FCC 47 CFR PART 22 SUBPART H AND PART 24 SUBPART E
&
INDUSTRY CANADA RSS-132 & RSS-133

TEST REPORT

For

Module

Model: SARA-G350

Trade Name: u-blox

Issued to

u-blox AG
Zuercherstrasse 68, 8800 Thalwil, Switzerland

Issued by

Compliance Certification Services Inc.
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Issued Date: April 15, 2013

Testing Laboratory
1309

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		April 15, 2013		Initial Issue	ALL	Kelly Cheng

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1. TEST RESULT CERTIFICATION

Applicant: u-blox AG
Zuercherstrasse 68, 8800 Thalwil, Switzerland

Equipment Under Test: Module

Trade Name: u-blox

Model Number: SARA-G350

Date of Test: January 26 ~ April 15, 2013

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 22 Subpart H & Part 24 Subpart E & IC RSS-132 Issue 3: January 2013 and IC RSS-133 Issue 6, January 2013	No non-compliance noted

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in TIA/EIA-603-C: 2004 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rule FCC PART 22 Subpart H and PART 24 Subpart E.

The test results of this report relate only to the tested sample identified in this report.

Approved by:

Miller Lee
Section Manager
Compliance Certification Services Inc.

Reviewed by:

Gina Lo
Section Manager
Compliance Certification Services Inc.

2. EUT DESCRIPTION

Product	Module
Trade Name	u-blox
Model Number	SARA-G350
Received Date	March 05, 2013
Power Supply	Powered by Power Adapter I/P: 100-240VAC, 50-60Hz, 800mA O/P: 5~12V, 4A~2.50A
Frequency Range	GSM / GPRS: 850: 824.2 ~ 848.8 MHz GSM / GPRS: 1900: 1850.2 ~ 1909.8 MHz
Transmit Power (ERP & EIRP Power)	GSM 850: 26.51dBm GSM 1900: 25.02 dBm GPRS 850: 26.62 dBm GPRS 1900: 25.01 dBm
Modulation Technique	GSM: GMSK GPRS: GMSK
Type of Emission	GSM 850: 254KGXW--- GSM 1900: 251KGXW--- GPRS 850: 249KGXW--- GPRS 1900: 249KGXW---
Antenna Gain	GSM / GPRS 850: 2.1 dBi GSM / GPRS 1900: 3.2 dBi
Antenna Type	I-Bar Penta-band GSM Antenna

Remark:

1. *The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.*
2. *This submittal(s) (test report) is intended for FCC ID:* ***XPYSARAG350*** *filing to comply with Part 22 and Part 24 of the FCC 47 CFR Rules.*
3. *This submittal(s) (test report) is intended for IC ID:* ***8595A-SARAG350*** *filing to comply with RSS-132 and RSS-133.*

3. TEST METHODOLOGY

Both conducted and radiated testing were performed according to the procedures document on chapter 13 of ANSI C63.4: 2009, TIA/EIA-603-C: 2004 and FCC CFR 47, Part 2, PART 22 SUBPART H AND PART 24 SUBPART E.

The tests documented in this report were performed in accordance with IC RSS-132, SPSR503, RSS-133, SPSR510 and ANSI C63.4 and TIA/EIA-603-C.

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4: 2009.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4: 2009.

3.4 DESCRIPTION OF TEST MODES

The EUT (model: SARA-G350) had been tested under operating condition.

EUT staying in continuous transmitting mode was programmed.

GSM / GPRS 850:
Channel Low (CH128), Channel Mid (CH190) and Channel High (CH251) were chosen for full testing.

GSM / GPRS 1900:
Channel Low (CH512), Channel Mid (CH661) and Channel High (CH810) were chosen for full testing.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz.

Based on the above results from the different modulations, GSM850 / GSM1900 / GPRS 850 / GPRS1900 were determined to be the worst-case scenario for all tests.

The worst emission was found: in lie-down (X axis) for GSM850 / GSM1900 / GPRS 850 / GPRS1900 mode.

4. INSTRUMENT CALIBRATION

4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

4.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Remark: *Each piece of equipment is scheduled for calibration once a year and Loop Antenna is scheduled for calibration once three years.*

Conducted Emissions Test Site				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	MY43360131	03/20/2014
Power Meter	Anritsu	ML2495A	1012009	06/05/2013
Power Sensor	Anritsu	MA2411A	0917072	06/05/2013
Temp. / Humidity Chamber	Terchy	MHG-150LF	930619	10/18/2013

Wugu 966 Chamber A				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	US42510268	11/06/2013
EMI Test Receiver	R&S	ESCI	100064	02/28/2014
Pre-Amplifier	Mini-Circults	ZFL-1000LN	SF350700823	01/12/2014
Pre-Amplifier	MITEQ	AFS44-00102650-42-10P-44	1415367	11/19/2013
Bilog Antenna	Sunol Sciences	JB3	A030105	10/02/2013
Horn Antenna	EMCO	3117	00055165	02/13/2014
Horn Antenna	EMCO	3116	2487	10/10/2013
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
Site NSA	CCS	N/A	N/A	12/22/2013
Test S/W	EZ-EMC (CCS-3A1RE)			

4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0138
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9483
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5975
3M Semi Anechoic Chamber / 8G~18G	+/- 2.6112
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7389
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9683

***Remark**: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.*

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

☐ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

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☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)

Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

☐ No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841, TAIWAN, R.O.C.

Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

5.3 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements	FCC MRA: TW1039
Taiwan	TAF	LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-210, RSS-310 IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12,2, ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328, ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893, ETSI EN 301 489-1/3/7/17 FCC OET Bulletin 65 + Supplement C, EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385, EN 50392, IEC 62209, CNS 14958-1, CNS 14959 FCC Method –47 CFR Part 15 Subpart B IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-4-2/3/4/5/6/8/11	TAF Testing Laboratory 1309
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	Canada IC 2324G-1 IC 2324G-2

** No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.*

6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix I for the actual connections between EUT and support equipment.

6.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	FCC ID	Series No.	Data Cable	Power Cord
1.	Universal Radio Communication Tester (Remote)	R&S	CMU200	N/A	101245	N/A	Unshielded, 1.8m

Remark:

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

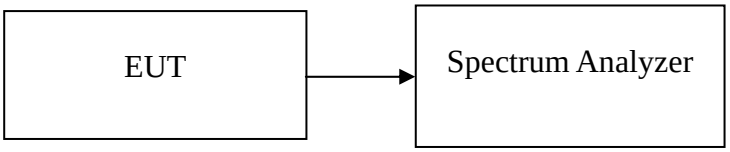
7. FCC PART 22 & 24 REQUIREMENTS

7.199% BANDWIDTH

LIMIT

None; for reporting purposes only.

Test Configuration



TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

TEST RESULTS

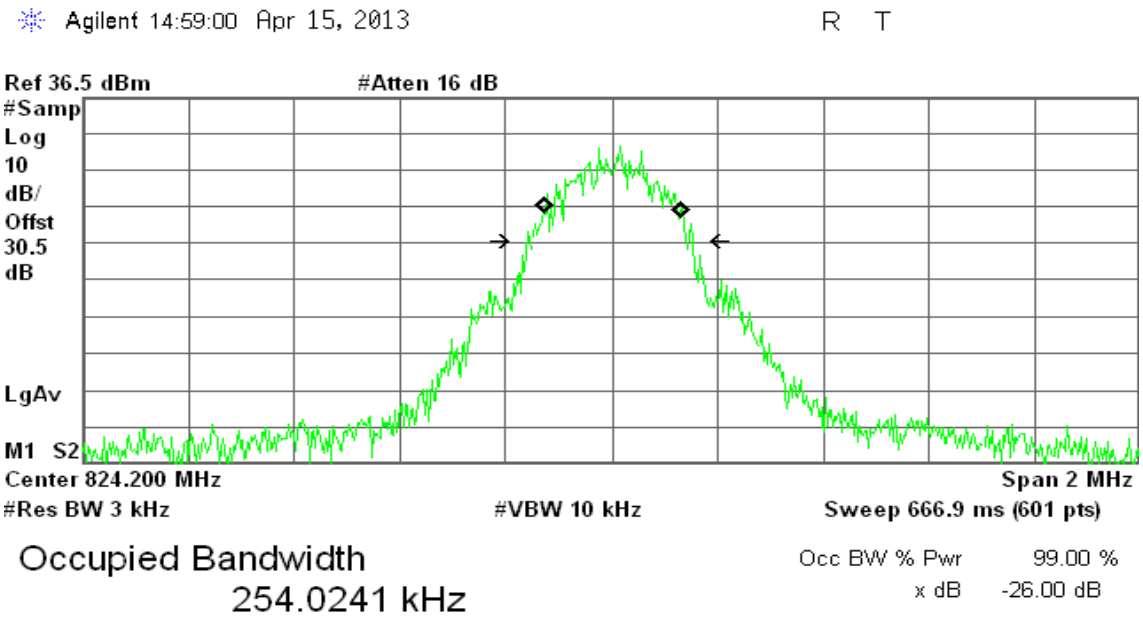
No non-compliance noted.

Test Data

Test Mode	CH	Frequency (MHz)	99% Bandwidth (kHz)
GSM 850	128	824.200	254.0241
	190	836.400	248.1605
	251	848.800	246.3874
GPRS 850 (Class 10)	128	824.200	239.4818
	190	836.570	242.4110
	251	848.800	249.3441
GSM 1900	512	1850.210	242.2582
	661	1880.000	251.9946
	810	1909.823	241.2578
GPRS 1900 (Class 10)	512	1850.173	249.0336
	661	1880.000	248.3274
	810	1909.800	241.2252

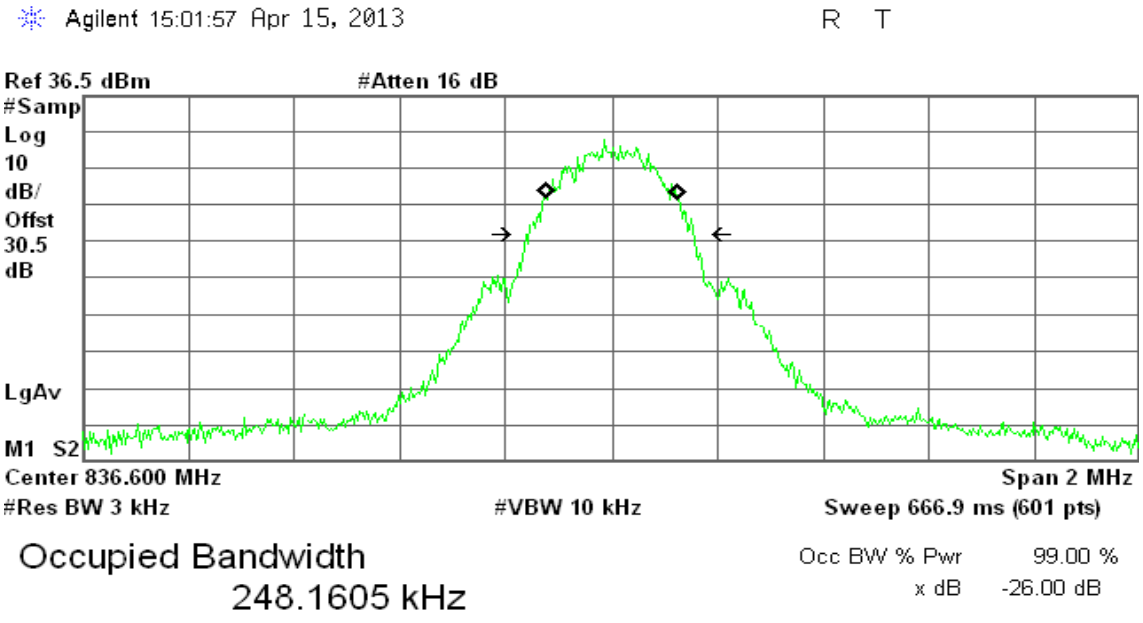
Test Plot

GSM 850 (CH Low)



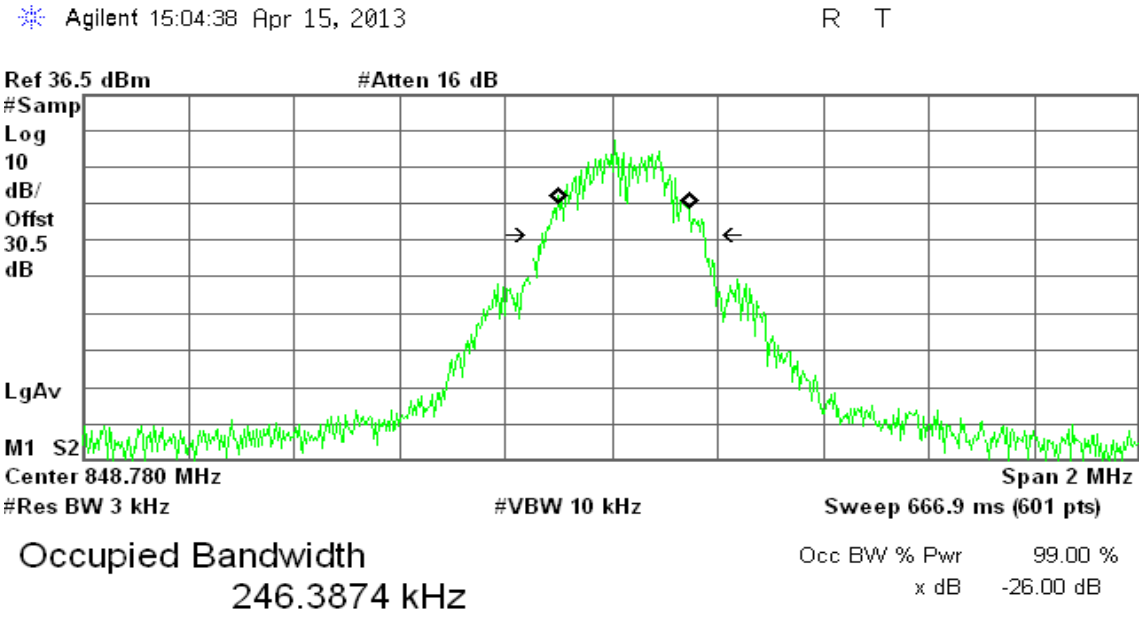
Transmit Freq Error	1.950 kHz
x dB Bandwidth	312.238 kHz*

GSM 850 (CH Mid)



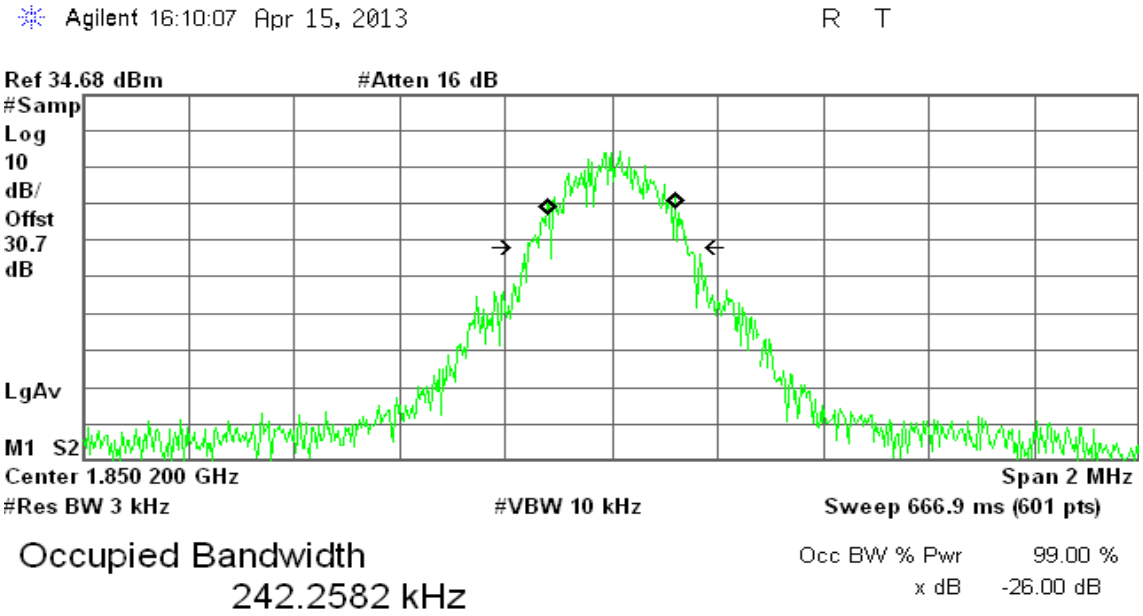
Transmit Freq Error	131.125 Hz
x dB Bandwidth	310.577 kHz*

GSM 850(CH High)



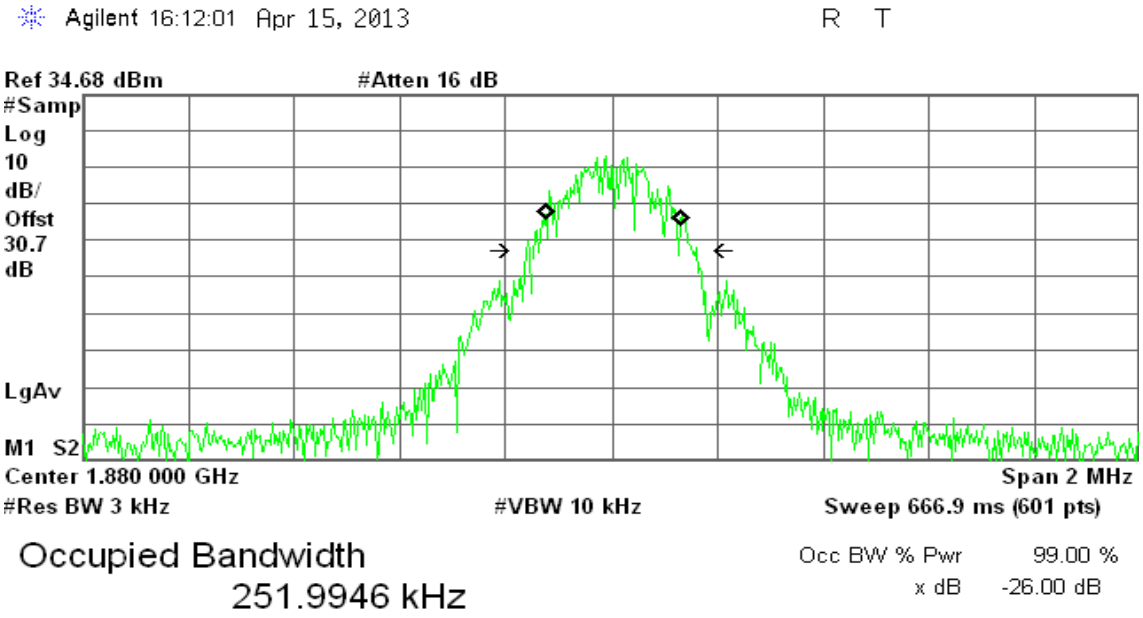
Transmit Freq Error	22.263 kHz
x dB Bandwidth	306.334 kHz*

GSM 1900 (CH Low)



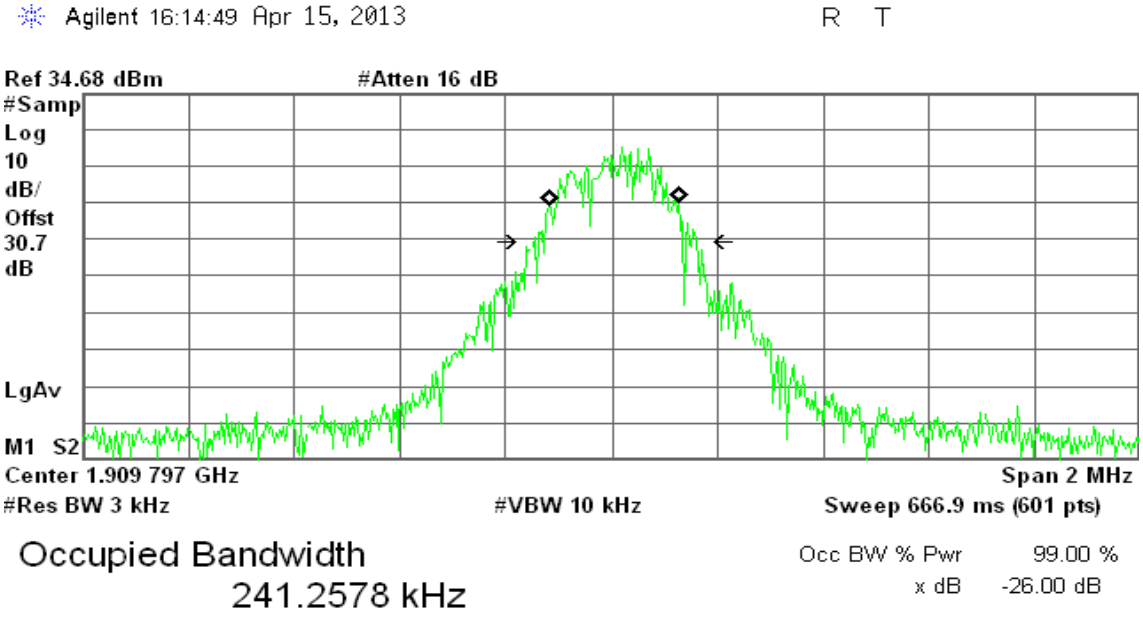
Transmit Freq Error	-140.128 Hz
x dB Bandwidth	299.942 kHz*

GSM 1900 (CH Mid)



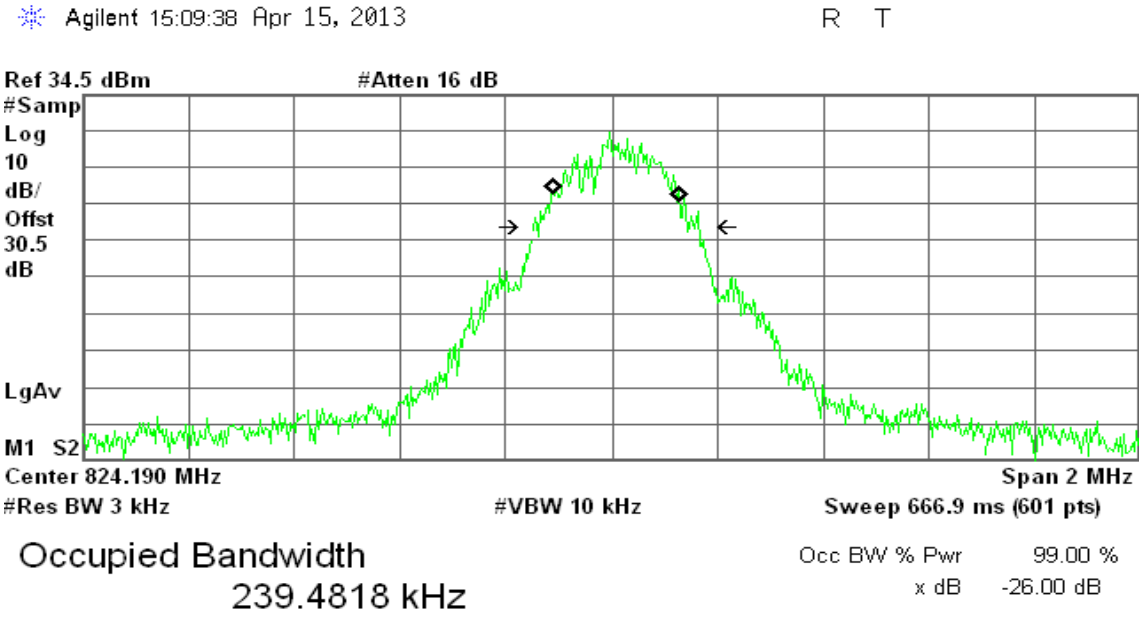
Transmit Freq Error	3.378 kHz
x dB Bandwidth	320.211 kHz*

GSM 1900 (CH High)



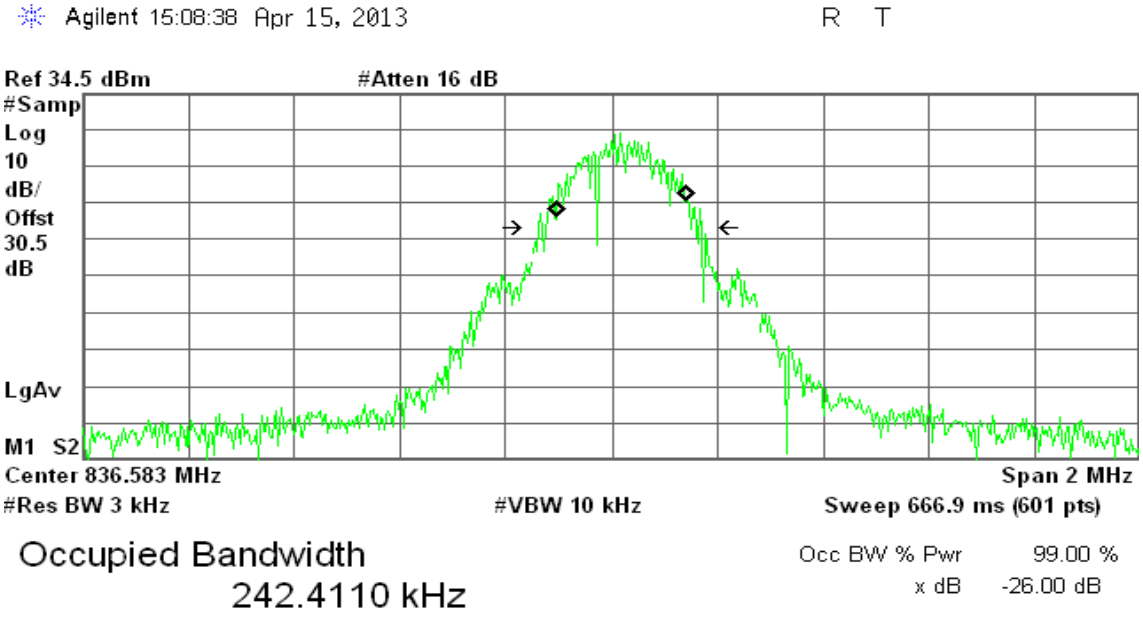
Transmit Freq Error	4.892 kHz
x dB Bandwidth	305.431 kHz*

GPRS 850 (CH Low)



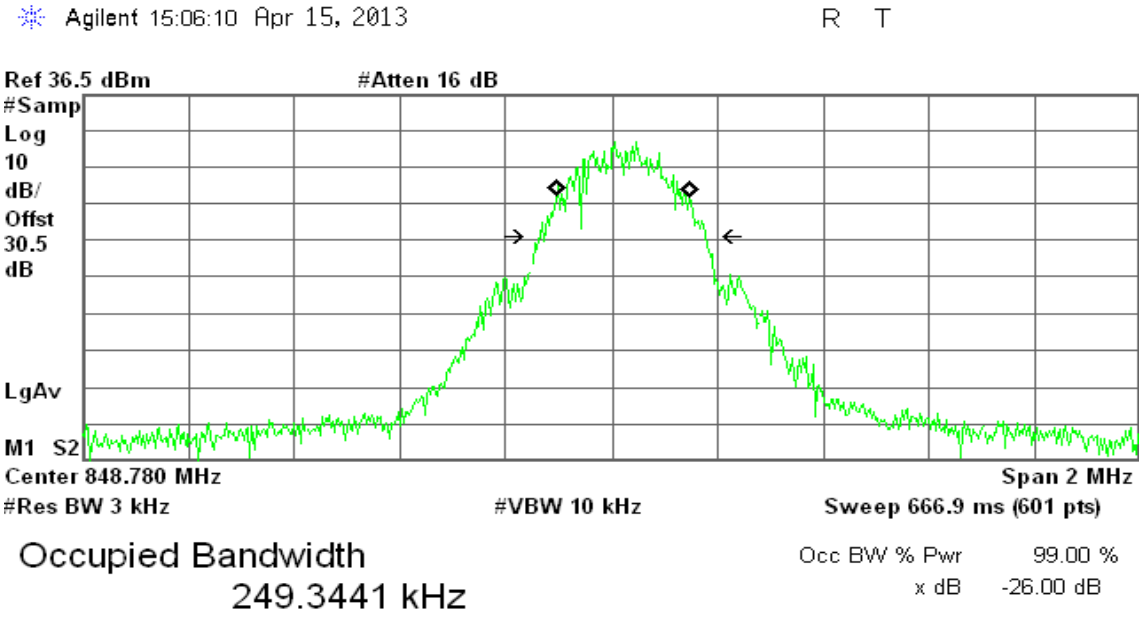
Transmit Freq Error	8.365 kHz
x dB Bandwidth	310.581 kHz*

GPRS 850 (CH Mid)



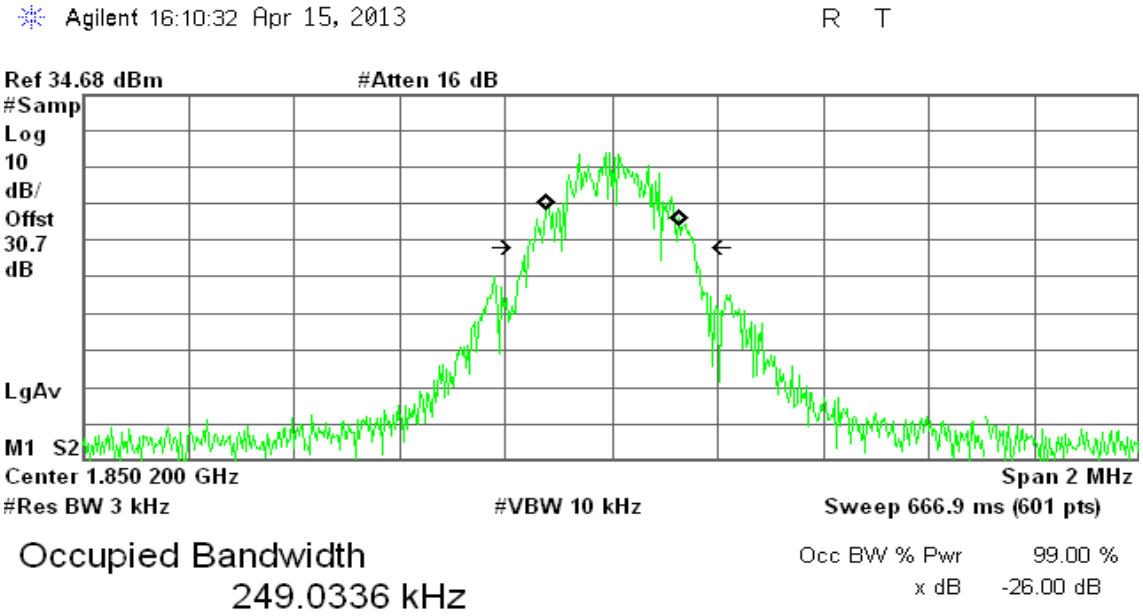
Transmit Freq Error	18.181 kHz
x dB Bandwidth	306.258 kHz*

GPRS 850(CH High)



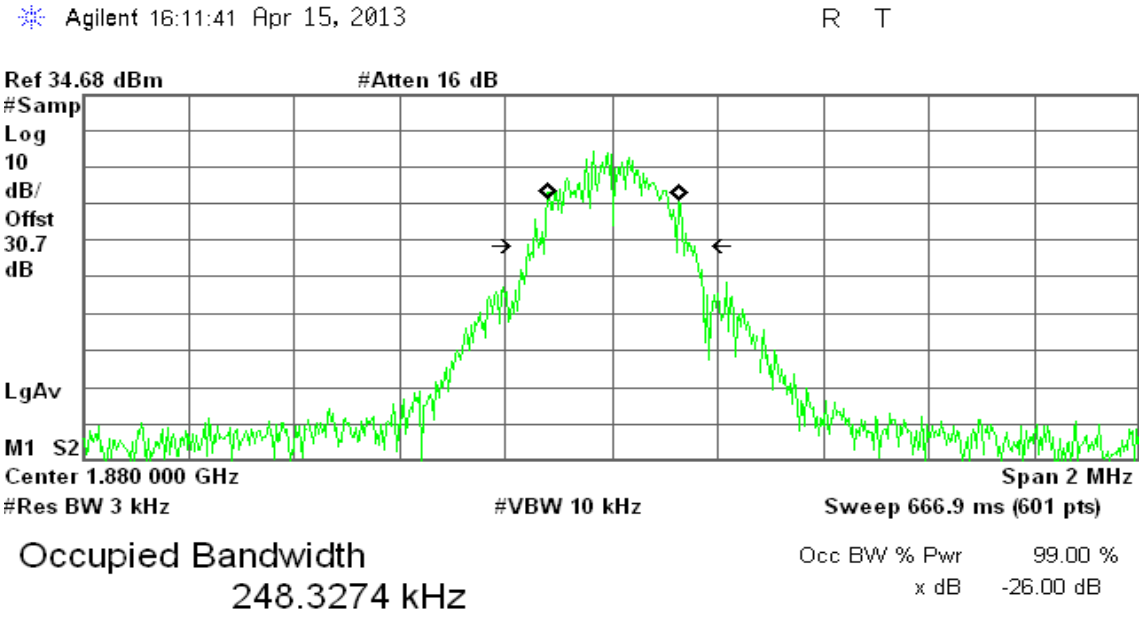
Transmit Freq Error	21.986 kHz
x dB Bandwidth	311.014 kHz*

GPRS 1900 (CH Low)



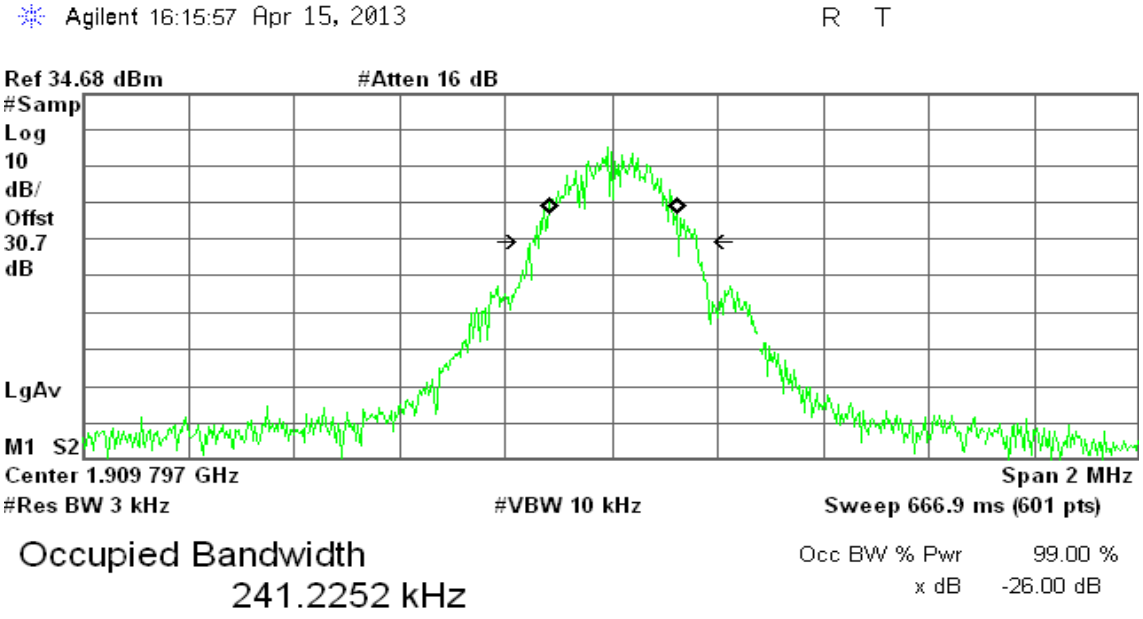
Transmit Freq Error	1.011 kHz
x dB Bandwidth	312.138 kHz*

GPRS 1900 (CH Mid)



Transmit Freq Error	3.474 kHz
x dB Bandwidth	313.882 kHz*

GPRS 1900 (CH High)



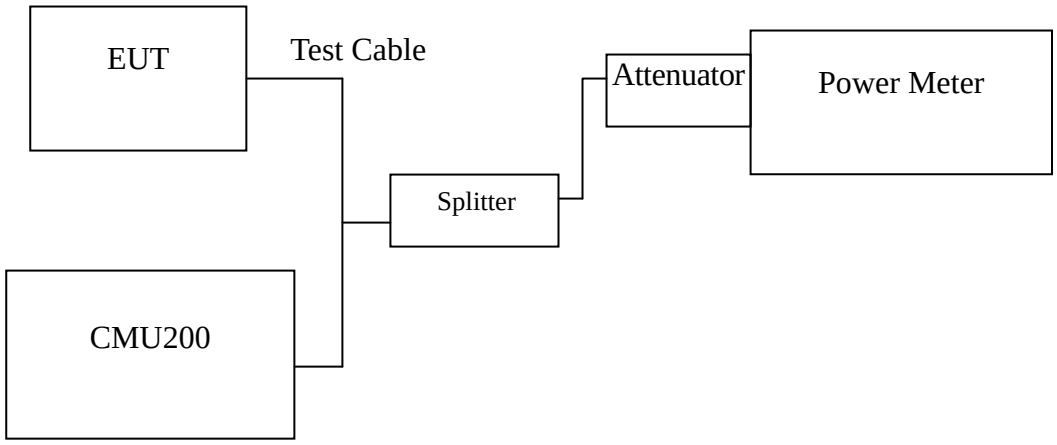
Transmit Freq Error	2.660 kHz
x dB Bandwidth	307.976 kHz*

7.2 PEAK POWER

LIMIT

According to FCC §2.1046.

Test Configuration



Remark: *Measurement setup for testing on Antenna connector*

TEST PROCEDURE

The transmitter output was connected to a calibrated attenuator, the other end of which was connected to a power meter. Transmitter output was read off the power meter in dBm. The power output at the transmitter antenna port was determined by adding the value of the attenuator to the power meter reading.

TEST RESULTS

No non-compliance noted.

Test Data

Test Mode	CH	Frequency (MHz)	Peak Power (dBm)	Output Power W
GSM 850	128	824.20	32.60	1.81970
	190	836.60	32.60	1.81970
	251	848.80	32.20	1.65959
GPRS 850 (Class 10)	128	824.20	32.50	1.77828
	190	836.60	32.50	1.77828
	251	848.80	32.30	1.69824

Test Mode	CH	Frequency (MHz)	Peak Power (dBm)	Output Power W
GSM 1900	512	1850.20	30.10	1.02329
	661	1880.00	30.00	1.00000
	810	1909.80	30.10	1.02329
GPRS 1900 (Class 10)	512	1850.20	30.20	1.04713
	661	1880.00	30.10	1.02329
	810	1909.80	29.90	0.97724

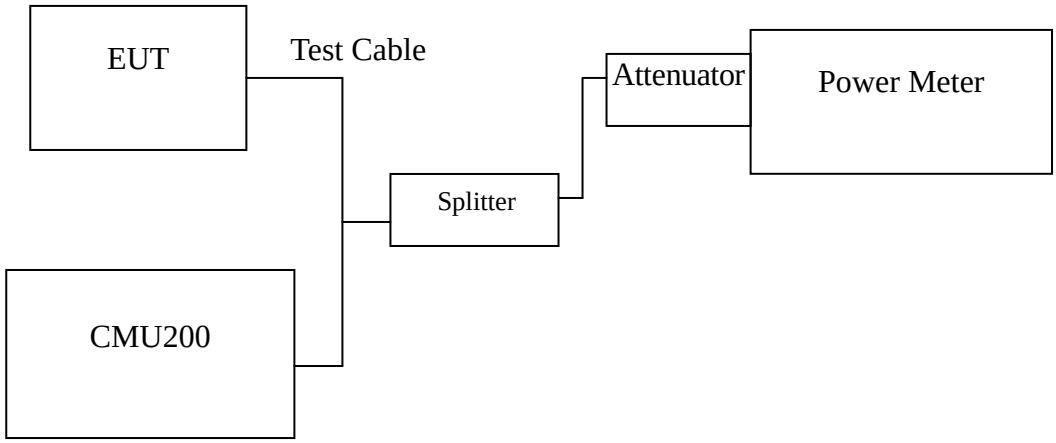
Remark: *The value of factor includes both the loss of cable and external attenuator*

7.3 AVERAGE POWER

LIMIT

For reporting purposes only.

Test Configuration



Remark: *Measurement setup for testing on Antenna connector*

TEST PROCEDURE

The transmitter output was connected to a calibrated attenuator, the other end of which was connected to a power meter. Transmitter output was read off the power meter in dBm. The power output at the transmitter antenna port was determined by adding the value of the attenuator to the power meter reading.

TEST RESULTS

No non-compliance noted.

TEST RESULTS

No non-compliance noted.

Test Data

Test Mode	CH	Frequency (MHz)	AVG Power (dBm)	Output Power W
GSM 850	128	824.20	32.20	1.65959
	190	836.60	32.10	1.62181
	251	848.80	31.80	1.51356
GPRS 850 (Class 10)	128	824.20	26.48	0.44457
	190	836.60	26.48	0.44457
	251	848.80	26.28	0.42456

Test Mode	CH	Frequency (MHz)	AVG Power (dBm)	Output Power W
GSM 1900	512	1850.20	29.60	0.91201
	661	1880.00	29.90	0.97724
	810	1909.80	29.60	0.91201
GPRS 1900 (Class 10)	512	1850.20	24.18	0.26178
	661	1880.00	24.08	0.25582
	810	1909.80	23.88	0.24431

Remark: *The value of factor includes both the loss of cable and external attenuator*

7.4 ERP & EIRP MEASUREMENT

LIMIT

According to FCC §2.1046

FCC 22.913(b): The Effective Radiated Power (ERP) of mobile transmitters must not exceed 7 Watts.

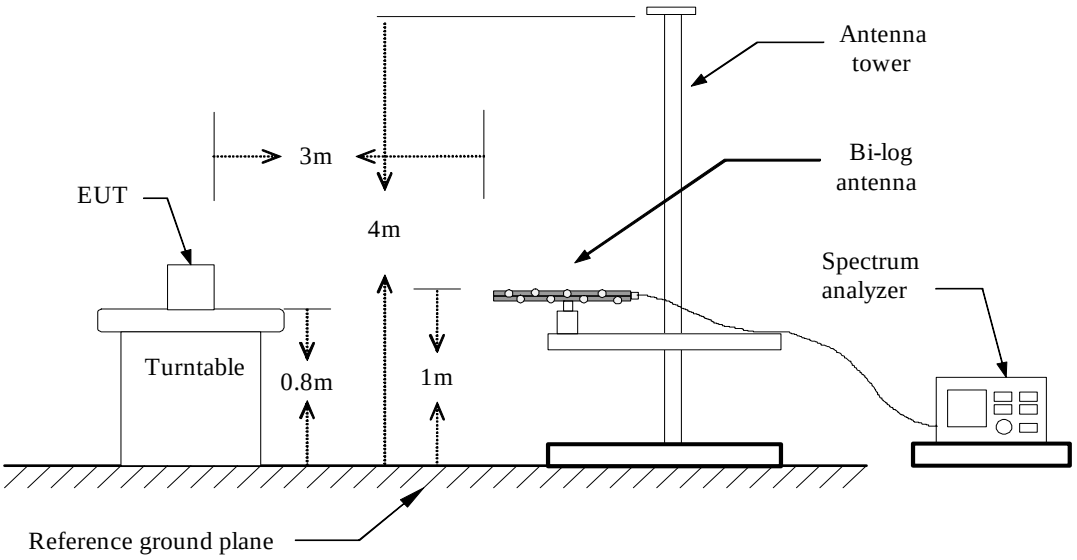
RSS-132 § 4.4 The maximum (ERP) shall be 6.3 Watts for mobile stations.

FCC 24.232(b): The equivalent Isotropic Radiated Power (EIRP) must not exceed 2 Watts.

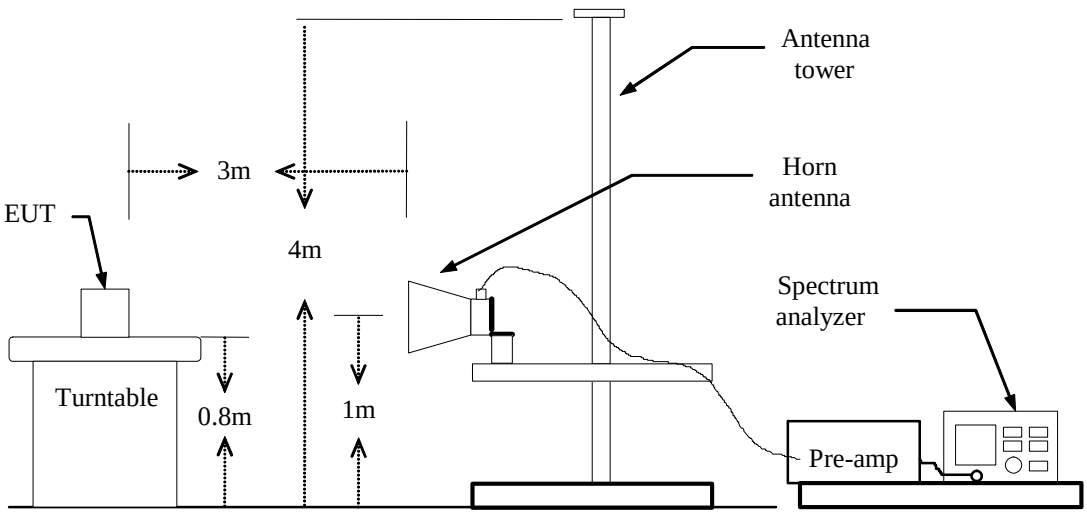
RSS133 § 6.4: Mobile stations and hand-held portables are limited to 2 watts maximum (EIRP).

Test Configuration

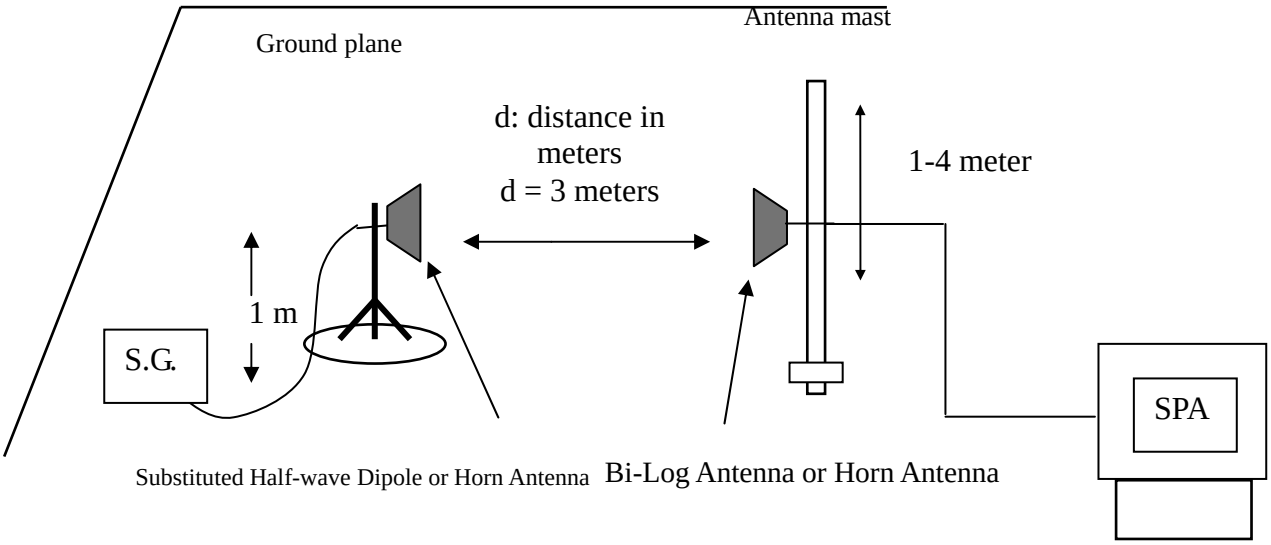
Below 1 GHz



Above 1 GHz



For Substituted Method Test Set-UP



TEST PROCEDURE

The EUT was placed on an non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer.

During the measurement of the EUT, the resolution bandwidth was set to 3MHz and the average bandwidth was set to 3MHz. The highest emission was recorded with the rotation of the turntable and the lowering of the test antenna. The reading was recorded and the field strength (E in dBuV/m) was calculated.

ERP in frequency band 824-849MHz, and EIRP in frequency band 1851.25 –1910MHz were measured using a substitution method. The EUT was replaced by half-wave dipole (824-849MHz) or horn antenna (1851.25-1910MHz) connected to a signal generator. The spectrum analyzer reading was recorded and ERP/EIRP was calculated as follows:

ERP = S.G. output (dBm) + Antenna Gain (dBi) – Cable (dB)-2.15
EIRP = S.G. output (dBm) + Antenna Gain (dBi) – Cable (dB)

TEST RESULTS

No non-compliance noted.

GSM 850 TEST DATA

Channel	Frequency (MHz)	Antenna Pol.	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
128	824.20	V	20.38	3.39	6.24	23.23	38.45	-15.22
	824.20	H	20.63	3.39	6.24	23.48	38.45	-14.97
190	836.60	V	22.26	3.4	6.37	25.23	38.45	-13.22
	836.60	H	23.47	3.4	6.37	26.44	38.45	-12.01
251	848.80	V	20.63	3.4	6.4	23.63	38.45	-14.82
	848.80	H	23.51	3.4	6.4	***26.51**	38.45	-11.94

GPRS 850 TEST DATA (CLASS 10)

Channel	Frequency (MHz)	Antenna Pol.	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
128	824.20	V	20.38	3.39	6.24	23.23	38.45	-15.22
	824.20	H	20.75	3.39	6.24	23.60	38.45	-14.85
190	836.60	V	22.12	3.4	6.37	25.09	38.45	-13.36
	836.60	H	23.65	3.4	6.37	***26.62**	38.45	-11.83
251	848.80	V	20.52	3.4	6.4	23.52	38.45	-14.93
	848.80	H	23.53	3.4	6.4	26.53	38.45	-11.92

GSM 1900 TEST DATA

Channel	Frequency (MHz)	Antenna Pol.	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
512	1850.20	V	22.98	5.37	5.67	23.28	33.00	-9.72
	1850.20	H	24.01	5.37	5.67	24.31	33.00	-8.69
661	1880.00	V	23.94	5.42	5.62	24.14	33.00	-8.86
	1880.00	H	24.2	5.42	5.62	24.40	33.00	-8.60
810	1909.80	V	24.94	5.48	5.56	***25.02**	33.00	-7.98
	1909.80	H	24.14	5.48	5.56	24.22	33.00	-8.78

GPRS 1900 TEST DATA (CLASS 10)

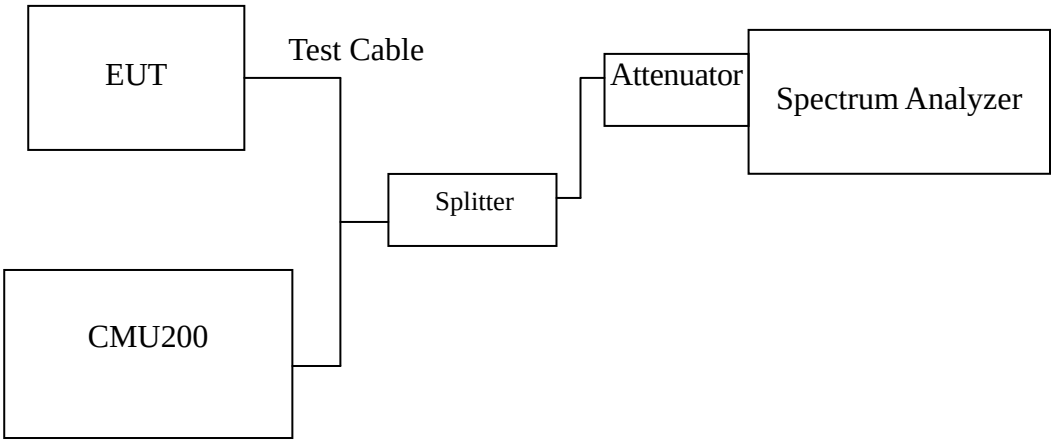
Channel	Frequency (MHz)	Antenna Pol.	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
512	1850.20	V	23.57	5.37	5.67	23.87	33.00	-9.13
	1850.20	H	24.04	5.37	5.67	24.34	33.00	-8.66
661	1880.00	V	23.94	5.42	5.62	24.14	33.00	-8.86
	1880.00	H	24.21	5.42	5.62	24.41	33.00	-8.59
810	1909.80	V	24.93	5.48	5.56	***25.01**	33.00	-7.99
	1909.80	H	24.19	5.48	5.56	24.27	33.00	-8.73

7.5 OCCUPIED BANDWIDTH MEASUREMENT

LIMIT

According to §FCC 2.1049.

Test Configuration



Remark: *Measurement setup for testing on Antenna connector*

TEST PROCEDURE

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW was set to about 1% of emission BW, VBW is set to 3 times the RBW, -26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

TEST RESULTS

No non-compliance noted

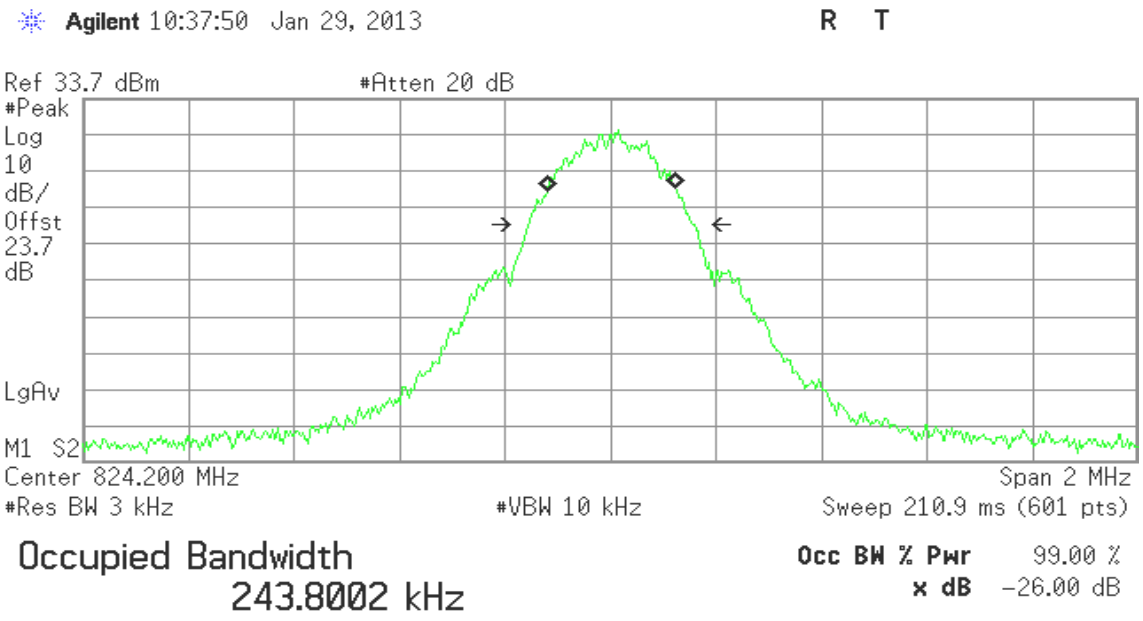
Test Data

Test Mode	CH	Frequency (MHz)	99% Bandwidth (kHz)
GSM 850	128	824.200	243.8002
	190	836.600	247.2487
	251	848.800	246.0641
GPRS 850 (Class 10)	128	824.200	246.9473
	190	836.600	242.2995
	251	848.800	245.7376

Test Mode	CH	Frequency (MHz)	99% Bandwidth (kHz)
GSM 1900	512	1850.200	244.4133
	661	1880.000	247.4817
	810	1909.800	241.4528
GPRS 1900 (Class 10)	512	1850.200	242.5283
	661	1880.000	244.8218
	810	1909.800	242.7628

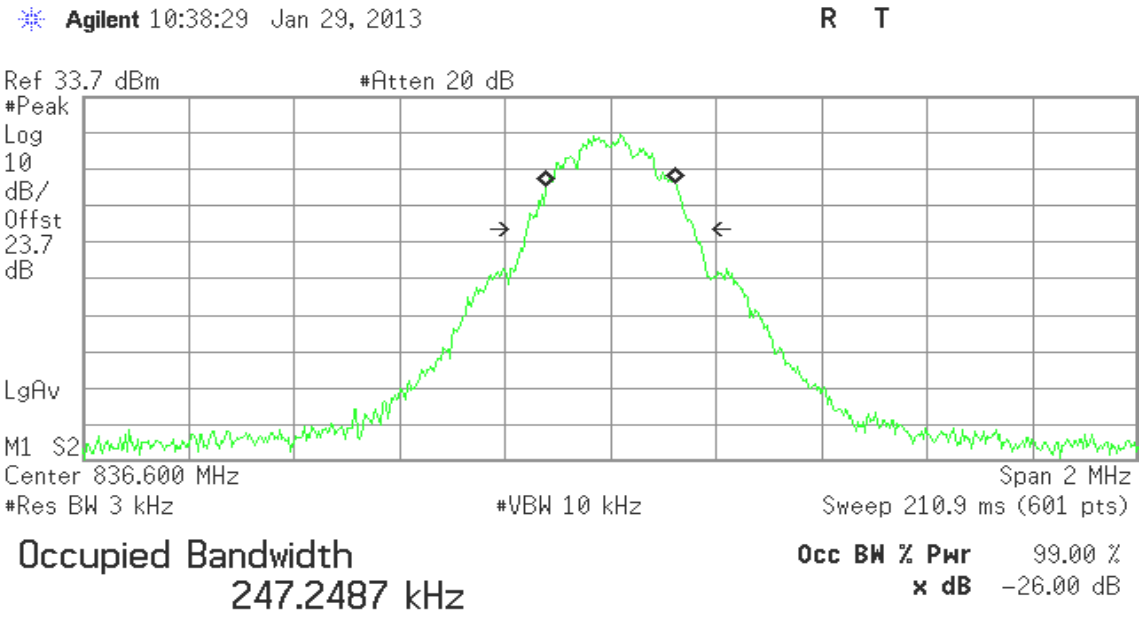
Test Plot

GSM 850 (CH Low)



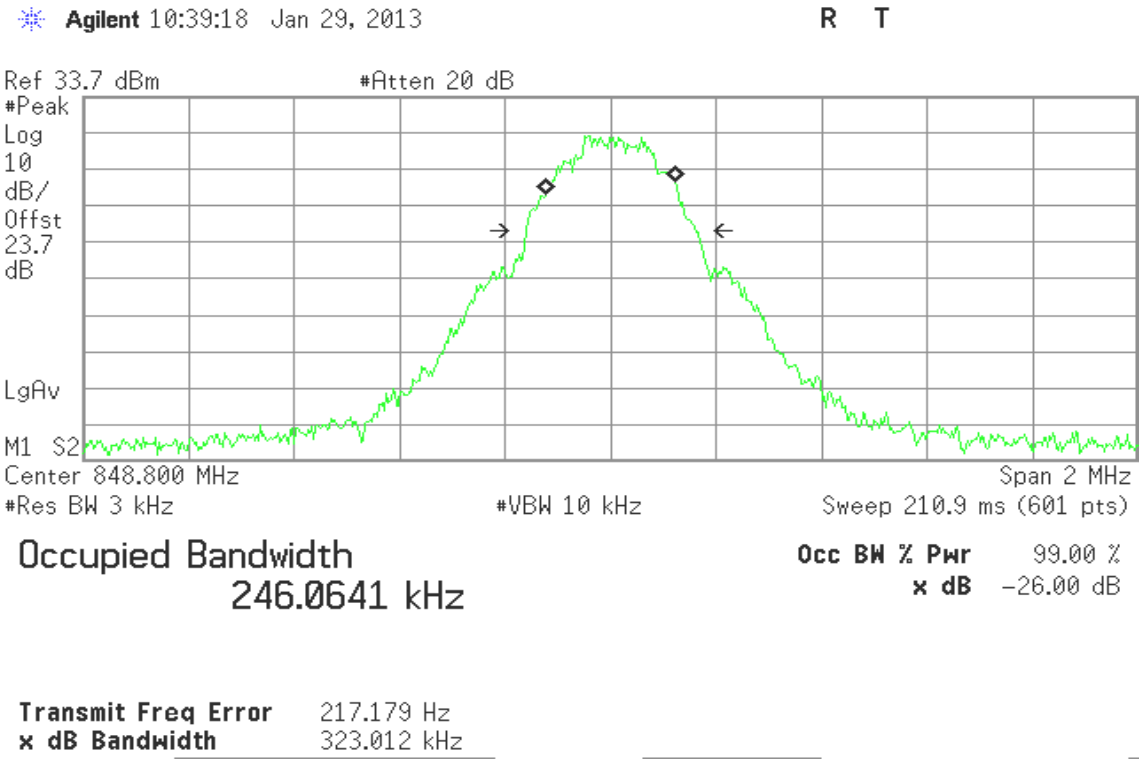
Transmit Freq Error	1.556 kHz
x dB Bandwidth	317.444 kHz

GSM 850 (CH Mid)

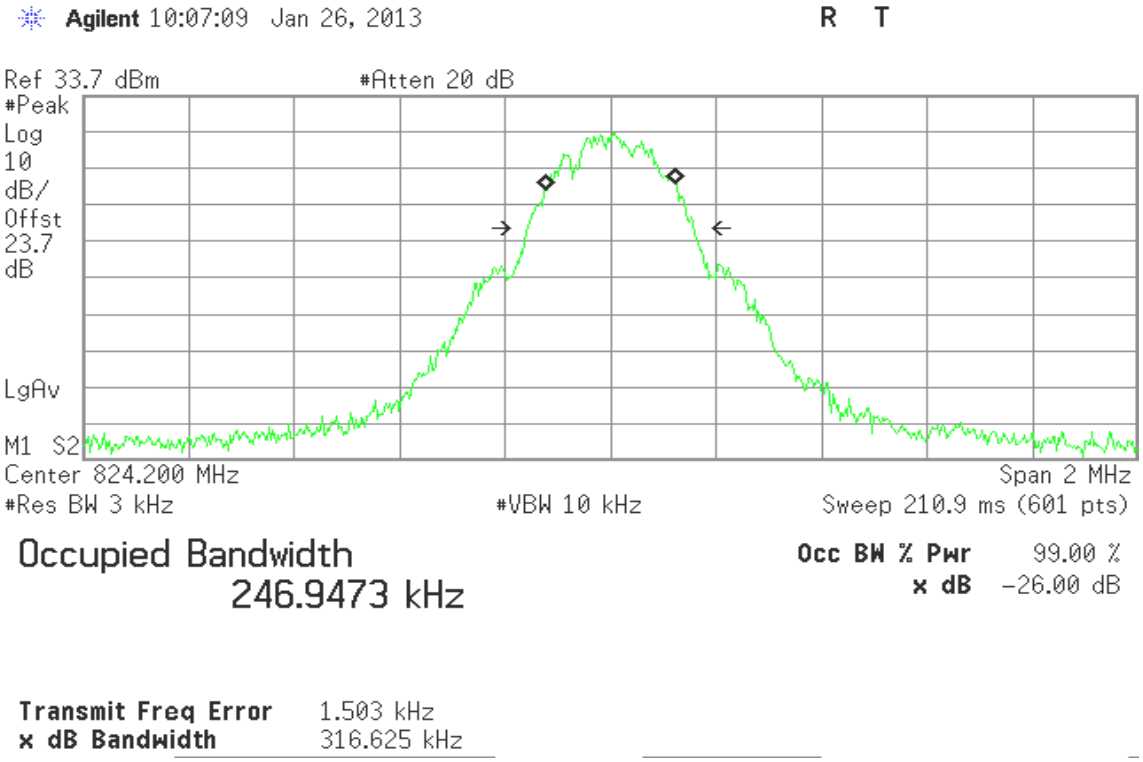


Transmit Freq Error	1.216 kHz
x dB Bandwidth	317.601 kHz

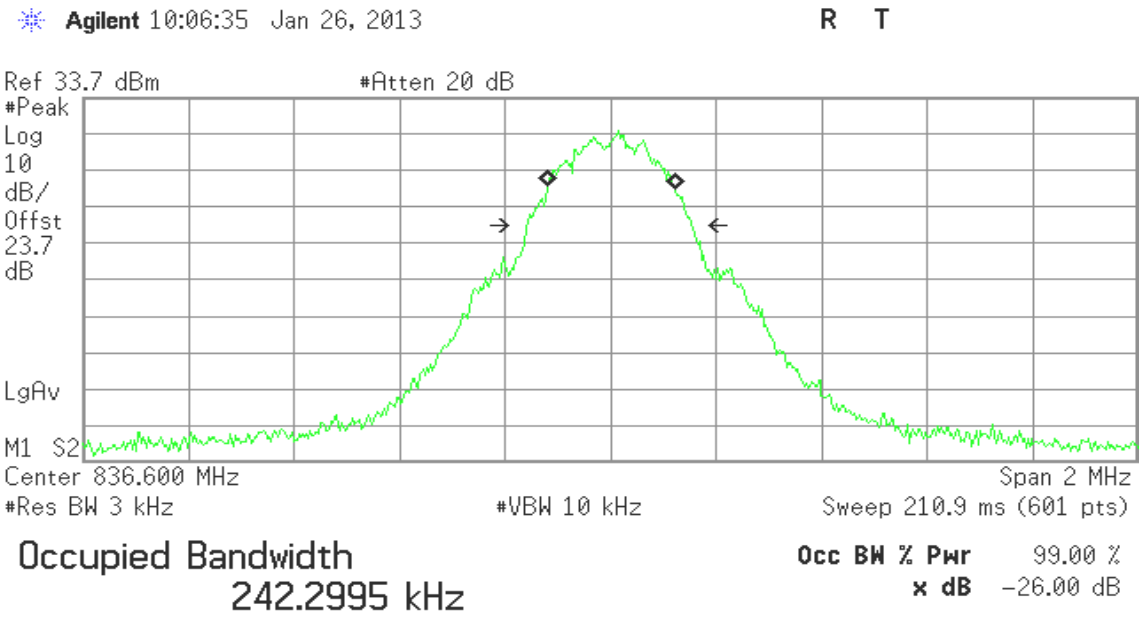
GSM 850 (CH High)



GPRS 850 (CH Low)

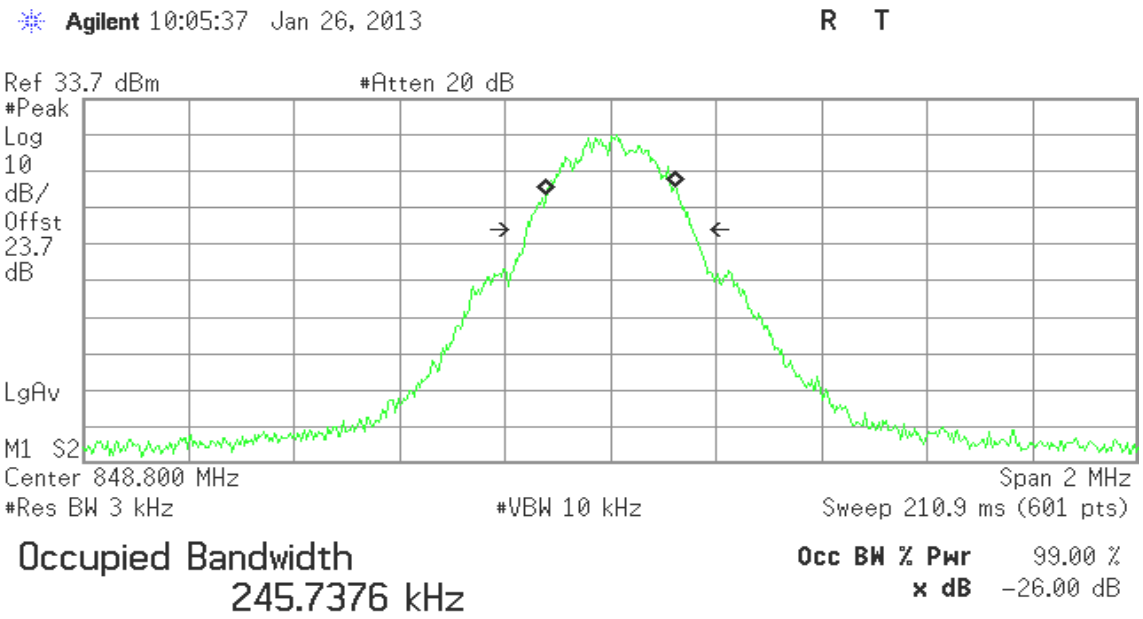


GPRS 850 (CH Mid)



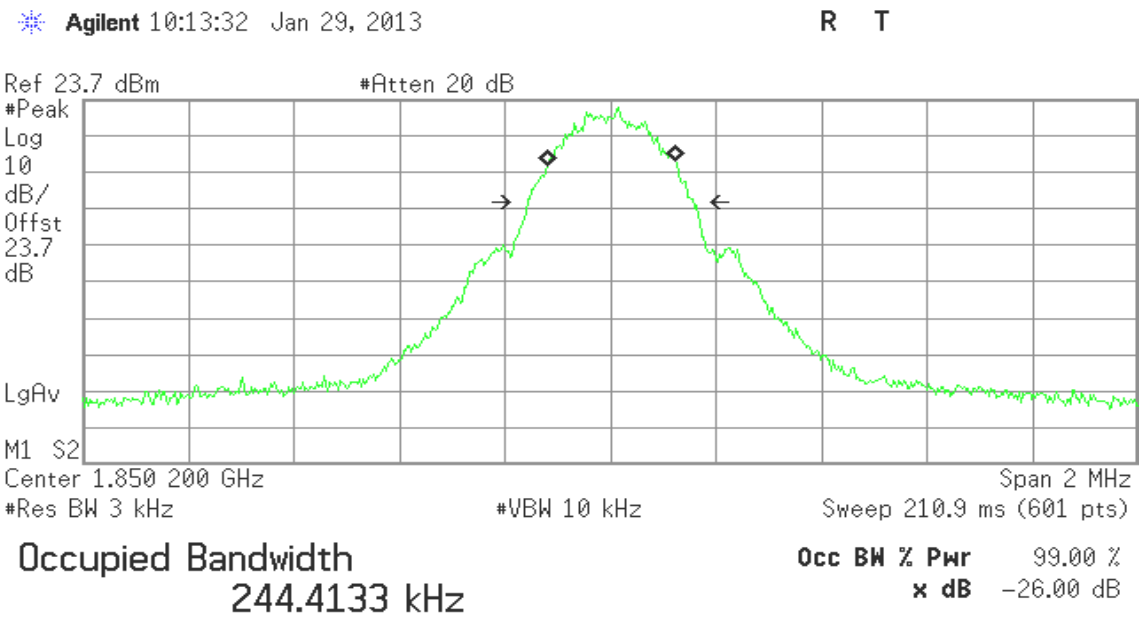
Transmit Freq Error 1.211 kHz
x dB Bandwidth 313.981 kHz

GPRS 850(CH High)



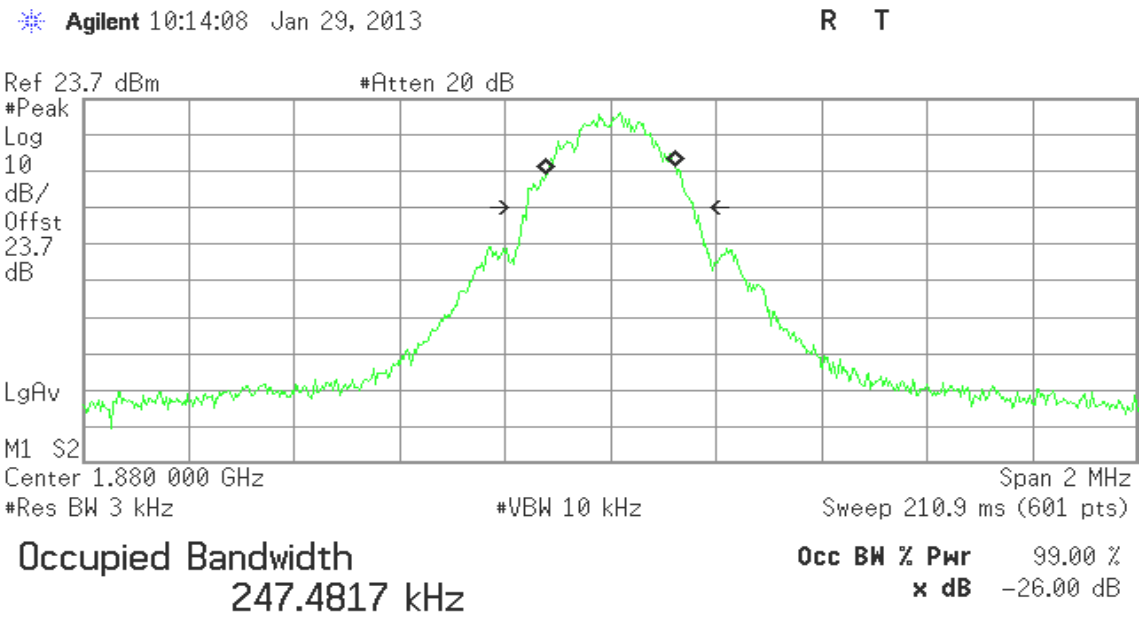
Transmit Freq Error 1.199 kHz
x dB Bandwidth 315.237 kHz

GSM 1900 (CH Low)



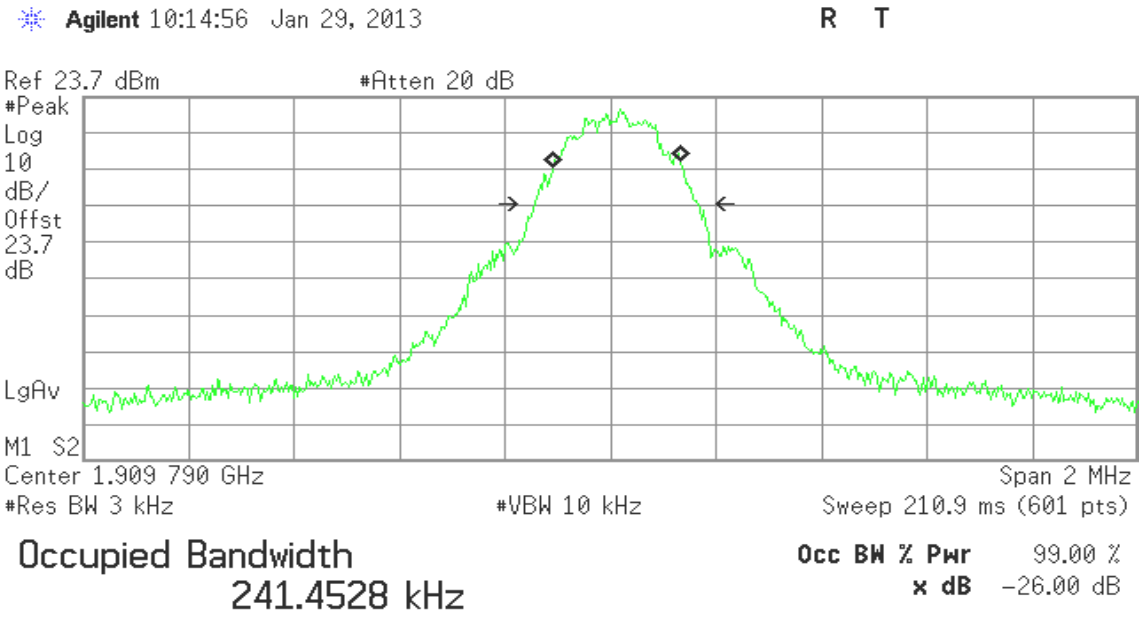
Transmit Freq Error	1.701 kHz
x dB Bandwidth	315.655 kHz

GSM 1900 (CH Mid)



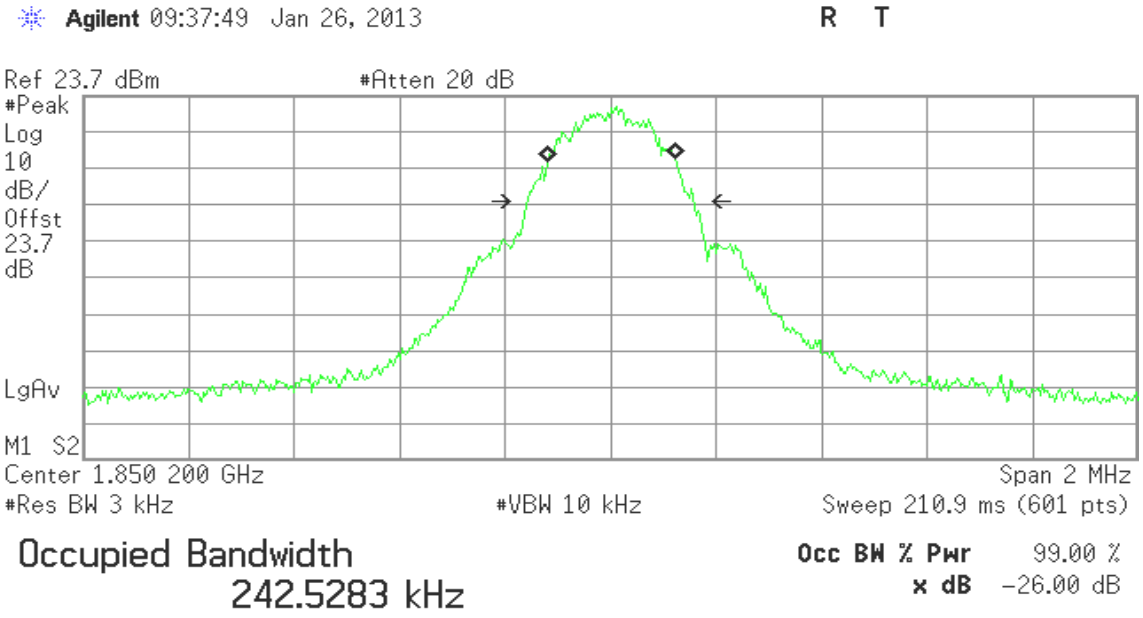
Transmit Freq Error	438.455 Hz
x dB Bandwidth	317.634 kHz

GSM 1900 (CH High)



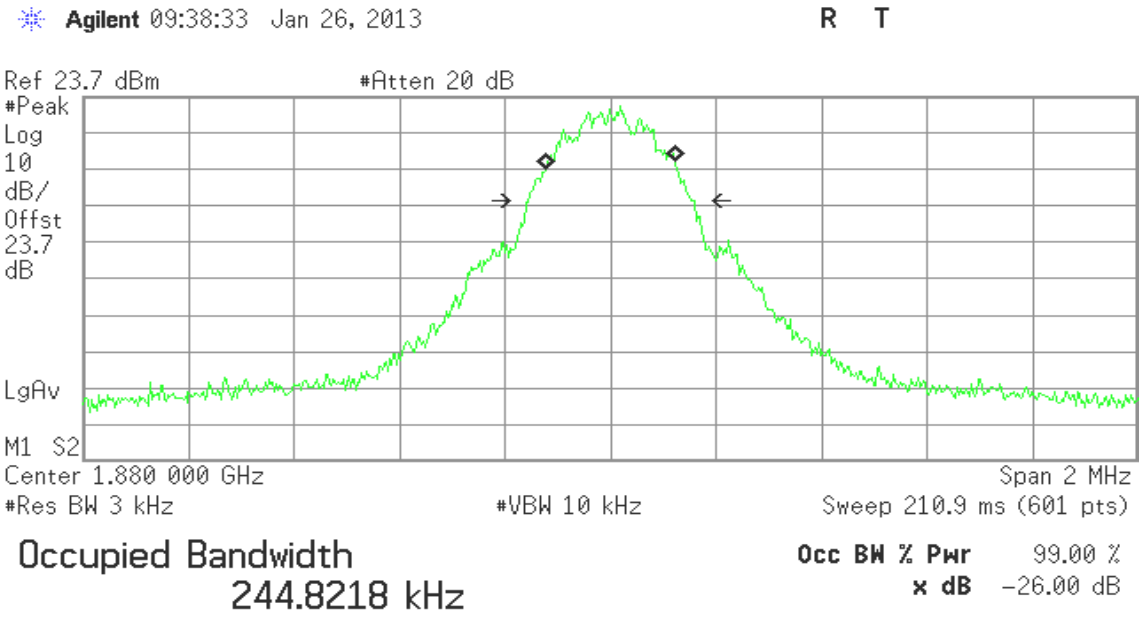
Transmit Freq Error	11.691 kHz
x dB Bandwidth	309.005 kHz

GPRS 1900 (CH Low)



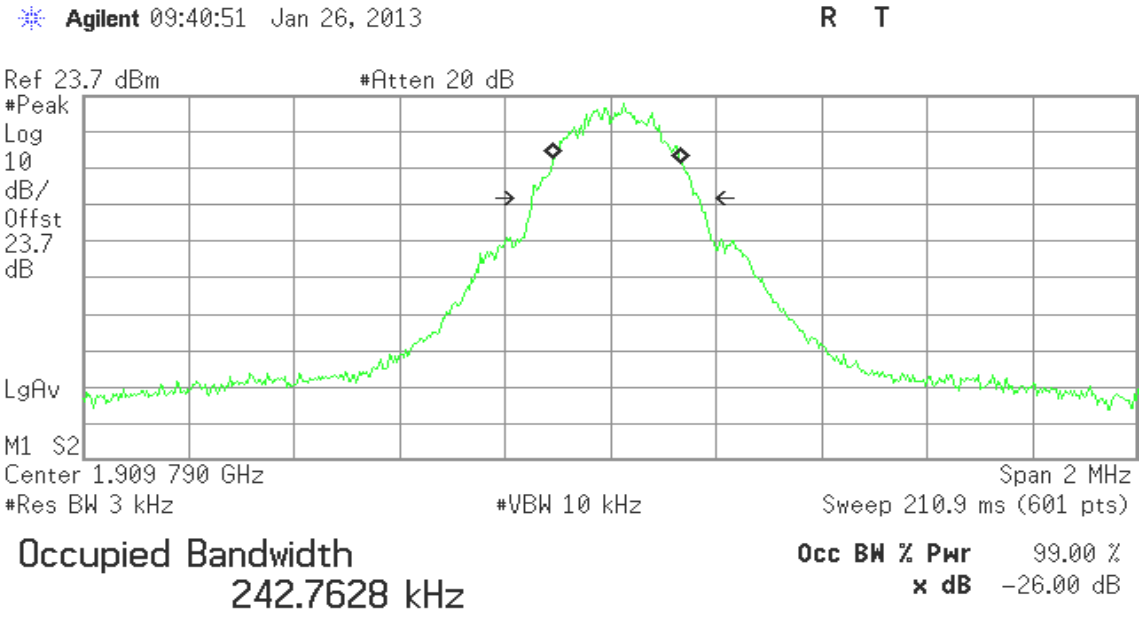
Transmit Freq Error	1.007 kHz
x dB Bandwidth	316.686 kHz

GPRS 1900 (CH Mid)



Transmit Freq Error	-242.181 Hz
x dB Bandwidth	316.426 kHz

GPRS 1900 (CH High)



Transmit Freq Error	11.867 kHz
x dB Bandwidth	315.497 kHz

7.6 OUT OF BAND EMISSION AT ANTENNA TERMINALS

LIMIT

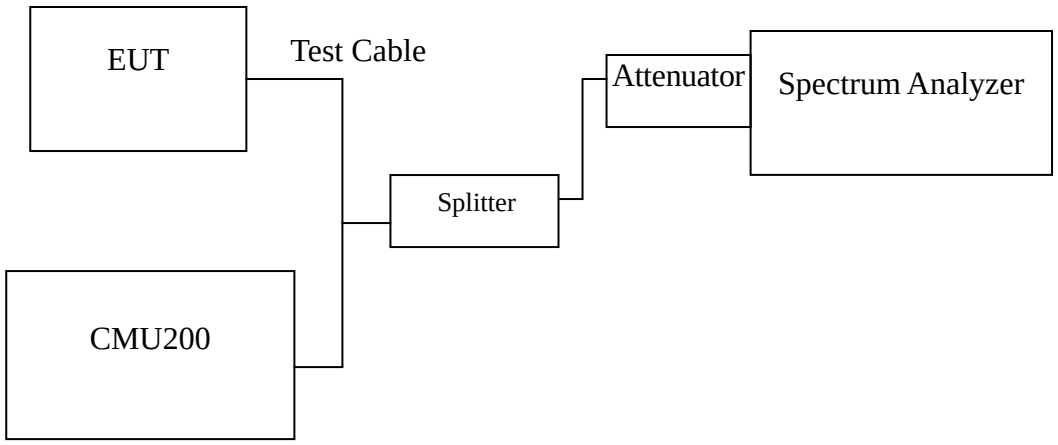
According to FCC §2.1051, FCC §22.917, FCC §24.238(a). RSS-132 (4.5.2), RSS-133 (6.6).

Out of Band Emissions: The mean power of emission must be attenuated below the mean power of the non-modulated carrier (P) on any frequency twice or more than twice the fundamental frequency by at lease 43 + 10 log P dB.

Mobile Emissions in Base Frequency Range: The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not exceed –80 dBm at the transmit antenna connector.
Band Edge Requirements: In the 1MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at lease 1% of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the Out of band Emission

Test Configuration

Out of band emission at antenna terminals:



TEST PROCEDURE

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

For the out of band: Set the RBW, VBW = 1MHz, Start=30MHz, Stop= 10 th harmonic. Limit = -13dBm

Band Edge Requirements (824 MHz and 849 MHz /1850MHz and 1910MHz): In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions. Limit, -13dBm.

TEST RESULTS

No non-compliance noted.

Test Data

Mode	CH	Location	Description
GSM 850	128	Figure 7-1	Conducted spurious emissions, 30MHz - 20GHz
	190	Figure 7-2	Conducted spurious emissions, 30MHz - 20GHz
	251	Figure 7-3	Conducted spurious emissions, 30MHz - 20GHz
GPRS 850 (Class 10)	128	Figure 8-1	Conducted spurious emissions, 30MHz - 20GHz
	190	Figure 8-2	Conducted spurious emissions, 30MHz - 20GHz
	251	Figure 8-3	Conducted spurious emissions, 30MHz - 20GHz

Mode	CH	Location	Description
GSM 1900	512	Figure 9-1	Conducted spurious emissions, 30MHz - 20GHz
	661	Figure 9-2	Conducted spurious emissions, 30MHz - 20GHz
	810	Figure 9-3	Conducted spurious emissions, 30MHz - 20GHz
GPRS 1900 (Class 10)	512	Figure 10-1	Conducted spurious emissions, 30MHz - 20GHz
	661	Figure 10-2	Conducted spurious emissions, 30MHz - 20GHz
	810	Figure 10-3	Conducted spurious emissions, 30MHz - 20GHz

Mode	CH	Location	Description
GSM 850	128	Figure 11-1	Band Edge emissions
	251	Figure 11-2	Band Edge emissions
GPRS 850 (Class 10)	128	Figure 12-1	Band Edge emissions
	251	Figure 12-2	Band Edge emissions

Mode	CH	Location	Description
GSM 1900	512	Figure 13-1	Band Edge emissions
	810	Figure 13-2	Band Edge emissions
GPRS 1900 (Class 10)	512	Figure 14-1	Band Edge emissions
	810	Figure 14-2	Band Edge emissions

Test Plot

GSM 850

Figure 7-1: Out of Band emission at antenna terminals – GSM CH Low

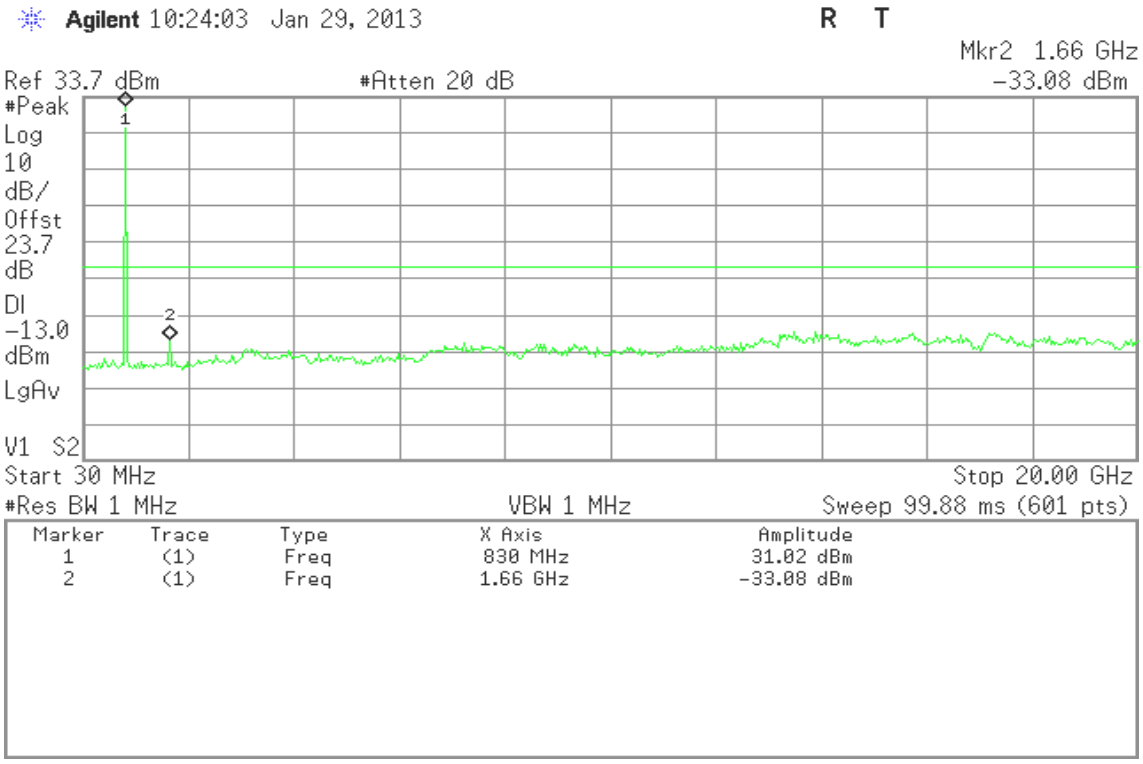


Figure 7-2: Out of Band emission at antenna terminals – GSM CH Mid

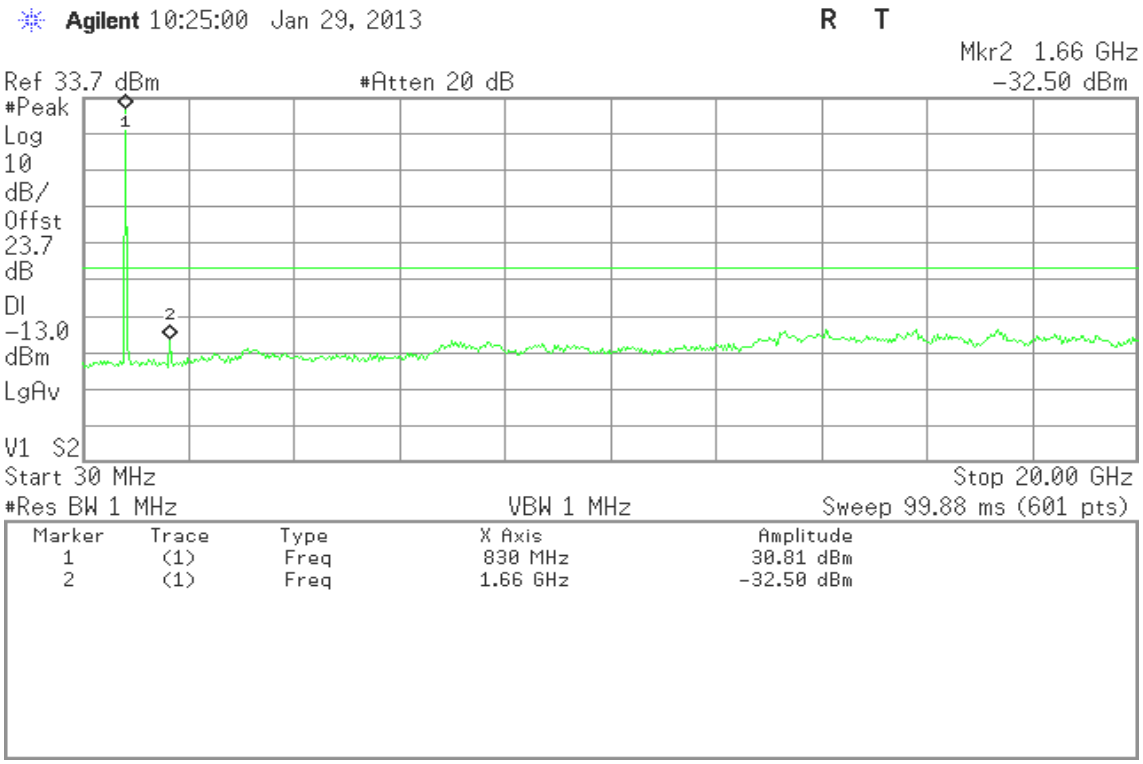
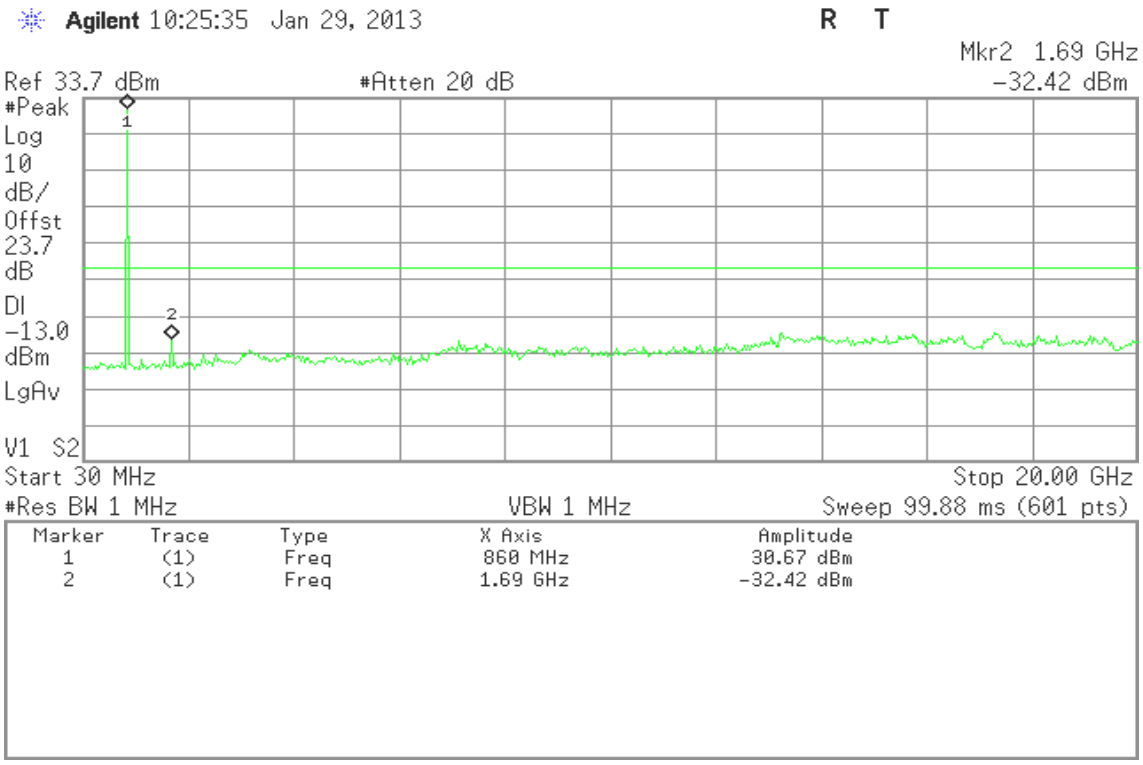


Figure 7-3: Out of Band emission at antenna terminals – GSM CH High



GPRS 850

Figure 8-1: Out of Band emission at antenna terminals – GPRS CH Low

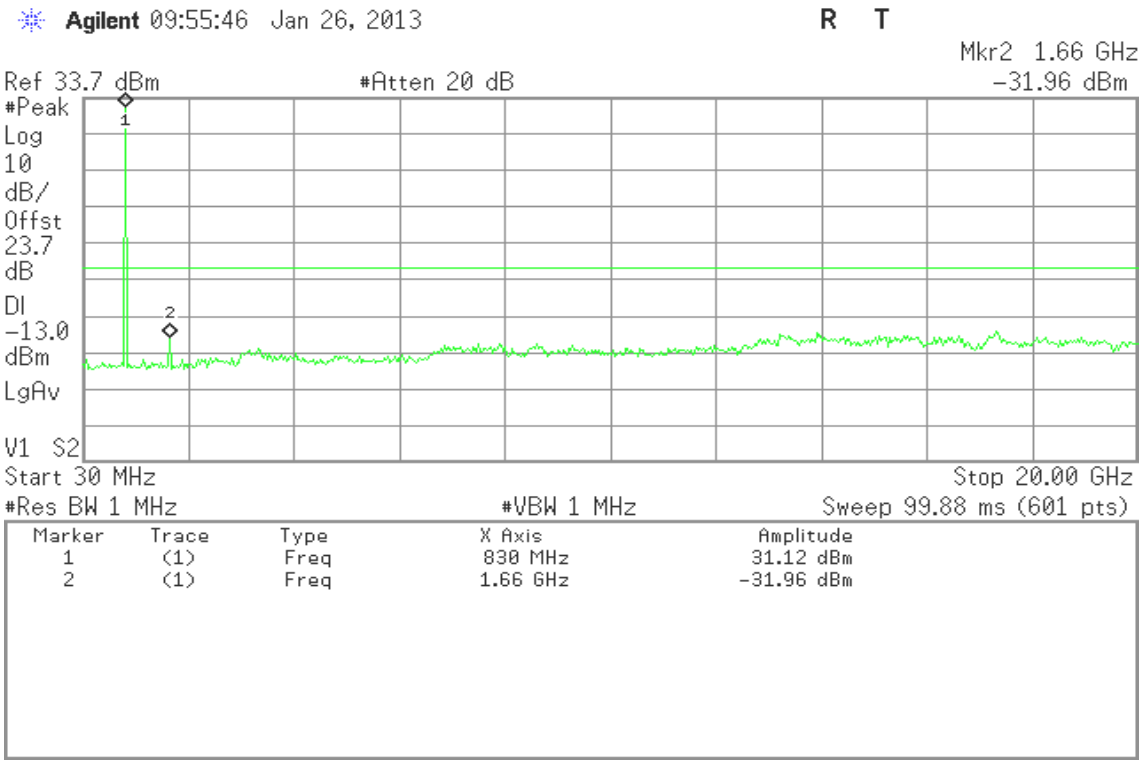


Figure 8-2: Out of Band emission at antenna terminals –GPRS CH Mid

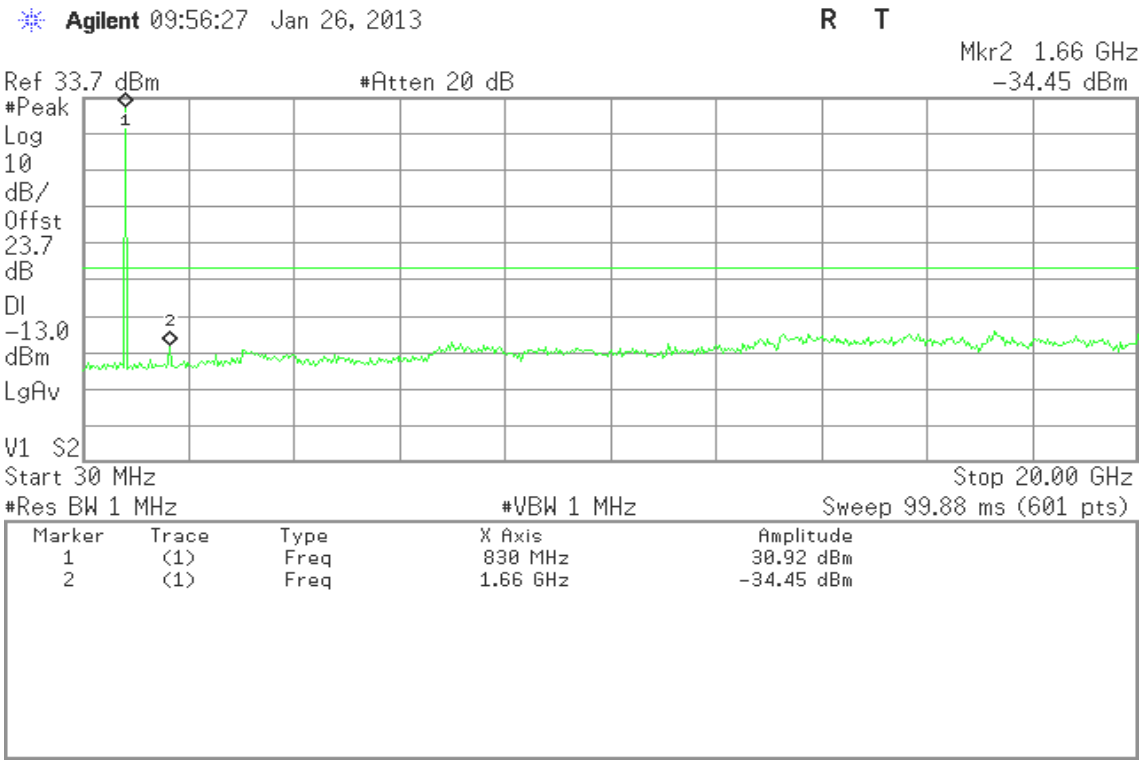
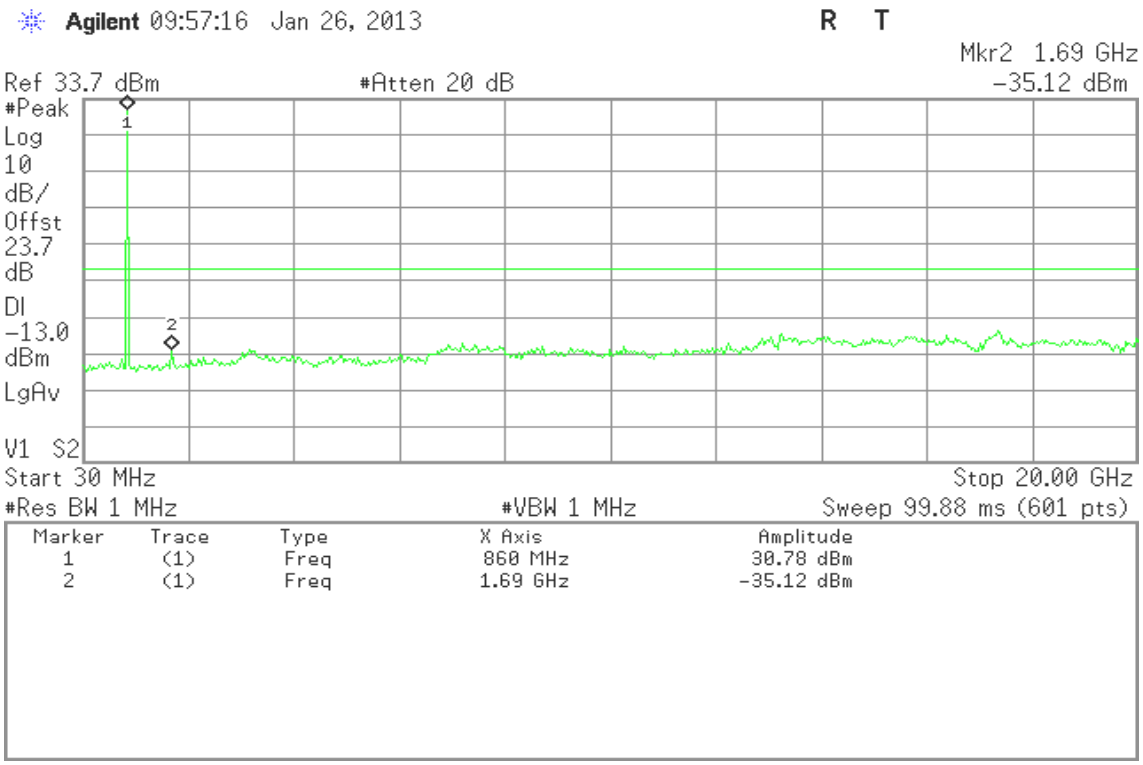


Figure 8-3: Out of Band emission at antenna terminals –GPRS CH High



GSM 1900

Figure 9-1: Out of Band emission at antenna terminals – GSM CH Low

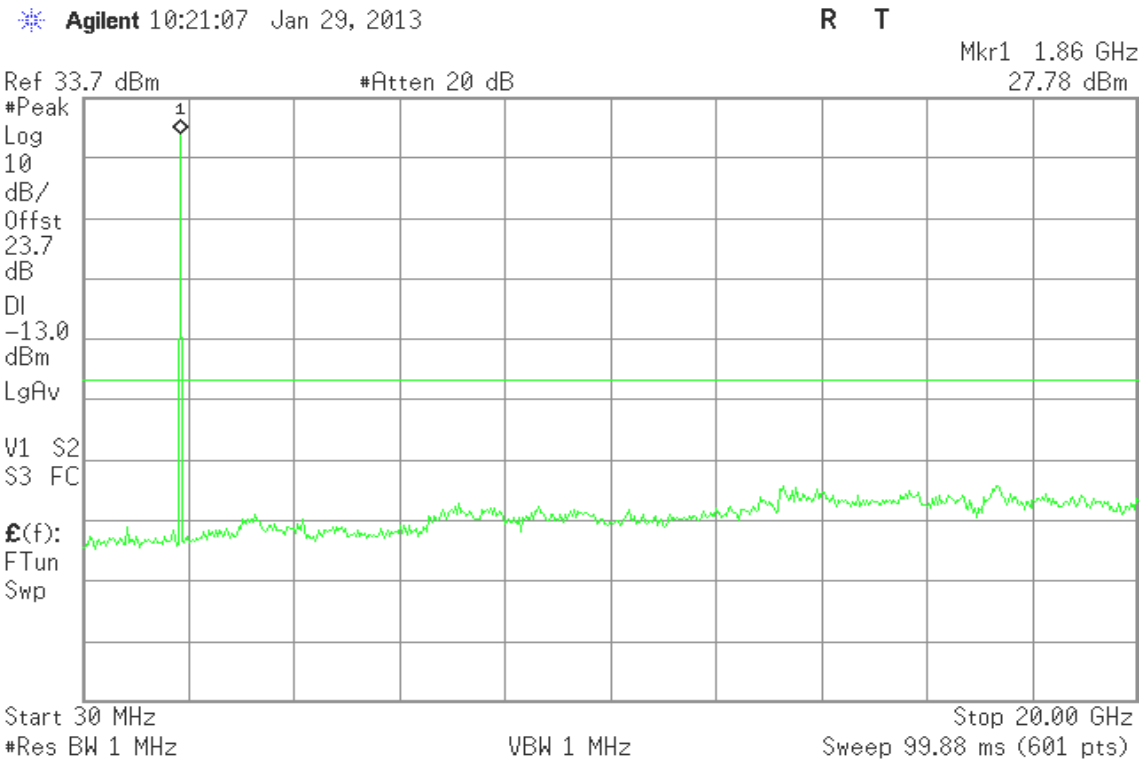


Figure 9-2: Out of Band emission at antenna terminals – GSM CH Mid

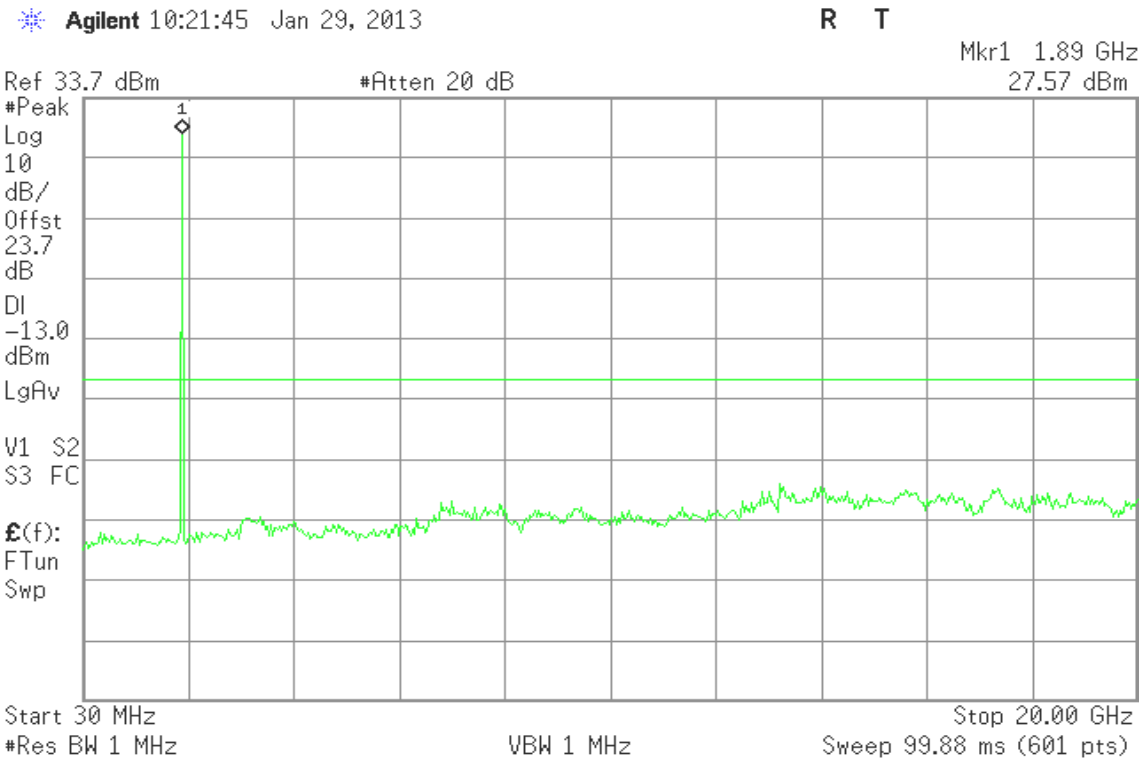
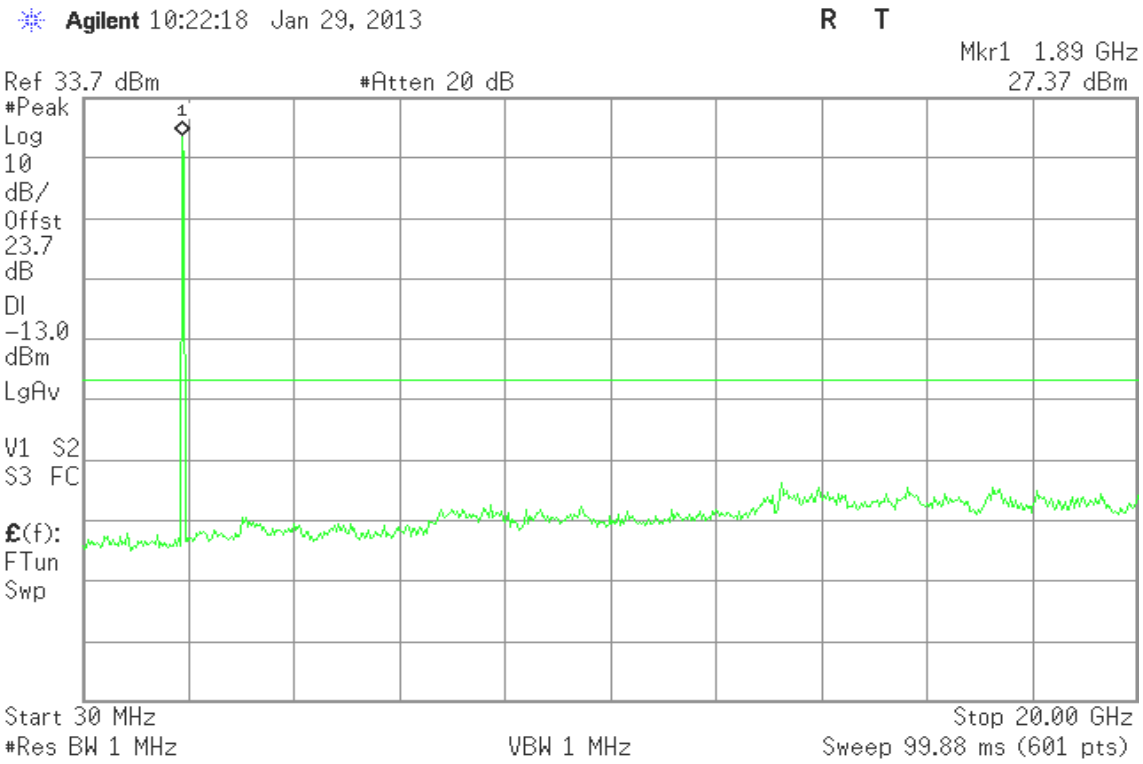


Figure 9-3: Out of Band emission at antenna terminals – GSM CH High



GPRS 1900

Figure 10-1: Out of Band emission at antenna terminals – GSM CH Low

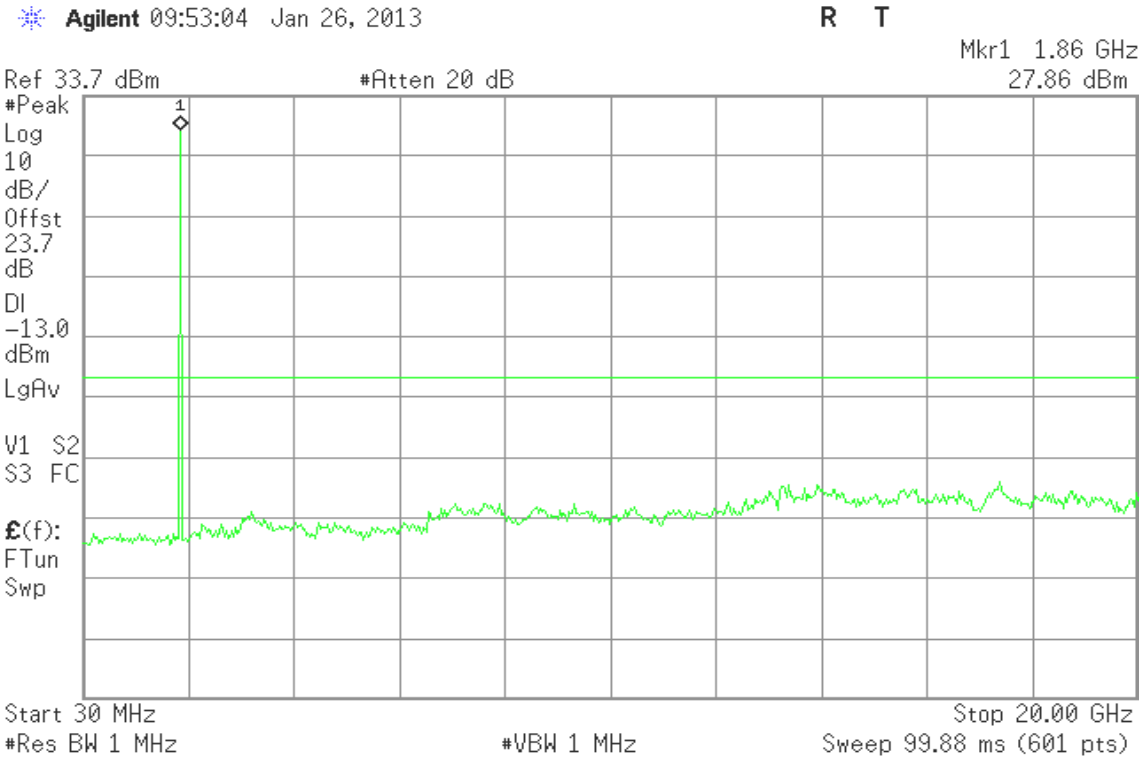


Figure 10-2: Out of Band emission at antenna terminals – GSM CH Mid

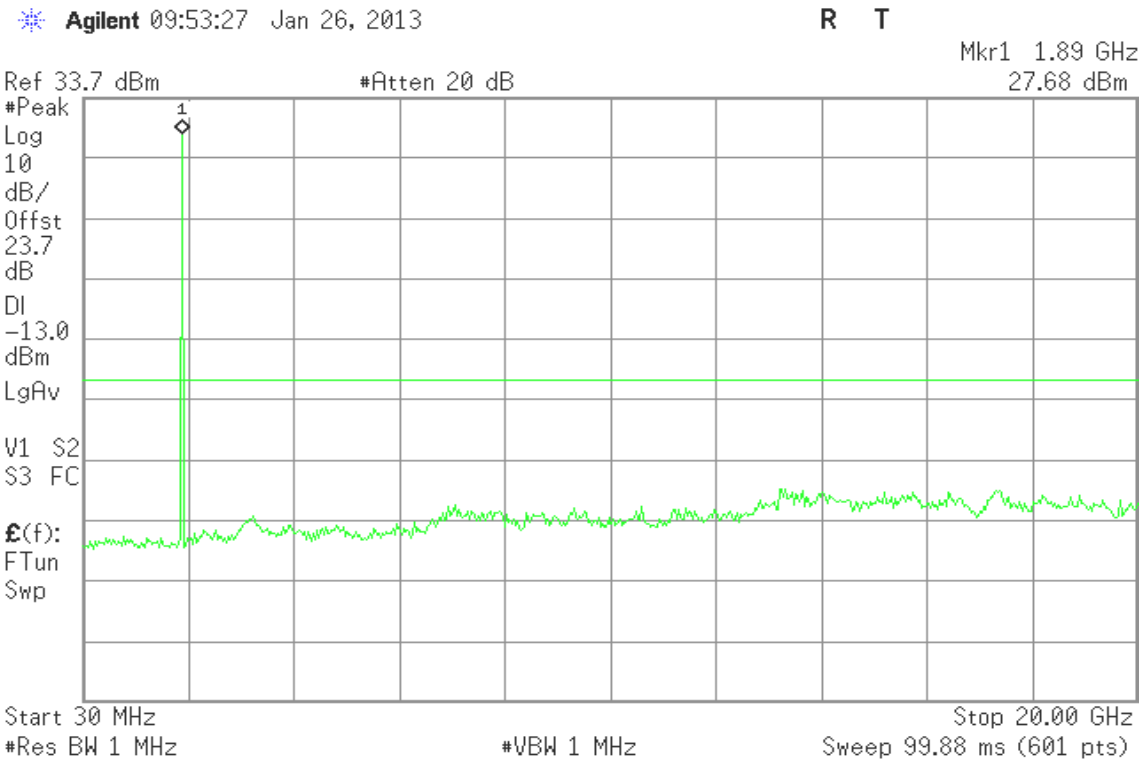
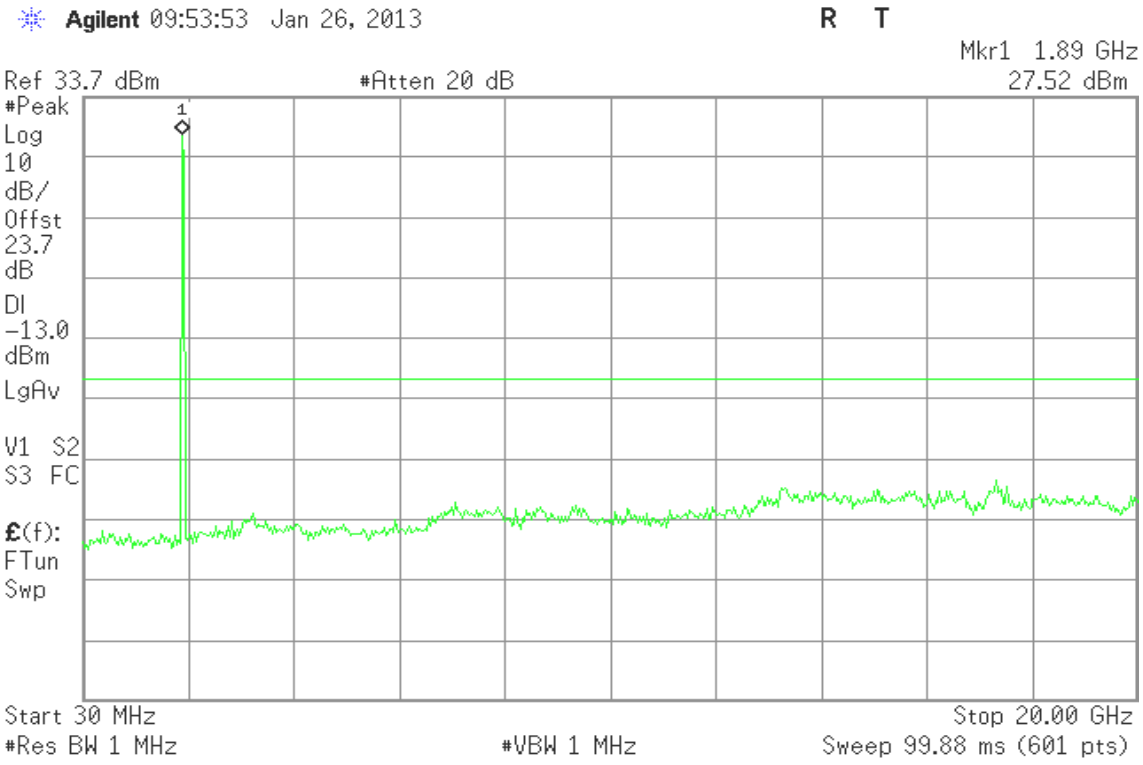


Figure 10-3: Out of Band emission at antenna terminals – GSM CH High



GSM 850

Figure 11-1: Band Edge emissions – GSM CH Low

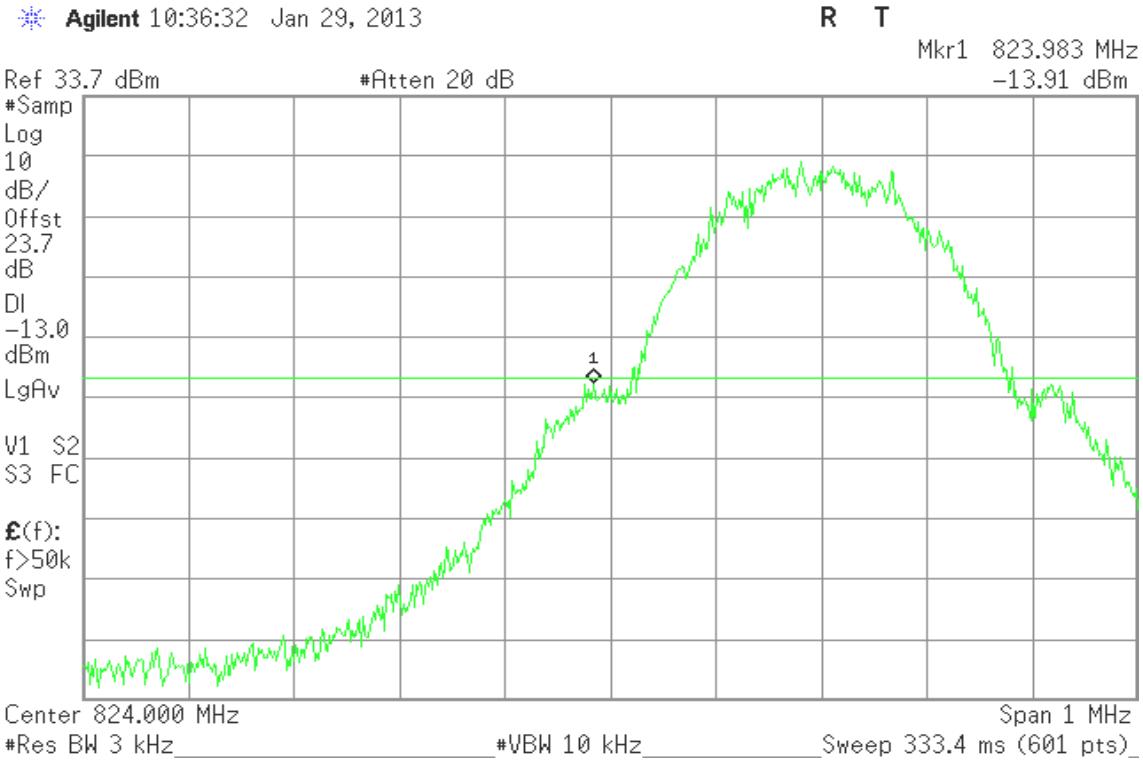
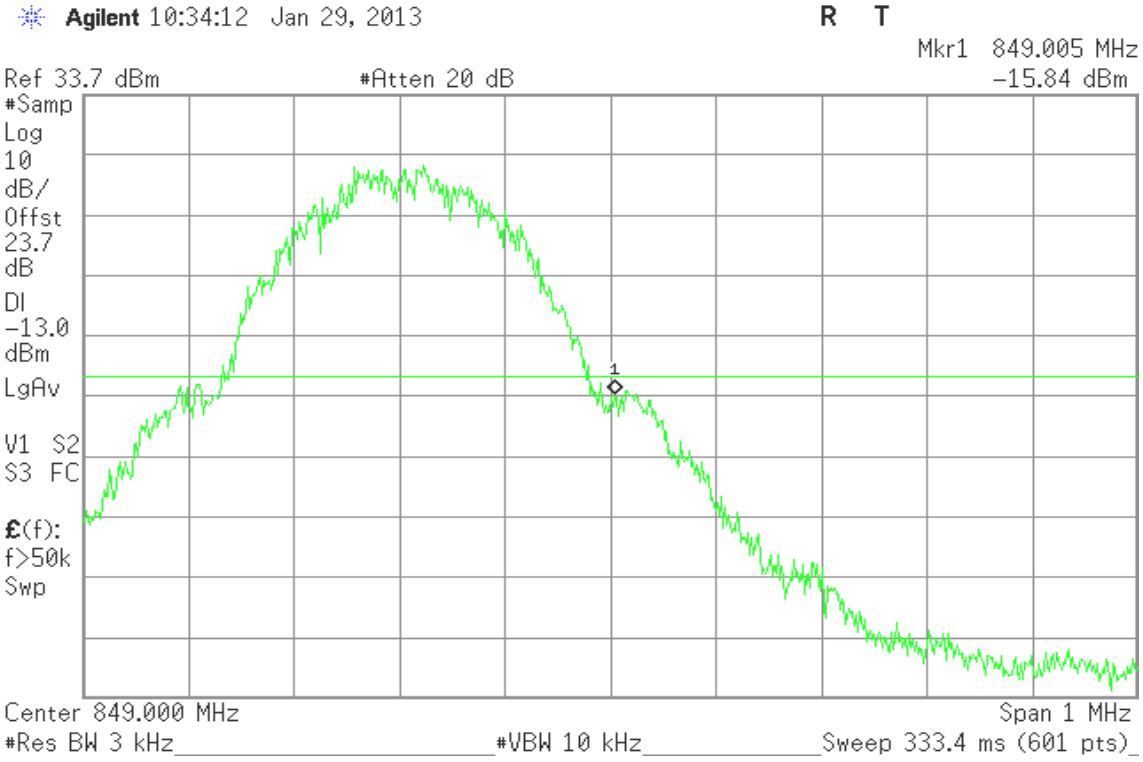


Figure 11-2: Band Edge emissions – GSM CH High



GPRS 850

Figure 12-1: Band Edge emissions – GPRS CH Low

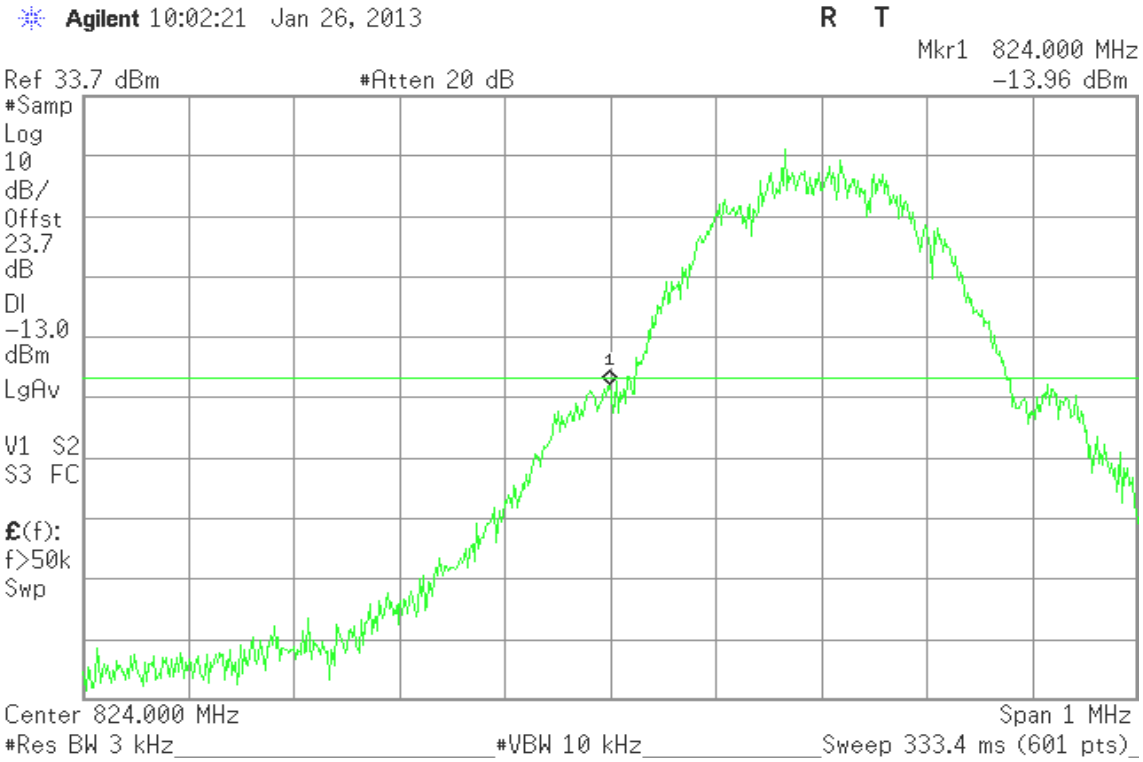
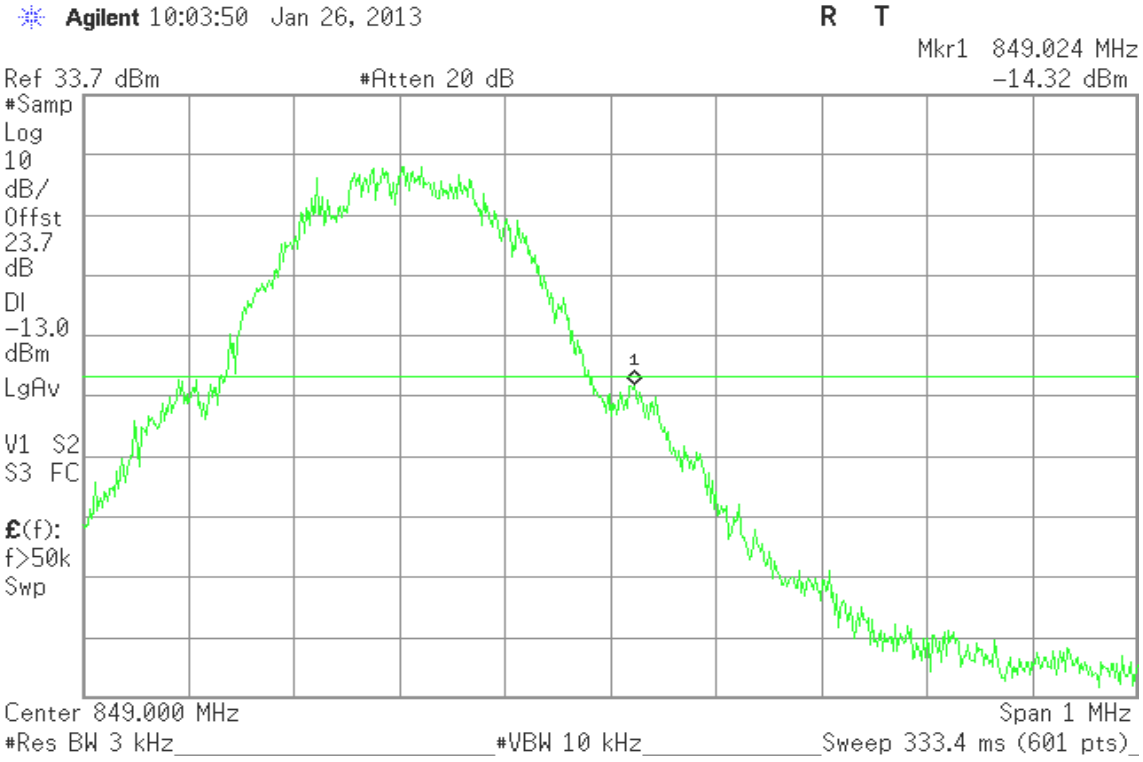


Figure 12-2: Band Edge emissions –GPRS CH High



GSM 1900

Figure 13-1: Band Edge emissions – GSM CH Low

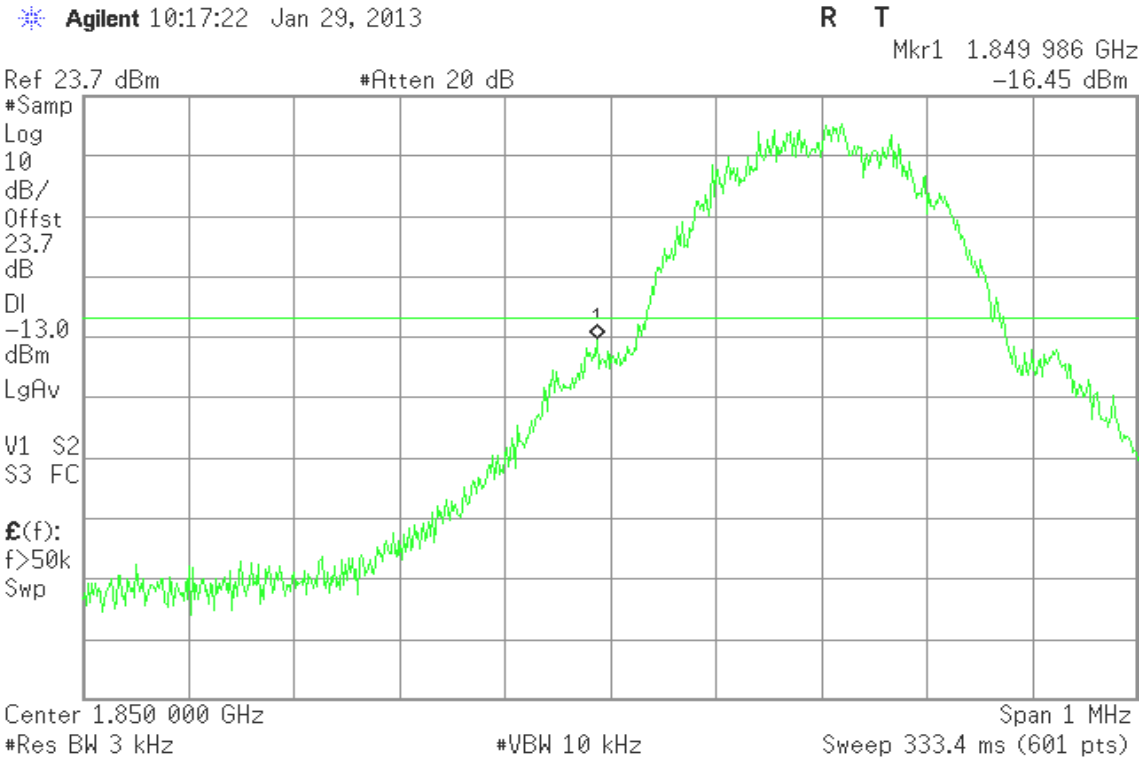
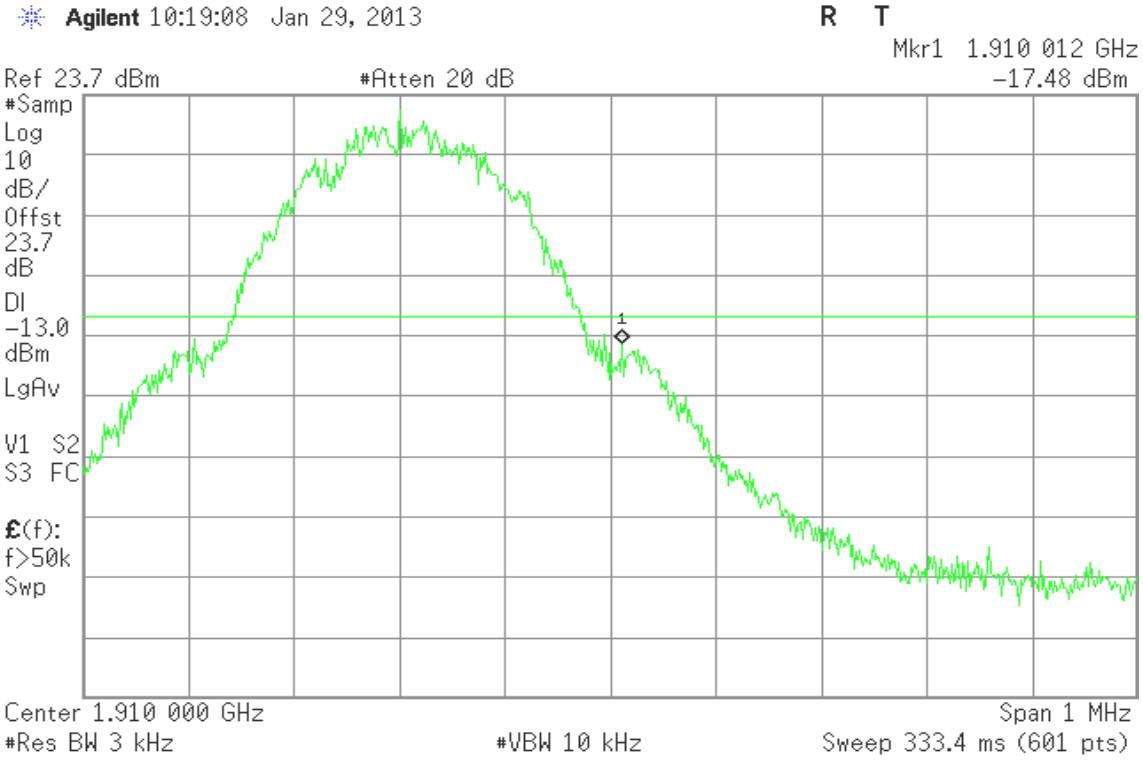


Figure 13-2: Band Edge emissions – GSM CH High



GPRS 1900

Figure 14-1: Band Edge emissions – GPRS CH Low

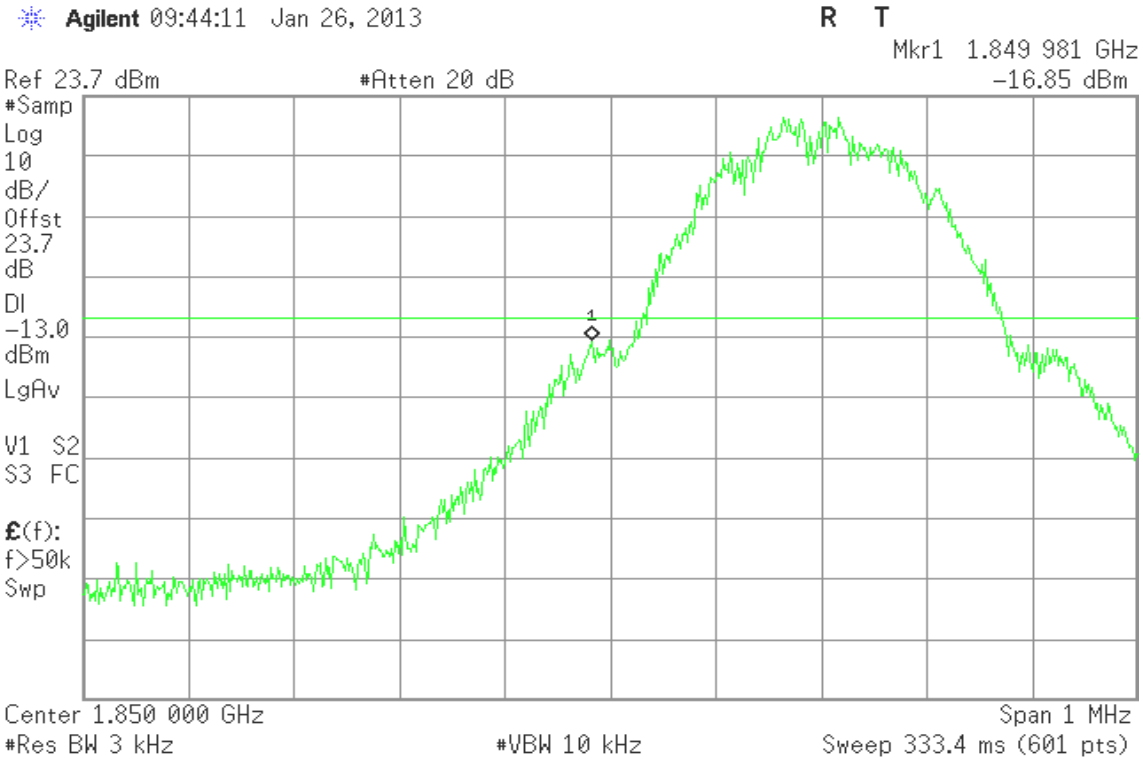
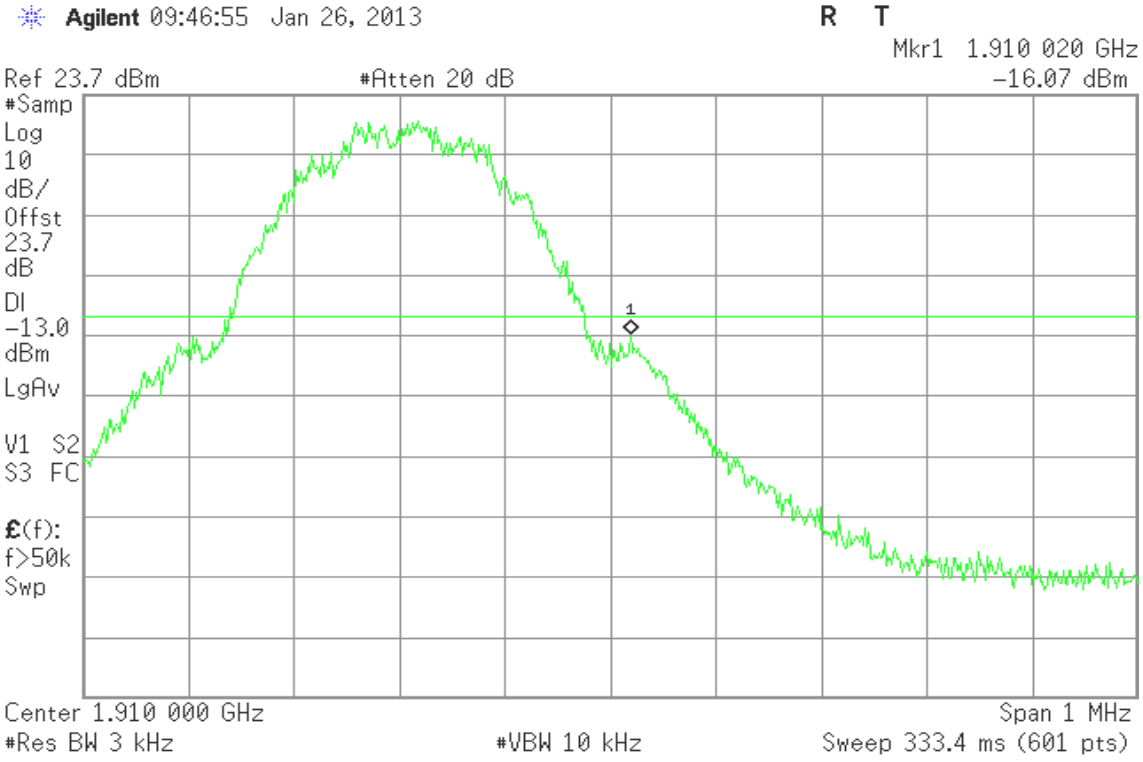


Figure 14-2: Band Edge emissions – GPRS CH High



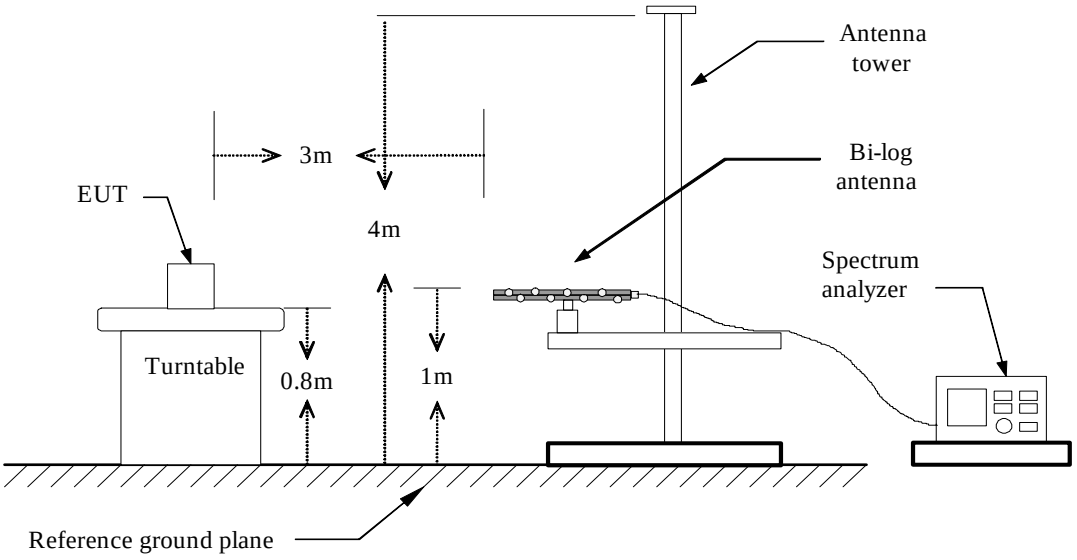
7.7 FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

LIMIT

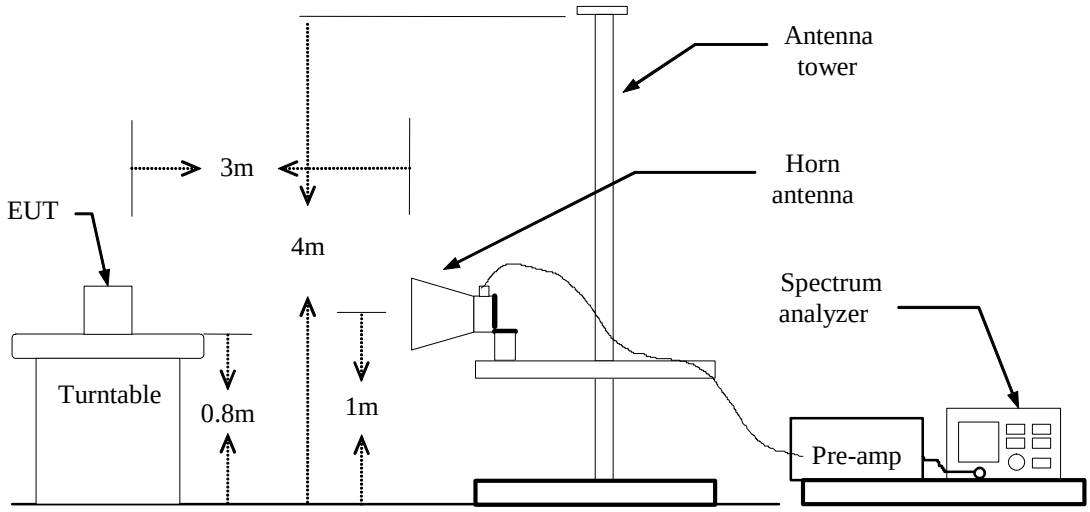
According to FCC §2.1053, RSS-132 (4.6) & RSS-133 (6.5).

Test Configuration

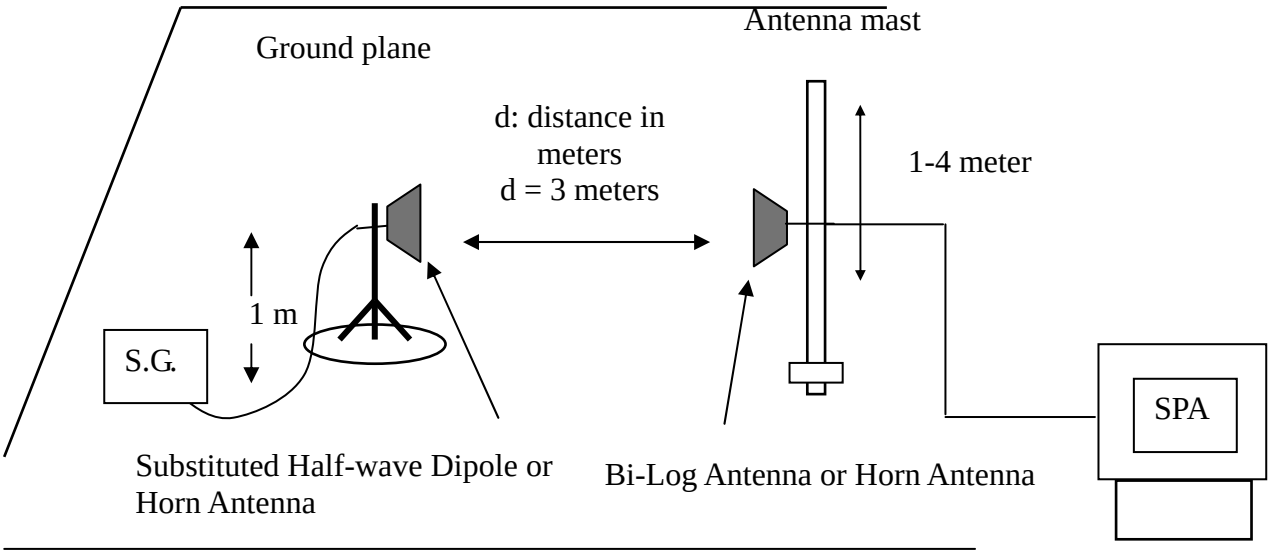
Below 1 GHz



Above 1 GHz



Substituted Method Test Set-up



TEST PROCEDURE

The EUT was placed on a non-conductive, the measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequency (low, middle and high channels). Once spurious emission were identified, the power of the emission was determined using the substitution method.

The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency.

ERP = S.G. output (dBm) + Antenna Gain (dBd) – Cable (dB)

EIRP = S.G. output (dBm) + Antenna Gain (dBi) – Cable (dB)

TEST RESULTS

Refer to the attached tabular data sheets.

Radiated Spurious Emission Measurement Result / Below 1GHz

Operation Mode: GSM 850 / TX / CH 128 **Test Date:** January 30, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
71.7100	-59.58	0.97	-1.61	-62.16	-13.00	-49.16	V
95.9600	-65.13	1.13	0.26	-66.00	-13.00	-53.00	V
161.9200	-72.24	1.5	1.61	-72.13	-13.00	-59.13	V
309.3600	-84.13	2.13	5.78	-80.48	-13.00	-67.48	V
384.0500	-78.14	2.31	5.99	-74.46	-13.00	-61.46	V
480.0800	-80.87	2.64	5.54	-77.97	-13.00	-64.97	V
71.7100	-54.03	0.97	-1.61	-56.61	-13.00	-43.61	H
95.9600	-58.36	1.13	0.26	-59.23	-13.00	-46.23	H
161.9200	-63.68	1.5	1.61	-63.57	-13.00	-50.57	H
191.9900	-68.13	1.62	3.79	-65.96	-13.00	-52.96	H
384.0500	-69.76	2.31	5.99	-66.08	-13.00	-53.08	H
431.5800	-71.68	2.5	5.81	-68.37	-13.00	-55.37	H

Remark:

1. *The emission behaviour belongs to narrowband spurious emission.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GSM 850 / TX / CH 190 **Test Date:** January 30, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
71.7100	-59.77	0.97	-1.61	-62.35	-13.00	-49.35	V
98.8700	-70.29	1.14	-0.21	-71.64	-13.00	-58.64	V
138.6400	-70.02	1.39	-0.38	-71.79	-13.00	-58.79	V
384.0500	-76.57	2.31	5.99	-72.89	-13.00	-59.89	V
431.5800	-77.78	2.5	5.81	-74.47	-13.00	-61.47	V
480.0800	-79.7	2.64	5.54	-76.80	-13.00	-63.80	V
71.7100	-56.32	0.97	-1.61	-58.90	-13.00	-45.90	H
95.9600	-59.13	1.13	0.26	-60.00	-13.00	-47.00	H
138.6400	-61.73	1.39	-0.38	-63.50	-13.00	-50.50	H
250.1900	-65.28	1.84	5.68	-61.44	-13.00	-48.44	H
384.0500	-71.15	2.31	5.99	-67.47	-13.00	-54.47	H
431.5800	-72.97	2.5	5.81	-69.66	-13.00	-56.66	H

Remark:

1. *The emission behaviour belongs to narrowband spurious emission.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GSM 850 / TX / CH 251 **Test Date:** January 30, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
71.7100	-59.14	0.97	-1.61	-61.72	-13.00	-48.72	V
161.9200	-73.36	1.5	1.61	-73.25	-13.00	-60.25	V
384.0500	-77.87	2.31	5.99	-74.19	-13.00	-61.19	V
448.0700	-80.41	2.58	5.74	-77.25	-13.00	-64.25	V
480.0800	-81.04	2.64	5.54	-78.14	-13.00	-65.14	V
625.5800	-81.83	2.96	6.16	-78.63	-13.00	-65.63	V
71.7100	-55.1	0.97	-1.61	-57.68	-13.00	-44.68	H
95.9600	-58.75	1.13	0.26	-59.62	-13.00	-46.62	H
150.2800	-63.31	1.43	0.71	-64.03	-13.00	-51.03	H
191.9900	-67.58	1.62	3.79	-65.41	-13.00	-52.41	H
384.0500	-70.56	2.31	5.99	-66.88	-13.00	-53.88	H
516.9400	-76.9	2.7	6.07	-73.53	-13.00	-60.53	H

Remark:

1. *The emission behaviour belongs to narrowband spurious emission.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GPRS 850 / TX / CH 128 **Test Date:** January 28, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
84.3200	-59.65	1.07	0.39	-60.33	-13.00	-47.33	V
150.2800	-69.05	1.43	0.71	-69.77	-13.00	-56.77	V
191.9900	-73.64	1.62	3.79	-71.47	-13.00	-58.47	V
354.9500	-77.5	2.25	5.75	-74.00	-13.00	-61.00	V
384.0500	-71.26	2.31	5.99	-67.58	-13.00	-54.58	V
450.9800	-80.34	2.59	5.74	-77.19	-13.00	-64.19	V
84.3200	-57.71	1.07	0.39	-58.39	-13.00	-45.39	H
150.2800	-65.2	1.43	0.71	-65.92	-13.00	-52.92	H
303.5400	-76.36	2.11	5.67	-72.80	-13.00	-59.80	H
384.0500	-65.61	2.31	5.99	-61.93	-13.00	-48.93	H
431.5800	-74.62	2.5	5.81	-71.31	-13.00	-58.31	H
589.6900	-78.52	2.89	6.19	-75.22	-13.00	-62.22	H

Remark:

1. *The emission behaviour belongs to narrowband spurious emission.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GPRS 850 / TX / CH 190 **Test Date:** January 28, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
84.3200	-61.47	1.07	0.39	-62.15	-13.00	-49.15	V
191.9900	-73.37	1.62	3.79	-71.20	-13.00	-58.20	V
354.9500	-78.27	2.25	5.75	-74.77	-13.00	-61.77	V
384.0500	-72.72	2.31	5.99	-69.04	-13.00	-56.04	V
459.7100	-80	2.6	5.88	-76.72	-13.00	-63.72	V
625.5800	-80.05	2.96	6.16	-76.85	-13.00	-63.85	V
84.3200	-59.8	1.07	0.39	-60.48	-13.00	-47.48	H
138.6400	-63.28	1.39	-0.38	-65.05	-13.00	-52.05	H
191.9900	-70.8	1.62	3.79	-68.63	-13.00	-55.63	H
256.9800	-73.87	1.89	5.62	-70.14	-13.00	-57.14	H
354.9500	-70.53	2.25	5.75	-67.03	-13.00	-54.03	H
384.0500	-65.67	2.31	5.99	-61.99	-13.00	-48.99	H

Remark:

1. *The emission behaviour belongs to narrowband spurious emission.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GPRS 850 / TX / CH 251 **Test Date:** January 28, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
84.3200	-61.73	1.07	0.39	-62.41	-13.00	-49.41	V
153.1900	-69.36	1.44	0.94	-69.86	-13.00	-56.86	V
319.0600	-82.33	2.17	5.71	-78.79	-13.00	-65.79	V
335.5500	-76.52	2.17	5.75	-72.94	-13.00	-59.94	V
384.0500	-72.35	2.31	5.99	-68.67	-13.00	-55.67	V
448.0700	-80.1	2.58	5.74	-76.94	-13.00	-63.94	V
101.7800	-61.67	1.16	-0.64	-63.47	-13.00	-50.47	H
141.5500	-63.24	1.4	-0.1	-64.74	-13.00	-51.74	H
191.9900	-70.4	1.62	3.79	-68.23	-13.00	-55.23	H
354.9500	-69.13	2.25	5.75	-65.63	-13.00	-52.63	H
384.0500	-64.85	2.31	5.99	-61.17	-13.00	-48.17	H
431.5800	-72.92	2.5	5.81	-69.61	-13.00	-56.61	H

Remark:

1. *The emission behaviour belongs to narrowband spurious emission.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GSM 1900 / TX / CH 512 **Test Date:** January 30, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
71.7100	-60.24	0.97	-1.61	-62.82	-13.00	-49.82	V
138.6400	-70.32	1.39	-0.38	-72.09	-13.00	-59.09	V
191.9900	-77.19	1.62	3.79	-75.02	-13.00	-62.02	V
354.9500	-79.99	2.25	5.75	-76.49	-13.00	-63.49	V
384.0500	-77.48	2.31	5.99	-73.80	-13.00	-60.80	V
708.0300	-78.2	3.14	6.31	-75.03	-13.00	-62.03	V
71.7100	-55.83	0.97	-1.61	-58.41	-13.00	-45.41	H
138.6400	-62.07	1.39	-0.38	-63.84	-13.00	-50.84	H
236.6100	-58.27	1.81	5.37	-54.71	-13.00	-41.71	H
604.2400	-63.07	2.92	6.36	-59.63	-13.00	-46.63	H
709.0000	-58.95	3.14	6.3	-55.79	-13.00	-42.79	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GSM 1900 / TX / CH 661 **Test Date:** January 30, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
71.7100	-60.77	0.97	-1.61	-63.35	-13.00	-50.35	V
138.6400	-70.66	1.39	-0.38	-72.43	-13.00	-59.43	V
354.9500	-79.33	2.25	5.75	-75.83	-13.00	-62.83	V
384.0500	-77	2.31	5.99	-73.32	-13.00	-60.32	V
516.9400	-82.81	2.7	6.07	-79.44	-13.00	-66.44	V
648.8600	-80.91	3.03	6.26	-77.68	-13.00	-64.68	V
95.9600	-59.04	1.13	0.26	-59.91	-13.00	-46.91	H
286.0800	-59.18	2.01	5.36	-55.83	-13.00	-42.83	H
384.0500	-70.16	2.31	5.99	-66.48	-13.00	-53.48	H
431.5800	-72.3	2.5	5.81	-68.99	-13.00	-55.99	H
571.2600	-69.49	2.87	6.1	-66.26	-13.00	-53.26	H
648.8600	-66.63	3.03	6.26	-63.40	-13.00	-50.40	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GSM 1900 / TX / CH 810 **Test Date:** January 30, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
71.7100	-60.54	0.97	-1.61	-63.12	-13.00	-50.12	V
138.6400	-70.3	1.39	-0.38	-72.07	-13.00	-59.07	V
161.9200	-73.06	1.5	1.61	-72.95	-13.00	-59.95	V
243.4000	-83.56	1.82	5.43	-79.95	-13.00	-66.95	V
335.5500	-73.24	2.17	5.75	-69.66	-13.00	-56.66	V
694.4500	-70.75	3.12	6.45	-67.42	-13.00	-54.42	V
138.6400	-61.99	1.39	-0.38	-63.76	-13.00	-50.76	H
335.5500	-55.99	2.17	5.75	-52.41	-13.00	-39.41	H
384.0500	-71	2.31	5.99	-67.32	-13.00	-54.32	H
431.5800	-73.96	2.5	5.81	-70.65	-13.00	-57.65	H
694.4500	-57.91	3.12	6.45	-54.58	-13.00	-41.58	H
925.3100	-49.68	3.59	6.5	-46.77	-13.00	-33.77	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GPRS 1900 / TX / CH 512 **Test Date:** January 28, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
48.4300	-59.44	0.79	-5.83	-66.06	-13.00	-53.06	V
153.1900	-67.56	1.44	0.94	-68.06	-13.00	-55.06	V
335.5500	-79.34	2.17	5.75	-75.76	-13.00	-62.76	V
384.0500	-72.86	2.31	5.99	-69.18	-13.00	-56.18	V
448.0700	-79.74	2.58	5.74	-76.58	-13.00	-63.58	V
757.5000	-77.87	3.22	6.25	-74.84	-13.00	-61.84	V
84.3200	-60.61	1.07	0.39	-61.29	-13.00	-48.29	H
138.6400	-61.53	1.39	-0.38	-63.30	-13.00	-50.30	H
234.6700	-77.78	1.8	5.38	-74.20	-13.00	-61.20	H
384.0500	-66.43	2.31	5.99	-62.75	-13.00	-49.75	H
516.9400	-77.27	2.7	6.07	-73.90	-13.00	-60.90	H
703.1800	-77.18	3.12	6.36	-73.94	-13.00	-60.94	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GPRS 1900 / TX / CH 661 **Test Date:** January 28, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
84.3200	-65.48	1.07	0.39	-66.16	-13.00	-53.16	V
150.2800	-68.32	1.43	0.71	-69.04	-13.00	-56.04	V
269.5900	-80.09	1.98	5.12	-76.95	-13.00	-63.95	V
384.0500	-76.57	2.31	5.99	-72.89	-13.00	-59.89	V
448.0700	-80.44	2.58	5.74	-77.28	-13.00	-64.28	V
745.8600	-77.2	3.2	6.1	-74.30	-13.00	-61.30	V
84.3200	-61.24	1.07	0.39	-61.92	-13.00	-48.92	H
138.6400	-63.11	1.39	-0.38	-64.88	-13.00	-51.88	H
342.3400	-71.38	2.18	5.8	-67.76	-13.00	-54.76	H
384.0500	-66.04	2.31	5.99	-62.36	-13.00	-49.36	H
516.9400	-78.63	2.7	6.07	-75.26	-13.00	-62.26	H
757.5000	-72.95	3.22	6.25	-69.92	-13.00	-56.92	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GPRS 1900 / TX / CH 810 **Test Date:** January 28, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
84.3200	-63.46	1.07	0.39	-64.14	-13.00	-51.14	V
150.2800	-68.74	1.43	0.71	-69.46	-13.00	-56.46	V
335.5500	-78.62	2.17	5.75	-75.04	-13.00	-62.04	V
384.0500	-74.19	2.31	5.99	-70.51	-13.00	-57.51	V
661.4700	-81.97	3.06	6.3	-78.73	-13.00	-65.73	V
889.4200	-78.94	3.5	6.7	-75.74	-13.00	-62.74	V
101.7800	-59.86	1.16	-0.64	-61.66	-13.00	-48.66	H
138.6400	-63.06	1.39	-0.38	-64.83	-13.00	-51.83	H
354.9500	-70.21	2.25	5.75	-66.71	-13.00	-53.71	H
384.0500	-65.98	2.31	5.99	-62.30	-13.00	-49.30	H
431.5800	-74.03	2.5	5.81	-70.72	-13.00	-57.72	H
757.5000	-73.03	3.22	6.25	-70.00	-13.00	-57.00	H

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Above 1GHz

Operation Mode: GSM 850 / TX / CH 128 **Test Date:** January 28, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1651.000	-58	5.05	6.03	-57.02	-13.00	-44.02	V
3296.000	-53.64	7.45	8.29	-52.80	-13.00	-39.80	V
N/A							
2470.000	-54.88	6.3	6.06	-55.12	-13.00	-42.12	H
3296.000	-52.97	7.45	8.29	-52.13	-13.00	-39.13	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GSM 850 / TX / CH 190 **Test Date:** January 30, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1672.000	-55.27	5.07	5.99	-54.35	-13.00	-41.35	V
3527.000	-51.42	7.93	8.93	-50.42	-13.00	-37.42	V
N/A							
3345.000	-53.12	7.51	8.44	-52.19	-13.00	-39.19	H
4185.000	-51.08	8.49	9.55	-50.02	-13.00	-37.02	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GSM 850 / TX / CH 251 **Test Date:** January 30, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1749.000	-43.86	5.2	5.85	-43.21	-13.00	-30.21	V
3576.000	-52.58	8.05	8.98	-51.65	-13.00	-38.65	V
N/A							
3394.000	-52.83	7.56	8.58	-51.81	-13.00	-38.81	H
4241.000	-50.21	8.54	9.59	-49.16	-13.00	-36.16	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GPRS 850 / TX / CH 128 **Test Date:** January 25, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1952.000	-43.01	5.59	5.49	-43.11	-13.00	-30.11	V
3478.000	-52.79	7.8	8.83	-51.76	-13.00	-38.76	V
N/A							
1651.000	-52.13	5.05	6.03	-51.15	-13.00	-38.15	H
2470.000	-44.52	6.3	6.06	-44.76	-13.00	-31.76	H
4122.000	-49.39	8.47	9.5	-48.36	-13.00	-35.36	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GPRS 850 / TX / CH 190 **Test Date:** January 28, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1672.000	-52.43	5.07	5.99	-51.51	-13.00	-38.51	V
3527.000	-52.23	7.93	8.93	-51.23	-13.00	-38.23	V
N/A							
1749.000	-44.96	5.2	5.85	-44.31	-13.00	-31.31	H
2512.000	-55.16	6.37	6.13	-55.40	-13.00	-42.40	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GPRS 850 / TX / CH 251 **Test Date:** January 28, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1700.000	-56.39	5.11	5.94	-55.56	-13.00	-42.56	V
3576.000	-49.54	8.05	8.98	-48.61	-13.00	-35.61	V
N/A							
1700.000	-56.32	5.11	5.94	-55.49	-13.00	-42.49	H
3625.000	-54.79	8.13	9.03	-53.89	-13.00	-40.89	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GSM 1900 / TX / CH 512 **Test Date:** January 30, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3611.000	-51.31	8.12	9.01	-50.42	-13.00	-37.42	V
7202.000	-46.52	11.85	12.22	-46.15	-13.00	-33.15	V
N/A							
4339.000	-52.82	8.62	9.67	-51.77	-13.00	-38.77	H
5809.000	-51.78	10.42	10.86	-51.34	-13.00	-38.34	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GSM 1900 / TX / CH 661 **Test Date:** January 30, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3667.000	-50.63	8.17	9.07	-49.73	-13.00	-36.73	V
6838.000	-47.64	11.39	11.71	-47.32	-13.00	-34.32	V
N/A							
4122.000	-53.39	8.47	9.5	-52.36	-13.00	-39.36	H
6404.000	-49.17	11.21	11.22	-49.16	-13.00	-36.16	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GSM 1900 / TX / CH 810 **Test Date:** January 30, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3541.000	-50.99	7.97	8.94	-50.02	-13.00	-37.02	V
4808.000	-52.77	9.32	10.29	-51.80	-13.00	-38.80	V
N/A							
4115.000	-52.82	8.46	9.49	-51.79	-13.00	-38.79	H
6530.000	-49.33	11.1	11.34	-49.09	-13.00	-36.09	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GPRS 1900 / TX / CH 512 **Test Date:** January 28, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3422.000	-53.7	7.64	8.67	-52.67	-13.00	-39.67	V
3772.000	-50.75	8.24	9.17	-49.82	-13.00	-36.82	V
N/A							
3177.000	-54.54	7.24	7.93	-53.85	-13.00	-40.85	H
5123.000	-52.98	9.48	10.65	-51.81	-13.00	-38.81	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GPRS 1900 / TX / CH 661 **Test Date:** January 28, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3422.000	-53.84	7.64	8.67	-52.81	-13.00	-39.81	V
3772.000	-50.96	8.24	9.17	-50.03	-13.00	-37.03	V
N/A							
3618.000	-55.02	8.13	9.02	-54.13	-13.00	-41.13	H
5459.000	-53	9.89	10.78	-52.11	-13.00	-39.11	H
N/A							

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

Operation Mode: GPRS 1900 / TX / CH 810 **Test Date:** January 28, 2013

Temperature: 26°C **Tested by:** David Shu

Humidity: 60 % RH **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3863.000	-51.52	8.34	9.26	-50.60	-13.00	-37.60	V
5151.000	-53.58	9.51	10.66	-52.43	-13.00	-39.43	V
N/A							
1910.000	-36.23	5.48	5.56	-36.15	-13.00	-23.15	H
4220.000	-52.7	8.51	9.58	-51.63	-13.00	-38.63	H
N/A							

Remark:

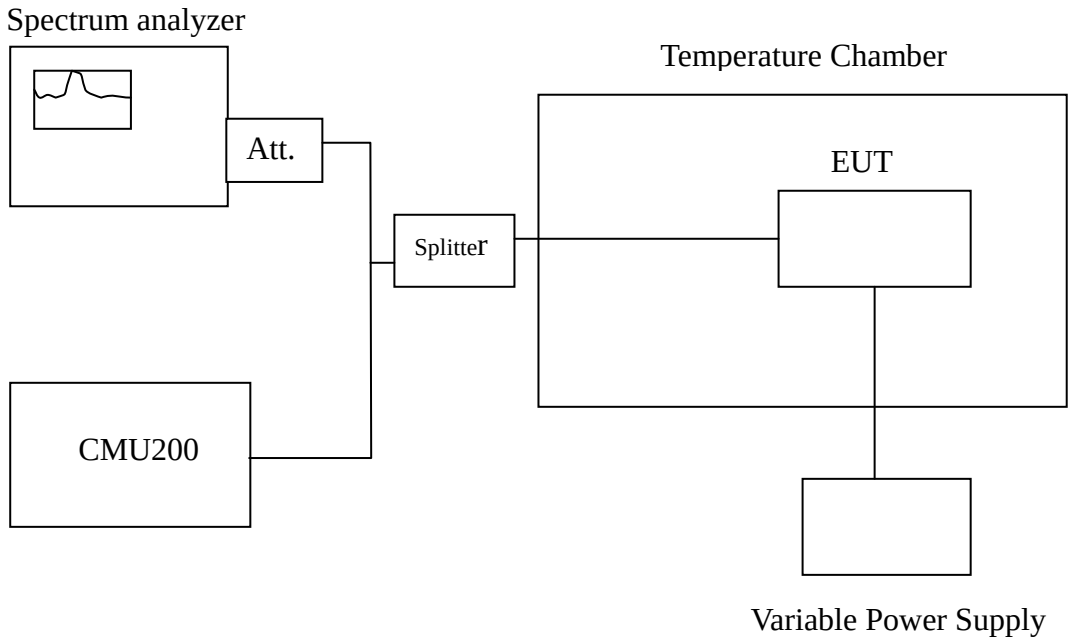
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

7.8 FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT

LIMIT

According to FCC §2.1055, FCC §24.235, RSS-132 (4.3) & RSS-133 (6.3).
Frequency Tolerance: 2.5 ppm

Test Configuration



Remark: *Measurement setup for testing on Antenna connector.*

TEST PROCEDURE

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to –30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

TEST RESULTS

No non-compliance noted.

Reference Frequency: GSM Mid Channel 836.6 MHz @ 20°C				
Limit: ± 2.5 ppm = 2090 Hz				
Power Supply Vdc	Environment Temperature (°C)	Frequency (Hz)	Delta (Hz)	Limit (Hz)
3.7	50	83599998	-7	2090
	40	83599993	-12	
	30	83599983	-22	
	20	83600005	0	
	10	83599991	-14	
	0	83599995	-10	
	-10	83599994	-11	
	-20	83599993	-12	
	-30	83599999	-6	

Reference Frequency: GSM Mid Channel 1880 MHz @ 20°C				
Limit: ± 2.5 ppm = 4700 Hz				
Power Supply Vdc	Environment Temperature (°C)	Frequency (Hz)	Delta (Hz)	Limit (Hz)
3.7	50	1879999998	-7	4700
	40	1879999997	-8	
	30	1879999996	-9	
	20	1880000005	0	
	10	1879999992	-13	
	0	1879999990	-15	
	-10	1879999996	-9	
	-20	1879999994	-11	
	-30	1879999999	-6	

Reference Frequency: GPRS Mid Channel 836.6 MHz @ 20°C				
Limit: +/- 2.5 ppm = 2090 Hz				
Power Supply Vdc	Environment Temperature (°C)	Frequency (Hz)	Delta (Hz)	Limit (Hz)
3.7	50	83599990	-29	2090
	40	83599985	-34	
	30	83599983	-36	
	20	83600019	0	
	10	83599976	-43	
	0	83599975	-44	
	-10	83599974	-45	
	-20	83599972	-47	
	-30	83599970	-49	

Reference Frequency: GPRS Mid Channel 1880 MHz @ 20°C				
Limit: ± 2.5 ppm = 4700 Hz				
Power Supply Vdc	Environment Temperature (°C)	Frequency (Hz)	Delta (Hz)	Limit (Hz)
3.7	50	1879999985	-43	4700
	40	1879999983	-45	
	30	1879999976	-52	
	20	1880000028	0	
	10	1879999972	-56	
	0	1879999971	-57	
	-10	1879999976	-52	
	-20	1879999967	-61	
	-30	1879999965	-63	

7.9 FREQUENCY STABILITY V.S. VOLTAGE MEASUREMENT

LIMIT

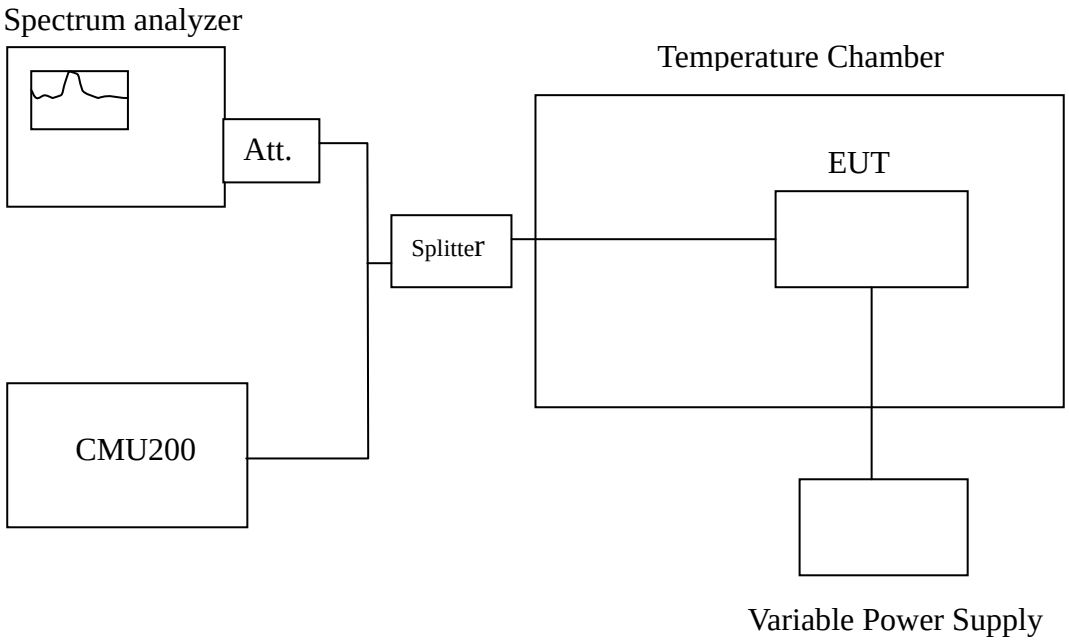
According to FCC §2.1055, FCC §22.355, .FCC §24.235,

Frequency Tolerance: 2.5 ppm.

According to RSS-132 (4.3) & RSS-133 (6.3).

The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations and ±1.0 ppm for base stations.

Test Configuration



Remark: *Measurement setup for testing on Antenna connector.*

TEST PROCEDURE

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation (± 15%) and endpoint, record the maximum frequency change.

TEST RESULTS

No non-compliance noted.

Reference Frequency: GSM Mid Channel 836.6 MHz @ 20°C				
Limit: ± 2.5 ppm = 2090Hz				
Power Supply Vdc	Environment Temperature (°C)	Frequency (Hz)	Delta (Hz)	Limit (Hz)
4.255	20	83600001	-4	2090
3.7		83600005	0	
3.145		83600008	3	
2.9 (End Point)		83600007	-1	

Reference Frequency: GSM Mid Channel 1880 MHz @ 20°C				
Limit: ± 2.5 ppm = 4700 Hz				
Power Supply Vdc	Environment Temperature (°C)	Frequency (Hz)	Delta (Hz)	Limit (Hz)
4.255	20	1880000002	-3	4700
3.7		1880000005	0	
3.145		1880000006	1	
2.9 (End Point)		1880000004	-1	

Reference Frequency: GPRS Mid Channel 836.6 MHz @ 20°C				
Limit: ± 2.5 ppm = 2090Hz				
Power Supply Vdc	Environment Temperature (°C)	Frequency (Hz)	Delta (Hz)	Limit (Hz)
4.255	20	83600014	-5	2090
3.7		83600019	0	
3.145		83600028	9	
2.9 (End Point)		83599519	-509	

Reference Frequency: GPRS Mid Channel 1880 MHz @ 20°C				
Limit: ± 2.5 ppm = 4700 Hz				
Power Supply Vdc	Environment Temperature (°C)	Frequency (Hz)	Delta (Hz)	Limit (Hz)
4.255	20	1880000025	-3	4700
3.7		1880000028	0	
3.145		1880000029	1	
2.9 (End Point)		1880000026	-2	