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TEST REPORT

Report Number:	**101417400LEX-002**
Project Number:	**G101417400**
Report Issue Date:	**4/24/2014**
Product Name:	**CELLX 4**
Model Number:	**CELLX 4**
FCCID:	**L4Q-GSM04VOIPUS**
ICID:	**8763A-GSM04VOIPUS**
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:
TELES AG
Ernst-Reuter-Platz 8
10587 Berlin, Germany

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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 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. The test site is listed with Industry Canada under OATS site number 2042M-1

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
12	Occupied Bandwidth	§2.1049, §22.917(b)(d), and §24.238(a)	RSS-GEN (4.6.1), RSS-133 (2.3)	Pass
14	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
24	Radiated Output Power	§ 22.913(a) and § 24.232(c)	RSS-132 (4.4), RSS-133 (6.4)	Pass
27	Radiated Spurious Emissions (Transmitter)	§2.1053, §22.917(a)(b), and §24.238(a)(b)	RSS-132 (4.5), RSS-133 (6.5)	Pass
31	Frequency Stability	§2.1055, §22.355, and §24.235	RSS-132 (4.3), RSS-133 (6.3)	Pass

3 Description of Equipment Under Test

Equipment Under Test	
Manufacturer	TELES AG
Model Number	CELLX 4
Serial Number	97803460700314
FCC Identifier	L4Q-GSM04VOIPUS
IC Identifier	8763A-GSM04VOIPUS
Receive Date	1/1/2014
Test Start Date	2/21/2014
Test End Date	3/17/2014
Device Received Condition	Good
Test Sample Type	Production
Frequency Band	824MHz - 849MHz (GSM 850 Band) 1850MHz – 1910MHz (GSM 1900 Band)
Modulation Type	GSM (GMSK)
Transmission Control	Base Station Simulator
Maximum Output Power (Conducted With Four Modules Transmitting)	33.9 dBm (GSM 850 Band) 30.28 dBm (GSM 1900 Band)
Test Channels	128, 192, & 251 (GSM 850 Band) 512, 661, & 810 (GSM 1900 Band)
Antenna Type	SMA Connector
Operating Voltage	115VAC/60Hz (Via AC / DC Power Adapter)

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Cellular Gateway	TELES AG	CELLX 4	97803460700314

Receive Date:	1/1/2014
Received Condition:	Good
Type:	Production

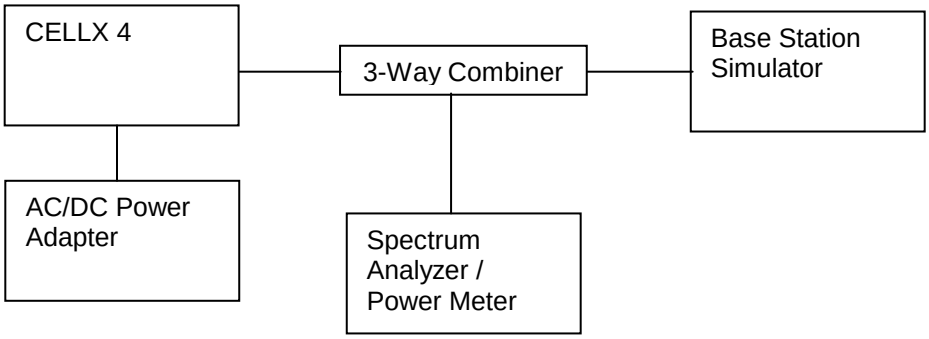
Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Transmitting a GSM 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	Ethernet Hub
DC Power Cable	5 ft	None	None	Test Sample	AC/DC Power Converter
RJ11 Cable	6 ft	None	None	RJ11 Port	Telephone

3.4 Support Equipment:

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Ethernet Hub	Netgear	EN106	ENT6B03054560

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).

§22.913 (a)

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

§ 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.

§ 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.

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	3917	Rohde&Schwarz	CMW500	9/26/2013	9/26/2014
Environmental Chamber	3947	Test Equity	115A	Time Of Use	Time Of Use
Spectrum Analyzer	3720	Rohde & Schwarz	FSEK 30	9/10/2013	9/10/2014
Multimeter/Temp Meter	3400	Fluke	289	5/29/2013	5/29/2014
Spectrum Analyzer	3099	Rohde & Schwarz	FSP7	9/12/2013	9/12/2014
Directional Coupler	08736	Narda	4226-20	Time of Use	Time of Use
Power Meter	3287	Giga tronics	8651A	10/14/2013	10/14/2014
Power sensor	3168	Giga tronics	80601A	10/15/2013	10/15/2014

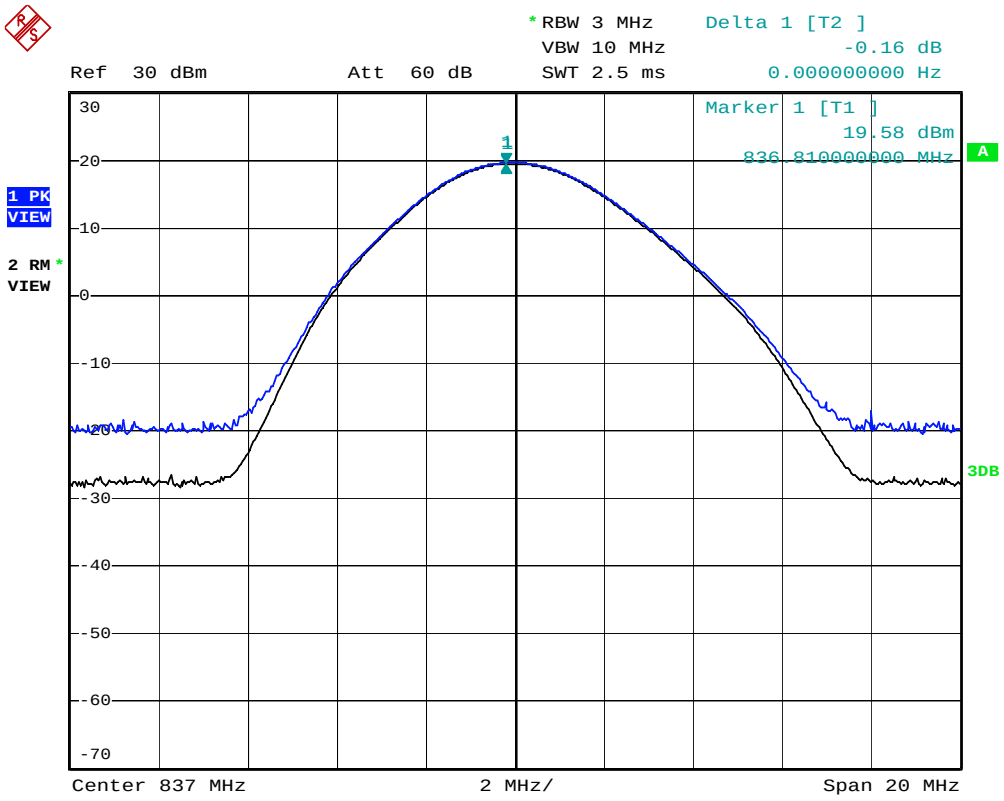
5 Results:

The device transmits an uncorrelated MIMO signal with one antenna shared between four GSM transmitter modules. In accordance with KDB 662911 an additional factor of 10*log(Nant) or 6 dB was considered when comparing the measurements to the limit.

Conducted Output Power (Single Module Transmitting)

BAND	Channel	AVG (dBm)	PAR
GSM 850	LOW	27.82	---
GSM 850	MID	27.90	0.16
GSM 850	HIGH	27.41	---
GSM 1900	LOW	23.97	---
GSM 1900	MID	24.28	0.17
GSM 1900	HIGH	23.69	--

Peak–to–Average Ratio (GSM850 Band)



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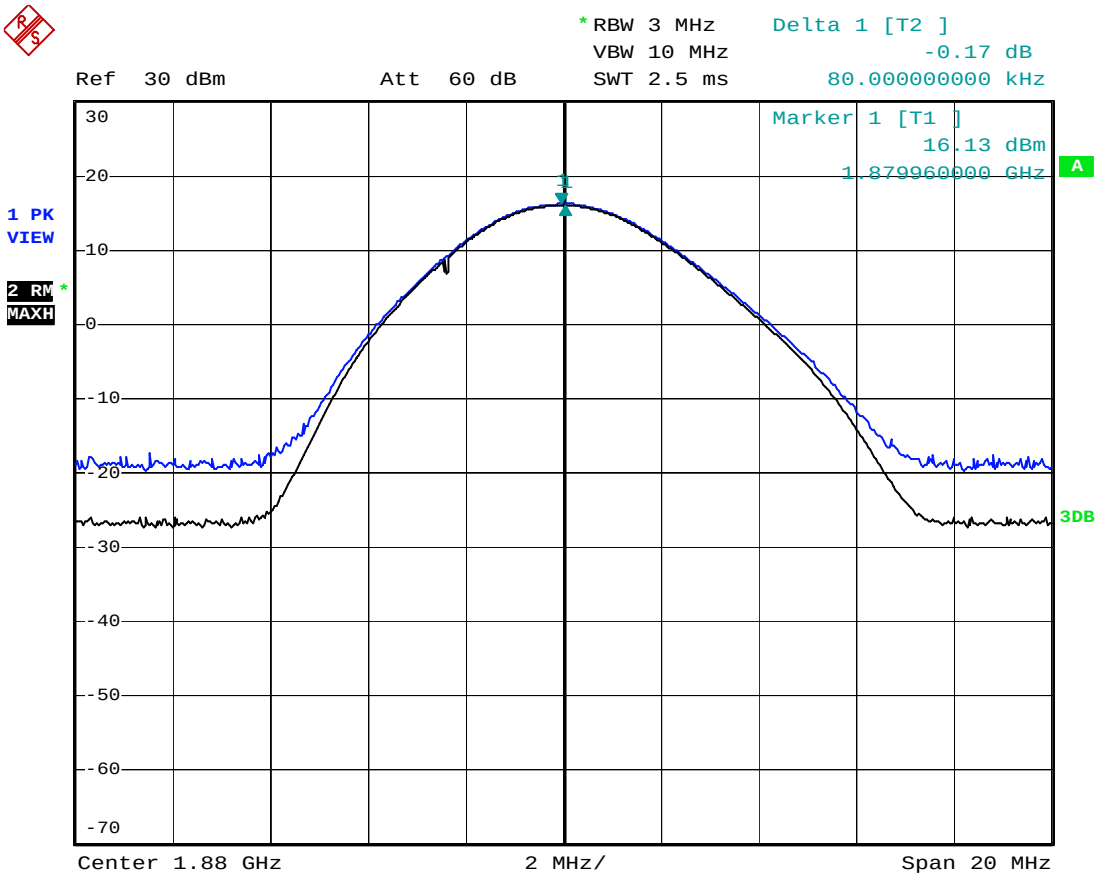
Peak–to–Average Ratio – (GSM1900 Band)



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6 Occupied Bandwidth

6.1 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.

6.2 Test Procedure

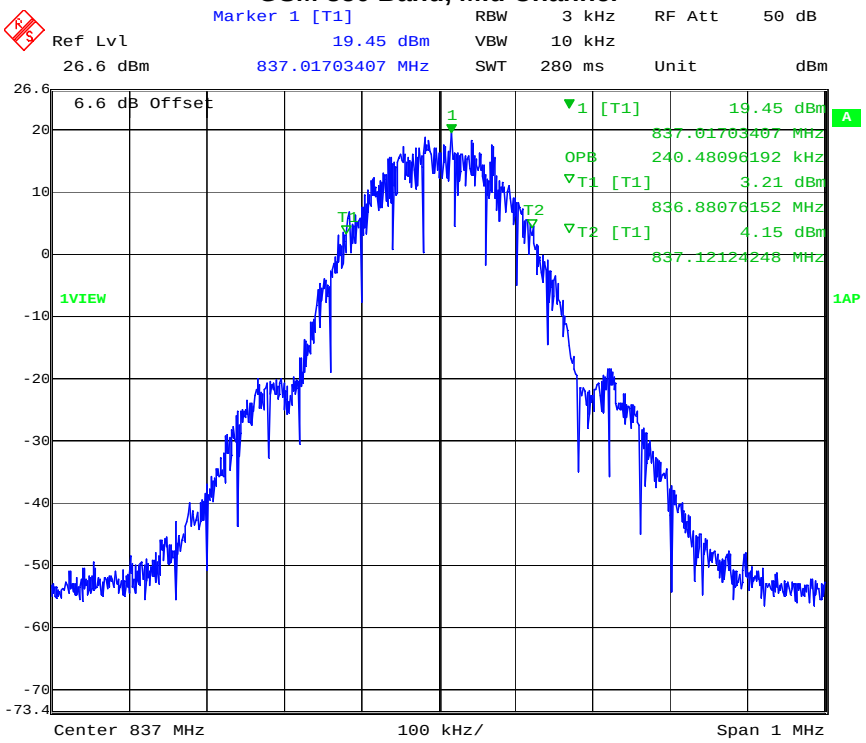
The EUT was connected to a spectrum analyzer using a coaxial cable and power divider. The EUT was placed into a call using base station simulator. The base station simulator was set to force the EUT to its maximum power setting. The occupied bandwidth function of the analyzer was used to automatically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

6.3 Test Equipment Used:

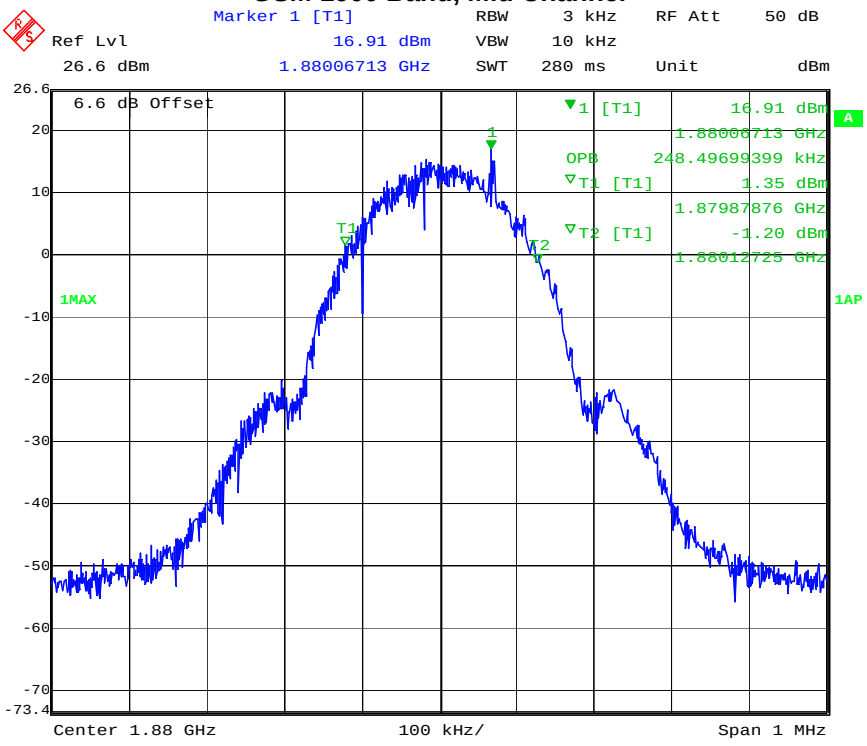
Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Base Station Simulator	3917	Rohde&Schwarz	CMW500	9/26/2013	9/26/2014
Spectrum Analyzer	3099	Rohde & Schwarz	FSP7	9/12/2013	9/12/2014
Directional Coupler	08736	Narda	4226-20	Time of Use	Time of Use

6.4 Results:

GSM 850 Band, Mid Channel



GSM 1900 Band, Mid Channel



7 Conducted Spurious Emissions at Antenna Terminals

7.1 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.

7.2 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 and the detector was set to peak detection for general scans up to the 10th harmonic. Emissions scans near the fundamental were measured using an RMS detector. Sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

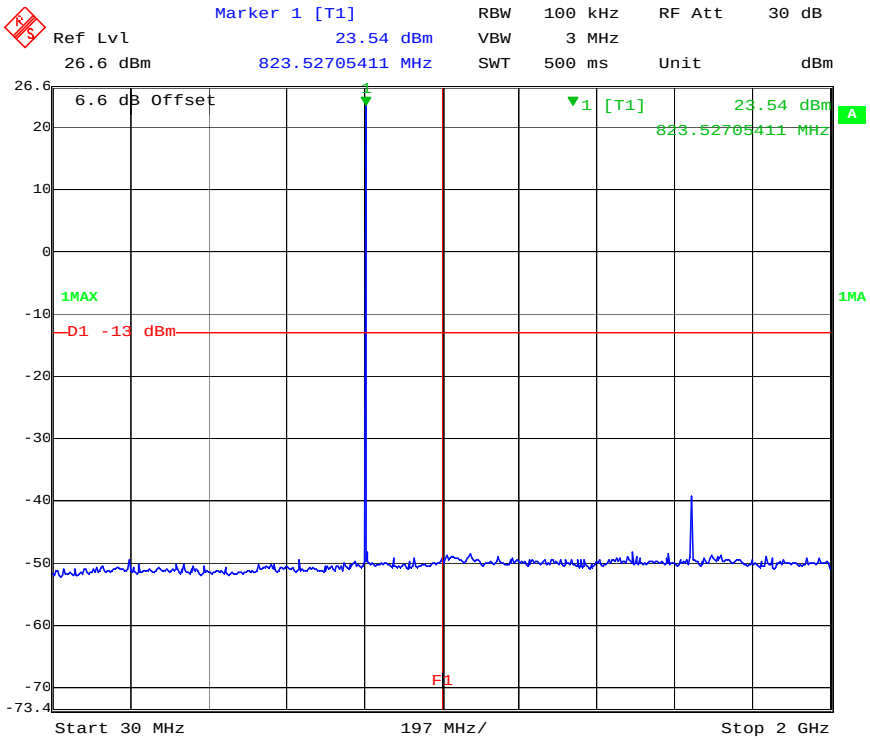
7.3 Test Equipment Used:

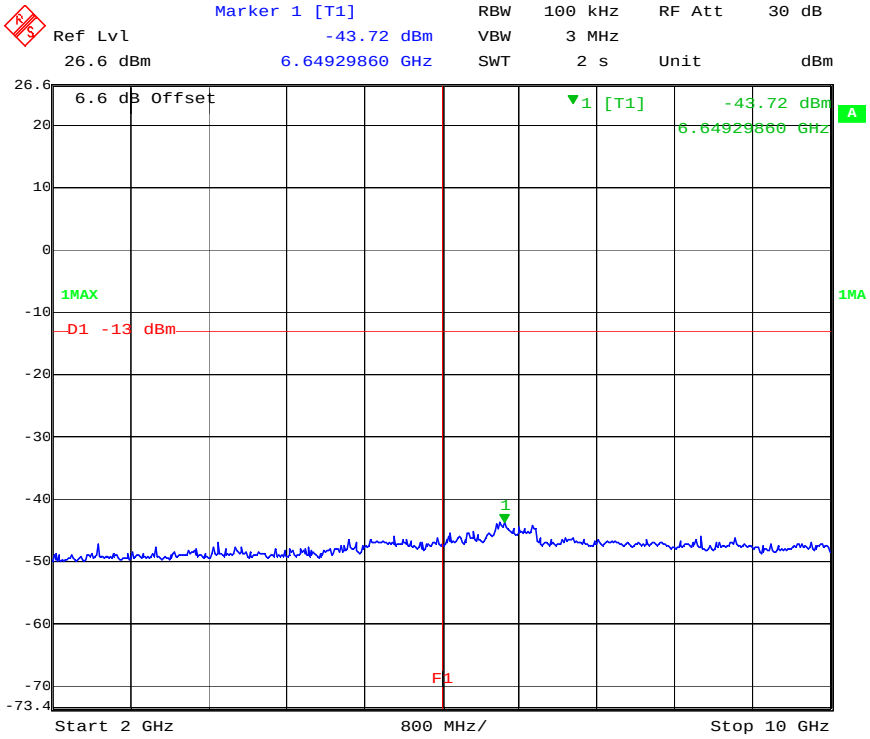
Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Base Station Simulator	3917	Rohde&Schwarz	CMW500	9/26/2013	9/26/2014
Spectrum Analyzer	3720	Rohde & Schwarz	FSEK 30	9/10/2013	9/10/2014
Multimeter/Temp Meter	3400	Fluke	289	5/29/2013	5/29/2014
Spectrum Analyzer	3099	Rohde & Schwarz	FSP7	9/12/2013	9/12/2014
Directional Coupler	08736	Narda	4226-20	Time of Use	Time of Use

7.4 Results:

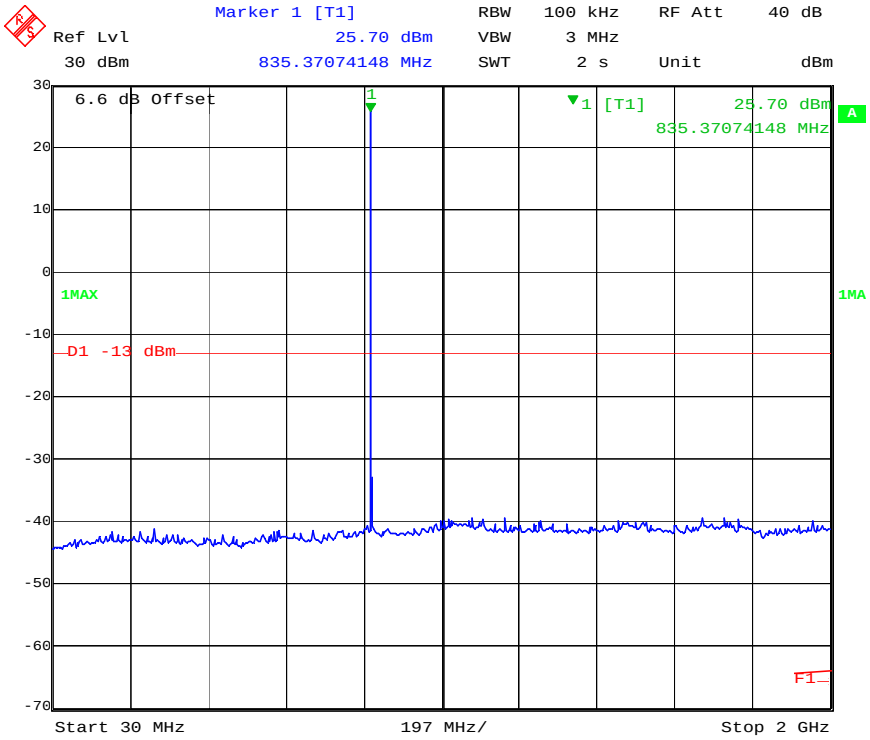
The following plots show that all spurious emissions are attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. Plots for emissions within 1MHz of the band edge as well as for emission outside of this range are shown. The device transmits an uncorrelated MIMO signal with one antenna shared between four GSM transmitter modules. In accordance with KDB 662911 an additional factor of 10*log(Nant) or 6 dB was considered when comparing the measurements to the limit.

GSM 850 Band - Low Channel





GSM 850 Band – Mid Channel



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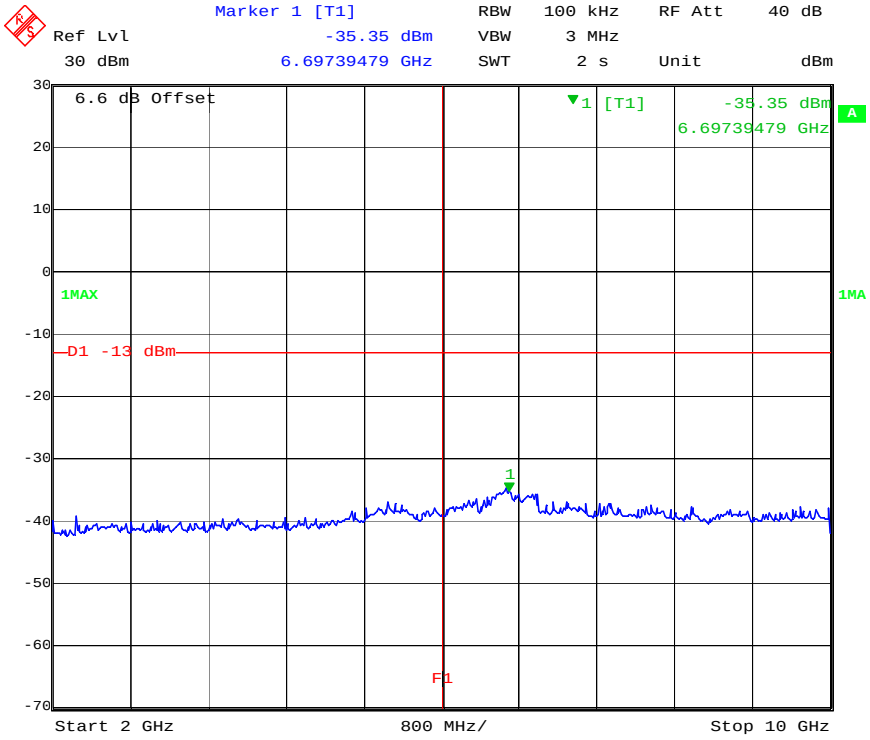

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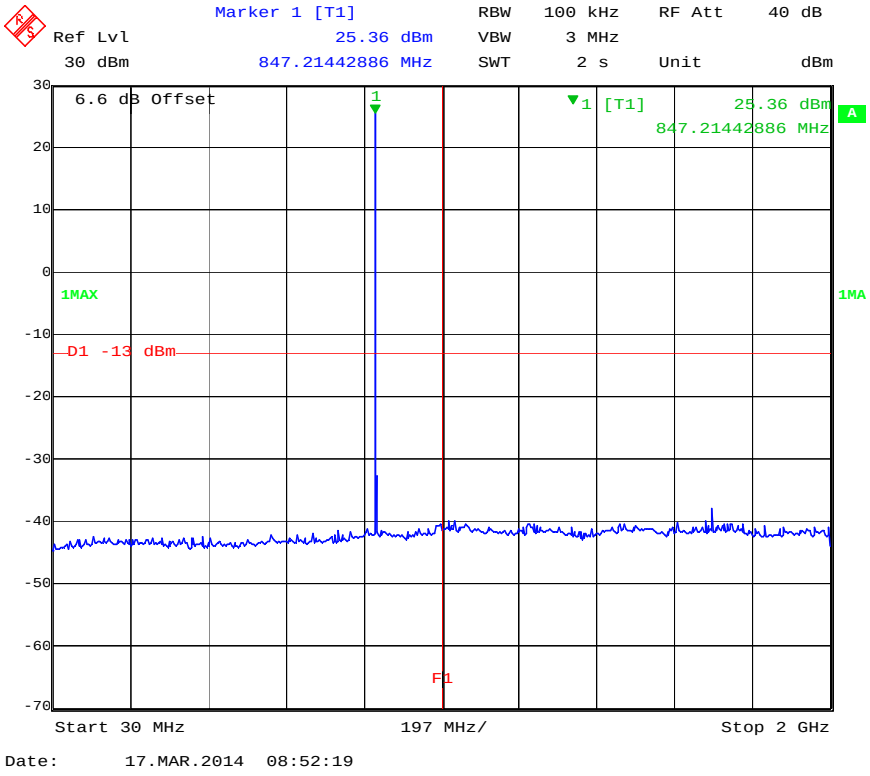
GSM 850 Band - High Channel



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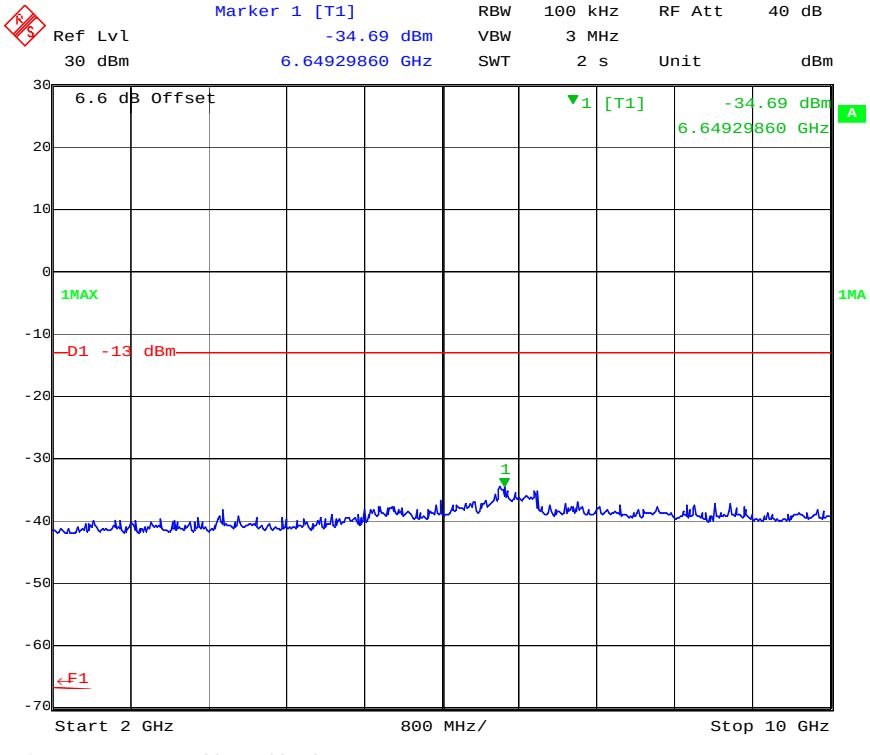

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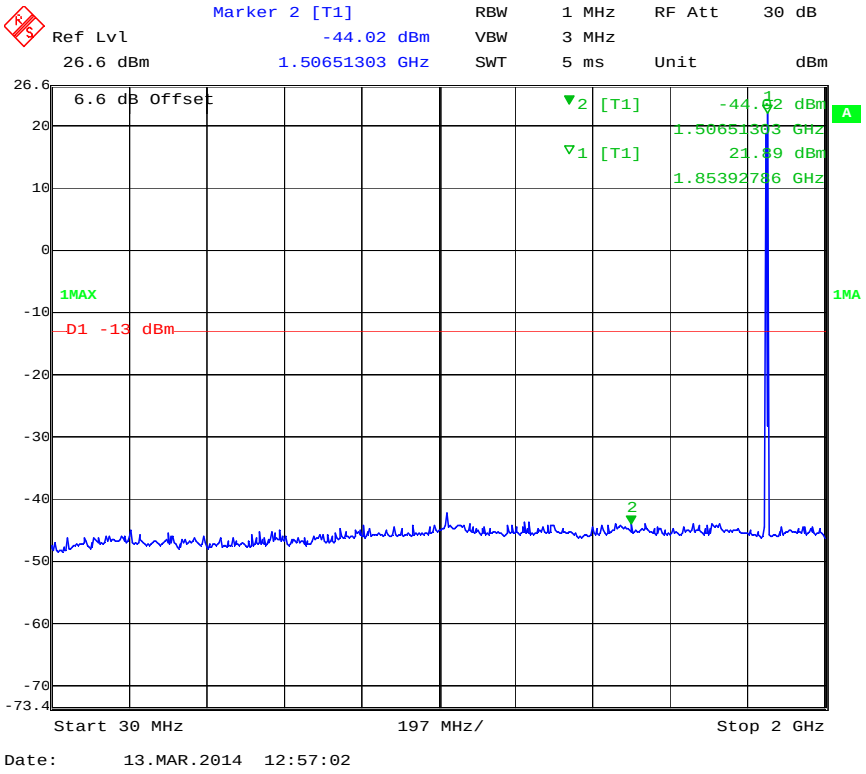
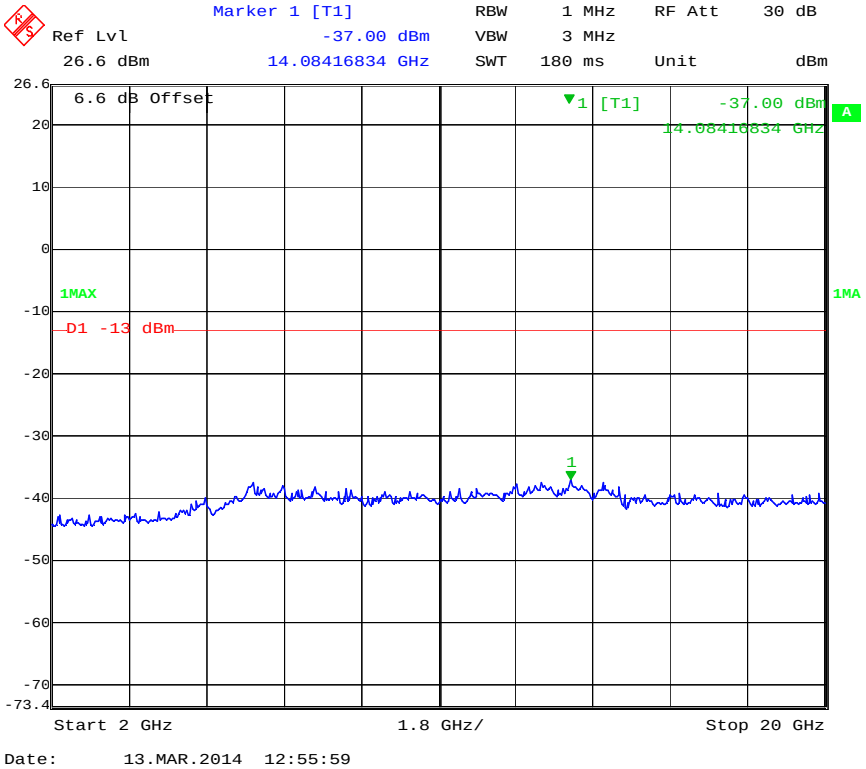
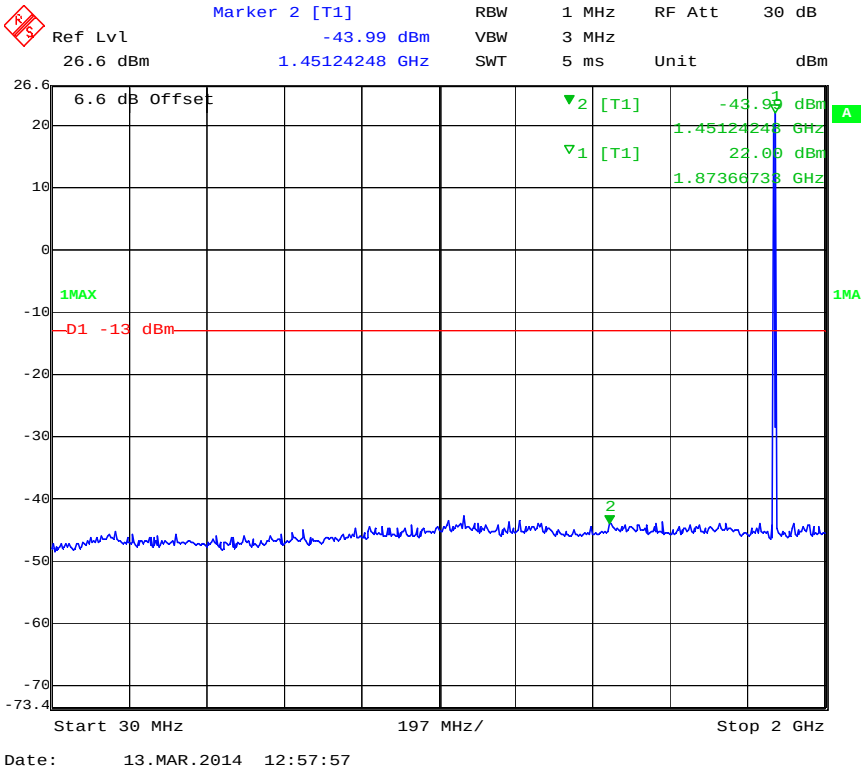
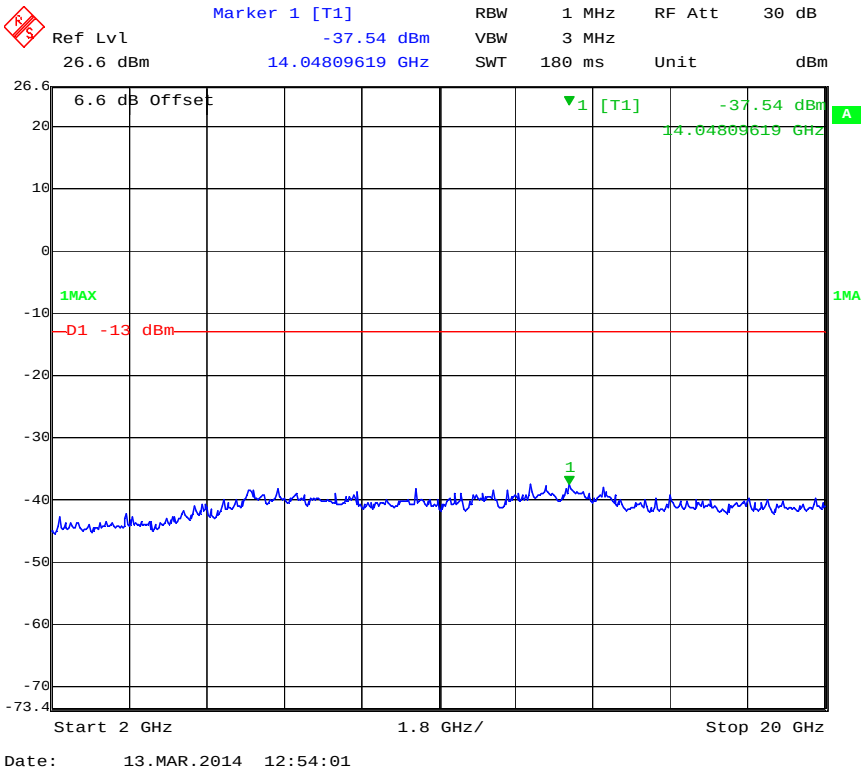
GSM 1900 Band - Low Channel



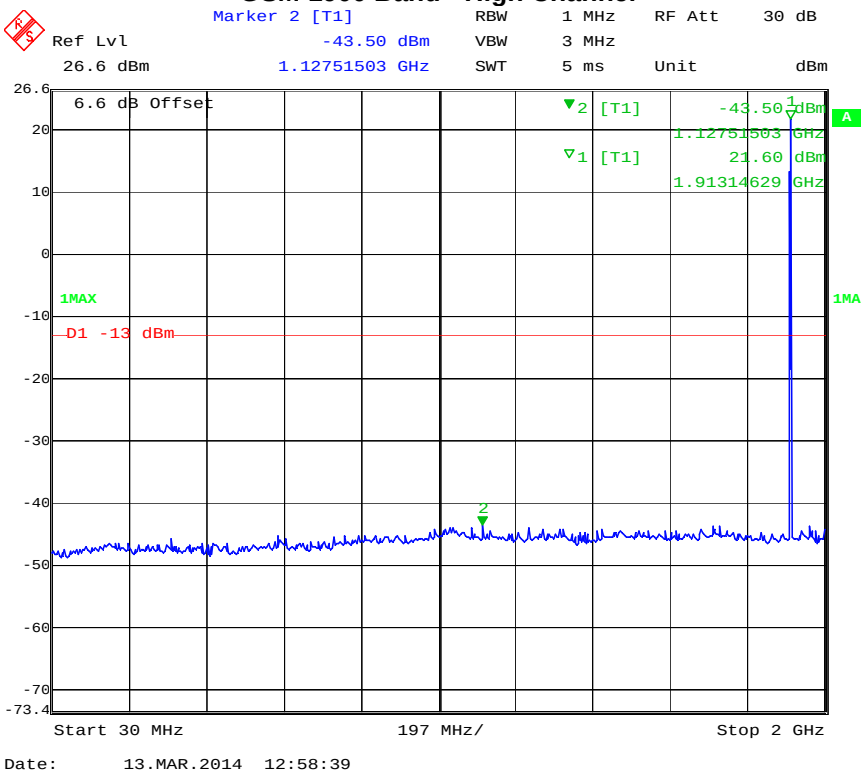


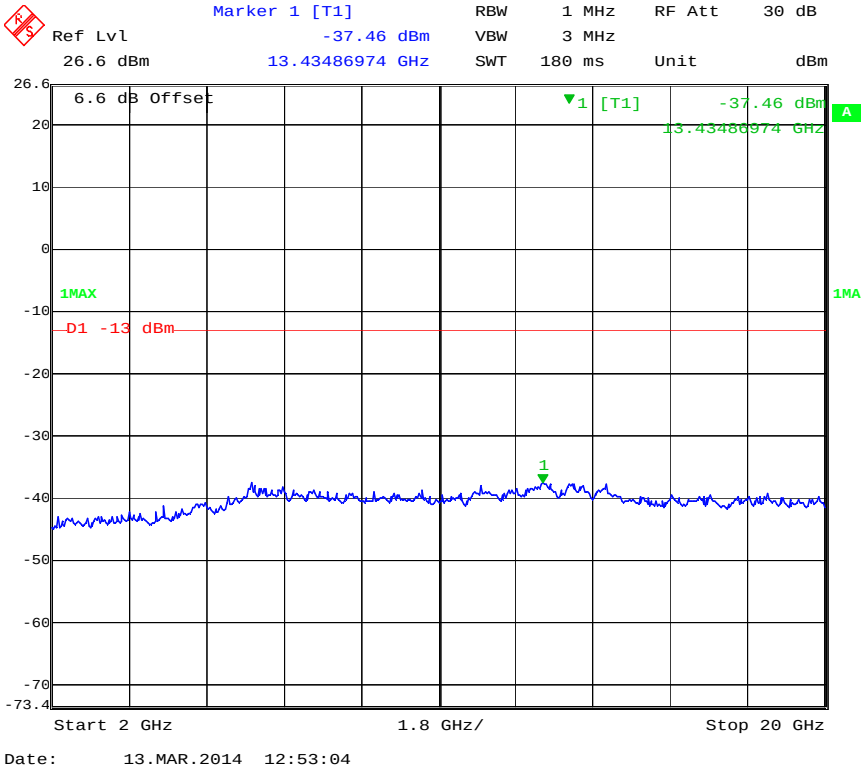
GSM 1900 Band – Mid Channel





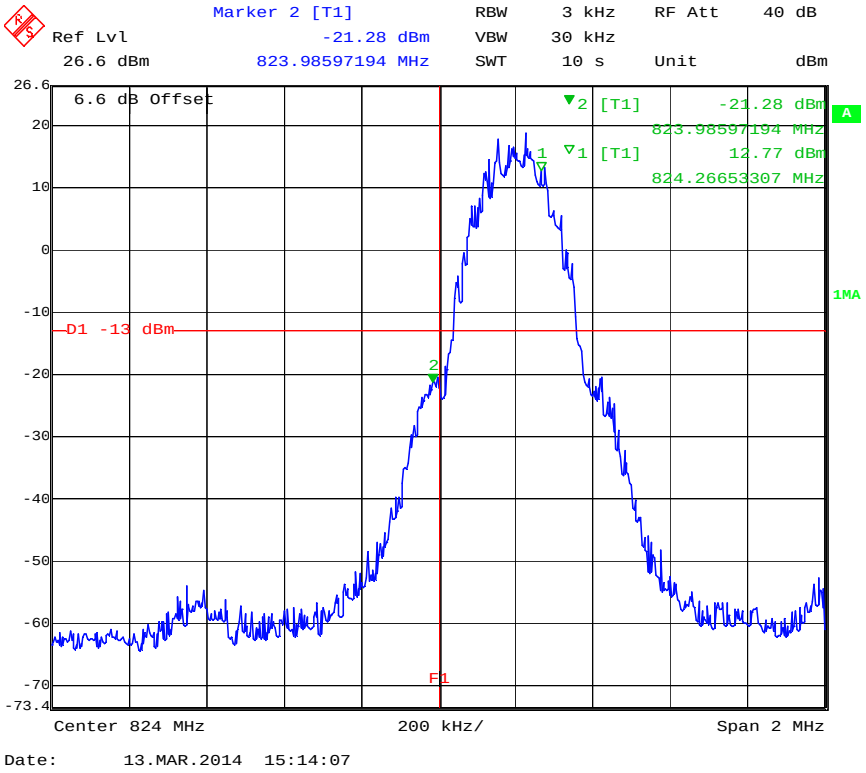
GSM 1900 Band - High Channel



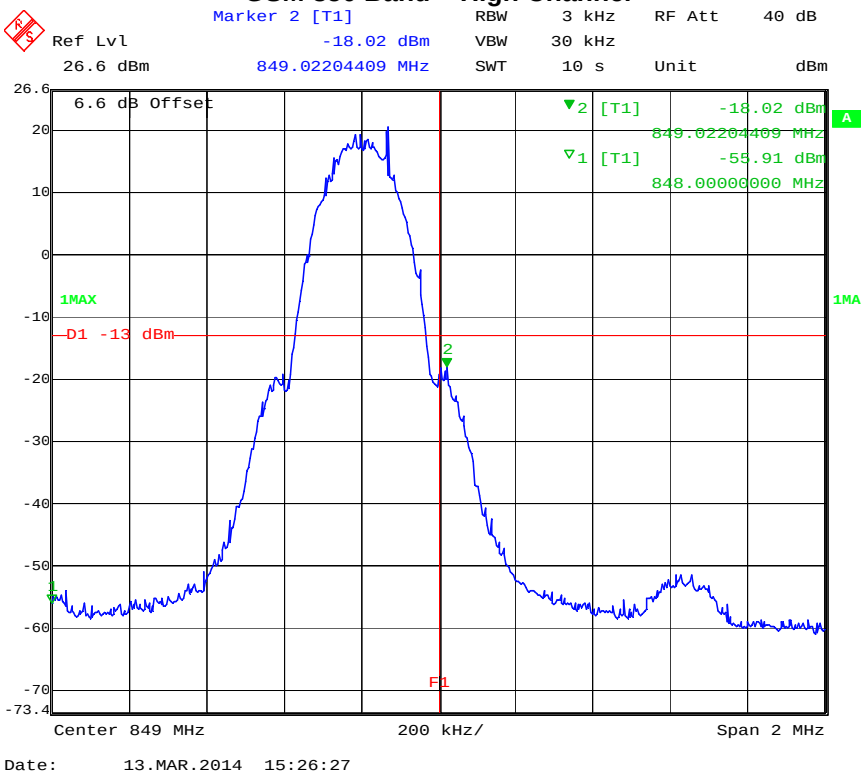


Emissions within 1MHz of the band edge:

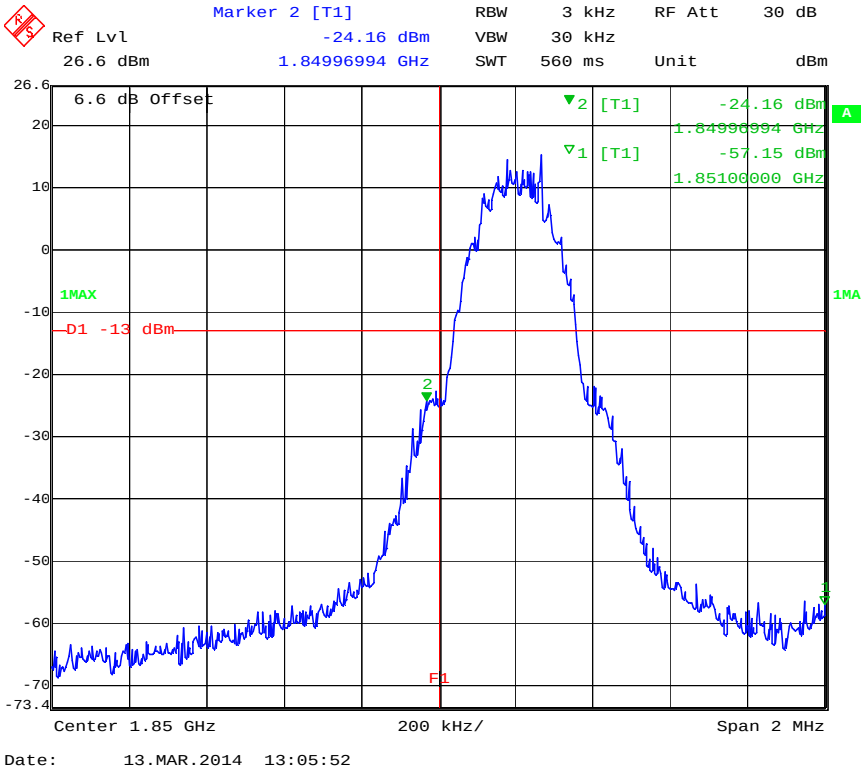
GSM 850 Band – Low Channel



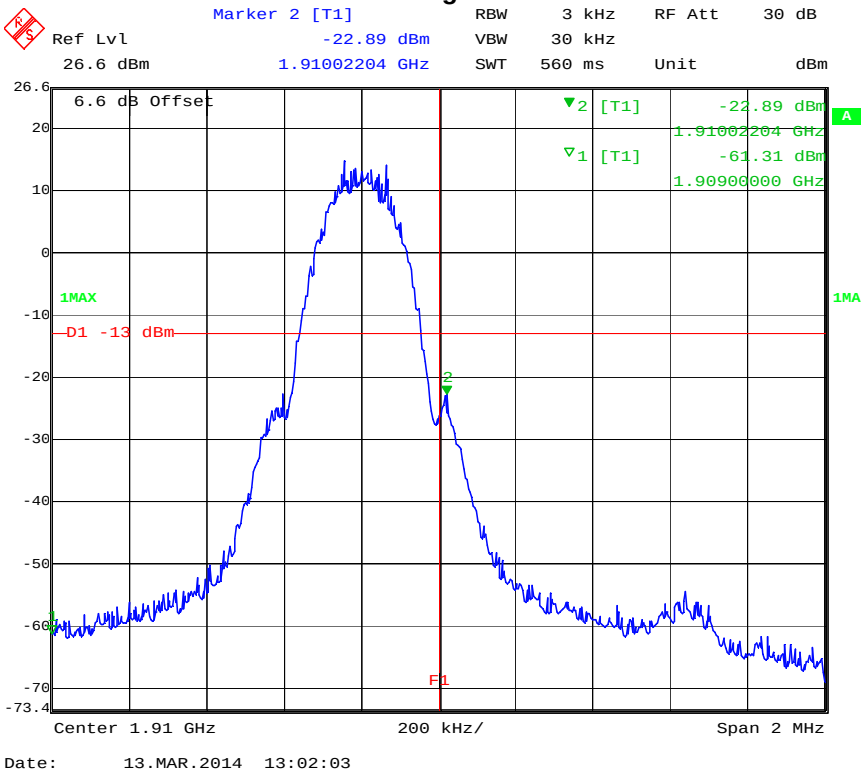
GSM 850 Band – High Channel



GSM 1900 Band – Low Channel - GPRS

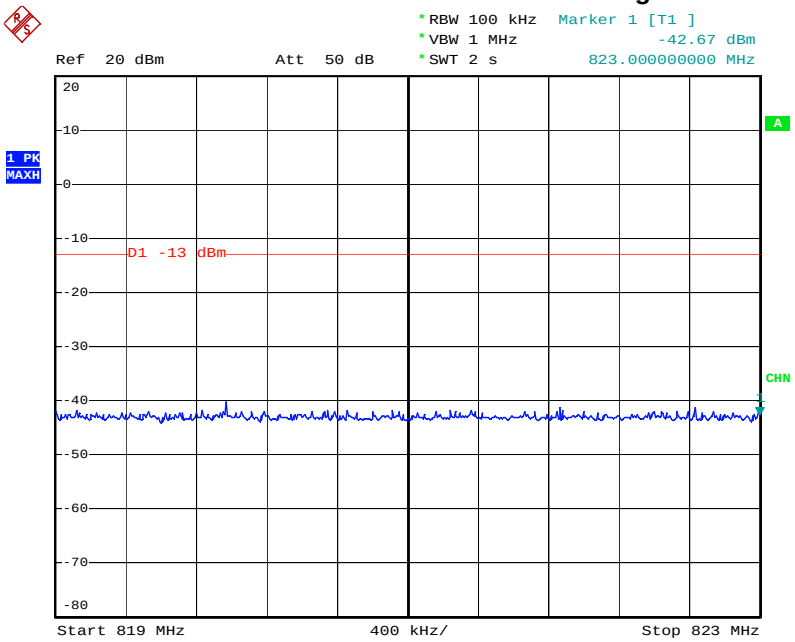


GSM 1900 Band – High Channel – GPRS



Emissions within 4MHz of the block edge:

GSM 850 Band – Low Channel Band Edge – GPRS



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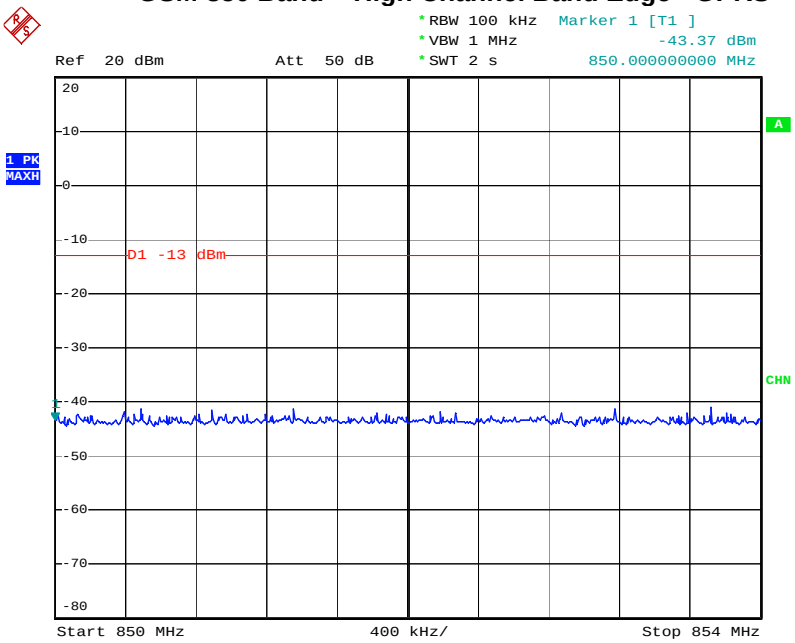
GSM 850 Band – High Channel Band Edge - GPRS



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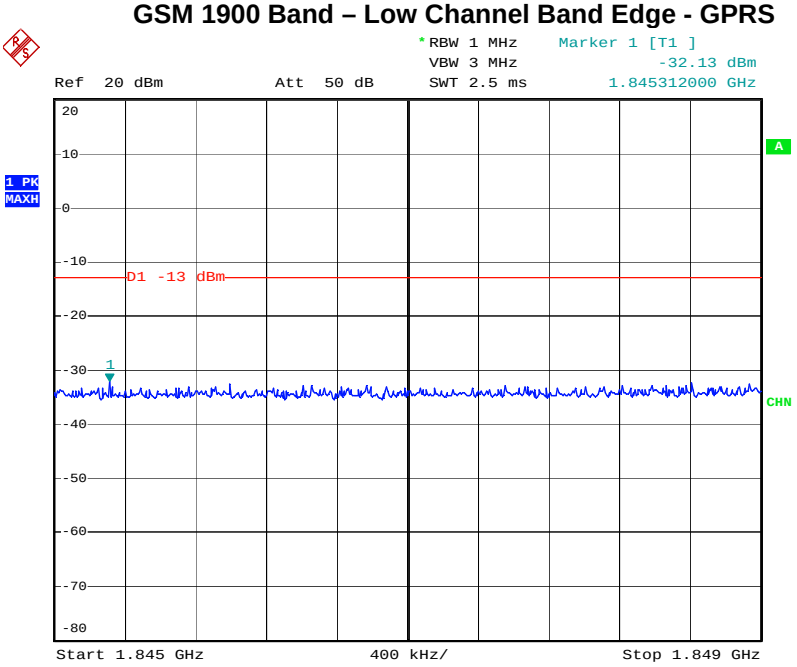
GSM 1900 Band – Low Channel Band Edge - GPRS



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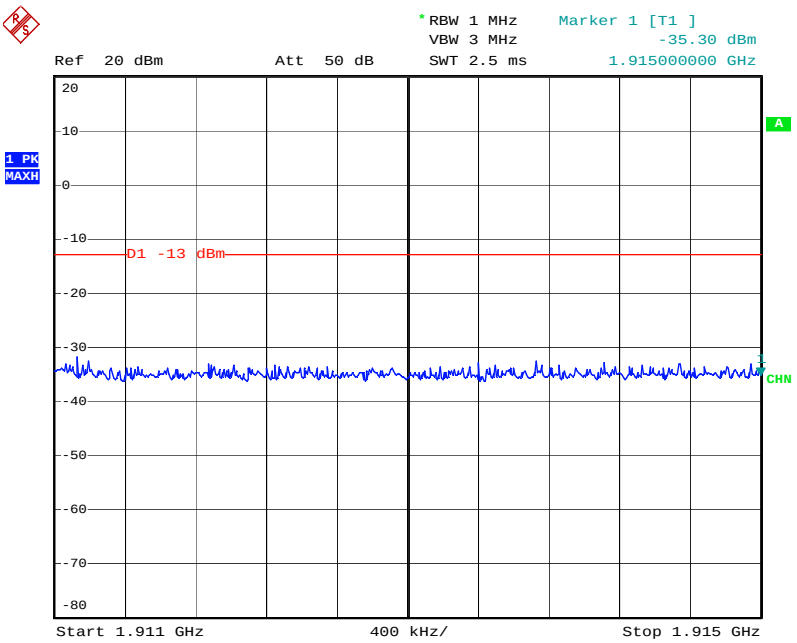
GSM 1900 Band – High Channel Band Edge – GPRS



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8 Radiated Output Power

8.1 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.

8.2 Test Procedure

The radiated output power is determined by adding the peak antenna gain to the measured conducted output power to determine the peak radiated power.

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

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

8.3 Results:

The CELLX 4 meets the radiated power requirements of FCC §22.913 and §24.232. The antenna info provided by the manufacturer indicates a 0dBi antenna gain. The worst case calculations for GSM850 and GSM1900 are shown below. Each includes a 6dB factor to account for four possible GSM transmissions occurring at the same time.

GSM850:

ERP = 27.9dBm + 6dB +0dBi – 2.15 = 31.75dBm

GSM1900:

EIRP = 24.28dBm + 6dB + 0dBi = 30.28dBm

9 Radiated Spurious Emissions (Transmitter)

9.1 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.

9.2 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.

9.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	1302.6005.40	Rohde & Schwarz	ESU40	9/11/2013	9/11/2014
Preamplifier	122005	Rohde&Schwarz	TS-PR18	9/19/2013	9/19/2014
Biconnilog Antenna	00051864	ETS	3142C	12/17/2013	12/17/2014
Horn Antenna	1096	Antenna Research	DRG118A	4/24/2013	4/24/2014
Horn Antenna	6556	ETS	3115	4/24/2013	4/24/2014
System Controller	121701-1	Sunol Sciences	SC99V	Calibration Not Required	Calibration Not Required
Base Station Simulator	3917	Rohde&Schwarz	CMW500	9/26/2013	9/26/2014
Signal Generator	3782	Rohde&Schwarz	SMB100A	9/12/2013	9/12/2014
High Pass Filter	013	Micro-Tronics	HPM50108	Time Of Use	Time Of Use
Band Reject Filter	109	Micro-Tronics	BRM50707	Time Of Use	Time Of Use
Environmental Chamber	3947	Test Equity	115A	Time Of Use	Time Of Use
Multimeter/Temp Meter	3400	Fluke	289	5/29/2013	5/29/2014

9.4 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. The emissions were measured using an RMS detector and the analyzer was gated so that the emission was only measured during the on-times of the transmitter.

Worst Case Spurious Measurements – GSM 850 Bands – GPRS Mode

Radiated Spurious Emissions Measurement

Test Engineer: Bryan Taylor
Test Date: 2/20/2014
Temp. / Humidity / Pressure: 24.2C/20.1%/996.6mbar
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/Channel 128	1648.4	H	-52.41	-50.6	2.84	6.70	-13	-46.73
	1648.4	V	-50.45	-47.43	2.84	6.70	-13	-43.56
	2472.6	H	-57.73	-50.74	3.78	7.16	-13	-47.36
	2472.6	V	-54.51	-45.75	3.78	7.16	-13	-42.37
	3296.8	H	-66.14	-57.44	4.42	7.14	-13	-54.72
	3296.8	V	-65.42	-55.66	4.42	7.14	-13	-52.94
	4121	H	-66.74	-55.81	5.31	8.15	-13	-52.98
	4121	V	-66.07	-55.16	5.31	8.15	-13	-52.33
	4945.2	H	-67.15	-52.99	6.24	8.80	-13	-50.43
	4945.2	V	-65.43	-51.98	6.24	8.80	-13	-49.42
	5769.4	H	-62.48	-46.79	6.55	9.27	-13	-44.07
	5769.4	V	-61.76	-47.25	6.55	9.27	-13	-44.53
	6593.6	H	-66.07	-49.04	7.10	9.96	-13	-46.17
	6593.6	V	-65.22	-48.84	7.10	9.96	-13	-45.97
	7417.8	H	-70.07	-52.02	7.71	8.72	-13	-51.01
	7417.8	V	-67.81	-50.62	7.71	8.72	-13	-49.61
	8242	H	-69.66	-49.74	8.25	9.16	-13	-48.83
	8242	V	-69.41	-50.55	8.25	9.16	-13	-49.64
GSM 850/Channel 192	1674	H	-53.1	-50.44	2.93	6.70	-13	-46.67
	1674	V	-50.23	-46.45	2.93	6.70	-13	-42.68
	2511	H	-60.73	-53.66	3.69	7.43	-13	-49.92
	2511	V	-58.43	-49.63	3.69	7.43	-13	-45.89
	3348	H	-66.91	-58.45	4.53	7.19	-13	-55.80
	3348	V	-65.88	-56.41	4.53	7.19	-13	-53.76
	4185	H	-67.27	-55.87	5.36	8.15	-13	-53.08
	4185	V	-64.41	-53.5	5.36	8.15	-13	-50.71
	5022	H	-65.48	-50.82	6.54	8.87	-13	-48.50
	5022	V	-65.49	-51.86	6.54	8.87	-13	-49.54
	5859	H	-65.26	-49.06	6.76	9.57	-13	-46.25
	5859	V	-62.94	-47.48	6.76	9.57	-13	-44.67
	6696	H	-67.91	-49.96	7.23	9.81	-13	-47.38
	6696	V	-67.68	-50.42	7.23	9.81	-13	-47.84
	7533	H	-68.38	-49.91	7.62	9.02	-13	-48.51
	7533	V	-68.19	-50.91	7.62	9.02	-13	-49.51
	8370	H	-70.68	-51.21	8.27	9.22	-13	-50.26
	8370	V	-71.48	-52.9	8.27	9.22	-13	-51.95
GSM 850/Channel 251	1697.6	H	-54.16	-51.22	2.95	6.70	-13	-47.47
	1697.6	V	-50.17	-45.85	2.95	6.70	-13	-42.10
	2546.4	H	-62.63	-55.22	3.75	7.43	-13	-51.55
	2546.4	V	-60.28	-50.93	3.75	7.43	-13	-47.26
	3395.2	H	-67.39	-58.48	4.54	7.19	-13	-55.84
	3395.2	V	-66.89	-57.27	4.54	7.19	-13	-54.63
	4244	H	64.78	76.08	5.48	8.37	-13	78.96
	4244	V	-63.46	-52.77	5.48	8.37	-13	-49.89
	5092.8	H	-66.03	-51.73	6.56	8.87	-13	-49.43
	5092.8	V	-65.19	-51.88	6.56	8.87	-13	-49.58
	5941.6	H	-66.63	-50.08	6.85	9.53	-13	-47.40
	5941.6	V	-63.19	-47.37	6.85	9.53	-13	-44.69
	6790.4	H	-67.73	-49.48	7.43	9.55	-13	-47.36
	6790.4	V	-67.62	-50.55	7.43	9.55	-13	-48.43
	7639.2	H	-70.63	-52.25	7.43	9.20	-13	-50.48
	7639.2	V	-69.76	-52.61	7.43	9.20	-13	-50.84
	8488	H	-71.15	-51.56	8.36	9.13	-13	-50.79
	8488	V	-70.79	-52.16	8.36	9.13	-13	-51.39
								F=B-C+D

Worst Case Spurious Measurements – GSM 1900 Band – GPRS Mode

Radiated Spurious Emissions Measurement

Test Engineer: Bryan Taylor
Test Date: 2/20/2014
Temp. / Humidity / Pressure: 22.9C/20.7%/997.1mbar
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/Channel 512	3700.4	H	-67.41	-56.94	4.92	7.07	-13	-54.79
	3700.4	V	-62.99	-50.68	4.92	7.07	-13	-48.53
	5550.6	H	-68.52	-54.18	6.46	8.48	-13	-52.16
	5550.6	V	-63.6	-49.93	6.46	8.48	-13	-47.91
	7400.8	H	-65.11	-47.34	7.71	8.72	-13	-46.33
	7400.8	V	-54.18	-37.31	7.71	8.72	-13	-36.30
	9251	H	-66.6	-39.99	9.40	9.41	-13	-39.99
	9251	V	-65.43	-46.23	9.40	9.41	-13	-46.23
	11101.2	H	-67.46	-41.11	9.01	10.70	-13	-39.42
	11101.2	V	-68.62	-42.32	9.01	10.70	-13	-40.63
	12951.4	H	-67.34	-40.17	13.02	11.17	-13	-42.02
	12951.4	V	-68.59	-43.57	13.02	11.17	-13	-45.42
	14801.6	H	-72.15	-28.01	13.60	10.37	-13	-31.24
	14801.6	V	-73.46	-31.94	13.60	10.37	-13	-35.17
	16651.8	H	-71.65	-26.84	17.75	13.70	-13	-30.89
	16651.8	V	-72.44	-25.72	17.75	13.70	-13	-29.77
	18502	H	-73.01	-26.14	16.73	7.78	-13	-35.09
	18502	V	-72.11	-25.04	16.73	7.78	-13	-33.99
GSM 1900/Channel 661	3760	H	-66.12	-55.97	4.87	7.07	-13	-53.77
	3760	V	-62.98	-51.8	4.87	7.07	-13	-49.60
	5640	H	-66.01	-52.24	6.45	8.84	-13	-49.85
	5640	V	-63.27	-50.47	6.45	8.84	-13	-48.08
	7520	H	-64.17	-46.12	7.62	9.02	-13	-44.72
	7520	V	-66.95	-50.02	7.62	9.02	-13	-48.62
	9400	H	-67.35	-43.83	9.50	9.52	-13	-43.81
	9400	V	-68.09	-47.03	9.50	9.52	-13	-47.01
	11280	H	-69.14	-43.34	8.02	10.65	-13	-40.72
	11280	V	-68.79	-42.65	8.02	10.65	-13	-40.03
	13160	H	-67.61	-39.81	13.67	10.82	-13	-42.67
	13160	V	-65.23	-39.87	13.67	10.82	-13	-42.73
	15040	H	-72.46	-21.39	14.10	10.93	-13	-24.56
	15040	V	-73.21	-24.36	14.10	10.93	-13	-27.53
	16920	H	-72.12	-33.38	15.57	12.01	-13	-36.94
	16920	V	-73.58	-32.87	15.57	12.01	-13	-36.43
	18800	H	-73.11	-24.71	15.81	7.28	-13	-33.23
	18800	V	-72.64	-26.9	15.81	7.28	-13	-35.42
GSM 1900/Channel 810	3819.6	H	-64.32	-53.43	4.99	6.73	-13	-51.68
	3819.6	V	-63.79	-52.49	4.99	6.73	-13	-50.74
	5729.4	H	-64.05	-48.13	6.71	9.27	-13	-45.57
	5729.4	V	-64.54	-49.44	6.71	9.27	-13	-46.88
	7639.2	H	-68.06	-49.65	7.43	9.20	-13	-47.88
	7639.2	V	-65.43	-48	7.43	9.20	-13	-46.23
	9549	H	-68.12	-44.82	9.61	9.77	-13	-44.65
	9549	V	-69.31	-48.34	9.61	9.77	-13	-48.17
	11458.8	H	-72.03	-47.19	9.19	10.54	-13	-45.84
	11458.8	V	-69.46	-45.18	9.19	10.54	-13	-43.83
	13368.6	H	-69.76	-42.65	13.51	10.70	-13	-45.46
	13368.6	V	-69.17	-44.16	13.51	10.70	-13	-46.97
	15278.4	H	-72.14	-34.19	13.99	11.91	-13	-36.27
	15278.4	V	-73.46	-37.44	13.99	11.91	-13	-39.52
	17188.2	H	-74.01	-31.36	13.11	11.27	-13	-33.20
	17188.2	V	-73.59	-30.44	13.11	11.27	-13	-32.28
	19098	H	-74.26	-26.3	15.36	5.52	-13	-36.14
	19098	V	-73.04	-28.62	15.36	5.52	-13	-38.46
								F=B-C+D

10 Frequency Stability

10.1 Test Limits

§ 2.1055, §22.355, §24.235

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

10.2 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.

10.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Base Station Simulator	3917	Rohde&Schwarz	CMW500	9/26/2013	9/26/2014
Environmental Chamber	3947	Test Equity	115A	Time Of Use	Time Of Use
Multimeter/Temp Meter	3400	Fluke	289	5/29/2013	5/29/2014

10.4 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

Voltage (%)	Voltage (VAC)	Temp (°C)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100%	**115**	-30	8.000000	0.0000010	0.0096
100%	**115**	-20	3.000000	0.0000004	0.0036
100%	**115**	-10	5.000000	0.0000006	0.0060
100%	**115**	0	3.000000	0.0000004	0.0036
100%	**115**	10	8.000000	0.0000010	0.0096
100%	**115**	20	5.000000	0.0000006	0.0060
100%	**115**	30	2.000000	0.0000002	0.0024
100%	**115**	40	5.000000	0.0000006	0.0060
100%	**115**	50	2.000000	0.0000002	0.0024
100%	**115**	60	9.000000	0.0000011	0.0108

Frequency Stability for GSM 1900 Band

Voltage (%)	Voltage (VAC)	Temp (℃)	Frequency Error (Hz)	Deviation (%)	Deviation (ppm)
100%	**115**	-30	42.000000	0.0000022	0.0223
100%	**115**	-20	39.000000	0.0000021	0.0207
100%	**115**	-10	39.000000	0.0000021	0.0207
100%	**115**	0	41.000000	0.0000022	0.0218
100%	**115**	10	36.000000	0.0000019	0.0191
100%	**115**	20	34.000000	0.0000018	0.0181
100%	**115**	30	36.000000	0.0000019	0.0191
100%	**115**	40	35.000000	0.0000019	0.0186
100%	**115**	50	33.000000	0.0000018	0.0176
100%	**115**	60	35.000000	0.0000019	0.0186

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	4/24/2014	101417400LEX-002	Original Issue