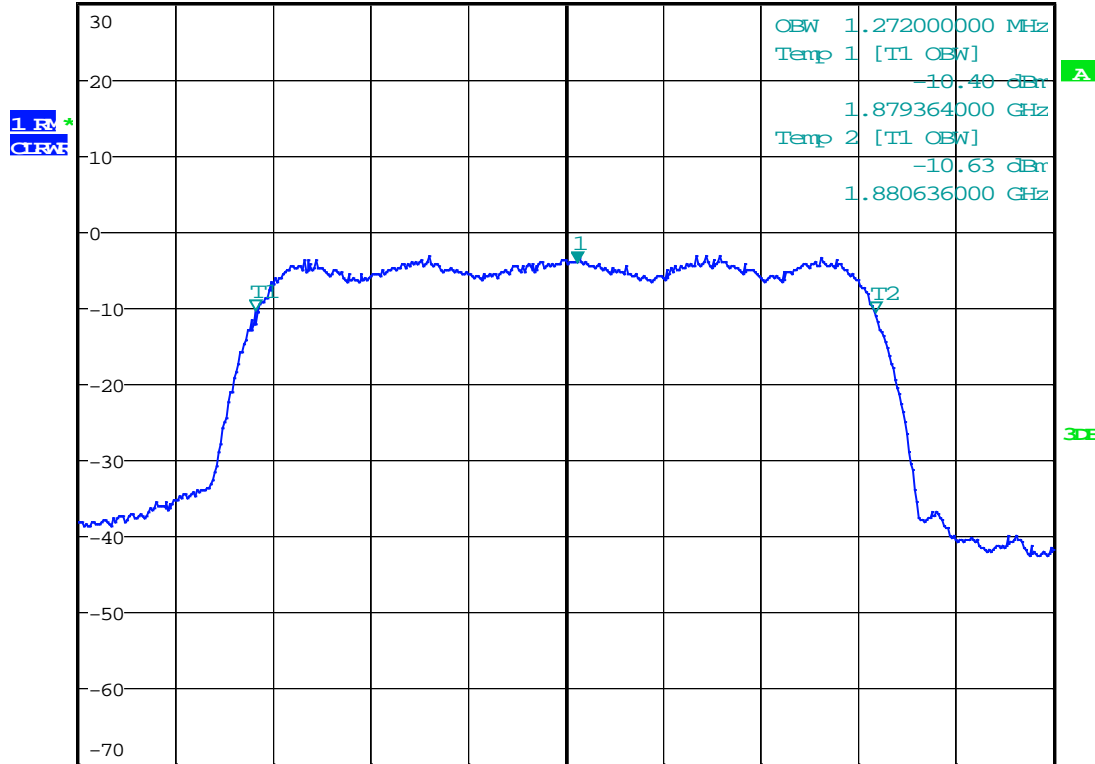
Cell Band, Mid Channel, CDMA Mode



*RBW 10 kHz Marker 1 [T1] -4.10 dBm
*VBW 100 kHz
*SWI 5 s 1.880024000 GHz

Ref 30 dBm

*Att 45 dB



Center 1.88 GHz

200 kHz/

Span 2 MHz

Date: 7.MAY.2013 16:33:57

PCS Band, Mid Channel, CDMA Mode

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.

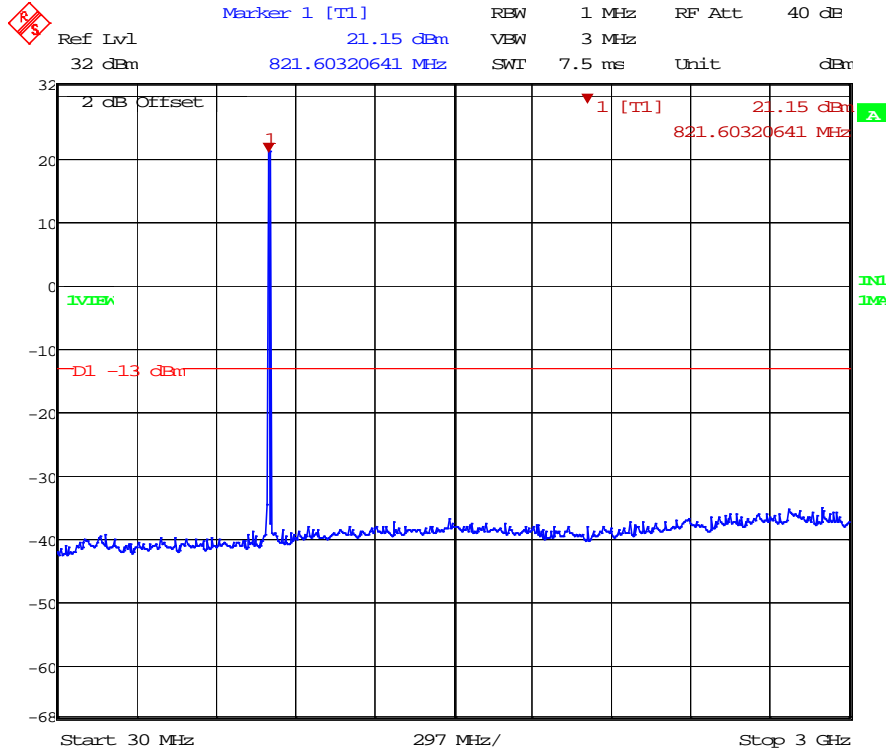
6.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3099	Rohde & Schwarz	FSP7	9/11/2012	9/11/2013
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	9/15/2012	9/14/2013
Base Station Simulator	100401	Rohde & Schwarz	CMU 200	8/2/2012	8/2/2013

6.4 Results:

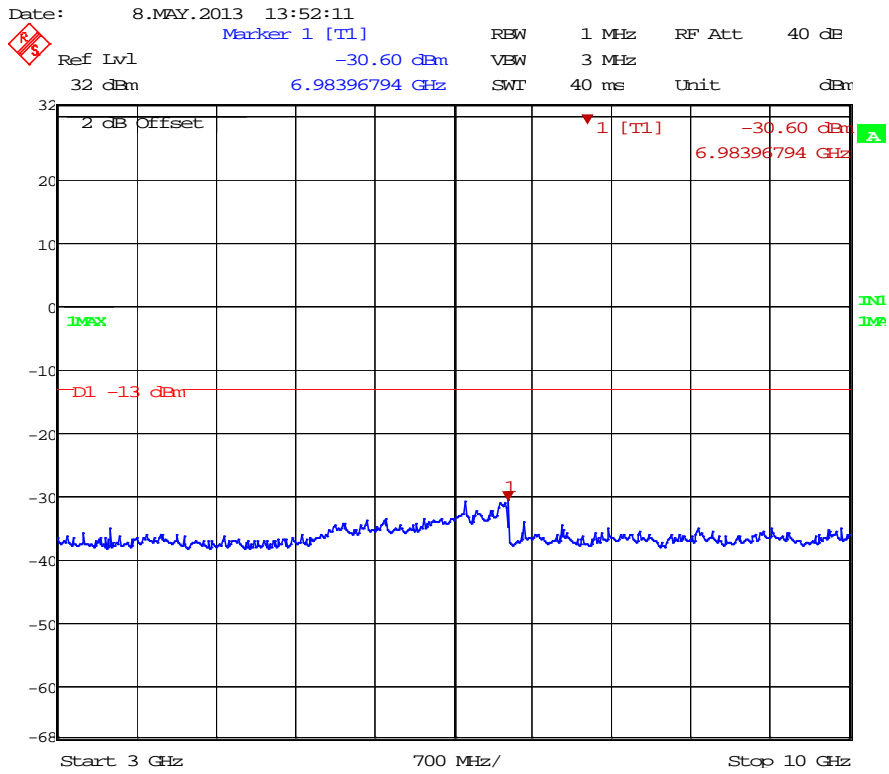
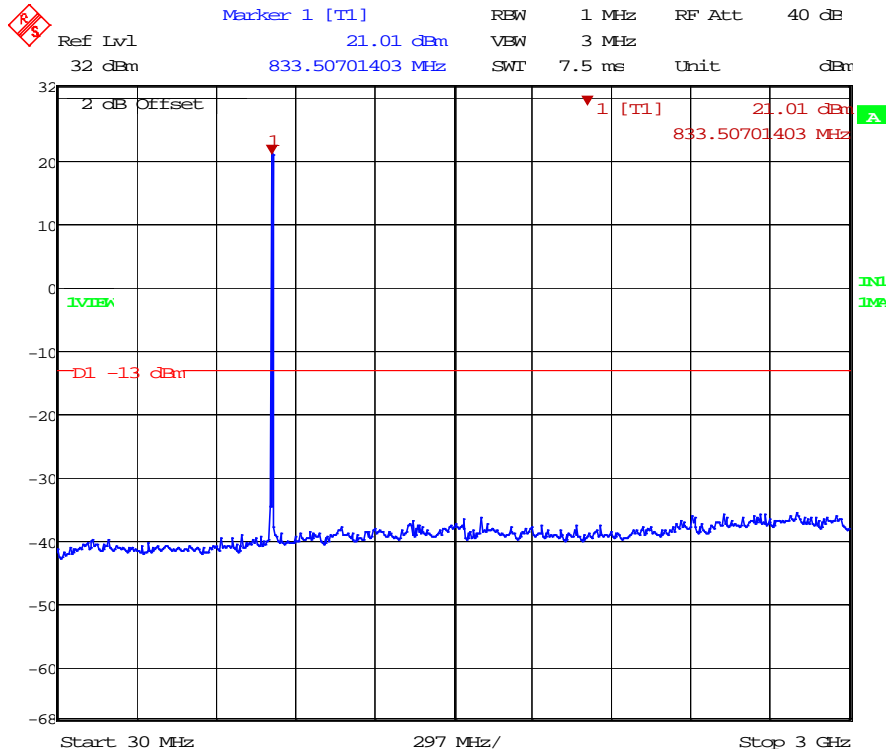
The following plots show that all spurious emissions are attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. Plots for emissions within 1MHz of the band edge as well as for emission outside of this range are shown.

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



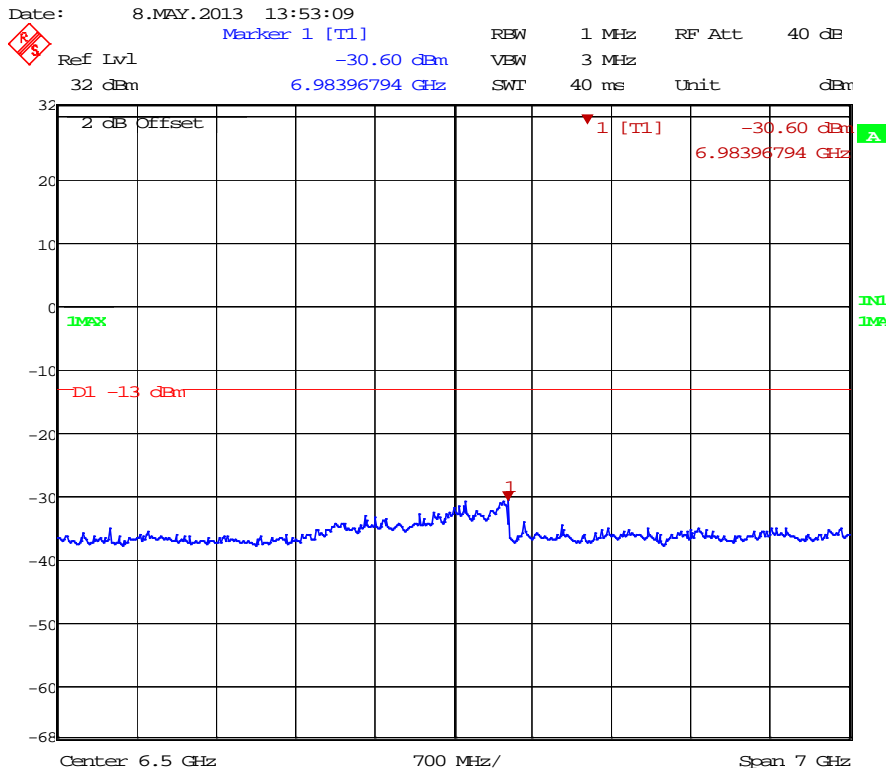
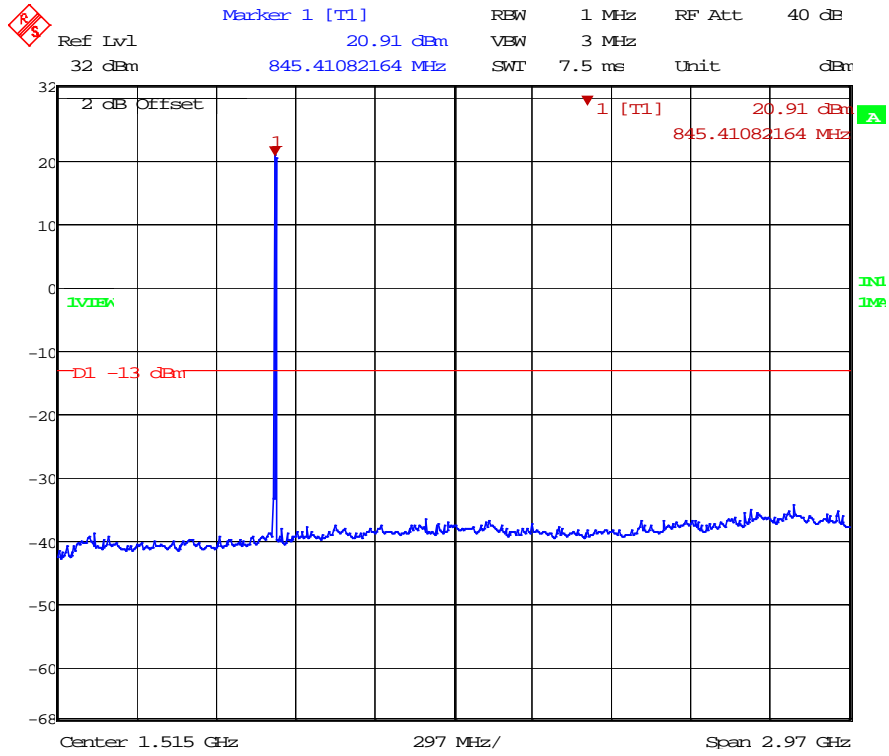
Date: 8.MAY.2013 13:51:25

Cell Band - Low Channel



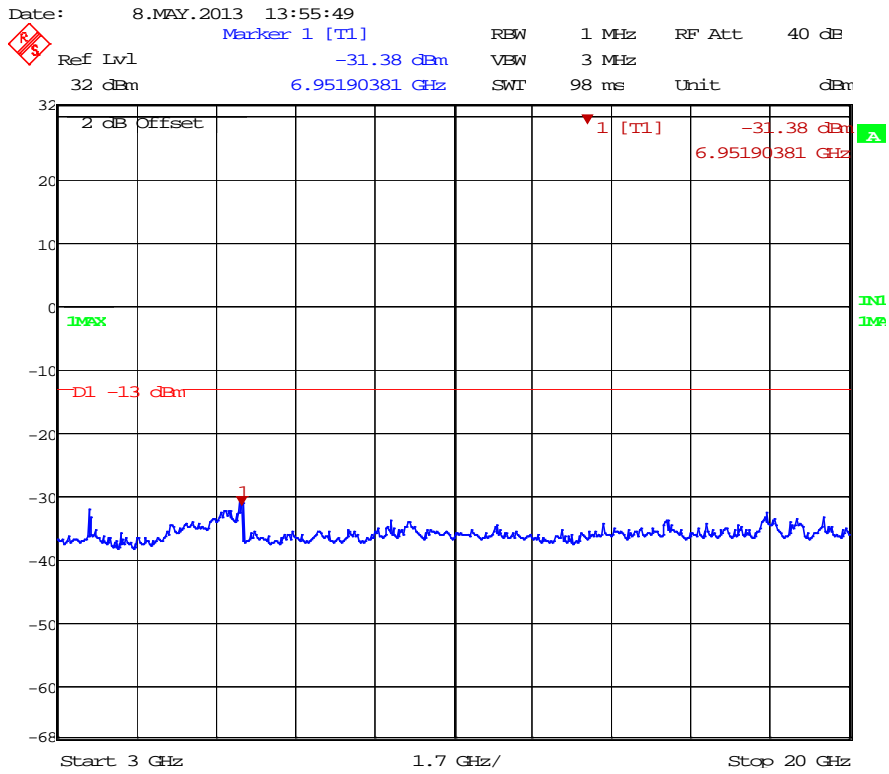
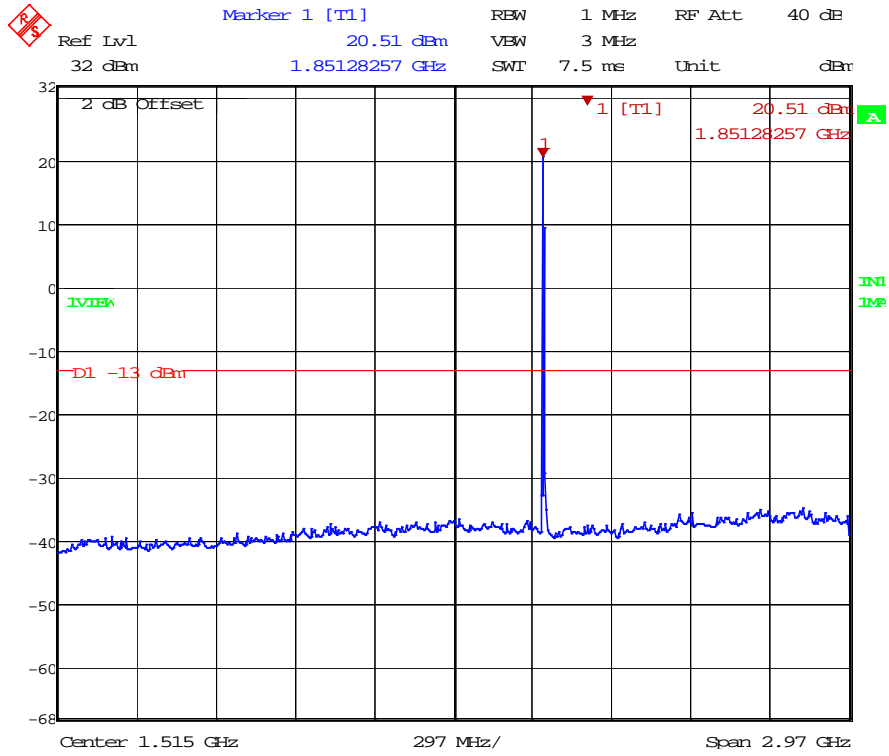
Date: 8.MAY.2013 14:16:40

Cell Band - Mid Channel



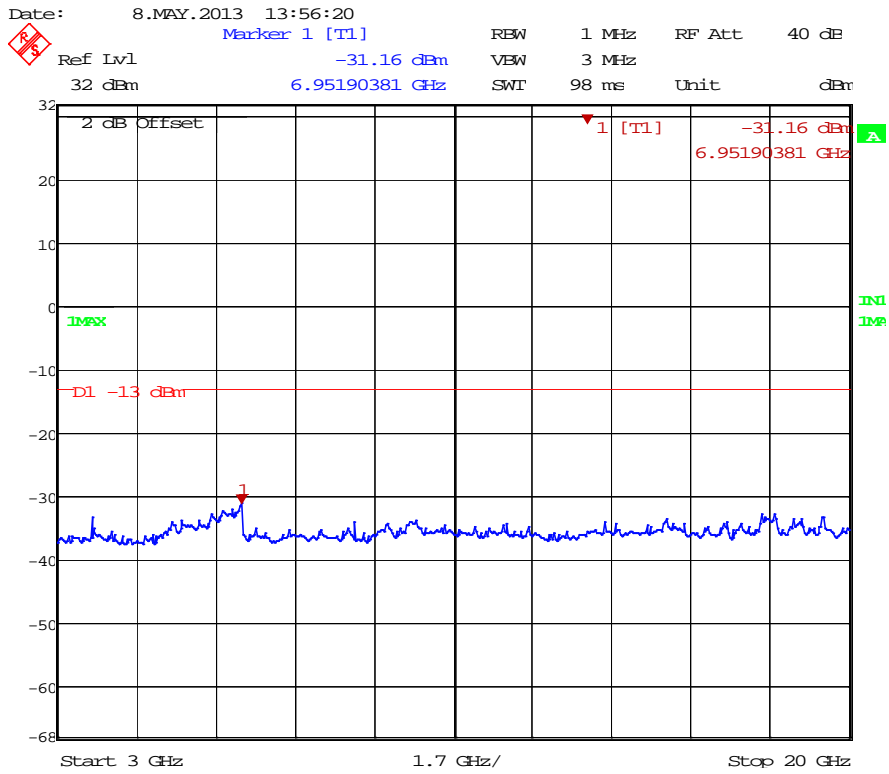
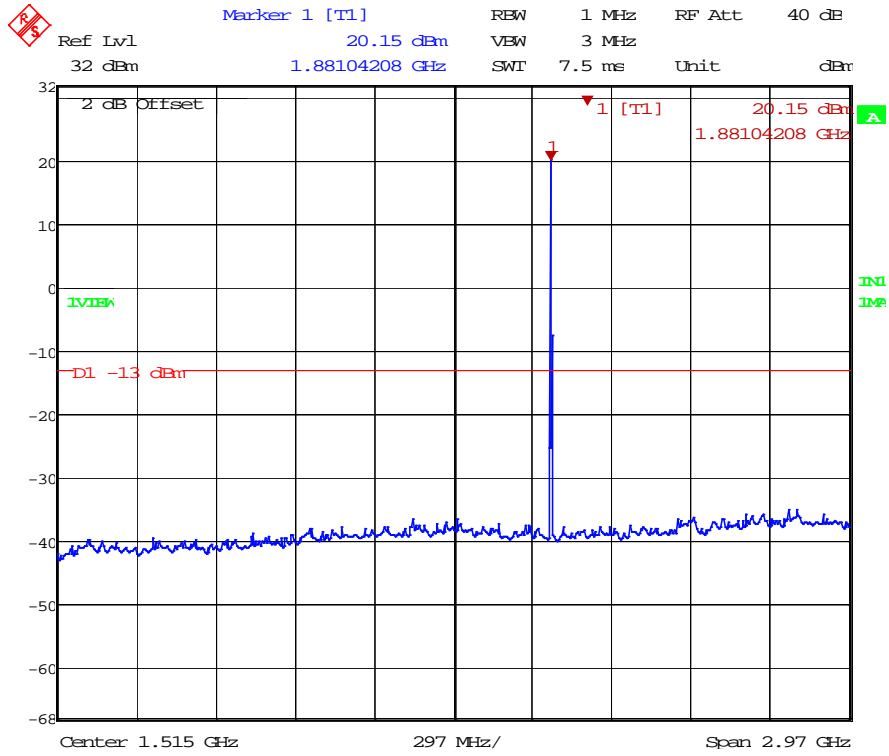
Date: 8.MAY.2013 14:17:44

Cell Band - High Channel



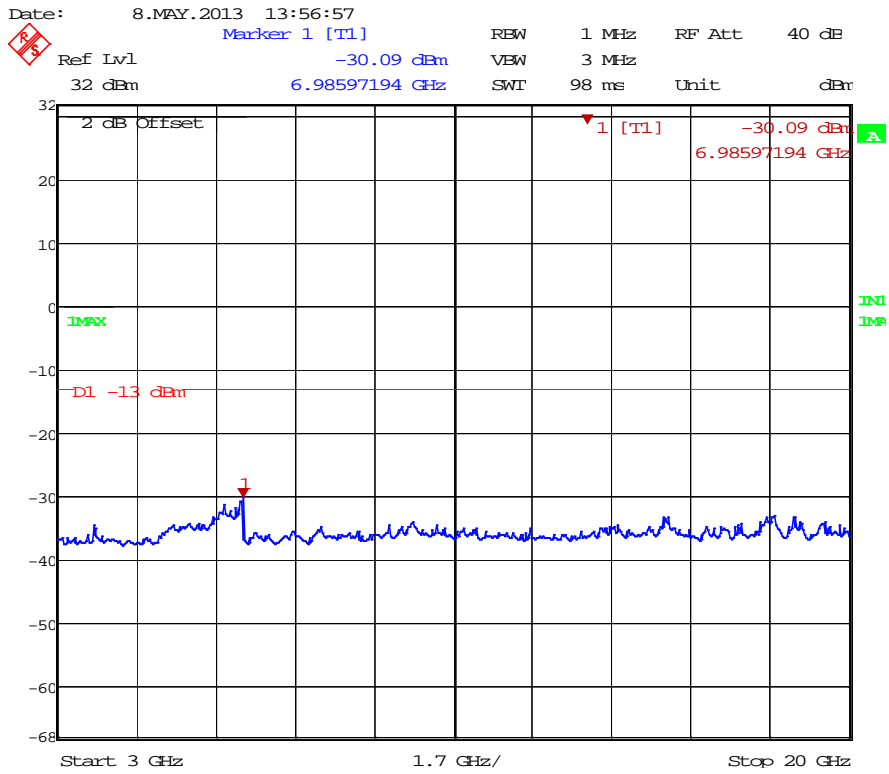
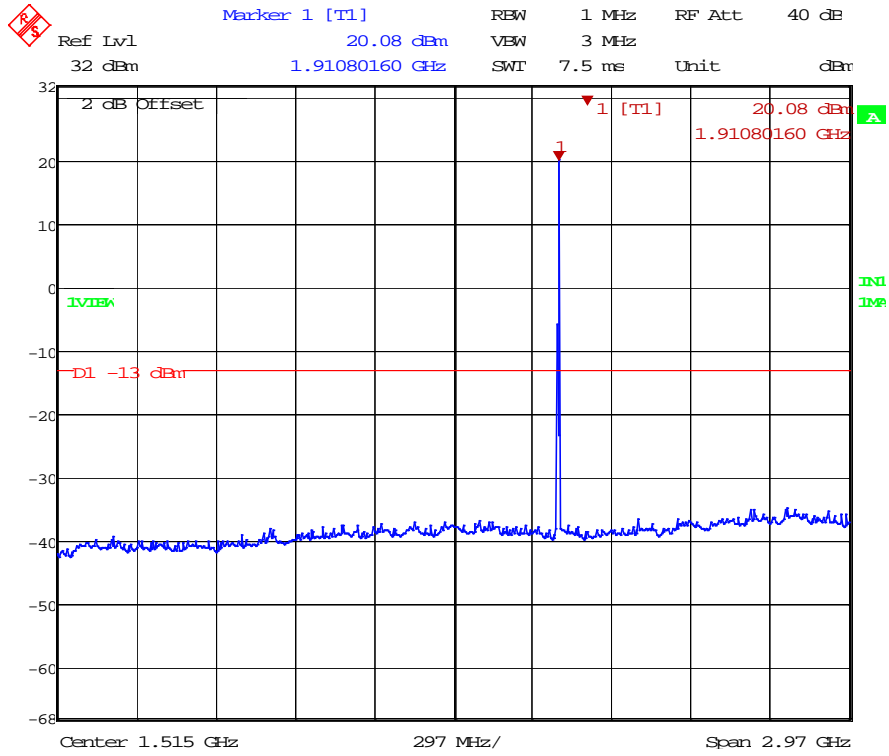
Date: 8.MAY.2013 14:01:16

PCS Band - Low Channel



Date: 8.MAY.2013 14:00:15

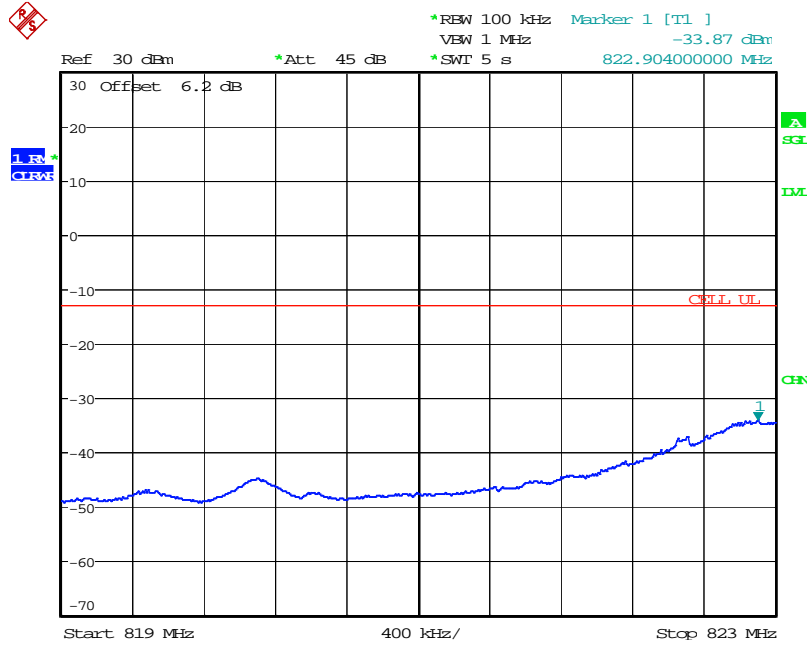
PCS Band – Mid Channel



Date: 8.MAY.2013 13:58:16

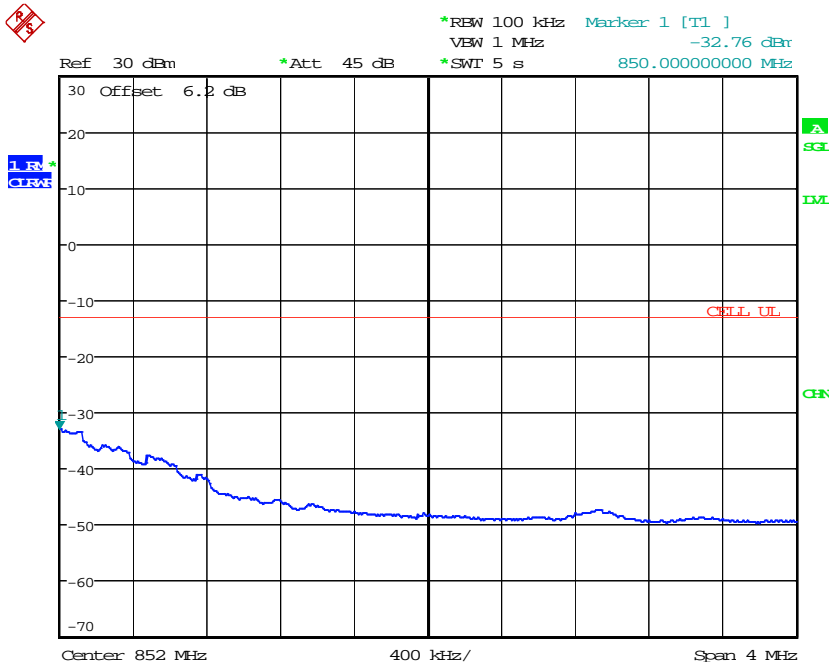
PCS Band - High Channel

Emissions within 4MHz of the block edge:



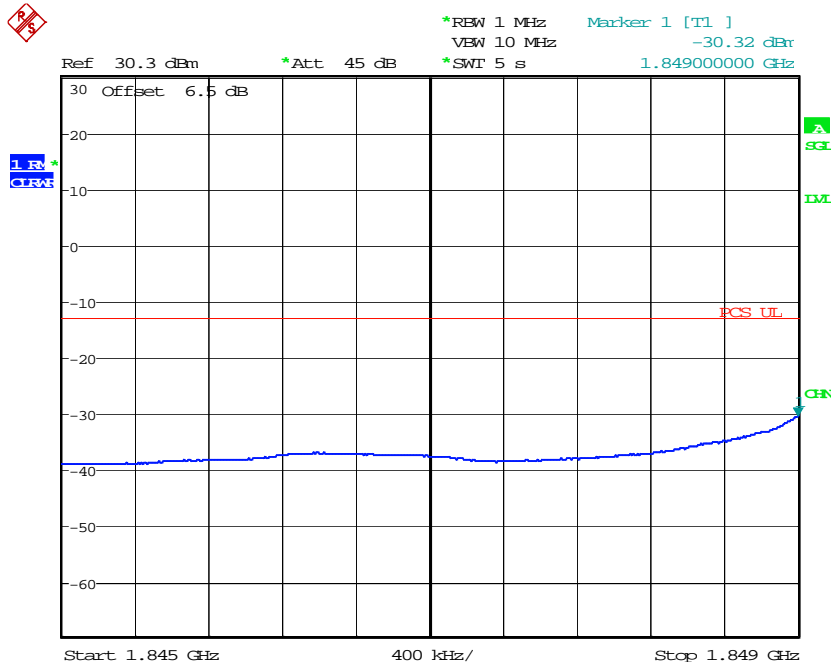
Date: 8.MAY.2013 12:53:34

Cell Band - Low Channel



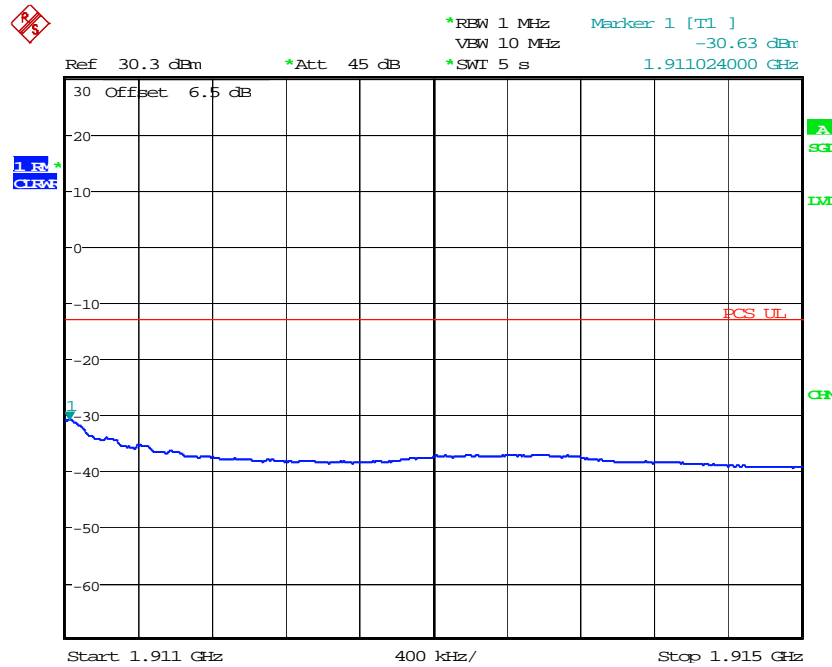
Date: 8.MAY.2013 12:51:42

Cell Band - High Channel



Date: 8.MAY.2013 13:11:16

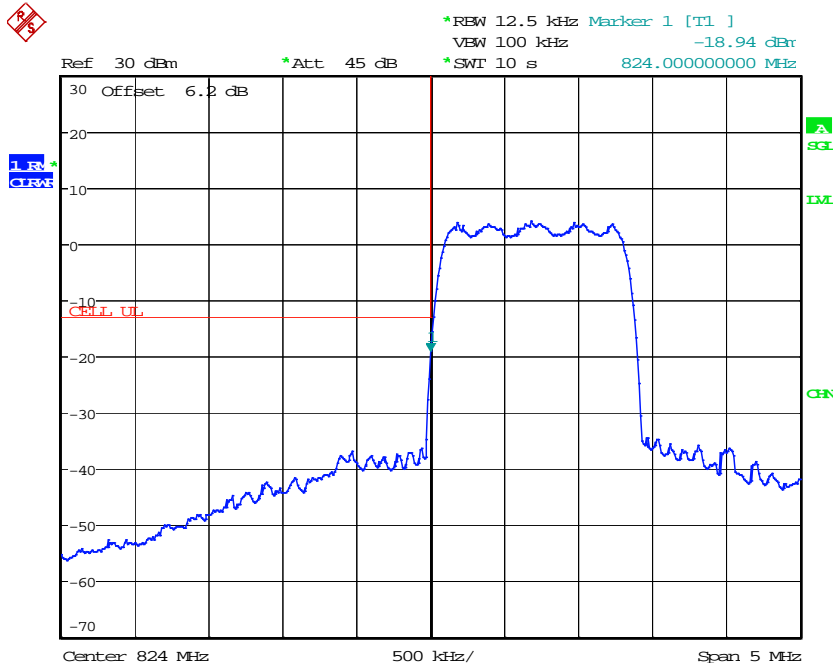
PCS Band - Low Channel



Date: 8.MAY.2013 13:12:22

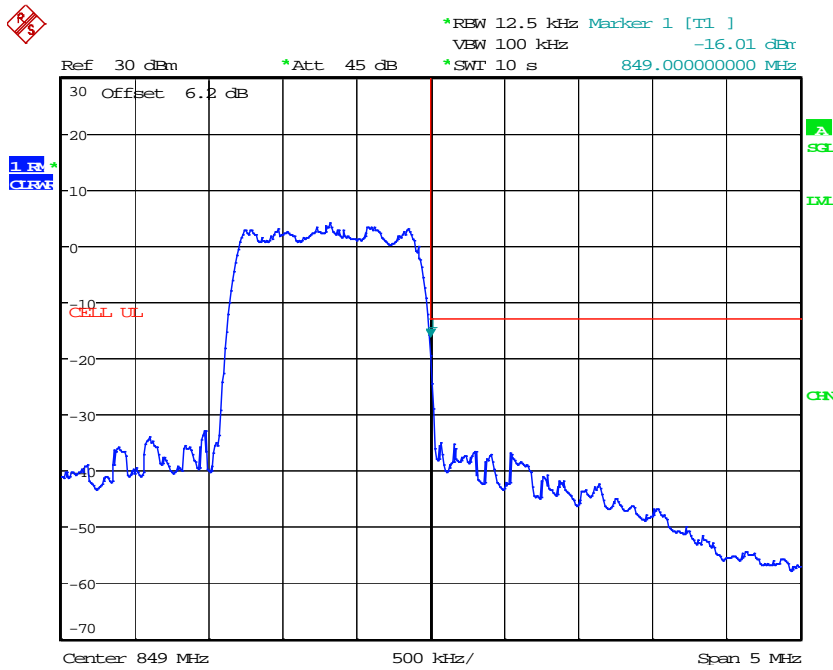
PCS Band - High Channel

Emissions within 1MHz of the band edge:



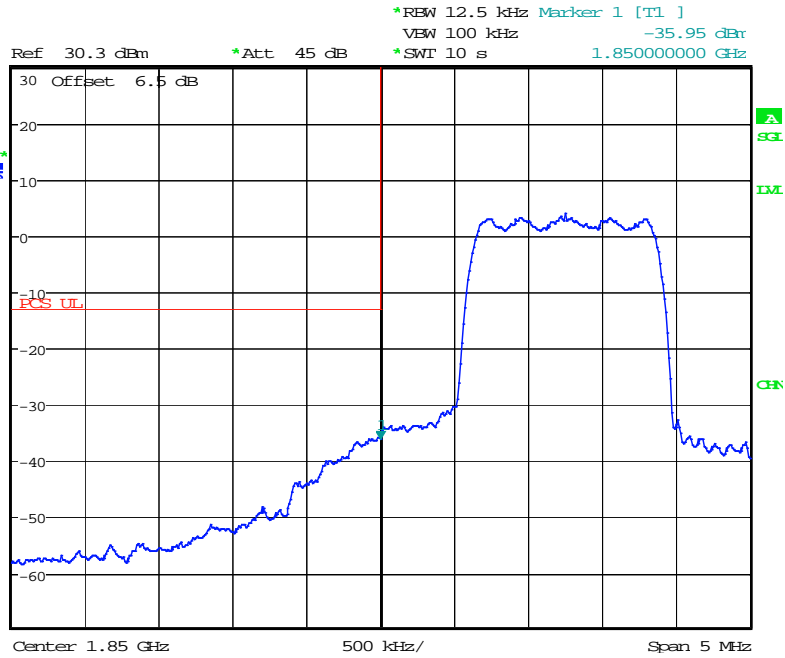
Date: 8.MAY.2013 13:18:34

Cell Band - Low Band Edge



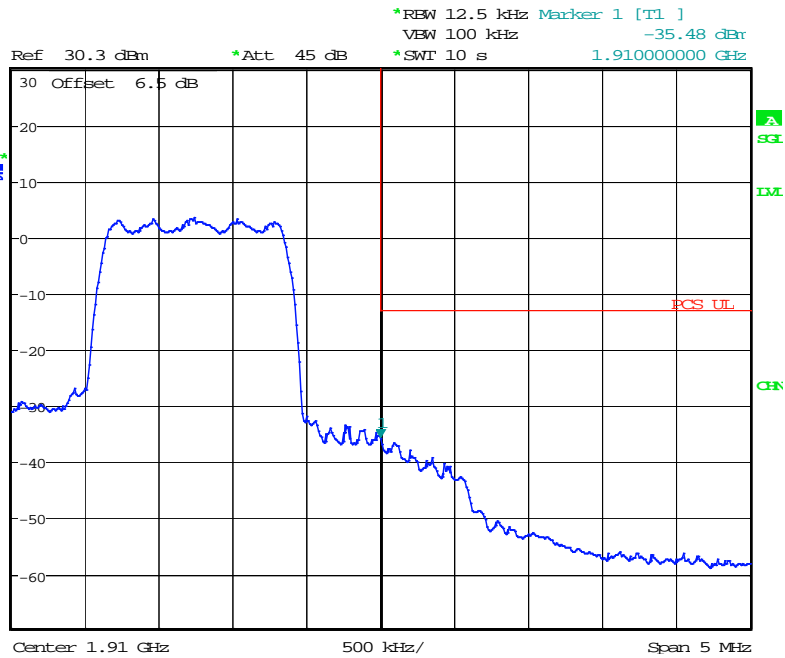
Date: 8.MAY.2013 13:19:22

Cell Band - High Band Edge



Date: 8.MAY.2013 13:16:22

PCS Band - Low Band Edge



Date: 8.MAY.2013 13:15:24

PCS Band - High Band Edge

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

For the external antenna configuration, 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 based on tune-up tolerance measured in each band.

For the internal antenna, the antenna gain was measured in an antenna pattern measurement chamber. The gain was added to the maximum conducted output power to determine radiated power.

7.3 Test Equipment Used:

Description	Asset Number	Manufacturer	Model	Cal. Date	Cal. Due
Base Station Simulator	100401	Rohde & Schwarz	CMU 200	8/2/2012	8/2/2013

7.4 Results:

Radiated Power – External Antenna (Cell Band)

Frequency	824 MHz	
Limit	0.5493 mW/cm ²	
Distance	20 cm	
Conducted Power	24.5 dBm	281.83829 mW
TX Ant Gain	9.40 dBi	
EIRP	33.90 dBm	2454.7089 mW
ERP = EIRP - 2.15	31.75 dBm	1496.2357 mW
Power Density	0.1984 mW/cm ² at 20cm	

Radiated Power – External Antenna (PCS Band)

Frequency	1880 MHz	
Limit	1.0000 mW/cm ²	
Distance	20 cm	
Conducted Power	24.5 dBm	281.83829 mW
TX Ant Gain	8.4 dBi	
EIRP	32.9 dBm	1949.8446 mW
Power Density	0.3879 mW/cm ² at 20cm	

Radiated Power – Internal Antenna

Band	Channel	Frequency (MHz)	Conducted Power (dBm)	Peak Antenna Gain (dBi)	EIRP (dBm)	ERP(dBm)
CDMA 850	1013	824.7	23.83	3.01	26.84	24.69
	384	836.52	24.02	6.28	30.3	28.15
	777	848.31	23.92	4.85	28.77	26.62
CDMA 1900	25	1851.25	23.51	5.12	28.63	26.48
	600	1880	23.39	4.59	27.98	25.83
	1175	1908.75	23.52	3.73	27.25	25.1

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 and the antenna output was terminated. 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	9/15/2012	9/14/2013
Preamplifier	987410	Miteq	AFS44-00102000-30-10P-44	9/4/2012	9/4/2013
Preamplifier	SF456200904	Mini-Circuits	ZX60-3018G-S+	9/4/2012	9/4/2013
Biconnilog Antenna	00051864	ETS	3142C	12/14/2012	12/14/2013
Horn Antenna	6556	ETS	3115	9/13/2012	9/13/2013
Horn Antenna	1096	Antenna Research	DRG-118/A	8/7/2012	8/7/2013
System Controller	121701-1	Sunol Sciences	SC99V	Time of Use	Time of Use
High Pass Filter	3986-01 DC0408	Microwave Circuits, Inc.	H3G020G2	Time of Use	Time of Use
Base Station Simulator	100401	Rohde & Schwarz	CMU 200	8/2/2012	8/2/2013
Signal Generator	2065	HP	83620B	3/19/2013	3/19/2014

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 RC1/SO55 configuration yielded the highest measurement.

Worst Case Spurious Measurements – Cell Band

Radiated Spurious Emissions Measurement								
Test Engineer:		Jason Centers						
Test Date:		5/3/2013						
Temp. / Humidity / Pressure:		25.4C/31.7%/982.05mbar						
Bandwidth Settings:		RBW = VBW = 1MHz						
Notes:		Spurious emissions not reported here were below the measurement noise floor.						
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 Ch 1013	1649.4	H	-79.35	-44.47	2.84	6.70	-13	-40.60
	1649.4	V	-79.76	-44.44	2.84	6.70	-13	-40.57
	2474.1	H	-79.66	-40.9	3.78	7.16	-13	-37.52
	2474.1	V	-79.03	-39.99	3.78	7.16	-13	-36.61
	3298.8	H	-66.45	-58.36	4.42	7.14	-13	-55.64
	3298.8	V	-64.48	-57.4	4.42	7.14	-13	-54.68
	4123.5	H	-64.04	-53.17	5.66	8.15	-13	-50.68
	4123.5	V	-65.27	-55.25	5.66	8.15	-13	-52.76
	4948.2	H	-65.34	-52.81	6.19	8.80	-13	-50.20
	4948.2	V	-65.44	-54.1	6.19	8.80	-13	-51.49
	5772.9	H	-66.24	-51.31	6.54	9.27	-13	-48.58
	5772.9	V	-66.15	-50.14	6.54	9.27	-13	-47.41
	6597.6	H	-66.48	-43.63	7.10	9.96	-13	-40.76
	6597.6	V	-66.15	-48.56	7.10	9.96	-13	-45.69
	7422.3	H	Below Measurement Noise Floor					
7422.3	V	Below Measurement Noise Floor						
8247	H	Below Measurement Noise Floor						
8247	V	Below Measurement Noise Floor						
Cell Band Ch 384	1673.04	H	-79.24	-44.36	2.93	6.70	-13	-40.59
	1673.04	V	-79.36	-44.04	2.93	6.70	-13	-40.27
	2509.56	H	-78.6	-39.84	3.69	7.43	-13	-36.10
	2509.56	V	-79.07	-40.03	3.69	7.43	-13	-36.29
	3346.08	H	-63.86	-55.77	4.53	7.19	-13	-53.12
	3346.08	V	-63.49	-56.41	4.53	7.19	-13	-53.76
	4182.6	H	-64.19	-53.32	5.36	8.15	-13	-50.53
	4182.6	V	-64.33	-54.31	5.36	8.15	-13	-51.52
	5019.12	H	-64.95	-52.42	6.29	8.87	-13	-49.84
	5019.12	V	-65.25	-53.91	6.29	8.87	-13	-51.33
	5855.64	H	-65.73	-50.8	6.44	9.57	-13	-47.67
	5855.64	V	-65.76	-49.75	6.44	9.57	-13	-46.62
	6692.16	H	-66.79	-43.94	7.23	9.81	-13	-41.36
	6692.16	V	-68.02	-50.43	7.23	9.81	-13	-47.85
	7528.68	H	Below Measurement Noise Floor					
7528.68	V	Below Measurement Noise Floor						
8365.2	H	Below Measurement Noise Floor						
8365.2	V	Below Measurement Noise Floor						
Cell Band Ch 777	1696.62	H	-80.05	-45.17	2.95	6.70	-13	-41.42
	1696.62	V	-80.45	-45.13	2.95	6.70	-13	-41.38
	2544.93	H	-78.31	-39.55	3.79	7.43	-13	-35.92
	2544.93	V	-78.31	-39.27	3.79	7.43	-13	-35.64
	3393.24	H	-64.35	-56.26	4.58	7.19	-13	-53.65
	3393.24	V	-63.76	-56.68	4.58	7.19	-13	-54.07
	4241.55	H	-64.24	-53.37	5.48	8.37	-13	-50.49
	4241.55	V	-64.81	-54.79	5.48	8.37	-13	-51.91
	5089.86	H	-64.8	-52.27	6.45	8.87	-13	-49.85
	5089.86	V	-65.4	-54.06	6.45	8.87	-13	-51.64
	5938.17	H	-65.88	-50.95	6.66	9.53	-13	-48.08
	5938.17	V	-66.21	-50.2	6.66	9.53	-13	-47.33
	6786.48	H	-66.55	-43.7	7.43	9.55	-13	-41.58
	6786.48	V	-66.75	-49.16	7.43	9.55	-13	-47.04
	7634.79	H	Below Measurement Noise Floor					
7634.79	V	Below Measurement Noise Floor						
8483.1	H	Below Measurement Noise Floor						
8483.1	V	Below Measurement Noise Floor						
								F=B-C+D

Worst Case Spurious Measurements – PCS Band

Radiated Spurious Emissions Measurement									
Test Engineer:		Jason Centers							
Test Date:		5/3/2013							
Temp. / Humidity / Pressure:		25.4C/31.7%/982.05mbar							
Bandwidth Settings:		RBW = VBW = 1MHz							
Notes:		Spurious emissions not reported here were below the measurement noise floor.							
Band/Channel	Spurious Frequency (MHz)	Polarity	A Device Reading (dBm)	B Signal Generator Level (dBm)	C Cable Loss (dB)	D Tx Antenna Gain (dBd)	E Limit (dBm)	F Radiated Spurious Emission Level (dBm)	
PCS Band Ch 25	3702.5	H	-52.15	-44.1	4.88	7.07	-13	-41.91	
	3702.5	V	-51.53	-43.69	4.88	7.07	-13	-41.50	
	5553.75	H	-66.56	-53.28	6.46	8.48	-13	-51.26	
	5553.75	V	-65.42	-51.65	6.46	8.48	-13	-49.63	
	7405	H	Below Measurement Noise Floor						
	7405	V							
	9256.26	H							
	9256.26	V							
11107.5	H								
11107.5	V								
PCS Band Ch 600	3760	H	-55.64	-44.78	4.87	7.07	-13	-42.58	
	3760	V	-58.63	-49.69	4.87	7.07	-13	-47.49	
	5640	H	-65.78	-52.17	6.45	8.84	-13	-49.78	
	5640	V	-66.1	-52.98	6.45	8.84	-13	-50.59	
	7520	H	Below Measurement Noise Floor						
	7520	V							
	9400	H							
	9400	V							
11280	H								
11280	V								
PCS Band Ch 1175	3817.5	H	-60.71	-50.94	5.00	6.73	-13	-49.21	
	3817.5	V	-60.31	-47.34	5.00	6.73	-13	-45.61	
	5726.25	H	-66.79	-51.28	6.89	9.27	-13	-48.91	
	5726.25	V	-66.17	-54.57	6.89	9.27	-13	-52.20	
	7635	H	Below Measurement Noise Floor						
	7635	V							
	9543.75	H							
	9543.75	V							
11452.5	H								
11452.5	V								

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 ± 2.5 ppm 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	2161	Envirotronics	SSH32C	4/4/2013	4/13/2014
Base Station Simulator	100401	Rohde & Schwarz	CMU 200	8/2/2012	8/2/2013
Digital Multimeter	65920874	Fluke	87	3/16/2013	3/16/2014

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 ± 2.5 ppm limit.

Frequency Stability for Cell Band

Operating Frequency:		836,520,000 Hz			
Channel:		384			
Reference Voltage:		115 VAC			
Deviation Limit:		2.5 ppm			
Notes:		Cell Band			
Voltage (%)	Voltage (VAC)	Temp (°C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100%	115	-30	10	0.0000012	0.0120
100%	115	-20	11	0.0000013	0.0131
100%	115	-10	14	0.0000017	0.0167
100%	115	0	10	0.0000012	0.0120
100%	115	10	12	0.0000014	0.0143
100%	115	20	14	0.0000017	0.0167
100%	115	30	11	0.0000013	0.0131
100%	115	40	13	0.0000016	0.0155
100%	115	50	14	0.0000017	0.0167
100%	115	60	13	0.0000016	0.0155
115%	132.25	20	10	0.0000012	0.0120
85%	97.75	20	10	0.0000012	0.0120

Frequency Stability for PCS Band

Operating Frequency:		1,880,000,000 Hz			
Channel:		600			
Reference Voltage:		115 VAC			
Deviation Limit:		2.5 ppm			
Notes:		PCS Band			
Voltage (%)	Voltage (VAC)	Temp (°C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100%	115	-30	37	0.0000044	0.0442
100%	115	-20	18	0.0000022	0.0215
100%	115	-10	10	0.0000012	0.0120
100%	115	0	11	0.0000013	0.0131
100%	115	10	7	0.0000008	0.0084
100%	115	20	13	0.0000016	0.0155
100%	115	30	14	0.0000017	0.0167
100%	115	40	16	0.0000019	0.0191
100%	115	50	23	0.0000027	0.0275
100%	115	60	17	0.0000020	0.0203
115%	132.25	20	11	0.0000013	0.0131
85%	97.75	20	22	0.0000026	0.0263

10 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	

11 Revision History

Revision Level	Date	Report Number	Notes
0	6/3/13	101159665LEX-001	Original Issue