TEST REPORT

of

FCC Part 22 Subpart H and Part 24 Subpart E
FCC ID : X3HCP100G

Equipment Under Test	:	LBS
Model Name	:	CP-100G
Serial No.	:	N/A
Applicant	:	CUMAN Co., Ltd.
Manufacturer	:	CUMAN Co., Ltd.
Date of Test(s)	:	2010-02-18 ~ 2010-03-15
Date of Issue	:	2010-04-02

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

Tested By: **Date** **2010-04-02**

Grant Lee

Approved By **Date** **2010-04-02**

Charles Kim

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1. General information

1.1. Testing laboratory

SGS Testing Korea Co., Ltd.
- 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

www.electrolab.kr.sgs.com
Telephone : +82 +31 428 5700
FAX : +82 +31 427 2371

1.2. Details of applicant

Applicant : CUMAN Co., Ltd.
Address : 2F, Dongsung build. 1229-11 Gaepo-Dong, Gangnam-Gu, Seoul, Korea
Contact Person : WOO, JAE IL
Phone No. : +82 +70 8220 6951

1.3. Description of EUT

Kind of Product	LBS
Model Name	CP-100G
Serial Number	N/A
Power Supply	DC 3.7 V (Li-polymer Battery)
Rated Power	GSM850 : 30.2 dBm GSM1900 : 28.5 dBm
Frequency Range	GSM850 : 824.2 MHz ~ 848.8 MHz GSM1900 : 1850.2 MHz ~ 1909.8 MHz
Number of Channels	GSM850 : 125 GSM1900 : 300
Antenna gain	GSM850 : 6.2 dBi GSM1900 : 3.8 dBi
Antenna type	Fix type
Class of GPRS	Class 10

1.4. Description of test mode

1.4.1 GSM Band

Band	Mode		Frequency (MHz)	Average output power (dBm)
GSM 850	GSM	Voice	824.2	30.1
			836.6	30.2
			848.8	30.1
	GPRS	1 Tx Slot	824.2	30.0
			836.6	30.1
			848.8	30.1
		2 Tx Slot	824.2	29.9
			836.6	30.0
			848.8	30.0
GSM 1900	GSM	Voice	1850.2	28.5
			1880.0	28.3
			1909.8	28.1
	GPRS	1 Tx Slot	1850.2	28.5
			1880.0	28.2
			1909.8	28.1
		2 Tx Slot	1850.2	28.4
			1880.0	28.2
			1909.8	28.1

GSM (850 / 1900)
We found out the test mode with the highest power level after we analyze all the data rates. So we chose GSM voice mode (worst case) as a representative.

1.5. Test equipment list

Equipment	Manufacturer	Model	Cal Due.
Signal Generator	Agilent	E4438C	Mar. 31, 2011
Signal Generator	Rohde & Schwarz	SMR40	Sep. 25, 2010
Spectrum Analyzer	Rohde & Schwarz	FSV30	May. 15, 2010
Spectrum Analyzer	Agilent	E4440A	Mar. 31, 2011
Signal Generator	Rohde & Schwarz	SMR40	Sep. 25, 2010
Mobile Test Unit	Agilent	E5515C	Mar. 31, 2011
Directional Coupler	Narda	4226-20	Jan. 07, 2011
High Pass Filter	Wainwright	WHK3.0/18G-10SS	Sep. 29, 2010
Band Reject Filter	Wainwright	WRCG824/849-814/85960/10SS	Apr. 01, 2011
DC power Supply	Agilent	U8002A	Jan. 06, 2011
Preamplifier	Empower RF Systems,Inc	2002-BBS2C4AEL	Mar. 31, 2011
Preamplifier	Rohde & Schwarz	8449B	Mar. 31, 2011
Test Receiver	R & S	ESU26	Apr. 21, 2010
Bilog Antenna	SCHWARZBECK MESSELEKTRONIK	VULB9163	Jul. 22, 2010
Horn Antenna	Rohde & Schwarz	HF 906	Oct. 08, 2011
Horn Antenna	SCHWARZBECK	BBH 9120D	Nov. 09, 2011
Dipole Antenna	VHAP/UHAP	975/958	Oct. 10, 2011
Antenna Master	EMCO	1050	N.C.R
Turn Table	Daeil EMC	DI-1500	N.C.R
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.6 m)	Jan. 27, 2011

1.6. Summary of test results

The EUT has been tested according to the following specifications:

APPLIED STANDARD : FCC Part 22, 24		
Section in FCC part	**Test Item**	**Result**
§2.1046 §22.913(a) §24.232(b)	RF Radiated Output Power	Complied
§2.1053 §22.917(e) §24.238(a)	Spurious Radiated Emission	Complied
§2.1046(a)	Conducted Output Power	Complied
§2.1049(h) (i)	Occupied Bandwidth	Complied
§2.1051 §22.917(e) §24.238(a)	Spurious Emission at Antenna Terminal	Complied
§2.1055 §22.355 §24.235	Frequency Stability	Complied
§22.917(e) §24.238(a)	Band Edge	Complied

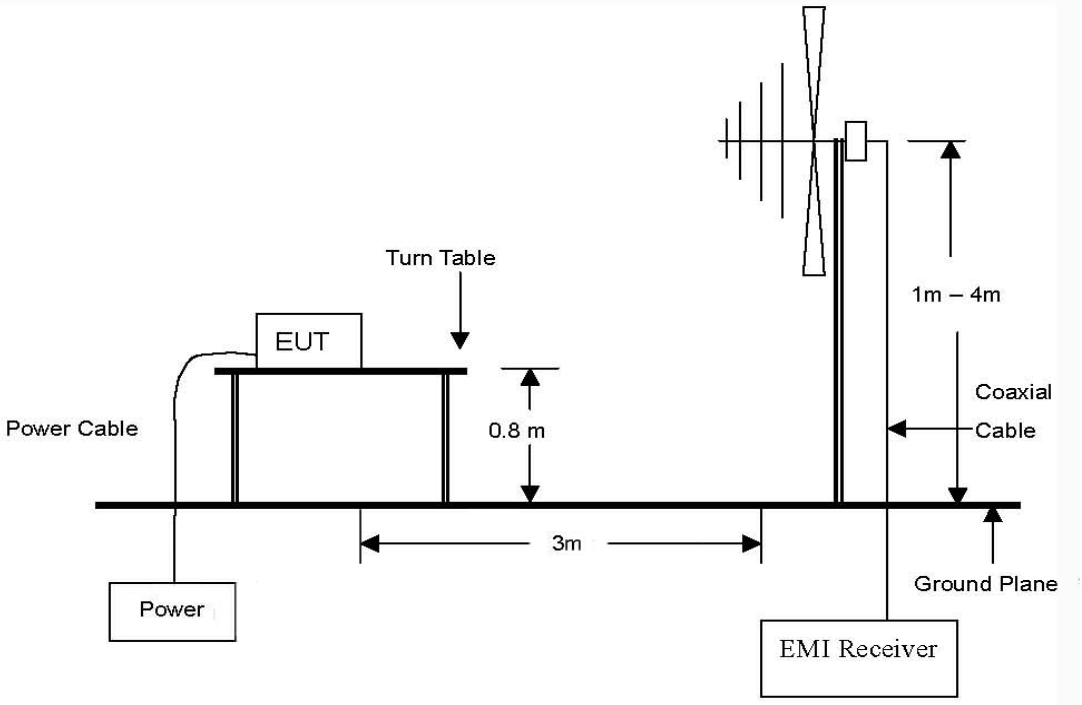
1.7. Test report revision

Revision	Report number	Description
0	F690501/RF-RTL003660	Initial
1	F690501/RF-RTL003660-1	Addition 1. Antenna information 2. The class of GPRS 3. address worst case from x, y, z 4. Revise typo

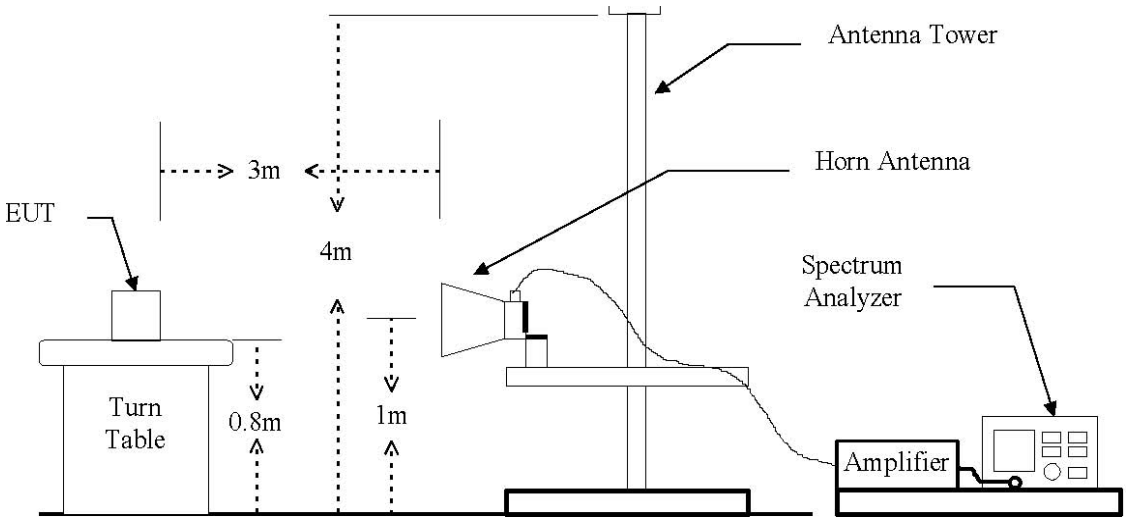
2. RF radiated output power & spurious radiated emission

2.1. Test setup

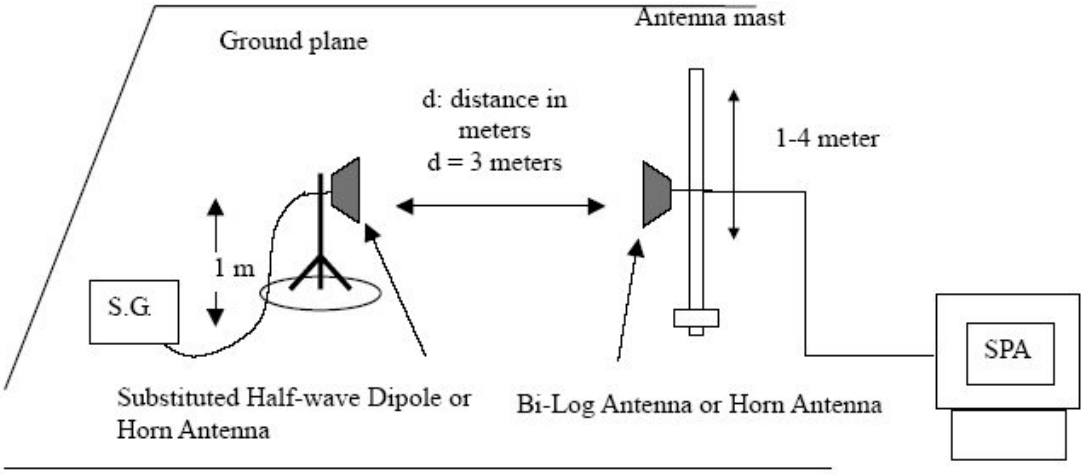
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



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



The diagram below shows the test setup for substituted method



2.2. Limit

FCC §22.913(a), the ERP of mobile transmitters must not exceed 7 watts. FCC §24.232(b) 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.

2.3. 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 closest to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3m 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 average 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 a maximum signal level is detected by the measuring receiver.
7. The transmitter shall then the 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 a 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 (1850 ~1910 MHz) connected to a signal generator.
11. In necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase he 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 received, 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 dBm, 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.

2.4. Test result for RF output power

Ambient temperature : 24 ℃
Relative humidity : 47 % R.H.

2.4.1. Test mode: GSM

RF output power was measured in three orthogonal EUT positions(x-axis, y-axis and z-axis). Worst case is y-axis.

GSM850

Frequency (MHz)	Ant. Pol. (H/V)	S.G level + Amp. (dBm)	Cable loss (dB)	Ant. gain (dBd)	E.R.P.	
					(dBm)	(mW)
824.20	V	32.76	3.42	-10.44	18.90	77.67
824.20	H	34.24	3.42	-10.44	20.38	109.21
836.60	V	32.04	3.38	-10.48	18.18	65.76
836.60	H	34.10	3.38	-10.48	20.24	105.68
848.80	V	33.66	3.33	-10.53	19.80	95.45
848.80	H	29.55	3.33	-10.53	15.69	37.05

GSM1900

Frequency (MHz)	Ant. Pol. (H/V)	S.G level + Amp. (dBm)	Cable loss (dB)	Ant. gain (dBi)	E.I.R.P.	
					(dBm)	(mW)
1850.20	V	17.94	4.87	6.97	20.04	100.82
1850.20	H	23.37	4.87	6.97	25.47	352.38
1880.00	V	17.07	4.91	7.05	19.21	83.42
1880.00	H	22.42	4.91	7.05	24.56	285.53
1909.80	V	17.21	4.94	7.12	19.40	87.02
1909.80	H	22.13	4.94	7.12	24.31	269.88

Remark:
1. E.R.P. & E.I.R.P = [S.G level + Amp.](dBm) - Cable loss(dB) + Ant. gain (dBd/dBi)
2. The E.I.R.P was measured in three orthogonal EUT position(x-axis, y-axis and z-axis). Worst cases are z-axis.

2.5. Test result for spurious radiated emission

Ambient temperature : 24 ℃
Relative humidity : 47 % R.H.

2.5.1. Test mode: GSM

- Measured output Power : 30.20 dBm = 1.047 W
- Modulation Signal : GSM850
- Distance : 3 meters
- Limit : -(43 + 10log$_{10}$(W)) = - 43.20 dBc

Frequency (MHz)	Ant. Pol. (H/V)	S.G level (dBm)	Cable loss (dB)	Ant. gain (dBd)	E.R.P (dBm)	dBc	Margin (dB)
Low Channel (824.2 MHz)							
1648.40	V	-24.78	4.54	6.44	-22.87	-53.07	9.87
1648.40	H	-28.58	4.54	6.44	-26.68	-56.88	13.68
2472.60	V	-49.43	5.67	7.97	-47.13	-77.33	34.13
2472.60	H	-47.21	5.67	7.97	-44.91	-75.11	31.91
Middle Channel (836.6 MHz)							
1673.20	V	-30.27	4.58	6.51	-28.34	-58.54	15.34
1673.20	H	-31.81	4.58	6.51	-29.88	-60.08	16.88
2509.80	V	-53.47	5.72	8.02	-51.17	-81.37	38.17
2509.80	H	-49.07	5.72	8.02	-46.77	-76.97	33.77
High Channel (848.8 MHz)							
1697.60	V	-34.02	4.62	6.57	-32.07	-62.27	19.07
1697.60	H	-39.32	4.62	6.57	-37.37	-67.57	24.37
2546.40	V	-54.18	5.75	8.07	-51.86	-82.06	38.86
2546.40	H	-50.05	5.75	8.07	-47.73	-77.93	34.73

- Measured output Power : 28.50 dBm = 0.708 W
- Modulation Signal : GSM1900
- Distance : 3 meters
- Limit : -(43 + 10log$_{10}$(W)) = - 41.50 dBc

Frequency (MHz)	Ant. Pol. (H/V)	S.G level (dBm)	Cable loss (dB)	Ant. gain (dBi)	E.I.R.P (dBm)	dBc	Margin (dB)
Low Channel(1850.2 MHz)							
3700.40	V	-42.91	7.13	11.85	-38.19	-66.69	25.19
3700.40	H	-39.53	7.13	11.85	-34.81	-63.31	21.81
5550.60	V	-35.97	9.24	12.12	-33.08	-61.58	20.08
5550.60	H	-38.98	9.24	12.12	-36.09	-64.59	23.09
Middle Channel(1880.0 MHz)							
3760.00	V	-38.94	7.23	11.85	-34.33	-62.83	21.33
3760.00	H	-39.05	7.23	11.85	-34.44	-62.94	21.44
5640.00	V	-38.80	9.36	12.08	-36.08	-64.58	23.08
5640.00	H	-40.00	9.36	12.08	-37.28	-65.78	24.28
7520.00	V	-38.84	11.31	10.22	-39.93	-68.43	26.93
7520.00	H	-38.33	11.31	10.22	-39.42	-67.92	26.42
High Channel(1909.8 MHz)							
3819.60	V	-37.82	7.33	11.84	-33.31	-61.81	20.31
3819.60	H	-37.07	7.33	11.84	-32.56	-61.06	19.56
5726.40	V	-37.21	9.46	12.04	-34.63	-63.13	21.63
5726.40	H	-41.72	9.46	12.04	-39.14	-67.64	26.14
7639.34	V	-37.81	11.44	10.24	-39.01	-67.51	26.01
7639.34	H	-36.55	11.44	10.24	-37.75	-66.25	24.75

Remark:
1. E.R.P. & E.I.R.P = S.G level (dBm) - Cable loss (dB) + Ant. gain (dBd/dBi)
2. No more harmonic above 3rd harmonic for all channel.

3. Conducted Output Power

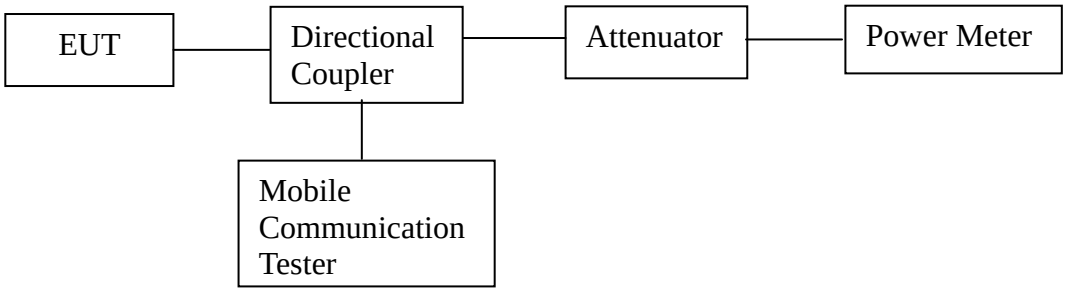
3.1. Limit

Requirements: CFR 47, Section §2.1046

3.2. Test Procedure

1. The RF output of the transmitter was connected to the input of the power meter through sufficient attenuation.

2. The mobile was set up for the max. output power with pseudo random data modulation.
3. The power was measured with Power meter



3.3. Test Result

Ambient temperature : 24 ℃
Relative humidity : 47 % R.H.

Band	Mode	Frequency (MHz)	Output Power (dBm)
GSM850	GSM Voice	824.2	30.1
		836.6	30.2
		848.8	30.1
GSM1900	GSM Voice	1850.2	28.5
		1880.0	28.3
		1909.8	28.1

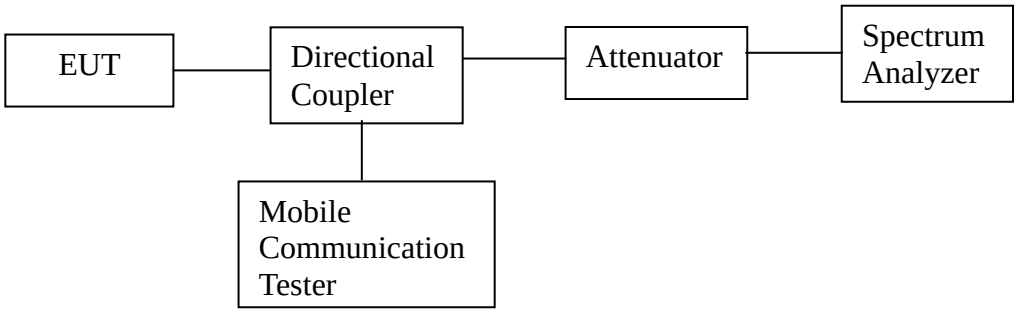
4. Occupied Bandwidth 99 %

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



4.3 Test Results

Ambient temperature : 24 ℃
Relative humidity : 47 % R.H.

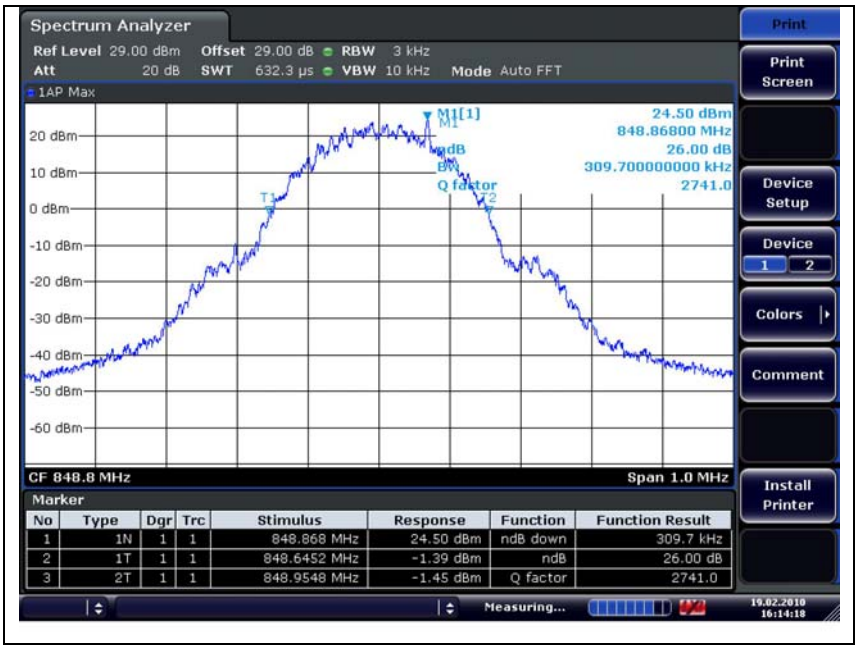
Band	Mode	Frequency (MHz)	Occupied Bandwidth (MHz)
GSM850	GSM Voice	824.2	0.310
		836.6	0.311
		848.8	0.310
GSM1900	GSM Voice	1850.2	0.311
		1880.0	0.310
		1909.8	0.304

Please refer to the following plots.

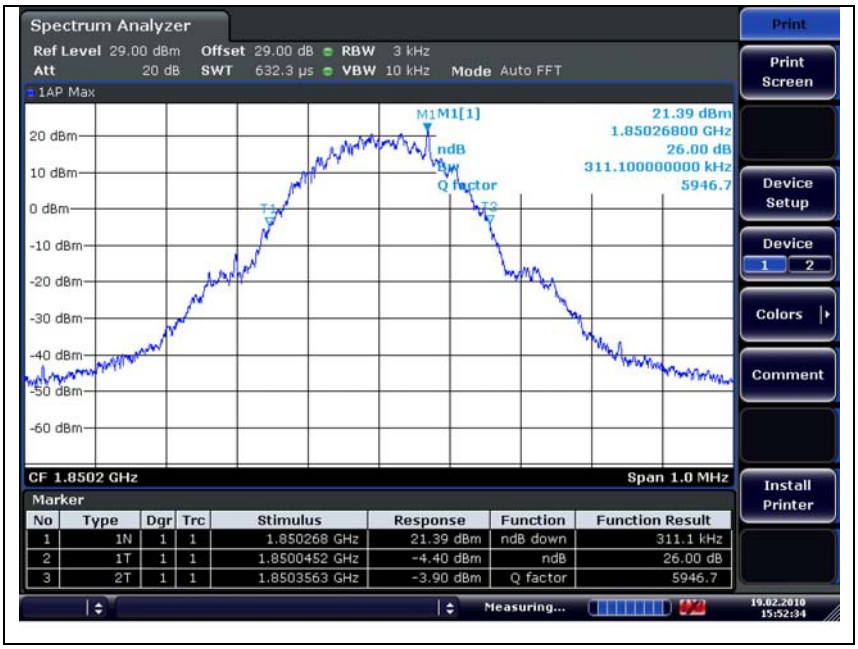
GSM850
99 %
Low Channel

Middle Channel

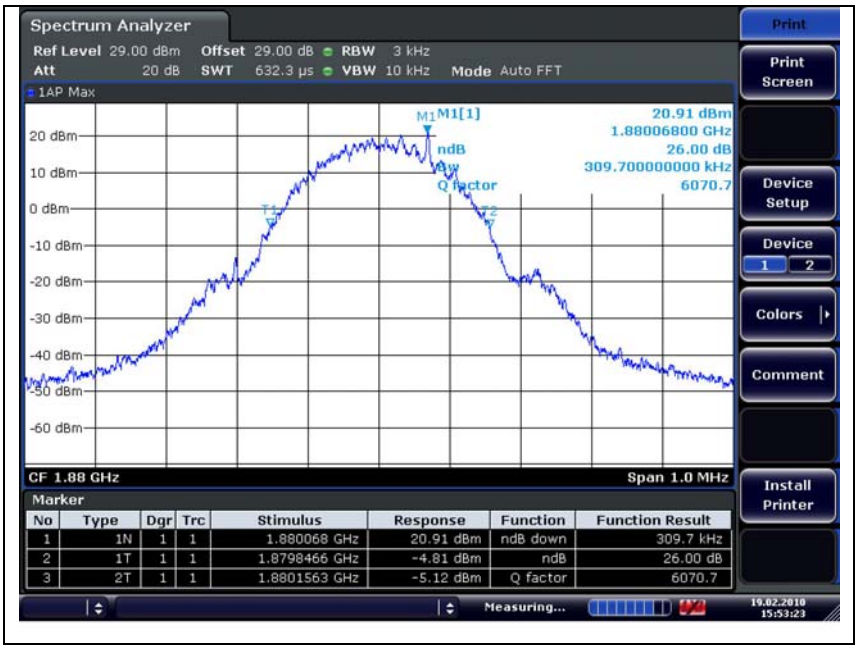
High Channel



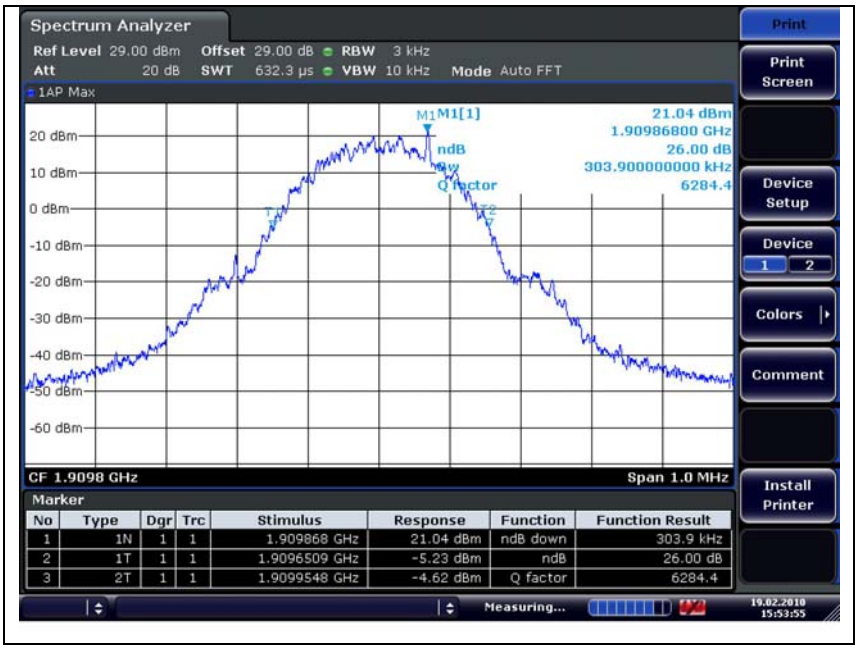
GSM1900
99 %
Low Channel



Middle Channel



High Channel



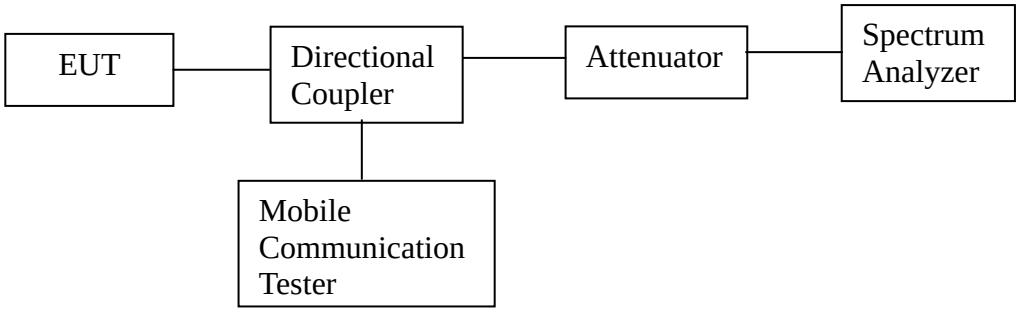
5. Spurious Emissions at Antenna Terminal

5.1. Limit

§ 22.917(e) 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+10log(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



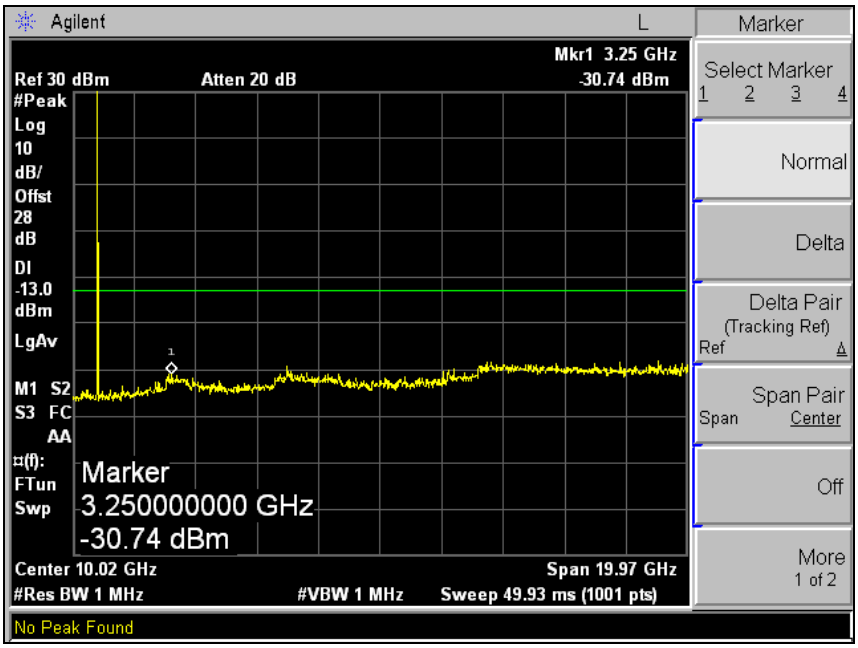
5.3. Test Results

Ambient temperature	:	24 ℃
Relative humidity	:	47 % R.H.

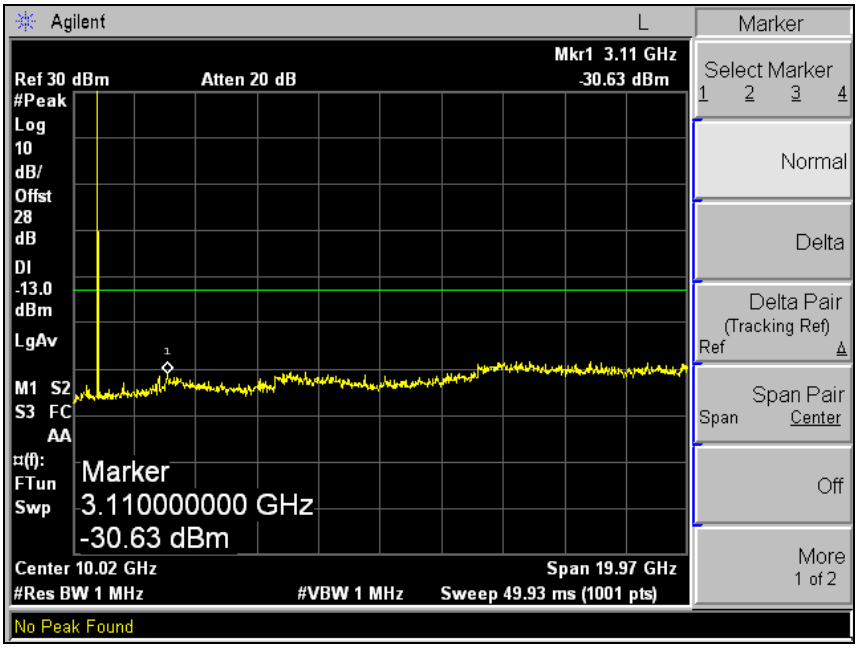
Please refer to the following plots.

GSM850

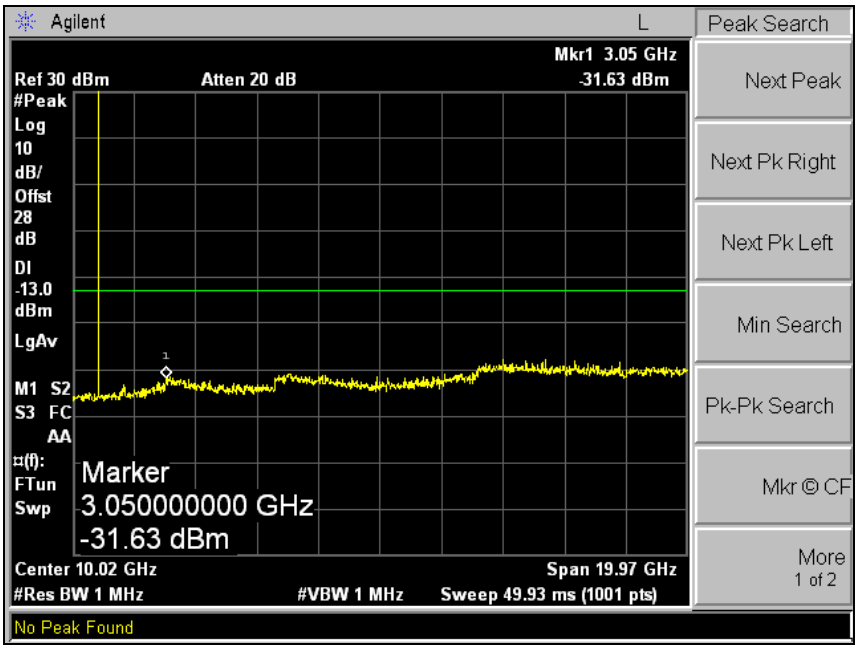
Low Channel



Middle Channel

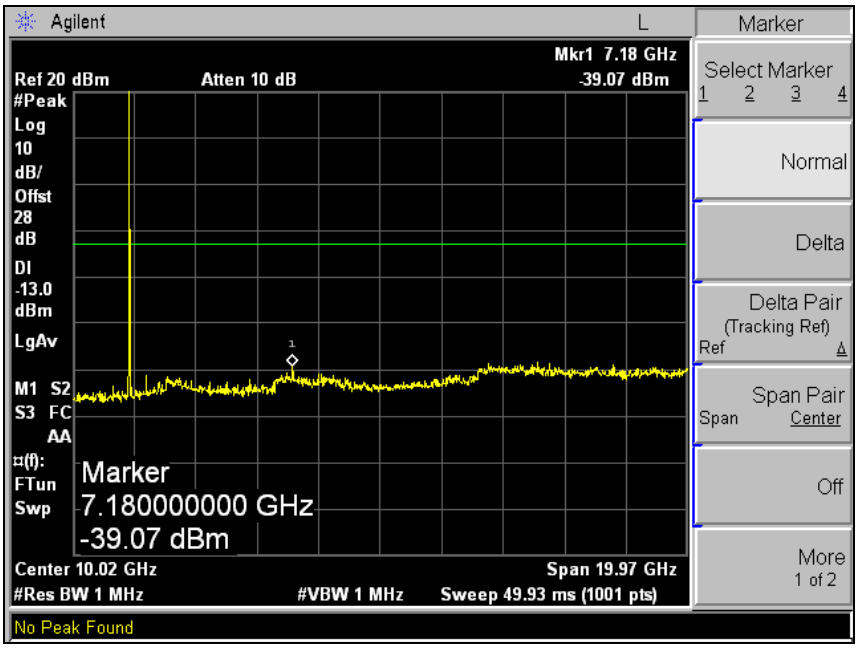


High Channel

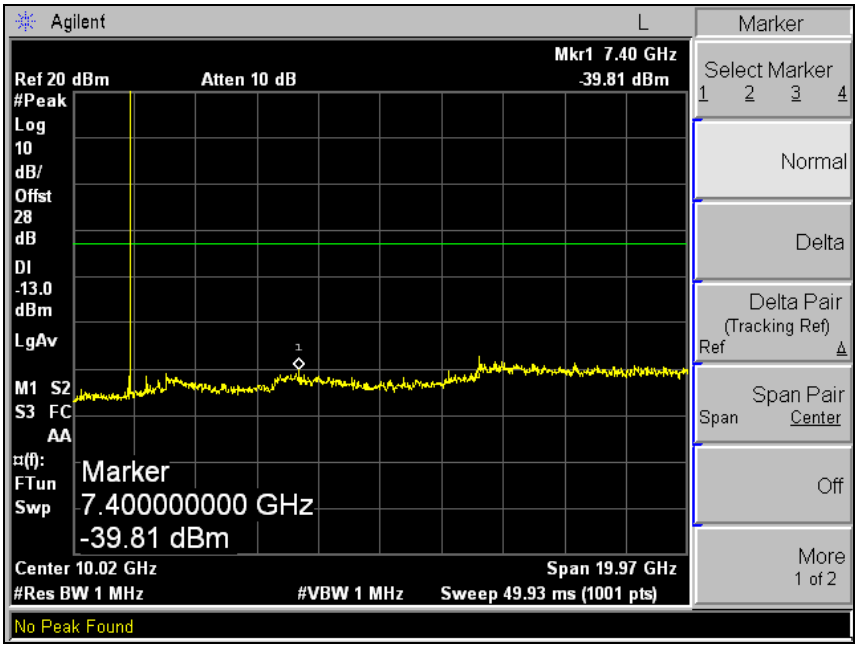


GSM1900

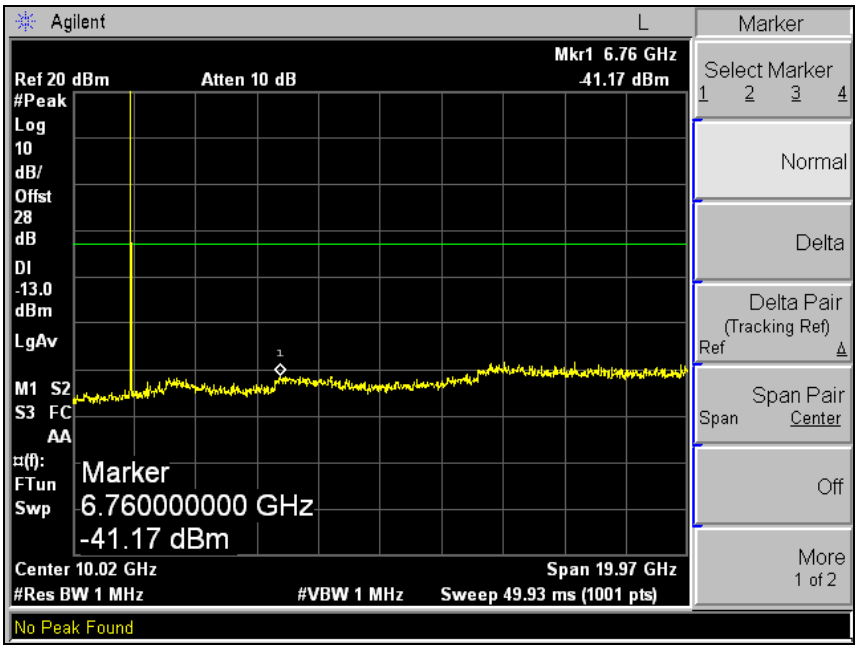
Low Channel



Middle Channel



High Channel



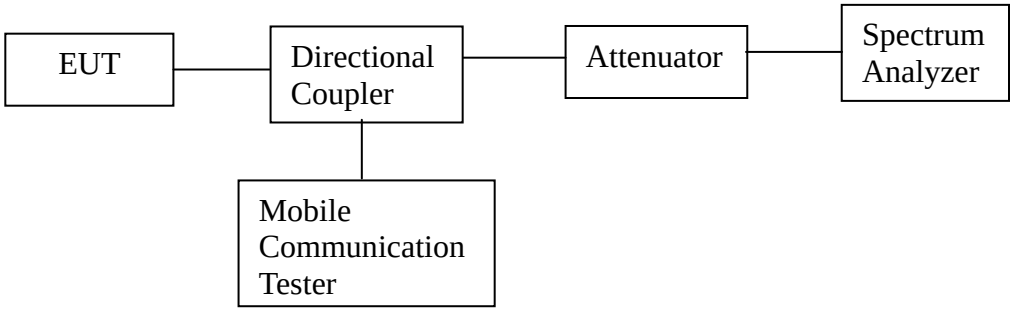
6. Band Edge

6.1. Limit

§ 22.917(e) 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+10log(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.



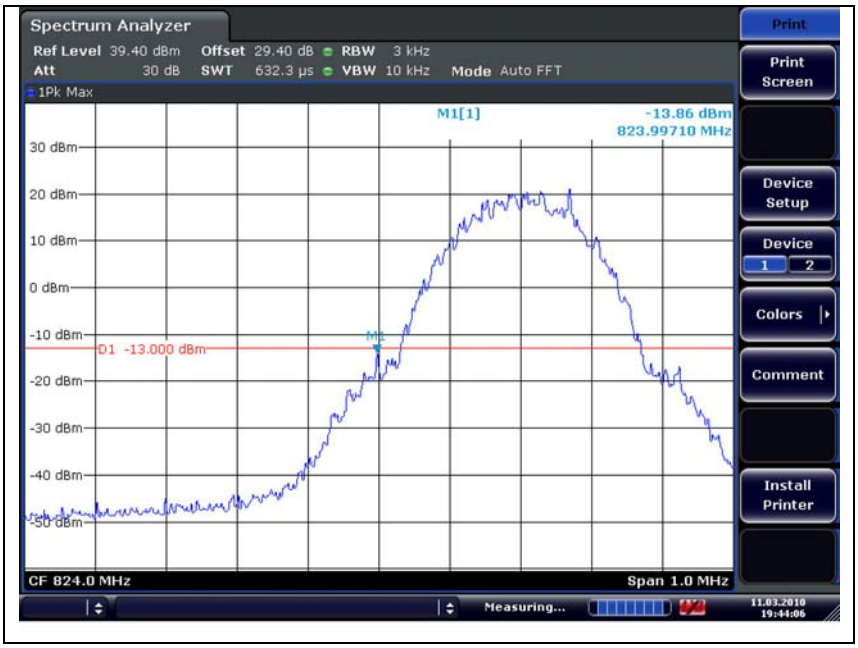
6.3. Test Results

Ambient temperature	:	24 ℃
Relative humidity	:	47 % R.H.

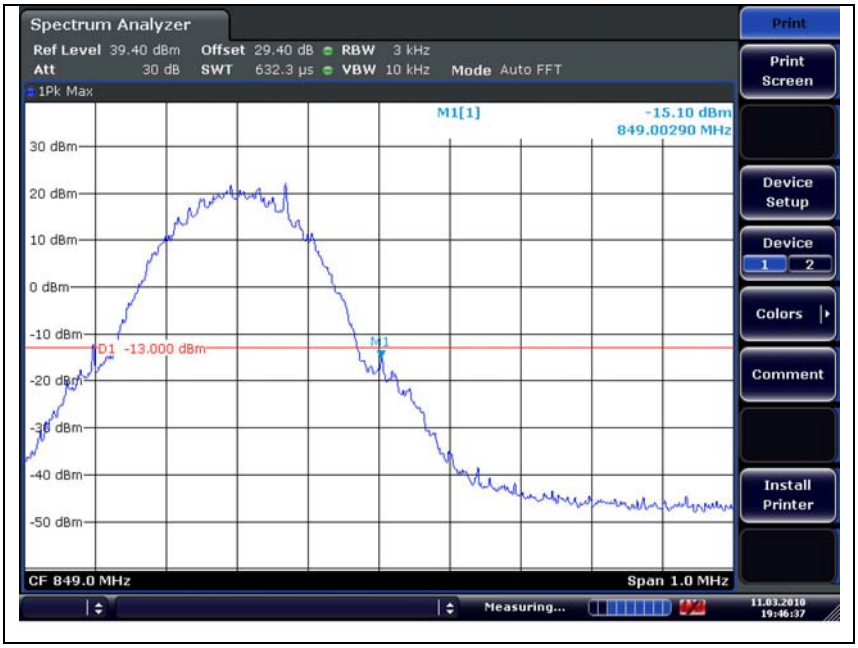
Please refer to the following plots.

GSM850

Low Channel

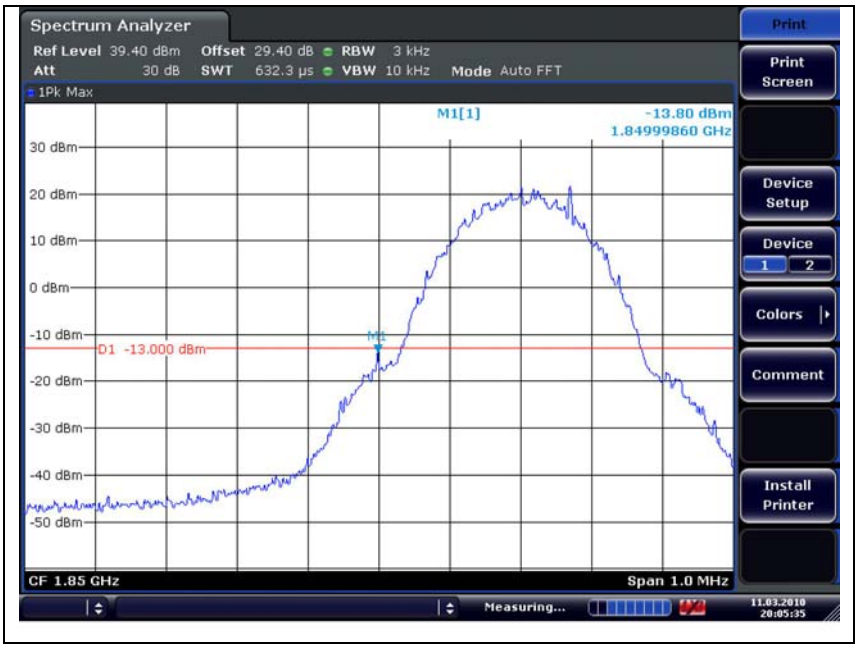


High Channel

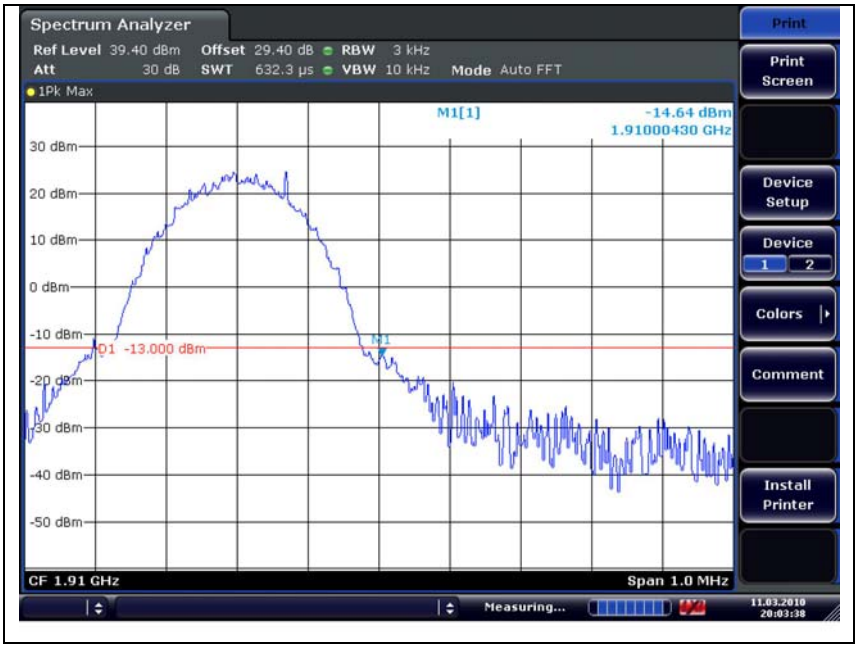


GSM1900

Low Channel



High Channel



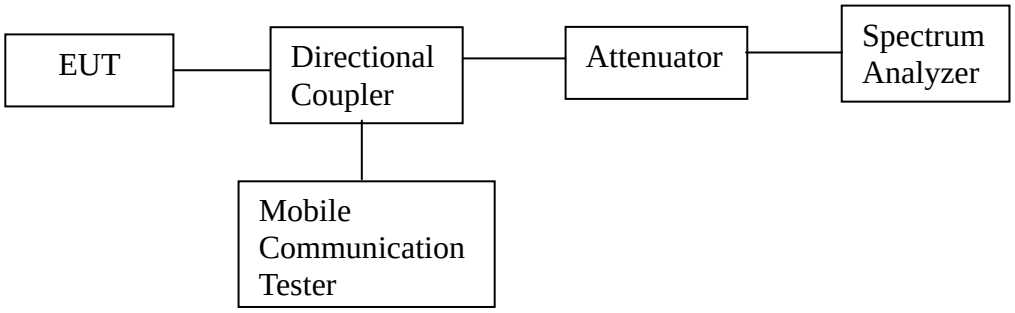
7. Frequency Stability

7.1. Limit

Requirements: FCC § 2.1055 (a), § 2.1055 (d) & 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.
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 C-1 is +/- 2.5 ppm.
§24.235 The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

7.2. 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.
4. Frequency Stability vs. Voltage: An external variable AC power supply was connected to the battery terminals of the equipment under test. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the battery end point. The output frequency was recorded for each battery voltage.



7.3. Test Results

Ambient temperature : 24 ℃
Relative humidity : 47 % R.H.

7.3.1. GSM mode at middle channel

GSM850

Reference Frequency: 836.6 MHz, Limit: 2.5 ppm			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (Vdc)**	**Frequency Measure with Time Elapse**	
		Frequency Error (Hz)	**ppm**
50	3.7	-28	-0.033
40		-21	-0.025
30		-24	-0.029
24		-23	-0.027
10		-28	-0.033
0		-27	-0.032
-10		-30	-0.036
-20		-35	-0.042
-30		-33	-0.039
Frequency Stability versus power Supply			
Environment Temperature (℃)	**Power Supplied (Vdc)**	**Frequency Measure with Time Elapse**	
		Frequency Error (Hz)	**ppm**
24	4.255	-18	-0.022
	2.5 (batt. End point)	-121	-0.145

GSM1900

Reference Frequency: 1880.0 MHz, Limit: 2.5 ppm			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (Vdc)**	**Frequency Measure with Time Elapse**	
		Frequency Error (Hz)	**ppm**
50	3.7	-23	-0.012
40		-16	-0.009
30		-23	-0.012
24		-20	-0.011
10		-11	-0.006
0		-27	-0.014
-10		-21	-0.011
-20		-26	-0.014
-30		-23	-0.012
Frequency Stability versus power Supply			
Environment Temperature (℃)	**Power Supplied (Vdc)**	**Frequency Measure with Time Elapse**	
		Frequency Error (Hz)	**ppm**
24	4.255	-24	-0.013
	2.5 (batt. End point)	-23	-0.065