731 Enterprise Drive
Lexington, KY 40510

Telephone: 859-226-1000
Facsimile: 859-226-1040
www.intertek-etlsemko.com

TEST REPORT

Report Number:	**100953679LEX-002**
Project Number:	**G100953679**
Report Issue Date:	**4/4/2013**
Product Name:	**TCA203**
Model Number:	**TCA203**
FCCID:	**G95TCA203**
ICID:	**431C-TCA203**
FCC Standards:	**FCC Part 22 Subpart H** **FCC Part 24 Subpart E**
Industry Canada Standards:	**RSS-132 Issue 3** **RSS-133 Issue 6**

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

Client:
Technicolor USA, Inc.
101 West 103rd St
Indianapolis, IN 46290

Report prepared by
Bryan Taylor, Team Leader

Report reviewed by
James Sudduth, Senior Staff Engineer

TABLE OF CONTENTS

1 Introduction and Conclusion 3
2 Test Summary 3
3 Description of Equipment Under Test 4
4 Conducted Output Power 7
5 Occupied Bandwidth 13
6 Conducted Spurious Emissions at Antenna Terminals 20
7 Radiated Output Power 43
8 Radiated Spurious Emissions (Transmitter) 44
9 Frequency Stability 51
10 Radiated Spurious Emissions (Receiver) 55
11 Measurement Uncertainty 58
12 Revision History 59

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 laboratory 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.

2 Test Summary

Page	Test full name	FCC Reference	Industry Canada	Result
7	Conducted Output Power	§2.1046 §24.232(d)	RSS-132 (4.4), RSS-133 (4.1), RSS-133 (6.4)	Pass
13	Occupied Bandwidth	§2.1049, §22.917(b)(d), and §24.238(a)	RSS-GEN (4.6.1), RSS-133 (2.3)	Pass
20	Conducted Spurious Emissions	§2.1049, §2.1051, §22.917(a)(b), and § 24.238(a)(b)	RSS-132 (4.5), RSS-133 (6.5.1)	Pass
37	Radiated Output Power	§ 22.913(a) and § 24.232(c)	RSS-132 (4.4), RSS-133 (6.4)	Pass
44	Radiated Spurious Emissions (Transmitter)	§2.1053, §22.917(a)(b), and §24.238(a)(b)	RSS-132 (4.5), RSS-133 (6.5)	Pass
51	Frequency Stability	§2.1055, §22.355, and §24.235	RSS-132 (4.3), RSS-133 (6.3)	Pass
55	Radiated Spurious Emissions (Receiver)	---	RSS-132 (4.6), RSS-133 (6.6), RSS-GEN (4.10)	Pass

3 Description of Equipment Under Test

Equipment Under Test	
Manufacturer	Technicolor USA, Inc.
Model Number	TCA203
Serial Number	Intertek 10
FCC Identifier	G95TCA203
IC Identifier	431C-TCA203
Receive Date	2/13/2013
Test Start Date	2/13/2013
Test End Date	3/15/2013
Device Received Condition	Good
Test Sample Type	Production
Frequency Band	824MHz - 849MHz (GSM 850 Band) 1850MHz – 1910MHz (GSM 1900 Band)
Modulation Type	GSM (GMSK), GPRS (GMSK), EDGE (8-PSK)
Transmission Control	Base Station Simulator
Maximum Output Power (Conducted)	32.46dBm (GSM 850 - GMSK) 28.75dBm (GSM 1900 - GMSK) 26.56dBm (GSM 850 – EDGE / 8PSK) 25.33dBm (GSM 1900 – EDGE / 8PSK) 22.33dBm (WCDMA Band V) 22.34dBm (WCDMA Band II)
Test Channels	128, 190, & 251 (GSM 850 Band) 512, 661, & 810 (GSM 1900 Band) 4132, 4182, 4233 (WCDMA Band V) 9262, 9400, 9538 (WCDMA Band II)
Antenna Type	Internal
Operating Voltage	115VAC/60Hz (Via AC / DC Power Adapter)

Description of Equipment Under Test
The TCA203 is a touch screen alarm panel that contains a zigbee, 802.11b/g/n, and cellular modules. This report contains data pertaining to the cellular transmissions.

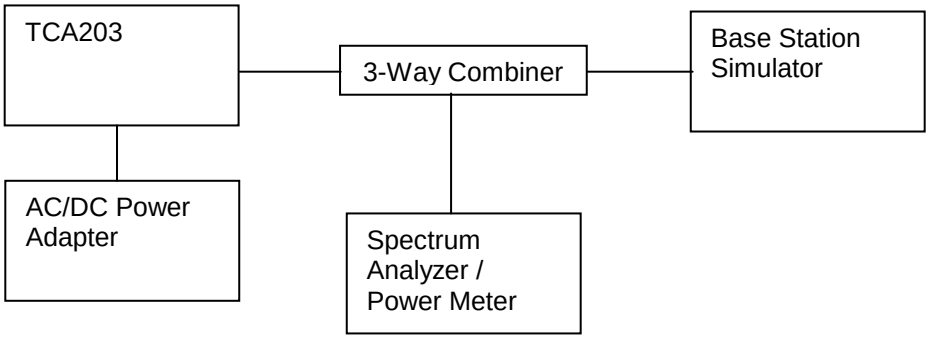
Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Transmitting a GSM or WCDMA 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
Ethernet Cable	50 ft	None	None	Test Sample	Laptop Computer
DC Power Cable	5 ft	None	None	Test Sample	AC/DC Power Converter

3.4 Support Equipment:

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Laptop Computer	Lenovo	Thinkpad	12002MU

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 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 burst average power was measured with a power meter dBm. The power output at the transmitter antenna port was determined by adding the value of the cable insertion loss to the 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 a spectrum analyzer with a RBW wider than the EBW of the measured signal. The delta between the peak and average trace was recorded.

4.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Base Station Simulator	3747L	Rohde & Schwarz	CMU200	4/13/2012	4/13/2013
Environmental Chamber	29410	Thermotron	SE-1000-5-5	4/25/2012	4/25/2013
Spectrum Analyzer	3720	Rohde & Schwarz	FSEK 30	11/26/2012	11/26/2013
Power Meter	3166	Gigatronics	8541C	10/4/2012	10/4/2013
Power Sensor	3404	Gigatronics	80601A	10/4/2012	10/4/2013
RF Combiner	E18106	Weinschel Engineering	1506A	Time of Use	Time of Use
Directional Coupler	08736	Narda	4226-20	Time of Use	Time of Use

4.4 Results:

Conducted Output Power at Nominal Temperature

Burst Average Power				
Band	**Channel**	**Frequency (MHz)**	**GSM (GMSK)**	**EDGE (8PSK)**
GSM 850	128	824.2	31.6	26.42
	192	837	32.46	26.56
	251	848.8	31.94	26.55
GSM 1900	512	1850.2	28.75	25.33
	661	1880	28.67	25.29
	810	1909.8	28.2	24.89

Burst Average Power and RMS Power				
Band	**Channel**	**Frequency (MHz)**	**Power Meter (Burst Avg)**	**CMU (RMS)**
WCDMA Band V	4132	826.4	22.14	22.30
	4182	836.4	22.18	22.33
	4233	846.6	22.08	22.31
WCDMA Band II	9262	1852.4	21.98	22.21
	9400	1880	22.01	22.19
	9538	1907.6	22.13	22.34

Conducted Output Power at Temperature and Voltage Extremes (GSM850 and 1900)

			Burst Average Power (dBm)		
Configuration	Temp	Input Voltage (VAC)	Ch. 128	Ch. 192	Ch. 251
GSM850 - GPRS 1Tx Slot	-30	115	32.9	33.2	32.8
	20	115	32.2	32.6	32.3
	20	138	32.1	32.5	32.3
	20	93.5	32.1	32.5	32.2
	60	115	31.3	31.7	31.5

			Burst Average Power (dBm)		
Configuration	Temp	Input Voltage (VAC)	Ch. 128	Ch. 192	Ch. 251
GSM850 - EDGE 1Tx Slot	-30	115	26.2	26.4	26.1
	20	115	26.9	27.3	27
	20	138	26.9	27.3	27
	20	93.5	26.9	27.3	27
	60	115	25.5	25.8	25.7

			Burst Average Power (dBm)		
Configuration	Temp	Input Voltage (VAC)	Ch. 512	Ch. 661	Ch. 810
GSM1900 - GPRS 1Tx Slot	-30	115	29.1	28.9	28.4
	20	115	28.2	28.1	27.6
	20	138	28.2	28.2	27.7
	20	93.5	28.2	28.2	27.7
	60	115	28.1	28.2	27.8

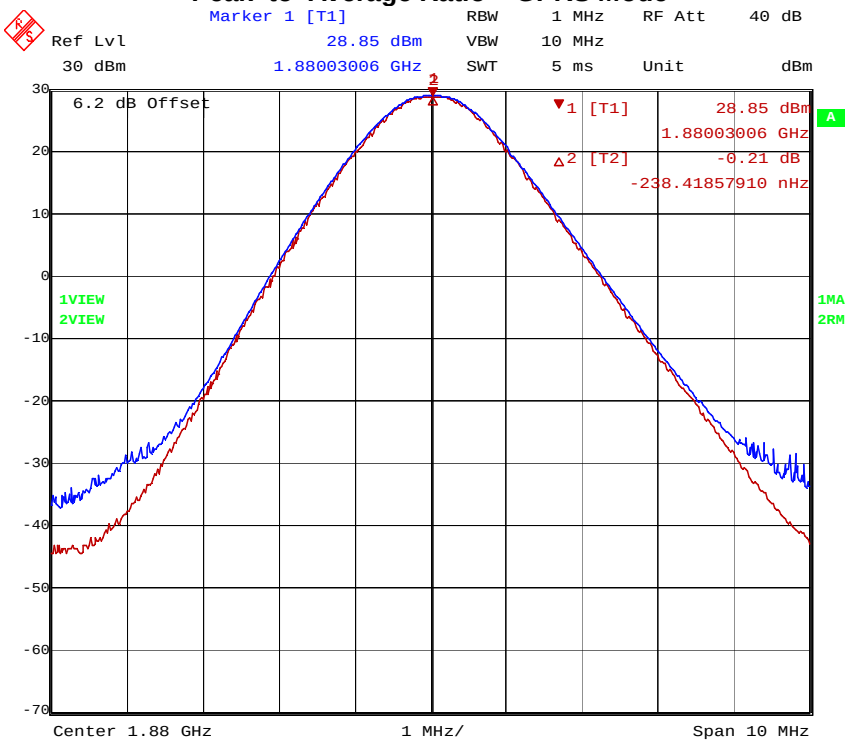
			Burst Average Power (dBm)		
Configuration	Temp	Input Voltage (VAC)	Ch. 512	Ch. 661	Ch. 810
GSM1900 - EDGE 1Tx Slot	-30	115	24.8	24.7	24.2
	20	115	24.9	24.9	24.4
	20	138	24.9	24.9	24.3
	20	93.5	24.9	24.9	24.4
	60	115	24.9	24.9	24.4

Conducted Output Power at Temperature and Voltage Extremes (WCDMA Band IV and II)

			Burst Average Power (dBm)		
Configuration	Temp	Input Voltage (VAC)	Ch. 4132	Ch. 4182	Ch. 4233
WCDMA Band V - 1Tx Slot	-30	115	22.87	23.56	22.81
	20	115	22.88	22.95	22.68
	20	138	22.79	23	22.66
	20	93.5	22.79	22.85	22.46
	60	115	24.31	23.74	23.83

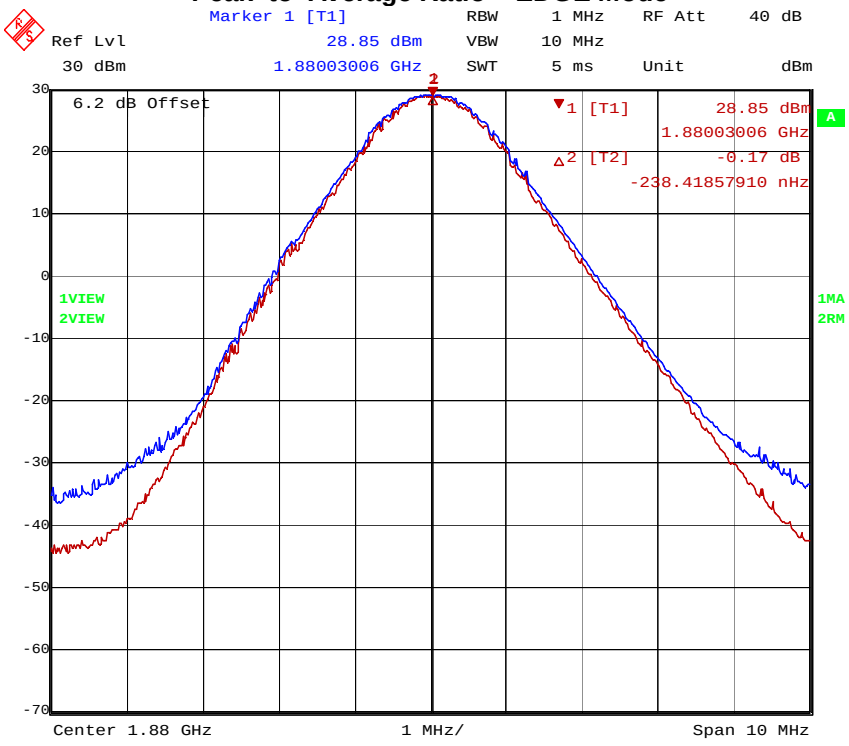
			Burst Average Power (dBm)		
Configuration	Temp	Input Voltage (VAC)	Ch. 9262	Ch. 9400	Ch. 9538
WCDMA Band II - 1Tx Slot	-30	115	20.56	21.23	21.59
	20	115	20.08	20.76	20.93
	20	138	20.03	20.64	21.03
	20	93.5	20.18	20.7	21.11
	60	115	21.65	21.37	21.11

Peak–to–Average Ratio – GPRS Mode



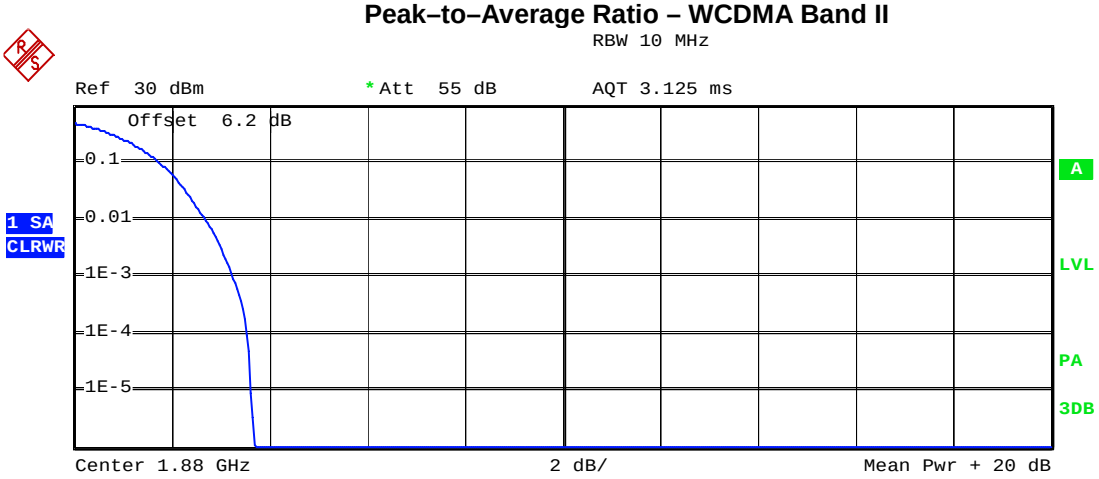
Date: 21.FEB.2013 14:02:42

Peak–to–Average Ratio – EDGE Mode



Date: 21.FEB.2013 14:08:40

Peak–to–Average Ratio – WCDMA Band II



Complementary Cumulative Distribution Function (100000 samples)

	Trace 1
Mean	21.92 dBm
Peak	25.62 dBm
Crest	3.70 dB
10 %	1.76 dB
1 %	2.72 dB
.1 %	3.28 dB
.01 %	3.56 dB

Date: 21.FEB.2013 16:13:58

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 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.

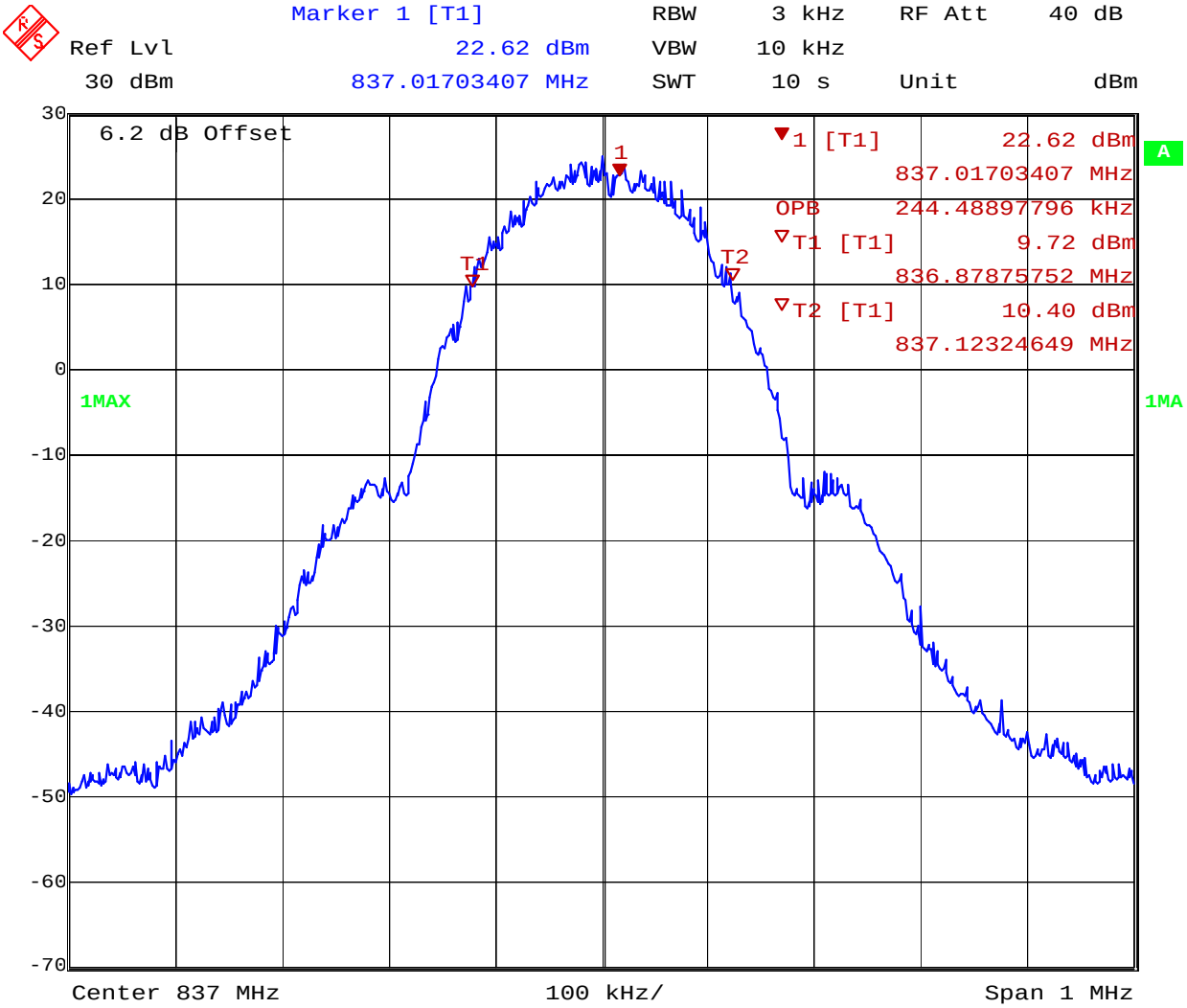
5.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3720	Rohde & Schwarz	FSEK 30	11/26/2012	11/26/2013
Base Station Simulator	3747L	Rohde & Schwarz	CMU200	4/13/2012	4/13/2013
Directional Coupler	08736	Narda	4226-20	Time of Use	Time of Use

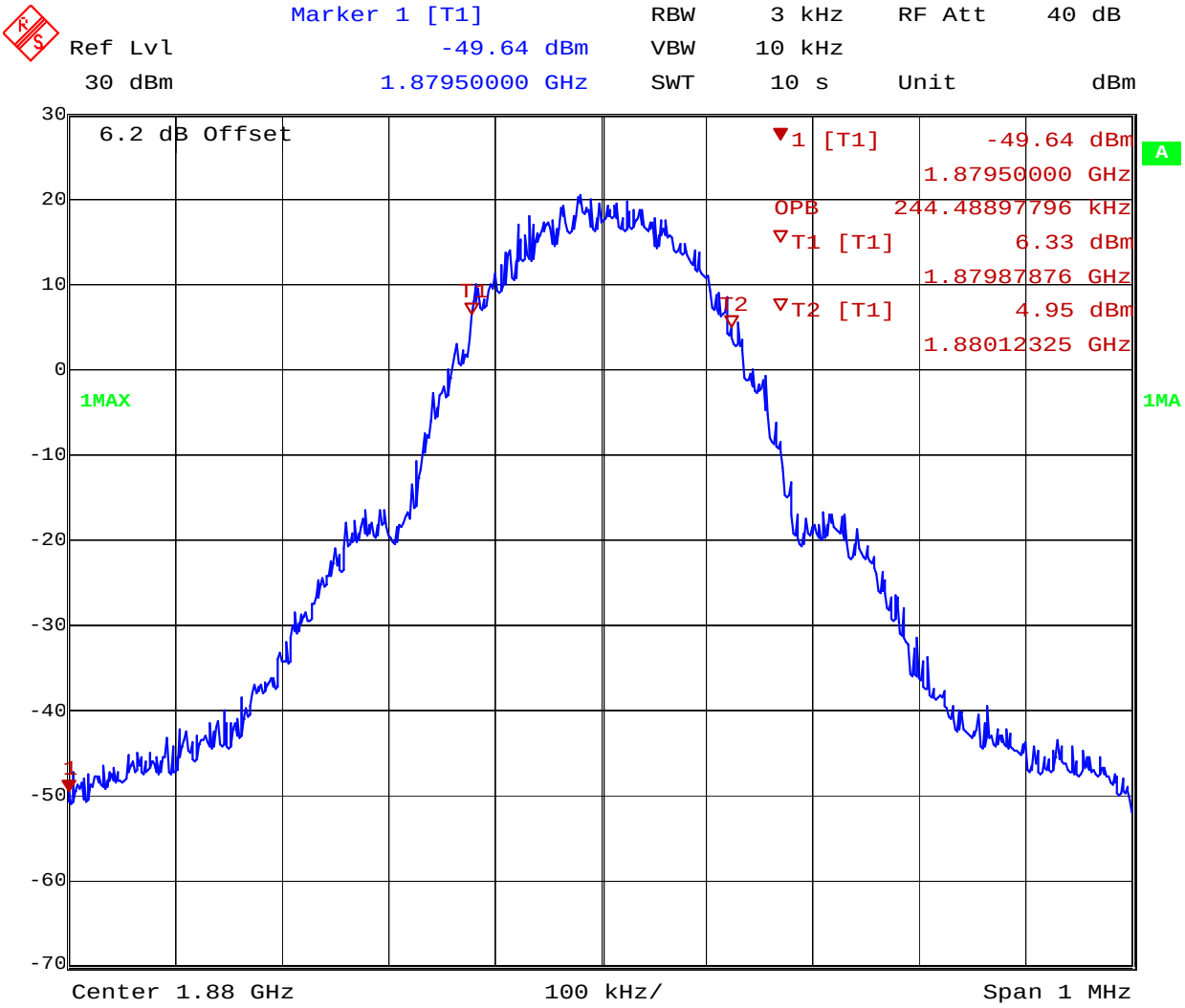
5.4 Results:

The occupied bandwidth is shown on each of the following plots. Peak detection was used for these measurements.

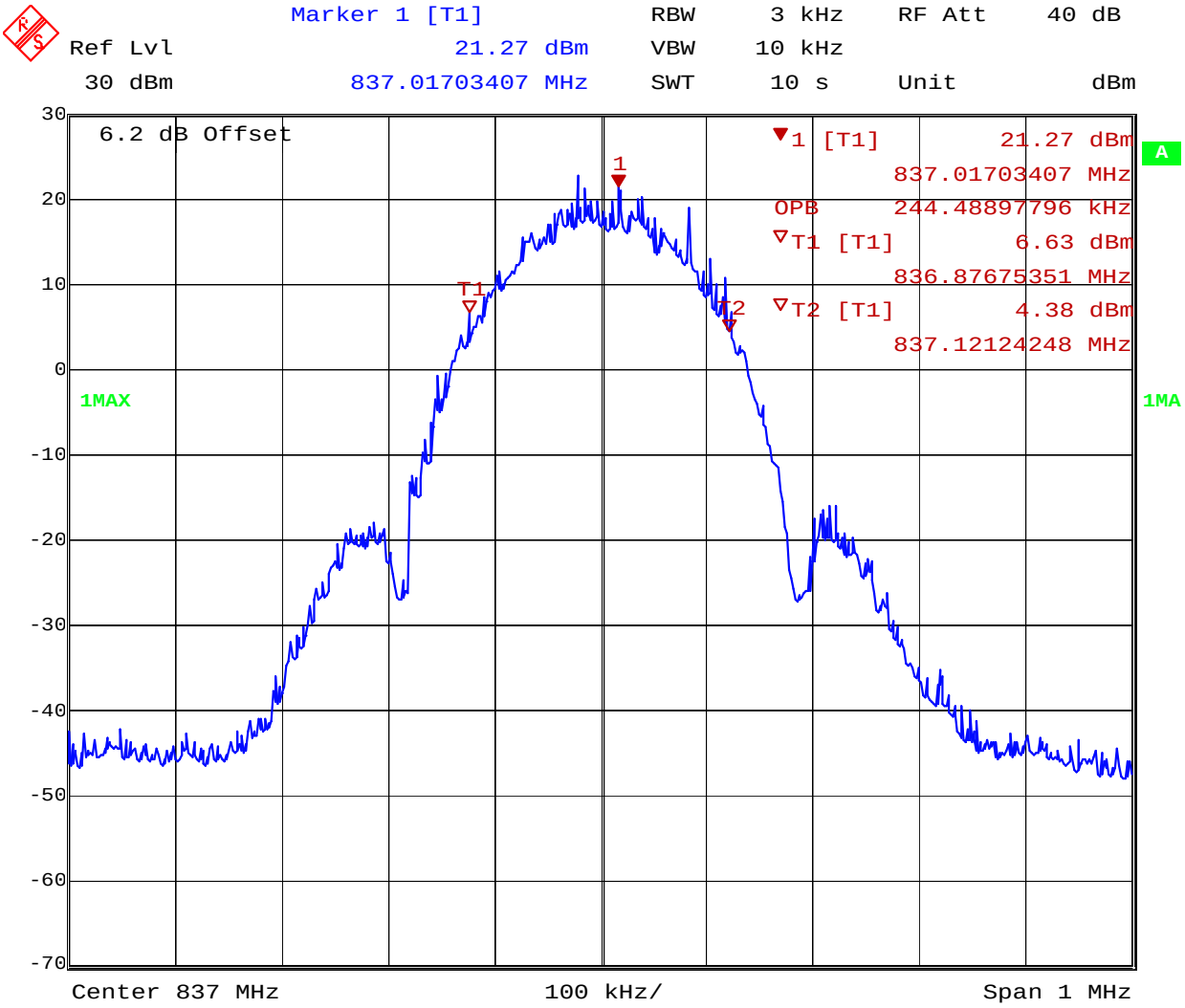
GSM 850Band, Mid Channel – GPRS



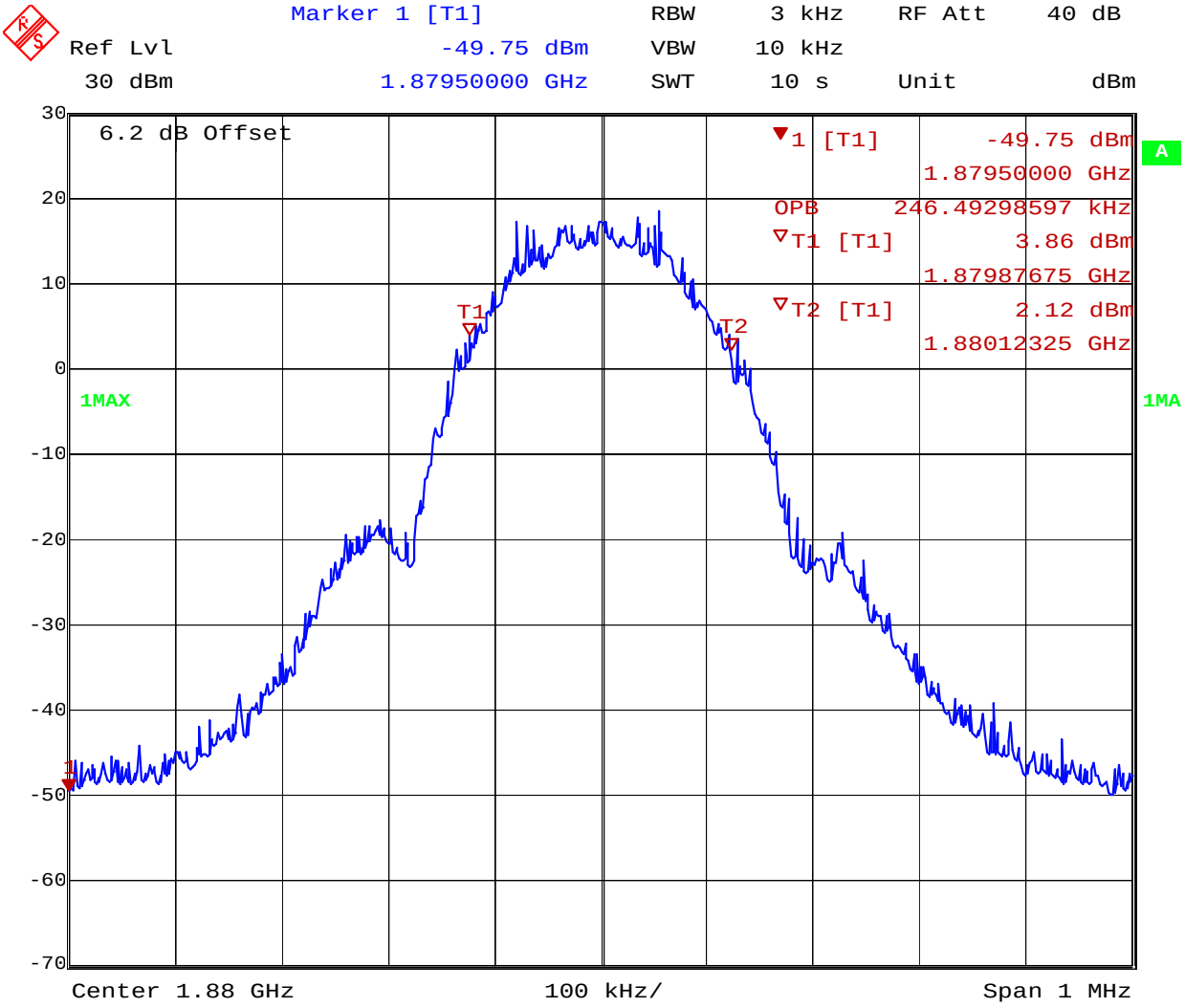
GSM 1900 Band, Mid Channel – GPRS



GSM 850Band, Mid Channel – EDGE

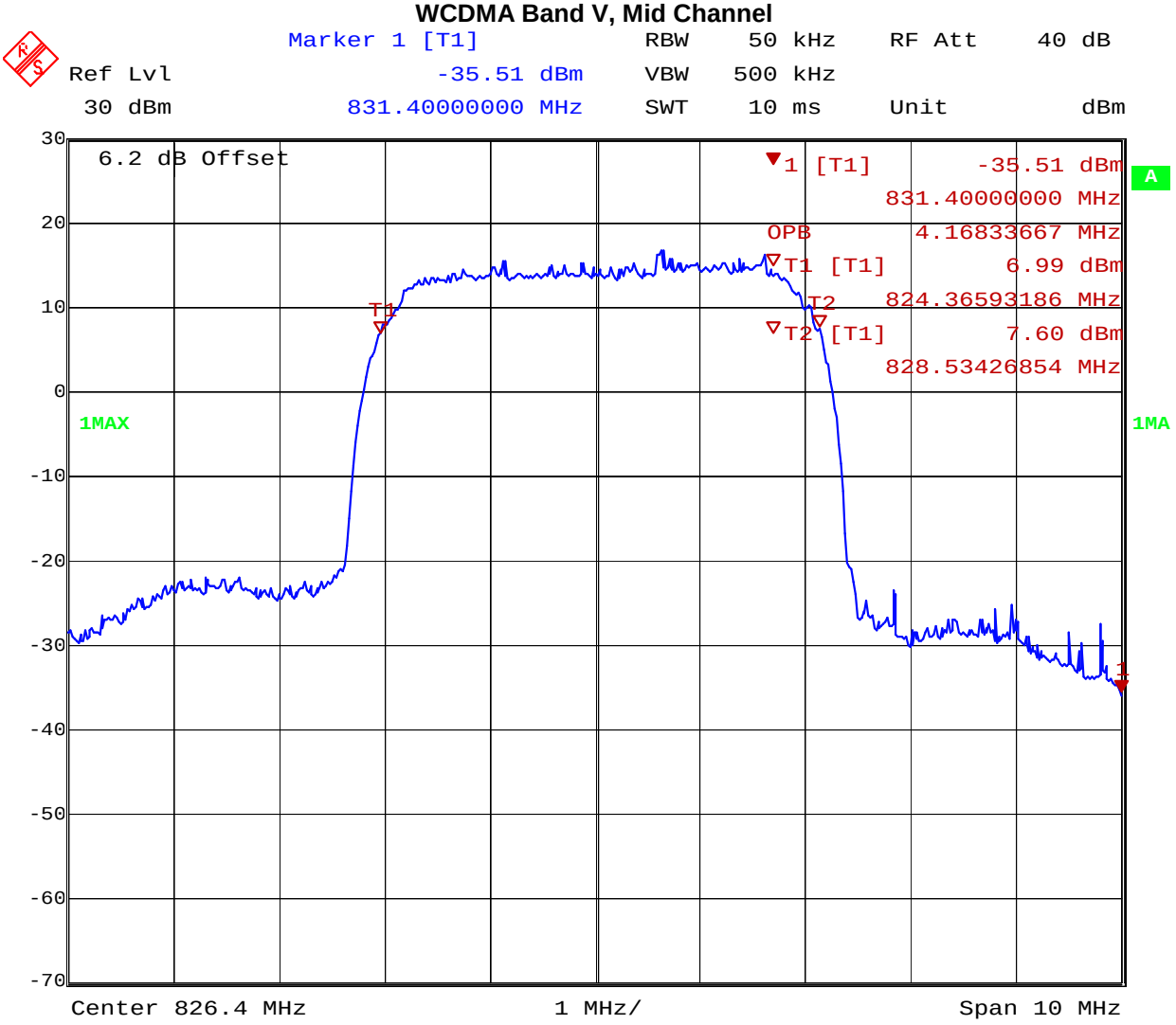


GSM 1900 Band, Mid Channel – EDGE



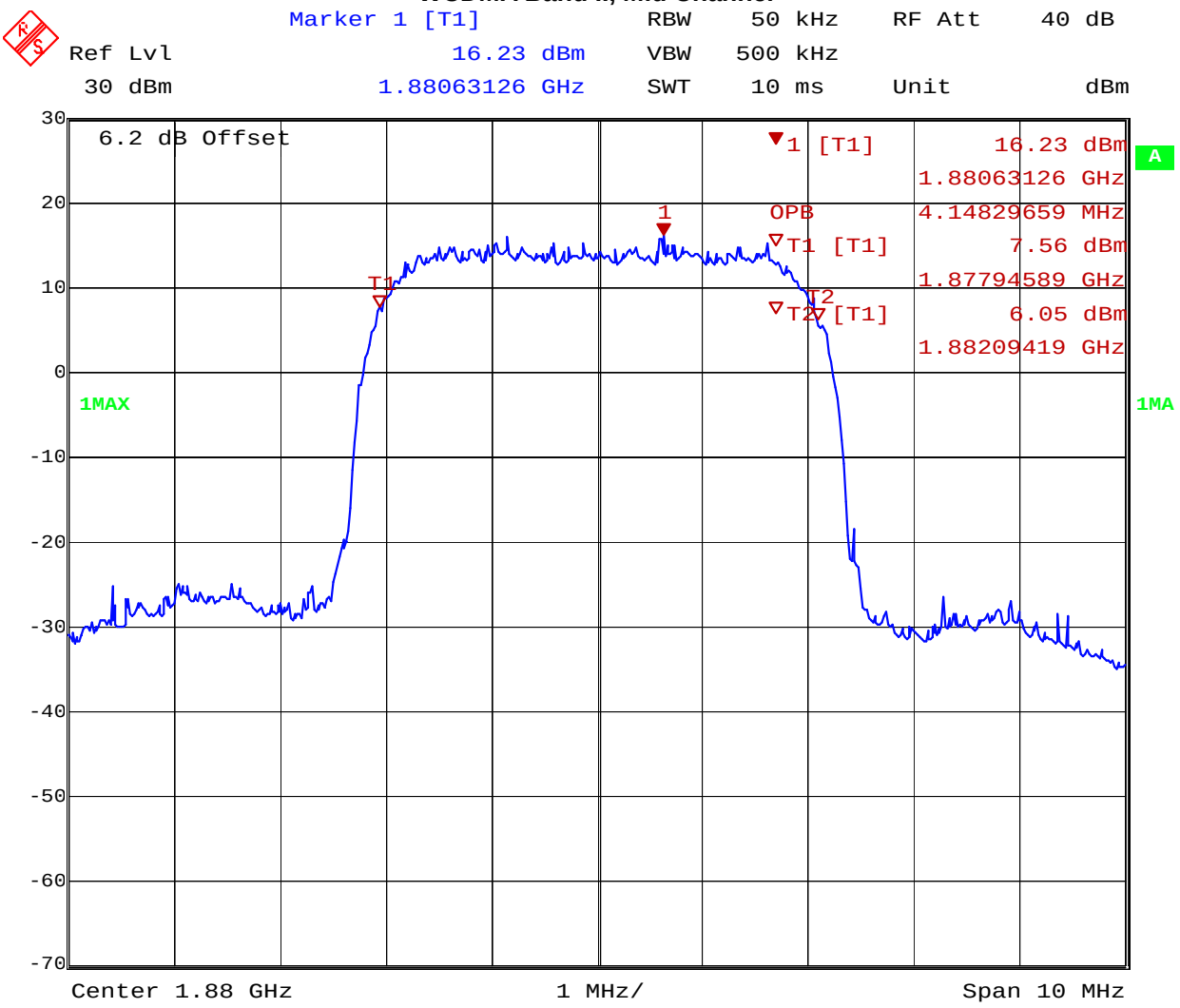
Date: 20.FEB.2013 13:09:54

WCDMA Band V, Mid Channel



Date: 20.FEB.2013 12:55:46

WCDMA Band II, Mid Channel



Date: 20.FEB.2013 12:48:07

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:

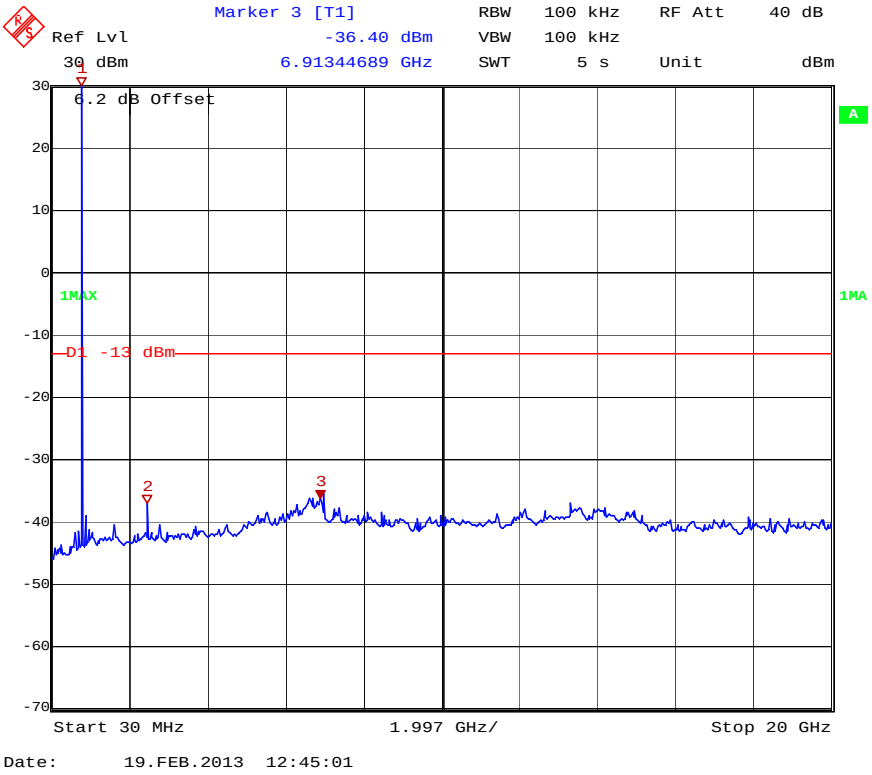
Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	10883494	Rohde&Schwarz	FSEK30	11/26/2012	11/26/2013
Base Station Simulator	1100.008.10	Rohde&Schwarz	CMU200	4/13/2012	4/13/2013
RF Combiner	E18106	Weinschel	1506A	Time of Use	Time of Use

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.

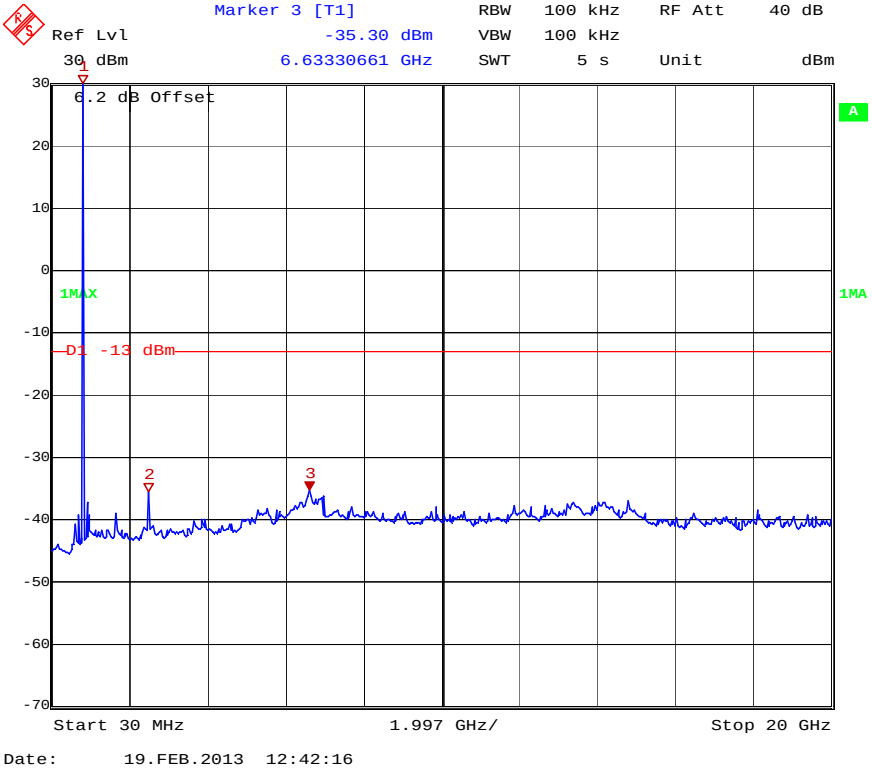
In the following plots, peak detection was used for the 30MHz – 20GHz scans. Emissions close to the limit and close to the band edge were measured with average detection.

GSM 850 Band - Low Channel – GPRS



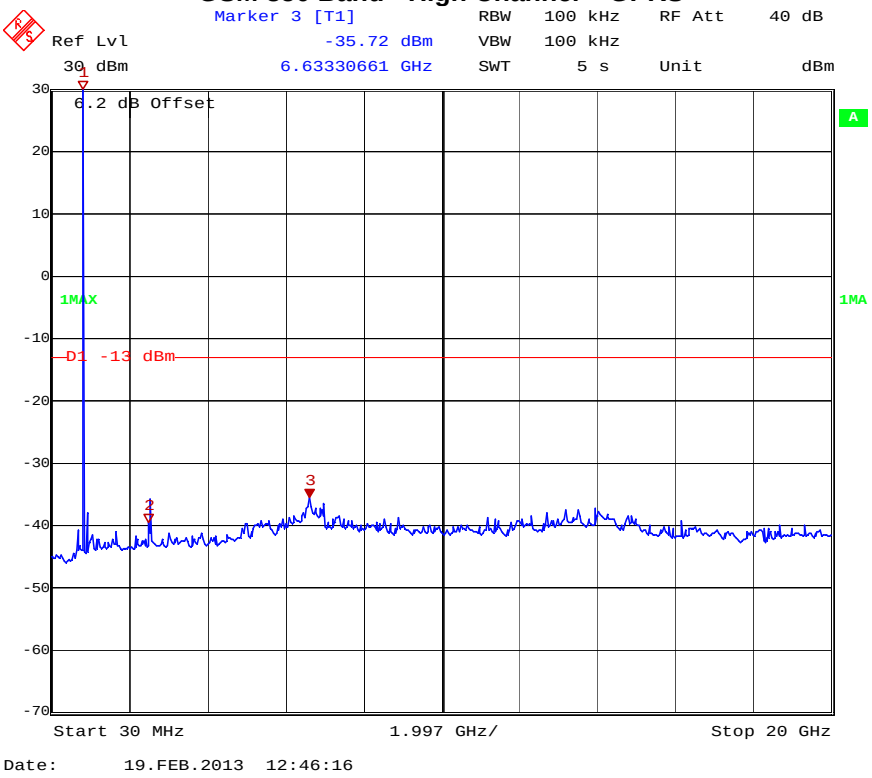
Date: 19.FEB.2013 12:45:01

GSM 850 Band – Mid Channel – GPRS



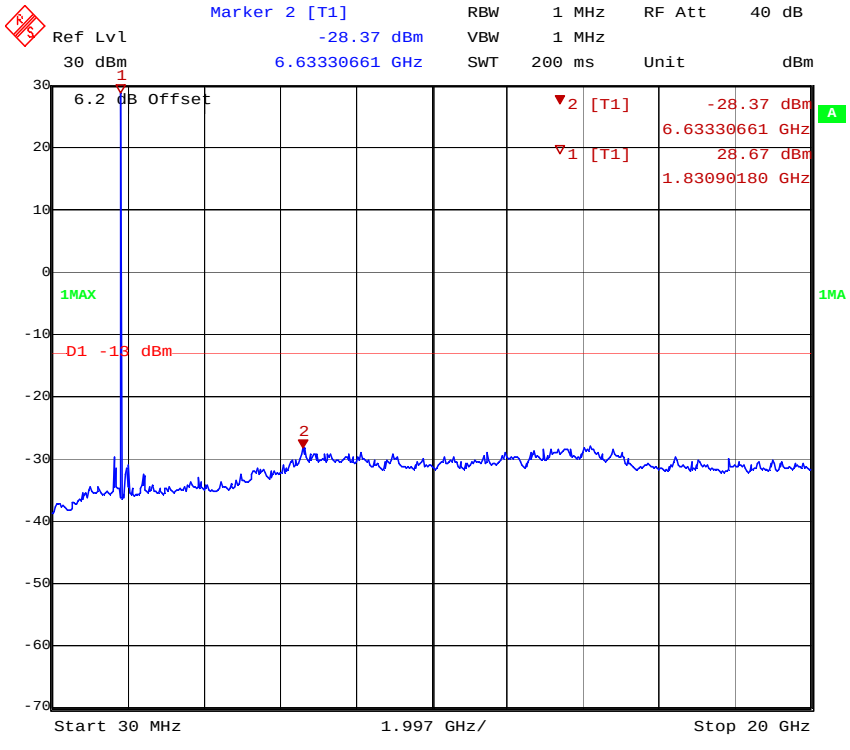
Date: 19.FEB.2013 12:42:16

GSM 850 Band - High Channel – GPRS



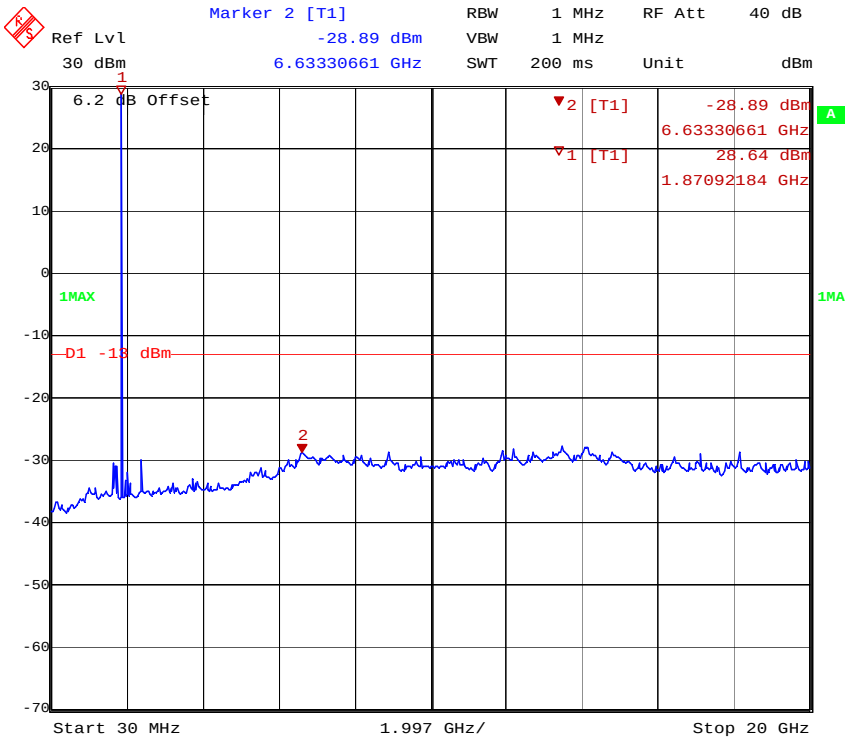
Date: 19.FEB.2013 12:46:16

GSM 1900 Band - Low Channel – GPRS



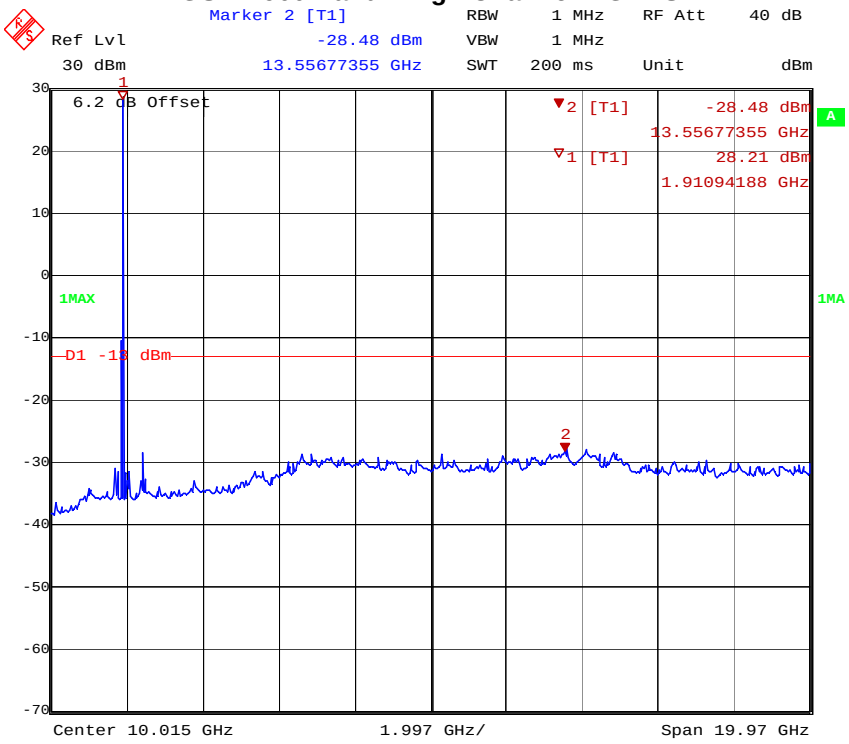
Date: 21.FEB.2013 07:07:09

GSM 1900 Band – Mid Channel – GPRS



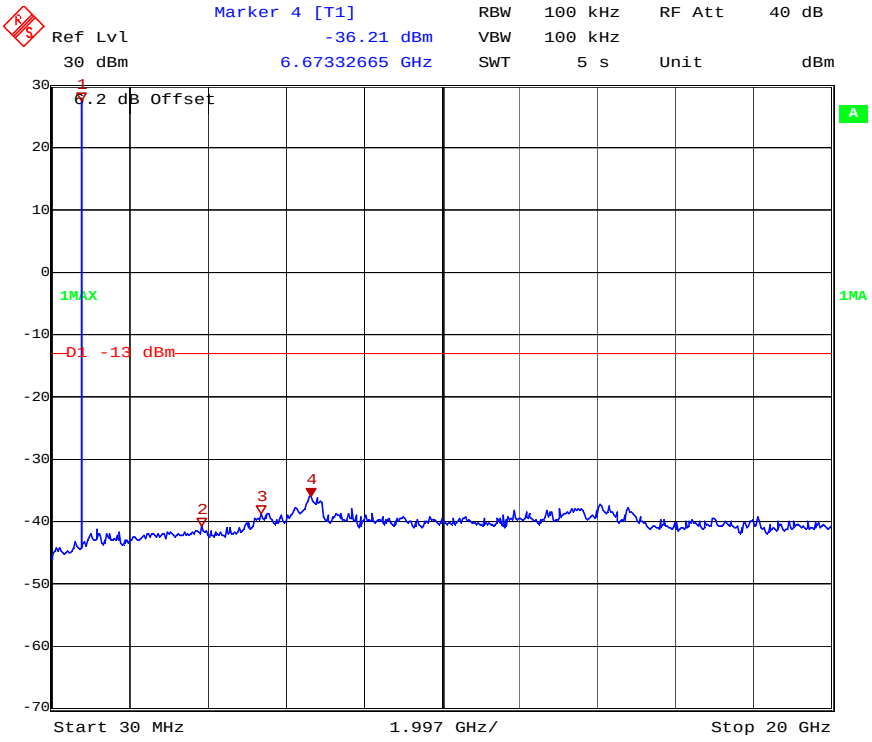
Date: 21.FEB.2013 07:19:44

GSM 1900 Band - High Channel – GPRS



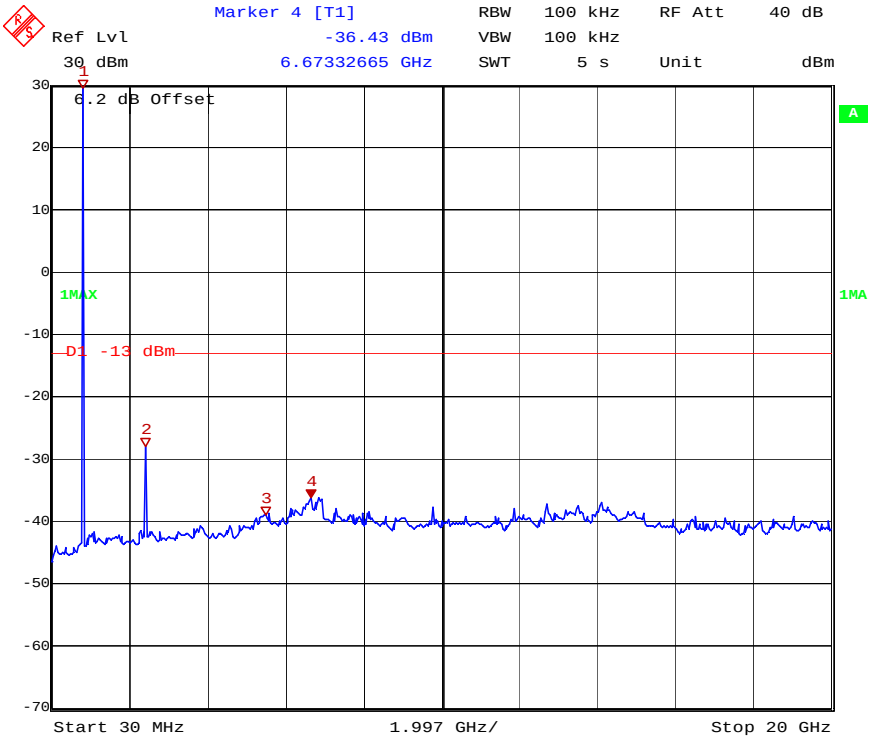
Date: 21.FEB.2013 07:33:21

GSM 850 Band - Low Channel – EDGE



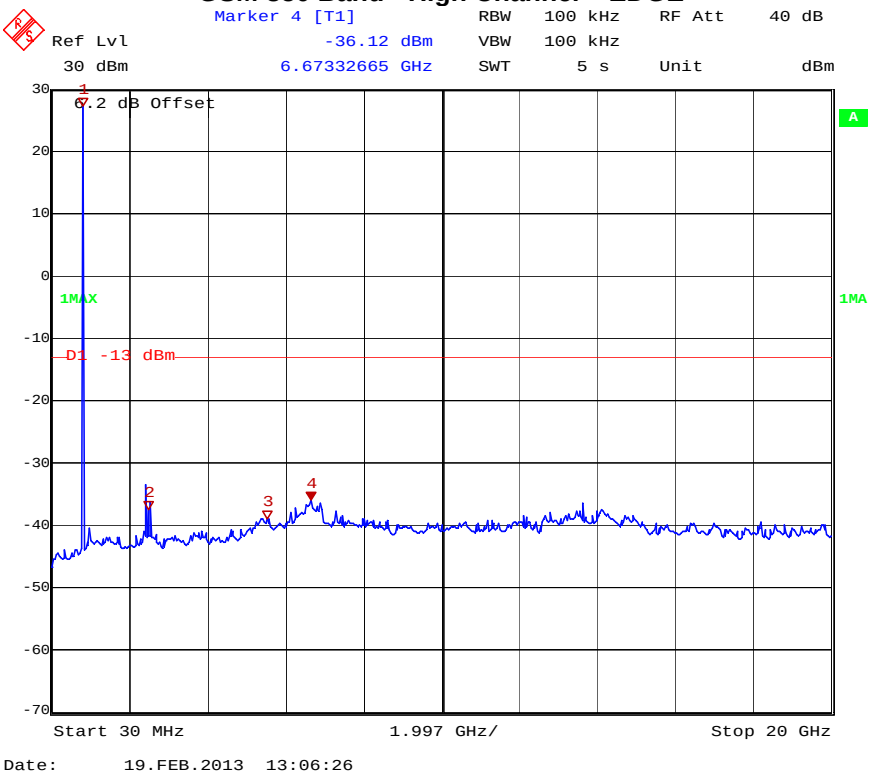
Date: 19.FEB.2013 13:02:55

GSM 850 Band – Mid Channel – EDGE

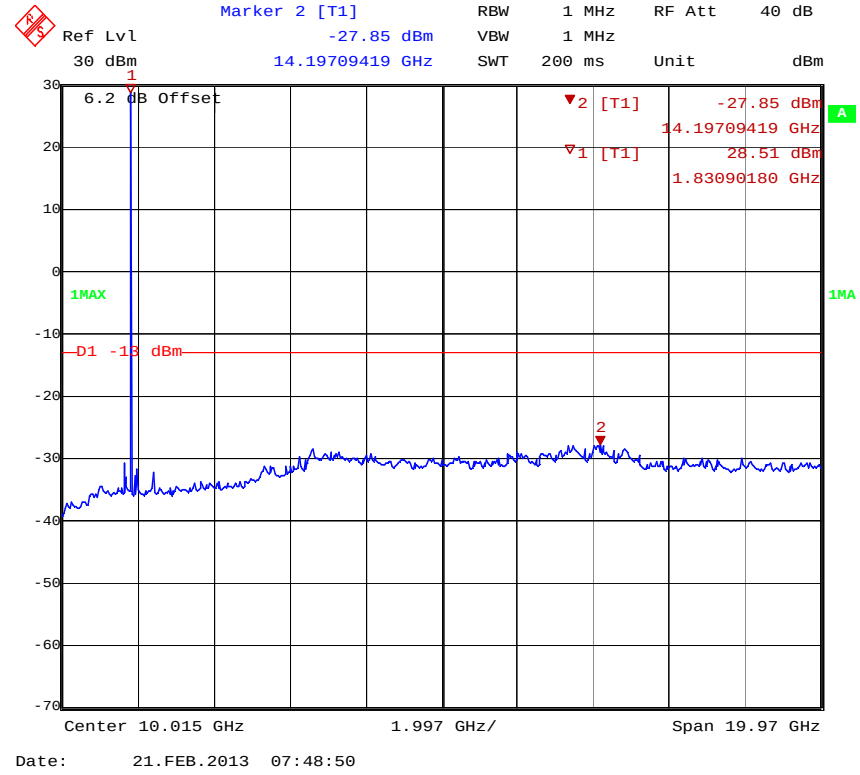


Date: 19.FEB.2013 13:04:36

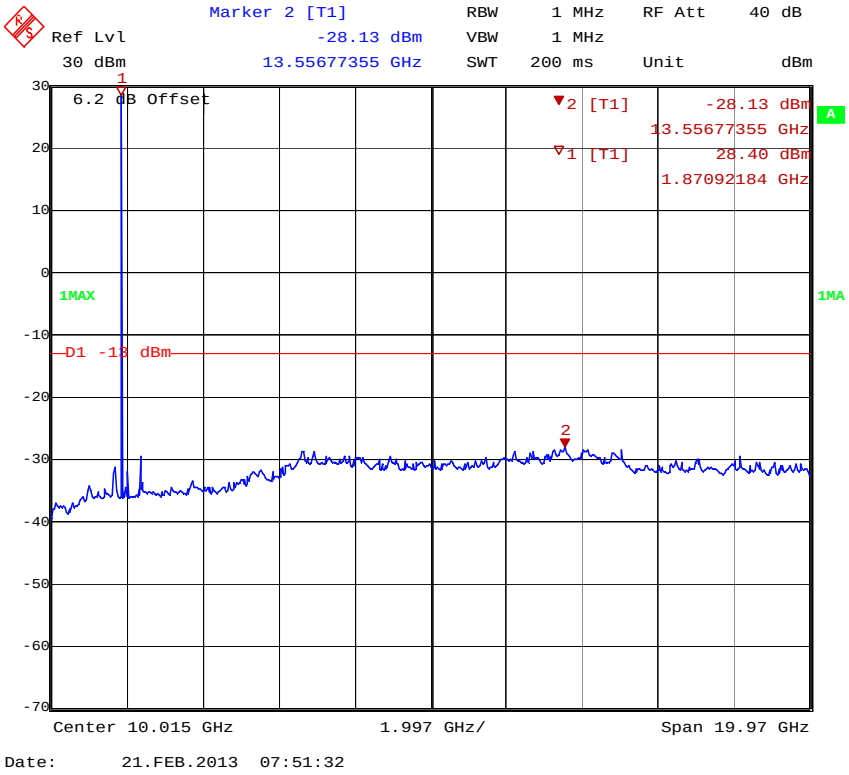
GSM 850 Band - High Channel – EDGE



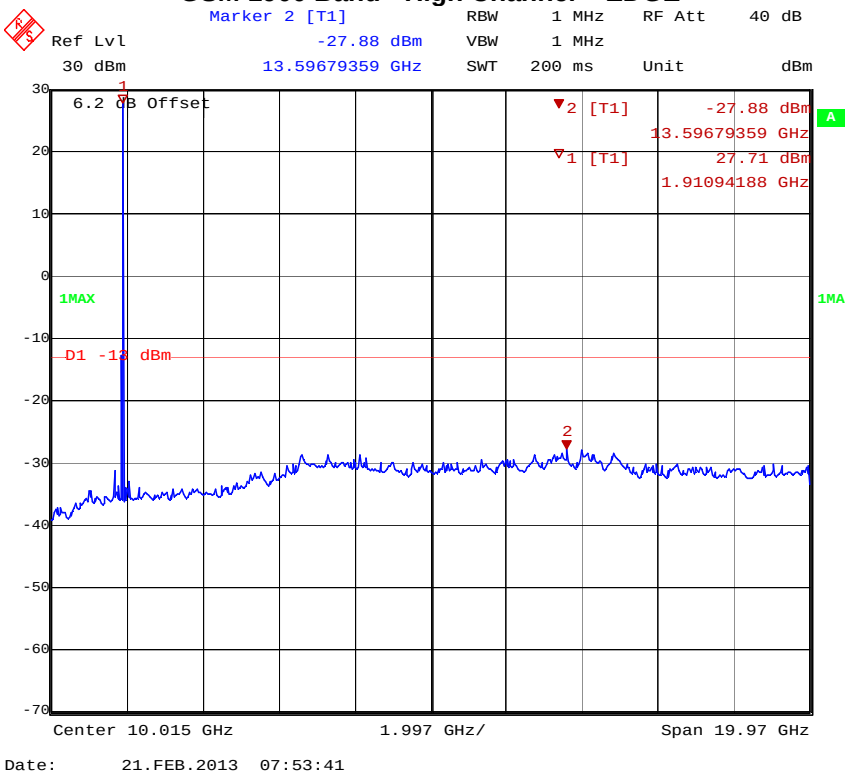
GSM 1900 Band - Low Channel – EDGE



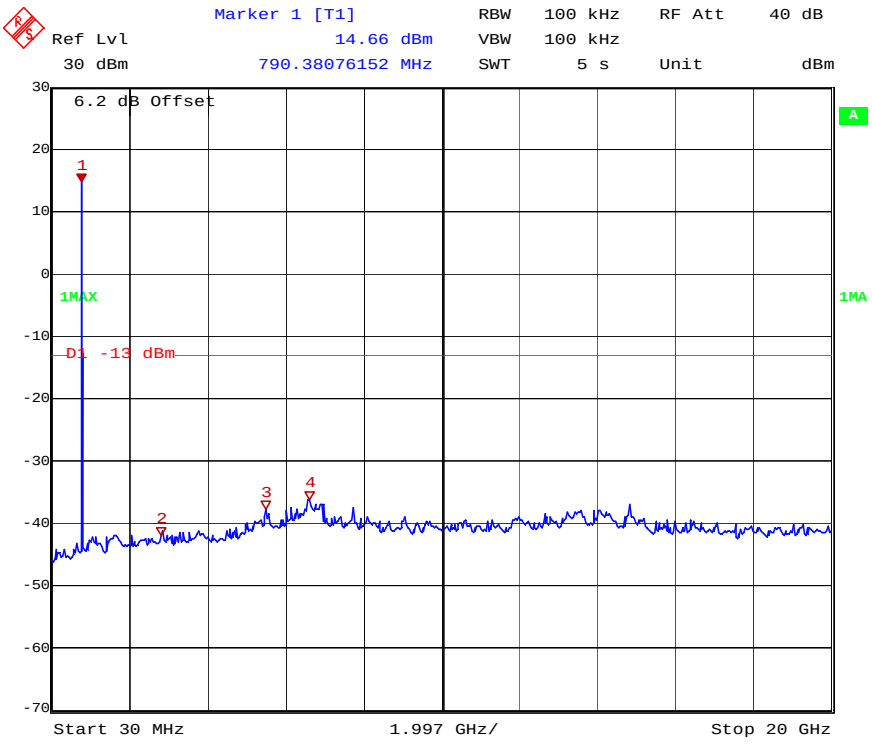
GSM 1900 Band – Mid Channel – EDGE



GSM 1900 Band - High Channel – EDGE

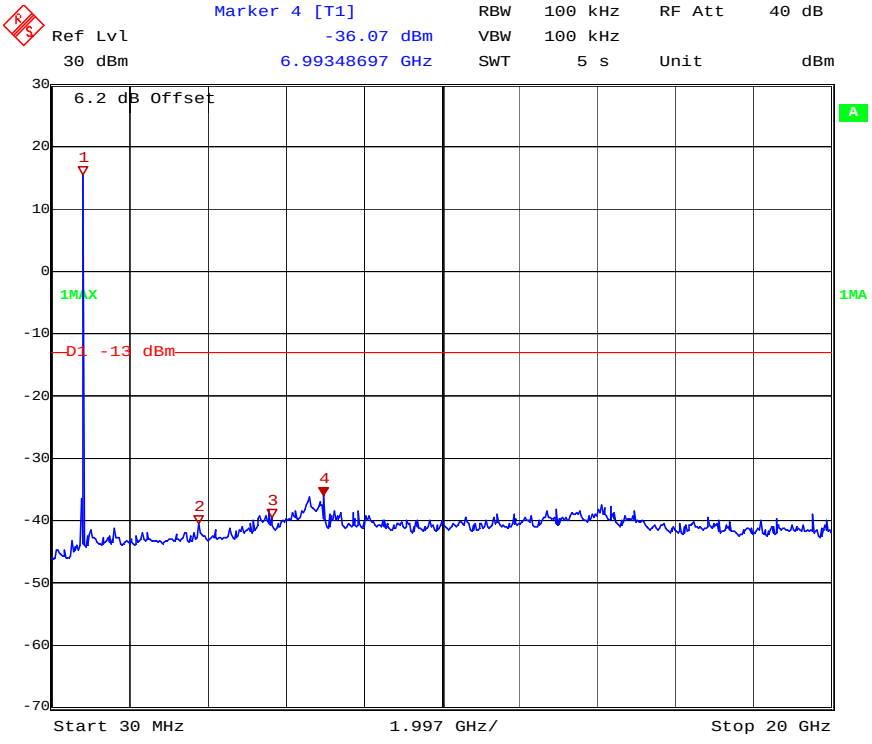


WCDMA Band V - Low Channel



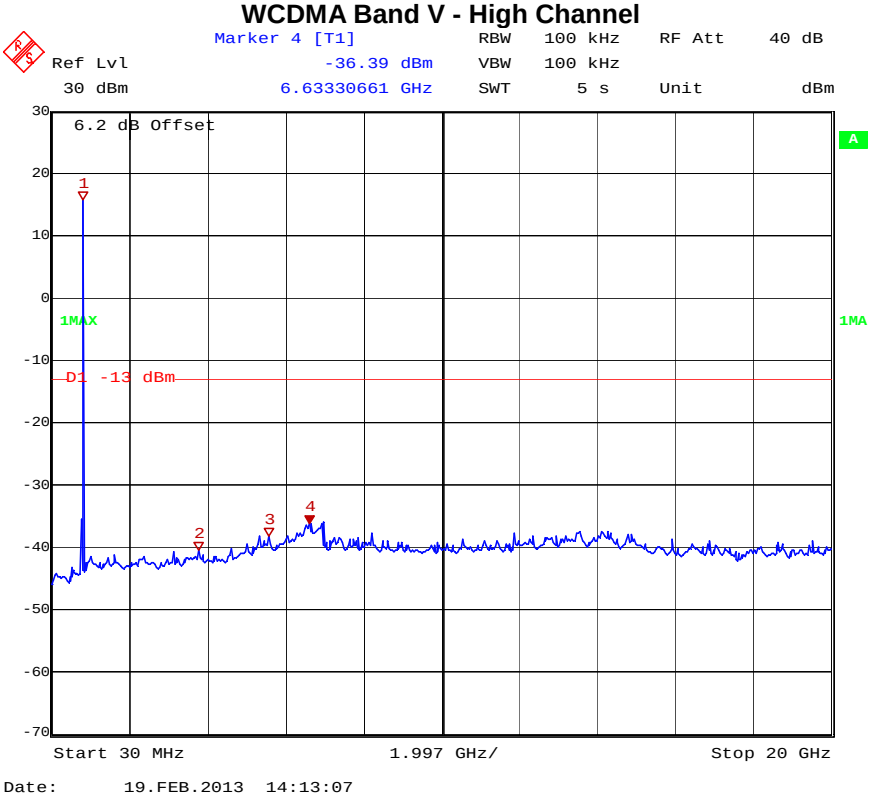
Date: 19.FEB.2013 14:10:24

WCDMA Band V - Mid Channel



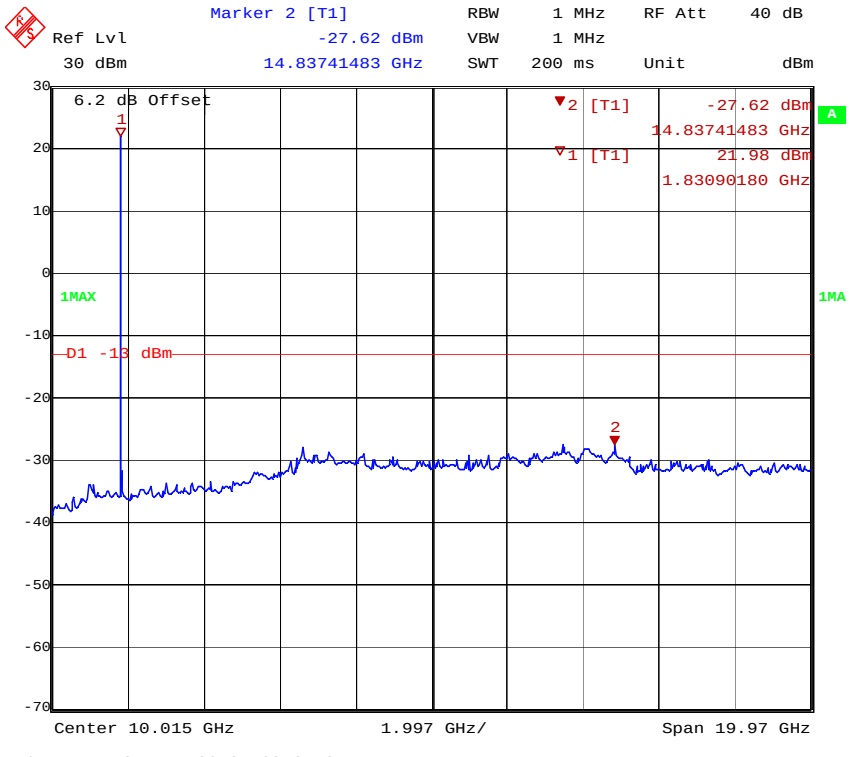
Date: 19.FEB.2013 14:11:37

WCDMA Band V - High Channel



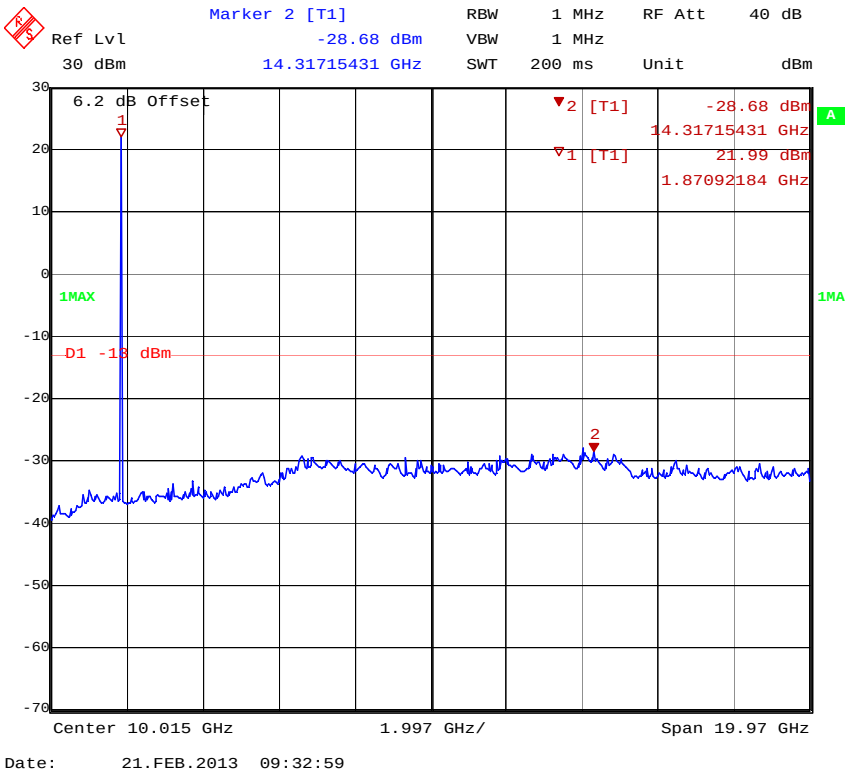
Date: 19.FEB.2013 14:13:07

WCDMA Band II - Low Channel



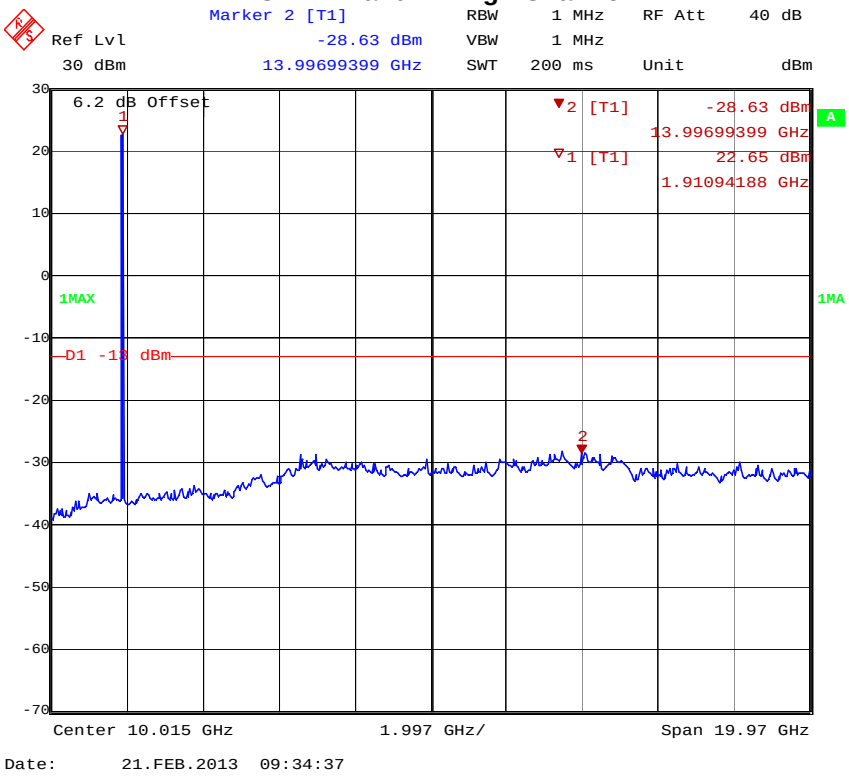
Date: 21.FEB.2013 09:31:37

WCDMA Band II - Mid Channel



Date: 21.FEB.2013 09:32:59

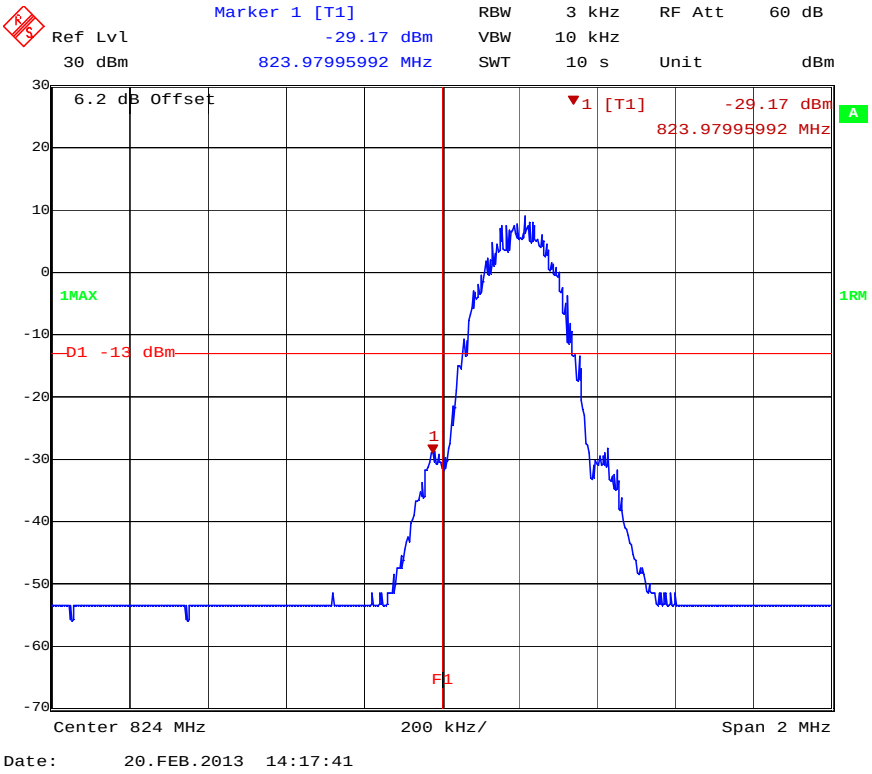
WCDMA Band II - High Channel



Date: 21.FEB.2013 09:34:37

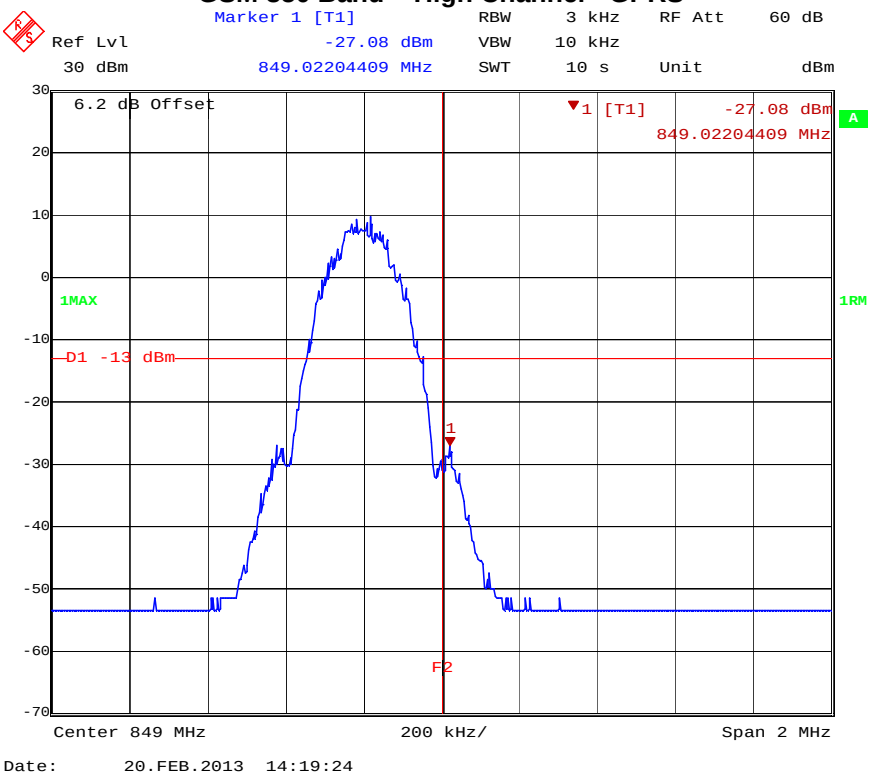
Emissions within 1MHz of the band edge:

GSM 850 Band – Low Channel – GPRS



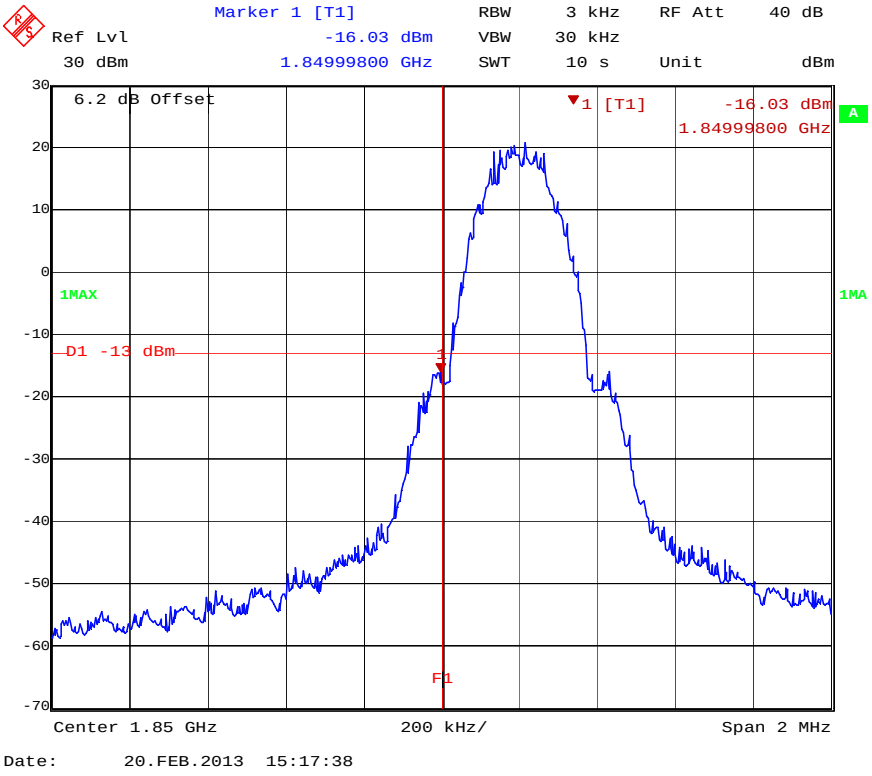
Date: 20.FEB.2013 14:17:41

GSM 850 Band – High Channel - GPRS

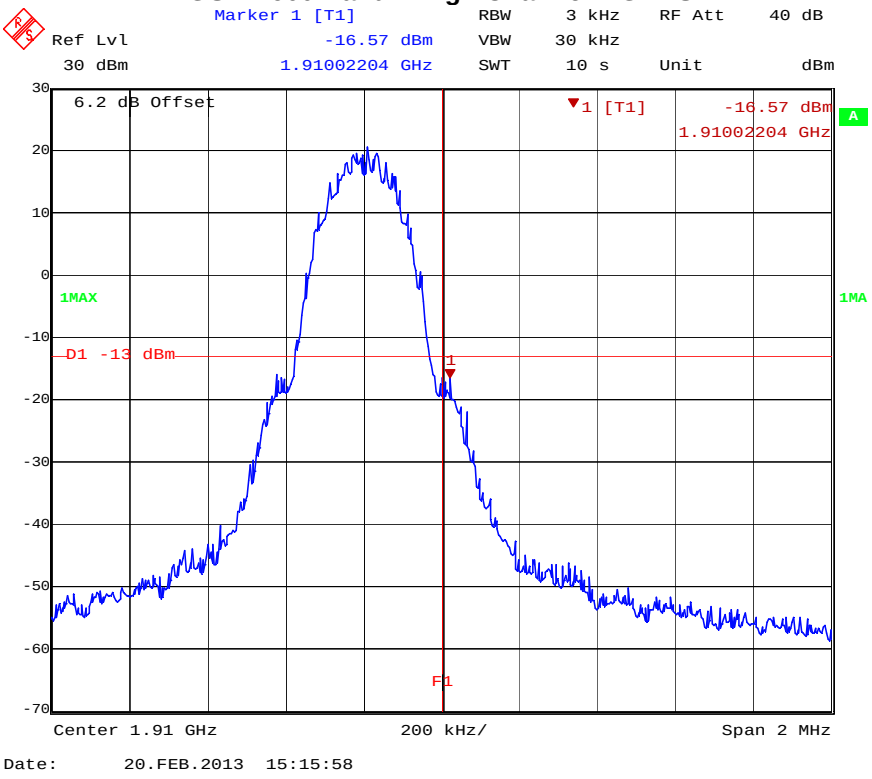


Date: 20.FEB.2013 14:19:24

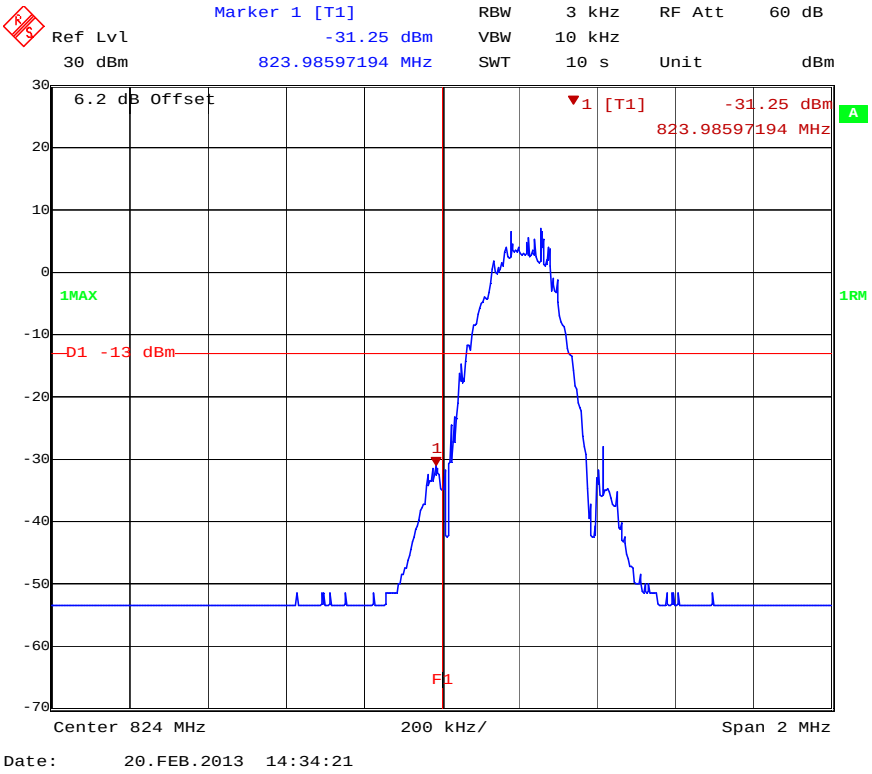
GSM 1900 Band – Low Channel - GPRS



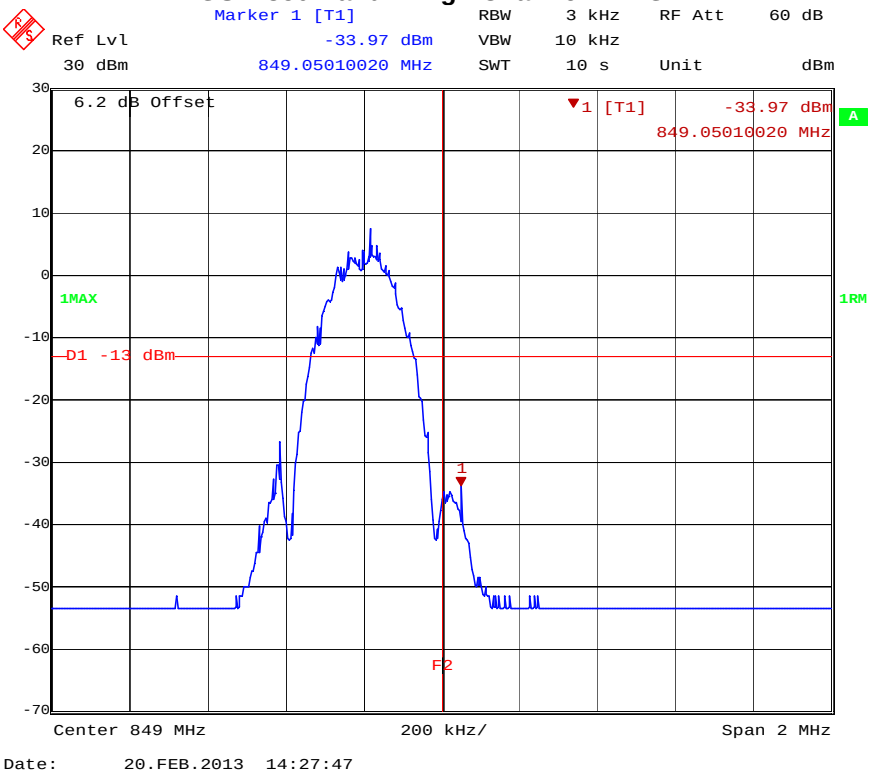
GSM 1900 Band – High Channel – GPRS



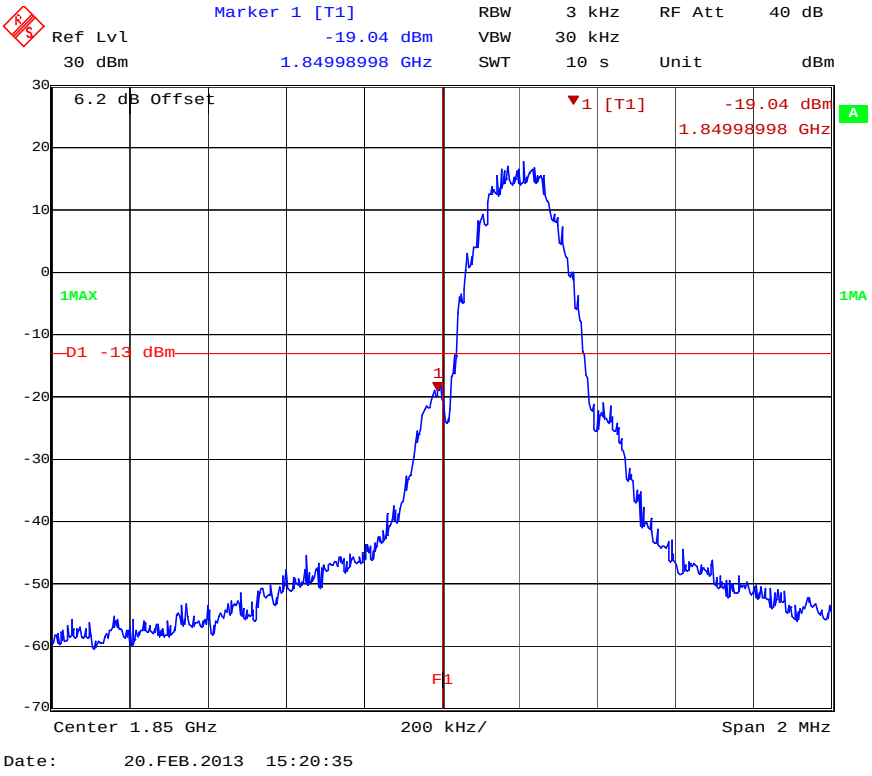
GSM 850 Band – Low Channel - EDGE



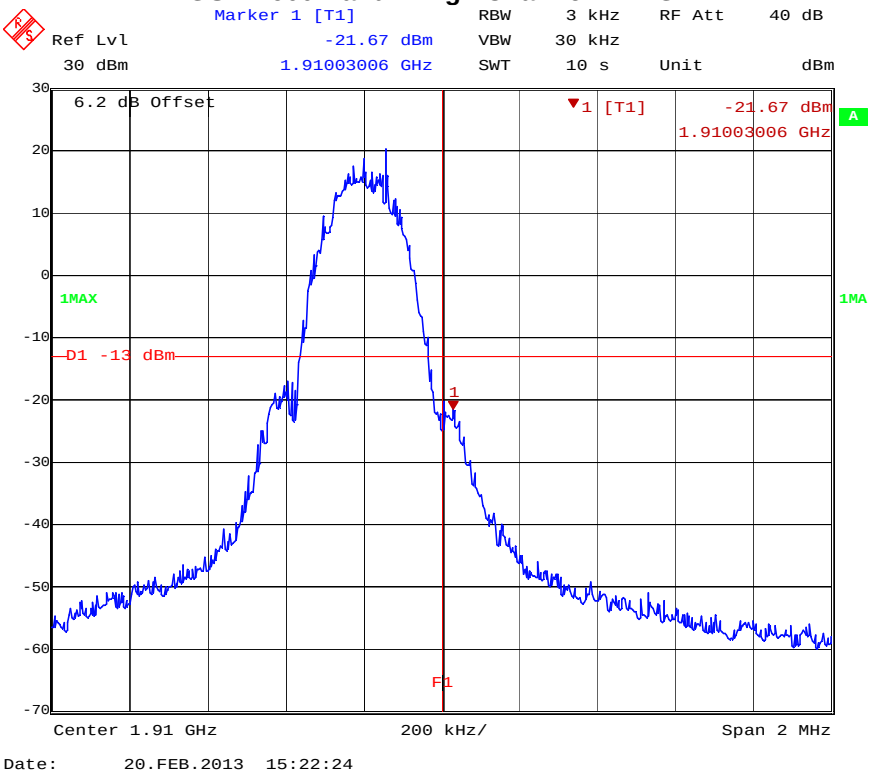
GSM 850 Band – High Channel - EDGE



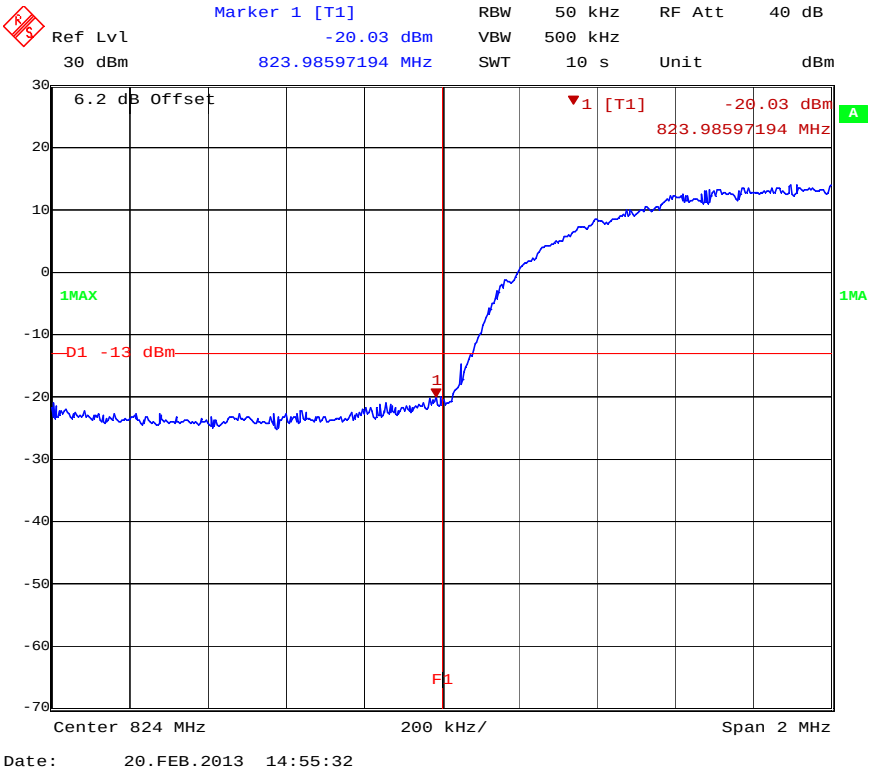
GSM 1900 Band – Low Channel - EDGE



GSM 1900 Band – High Channel – EDGE

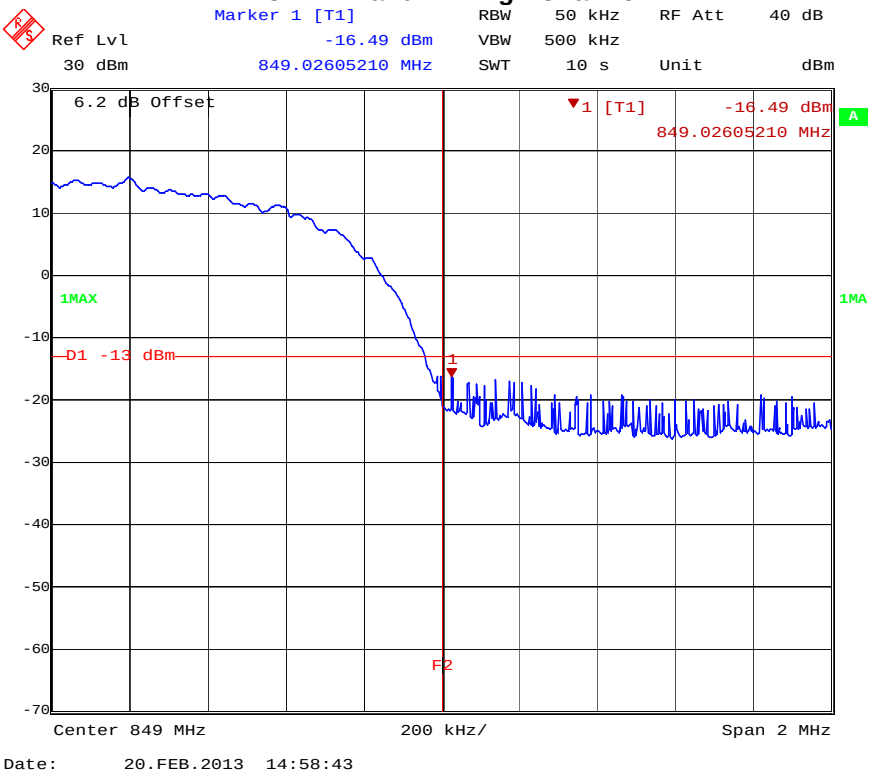


WCDMA Band V – Low Channel



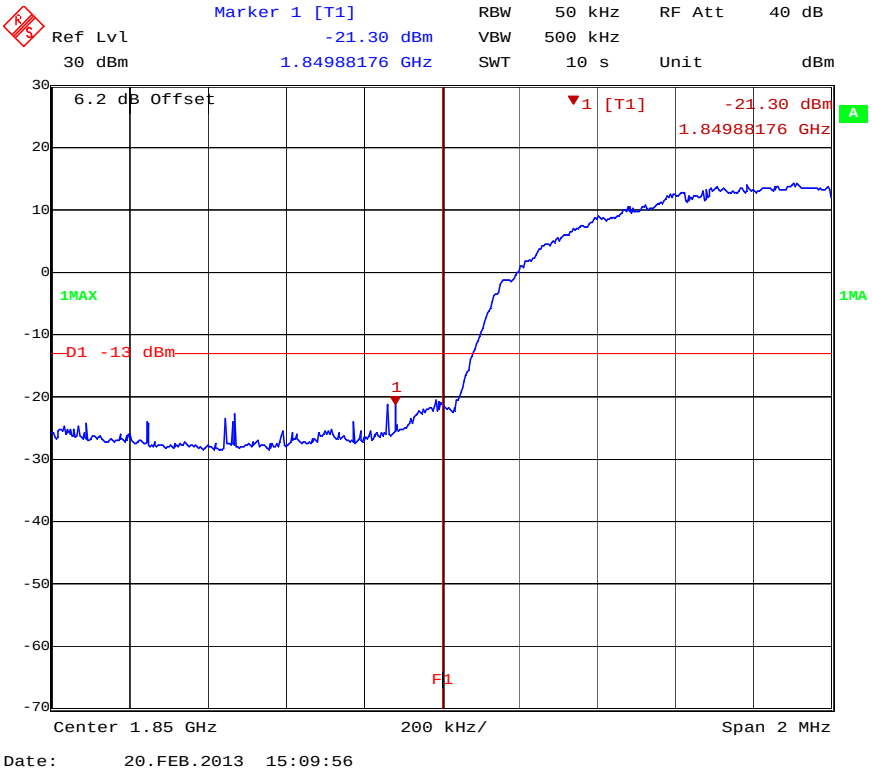
Date: 20.FEB.2013 14:55:32

WCDMA Band V – High Channel

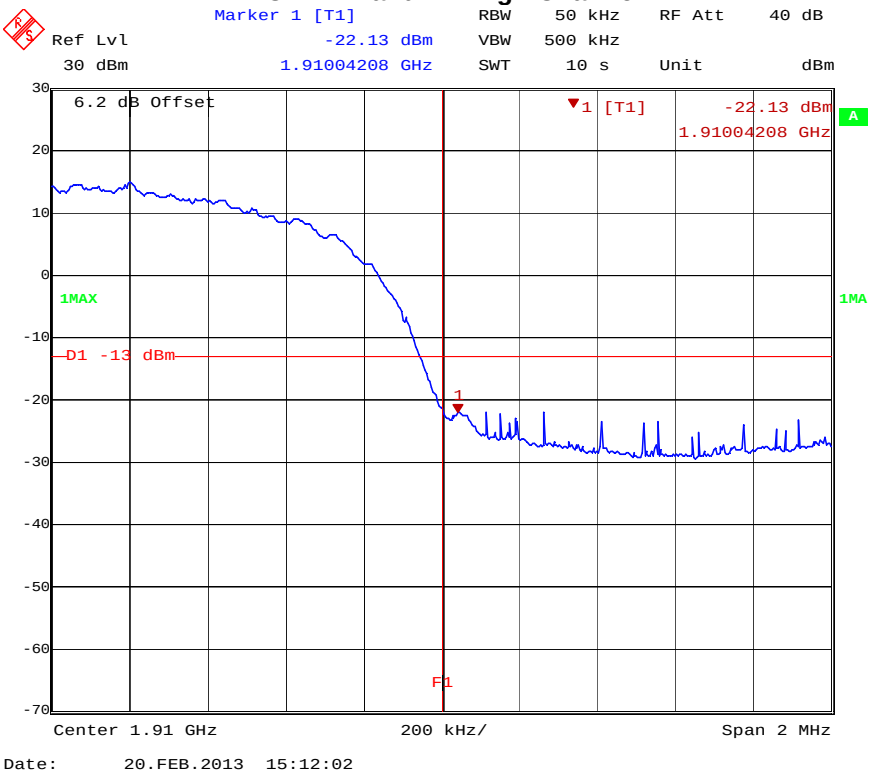


Date: 20.FEB.2013 14:58:43

WCDMA Band II – Low Channel

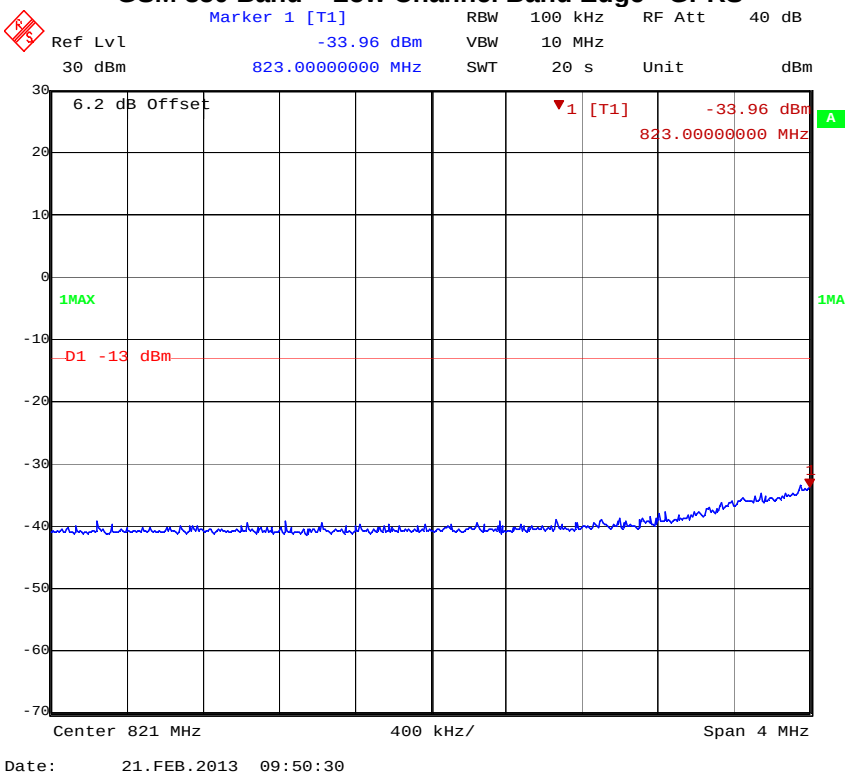


WCDMA Band II – High Channel

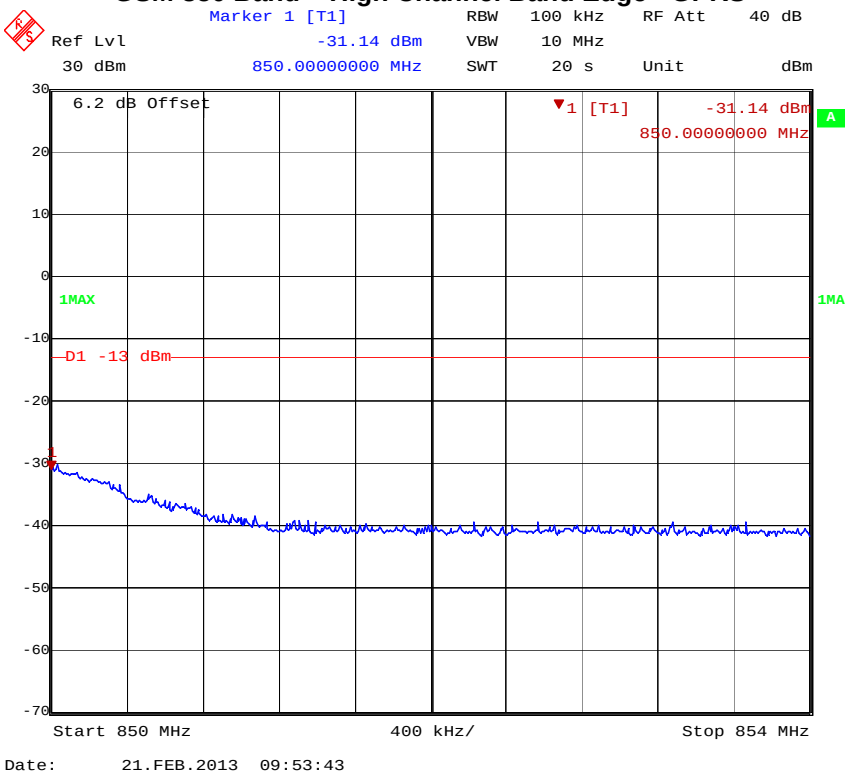


Emissions within 4MHz of the block edge:

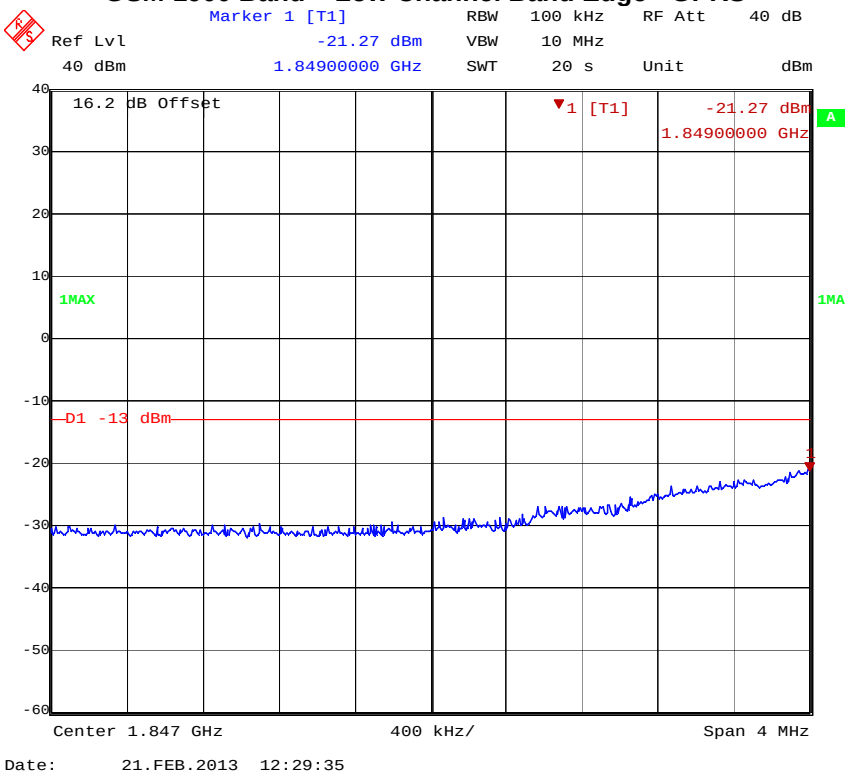
GSM 850 Band – Low Channel Band Edge - GPRS



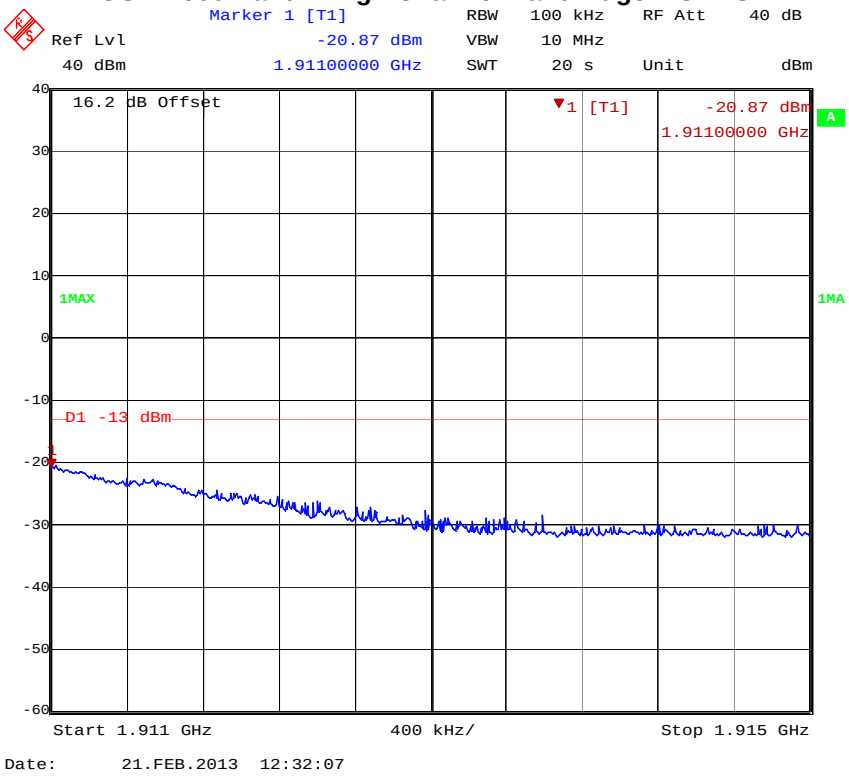
GSM 850 Band – High Channel Band Edge - GPRS



GSM 1900 Band – Low Channel Band Edge - GPRS[1]

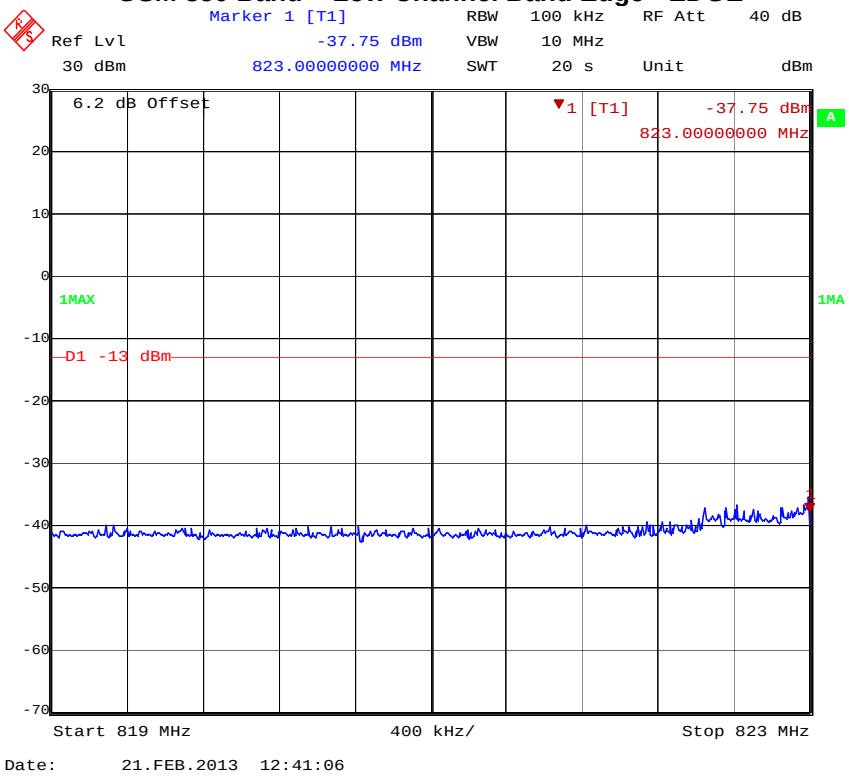


GSM 1900 Band – High Channel Band Edge – GPRS[2]

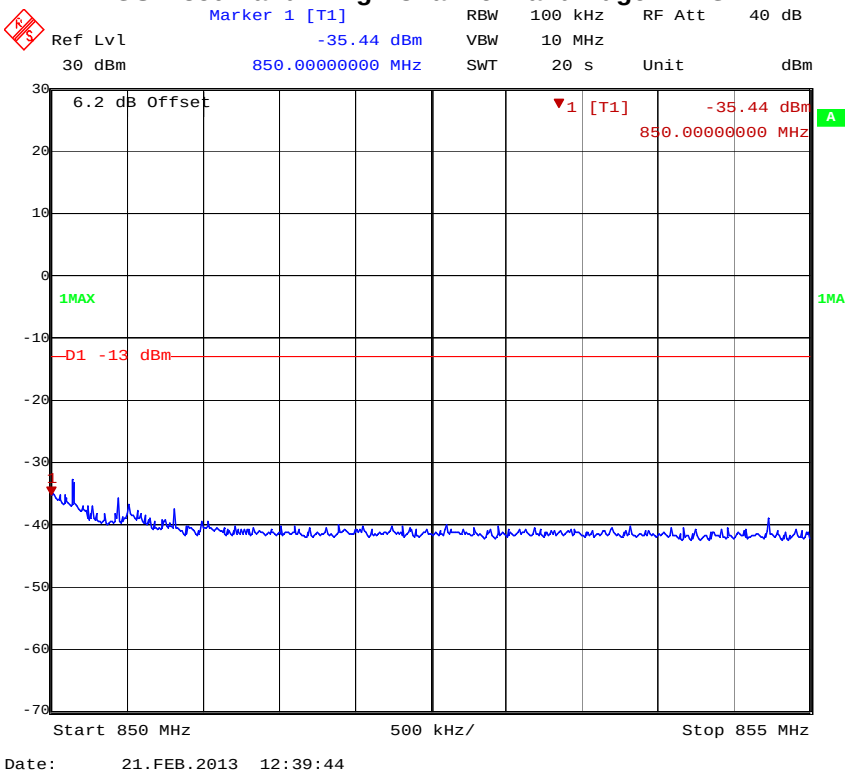


1 Lower resolution bandwidth of 100kHz was used. A correction factor of 10*log(100kHz / 1MHz) was applied.
2 Lower resolution bandwidth of 100kHz was used. A correction factor of 10*log(100kHz / 1MHz) was applied.

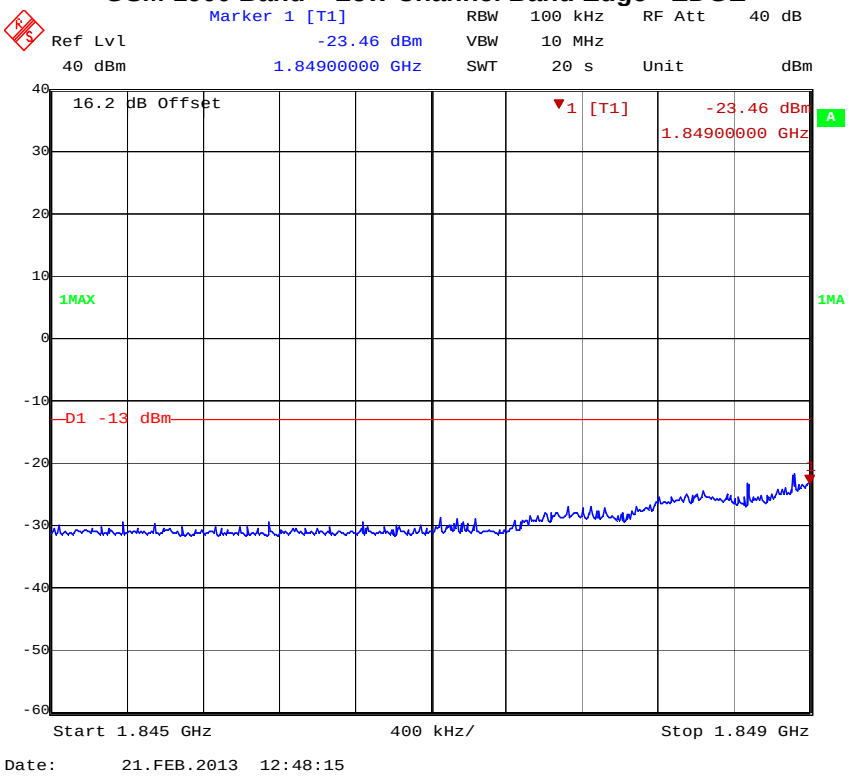
GSM 850 Band – Low Channel Band Edge - EDGE



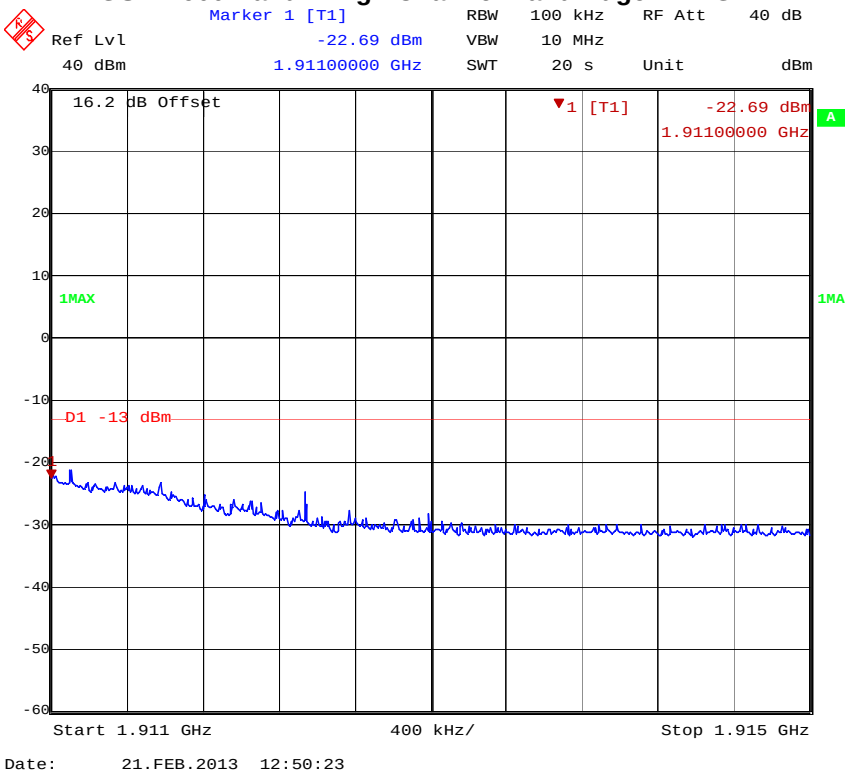
GSM 850 Band – High Channel Band Edge - EDGE



GSM 1900 Band – Low Channel Band Edge - EDGE[3]

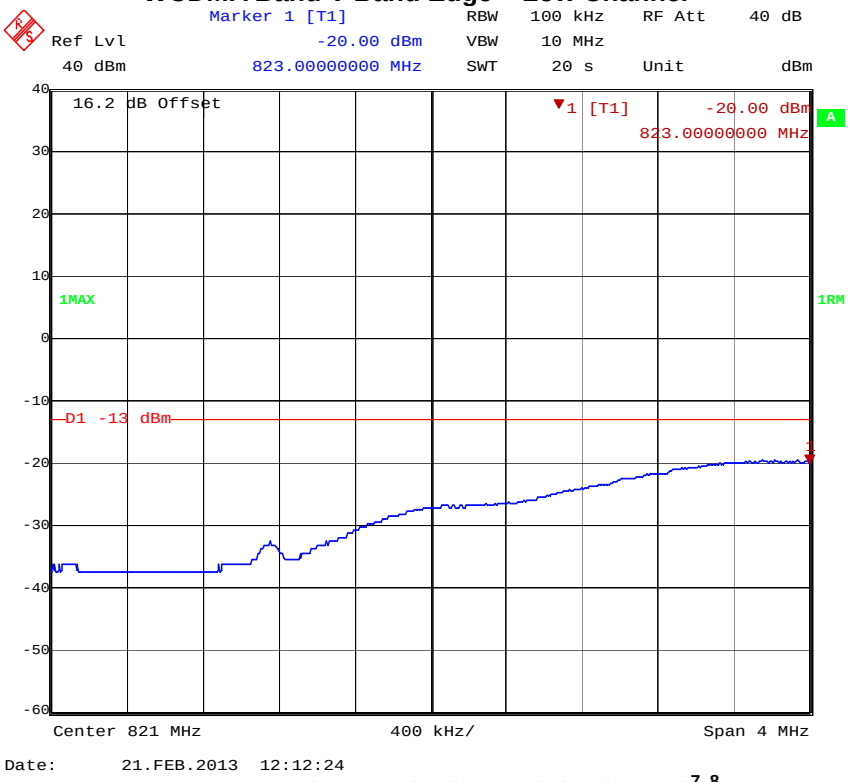


GSM 1900 Band – High Channel Band Edge – EDGE[4]

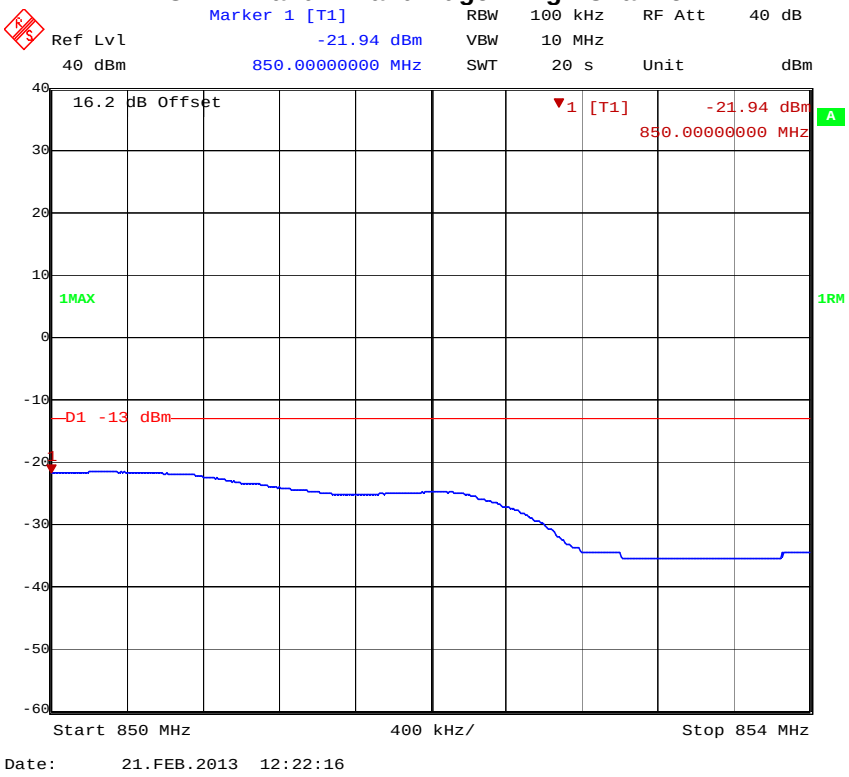


3 Lower resolution bandwidth of 100kHz was used. A correction factor of 10*log(100kHz / 1MHz) was applied.
4 Lower resolution bandwidth of 100kHz was used. A correction factor of 10*log(100kHz / 1MHz) was applied.

WCDMA Band V Band Edge – Low Channel[5, 6]

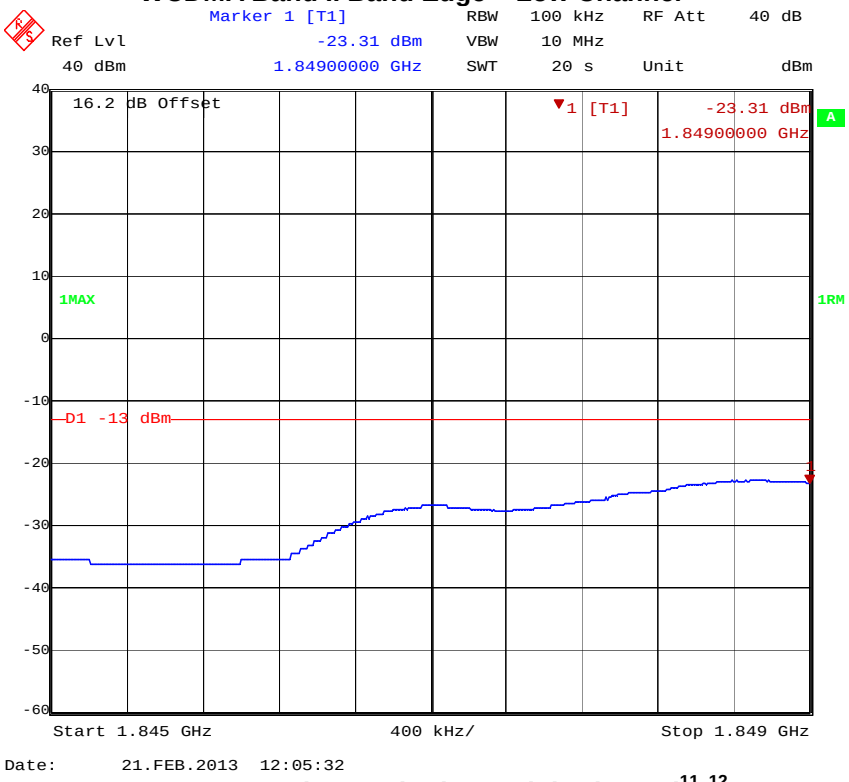


WCDMA Band V Band Edge – High Channel[7, 8]

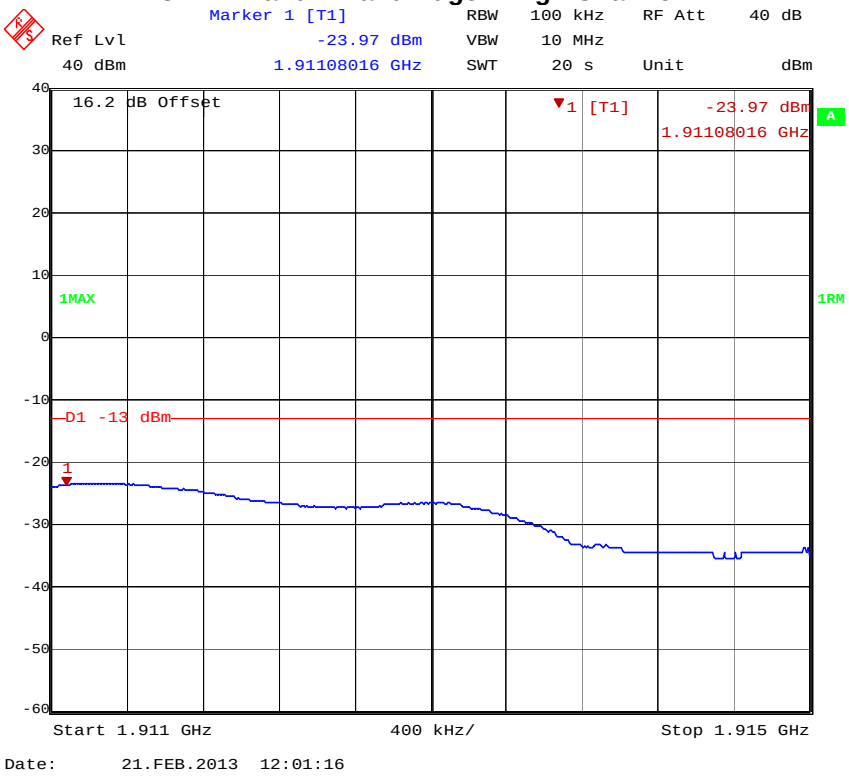


5 Lower resolution bandwidth of 100kHz was used. A correction factor of 10*log(100kHz / 1MHz) was applied.
6 RMS Detector used on measured spectrum.
7 Lower resolution bandwidth of 100kHz was used. A correction factor of 10*log(100kHz / 1MHz) was applied.
8 RMS Detector used on measured spectrum.

WCDMA Band II Band Edge – Low Channel[9, 10]



WCDMA Band II Band Edge – High Channel[11, 12]



9 Lower resolution bandwidth of 100kHz was used. A correction factor of 10*log(100kHz / 1MHz) was applied.
10 RMS Detector used on measured spectrum.
11 Lower resolution bandwidth of 100kHz was used. A correction factor of 10*log(100kHz / 1MHz) was applied.
12 RMS Detector used on measured spectrum.

7 Radiated Output Power

7.1 Test Limits

§ 22.913

(a) (2) The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 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 radiated output power was determined by adding the peak antenna gain to the measured conducted output power to determine the peak radiated power.

$$ERP = ConductedOutputPower(dBm) + AntennaGain(dBi) - 2.15$$

$$EIRP = ConductedOutputPower(dBm) + AntennaGain(dBi)$$

7.3 Results:

The TCA203 meets the radiated power requirements of FCC §22.913 and §24.232.

Radiated Output Power Measurements

Test Engineer: Bryan Taylor
Test Date: 2/21/2013
Temp. / Humidity / Pressure: 23.5C / 41.6% / 988.9mBar
Bandwidth Settings: RBW = VBW = 1MHz
Notes:

Band	Channel	Frequency (MHz)	Conducted Power (dBm)	Peak Antenna Gain (dBi)	EIRP (dBm)	ERP(dBm)
	128	824.2	31.6	4.28	35.88	33.73
	190	836.6	32.46	4.28	36.74	34.59
GSM 850 (GPRS)	251	848.8	31.94	4.28	36.22	34.07
	128	824.2	26.42	4.28	30.70	28.55
	190	836.6	26.56	4.28	30.84	28.69
GSM 850 (EDGE)	251	848.8	26.55	4.28	30.83	28.68
	512	1850.2	28.75	3.00	31.75	29.60
	661	1880	28.67	3.00	31.67	29.52
GSM 1900 (GPRS)	810	1909.8	28.2	3.00	31.20	29.05
	512	1850.2	25.33	3.00	28.33	26.18
	661	1880	25.29	3.00	28.29	26.14
GSM 1900 (EDGE)	810	1909.8	24.89	3.00	27.89	25.74
	4132	826.4	22.14	4.28	26.42	24.27
	4182	836.4	22.18	4.28	26.46	24.31
WCDMA Band V	4233	846.6	22.08	4.28	26.36	24.21
	9262	1852.4	21.98	3.00	24.98	22.83
	9400	1880	22.01	3.00	25.01	22.86
WCDMA Band II	9538	1907.6	22.13	3.00	25.13	22.98

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	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
Bilog Antenna	2362	ETS	3142B	12/26/2012	12/26/2013
Horn Antenna	1096	Antenna Research	DRG118A	8/7/2012	8/7/2013
Horn Antenna	6556	ETS	3115	9/13/2012	9/13/2013
System Controller	121701-1	Sunol Sciences	SC99V	Calibration Not Required	Calibration Not Required
High Pass Filter	3986-01 DC0408	Microwave Circuits, Inc.	H3G020G2	Calibrate at Time Of Use	Calibrate at Time Of Use
Base Station Simulator	1100.008.10	Rohde&Schwarz	CMU200	4/13/2012	4/13/2013
Signal Generator	2065	HP	83620B	3/21/2012	3/21/2013

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. Average detection was used for the radiated spurious emissions reported below.

Worst Case Spurious Measurements – GSM 850 Band – GPRS Mode

Radiated Spurious Emissions Measurement

Test Engineer: Bryan Taylor
Test Date: 3/14/2013
Temp. / Humidity / Pressure: 23.5C / 43.8% / 988.7mBar
Bandwidth Settings: RBW = VBW = 1MHz

Notes: Spurious emissions not reported here were below the measurement noise floor.

			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)
GSM 850 Band; GPRS Mode; Low Channel (128)	1648.4	H	-65.2	-25.56	2.84	6.70	-13	-21.69
	1648.4	V	-65.5	-24.44	2.84	6.70	-13	-20.57
	2472.6	H	-65.41	-22.33	3.78	7.16	-13	-18.95
	2472.6	V	-69.03	-26.38	3.78	7.16	-13	-23.00
	3296.8	H	-54.09	-46	4.42	7.14	-13	-43.28
	3296.8	V	-49.76	-42.68	4.42	7.14	-13	-39.96
	4121	H	-61.08	-50.21	5.31	8.15	-13	-47.38
	4121	V	-66.95	-56.93	5.31	8.15	-13	-54.10
	4945.2	H	-62.4	-49.87	6.24	8.80	-13	-47.31
	4945.2	V	-66.2	-54.86	6.24	8.80	-13	-52.30
	5769.4	H	-62.68	-47.75	6.55	9.27	-13	-45.03
	5769.4	V	-65.28	-49.27	6.55	9.27	-13	-46.55
	6593.6	H	-70.23	-47.38	7.10	9.96	-13	-44.51
	6593.6	V	-72.93	-55.34	7.10	9.96	-13	-52.47
	7417.8	H	-67.45	-45.03	7.71	8.72	-13	-44.02
	7417.8	V	-67.61	-43.39	7.71	8.72	-13	-42.38
	8242	H	-70.6	-45.86	8.25	9.16	-13	-44.95
	8242	V	-70.81	-46.51	8.25	9.16	-13	-45.60
GSM 850 Band; GPRS Mode; Mid Channel (192)	1674	H	-66.41	-31.53	2.93	6.70	-13	-27.76
	1674	V	-66.84	-31.52	2.93	6.70	-13	-27.75
	2511	H	-69.66	-30.9	3.69	7.43	-13	-27.16
	2511	V	-69.9	-30.86	3.69	7.43	-13	-27.12
	3348	H	-53.41	-48.48	4.53	7.19	-13	-45.83
	3348	V	-54.06	-45.97	4.53	7.19	-13	-43.32
	4185	H	-61.1	-51.46	5.36	8.15	-13	-48.67
	4185	V	-63.9	-54.62	5.36	8.15	-13	-51.83
	5022	H	-60.3	-49.95	6.54	8.87	-13	-47.63
	5022	V	-65.7	-54.53	6.54	8.87	-13	-52.21
	5859	H	-54.68	-39.77	6.76	9.57	-13	-36.96
	5859	V	-64.11	-48.95	6.76	9.57	-13	-46.14
	6696	H	-67.89	-50.77	7.23	9.81	-13	-48.19
	6696	V	-70.93	-53.71	7.23	9.81	-13	-51.13
	7533	H	-64.76	-40.85	7.62	9.02	-13	-39.45
	7533	V	-68.45	-44.98	7.62	9.02	-13	-43.58
	8370	H	-70.72	-45.66	8.27	9.22	-13	-44.71
	8370	V	-71.03	-47.6	8.27	9.22	-13	-46.65
GSM 850 Band; GPRS Mode; High Channel (251)	1697.6	H	-67.21	-32.45	2.95	6.70	-13	-28.70
	1697.6	V	-69.03	-33.5	2.95	6.70	-13	-29.75
	2546.4	H	-69.72	-31.5	3.75	7.43	-13	-27.83
	2546.4	V	-69.48	-31.77	3.75	7.43	-13	-28.10
	3395.2	H	-57.76	-52.14	4.54	7.19	-13	-49.50
	3395.2	V	-57.14	-48.36	4.54	7.19	-13	-45.72
	4244	H	-57.38	-48.55	5.48	8.37	-13	-45.67
	4244	V	-65.34	-56.81	5.48	8.37	-13	-53.93
	5092.8	H	-62.87	-49.37	6.56	8.87	-13	-47.07
	5092.8	V	-63.45	-52.34	6.56	8.87	-13	-50.04
	5941.6	H	-54.18	-39.69	6.85	9.53	-13	-37.01
	5941.6	V	-65.31	-49.9	6.85	9.53	-13	-47.22
	6790.4	H	-64.95	-44.53	7.43	9.55	-13	-42.41
	6790.4	V	-68.21	-49.22	7.43	9.55	-13	-47.10
	7639.2	H	-66.67	-45.4	7.43	9.20	-13	-43.63
	7639.2	V	-68.6	-47.54	7.43	9.20	-13	-45.77
	8488	H	-70.56	-43.12	8.36	9.13	-13	-42.35
	8488	V	-70.93	-42.65	8.36	9.13	-13	-41.88
								F=B-C+D

Worst Case Spurious Measurements – GSM 850 Band – EDGE Mode

Radiated Spurious Emissions Measurement

Test Engineer: Bryan Taylor
Test Date: 3/14/2013
Temp. / Humidity / Pressure: 23.5C / 43.8% / 988.7mBar
Bandwidth Settings: RBW = VBW = 1MHz

Notes: Spurious emissions not reported here were below the measurement noise floor.

			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)
GSM 850 Band; EDGE Mode; Low Channel (128)	1648.4	H	-68.2	-28.56	2.84	6.70	-13	-24.69
	1648.4	V	-67.3	-26.24	2.84	6.70	-13	-22.37
	2472.6	H	-68.1	-25.02	3.78	7.16	-13	-21.64
	2472.6	V	-69.34	-26.69	3.78	7.16	-13	-23.31
	3296.8	H	-59.43	-51.34	4.42	7.14	-13	-48.62
	3296.8	V	-55.63	-48.55	4.42	7.14	-13	-45.83
	4121	H	-67.89	-57.02	5.31	8.15	-13	-54.19
	4121	V	-71.45	-61.43	5.31	8.15	-13	-58.60
	4945.2	H	-68.54	-56.01	6.24	8.80	-13	-53.45
	4945.2	V	-71.23	-59.89	6.24	8.80	-13	-57.33
	5769.4	H	-68.7	-53.77	6.55	9.27	-13	-51.05
	5769.4	V	-70.2	-54.19	6.55	9.27	-13	-51.47
	6593.6	H	-71.3	-48.45	7.10	9.96	-13	-45.58
	6593.6	V	-76.4	-58.81	7.10	9.96	-13	-55.94
	7417.8	H	-72.23	-49.81	7.71	8.72	-13	-48.80
	7417.8	V	-73.89	-49.67	7.71	8.72	-13	-48.66
	8242	H	-76.55	-51.81	8.25	9.16	-13	-50.90
	8242	V	-76.42	-52.12	8.25	9.16	-13	-51.21
GSM 850 Band; EDGE Mode; Mid Channel (192)	1674	H	-66.36	-31.48	2.93	6.70	-13	-27.71
	1674	V	-64.78	-29.46	2.93	6.70	-13	-25.69
	2511	H	-68.56	-29.8	3.69	7.43	-13	-26.06
	2511	V	-69.45	-30.41	3.69	7.43	-13	-26.67
	3348	H	-57.91	-52.98	4.53	7.19	-13	-50.33
	3348	V	-59.12	-51.03	4.53	7.19	-13	-48.38
	4185	H	-66.82	-57.18	5.36	8.15	-13	-54.39
	4185	V	-67.59	-58.31	5.36	8.15	-13	-55.52
	5022	H	-68.54	-58.19	6.54	8.87	-13	-55.87
	5022	V	-69.66	-58.49	6.54	8.87	-13	-56.17
	5859	H	-62.49	-47.58	6.76	9.57	-13	-44.77
	5859	V	-69.54	-54.38	6.76	9.57	-13	-51.57
	6696	H	-71.33	-54.21	7.23	9.81	-13	-51.63
	6696	V	-76.56	-59.34	7.23	9.81	-13	-56.76
	7533	H	-74.35	-50.44	7.62	9.02	-13	-49.04
	7533	V	-73.43	-49.96	7.62	9.02	-13	-48.56
	8370	H	-76.45	-51.39	8.27	9.22	-13	-50.44
	8370	V	-74.42	-50.99	8.27	9.22	-13	-50.04
GSM 850 Band; EDGE Mode; High Channel (251)	1697.6	H	-67.54	-32.78	2.95	6.70	-13	-29.03
	1697.6	V	-68.98	-33.45	2.95	6.70	-13	-29.70
	2546.4	H	-68.17	-29.95	3.75	7.43	-13	-26.28
	2546.4	V	-68.57	-30.86	3.75	7.43	-13	-27.19
	3395.2	H	-64.77	-59.15	4.54	7.19	-13	-56.51
	3395.2	V	-65.43	-56.65	4.54	7.19	-13	-54.01
	4244	H	-64.86	-56.03	5.48	8.37	-13	-53.15
	4244	V	-70.01	-61.48	5.48	8.37	-13	-58.60
	5092.8	H	-68.56	-55.06	6.56	8.87	-13	-52.76
	5092.8	V	-68.23	-57.12	6.56	8.87	-13	-54.82
	5941.6	H	-60.11	-45.62	6.85	9.53	-13	-42.94
	5941.6	V	-67.47	-52.06	6.85	9.53	-13	-49.38
	6790.4	H	-70.65	-50.23	7.43	9.55	-13	-48.11
	6790.4	V	-71.67	-52.68	7.43	9.55	-13	-50.56
	7639.2	H	-73.33	-52.06	7.43	9.20	-13	-50.29
	7639.2	V	-74.12	-53.06	7.43	9.20	-13	-51.29
	8488	H	-75.99	-48.55	8.36	9.13	-13	-47.78
	8488	V	-75.43	-47.15	8.36	9.13	-13	-46.38
								F=B-C+D

Worst Case Spurious Measurements – GSM 1900 Band – GPRS Mode

Radiated Spurious Emissions Measurement

Test Engineer: Bryan Taylor
Test Date: 3/14/2013
Temp. / Humidity / Pressure: 23.5C / 43.8% / 988.7mBar
Bandwidth Settings: RBW = VBW = 1MHz

Notes: Spurious emissions not reported here were below the measurement noise floor.

			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)
GSM 1900 Band; GPRS Mode; Low Channel (512)	3700.4	H	-40.88	-32.83	4.92	7.07	-13	-30.68
	3700.4	V	-40.72	-32.88	4.92	7.07	-13	-30.73
	5550.6	H	-45.14	-31.86	6.46	8.48	-13	-29.84
	5550.6	V	-48.78	-35.01	6.46	8.48	-13	-32.99
	7400.8	H	-69.38	-47.4	7.71	8.72	-13	-46.39
	7400.8	V	-71.82	-49.75	7.71	8.72	-13	-48.74
	9251	H	-73.81	-44.38	9.40	9.41	-13	-44.38
	9251	V	-69.45	-43.19	9.40	9.41	-13	-43.19
	11101.2	H	-72.28	-42.13	9.01	10.70	-13	-40.44
	11101.2	V	-73.5	-42.21	9.01	10.70	-13	-40.52
GSM 1900 Band; GPRS Mode; Mid Channel (661)	3760	H	-39.71	-28.85	4.87	7.07	-13	-26.65
	3760	V	-44.58	-35.64	4.87	7.07	-13	-33.44
	5640	H	-41.56	-27.95	6.45	8.84	-13	-25.56
	5640	V	-45.29	-32.17	6.45	8.84	-13	-29.78
	7520	H	-72.12	-47.73	7.62	9.02	-13	-46.33
	7520	V	-71.71	-47.68	7.62	9.02	-13	-46.28
	9400	H	-69.46	-41.52	9.50	9.52	-13	-41.50
	9400	V	-71.81	-44.87	9.50	9.52	-13	-44.85
	11280	H	-70.78	-38.26	8.02	10.65	-13	-35.64
	11280	V	-69.95	-37.72	8.02	10.65	-13	-35.10
GSM 1900 Band; GPRS Mode; High Channel (810)	3819.6	H	-45.08	-35.31	4.99	6.73	-13	-33.56
	3819.6	V	-40.9	-27.93	4.99	6.73	-13	-26.18
	5729.4	H	-42.61	-27.1	6.71	9.27	-13	-24.54
	5729.4	V	-42.38	-30.78	6.71	9.27	-13	-28.22
	7639.2	H	-68.35	-46.9	7.43	9.20	-13	-45.13
	7639.2	V	-72.57	-48.93	7.43	9.20	-13	-47.16
	9549	H	-71.84	-41.08	9.61	9.77	-13	-40.91
	9549	V	-70.28	-41.96	9.61	9.77	-13	-41.79
	11458.8	H	-71.29	-40.98	9.19	10.54	-13	-39.63
	11458.8	V	-71.51	-40.17	9.19	10.54	-13	-38.82
								F=B-C+D

Worst Case Spurious Measurements – GSM 1900 Band – EDGE Mode

Radiated Spurious Emissions Measurement

Test Engineer: Bryan Taylor
Test Date: 3/14/2013
Temp. / Humidity / Pressure: 23.5C / 43.8% / 988.7mBar
Bandwidth Settings: RBW = VBW = 1MHz

Notes: Spurious emissions not reported here were below the measurement noise floor.

			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)
GSM 1900 Band; EDGE Mode; Low Channel (512)	3700.4	H	-43.68	-35.63	4.92	7.07	-13	-33.48
	3700.4	V	-43.52	-35.68	4.92	7.07	-13	-33.53
	5550.6	H	-47.94	-34.66	6.46	8.48	-13	-32.64
	5550.6	V	-51.58	-37.81	6.46	8.48	-13	-35.79
	7400.8	H	-72.18	-50.2	7.71	8.72	-13	-49.19
	7400.8	V	-74.62	-52.55	7.71	8.72	-13	-51.54
	9251	H	-76.61	-47.18	9.40	9.41	-13	-47.18
	9251	V	-72.25	-45.99	9.40	9.41	-13	-45.99
	11101.2	H	-75.08	-44.93	9.01	10.70	-13	-43.24
	11101.2	V	-76.3	-45.01	9.01	10.70	-13	-43.32
GSM 1900 Band; EDGE Mode; Mid Channel (661)	3760	H	-42.51	-31.65	4.87	7.07	-13	-29.45
	3760	V	-47.38	-38.44	4.87	7.07	-13	-36.24
	5640	H	-44.36	-30.75	6.45	8.84	-13	-28.36
	5640	V	-48.09	-34.97	6.45	8.84	-13	-32.58
	7520	H	-74.92	-50.53	7.62	9.02	-13	-49.13
	7520	V	-74.51	-50.48	7.62	9.02	-13	-49.08
	9400	H	-72.26	-44.32	9.50	9.52	-13	-44.30
	9400	V	-74.61	-47.67	9.50	9.52	-13	-47.65
	11280	H	-73.58	-41.06	8.02	10.65	-13	-38.44
	11280	V	-72.75	-40.52	8.02	10.65	-13	-37.90
GSM 1900 Band; EDGE Mode; High Channel (810)	3819.6	H	-47.88	-38.11	4.99	6.73	-13	-36.36
	3819.6	V	-43.7	-30.73	4.99	6.73	-13	-28.98
	5729.4	H	-45.41	-29.9	6.71	9.27	-13	-27.34
	5729.4	V	-45.18	-33.58	6.71	9.27	-13	-31.02
	7639.2	H	-71.15	-49.7	7.43	9.20	-13	-47.93
	7639.2	V	-75.37	-51.73	7.43	9.20	-13	-49.96
	9549	H	-74.64	-43.88	9.61	9.77	-13	-43.71
	9549	V	-73.08	-44.76	9.61	9.77	-13	-44.59
	11458.8	H	-74.09	-43.78	9.19	10.54	-13	-42.43
	11458.8	V	-74.31	-42.97	9.19	10.54	-13	-41.62
								F=B-C+D

Worst Case Spurious Measurements – WCDMA Band V

Radiated Spurious Emissions Measurement

Test Engineer: Bryan Taylor
Test Date: 3/15/2013
Temp. / Humidity / Pressure: 23.5C / 43.8% / 988.7mBar
Bandwidth Settings: RBW = VBW = 1MHz

Notes: Spurious emissions not reported here were below the measurement noise floor.

			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)
WCDMA Band V Channel 4132 (826.4MHz)	1652.8	H	-53.08	-18.52	2.84	6.70	-13	-14.66
	1652.8	V	-55.61	-20.8	2.84	6.70	-13	-16.94
	2479.2	H	-66.86	-29.15	3.62	7.16	-13	-25.61
	2479.2	V	-71.55	-33.08	3.62	7.16	-13	-29.54
WCDMA Band V Channel 4182 (836.4MHz)	1672.8	H	-61.61	-26.31	2.93	6.70	-13	-22.54
	1672.8	V	-53.18	-18.06	2.93	6.70	-13	-14.29
	2509.2	H	-68.31	-31.48	3.69	7.43	-13	-27.74
	2509.2	V	-65.97	-27.37	3.69	7.43	-13	-23.63
WCDMA Band V Channel 4233 (846.6MHz)	1693.2	H	-53.94	-18.97	2.94	6.70	-13	-15.20
	1693.2	V	-52.62	-17.05	2.94	6.70	-13	-13.28
	2539.8	H	-77.64	-38.98	3.78	7.43	-13	-35.34
	2539.8	V	-67.59	-28.66	3.78	7.43	-13	-25.02
								F=B-C+D

Worst Case Spurious Measurements – WCDMA Band II

Radiated Spurious Emissions Measurement

Test Engineer: Bryan Taylor
Test Date: 3/15/2013
Temp. / Humidity / Pressure: 23.5C / 43.8% / 988.7mBar
Bandwidth Settings: RBW = VBW = 1MHz

Notes: Spurious emissions not reported here were below the measurement noise floor.

			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)
WCDMA Band II Channel 9262 (1852.4MHz)	3704.8	H	-50.23	-41.18	4.88	7.07	-13	-38.99
	3704.8	V	-43.1	-35.79	4.88	7.07	-13	-33.60
	5557.2	H	-46.16	-32.7	6.52	8.48	-13	-30.74
	5557.2	V	-51.01	-36.47	6.52	8.48	-13	-34.51
	7409.6	H	-70.99	-47.66	7.71	8.72	-12	-46.65
	7409.6	V	-71.02	-48.55	7.71	8.72	-11	-47.54
WCDMa Band II Channel 9400 (1880MHz)	3760	H	-51.69	-43.23	4.87	7.07	-13	-41.03
	3760	V	-51.53	-41.11	4.87	7.07	-13	-38.91
	5640	H	-49.48	-35.81	6.45	8.84	-13	-33.42
	5640	V	-49.76	-37.93	6.45	8.84	-13	-35.54
	7520	H	-72.39	-49.69	7.62	9.02	-12	-48.29
	7520	V	-71.82	-47.31	7.62	9.02	-11	-45.91
WCDMA Band II Channel 9538 (1907.6MHz)	3815.2	H	-52.18	-42.31	5.00	6.73	-13	-40.58
	3815.2	V	-54.61	-44.07	5.00	6.73	-13	-42.34
	5722.8	H	-52.28	-39.27	6.89	9.27	-13	-36.90
	5722.8	V	-50.98	-37.69	6.89	9.27	-13	-35.32
	7630.4	H	-71.56	-48.79	7.43	9.20	-12	-47.02
	7630.4	V	-72.43	-49.9	7.43	9.20	-11	-48.13
								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 AC variac 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
Base Station Simulator	1100.008.10	Rohde&Schwarz	CMU200	4/13/2012	4/13/2013
Environmental Chamber	29410	Thermotron	SE-1000-5-5	4/25/2012	4/25/2013
Multimeter	1705	Fluke	87	7/27/2012	7/27/2013

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 GSM 850 Band – GPRS Mode

Operating Freqeuncy: 837,000,000 Hz
Channel: 192
Reference Voltage: 115 VAC
Deviation Limit: 2.5 ppm
Notes: Frequency Stability in GSM 850 Band, GPRS Mode

Voltage (%)	Voltage (VAC)	Temp (℃)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100%	115	-30	24	0.0000029	0.0287
100%	115	-20	26	0.0000031	0.0311
100%	115	-10	-28	-0.0000033	-0.0335
100%	115	0	-23	-0.0000027	-0.0275
100%	115	10	-31	-0.0000037	-0.0370
100%	115	20	-32	-0.0000038	-0.0382
100%	115	30	-29	-0.0000035	-0.0346
100%	115	40	27	0.0000032	0.0323
100%	115	50	17	0.0000020	0.0203
100%	115	60	21	0.0000025	0.0251
115%	138	20	-15	-0.0000018	-0.0179
85%	93.5	20	-11	-0.0000013	-0.0131

Frequency Stability for GSM 1900 Band – GPRS Mode

Operating Freqeuncy: 1,880,000,000 Hz
Channel: 661
Reference Voltage: 115 VAC
Deviation Limit: 2.5 ppm
Notes: Frequency Stability in GSM 1900 Band, GPRS Mode

Voltage (%)	Voltage (VAC)	Temp (℃)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100%	115	-30	46	0.0000024	0.0245
100%	115	-20	24	0.0000013	0.0128
100%	115	-10	-31	-0.0000016	-0.0165
100%	115	0	-51	-0.0000027	-0.0271
100%	115	10	-59	-0.0000031	-0.0314
100%	115	20	49	0.0000026	0.0261
100%	115	30	-36	-0.0000019	-0.0191
100%	115	40	45	0.0000024	0.0239
100%	115	50	27	0.0000014	0.0144
100%	115	60	35	0.0000019	0.0186
115%	138	20	23	0.0000012	0.0122
85%	93.5	20	26	0.0000014	0.0138

Frequency Stability for GSM 850 Band – EDGE Mode

Operating Freqeuncy: 837,000,000 Hz
Channel: 192
Reference Voltage: 115 VAC
Deviation Limit: 2.5 ppm
Notes: Frequency Stability in GSM 850 Band, EDGE Mode

Voltage (%)	Voltage (VAC)	Temp (℃)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100%	115	-30	50	0.0000060	0.0597
100%	115	-20	-18	-0.0000022	-0.0215
100%	115	-10	-34	-0.0000041	-0.0406
100%	115	0	-34	-0.0000041	-0.0406
100%	115	10	-38	-0.0000045	-0.0454
100%	115	20	-35	-0.0000042	-0.0418
100%	115	30	-18	-0.0000022	-0.0215
100%	115	40	-20	-0.0000024	-0.0239
100%	115	50	22	0.0000026	0.0263
100%	115	60	26	0.0000031	0.0311
115%	138	20	-34	-0.0000041	-0.0406
85%	93.5	20	-44	-0.0000053	-0.0526

Frequency Stability for GSM 1900 Band – EDGE Mode

Operating Freqeuncy: 1,880,000,000 Hz
Channel: 661
Reference Voltage: 115 VAC
Deviation Limit: 2.5 ppm
Notes: Frequency Stability in GSM 1900 Band, EDGE Mode

Voltage (%)	Voltage (VAC)	Temp (℃)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100%	115	-30	67	0.0000036	0.0356
100%	115	-20	45	0.0000024	0.0239
100%	115	-10	-29	-0.0000015	-0.0154
100%	115	0	-79	-0.0000042	-0.0420
100%	115	10	-54	-0.0000029	-0.0287
100%	115	20	-43	-0.0000023	-0.0229
100%	115	30	-31	-0.0000016	-0.0165
100%	115	40	36	0.0000019	0.0191
100%	115	50	24	0.0000013	0.0128
100%	115	60	23	0.0000012	0.0122
115%	138	20	-29	-0.0000015	-0.0154
85%	93.5	20	-57	-0.0000030	-0.0303

Frequency Stability for WCDMA Band V

Operating Freqeuncy: 836,400,000 Hz
Channel: 4182
Reference Voltage: 115 VAC
Deviation Limit: 2.5 ppm
Notes: Frequency Stability in WCDMA Band V Mode

Voltage (%)	Voltage (VAC)	Temp (℃)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100%	115	-30	-19	-0.0000023	-0.0227
100%	115	-20	-18	-0.0000022	-0.0215
100%	115	-10	-24	-0.0000029	-0.0287
100%	115	0	-18	-0.0000022	-0.0215
100%	115	10	-29	-0.0000035	-0.0346
100%	115	20	-18	-0.0000022	-0.0215
100%	115	30	17	0.0000020	0.0203
100%	115	40	17	0.0000020	0.0203
100%	115	50	20	0.0000024	0.0239
100%	115	60	18	0.0000022	0.0215
115%	138	20	-12	-0.0000014	-0.0143
85%	93.5	20	-19	-0.0000023	-0.0227

Frequency Stability for WCDMA Band II

Operating Freqeuncy: 1,880,000,000 Hz
Channel: 9400
Reference Voltage: 115 VAC
Deviation Limit: 2.5 ppm
Notes: Frequency Stability in WCDMA Band II Mode

Voltage (%)	Voltage (VAC)	Temp (℃)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100%	115	-30	-33	-0.0000018	-0.0176
100%	115	-20	-35	-0.0000019	-0.0186
100%	115	-10	-41	-0.0000022	-0.0218
100%	115	0	-40	-0.0000021	-0.0213
100%	115	10	-43	-0.0000023	-0.0229
100%	115	20	32	0.0000017	0.0170
100%	115	30	-32	-0.0000017	-0.0170
100%	115	40	-38	-0.0000020	-0.0202
100%	115	50	47	0.0000025	0.0250
100%	115	60	49	0.0000026	0.0261
115%	138	20	34	0.0000018	0.0181
85%	93.5	20	-34	-0.0000018	-0.0181

10 Radiated Spurious Emissions (Receiver)

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

These limits are identical to those in RSS-GEN

10.2 Test Procedure

ANSI C63.4: 2009

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

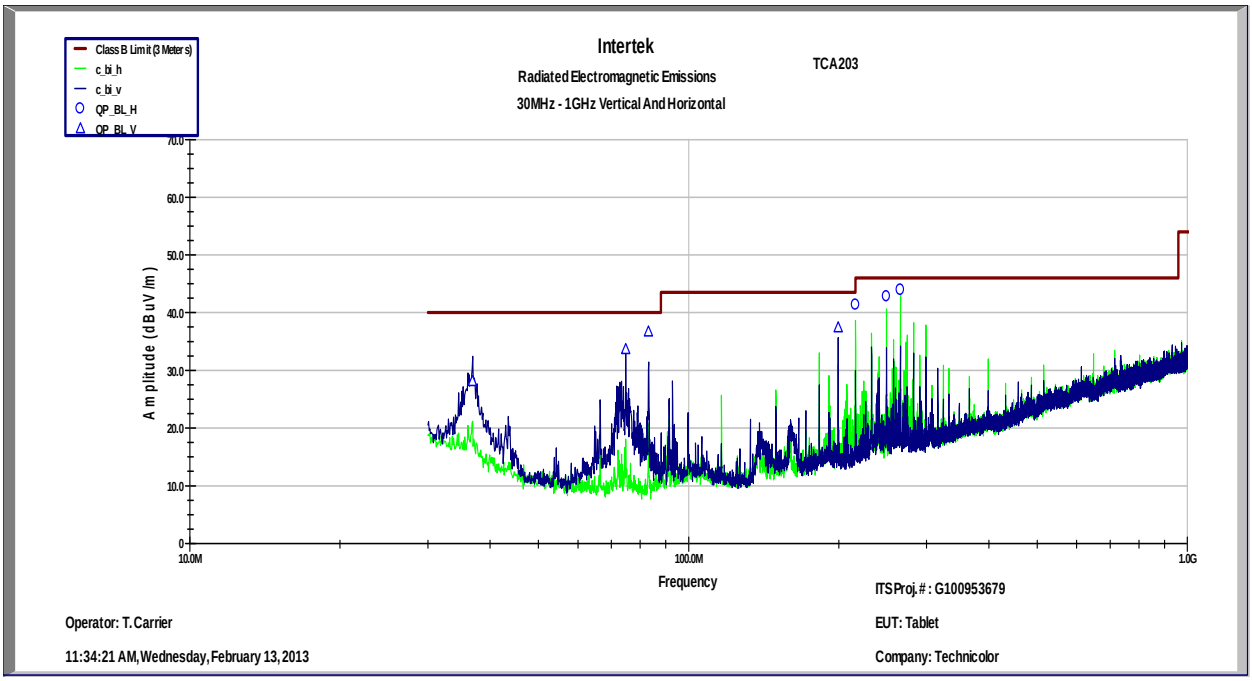
FS = 19.48 + 18.52 + 0.78 = 38.78 dBμV/m
Level in μV/m = Common Antilogarithm [(38.78 dBμV/m)/20] = 86.89 μV/m

10.4 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	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
System Controller	121701-1	Sunol Sciences	SC99V	Calibration Not Required	Calibration Not Required
Base Station Simulator	1100.008.10	Rohde&Schwarz	CMU200	4/13/2012	4/13/2013

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 and RSS-GEN Section 6.1.



Peak Scan (Receive Mode)

Radiated Emissions										
Test Engineer:	Toby Carrier	**Start Date:**	2/13/2013	**End Date:**	2/13/2013					
Temperature:	24.7℃	**Humidity:**	26.80%	**Pressure:**	979.9 mbar					
Specification:	FCC Part 15B	**Test Limit:**	Class B							
Notes:	Idle 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**
36.89 MHz	V	13.3	0.79	13.99	28.08	40	-11.92	120kHz/QP	3m	**Compliant**
74.83 MHz	V	26.07	1.13	6.42	33.62	40	-6.38	120kHz/QP	3m	**Compliant**
83.118 MHz	V	28.58	1.19	6.9	36.67	40	-3.33	120kHz/QP	3m	**Compliant**
199.52 MHz	V	25.06	1.89	10.45	37.4	43.52	-6.12	120kHz/QP	3m	**Compliant**
216.13 MHz	H	28.15	1.96	11.22	41.33	46.02	-4.69	120kHz/QP	3m	**Compliant**
249.4 MHz	H	28.3	2.11	12.39	42.8	46.02	-3.22	120kHz/QP	3m	**Compliant**
265.99 MHz	H	28.7	2.21	13.02	43.93	46.02	-2.09	120kHz/QP	3m	**Compliant**
Calculations:					F = C + D + E		H = F - G			

Maximized Emissions

11 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	

12 Revision History

Revision Level	Date	Report Number	Notes
0	4/4/2013	100953679LEX-002	Original Issue