



TEST REPORT

Report No.: SRTC2014-H024-E0024

Product Name: GSM/GPRS/EDGE/UMTS

Digital Mobile Phone with Bluetooth and WiFi

Product Model: 6037I

Applicant: TCT Mobile Limited

Manufacturer: TCT Mobile Limited

Specification: FCC Part 24E, Part 22H, Part 2

(April 25, 2013 edition)

FCC ID: RAD458

The State Radio_monitoring_center Testing Center (SRTC)

No.80 Beilishi Road Xicheng District Beijing, China

Tel: 86-10-68009202 Fax: 86-10-68009205

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1. General information

1.1 Notes of the test report

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written permission of The State Radio_monitoring_center Testing Center (SRTC).

The test results relate only to individual items of the samples which have been tested.

1.2 Information about the testing laboratory

Company: The State Radio_monitoring_center Testing Center (SRTC)
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City: Beijing
Country or Region: China
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Tel: +86 10 68009181 +86 10 68009202
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Email: wangjf@srrc.org.cn / wangjunfeng@srtc.org.cn

1.3 Applicant's details

Company: TCT Mobile Limited
Address: 5F, C building, No. 232, Liang Jing Road ZhangJiang
High-Tech Park, Pudong Area
City: Shanghai
Country or Region: P.R.China
Grantee Code: RAD
Contacted person: Gong Zhizhou
Tel: +86-21-61460890
Fax: +86-21-61460602
Email: zhizhou.gong@tcl.com

1.4 Manufacturer's details

Company: TCT Mobile Limited
Address: 5F, C building, No. 232, Liang Jing Road ZhangJiang
High-Tech Park, Pudong Area
City: Shanghai
Country or Region: P.R.China
Contacted person: Gong Zhizhou
Tel: +86-21-61460890
Fax: +86-21-61460602
Email: zhizhou.gong@tcl.com

1.5 Application details

Date of reception of test sample: 31st March 2014

Date of test: 10th April 2014 to 23rd April 2014

1.6 Reference specification

FCC Part 24E, Part22H, Part 2 (April 25, 2013 edition)

1.7 Information of EUT

1.7.1 General information

Name of EUT	GSM/GPRS/EDGE/UMTS Digital Mobile Phone with Bluetooth and WiFi
FCC ID	RAD458
Frequency Range	GSM850: Tx:824~849MHz Rx:869~894MHz PCS1900: Tx:1850~1910MHz Rx:1930~1990MHz
Rated Output Power	GSM850:33.0dBm PCS1900:30.0dBm
Modulation Type	GSM/GPRS:GMSK EDGE:GMSK/8PSK
Emission Designator	GSM/GPRS:300KGXW EDGE:300KG7W
Duplex Mode	FDD
Duplex Spacing	GSM850:45MHz PCS1900:80MHz
Antenna Type	Fixed Internal
Power Supply	Battery or Charger
Rated Power Supply Voltage	3.8V
Extreme Temperature	Lowest: -30°C Highest: +50°C
Extreme Voltage	Minimum: 3.5V Maximum: 4.35V
HW Version	PIO
SW Version	v3EHG-US

1.7.2 EUT details

Product Name	Product Model	IMEI
GSM/GPRS/EDGE/UMTS Digital Mobile Phone with Bluetooth and WiFi	60371	864191020900314

1.7.3 Auxiliary equipment details

Equipment	Charger
Manufacturer	HUIZHOU BYD ELECTRONIC CO., LTD.
Model Number	one touch UC12US
Input Voltage	100V-240V a.c.
Output Voltage	5.0V d.c.
Frequency	50/60Hz

Equipment	Charger
Manufacturer	HUIZHOU BYD ELECTRONIC CO., LTD.
Model Number	one touch UC12EU
Input Voltage	100V-240V a.c.
Output Voltage	5.0V d.c.
Frequency	50/60Hz

Equipment	Charger
Manufacturer	HUIZHOU BYD ELECTRONIC CO., LTD.
Model Number	one touch UC12UK
Input Voltage	100V-240V a.c.
Output Voltage	5.0V d.c.
Frequency	50/60Hz

Equipment	Battery
Manufacturer	SCUD (FUJIAN) Electronics Co., Ltd.
Model Number	TLp020C2
Capacity	2000mAh
Rated Voltage	4.35V d.c.

Equipment	Data Cable
Manufacturer	Huizhou Shenghua Industry Co., Ltd.
Model Number	CDA0000025C1

Equipment	Data Cable
Manufacturer	Shenzhen Juwei Electronics Co., Ltd.
Model Number	CDA0000025C2


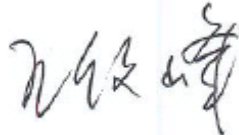

Note: As the information described above, there are three different models of charger manufactured by the same company and two different models of data cable manufactured by two different companies.

The relevant tests have been performed in order to verify in which combination case (EUT exercised by only one model of charger and one model of data cable) the EUT would have the worst features. So all the tests shown in this test report are performed when the EUT exercised by the charger one touch UC12US and the data cable CDA0000025C1.

2. Test information

2.1 Summary of the test results

No.	Test case	FCC reference	Verdict
1	RF Power Output	2.1046	Pass
2	Effective Radiated Power and Effective Isotropic Radiated Power	22.913(a)/24.232(c)	Pass
3	Occupied Bandwidth	2.1049	Pass
4	Emission Bandwidth	22.917(b)/24.238(b)	Pass
5	Spurious Emissions at antenna terminals	2.1051/22.917(a)/24.238(a)	Pass
6	Band Edges Compliance	2.1051/22.917(a)/24.238(a)	Pass
7	Frequency Stability	2.1055/22.355/24.235	Pass
8	Radiated Spurious Emissions	2.1053/22.917(a)/24.238(a)	Pass

This Test Report Is Issued by: Mr. Song Qizhu Director of the test lab 	Checked by: Mr. Wang Junfeng Deputy director of the test lab 
Tested by: Mr. Jiang Shuo Test engineer 	Issued date: 2014.05.20

2.2 Test result

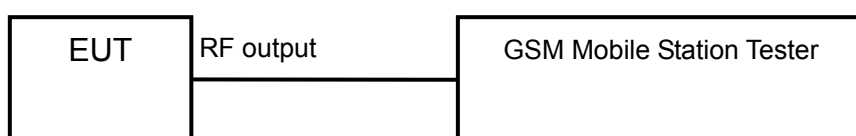
2.2.1 GSM850

2.2.1.1 RF Power Output-FCC Part2.1046

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. Then the test data can be read at the tester screen. The loss between RF output port of the EUT and the input port of the tester will be taken into consideration.

The measurement will be conducted at three channels No128, No189 and No251 (Bottom, middle and top channels of GSM850 band)

Limits	$\leq 33\text{dBm}$
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Test result:

GSM/GPRS MODE:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
824.2	128	31.96
836.4	189	31.95
848.8	251	31.86

EDGE (GMSK, 1Slot) MODE:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
824.2	128	31.96
836.4	189	31.95
848.8	251	31.86

EDGE (8PSK, 1Slot) MODE:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
824.2	128	25.36
836.4	189	25.50
848.8	251	25.68

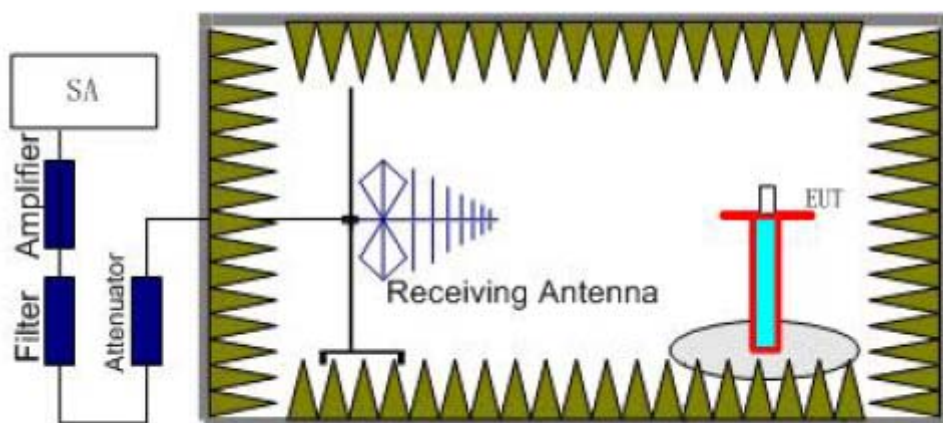
* For EDGE Mode, GMSK modulation type is selected as worse condition. So the following cases 2.2.1.3 – 2.2.1.8 are performed with this condition.

2.2.1.2 Effective Radiated Power-FCC Part22.913(a)

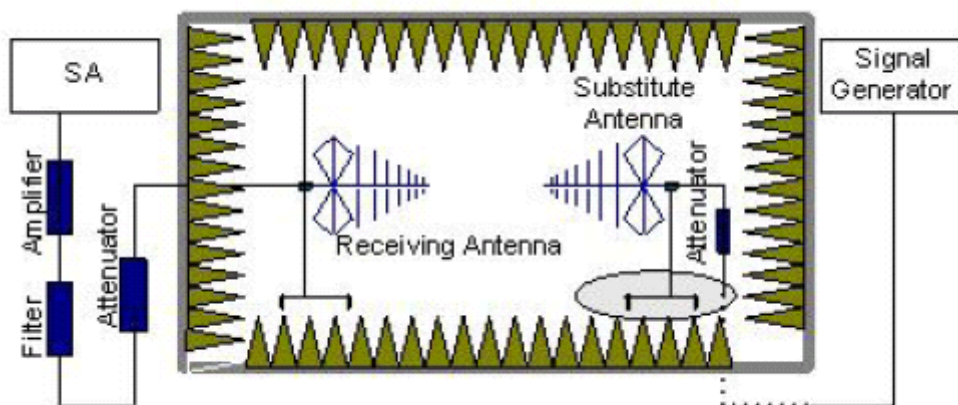
Ambient condition:

Temperature	Relative humidity	Pressure
19.3°C	41.3%	100.7kPa

Test setup:



Step 1



Step 2

Test procedure:

The measurements procedures in TIA-603C-2004 are used.

Step 1:

The measurement is carried out in the fully anechoic chamber. EUT was placed on a 2.4 meters high non-conductive table at a 3 meters test distance from the

test receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT. The height of receiving antenna is 2.4m and varies in certain range to find the maximum power value. A radio link shall be established between EUT and Tester. The output power of the cell signal of the tester will be decreased until the output power of the EUT reach a maximum value. A peak detector is used and RBW is set to 3MHz. Then the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees for detecting the maximum power value on spectrum analyzer or receiver. And the maximum value of the receiver should be recorded as (Pr).

Step 2:

A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator. To repeat the same procedure as step1 and the level of signal generator will be adjusted till the same power value on the spectrum analyzer or receiver. The ERP/EIRP of the EUT can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

A power (P_{mea}) is applied to the input of the substitution antenna, and adjusts the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (P_{mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

A “reference path loss” should be calculated after test. The attenuation of “reference path loss” is the cable loss between the Signal Source with the Substitution Antenna (P_{ca}) and the Substitution Antenna Gain (G_a).

The measurement results are obtained as described below:

$$\text{Power (EIRP)} = P_{mea} + P_{ca} + G_a$$

This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15dB) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP – 2.15 (dB).

The measurement will be done at three channels No128, No189 and No251 (Bottom, middle and top channels of GSM850 band)

Limits:

Operation Mode	Power Step	E.R.P. (dBm)
GSM	5	≤38.45
GPRS	3	≤38.45
EDGE	6	≤38.45

Test result:

GSM/GPRS MODE:

Frequency (MHz)	Power step	Peak ERP (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Correction (dB)	Pmea (dBm)	Polarization
824.2	5	32.4	-3.8	8.6	2.15	29.75	Vertical
836.4	5	32.7	-3.8	8.6	2.15	30.05	Vertical
848.8	5	32.9	-3.8	8.6	2.15	30.25	Vertical

EDGE (GMSK, 1Slot) MODE:

Frequency (MHz)	Power step	Peak ERP (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Correction (dB)	Pmea (dBm)	Polarization
824.2	6	32.3	-3.8	8.6	2.15	29.65	Vertical
836.4	6	32.4	-3.8	8.6	2.15	29.75	Vertical
848.8	6	32.8	-3.8	8.6	2.15	30.15	Vertical

EDGE (8PSK, 1Slot) MODE:

Frequency (MHz)	Power step	Peak ERP (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Correction (dB)	Pmea (dBm)	Polarization
824.2	6	25.9	-3.8	8.6	2.15	23.25	Vertical
836.4	6	26.1	-3.8	8.6	2.15	23.45	Vertical
848.8	6	26.7	-3.8	8.6	2.15	24.05	Vertical

Frequency: 848.8MHz

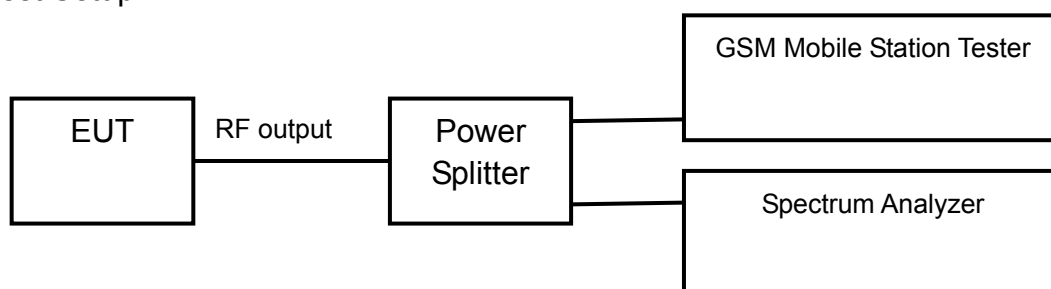
Peak ERP(dBm) = Pmea(30.25dBm)+Pca (-3.8dB)+Ga(8.6dB)-2.15dB = 32.9dBm

2.2.1.3 Occupied Bandwidth-FCC Part2.1049

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. The occupied bandwidth is measured using spectrum analyzer. RBW is set to 3kHz on spectrum analyzer. The bandwidth of 99% power can be read on spectrum analyzer.

The measurement will be conducted at three channels No128, No189 and No251 (Bottom, middle and top channels of GSM850 band)

Limits: No specific occupied bandwidth requirements in part 2.1049

Test result:

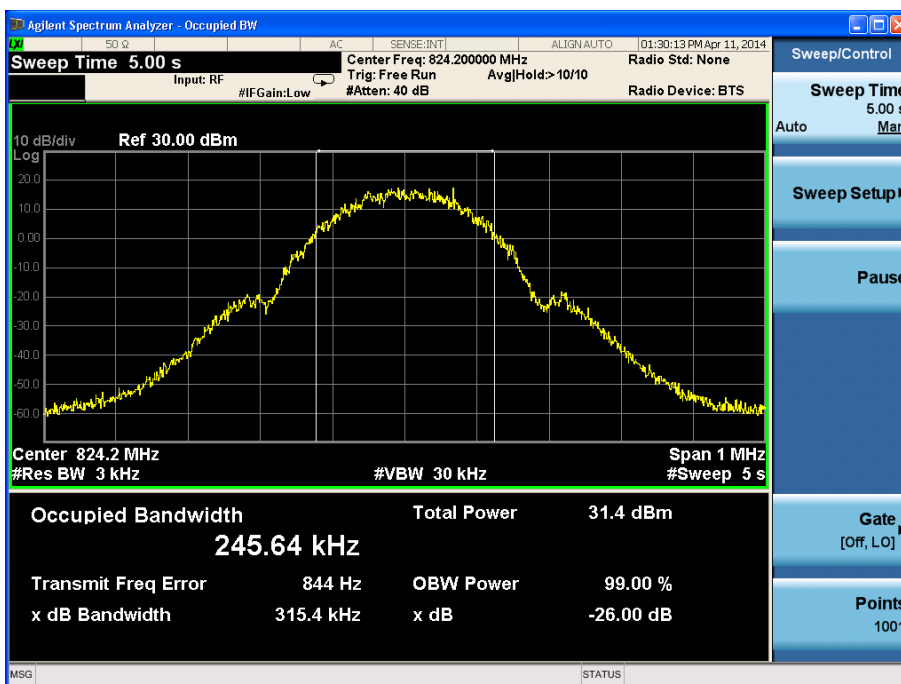
GSM/GPRS MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (kHz)
824.2	128	245.64
836.4	189	244.33
848.8	251	245.36

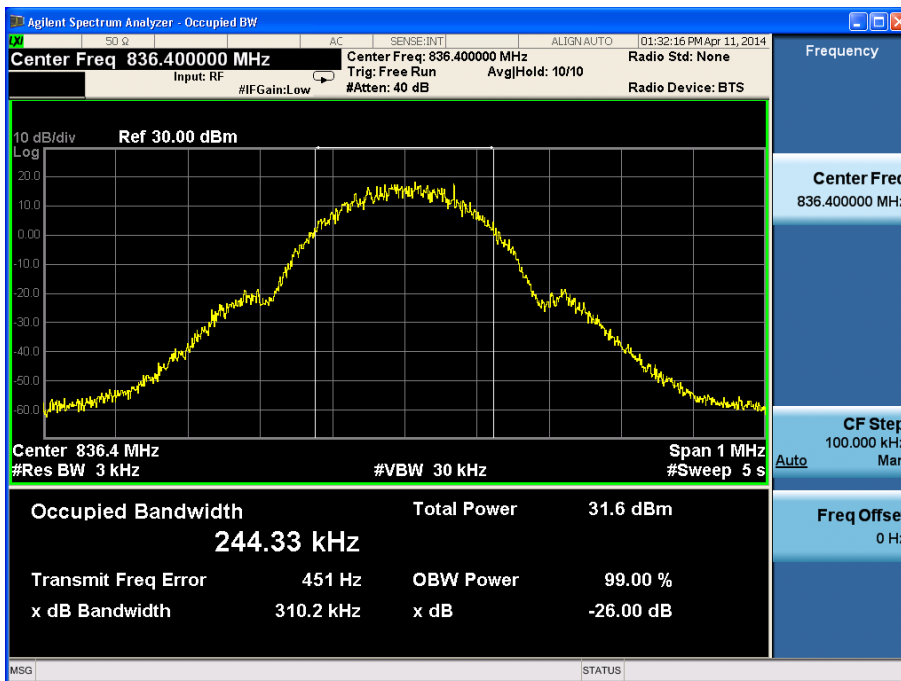
EDGE (GMSK) MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (kHz)
824.2	128	246.02
836.4	189	243.65
848.8	251	243.43

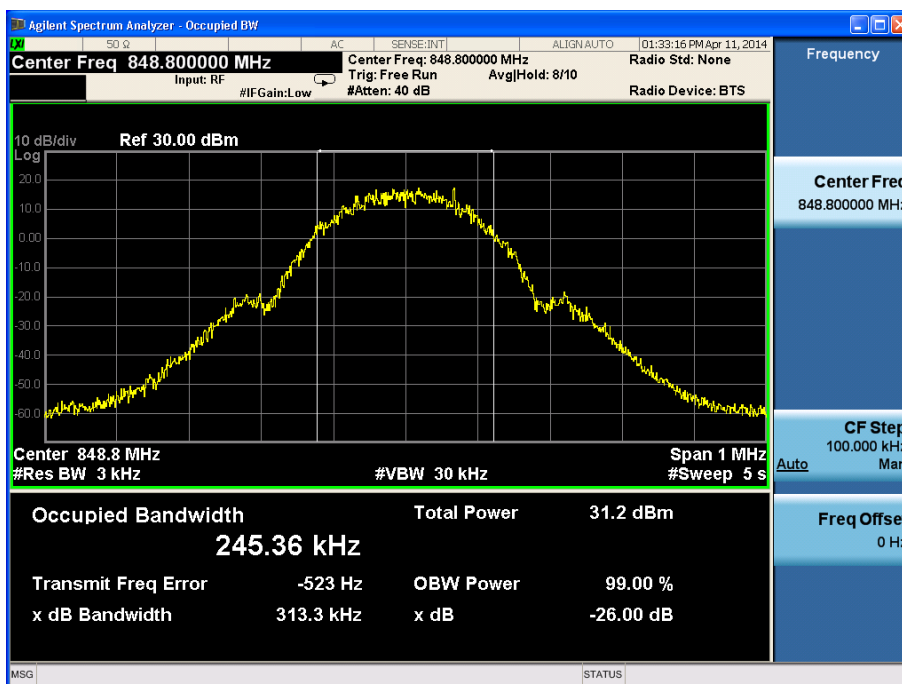
GSM/GPRS MODE:



Channel 128

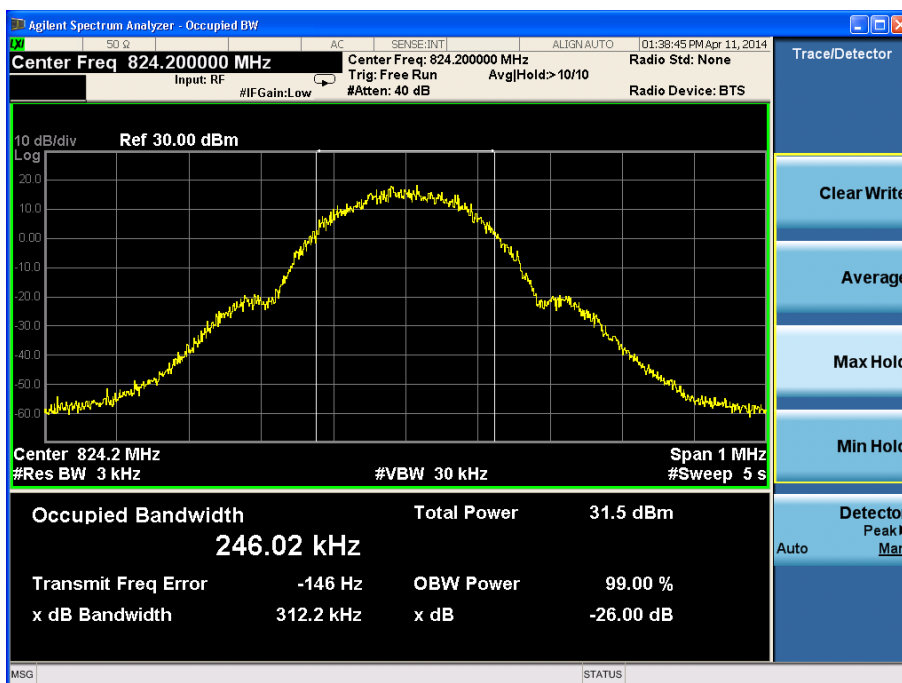


Channel 189

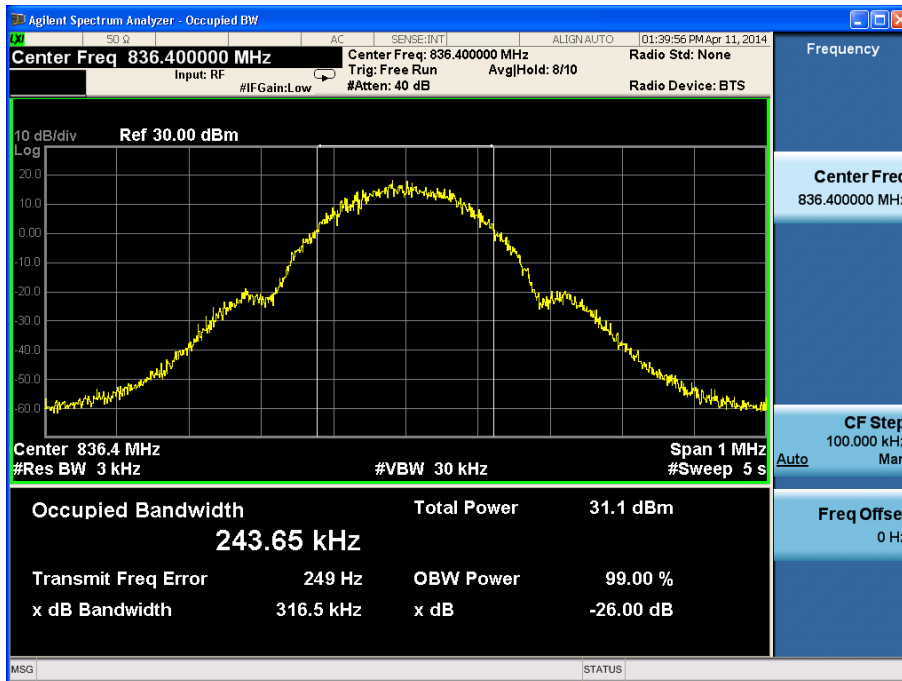


Channel 251

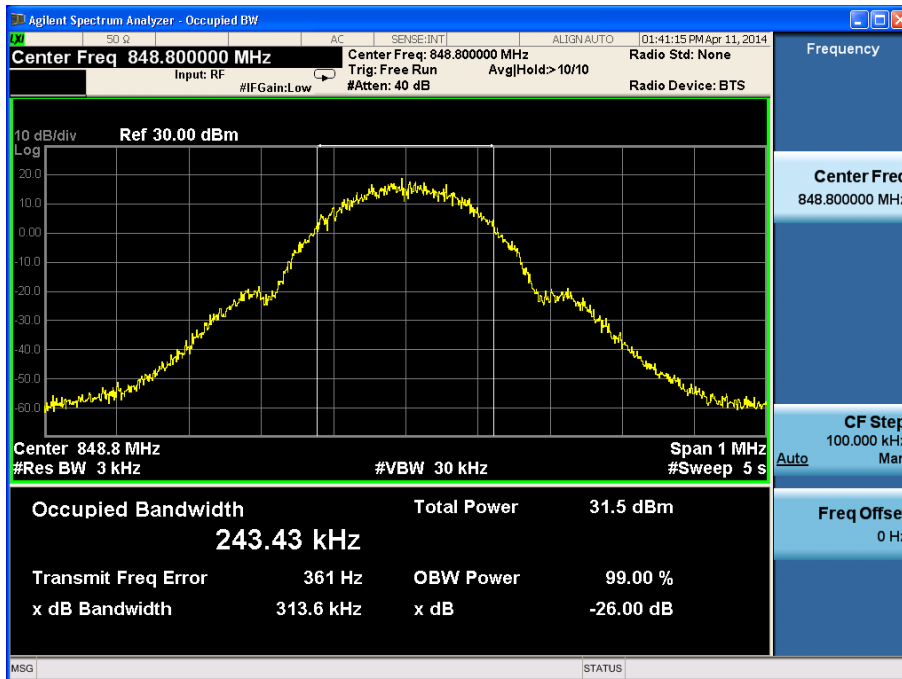
EDGE (GMSK) MODE:



Channel 128



Channel 189



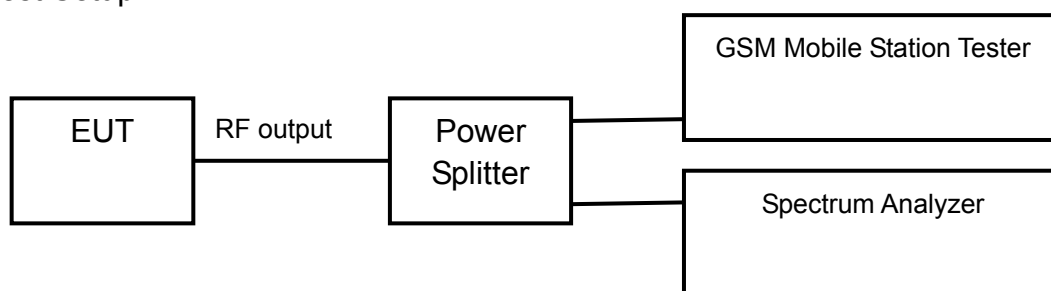
Channel 251

2.2.1.4 Emission Bandwidth-FCC Part22.917(b)

Ambient condition:

Temperature	Relative humidity	Pressure
23℃	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. The emission bandwidth is measured using spectrum analyzer. RBW is set to 3kHz on spectrum analyzer. The bandwidth of -26dB transmitter power can be read on spectrum analyzer.

The measurement will be conducted at three channels No128, No189 and No251 (Bottom, middle and top channels of GSM850 band)

Limits: No specific emission bandwidth requirements in part 22.917(b)

Test result:

GSM/GPRS MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of -26dB transmitter power (kHz)
824.2	128	315.4
836.4	189	310.2
848.8	251	313.3

EDGE (GMSK) MODE:

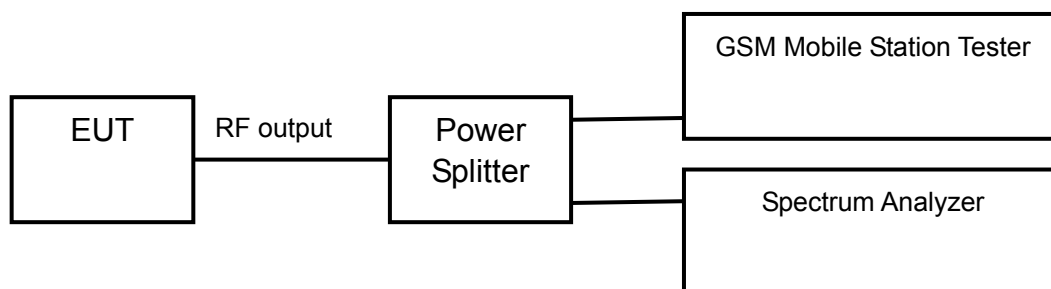
Carrier frequency (MHz)	Channel No.	Bandwidth of -26dB transmitter power (kHz)
824.2	128	312.2
836.4	189	316.5
848.8	251	313.6

2.2.1.5 Spurious Emissions at antenna terminal-FCC Part2.1051/22.917(a)

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. The measurement is carried out using a spectrum analyzer. The spectrum analyzer scans from 30MHz to 9GHz (higher than the 10th harmonic of the carrier). The peak detector is used and RBW is set to 1MHz on spectrum analyzer.

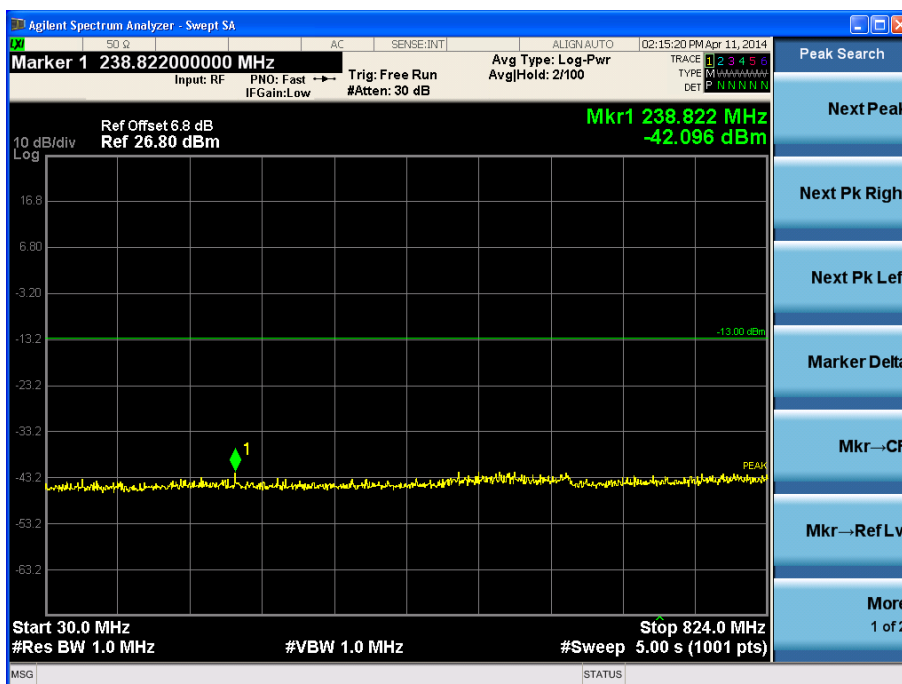
The measurement will be conducted at one channel No189 (middle channel of GSM850 band)

Limits	≤ -13dBm
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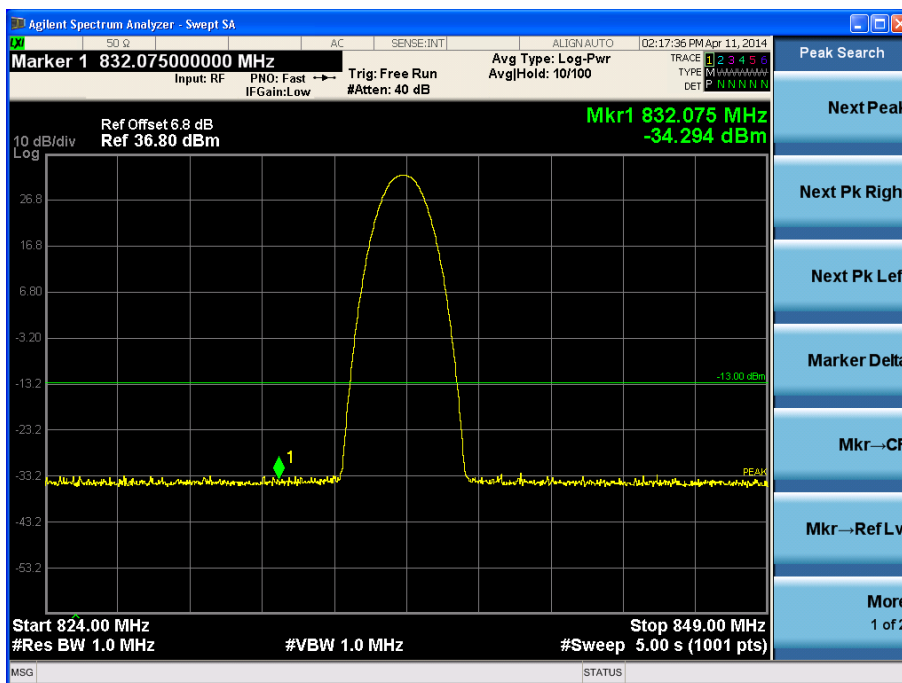
Test result:

Refer to the following figures.

GSM/GPRS MODE:

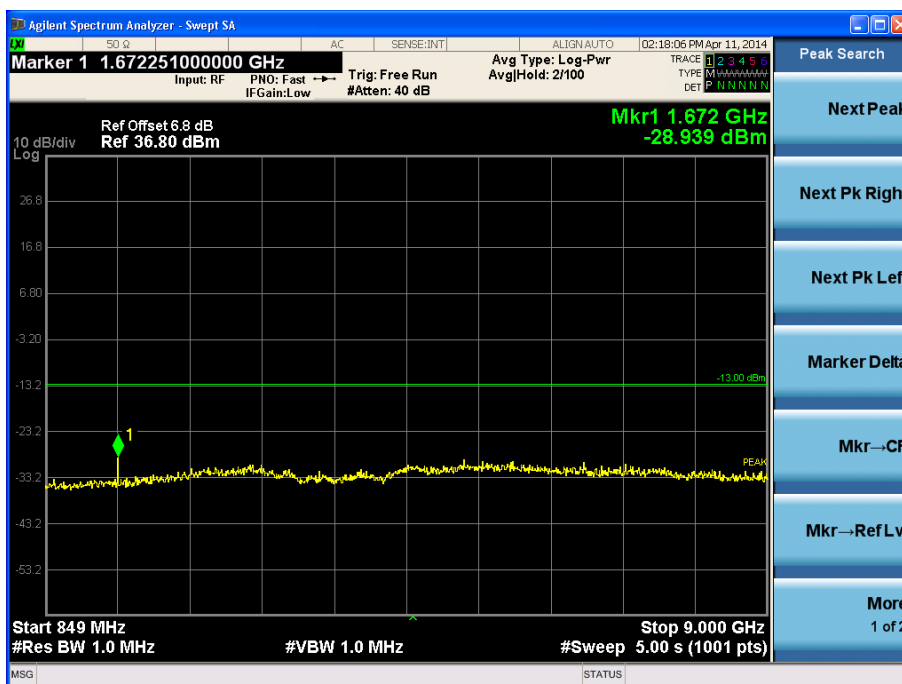


Channel 189, 30MHz~824MHz



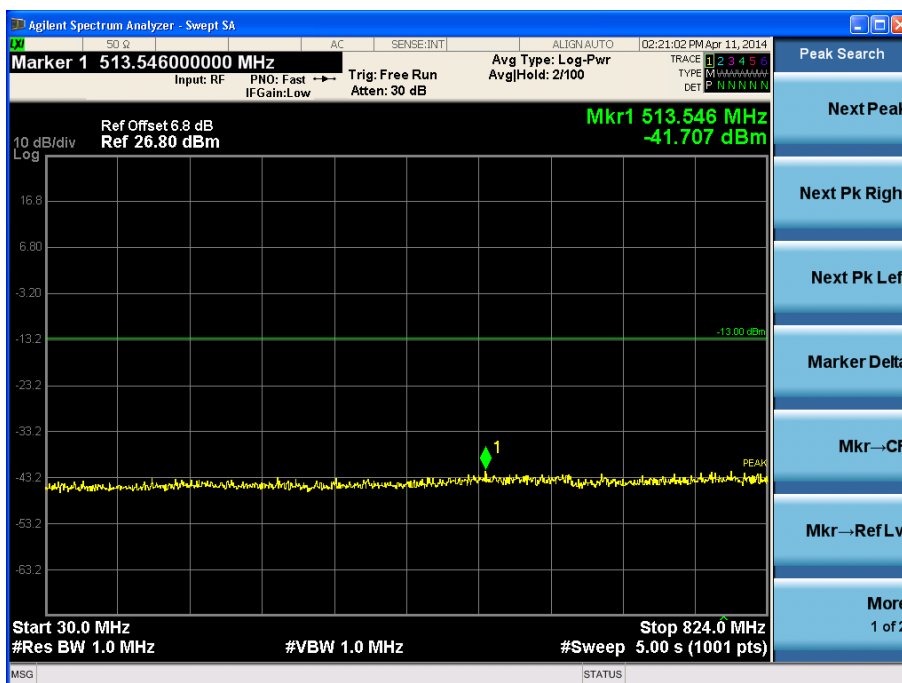
Channel 189, 824MHz~849MHz

Note: The signal beyond the limit is the base station simulator carrier.

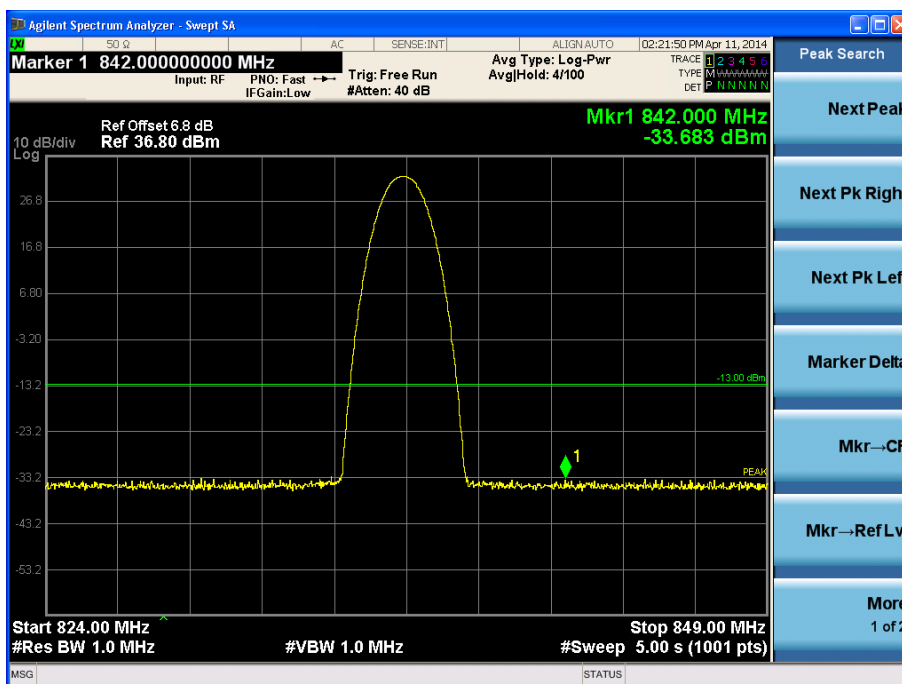


Channel 189, 849MHz~9GHz

EDGE (GMSK) MODE:

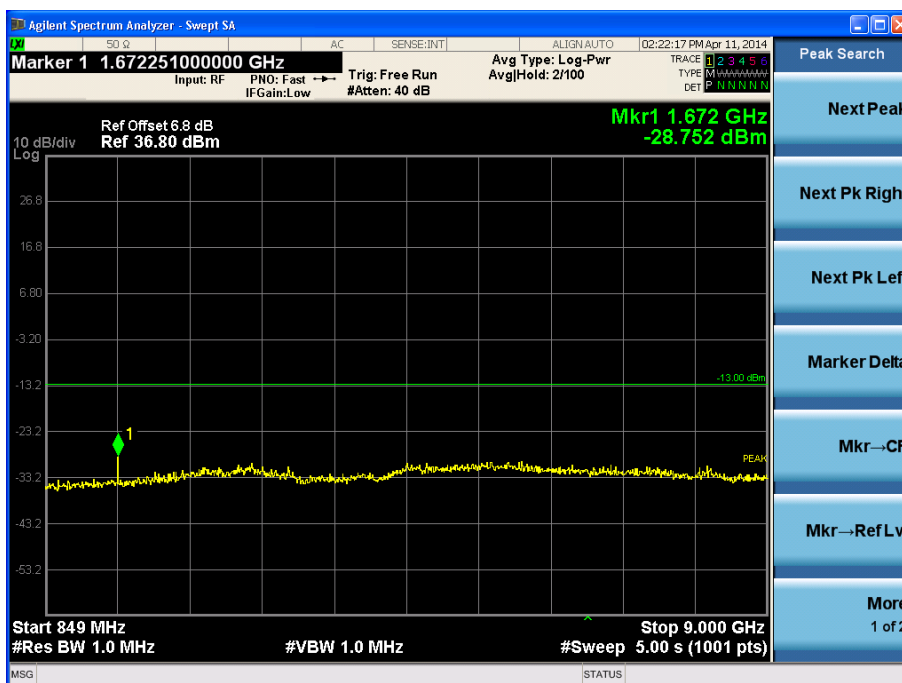


Channel 189, 30MHz~824MHz



Channel 189, 824MHz~849MHz

Note: The signal beyond the limit is the base station simulator carrier.



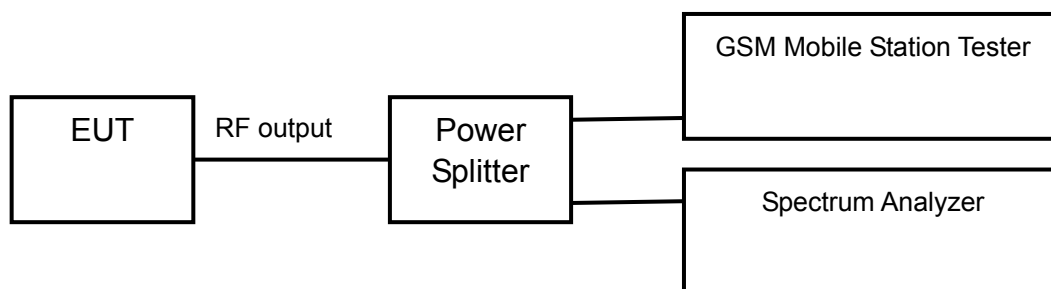
Channel 189, 849MHz~9GHz

2.2.1.6 Band Edges Compliance-FCC Part2.1051/22.917(a)

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. The measurement is carried out using a spectrum analyzer. The peak detector is used and RBW is set to at least 1% of the emission bandwidth on spectrum analyzer.

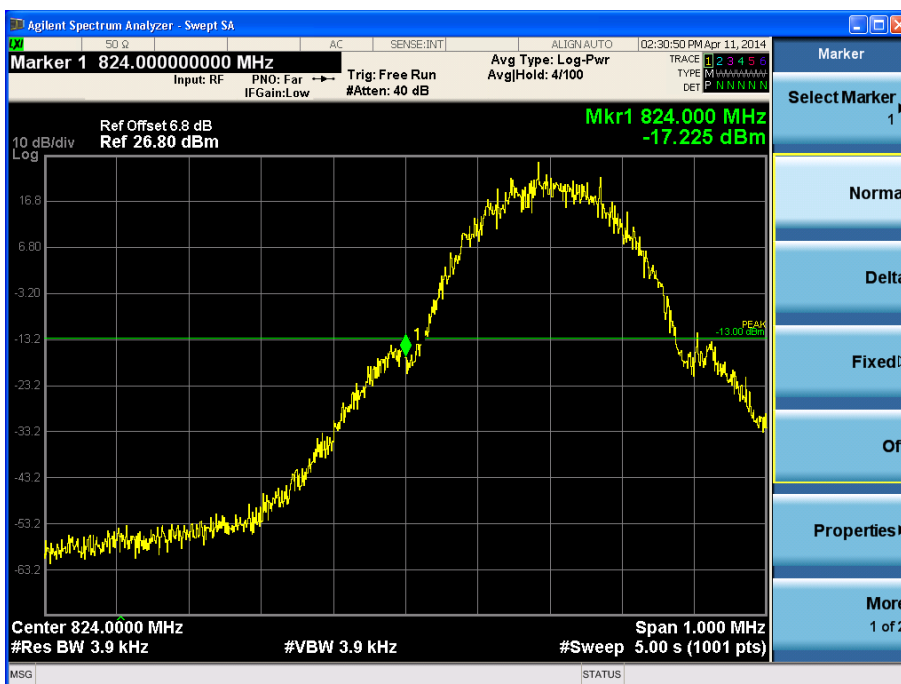
The measurement will be conducted at two channels No128 and No251 (Bottom and top channels of GSM850 band)

Limits	$\leq -13\text{dBm}$

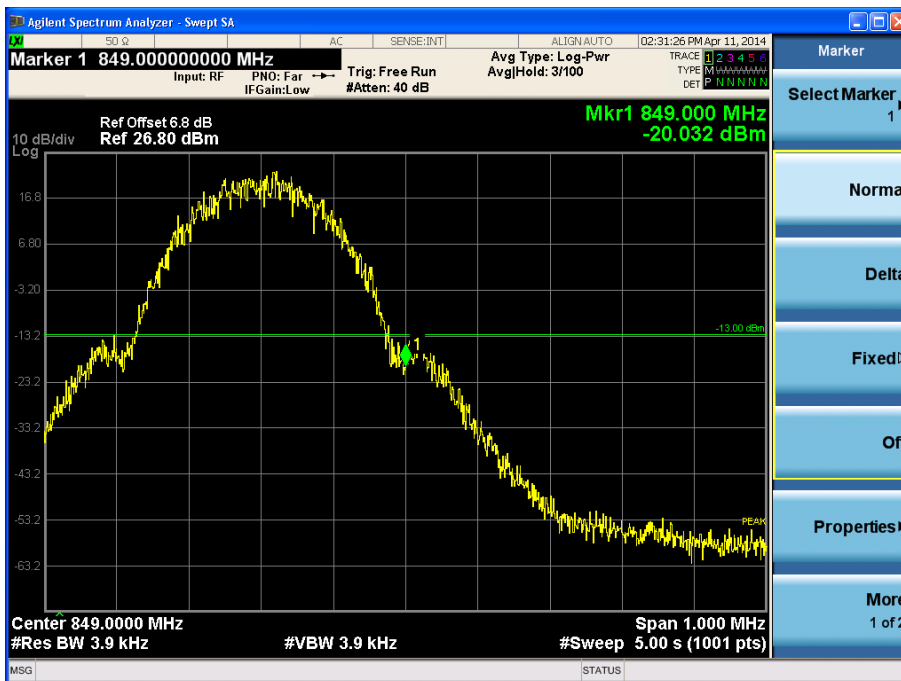
Test result:

Refer to the following figures.

GSM/GPRS MODE:

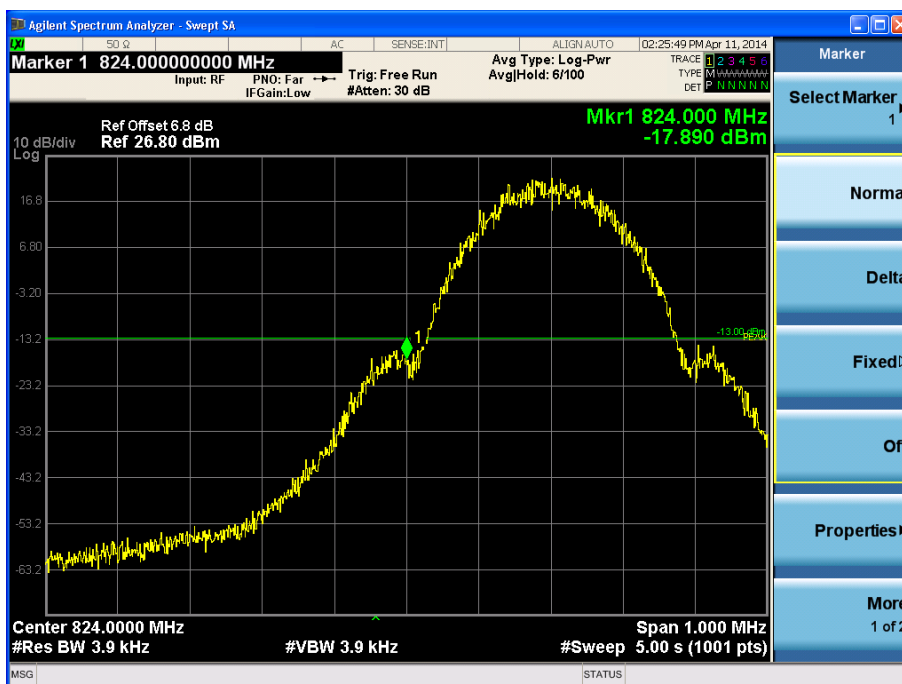


Channel 128

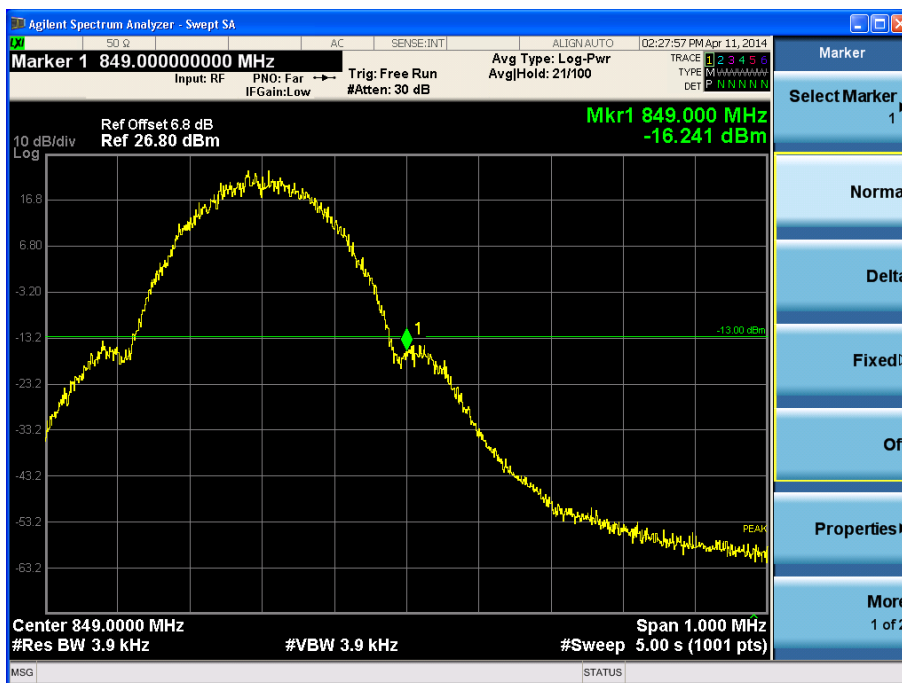


Channel 251

EDGE (GMSK) MODE:



Channel 128



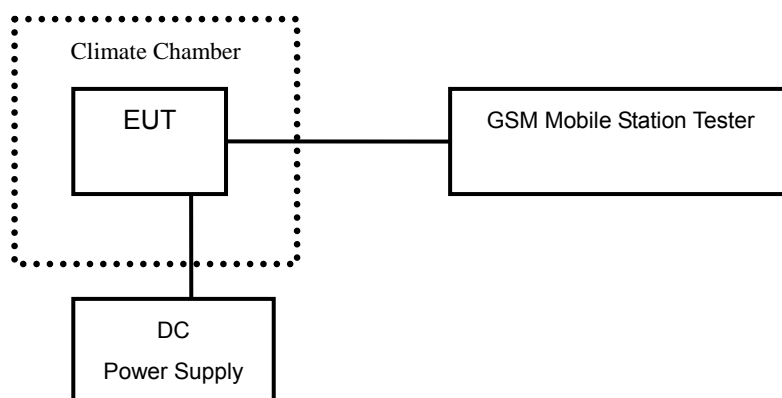
Channel 251

2.2.1.7 Frequency Stability-FCC Part2.1055/22.355

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test setup:



Test Procedure:

A radio link shall be established between EUT and Tester. The tester will sample the transmitter RF output signal and measure its frequency. The temperature inside the climate chamber is varied from -30 to +50°C in 10°C step size, and also the DC power supply voltage to the EUT is varied from 3.5 to 4.35V. The measurement will be conducted at three channels No128, No189 and No251 (Bottom, middle and top channels of GSM850 band).

Limits: No specific frequency stability requirements in part 2.1055 and part 22.355.

Test result:

GSM/GPRS MODE:

Temperature(°C)	Test Result (ppm)@3.8V		
	Channel 128	Channel 189	Channel 251
-30	0.011	0.012	0.012
-20	0.013	0.012	0.013
-10	0.011	0.013	0.014
0	0.012	0.011	0.013
+10	0.014	0.013	0.013
+20	0.015	0.014	0.014
+30	0.013	0.012	0.014
+40	0.011	0.013	0.013
+50	0.013	0.015	0.012

Voltage (V)	Test Result (ppm)@20°C		
	Channel 128	Channel 189	Channel 251
3.5	0.011	0.013	0.014
4.35	0.012	0.011	0.013

EDGE (GMSK) MODE:

Temperature(°C)	Test Result (ppm)@3.8V		
	Channel 128	Channel 189	Channel 251
-30	0.012	0.013	0.011
-20	0.013	0.013	0.013
-10	0.011	0.012	0.012
0	0.011	0.012	0.013
+10	0.014	0.014	0.014
+20	0.013	0.013	0.013
+30	0.014	0.013	0.014
+40	0.012	0.012	0.013
+50	0.012	0.014	0.011

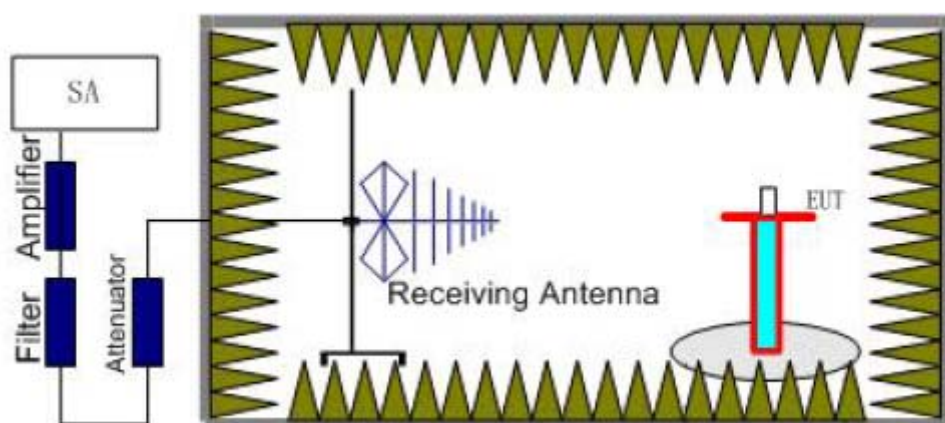
Voltage (V)	Test Result (ppm)@20°C		
	Channel 128	Channel 189	Channel 251
3.5	0.014	0.014	0.014
4.35	0.013	0.013	0.013

2.2.1.8 Radiated Spurious Emissions-FCC Part2.1053/22.917(a)

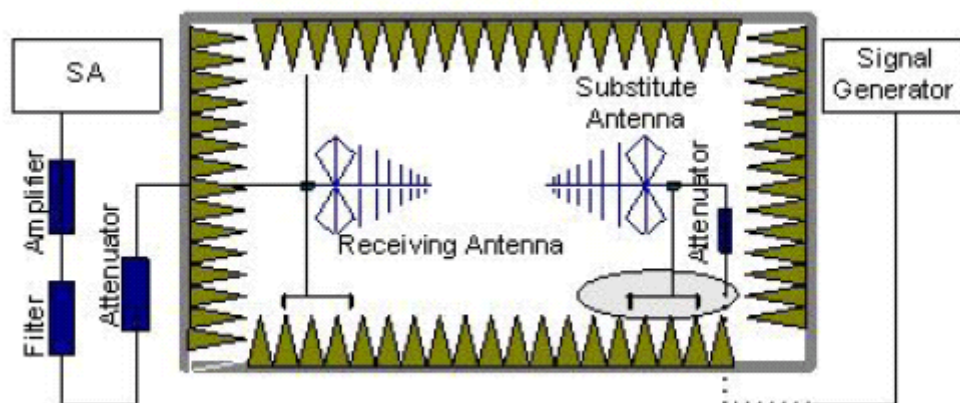
Ambient condition

Temperature	Relative humidity	Pressure
23°C	43%	99.7kPa

Test Setup:



Step 1



Step 2

Test procedure:

The measurements procedures in TIA-603C-2004 are used.

The spectrum was scanned from 30MHz to the 10th harmonic of the highest frequency generated within the equipment.

Step 1:

The measurement is carried out in the fully anechoic chamber. EUT was placed

on a 2.4 meter high non-conductive table at a 3 meter test distance from the test receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT. The height of receiving antenna is 2.4m and varies in certain range to find the maximum power value. A radio link shall be established between EUT and Tester. The output power of the cell signal of the tester will be decreased until the output power of the EUT reach a maximum value. The measurement is carried out using a spectrum analyzer or receiver. The spectrum analyzer scans from 30MHz to 20GHz (higher than the 10th harmonic of the carrier). The peak detector is used and RBW is set to 1MHz on spectrum analyzer. Then the antenna height and turn table rotation is adjusted till the maximum power value is founded on spectrum analyzer or receiver. A notch filter is necessary in the band near to the carrier frequency. A high pass filter is needed to avoid the distortion of the testing equipment in the band above the carrier frequency.

Step 2:

A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

A power (P_{mea}) is applied to the input of the substitution antenna, and adjusts the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

A “reference path loss” should be calculated after test. The attenuation of “reference path loss” is the cable loss between the Signal Source with the Substitution Antenna (P_{ca}) and the Substitution Antenna Gain (G_a).

Calculation procedure:

The data of cable loss and antenna gain has been calibrated in full testing frequency range before the testing.

The power of the Radiated Spurious Emissions is calculated by adding the cable loss and antenna gain. The basic equation with a sample calculation is as followed:

$$\text{Power(EIRP)} = P_{mea} + P_{ca} + G_a$$

This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15dB) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15 \text{ (dB)}$.

Assumed the power of signal source record is -20dBm. A cable loss of -30dB, and an antenna gain of 11dB are added.

$$P = P_{\text{mea}} + P_{\text{ca}} + G_a = (-20\text{dBm}) + (-30\text{dB}) + (11\text{dB}) = -39\text{dBm}$$

The measurement will be done at carrier frequencies that pertain to bottom (Channel 128), middle (Channel 189) and top (Channel 251) channels of the GSM 850 band.

Test result

GSM/GPRS MODE Channel 128

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1625.43	-42.6	-4.6	8.3	-46.3	-13	Vertical
2566.62	-42.7	-5.9	8.9	-45.7	-13	Vertical
2765.78	-42.8	-5.9	8.9	-45.8	-13	Vertical
3312.31	-51.5	-7.5	10.2	-54.2	-13	Vertical
7023.66	-54.2	-9.4	12.0	-56.8	-13	Vertical
9921.56	-54.4	-11.4	13.8	-56.8	-13	Horizontal

EDGE (GMSK) MODE Channel 128:

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1637.21	-41.2	-4.6	8.3	-44.9	-13	Vertical
2558.86	-42.3	-5.9	8.9	-45.3	-13	Vertical
2846.42	-42.7	-5.9	8.9	-45.7	-13	Vertical
3376.13	-52.2	-7.5	10.2	-54.9	-13	Vertical
7025.79	-53.3	-9.4	12.0	-55.9	-13	Horizontal
9934.57	-54.7	-11.4	13.8	-57.1	-13	Vertical

GSM/GPRS MODE Channel 189:

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1636.23	-41.2	-4.6	8.3	-44.9	-13	Vertical
2557.11	-42.2	-5.9	8.9	-45.2	-13	Vertical
2824.37	-42.5	-5.9	8.9	-45.5	-13	Vertical
3314.68	-52.3	-7.5	10.2	-55.0	-13	Horizontal
6978.74	-54.5	-9.4	12.0	-57.1	-13	Vertical
9976.12	-55.2	-11.4	13.8	-57.6	-13	Vertical

EDGE (GMSK) MODE Channel 189:

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1646.76	-41.3	-4.6	8.3	-45.0	-13	Vertical
2546.42	-42.1	-5.9	8.9	-45.1	-13	Vertical
2768.93	-42.8	-5.9	8.9	-45.8	-13	Vertical
3357.21	-52.2	-7.5	10.2	-54.9	-13	Horizontal
6967.69	-54.4	-9.4	12.0	-57.0	-13	Vertical
9973.56	-55.5	-11.4	13.8	-57.9	-13	Vertical

GSM/GPRS MODE Channel 251:

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1634.76	-41.3	-4.6	8.3	-45.0	-13	Vertical
2567.13	-42.2	-5.9	8.9	-45.2	-13	Horizontal
2857.18	-42.5	-5.9	8.9	-45.5	-13	Vertical
3348.74	-53.7	-7.5	10.2	-56.4	-13	Vertical
7023.78	-54.2	-9.4	12.0	-56.8	-13	Vertical
9971.36	-55.3	-11.4	13.8	-57.7	-13	Vertical

EDGE (GMSK) MODE Channel 251:

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1656.34	-41.2	-4.6	8.3	-44.9	-13	Vertical
2565.47	-42.2	-5.9	8.9	-45.2	-13	Horizontal
2765.78	-42.4	-5.9	8.9	-45.4	-13	Vertical
3346.37	-53.5	-7.5	10.2	-56.2	-13	Vertical
6997.23	-54.4	-9.4	12.0	-57.0	-13	Vertical
9967.13	-55.2	-11.4	13.8	-57.6	-13	Vertical

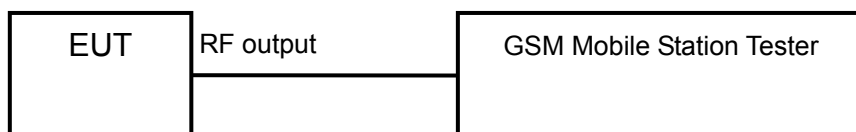
2.2.2 PCS1900

2.2.2.1 RF Power Output-FCC Part2.1046

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. Then the test data can be read at the tester screen. The loss between RF output port of the EUT and the input port of the tester will be taken into consideration.

The measurement will be conducted at three channels No512, No661 and No810 (Bottom, middle and top channels of PCS1900 band)

Limits	≤30dBm

Test result:

GSM/GPRS MODE:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
1850.2	512	29.67
1880.0	661	29.62
1909.8	810	29.49

EDGE (GMSK, 1Slot) MODE:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
1850.2	512	29.64
1880.0	661	29.57
1909.8	810	29.46

EDGE (8PSK, 1Slot) MODE:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
1850.2	512	25.03
1880.0	661	25.18
1909.8	810	25.41

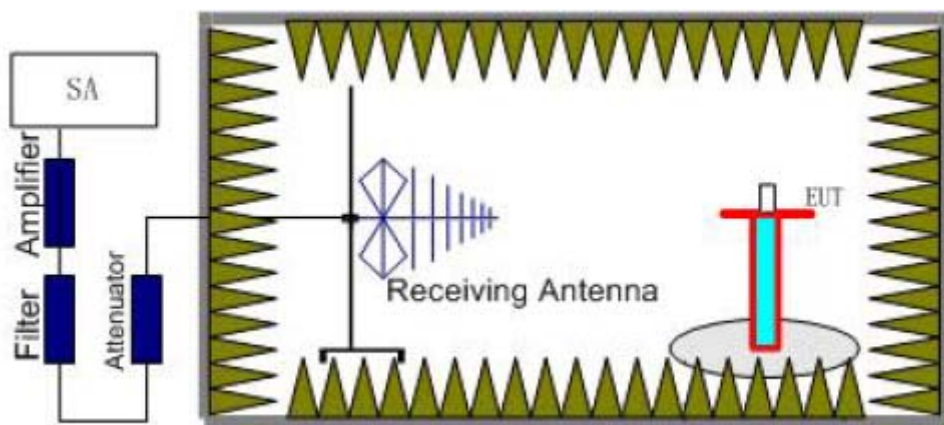
* For EDGE Mode, GMSK modulation type is selected as worse condition. So the following cases 2.2.2.3 – 2.2.2.8 are performed with this condition.

2.2.2.2 Effective Isotropic Radiated Power-FCC Part24.232(c)

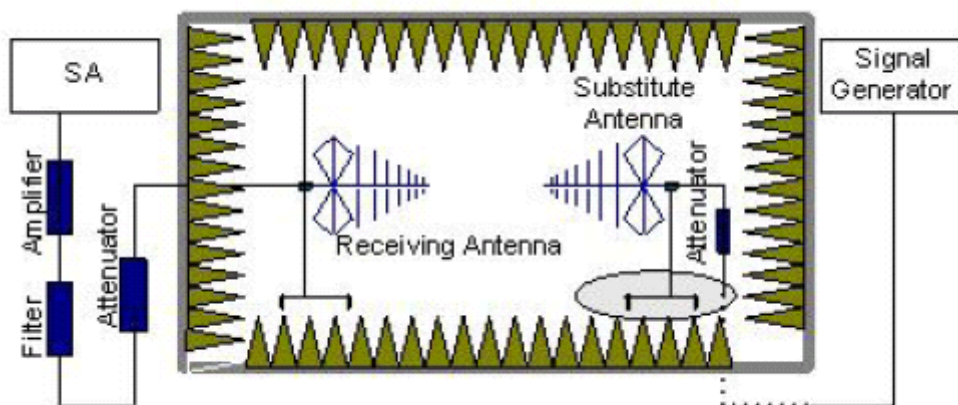
Ambient condition:

Temperature	Relative humidity	Pressure
23°C	43%	99.7kPa

Test setup:



Step 1



Step 2

Test procedure:

The measurements procedures in TIA-603C-2004 are used.

Step 1:

The measurement is carried out in the fully anechoic chamber. EUT was placed

on a 2.4 meters high non-conductive table at a 3 meters test distance from the test receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT. The height of receiving antenna is 2.4m and varies in certain range to find the maximum power value. A radio link shall be established between EUT and Tester. The output power of the cell signal of the tester will be decreased until the output power of the EUT reach a maximum value. A peak detector is used and RBW is set to 3MHz. Then the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees for detecting the maximum power value on spectrum analyzer or receiver. And the maximum value of the receiver should be recorded as (Pr).

Step 2:

A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator. To repeat the same procedure as step1 and the level of signal generator will be adjusted till the same power value on the spectrum analyzer or receiver. The ERP/EIRP of the EUT can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

A power (P_{mea}) is applied to the input of the substitution antenna, and adjusts the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (P_{mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

A “reference path loss” should be calculated after test. The attenuation of “reference path loss” is the cable loss between the Signal Source with the Substitution Antenna (P_{ca}) and the Substitution Antenna Gain (G_a).

The measurement results are obtained as described below:

$$\text{Power (EIRP)} = P_{mea} + P_{ca} + G_a$$

The measurement will be done at three channels No512, No661 and No810 (Bottom, middle and top channels of PCS1900 band)

Limits:

Operation Mode	Power Step	E.I.R.P. (dBm)
GSM	0	≤33
GPRS	3	≤33
EDGE	5	≤33

Test result:

GSM/GPRS MODE:

Frequency (MHz)	Power step	Peak EIRP(dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Polarization
1850.2	0	30.1	-4.8	8.6	26.3	Vertical
1880.0	0	30.2	-4.8	8.6	26.4	Vertical
1909.8	0	30.2	-4.8	8.6	26.4	Vertical

EDGE (GMSK, 1Slot) MODE:

Frequency (MHz)	Power step	Peak EIRP(dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Polarization
1850.2	5	30.1	-4.8	8.6	26.3	Vertical
1880.0	5	29.7	-4.8	8.6	25.9	Vertical
1909.8	5	29.9	-4.8	8.6	26.1	Vertical

EDGE (8PSK, 1Slot) MODE:

Frequency (MHz)	Power step	Peak EIRP(dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Polarization
1850.2	5	25.6	-4.8	8.6	21.8	Vertical
1880.0	5	25.5	-4.8	8.6	21.7	Vertical
1909.8	5	26.0	-4.8	8.6	22.2	Vertical

Frequency: 1909.8MHz

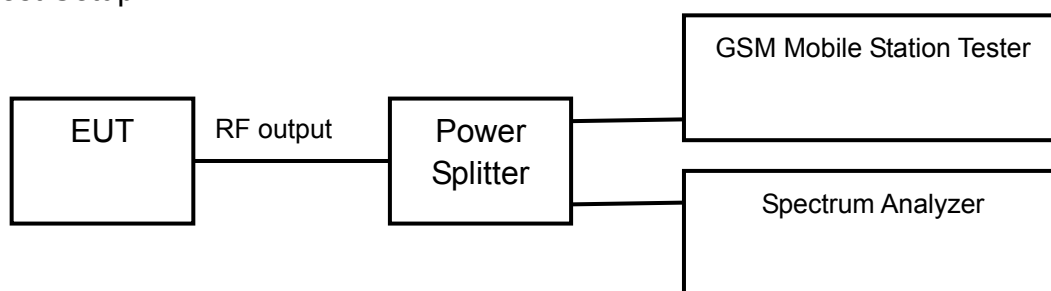
Peak EIRP(dBm) = Pmea(26.4dBm)+Pca(-4.8dB)+Ga(8.6dB) = 30.2dBm

2.2.2.3 Occupied Bandwidth-FCC Part2.1049

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. The occupied bandwidth is measured using spectrum analyzer. RBW is set to 3kHz on spectrum analyzer. The bandwidth of 99% power can be read on spectrum analyzer.

The measurement will be conducted at three channels No512, No661 and No810 (Bottom, middle and top channels of PCS1900 band)

Limits: No specific occupied bandwidth requirements in part 2.1049

Test result:

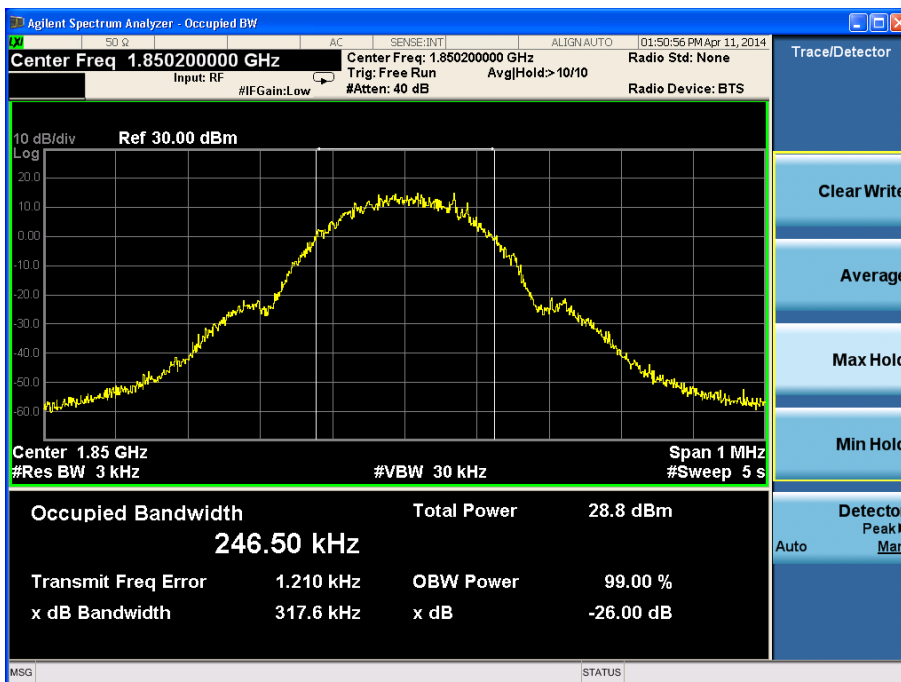
GSM/GPRS MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (kHz)
1850.2	512	246.50
1880.0	661	245.83
1909.8	810	245.67

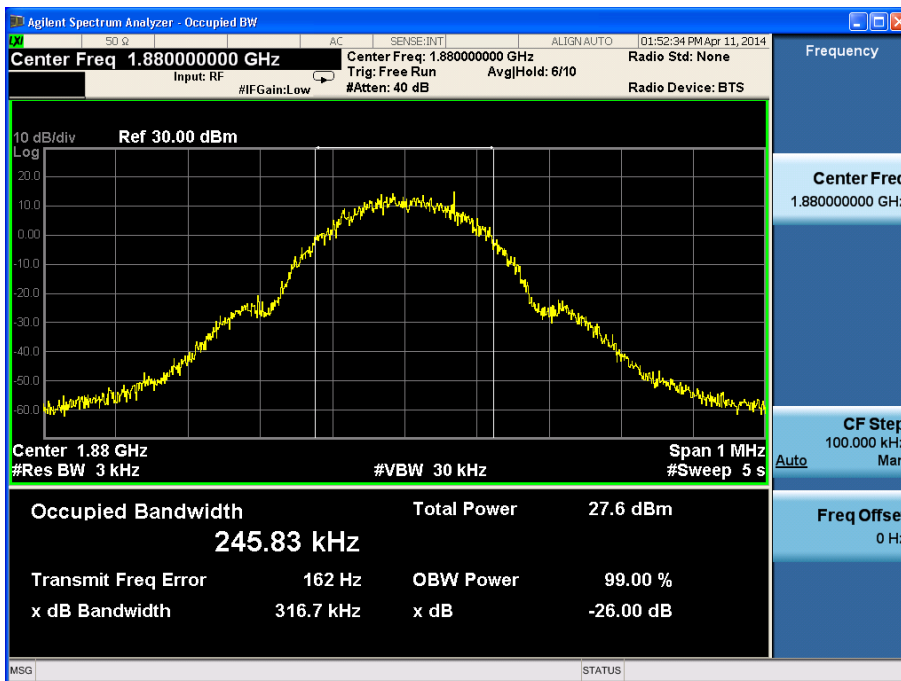
EDGE (GMSK) MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (kHz)
1850.2	512	244.94
1880.0	661	244.90
1909.8	810	246.00

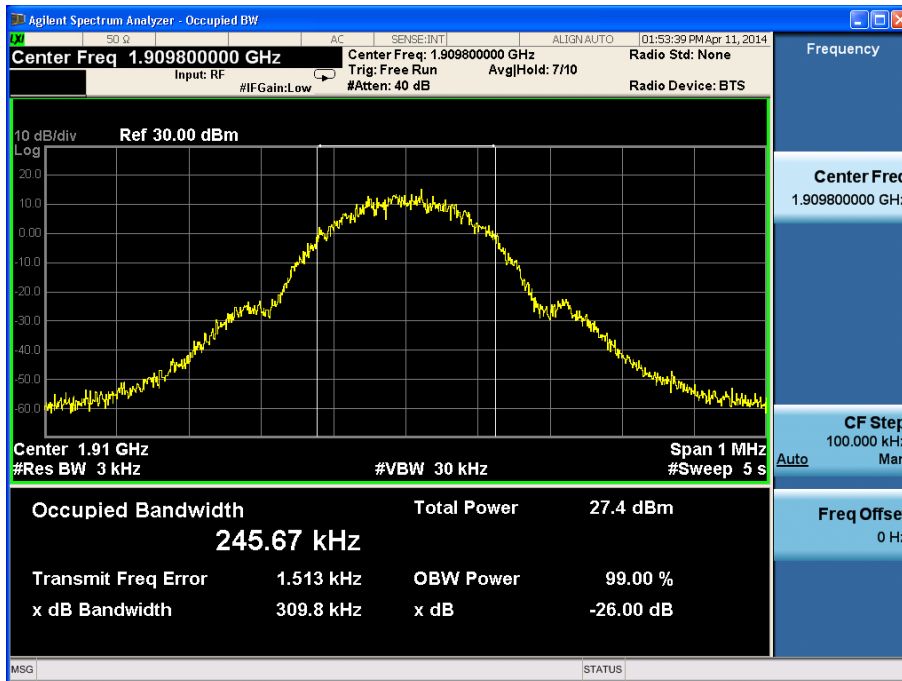
GSM/GPRS MODE:



Channel 512

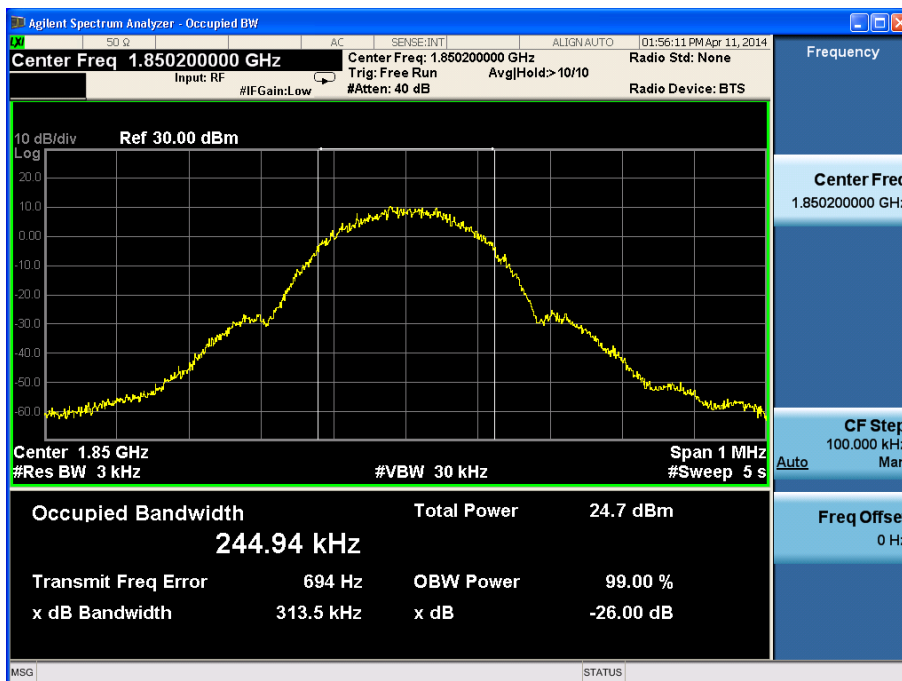


Channel 661

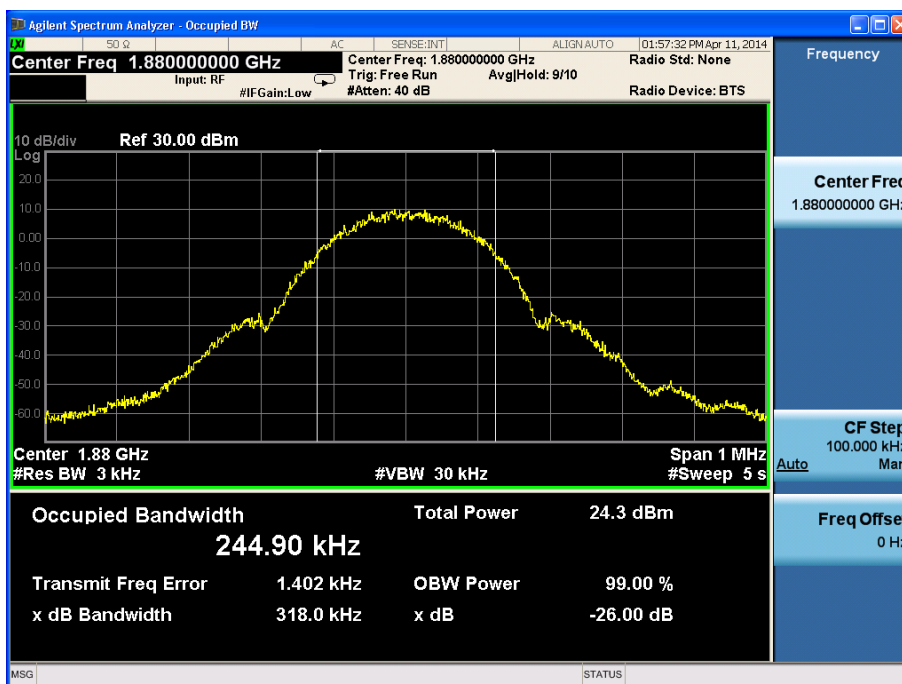


Channel 810

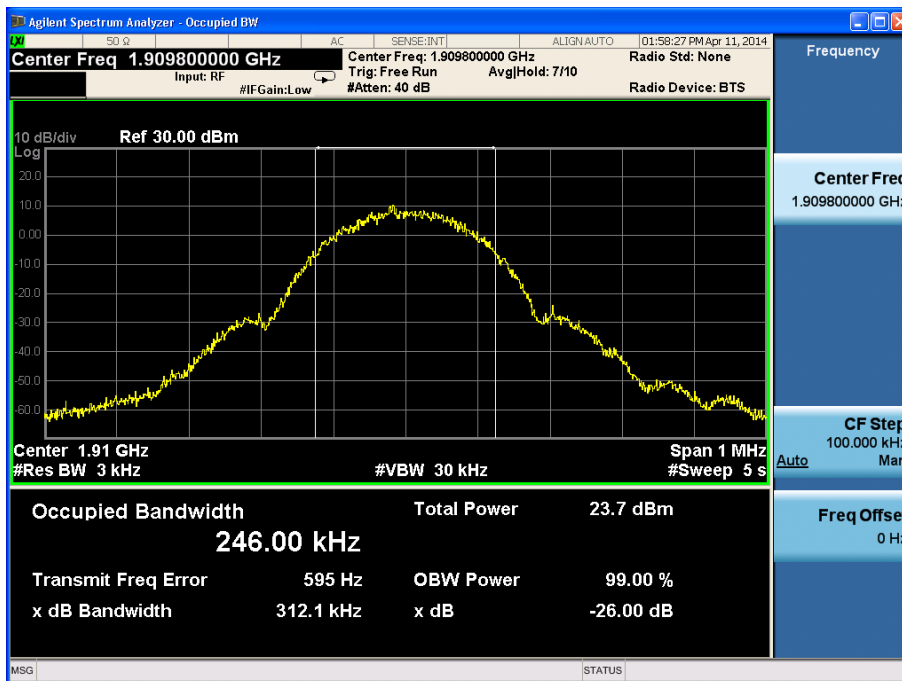
EDGE (GMSK) MODE:



Channel 512



Channel 661



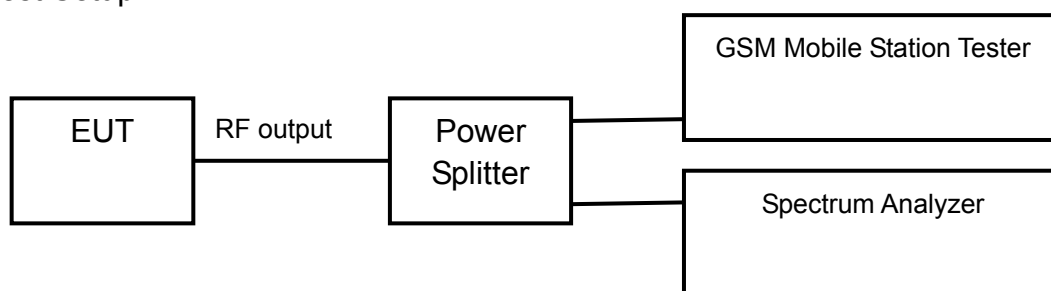
Channel 810

2.2.2.4 Emission Bandwidth-FCC Part24.238(b)

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. The emission bandwidth is measured using spectrum analyzer. RBW is set to 3kHz on spectrum analyzer. The bandwidth of -26dB transmitter power can be read on spectrum analyzer.

The measurement will be conducted at three channels No512, No661 and No810 (Bottom, middle and top channels of PCS1900 band)

Limits: No specific emission bandwidth requirements in part 24.238(b)

Test result:

GSM/GPRS MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of -26dB transmitter power (kHz)
1850.2	512	317.6
1880.0	661	316.7
1909.8	810	309.8

EDGE (GMSK) MODE:

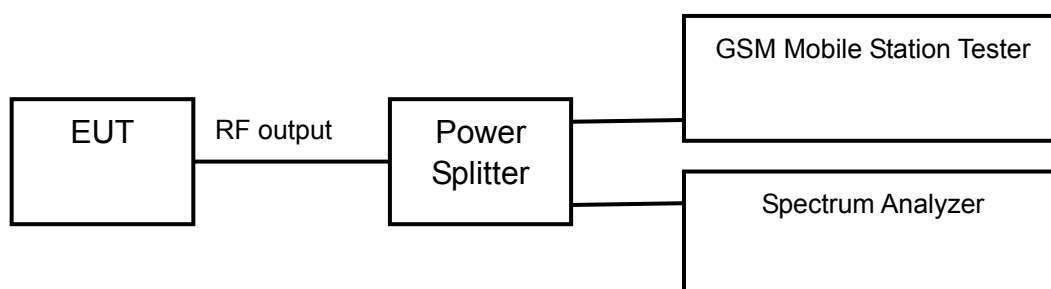
Carrier frequency (MHz)	Channel No.	Bandwidth of -26dB transmitter power (kHz)
1850.2	512	313.5
1880.0	661	318.0
1909.8	810	312.1

2.2.2.5 Spurious Emissions at antenna terminal-FCC Part2.1051/24.238(a)

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. The measurement is carried out using a spectrum analyzer. The spectrum analyzer scans from 30MHz to 20GHz (higher than the 10th harmonic of the carrier). The peak detector is used and RBW is set to 1MHz on spectrum analyzer.

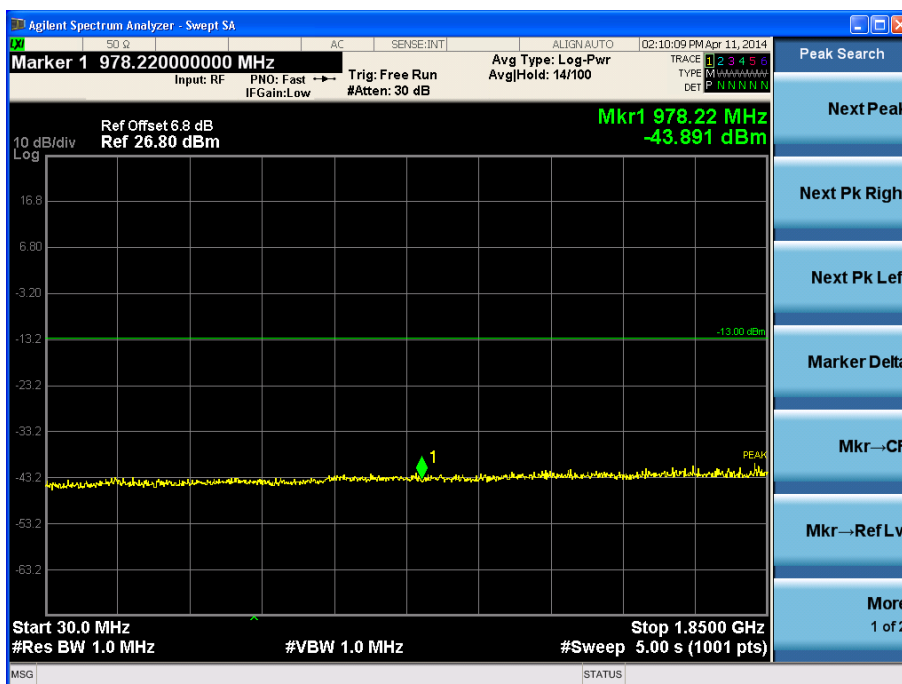
The measurement will be conducted at one channel No661 (middle channel of PCS1900 band)

Limits	≤-13dBm
--------	---------

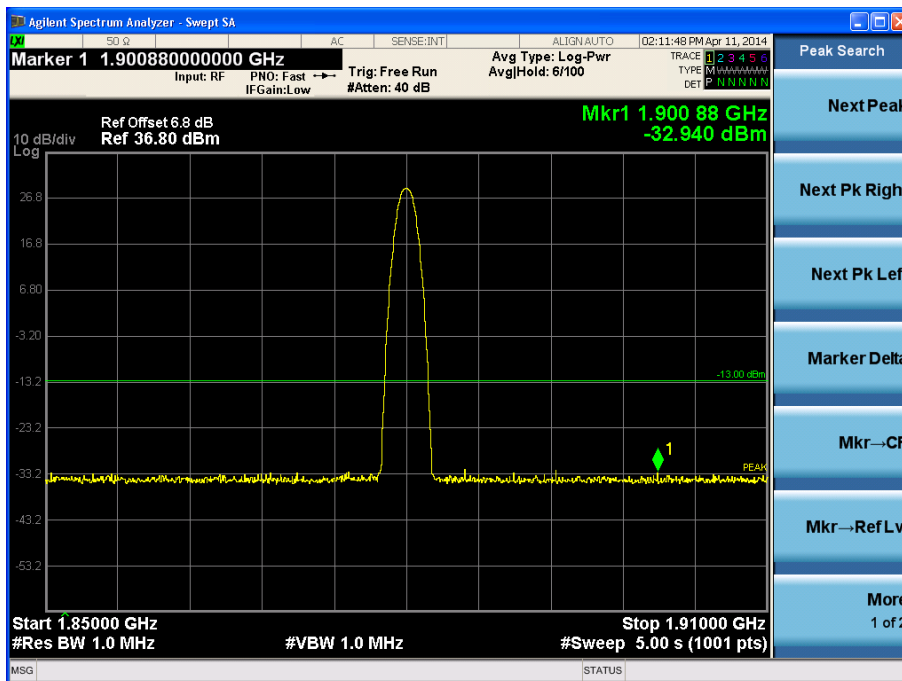
Test result:

Refer to the following figures.

GSM/GPRS MODE:

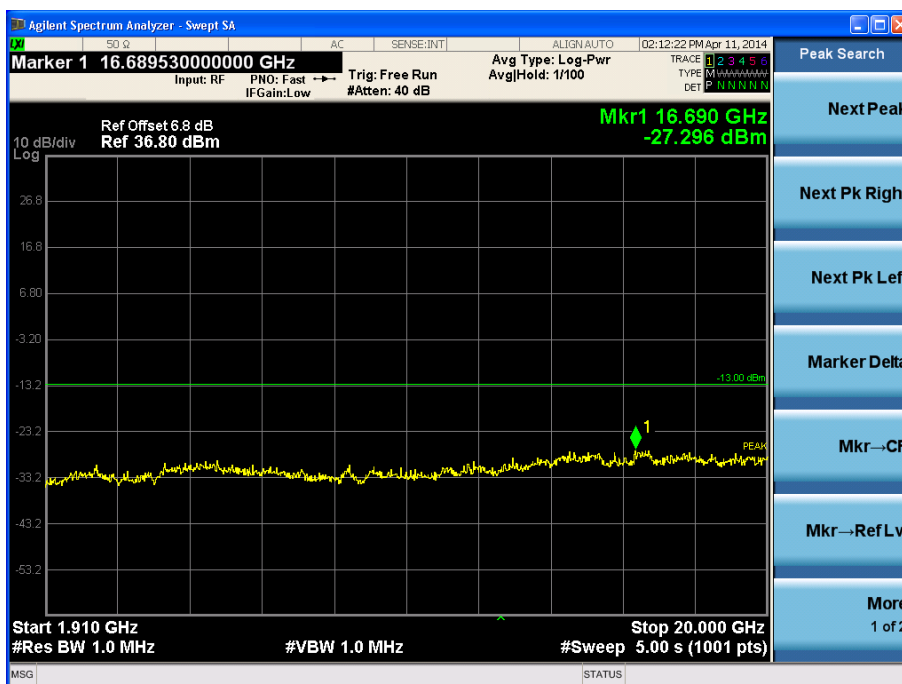


Channel 661, 30MHz~1850MHz



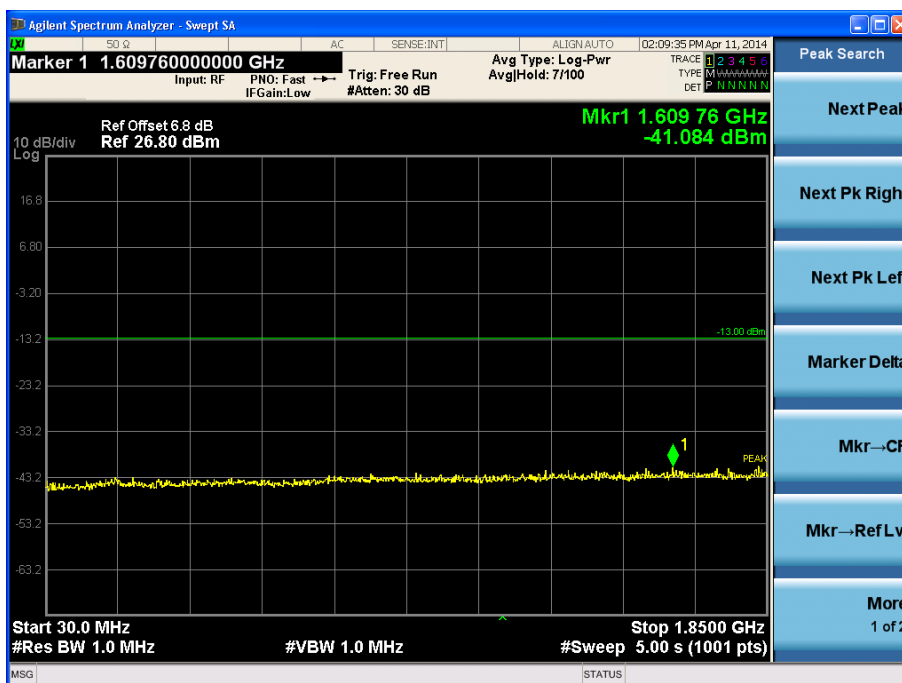
Channel 661, 1850MHz~1910MHz

Note: The signal beyond the limit is the base station simulator carrier.

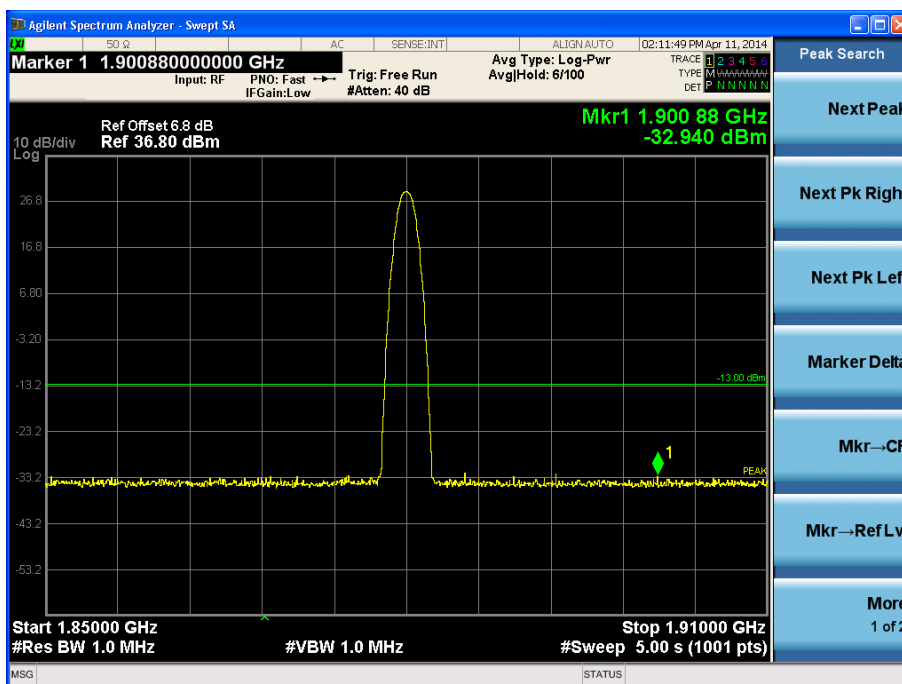


Channel 661, 1910MHz~20GHz

EDGE (GMSK) MODE:



Channel 661, 30MHz~1850MHz



Channel 661, 1850MHz~1910MHz

Note: The signal beyond the limit is the base station simulator carrier.



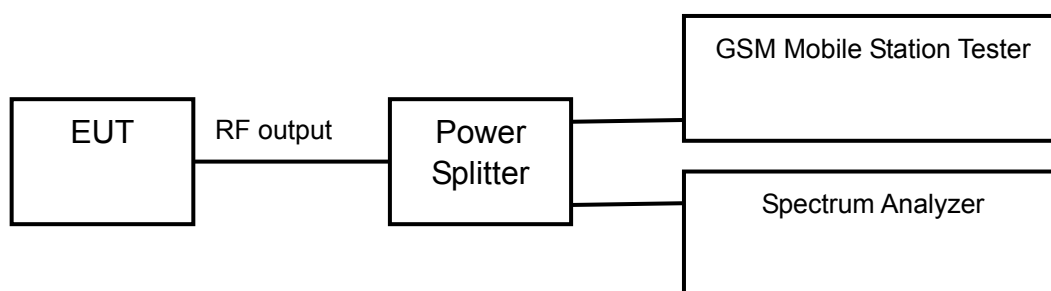
Channel 661, 1910MHz~20GHz

2.2.2.6 Band Edges Compliance-FCC Part2.1051/24.238(a)

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. The measurement is carried out using a spectrum analyzer. The peak detector is used and RBW is set to at least 1% of the emission bandwidth on spectrum analyzer.

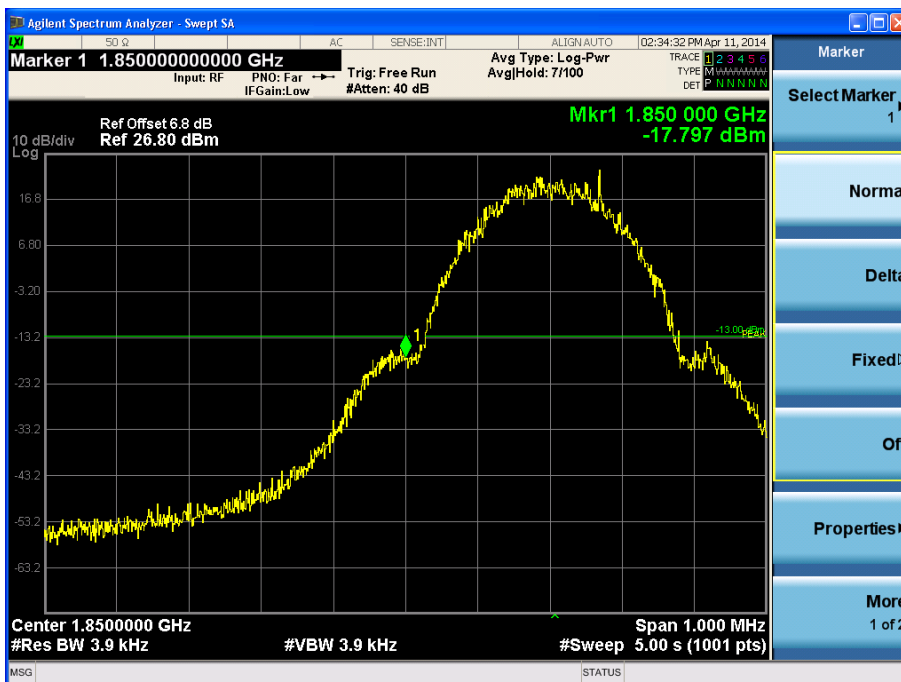
The measurement will be conducted at two channels No512 and No810 (Bottom and top channels of PCS1900 band)

Limits	$\leq -13\text{dBm}$
--------	----------------------

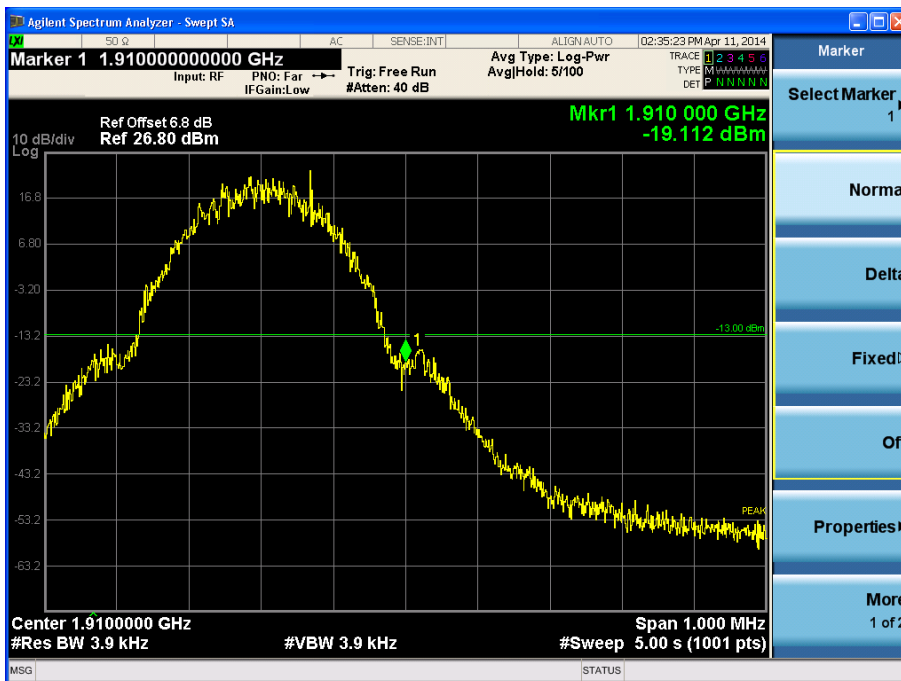
Test result:

Refer to the following figures.

GSM/GPRS MODE:

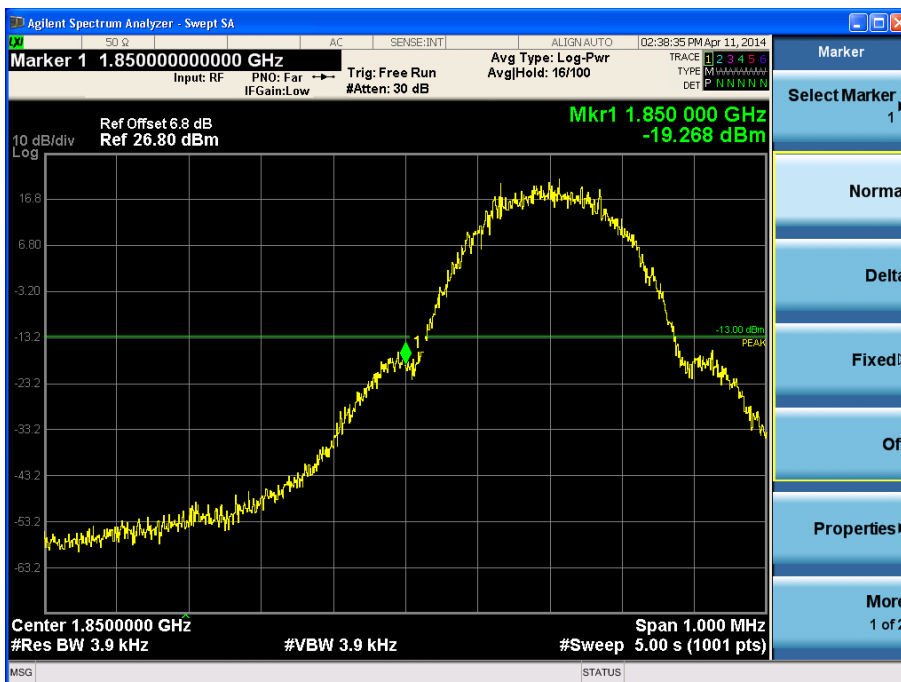


Channel 512

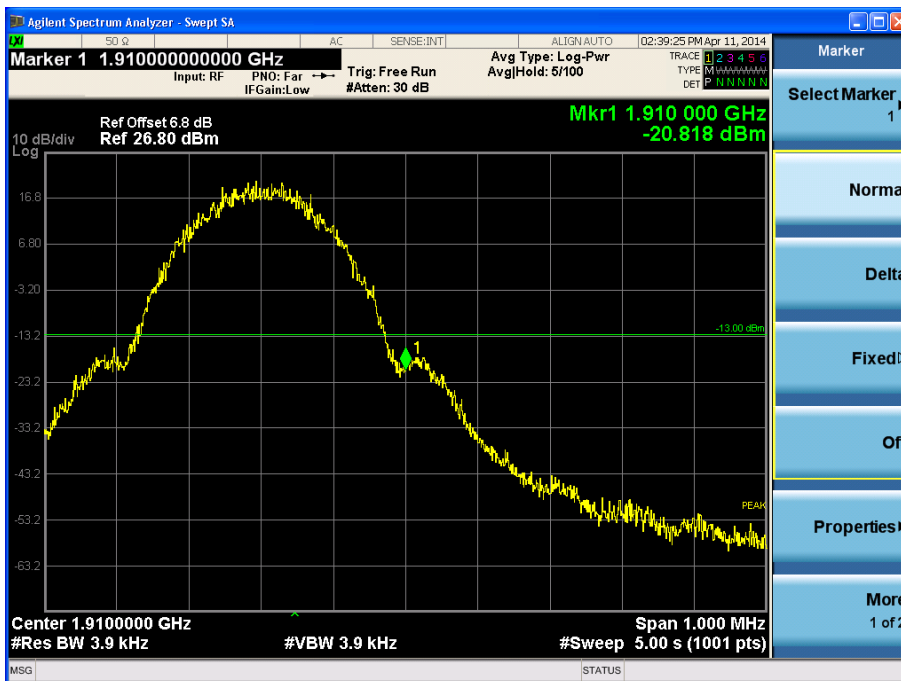


Channel 810

EDGE (GMSK) MODE:



Channel 512



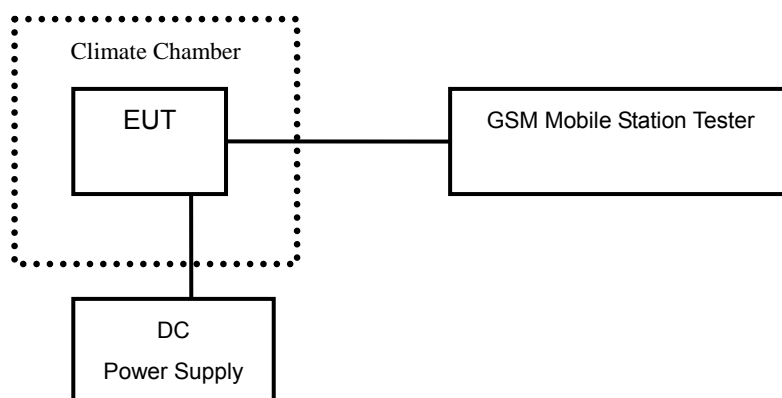
Channel 810

2.2.2.7 Frequency Stability-FCC Part2.1055/24.235

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test setup:



Test Procedure:

A radio link shall be established between EUT and Tester. The tester will sample the transmitter RF output signal and measure its frequency. The temperature inside the climate chamber is varied from -30 to +50°C in 10°C step size, and also the DC power supply voltage to the EUT is varied from 3.5 to 4.35V. The measurement will be conducted at three channels No512, No661 and No810 (Bottom, middle and top channels of PCS1900 band).

Limits: No specific frequency stability requirements in part 2.1055 and part 24.235.

Test result:

GSM/GPRS MODE:

Temperature(°C)	Test Result (ppm)@3.8V		
	Channel 512	Channel 661	Channel 810
-30	0.012	0.013	0.012
-20	0.013	0.012	0.013
-10	0.012	0.013	0.014
0	0.011	0.012	0.013
+10	0.014	0.013	0.014
+20	0.015	0.014	0.015
+30	0.014	0.013	0.014
+40	0.013	0.013	0.013
+50	0.013	0.014	0.013

Voltage (V)	Test Result (ppm)@20°C		
	Channel 512	Channel 661	Channel 810
3.5	0.011	0.013	0.015
4.35	0.010	0.014	0.014

EDGE (GMSK) MODE:

Temperature(°C)	Test Result (ppm)@3.8V		
	Channel 512	Channel 661	Channel 810
-30	0.012	0.011	0.012
-20	0.011	0.011	0.011
-10	0.010	0.012	0.011
0	0.011	0.011	0.012
+10	0.012	0.012	0.011
+20	0.011	0.011	0.012
+30	0.011	0.011	0.011
+40	0.011	0.012	0.011
+50	0.012	0.011	0.012

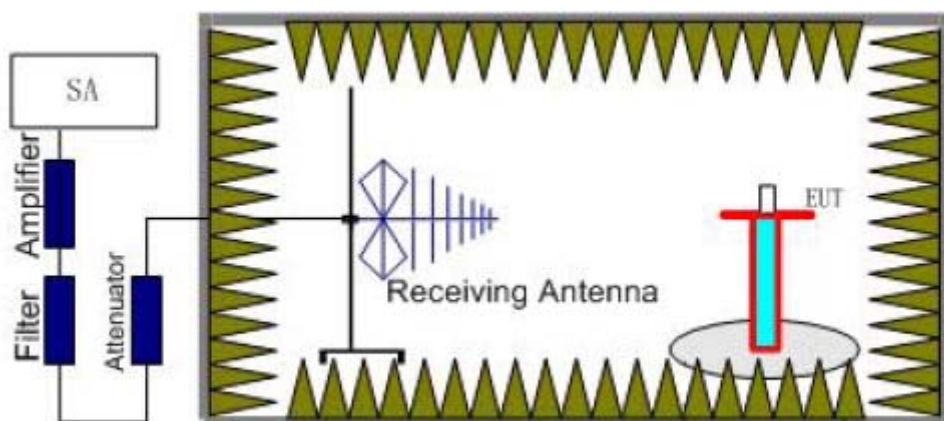
Voltage (V)	Test Result (ppm)@20°C		
	Channel 512	Channel 661	Channel 810
3.5	0.012	0.011	0.014
4.35	0.012	0.012	0.013

2.2.2.8 Radiated Spurious Emissions-FCC Part2.1053/24.238(a)

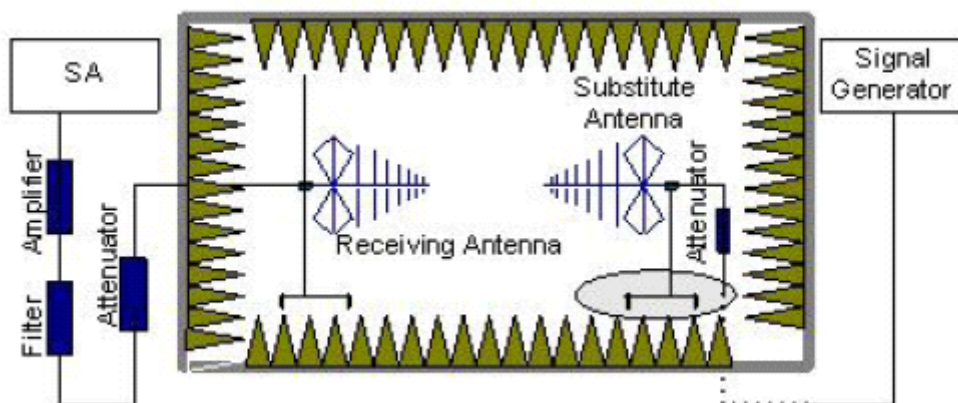
Ambient condition

Temperature	Relative humidity	Pressure
19.3°C	41.3%	100.7kPa

Test Setup:



Step 1



Step 2

Test procedure:

The measurements procedures in TIA-603C-2004 are used.

The spectrum was scanned from 30MHz to the 10th harmonic of the highest frequency generated within the equipment.

Step 1:

The measurement is carried out in the fully anechoic chamber. EUT was placed

on a 2.4 meter high non-conductive table at a 3 meter test distance from the test receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT. The height of receiving antenna is 2.4m and varies in certain range to find the maximum power value. A radio link shall be established between EUT and Tester. The output power of the cell signal of the tester will be decreased until the output power of the EUT reach a maximum value. The measurement is carried out using a spectrum analyzer or receiver. The spectrum analyzer scans from 30MHz to 20GHz (higher than the 10th harmonic of the carrier). The peak detector is used and RBW is set to 1MHz on spectrum analyzer. Then the antenna height and turn table rotation is adjusted till the maximum power value is founded on spectrum analyzer or receiver. A notch filter is necessary in the band near to the carrier frequency. A high pass filter is needed to avoid the distortion of the testing equipment in the band above the carrier frequency.

Step 2:

A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

A power (P_{mea}) is applied to the input of the substitution antenna, and adjusts the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

A “reference path loss” should be calculated after test. The attenuation of “reference path loss” is the cable loss between the Signal Source with the Substitution Antenna (P_{ca}) and the Substitution Antenna Gain (G_a).

Calculation procedure:

The data of cable loss and antenna gain has been calibrated in full testing frequency range before the testing.

The power of the Radiated Spurious Emissions is calculated by adding the cable loss and antenna gain. The basic equation with a sample calculation is as followed:

$$\text{Power(EIRP)} = P_{mea} + P_{ca} + G_a$$

This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15dB) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15 \text{ (dB)}$.

Assumed the power of signal source record is -20dBm. A cable loss of -30dB and an antenna gain of 11dB are added.

$$P=P_{\text{mea}}+P_{\text{ca}}+G_{\text{a}}=(-20\text{dBm})+(-30\text{dB})+(11\text{dB})=-39\text{dBm}$$

The measurement will be done at carrier frequencies that pertain to bottom (Channel 512), middle (Channel 661) and top (Channel 810) channels of PCS 1900 band.

Test result:

GSM/GPRS MODE Channel 512:

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2846.23	-53.3	-5.8	8.9	-56.4	-13	Vertical
2868.24	-53.5	-5.8	8.9	-56.6	-13	Vertical
3667.72	-54.2	-7.9	10.4	-56.7	-13	Vertical
6976.23	-54.5	-9.4	12.0	-57.1	-13	Vertical
7558.63	-54.9	-10.8	12.0	-56.1	-13	Vertical
17354.71	-55.4	-13.9	12.3	-53.8	-13	Vertical

EDGE (GMSK) MODE Channel 512:

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2866.73	-52.9	-5.8	8.9	-56.0	-13	Vertical
2878.43	-53.3	-5.8	8.9	-56.4	-13	Vertical
3674.84	-54.3	-7.9	10.4	-56.8	-13	Vertical
6995.34	-54.7	-9.4	12.0	-57.3	-13	Vertical
7567.47	-55.5	-10.8	12.0	-56.7	-13	Vertical
17348.67	-55.9	-13.9	12.3	-54.3	-13	Vertical

GSM/GPRS MODE Channel 661:

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2823.87	-52.6	-5.8	8.9	-55.7	-13	Vertical
2876.75	-53.2	-5.8	8.9	-56.3	-13	Vertical
3712.53	-53.6	-7.9	10.4	-56.1	-13	Vertical
6958.35	-54.1	-9.4	12.0	-56.7	-13	Vertical
7554.56	-54.5	-10.8	12.0	-55.7	-13	Horizontal
17357.76	-55.3	-13.9	12.3	-53.7	-13	Vertical

EDGE (GMSK) MODE Channel 661:

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2835.57	-52.8	-5.8	8.9	-55.9	-13	Vertical
2864.65	-53.1	-5.8	8.9	-56.2	-13	Horizontal
3769.63	-53.5	-7.9	10.4	-56.0	-13	Vertical
6973.46	-54.4	-9.4	12.0	-57.0	-13	Vertical
7548.14	-54.9	-10.8	12.0	-56.1	-13	Vertical
17364.49	-55.8	-13.9	12.3	-54.2	-13	Vertical

GSM/GPRS MODE Channel 810:

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2846.28	-52.4	-5.8	8.9	-55.5	-13	Vertical
2858.75	-52.7	-5.8	8.9	-55.8	-13	Vertical
3757.85	-53.2	-7.9	10.4	-55.7	-13	Vertical
6993.53	-54.7	-9.4	12.0	-57.3	-13	Vertical
7546.76	-55.5	-10.8	12.0	-56.7	-13	Vertical
17335.81	-56.1	-13.9	12.3	-54.5	-13	Vertical

EDGE (GMSK) MODE Channel 810:

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2852.57	-52.5	-5.8	8.9	-55.6	-13	Vertical
2868.81	-53.2	-5.8	8.9	-56.3	-13	Horizontal
3767.35	-53.7	-7.9	10.4	-56.2	-13	Vertical
6993.36	-54.2	-9.4	12.0	-56.8	-13	Vertical
7574.74	-55.4	-10.8	12.0	-56.6	-13	Vertical
17326.42	-56.1	-13.9	12.3	-54.5	-13	Vertical

2.3. List of test equipments

No.	Name/Model	Manufacturer	S/N	Calibration Due Date
1	E5515C(8960) Mobile Station Tester	Agilent	MY48367401	2014.8
2	N9020A Spectrum Analyzer	Agilent	MY48010771	2014.8
3	DC Power Supply E3645A	Agilent	MY40000740	2014.8
4	Power Splitter 11850C	Agilent	026057	2014.8
5	Temperature chamber SH241	ESPEC	92000390	2014.8
6	12.65m×8.03m×7.50m Fully-Anechoic Chamber	FRANKONIA	-----	-----
7	Turn table Diameter:1m	HD	-----	-----
8	Antenna master FAC(MA4.0)	MATURO	-----	-----
9	HF 906 Double-Ridged Waveguide Horn Antenna	R&S	100030	2014.8
10	HL562 Ultra log antenna	R&S	100016	2014.8
11	3160-09 Receive antenna	SCHWARZ-BECK	002058-002	2014.8
12	ESI 40 EMI test receiver	R&S	100015	2014.8
13	Radio tester	CMU 200	114667	2014.8

Appendix

Appendix1 Test Setup