

TEST REPORT

of

FCC Part 22 Subpart H, and Part 24 Subpart E
/ RSS-Section in RSS-132 issue 2, RSS-133 issue 5
FCC ID/ IC ID: A3LGTY3400X / 649E-GTY3400X

Equipment Under Test : 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Module
Model Name : GT-Y3400
Serial No. : N/A
Applicant : Samsung Electronics Co., Ltd.
Manufacturer : Samsung Electronics Co., Ltd.
Date of Test(s) : 2011. 11. 11 ~ 2011. 11. 24
Date of Issue : 2011. 11. 25

In the configuration tested, the EUT complied with the standards specified above.

Tested By:

Au.

Date

2011. 11. 25

Alvin Kim

Approved By:

C. K. IC.

Date

2011. 11. 25

Charles Kim

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1. General information

1.1. Testing laboratory

SGS Korea Co., Ltd.(Gunpo Laboratory)

- 705, Dongchun-Dong Sooji-Gu, Yongin-Shi, Kyungki-Do, South Korea.
- Wireless Div. 2FL, 18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea 435-040

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1.2. Details of applicant

Applicant : Samsung Electronics Co., Ltd.

Address : 416, Maetan-dong, Yeongtong-gu, Suwon-city, Gyeonggi-do, Korea

Contact Person : Lee, Sang-Cheong

Phone No. : +82 31 277 4784

1.3. Description of EUT

Kind of Product	850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Module
Model Name	GT-Y3400
Serial Number	N/A
HSPA Module Name (Company name)	GT-Y3400 (Samsung)
Power Supply	DC 3.3 V
Rated Power	GSM850 : 32.8 dB m GSM1900 : 28.3 dB m WCDMA850 : 22.9 dB m WCDMA1900 : 22.5 dB m
Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1 850.2 MHz ~ 1 909.8 MHz WCDMA850: 826.4 MHz ~ 846.6 MHz WCDMA1900: 1 852.4 MHz ~ 1 907.6 MHz
Class of GPRS	Class 12, Class B
Emission Designator	252KGXW (GSM850), 242KG7W (GSM850 EDGE), 247KGXW (GSM1900), 250KG7W (GSM1900 EDGE), 4M14F9W (WCDMA850), 4M15F9W (WCDMA1900)

1.4. Declaration by the manufacturer

- Main port has Tx and Rx function.
- Aux port has only Rx function.

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1.5. Description of test mode

Band	Frequency (MHz)	GPRS Data			
		GPRS	GPRS	GPRS	GPRS
		1 TX Slot	2 TX Slot	3 TX Slot	4 TX Slot
		(dBm)	(dBm)	(dBm)	(dBm)
GSM 850	824.2	32.7	28.7	26.7	25.4
	836.6	32.8	28.5	26.8	25.5
	848.8	32.7	28.7	26.3	25.2
GSM 1900	1 850.2	28.3	25.3	23.5	22.4
	1 880.0	28.0	25.5	23.7	22.3
	1 909.8	28.2	25.4	23.6	22.2

Band	Frequency (MHz)	EDGE Data			
		EDGE	EDGE	EDGE	EDGE
		1 TX Slot	2 TX Slot	3 TX Slot	4 TX Slot
		(dBm)	(dBm)	(dBm)	(dBm)
GSM 850	824.2	26.9	23.4	21.2	19.4
	836.6	26.8	23.0	21.0	19.6
	848.8	26.9	23.1	21.3	19.7
GSM 1900	1 850.2	25.4	21.4	19.5	18.3
	1 880.0	25.3	21.5	19.4	18.3
	1 909.8	25.2	21.3	19.4	17.9

3GPP Release version	Mode	3GPP 34.121 Subtest	Cellular Band[dBm]			PCS Band[dBm]		
			4132	4183	4233	9262	9400	9538
99	WCDMA	12.2kbps RMC	22.9	22.9	22.4	22.3	22.5	22.0
5	HSDPA	Subtest1	22.3	22.1	22.3	22.2	22.3	22.1
5		Subtest2	22.6	22.0	22.4	22.4	22.4	22.2
5		Subtest3	22.1	21.5	22.0	22.0	21.8	21.7
5		Subtest4	22.0	21.9	21.9	21.8	21.5	21.5
5	HSUPA	Subtest1	20.8	20.0	20.9	20.5	19.8	20.5
5		Subtest2	20.0	20.4	20.4	20.4	19.9	20.3
5		Subtest3	21.2	21.0	21.2	21.3	21.3	21.0
5		Subtest4	20.5	20.4	20.3	20.5	20.1	20.0
5		Subtest5	21.3	20.7	21.3	21.6	21.4	20.5

- GSM (850 / 1900) & WCDMA (850 / 1900)

We found out the test mode with the highest power level after we analyze all the data rates. So we chose GSM850 / GSM1900 1 TX Slot and WCDMA850 and WCDMA1900 12.2 kbps RMC (worst case) as a representative.

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1.6. Test equipment list

Equipment	Manufacturer	Model	S/N	Cal Due.
Signal Generator	R&S	SMBV100A	255384	Jul. 20, 2012
Signal Generator	R&S	SMR40	100272	Jul. 15, 2012
Spectrum Analyzer	R&S	FSV30	100768	Mar. 31, 2012
Mobile Test Unit	R&S	CMU200	106190	May. 30, 2012
Directional Coupler	KRYTAR	152613	122661	May. 16, 2012
High Pass Filter	Wainwright	WHK3.0/18G-10SS	344	Jul. 07, 2012
High Pass Filter	Wainwright	WHK1.5/15G-6SS	4	Mar. 30, 2012
Preamplifier	H.P.	8447F	2944A03909	Jul. 04, 2012
Preamplifier	R&S	SCU 18	10117	Mar. 23, 2012
Preamplifier	MITEQ Inc.	JS44-18004000-35-8P	1546891	Jul. 04, 2012
Test Receiver	R&S	ESU26	100109	Feb. 21, 2012
Bilog Antenna	SCHWARZBECK	VULB9163	396	Apr. 27, 2013
Horn Antenna	R&S	HF 906	100384	Oct. 10, 2012
Horn Antenna	SCHWARZBECK	BBHA9120D	183	Oct. 28, 2013
Dipole Antenna	SCHWARZBECK	VHA 9103/UHA 9105	9103-2817 9105-2514	May. 14, 2013
Antenna Master	INN-CO	MM4000	N.C.R.	N.C.R.
Turn Table	INN-CO	DS 1200 S	N.C.R.	N.C.R.
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.6 m)	N.C.R.	N.C.R.

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1.7. Summary of test results

The EUT has been tested according to the following specifications:

APPLIED STANDARD : FCC Part 22, 24/RSS-132 issue 2, RSS-133 issue 5			
Section in FCC part 22, 24	Section in RSS-133 RSS-132	Test Item	Result
§22.913(a)(2) §24.232(c)	RSS -133 (6.4)	RF Radiated Output Power	Complied
§2.1053 §22.917(a) §24.238(a)	RSS -132 (4.5.1) RSS -133 (6.5.1)	Spurious Radiated Emission	Complied
§2.1046	RSS -132 (4.4) RSS -133 (4.1)	Conducted Output Power	Complied
§2.1049	RSS-Gen (4.6.1) RSS-133 (2.3)	Occupied Bandwidth	Complied
§2.1051 §22.917(a) §24.238(a)	RSS -132 (4.5.1) RSS -133 (6.5.1)	Spurious Emission at Antenna Terminal	Complied
§24.232(d)	RSS-133 (6.4)	Peak-Average Ratio	Complied
§2.1055 §22.355 §24.235	RSS-132 (4.3) RSS-133 (6.3)	Frequency Stability	Complied
§2.1051 §22.917(a) §24.238(a)	RSS -132 (4.5.1) RSS -133 (6.5.1)	Band Edge	Complied
§1.1307 §2.1091	RSS-Gen 5.6 RSS-102	RF Exposure Evaluation (Maximum Permissible Exposure)	Complied

1.8. Test report revision

Revision	Report number	Description
0	F690501/RF-RTL005114	Initial
1	F690501/RF-RTL005114-1	Re-tested OBW item.
2	F690501/RF-RTL005114-2	Added declaration of manufacture

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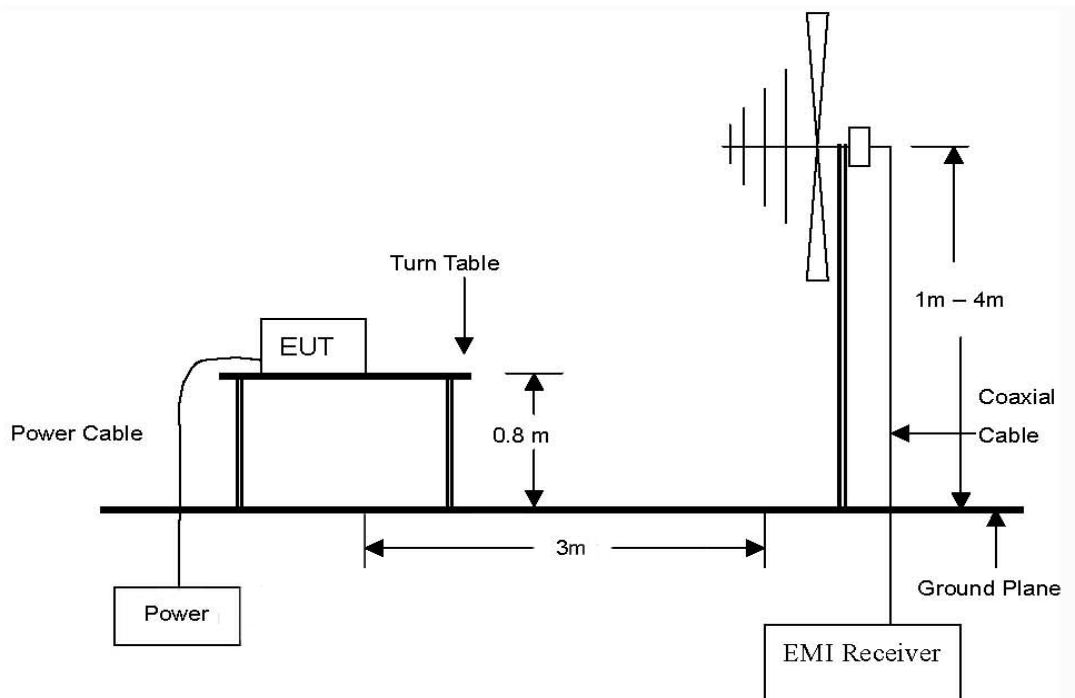
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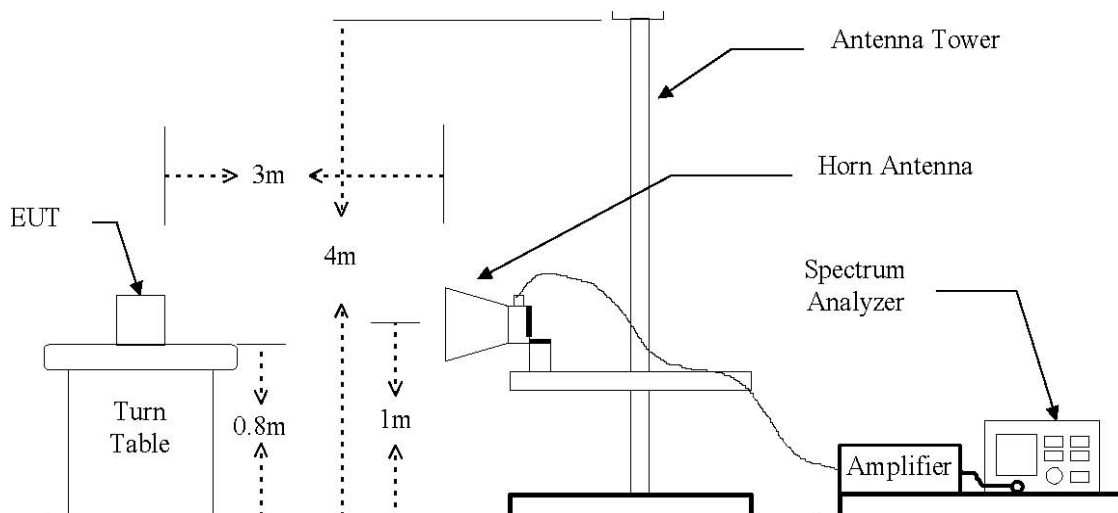
2. RF radiated output power & spurious radiated emission

2.1. Test setup

The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 18 GHz Emissions.



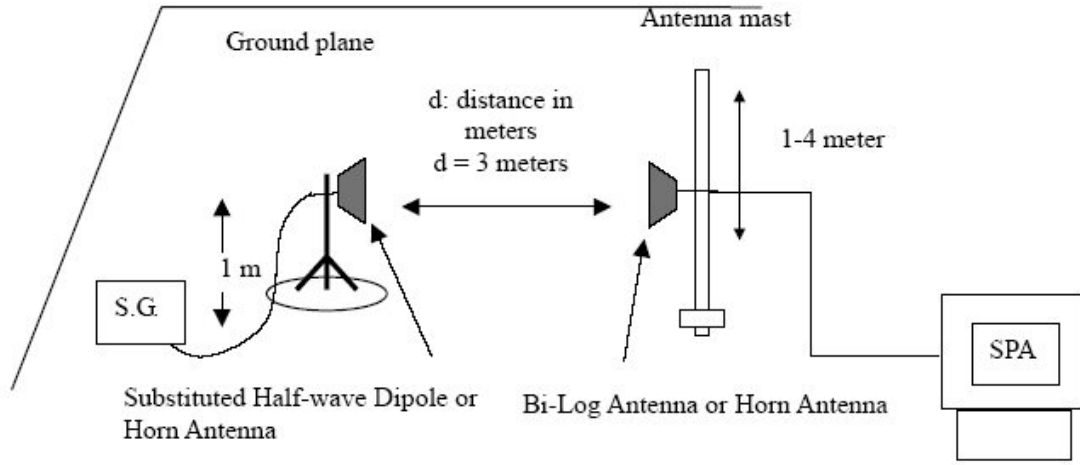
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The diagram below shows the test setup for substituted method



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2.2. Limit

2.2.1. RF Radiated output power

FCC §22.913(a)(2), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts. FCC §24.232(c), Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

2.2.2. Spurious Radiated emission

§ 22.917(a) and §24.238 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency must be attenuated below the transmitting (P) by a factor of at least $43 + 10\log(P)$ dB.

2.3. Test procedure: Based on ANSI/TIA 603C: 2004

1. On a test site, the EUT shall be placed at 80cm height on a turn table, and in the position close to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3 m from EUT to correspond to the fundamental frequency of the transmitter.
3. The output of the test antenna shall be connected to the measuring receiver and the peak detector is used for the measurement.
4. During the measurement of the EUT, the resolution bandwidth was to 1 MHz and the video bandwidth was set to 1 MHz.
5. The transmitter shall be switched on; the measuring receiver shall be tuned to the frequency of the transmitter under test.
6. The test antenna shall be raised and lowered through the specified range of height until the maximum signal level is detected by the measuring receiver.
7. The transmitter shall be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
8. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.
9. The maximum signal level detected by the measuring receiver shall be noted.
10. The EUT was replaced by half-wave dipole (824 ~ 849 MHz) or horn antenna (1 850 ~ 1 910 MHz) connected to a signal generator.
11. In necessary, the input attenuator setting on the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
12. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
13. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, which is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
14. The input level to the substitution antenna shall be recorded as power level in dB m, corrected for any change of input attenuator setting of the measuring receiver.
15. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

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2.4. Test result for RF radiated output power

Ambient temperature : (24 ± 2) °C
Relative humidity : 47 % R.H.

GSM850

Frequency (MHz)	Ant. Pol. (H/V)	S.G level + Amp. (dB m)	Cable loss (dB)	Ant. gain (dB d)	E.R.P.	
					(dB m)	(mW)
824.20	V	32.13	3.42	-2.90	25.81	381.07
824.20	H	37.91	3.42	-2.90	31.59	1 442.12
836.60	V	35.43	3.38	-2.97	29.08	809.10
836.60	H	37.38	3.38	-2.97	31.03	1 267.65
848.80	V	33.98	3.33	-3.21	27.44	554.63
848.80	H	38.57	3.33	-3.21	32.03	1 595.88

GSM850 (EDGE)

Frequency (MHz)	Ant. Pol. (H/V)	S.G level + Amp. (dB m)	Cable loss (dB)	Ant. gain (dB d)	E.R.P.	
					(dB m)	(mW)
848.80	V	29.04	3.33	-3.21	22.50	177.83
848.80	H	35.19	3.33	-3.21	28.65	732.82

GSM1900

Frequency (MHz)	Ant. Pol. (H/V)	S.G level + Amp. (dB m)	Cable loss (dB)	Ant. gain (dB i)	E.I.R.P.	
					(dB m)	(mW)
1 850.20	V	21.99	4.87	9.12	26.24	420.73
1 850.20	H	24.00	4.87	9.12	28.25	668.34
1 880.00	V	20.81	4.91	9.20	25.10	323.59
1 880.00	H	23.08	4.91	9.20	27.37	545.76
1 909.80	V	21.41	4.94	9.27	25.74	374.97
1 909.80	H	23.93	4.94	9.27	28.26	669.88

GSM1900 (EDGE)

Frequency (MHz)	Ant. Pol. (H/V)	S.G level + Amp. (dB m)	Cable loss (dB)	Ant. gain (dB i)	E.I.R.P.	
					(dB m)	(mW)
1 909.80	V	20.59	4.94	9.27	24.92	310.46
1 909.80	H	22.98	4.94	9.27	27.31	538.27

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WCDMA850

Frequency (MHz)	Ant. Pol. (H/V)	S.G level + Amp. (dB m)	Cable loss (dB)	Ant. gain (dB i)	E.I.R.P.	
					(dB m)	(mW)
826.40	V	26.34	3.41	-2.88	20.05	101.16
826.40	H	29.36	3.41	-2.88	23.07	202.77
836.60	V	26.33	3.38	-2.97	19.98	99.54
836.60	H	29.32	3.38	-2.97	22.97	198.15
846.60	V	26.41	3.34	-3.16	19.91	97.95
846.60	H	28.72	3.34	-3.16	22.22	166.72

WCDMA1900

Frequency (MHz)	Ant. Pol. (H/V)	S.G level + Amp. (dB m)	Cable loss (dB)	Ant. gain (dB i)	E.I.R.P.	
					(dB m)	(mW)
1 852.40	V	17.42	4.87	9.12	21.67	146.89
1 852.40	H	17.40	4.87	9.12	21.65	146.22
1 880.00	V	16.24	4.91	9.20	20.53	112.98
1 880.00	H	18.36	4.91	9.20	22.65	184.08
1 907.60	V	17.60	4.94	9.27	21.93	155.96
1 907.60	H	20.32	4.94	9.27	24.65	291.74

Remark:

1. E.R.P. & E.I.R.P. = [S.G level + Amp.](dB m) - Cable loss(dB) + Ant. gain (dB d/dBi)
2. The E.R.P. & E.I.R.P. was measured in three orthogonal EUT position (x-axis and z-axis). Worst cases of all mode are z-axis.

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2.5. Spurious radiated emission

- Modulation Signal : GSM850
- Measured output Power : 32.03 dB m = 1.596 W
- Distance : 3 meters
- Limit : $-(43 + 10\log_{10}(W)) = -45.03$ dB c

Frequency (MHz)	Ant. Pol. (H/V)	S.G level (dB m)	Cable loss (dB)	Ant. gain (dB d)	E.R.P (dB m)	dB c	Margin (dB)
Low Channel (824.2 MHz)							
1 648.46	V	-54.14	4.54	6.44	-52.24	-84.27	39.24
1 648.46	H	-49.18	4.54	6.44	-47.28	-79.31	34.28
Middle Channel (836.6 MHz)							
1 673.13	V	-53.15	4.58	6.51	-51.22	-83.25	38.22
1 673.13	H	-49.35	4.58	6.51	-47.42	-79.45	34.42
High Channel (848.8 MHz)							
1 697.53	V	-51.52	4.62	6.57	-49.57	-81.60	36.57
1 697.53	H	-48.89	4.62	6.57	-46.94	-78.97	33.94

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- Modulation Signal : GSM1900
- Measured output Power : 28.26 dB m = 0.670 W
- Distance : 3 meters
- Limit : $-(43 + 10\log_{10}(W)) = -41.26$ dB c

Frequency (MHz)	Ant. Pol. (H/V)	S.G level (dB m)	Cable loss (dB)	Ant. gain (dB i)	E.I.R.P. (dB m)	dB c	Margin (dB)
Low Channel(1 850.2 MHz)							
3 703.39	V	-61.31	7.14	11.85	-56.60	-84.86	43.60
3 703.39	H	-52.54	7.14	11.85	-47.83	-76.09	34.83
Middle Channel(1 880.0 MHz)							
3 760.15	V	-62.03	7.23	11.85	-57.41	-85.67	44.41
3 760.15	H	-53.64	7.23	11.85	-49.02	-77.28	36.02
High Channel(1 909.8 MHz)							
3 819.70	V	-60.55	7.33	11.84	-56.04	-84.30	43.04
3 819.70	H	-50.08	7.33	11.84	-45.57	-73.83	32.57

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- Modulation Signal : WCDMA850
- Measured output Power : 23.07 dB m = 0.203 W
- Distance : 3 meters
- Limit : $-(43 + 10\log_{10}(W)) = -36.07$ dB c

Frequency (MHz)	Ant. Pol. (H/V)	S.G level (dB m)	Cable loss (dB)	Ant. gain (dB i)	E.I.R.P. (dB m)	dB c	Margin (dB)
Low Channel (826.4 MHz)							
1 650.20	V	-51.04	4.54	6.44	-49.14	-72.21	36.14
1 650.20	H	-46.24	4.54	6.44	-44.34	-67.41	31.34
Middle Channel (836.6 MHz)							
1 670.73	V	-48.60	4.57	6.50	-46.67	-69.74	33.67
1 670.73	H	-45.92	4.57	6.50	-43.99	-67.06	30.99
High Channel (846.6 MHz)							
1 695.38	V	-45.84	4.61	6.56	-43.89	-66.96	30.89
1 695.38	H	-46.25	4.61	6.56	-44.30	-67.37	31.30

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- Modulation Signal : WCDMA1900
- Measured output Power : 24.65 dB m = 0.292 W
- Distance : 3 meters
- Limit : $-(43 + 10\log_{10}(W)) = -37.65$ dB c

Frequency (MHz)	Ant. Pol. (H/V)	S.G level (dB m)	Cable loss (dB)	Ant. gain (dB i)	E.I.R.P. (dB m)	dB c	Margin (dB)
Low Channel(1 852.4 MHz)							
3 705.68	V	-46.25	7.14	11.85	-41.54	-66.19	28.54
3 705.68	H	-43.30	7.14	11.85	-38.59	-63.24	25.59
Middle Channel(1 880.0 MHz)							
3 759.68	V	-44.22	7.23	11.85	-39.60	-64.25	26.60
3 759.68	H	-43.71	7.23	11.85	-39.09	-63.74	26.09
High Channel(1 907.6 MHz)							
3 815.69	V	-40.32	7.33	11.84	-35.81	-60.46	22.81
3 815.69	H	-39.76	7.33	11.84	-35.25	-59.90	22.25

Remark:

1. $E.R.P. \ \& \ E.I.R.P. = S.G \ level \ (dB \ m) - Cable \ loss \ (dB) + Ant. \ gain \ (dB \ d/dB \ i)$
2. No more harmonic above 3rd harmonic for all channel.

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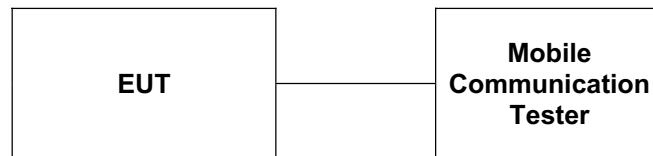
3. Conducted Output Power

3.1. Limit

Requirements: CFR 47, Section §2.1046

3.2. Test Procedure

1. The RF output of the transmitter was connected to the input of the Mobile Communication Test Unit through sufficient attenuation.
2. The mobile was set up for the max. output power with pseudo random data modulation.
3. The average power was measured with



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3.3. Test Result

Ambient temperature : (24 ± 2) °C
Relative humidity : 47 % R.H.

Band	Frequency (MHz)	GPRS Data			
		GPRS	GPRS	GPRS	GPRS
		1 TX Slot	2 TX Slot	3 TX Slot	4 TX Slot
		(dBm)	(dBm)	(dBm)	(dBm)
GSM 850	824.2	32.7	28.7	26.7	25.4
	836.6	32.8	28.5	26.8	25.5
	848.8	32.7	28.7	26.3	25.2
GSM 1900	1 850.2	28.3	25.3	23.5	22.4
	1 880.0	28.0	25.5	23.7	22.3
	1 909.8	28.2	25.4	23.6	22.2

Band	Frequency (MHz)	EDGE Data			
		EDGE	EDGE	EDGE	EDGE
		1 TX Slot	2 TX Slot	3 TX Slot	4 TX Slot
		(dBm)	(dBm)	(dBm)	(dBm)
GSM 850	824.2	26.9	23.4	21.2	19.4
	836.6	26.8	23.0	21.0	19.6
	848.8	26.9	23.1	21.3	19.7
GSM 1900	1 850.2	25.4	21.4	19.5	18.3
	1 880.0	25.3	21.5	19.4	18.3
	1 909.8	25.2	21.3	19.4	17.9

3GPP Release version	Mode	3GPP 34.121 Subtest	Cellular Band[dBm]			PCS Band[dBm]		
			4132	4183	4233	9262	9400	9538
99	WCDMA	12.2kbps RMC	22.9	22.9	22.4	22.3	22.5	22.0
5	HSDPA	Subtest1	22.3	22.1	22.3	22.2	22.3	22.1
5		Subtest2	22.6	22.0	22.4	22.4	22.4	22.2
5		Subtest3	22.1	21.5	22.0	22.0	21.8	21.7
5		Subtest4	22.0	21.9	21.9	21.8	21.5	21.5
5	HSUPA	Subtest1	20.8	20.0	20.9	20.5	19.8	20.5
5		Subtest2	20.0	20.4	20.4	20.4	19.9	20.3
5		Subtest3	21.2	21.0	21.2	21.3	21.3	21.0
5		Subtest4	20.5	20.4	20.3	20.5	20.1	20.0
5		Subtest5	21.3	20.7	21.3	21.6	21.4	20.5

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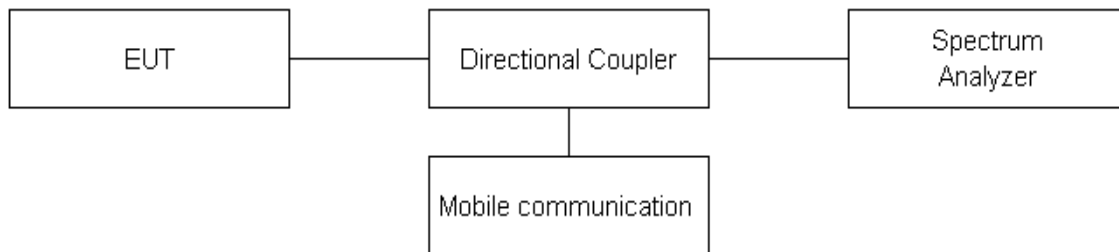
4. 1. Occupied Bandwidth 99 %

4.1. Limit

Requirements: CFR 47, Section §2.1049.

4.2. Test Procedure

1. The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.
2. The resolution bandwidth of the spectrum analyzer was set.
Occupied Bandwidth 99 % was tested under



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4.3 Test Results

Ambient temperature : (24 ± 2) °C
Relative humidity : 47 % R.H.

Band	Mode	Frequency (MHz)	Occupied Bandwidth (MHz)
GSM850	1 Tx slot	824.2	0.243
		836.6	0.239
		848.8	0.252
	EDGE	848.8	0.242
GSM1900	1 Tx slot	1 850.2	0.245
		1 880.0	0.245
		1 909.8	0.247
	EDGE	1 850.2	0.250
WCDMA850	12.2kbps RMC	826.4	4.139
		836.6	4.139
		846.6	4.139
WCDMA1900	12.2kbps RMC	1 852.4	4.139
		1 880.0	4.153
		1 907.6	4.139

Please refer to the following plots.

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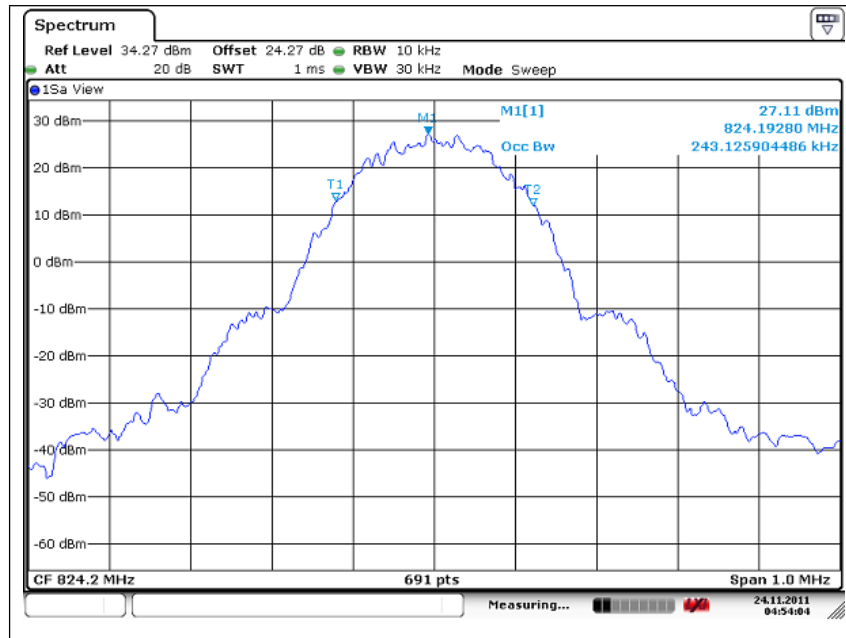
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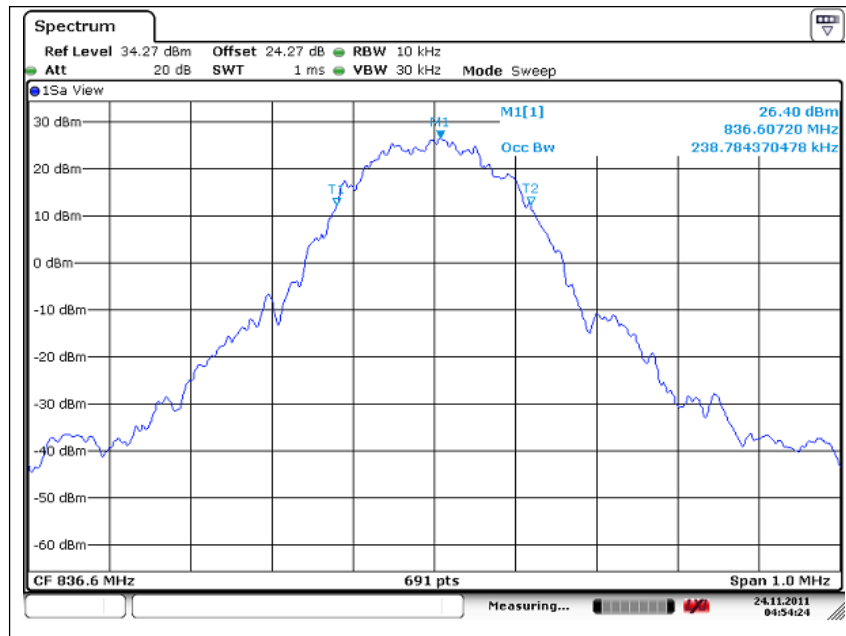
GSM850

99 %

Low Channel



Middle Channel



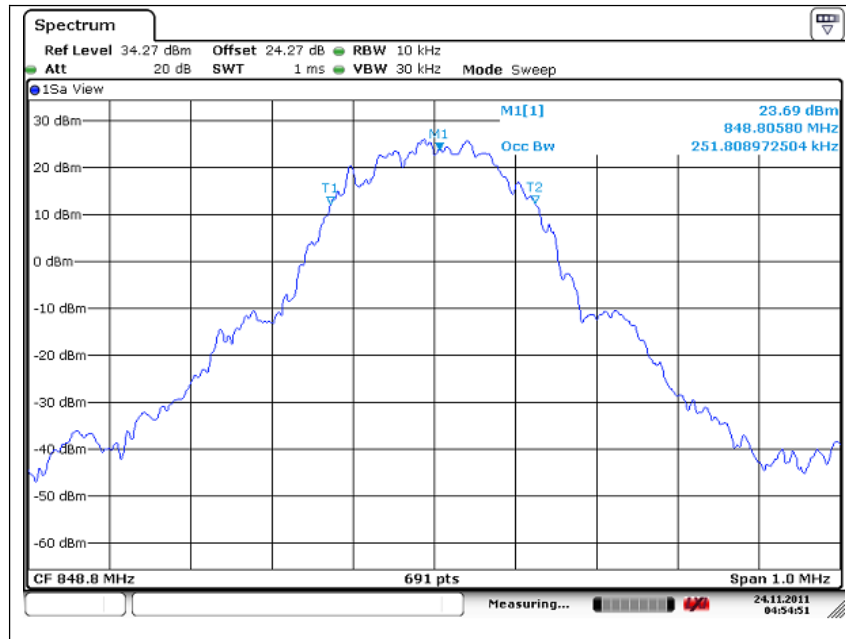
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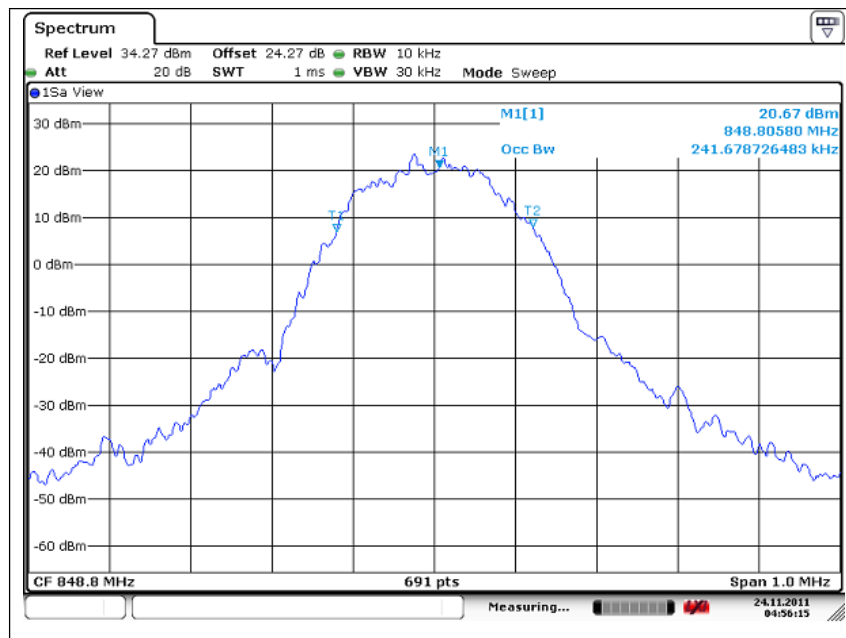
High Channel



GSM850 EDGE

99 %

High Channel



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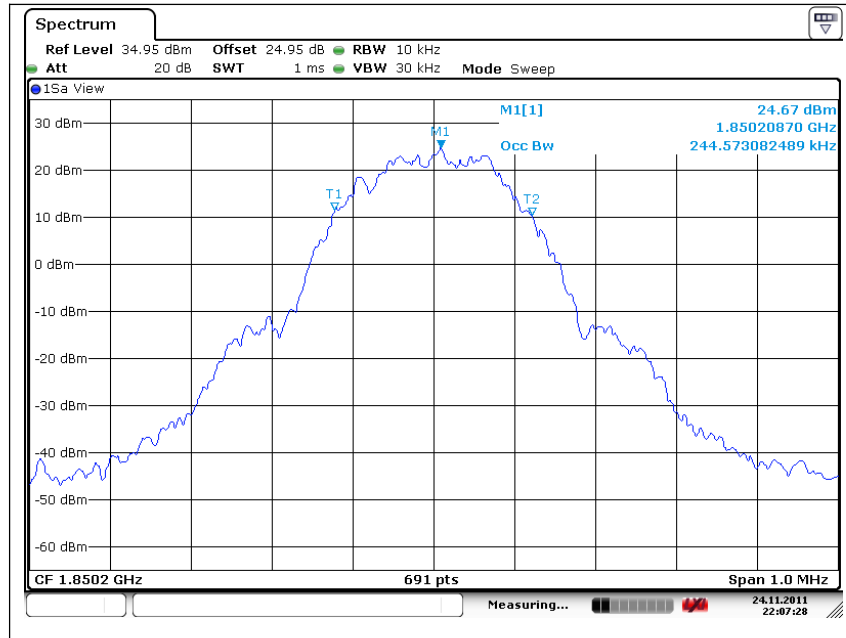
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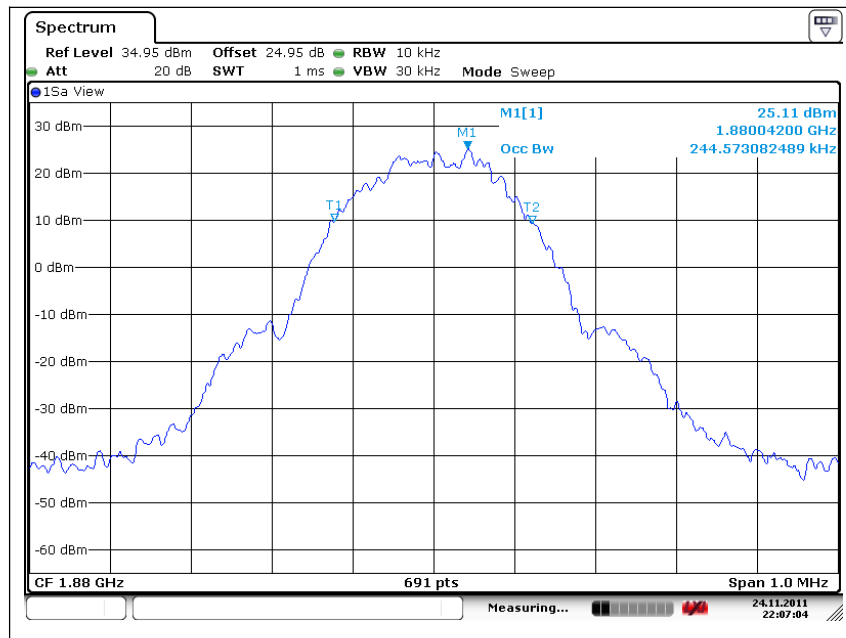
GSM1900

99 %

Low Channel



Middle Channel



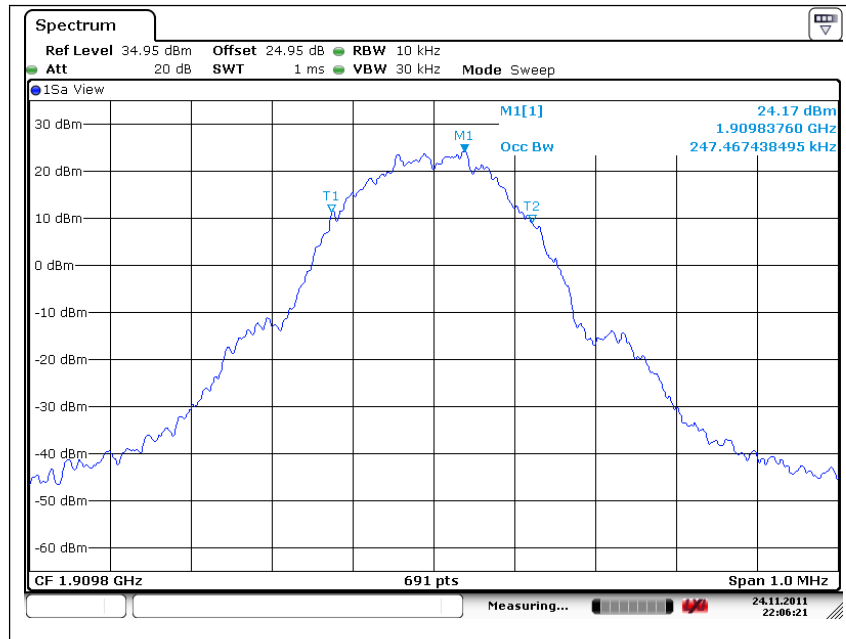
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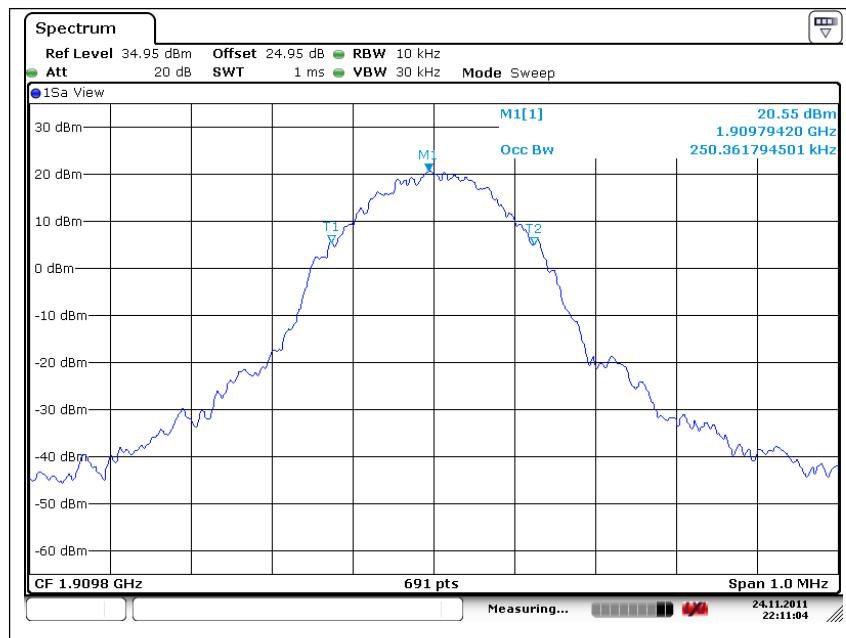
High Channel



GSM1900 EDGE

99 %

High Channel



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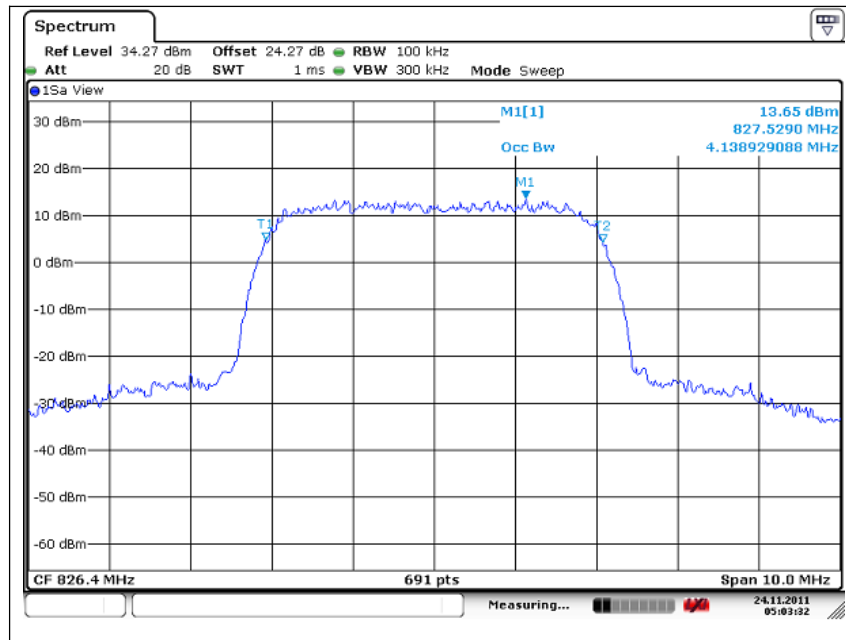
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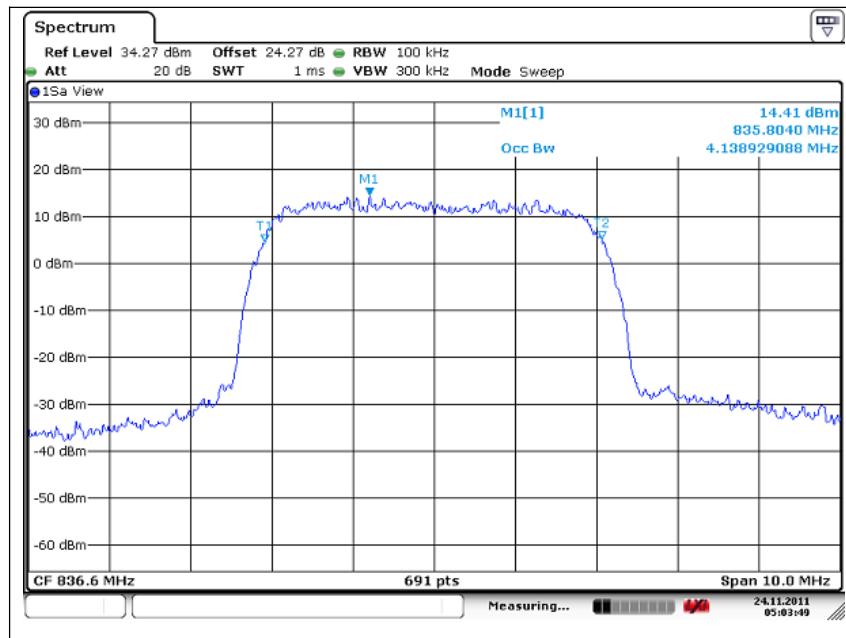
WCDMA850

99 %

Low Channel



Middle Channel



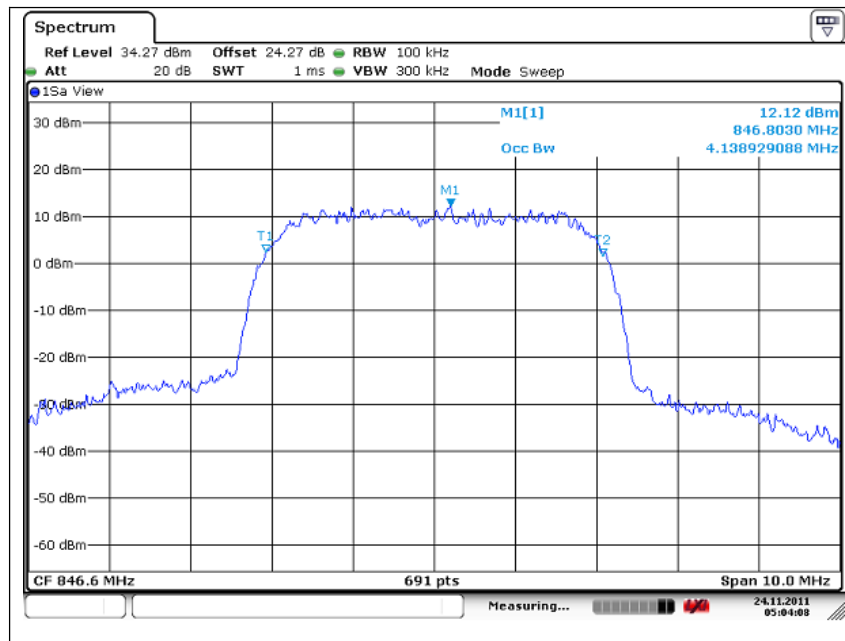
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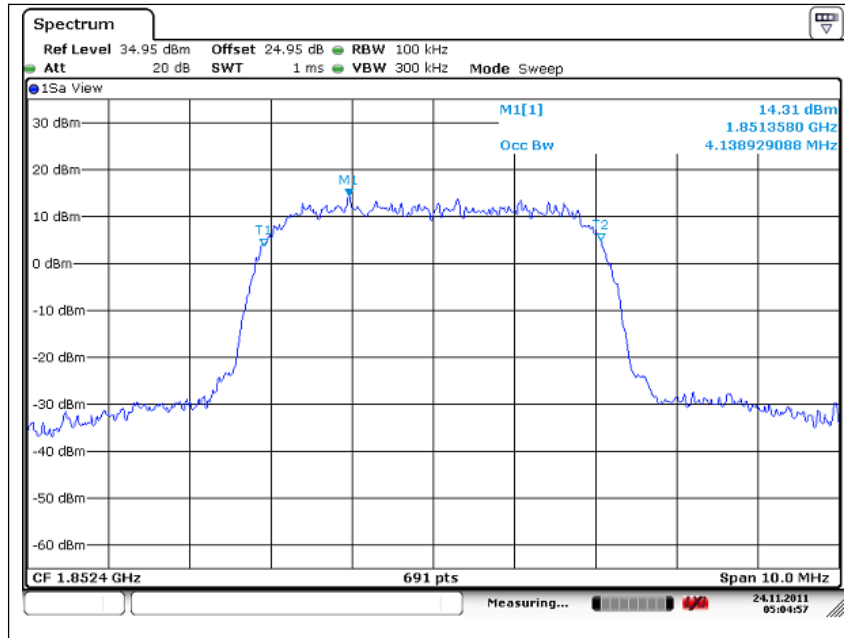
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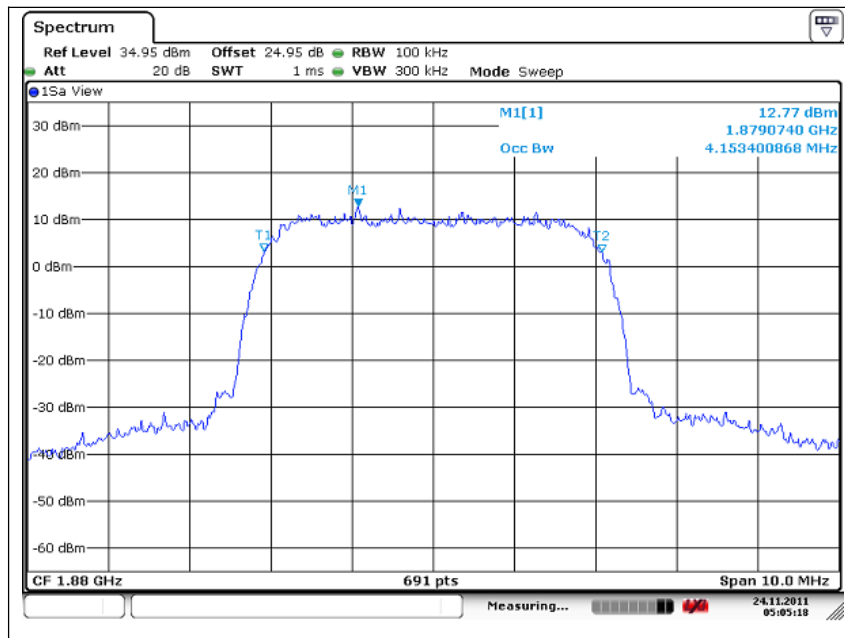
WCDMA1900

99 %

Low Channel



Middle Channel



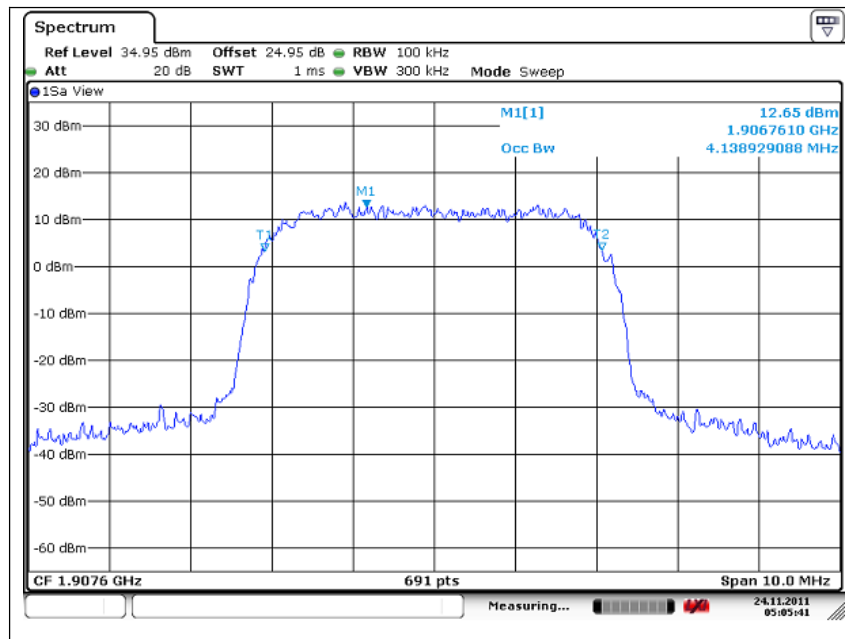
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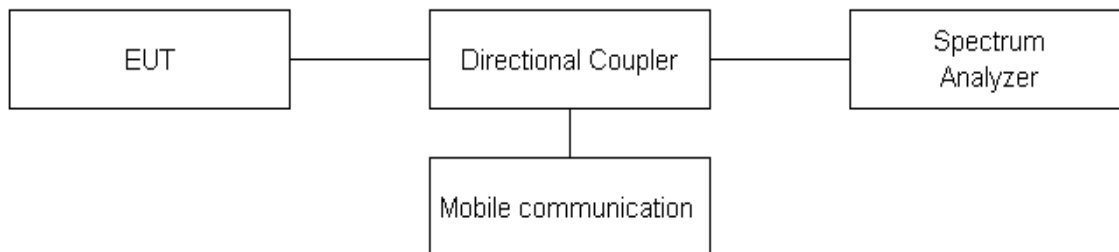
5. Spurious Emissions at Antenna Terminal

5.1. Limit

§ 22.917(a) and §24.238 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency must be attenuated below the transmitting (P) by a factor of at least $43 + 10\log(P)$ dB.

5.2. Test Procedure

1. The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.
2. The resolution bandwidth of the spectrum analyzer was set at 1 MHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.
3. Spurious Emission was tested under



5.3. Test Results

Ambient temperature : $(24 \pm 2) ^\circ\text{C}$
Relative humidity : 47 % R.H.

Please refer to the following plots.

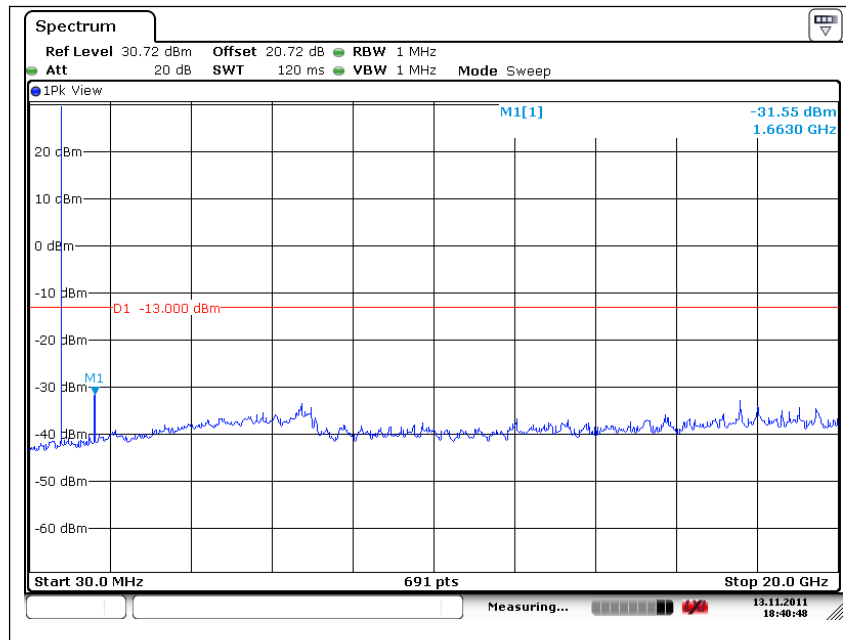
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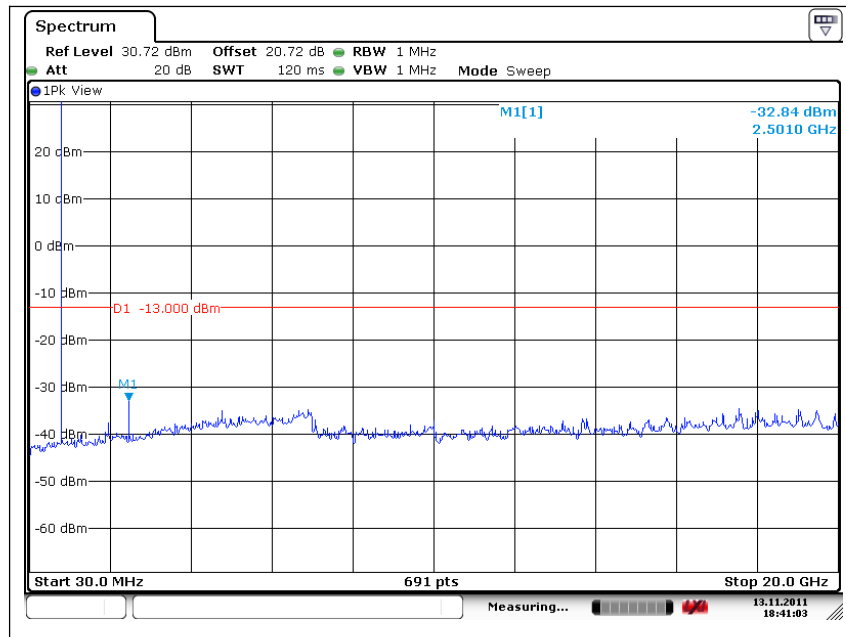
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GSM850 Low Channel



Middle Channel



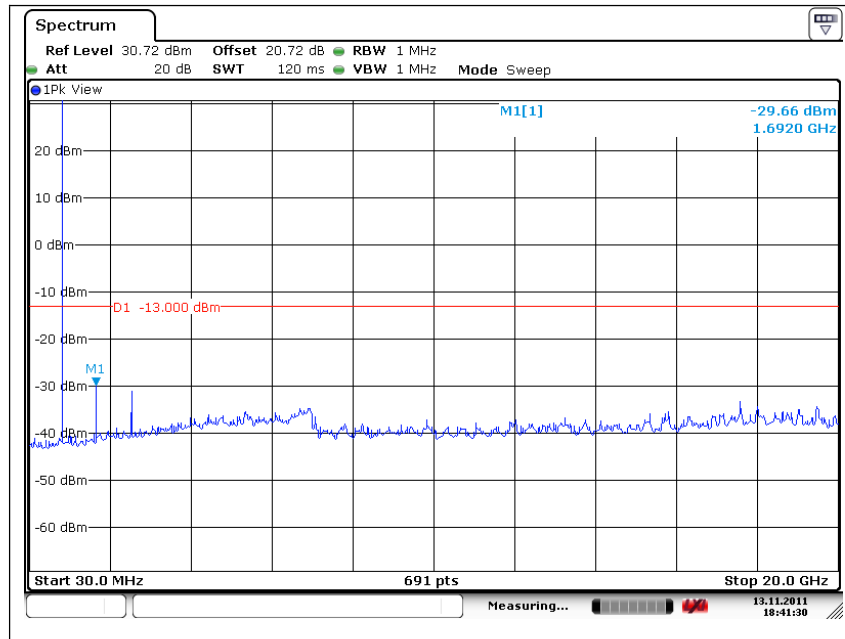
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High Channel



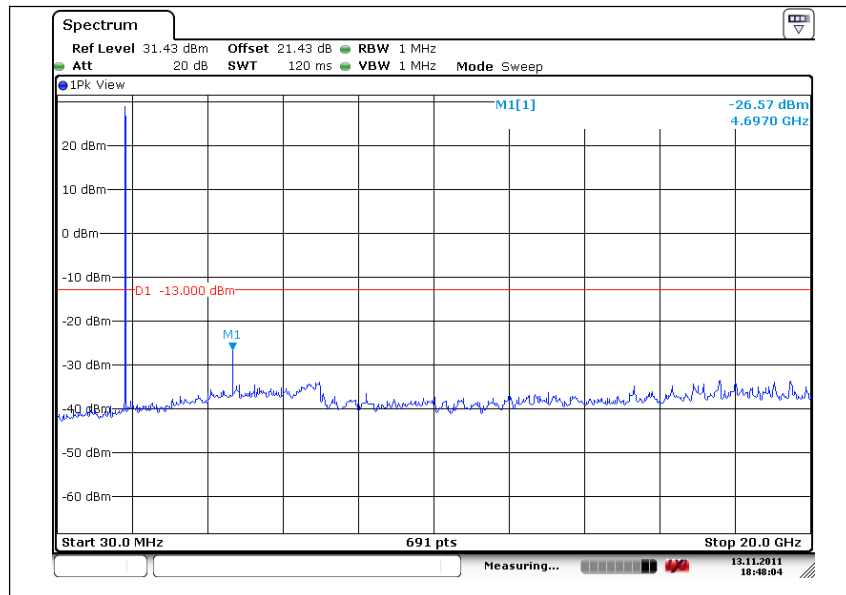
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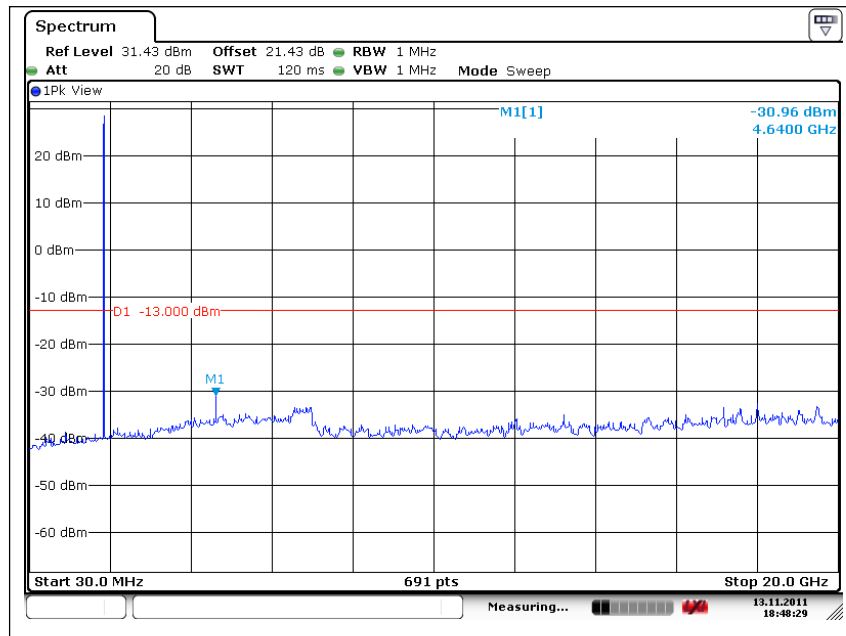
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GSM1900 Low Channel



Middle Channel



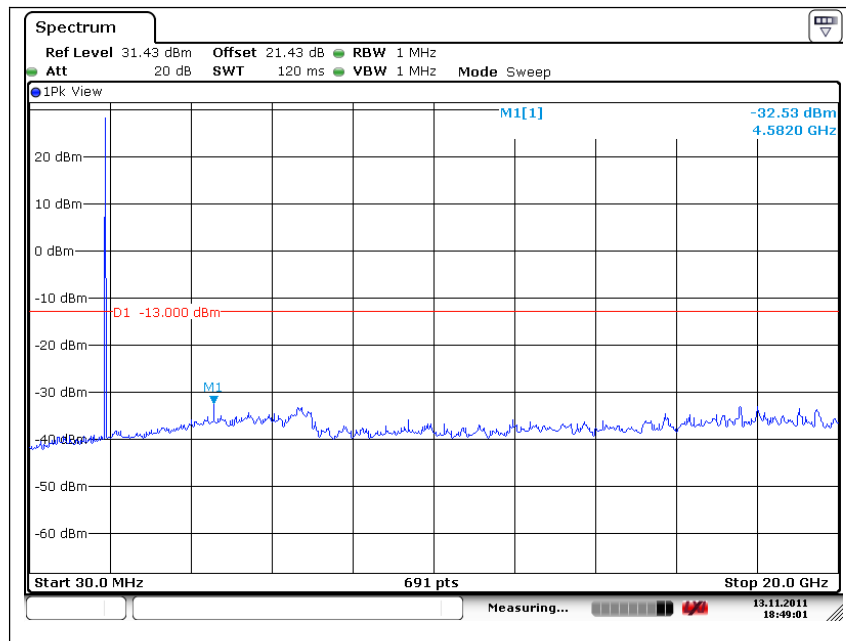
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High Channel



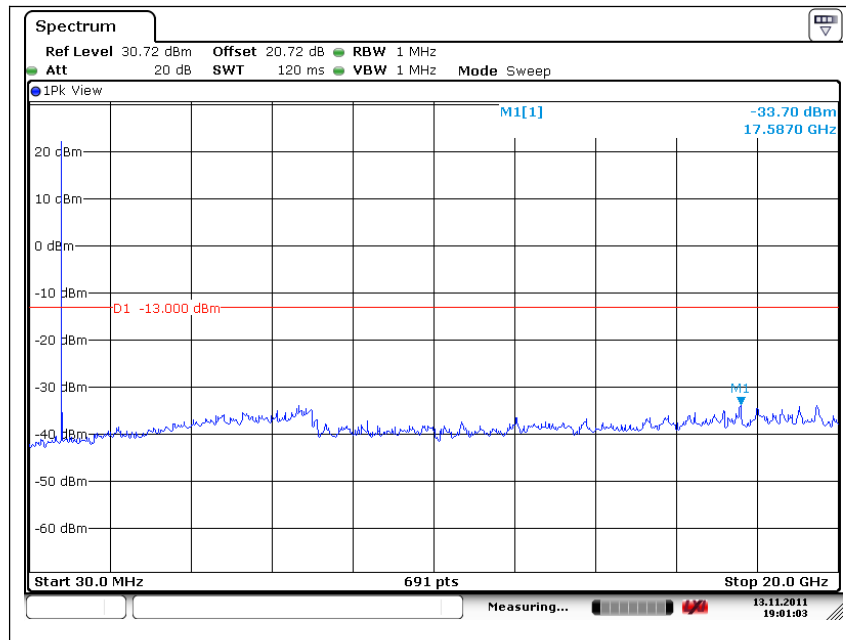
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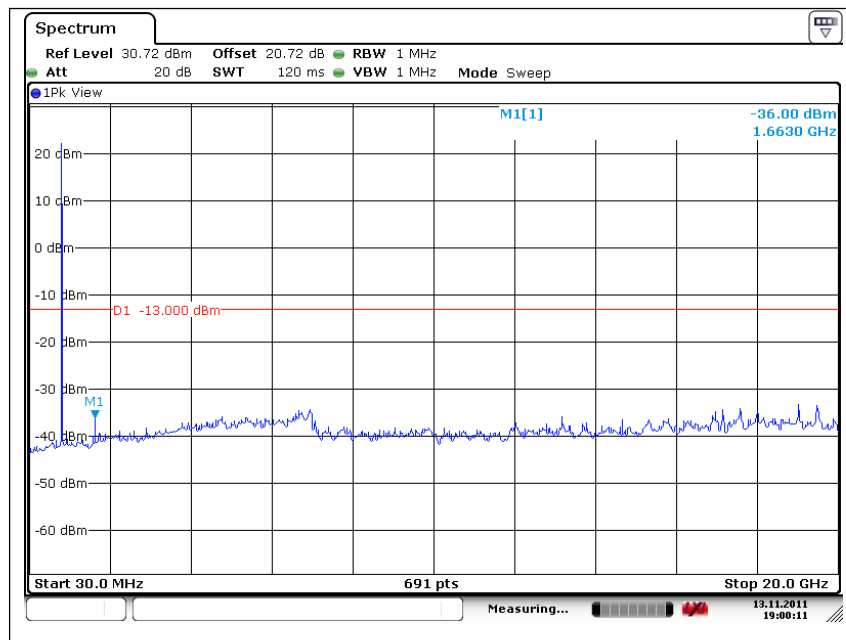
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WCDMA850 Low Channel



Middle Channel



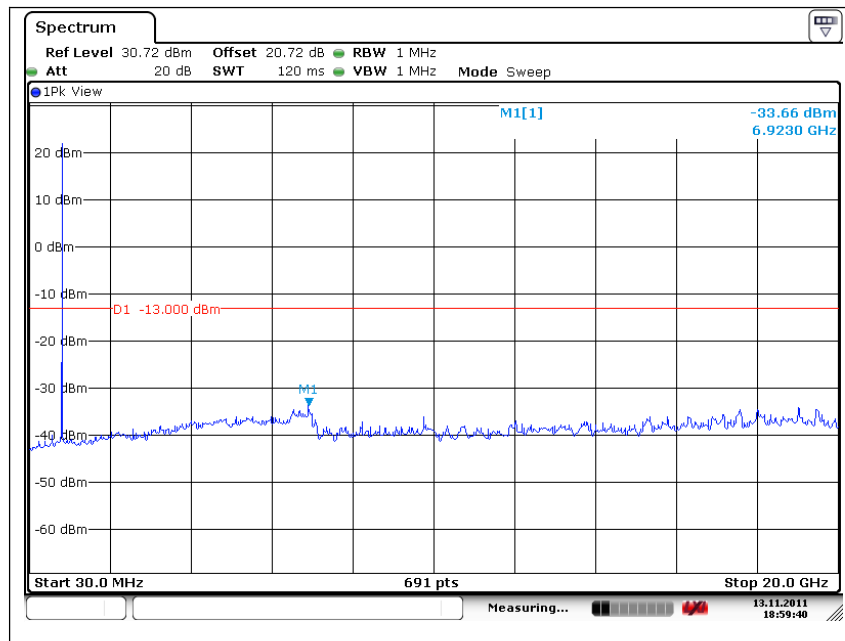
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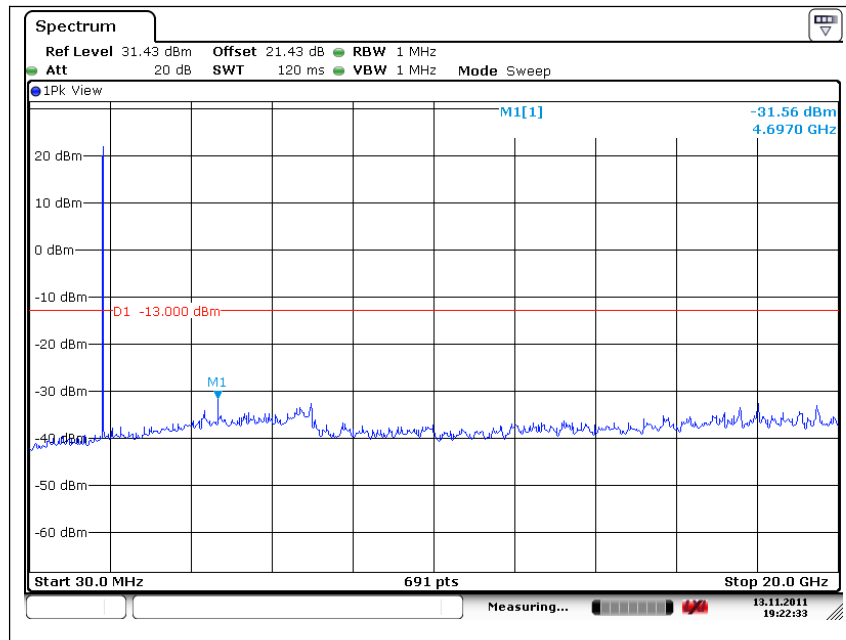
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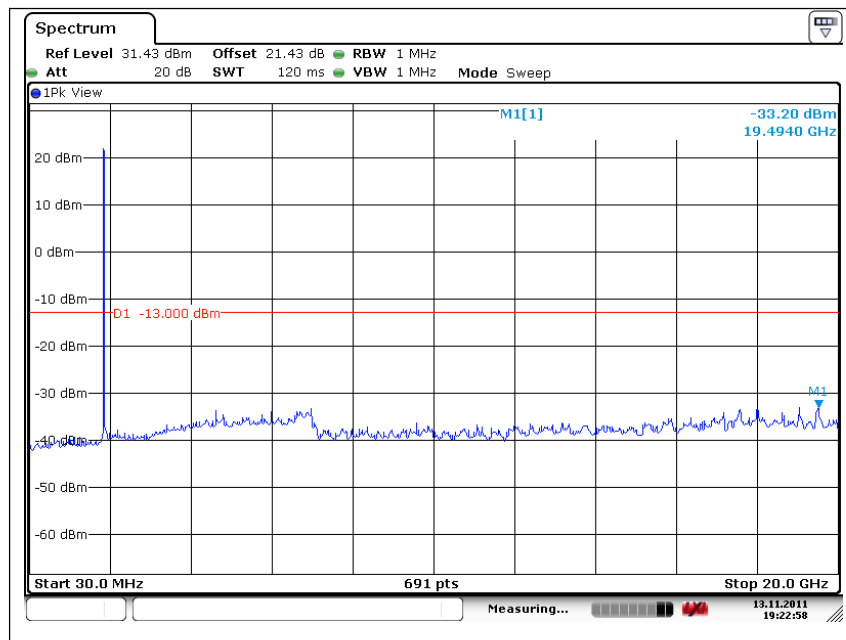
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WCDMA1900 Low Channel



Middle Channel



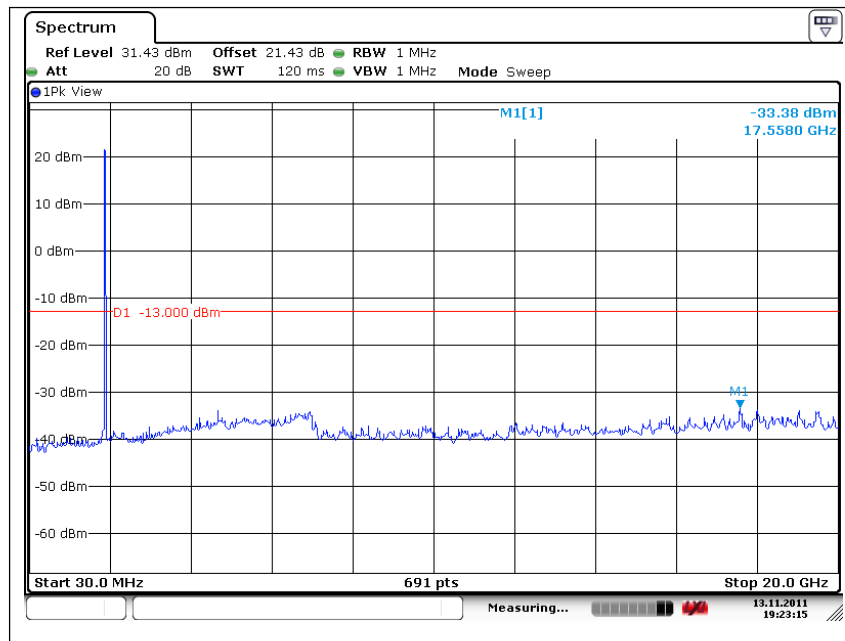
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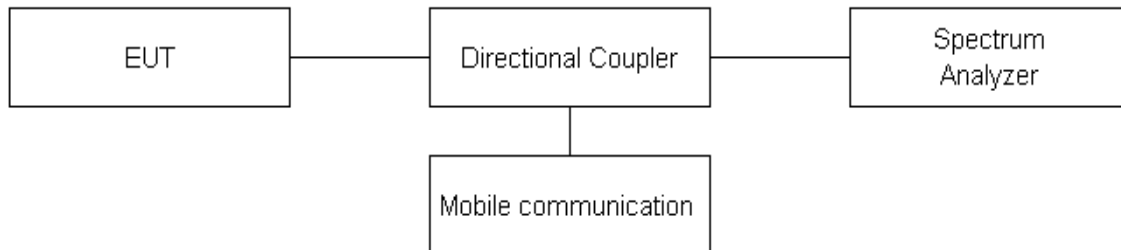
6. Band Edge

6.1. Limit

§ 22.917(a) and §24.238 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency must be attenuated below the transmitting (P) by a factor of at least $43+10\log(P)$ dB.

6.2. Test Procedure

1. The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.
2. The center of the spectrum analyzer was set to block edge frequency.



6.3. Test Results

Ambient temperature : $(24 \pm 2) ^\circ\text{C}$
Relative humidity : 47 % R.H.

Please refer to the following plots.

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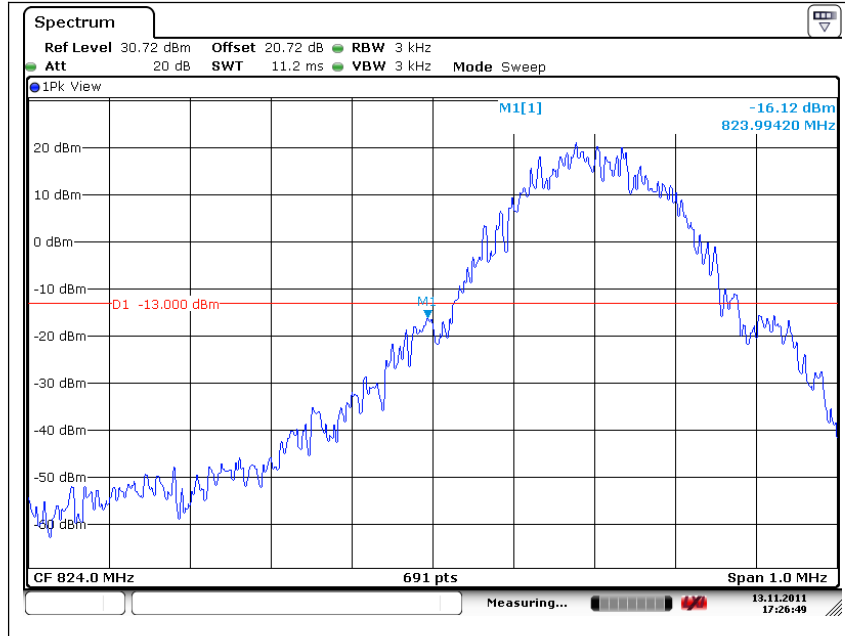
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GSM850

Low Channel



High Channel



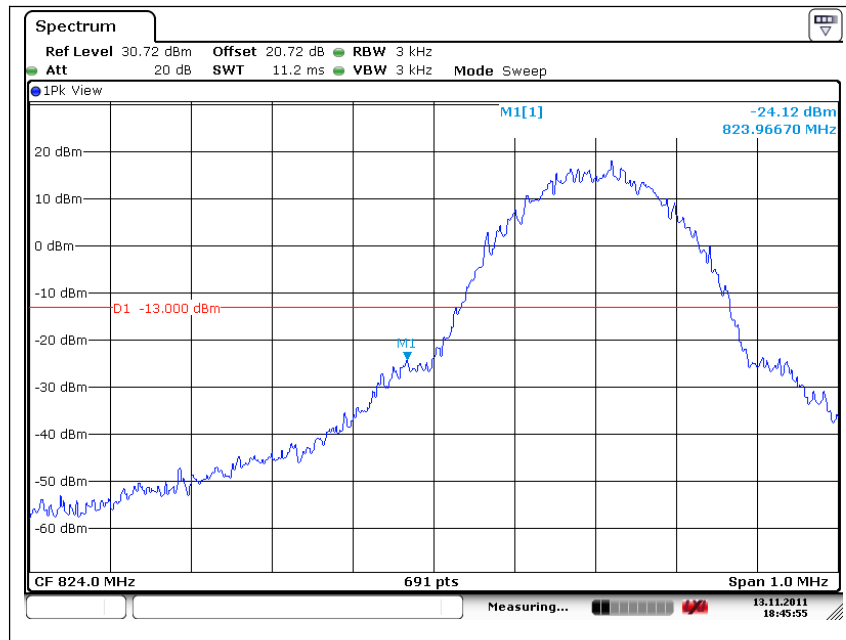
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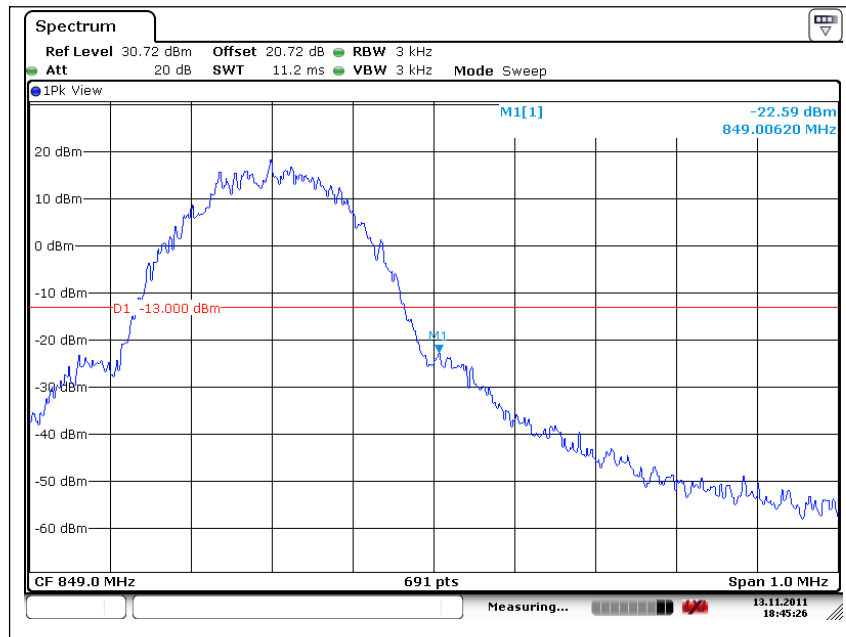
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GSM850 EDGE Low Channel



High Channel



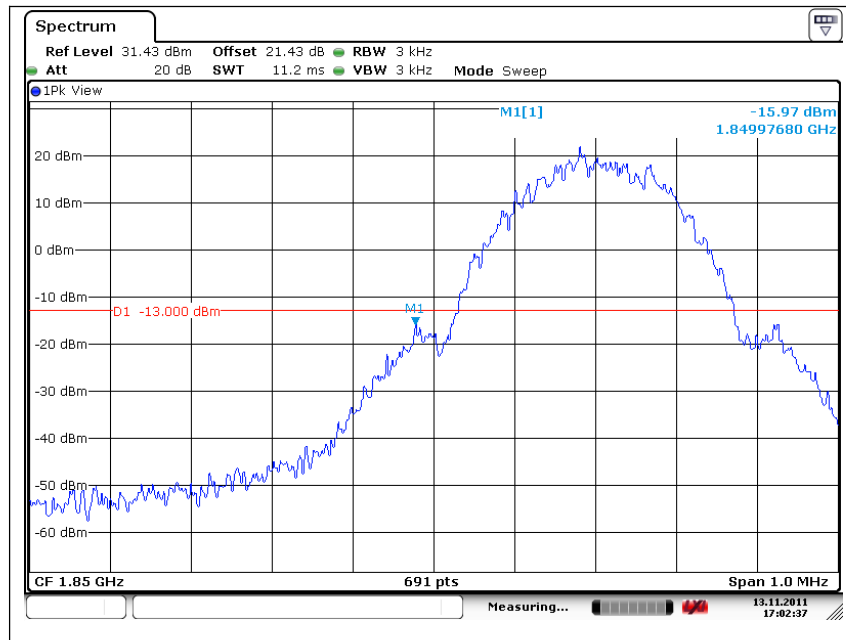
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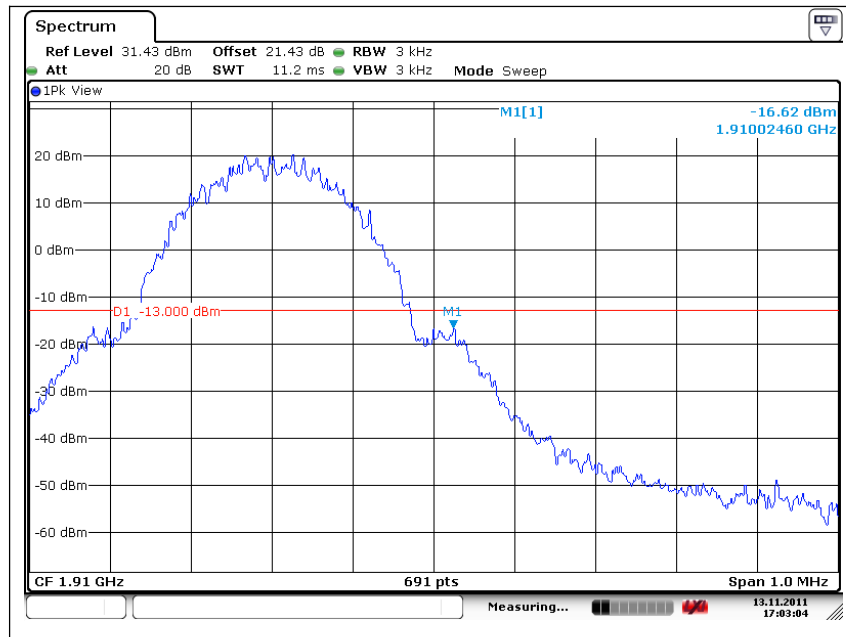
Tel. +82 31 428 5700 / Fax. +82 31 427 2371

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GSM1900 Low Channel



High Channel



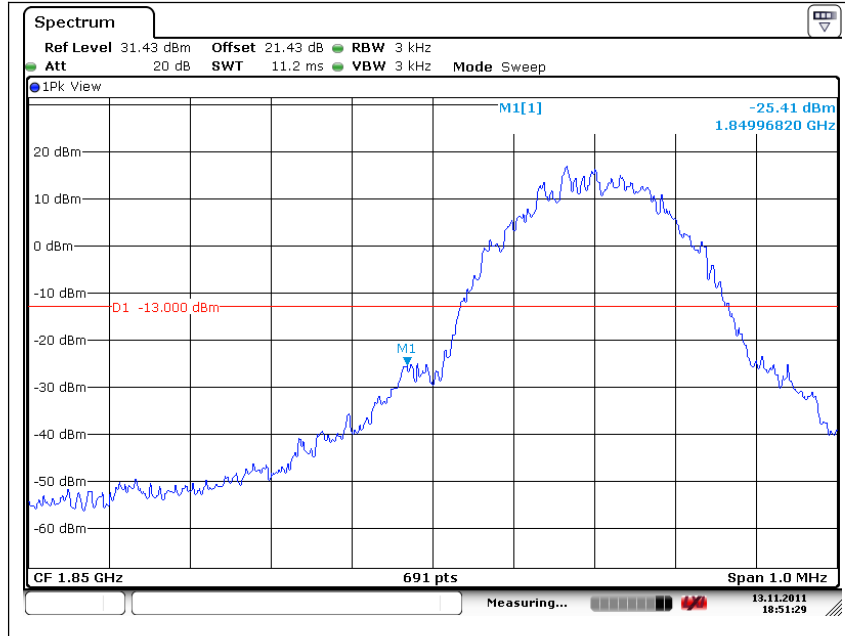
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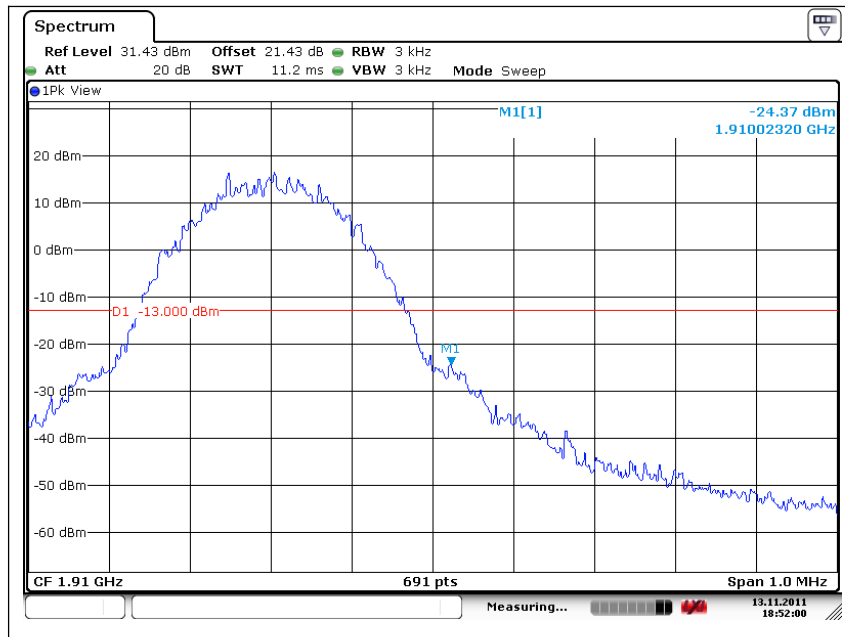
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GSM1900 EDGE Low Channel



High Channel



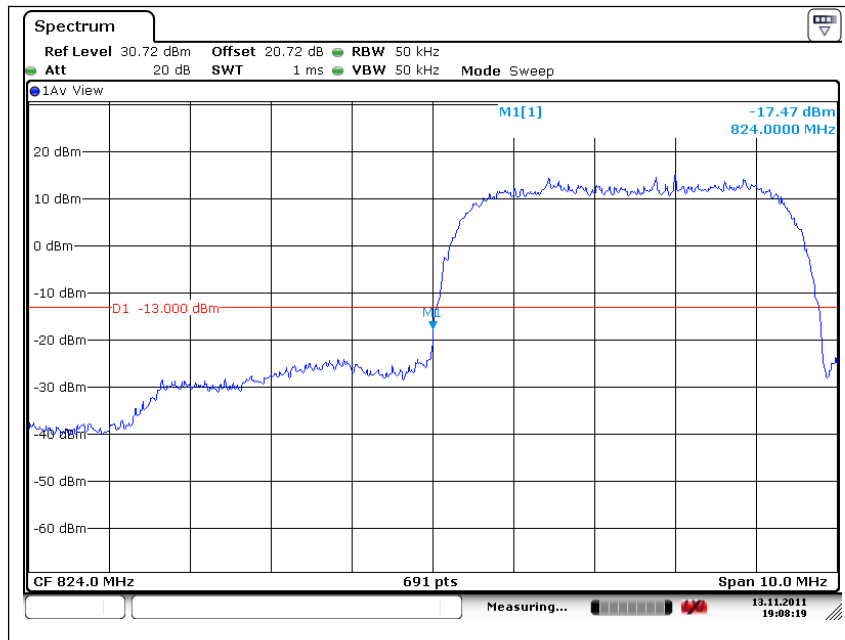
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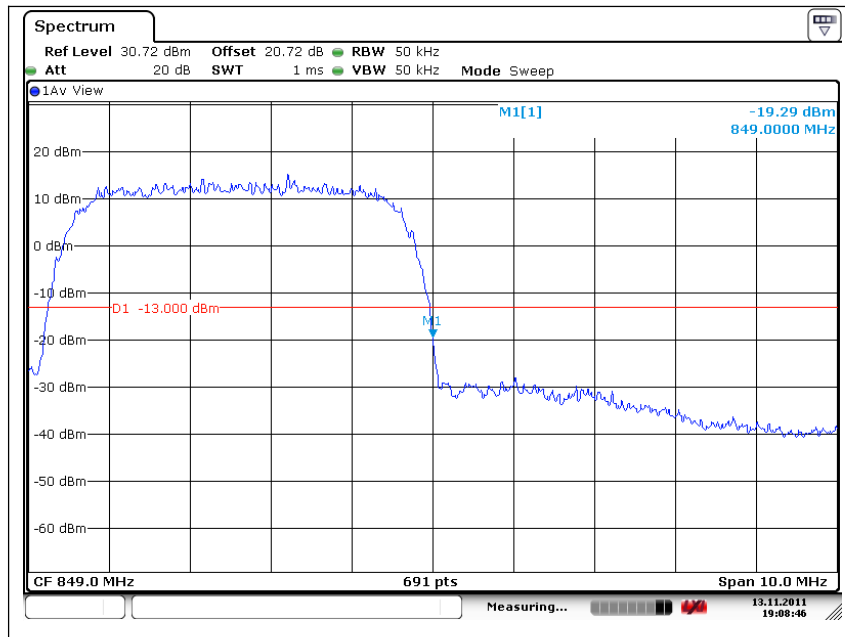
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WCDMA850 Low Channel



High Channel



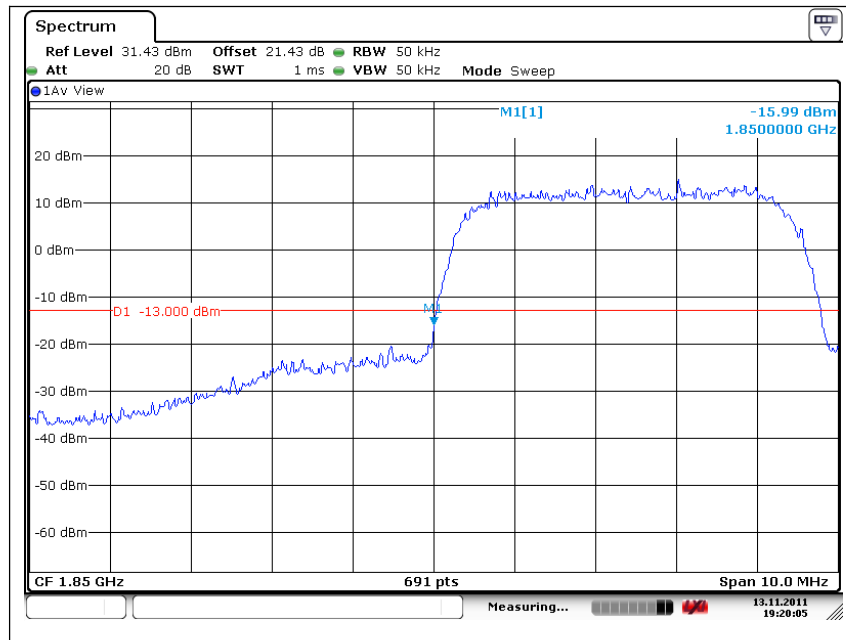
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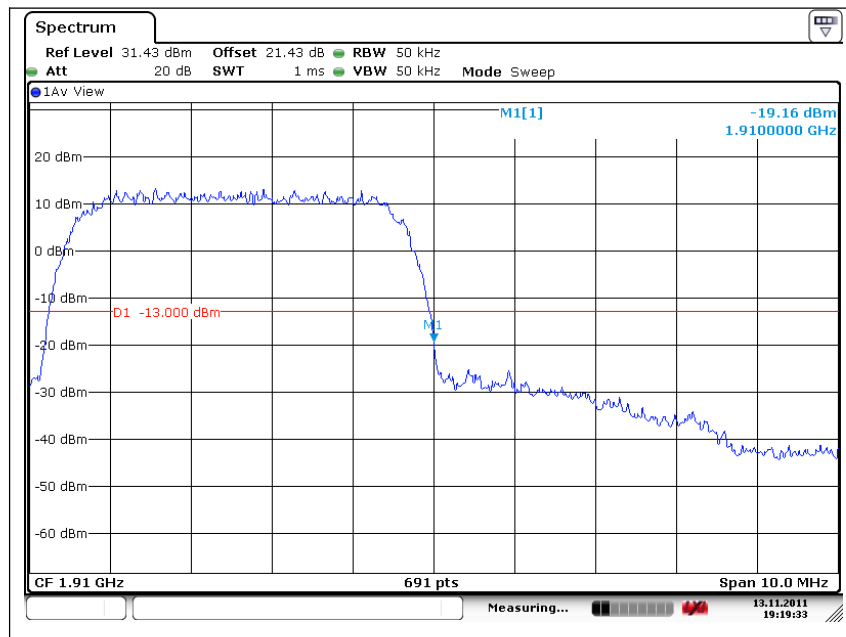
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WCDMA1900 Low Channel



High Channel



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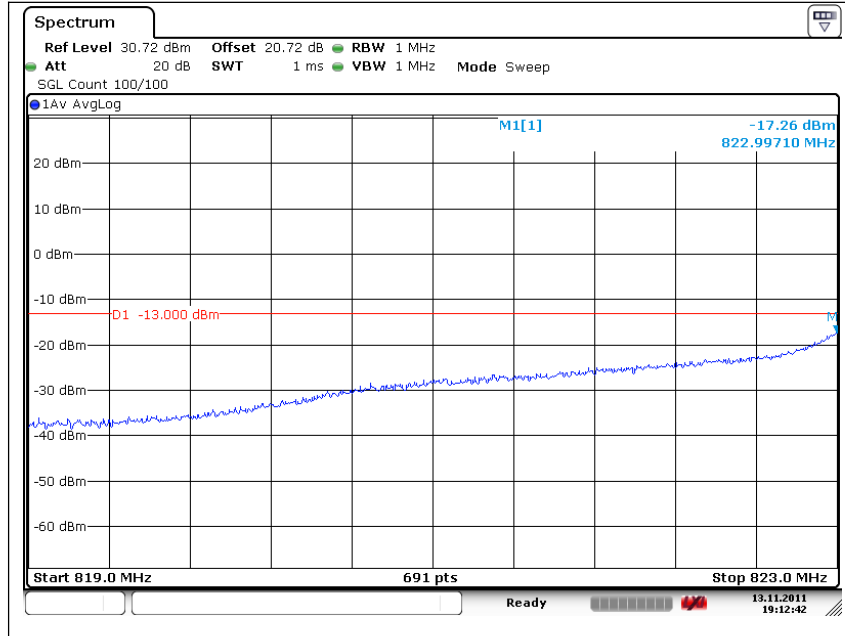
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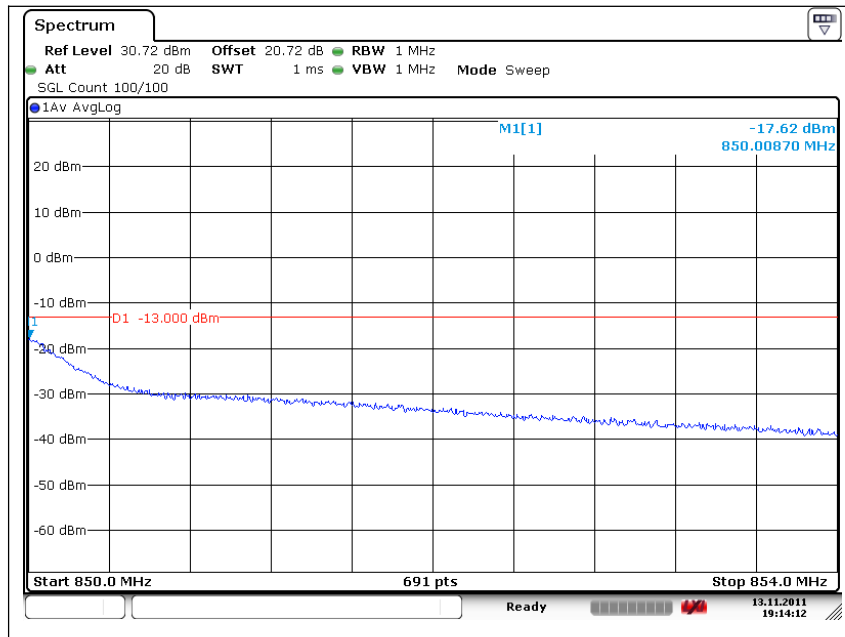
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4 MHz span plot_WCDMA850

Low Channel



High Channel



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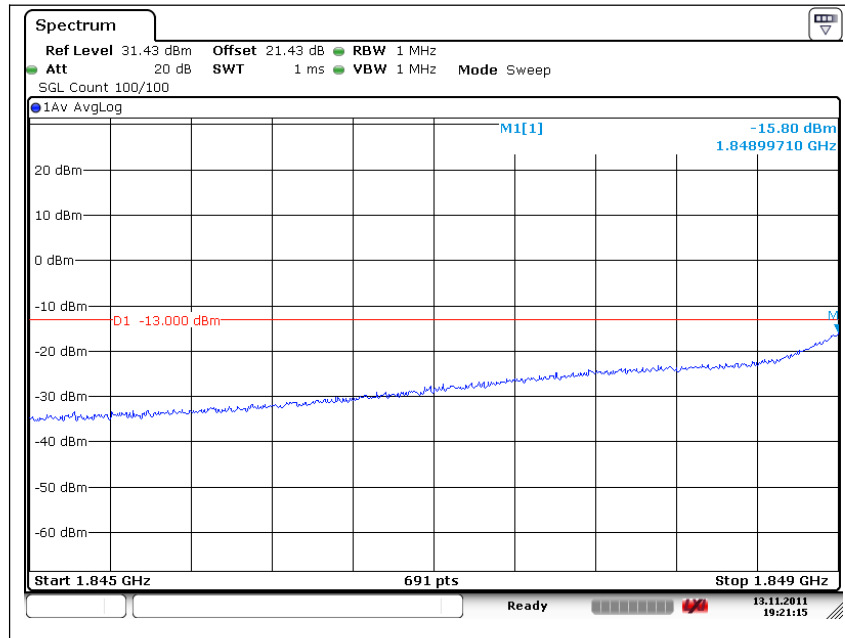
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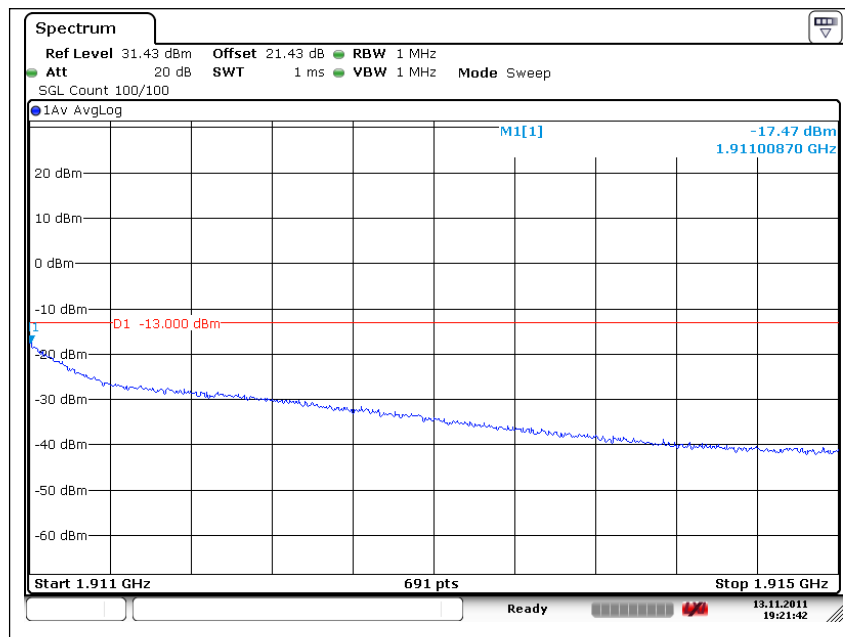
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4 MHz span plot_WCDMA1900

Low Channel



High Channel



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7. Peak-Average Ratio

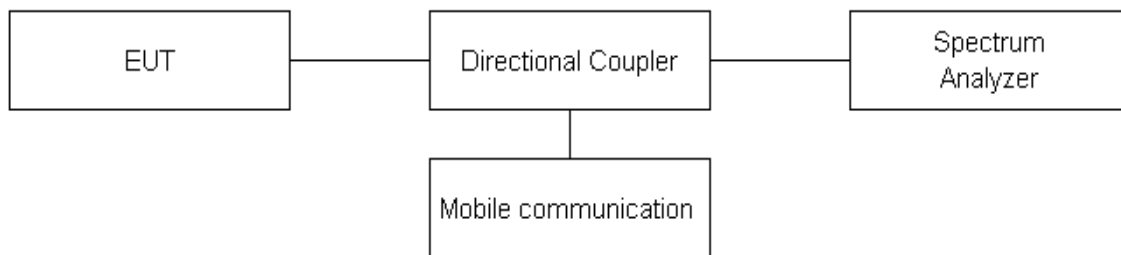
7.1. Limit

Requirements: FCC § 24.232 (d)

(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.

7.2. Test Procedure

1. The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.
2. The center of the spectrum analyzer was set to center frequency.



7.3. Test Results

Ambient temperature : (24 ± 2) °C
 Relative humidity : 47 % R.H.

Please refer to the following plots.

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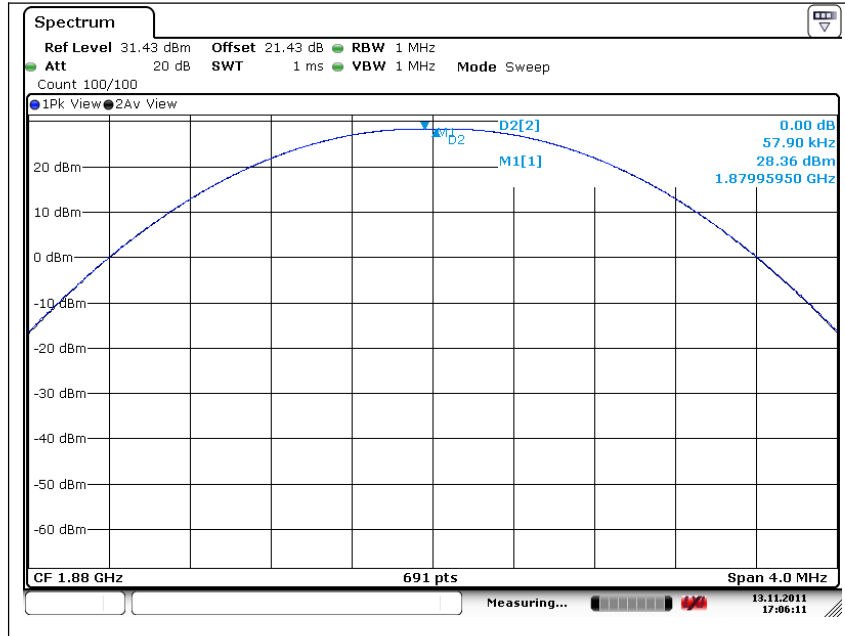
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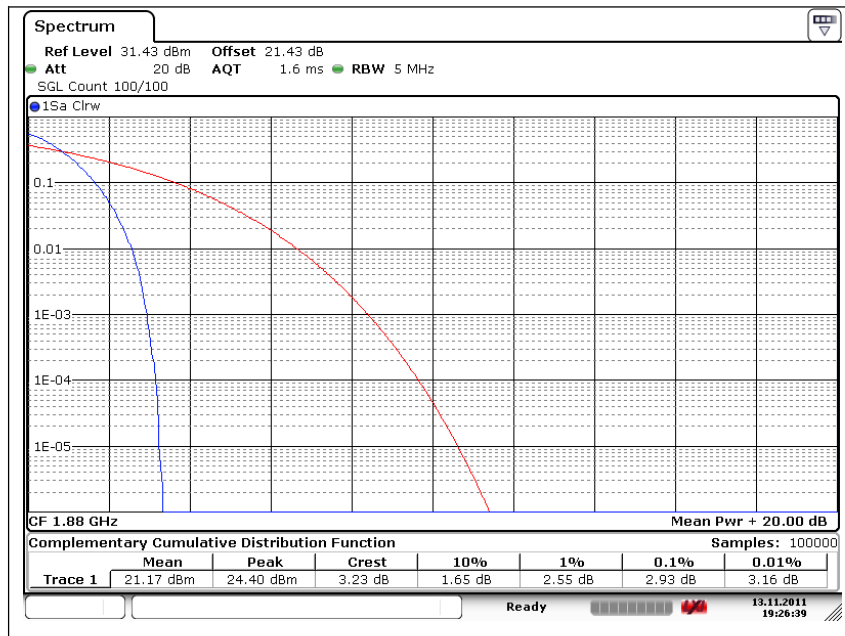
PAR plot_GSM 1900

Middle Channel



PAR plot_WCDMA1900

Middle Channel



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8. Frequency Stability

8.1. Limit

Requirements: FCC § 2.1055 & following:

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table of this section.

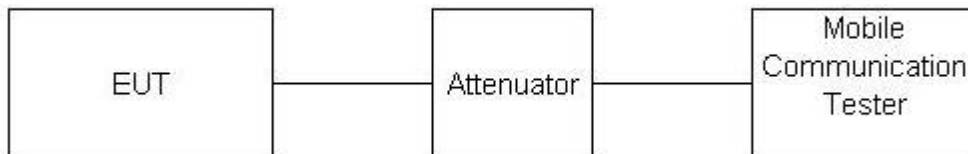
Frequency range (MHz)	Base, fixed (ppm)	Mobile ≤3 watts (ppm)	Mobile ≤3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10.0	n/a	n/a

For Mobile devices operating in the 824 to 849 MHz band at a power level less than or equal to 3 Watts, the limit specified in Table is +/- 2.5 ppm.

§24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block or bands of operation.

8.2. Test Procedure

1. Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed-through attenuators.
2. The EUT was placed inside the temperature chamber.
3. After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter.



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8.3. Test Results

Ambient temperature : (24 ± 2) °C
Relative humidity : 47 % R.H.

GSM850 mode at middle channel

Reference Frequency: 836.6 MHz, Limit: 2.5 ppm			
Frequency Stability versus Temperature			
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
50	3.3	-257	-0.307 2
40		-300	-0.358 6
30		290	0.346 6
24		313	0.374 1
10		260	0.310 8
0		247	0.295 2
-10		-255	-0.304 8
-20		-302	-0.361 0
-30		-159	-0.190 1
Frequency Stability versus power Supply			
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
24	3.80 (+15 %)	-303	-0.362 2
	2.81 (-15 %)	15	0.017 9

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GSM1900 mode at middle channel

Reference Frequency: 1 880.0 MHz, Limit: 2.5 ppm			
Frequency Stability versus Temperature			
Environment Temperature (℃)	Power Supplied (Vdc)	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
50	3.3	37	0.019 7
40		33	0.017 6
30		-45	-0.023 9
24		39	0.020 7
10		15	0.008 0
0		17	0.009 0
-10		23	0.012 2
-20		-21	-0.011 2
-30		-30	-0.016 0
Frequency Stability versus power Supply			
Environment Temperature (℃)	Power Supplied (Vdc)	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
24	3.80 (+15 %)	13	0.006 9
	2.81 (-15 %)	20	0.010 6

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WCDMA850 mode at middle channel

Reference Frequency: 836.6 MHz, Limit: 2.5 ppm			
Frequency Stability versus Temperature			
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
50	3.3	12	0.014 3
40		15	0.017 9
30		-11	-0.013 1
24		-5	-0.006 0
10		10	0.012 0
0		5	0.006 0
-10		9	0.010 8
-20		-20	-0.023 9
-30		13	0.015 5
Frequency Stability versus power Supply			
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
24	3.80 (+15 %)	-5	-0.006 0
	2.81 (-15 %)	11	0.013 1

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WCDMA1900 mode at middle channel

Reference Frequency: 1 880.0 MHz, Limit: 2.5 ppm			
Frequency Stability versus Temperature			
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
50	3.3	18	0.009 6
40		16	0.008 5
30		13	0.006 9
24		9	0.004 8
10		-5	-0.002 7
0		-4	-0.002 1
-10		-9	-0.004 8
-20		11	0.005 9
-30		13	0.006 9
Frequency Stability versus power Supply			
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
24	3.80 (+15 %)	-9	-0.004 8
	2.81 (-15 %)	-5	-0.002 7

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9. RF Exposure Evaluation

9.1 Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

According to FCC 1.1310 : The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in §1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time
(A) Limits for Occupational /Control Exposures				
300 – 1 500	--	--	F/300	6
1 500 – 100 000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
<u>300 – 1 500</u>	--	--	<u>F/1500</u>	<u>30</u>
<u>1 500 – 100 000</u>	--	--	<u>1</u>	<u>30</u>

9.1.1. Friis transmission formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$

Where P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

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9.1.2. Test Result of RF Exposure Evaluation

Test Item : RF Exposure Evaluation Data

Test Mode : Normal Operation

9.1.3. Output Power into Antenna & RF Exposure Evaluation Distance

Mode: GSM850

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Duty Cycle (%)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
Low	824.2	32.7	12.5	1.4	0.063 920	0.55
Middle	836.6	32.8	12.5	1.4	0.065 409	0.56
High	848.8	32.7	12.5	1.4	0.063 920	0.57

Note :

1. The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit .

Mode: GSM1900

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Duty Cycle (%)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
Low	1 850.2	28.3	25	1	0.042 332	1
Middle	1 880.0	28.0	25	1	0.039 507	1
High	1 909.8	28.2	25	1	0.041 369	1

Note :

1. The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit .

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Mode: WCDMA850

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Duty Cycle (%)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
Low	826.4	22.9	100	1.4	0.053 546	0.55
Middle	836.6	22.9	100	1.4	0.053 546	0.56
High	846.6	22.4	100	1.4	0.047 723	0.56

Note :

1. The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit.

Mode: WCDMA1900

Channel	Channel Frequency (MHz)	Output Average Power to Antenna (dB m)	Duty Cycle (%)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	LIMITS (mW/cm ²)
Low	1 852.4	22.3	100	1	0.042 533	1
Middle	1 880.0	22.5	100	1	0.044 538	1
High	1 907.6	22.0	100	1	0.039 694	1

Note :

1. The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit .

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