
TEST REPORT

Report No.: SRTC2015-9004(F)-0004

Product Name: GSM quad band mobile phone

Product Model: 1017G

Applicant: TCL Communication Ltd.

Manufacturer: TCL Communication Ltd.

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

(April 22, 2015 edition)

FCC ID: 2ACCJB012

The State Radio_monitoring_center Testing Center (SRTC)

No.80 Beilishi Road Xicheng District Beijing, China

Tel: 86-10-68009202 Fax: 86-10-6800920

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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)
Address: No.80 Beilishi Road, Xicheng District, Beijing China
City: Beijing
Country or Region: China
Contacted person: Wang Junfeng
Tel: +86 10 68009181 +86 10 68009202
Fax: +86 10 68009195 +86 10 68009205
Email: wangjf@srcc.org.cn / wangjunfeng@srtc.org.cn

1.3 Applicant's details

Company: TCL Communication Ltd.
Address: 5F, E building, No. 232, Liang Jing Road, ZhangJiang High-Tech Park, Pudong Area, Shanghai, 201203
City: Shanghai
Country or Region: P.R.China
Grantee Code: 2ACCJ
Contacted person: Houhua.FAN
Tel: +86-(0)21 61460666
Fax: +86-(0)21 61460602
Email: houhua.fan@tcl.com

1.4 Manufacturer's details

Company: TCL Communication Ltd.
Address: 5F, E building, No. 232, Liang Jing Road, ZhangJiang High-Tech Park, Pudong Area, Shanghai, 201203
City: Shanghai
Country or Region: P.R.China
Contacted person: Houhua.FAN
Tel: +86-(0)21 61460666
Fax: +86-(0)21 61460602
Email: houhua.fan@tcl.com

1.5 Application details

Date of reception of test sample: 20th April 2015

Date of test: 22th April 2015

1.6 Reference specification

FCC Part 24E, Part22H, Part 2 (April 22, 2015 edition)

1.7 Information of EUT

1.7.1 General information

Name of EUT	GSM quad band mobile phone
FCC ID	2ACCJB012
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
Emission Designator	300KGXW
Duplex Mode	FDD
Duplex Spacing	GSM850:45MHz PCS1900:80MHz
Antenna Type	Fixed Internal
Power Supply	Battery
Rated Power Supply Voltage	3.7V
Extreme Temperature	Lowest: -30°C Highest: +50°C
Extreme Voltage	Minimum: 3.5V Maximum: 4.2V
HW Version	1203_MB_PCB_V0.1
SW Version	1017G_L3EN_V01_150408_MCP32+32_FM_LATAM_AL

1.7.2 EUT details

Product Name	Product Model	IMEI
GSM quad band mobile phone	1017G	359161060005557 014365000006990

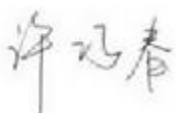

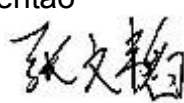
1.7.3 Auxiliary equipment details

Equipment	Battery
Manufacturer	BYD
Model Number	CAB0400000C1
Capacity	400 mAh

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: Ms. Xu Qiaochun 	Checked by: Mr. Li Bin 
Tested by: Mr. Zhang Wentao 	Issued date: 2015-04-24

2.2 Test result

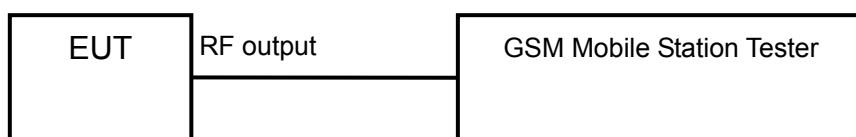
2.2.1 GSM850

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	≤33dBm
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Test result:

GSM MODE:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
824.2	128	32.69
836.4	189	32.78
848.8	251	32.76

GPRS MODE:

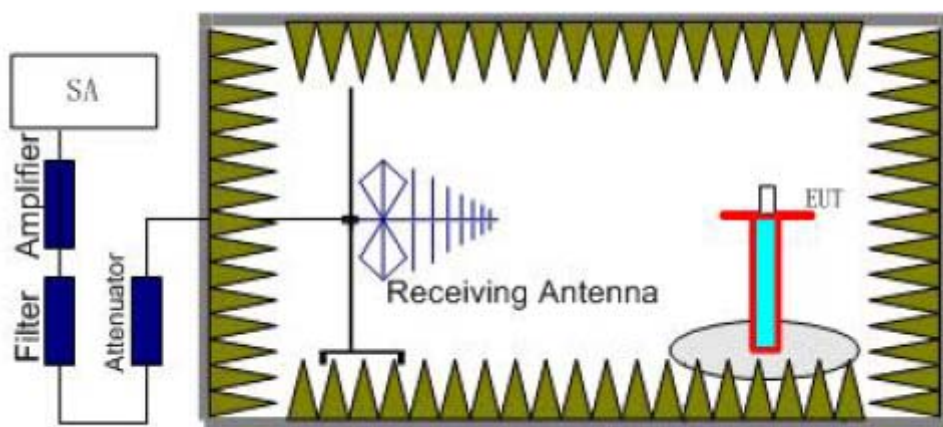
Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
824.2	128	32.71
836.4	189	32.75
848.8	251	32.74

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

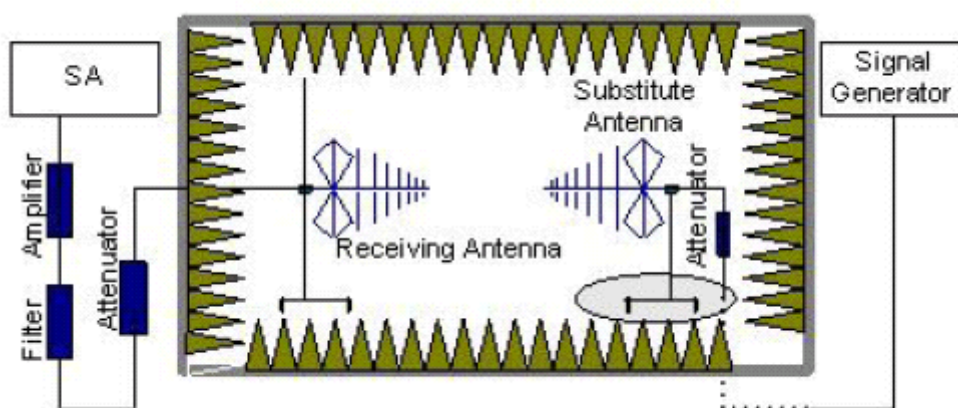
Ambient condition:

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.

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:

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

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

Test result:

GSM MODE:

Frequency (MHz)	Peak ERP (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Correction (dB)	Pmea (dBm)	Polarization
824.2	31.89	-3.80	8.60	2.15	29.24	Vertical
836.4	31.98	-3.80	8.60	2.15	29.33	Vertical
848.8	31.95	-3.80	8.60	2.15	29.30	Vertical

GPRS MODE:

Frequency (MHz)	Peak ERP (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Correction (dB)	Pmea (dBm)	Polarization
824.2	31.88	-3.80	8.60	2.15	29.23	Vertical
836.4	31.83	-3.80	8.60	2.15	29.18	Vertical
848.8	31.86	-3.80	8.60	2.15	29.21	Vertical

Single SIM

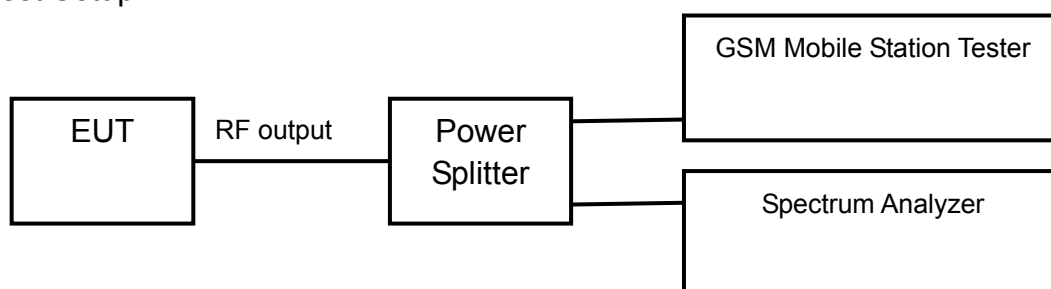
Frequency (MHz)	Peak ERP (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Correction (dB)	Pmea (dBm)	Polarization
836.4	31.90	-3.80	8.60	2.15	29.25	Vertical

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 3 kHz 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:

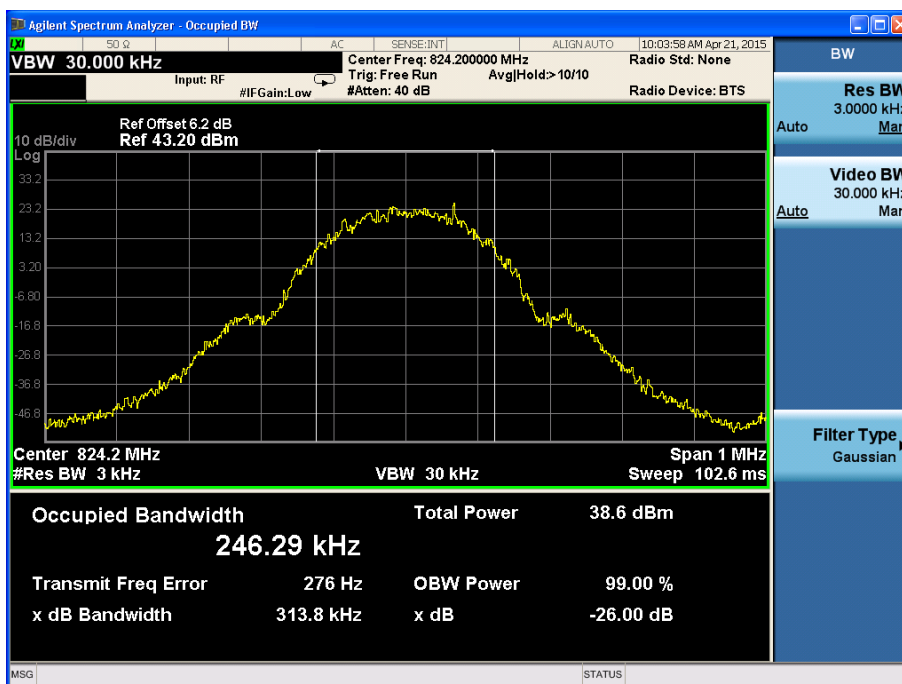
GSM MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (kHz)
824.2	128	246.29
836.4	189	245.92
848.8	251	247.87

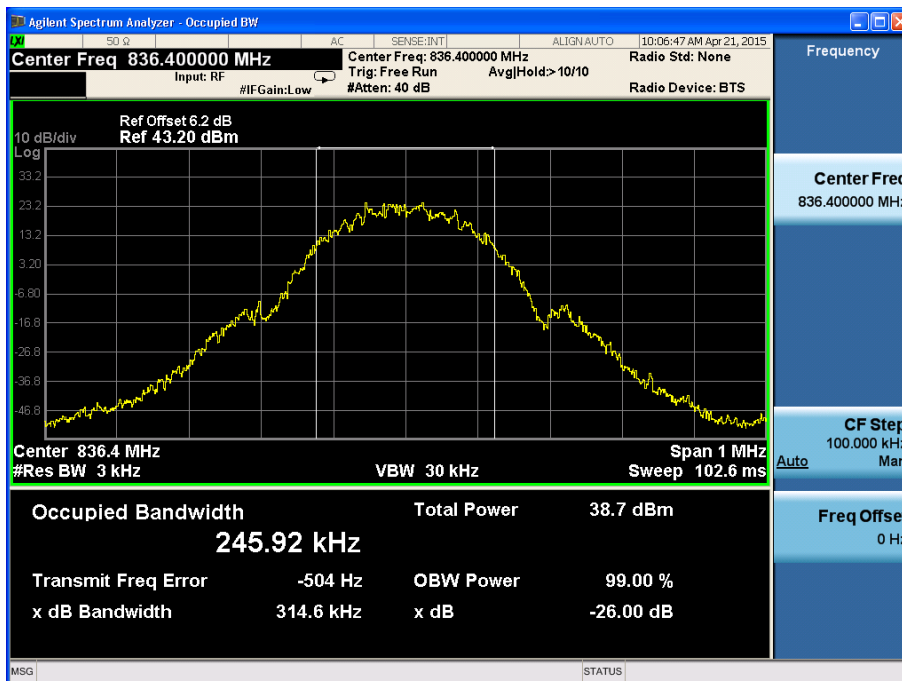
GPRS MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (kHz)
824.2	128	243.17
836.4	189	246.64
848.8	251	245.07

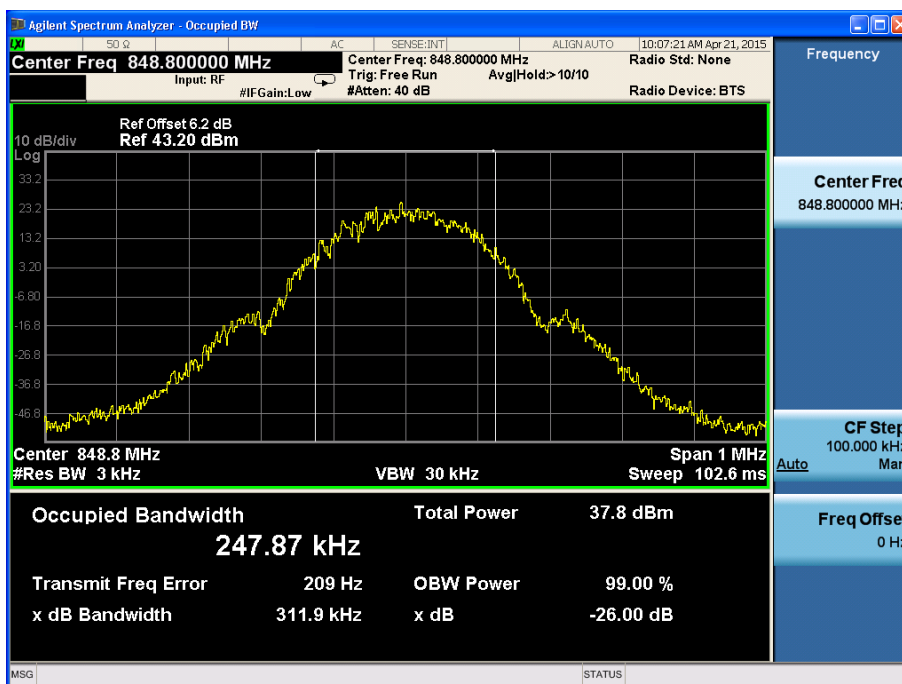
GSM MODE:



Channel 128

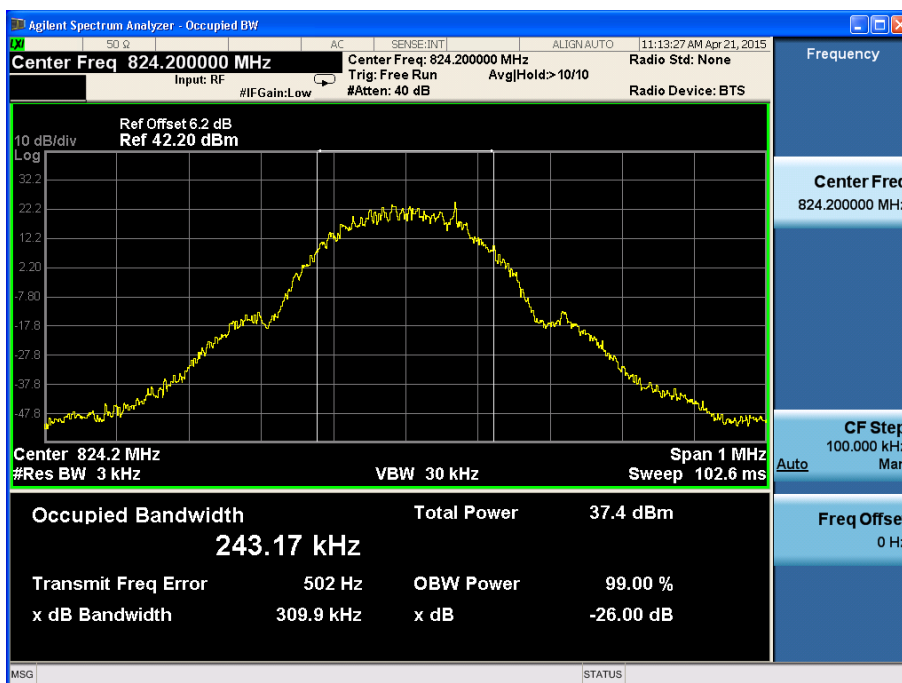


Channel 189

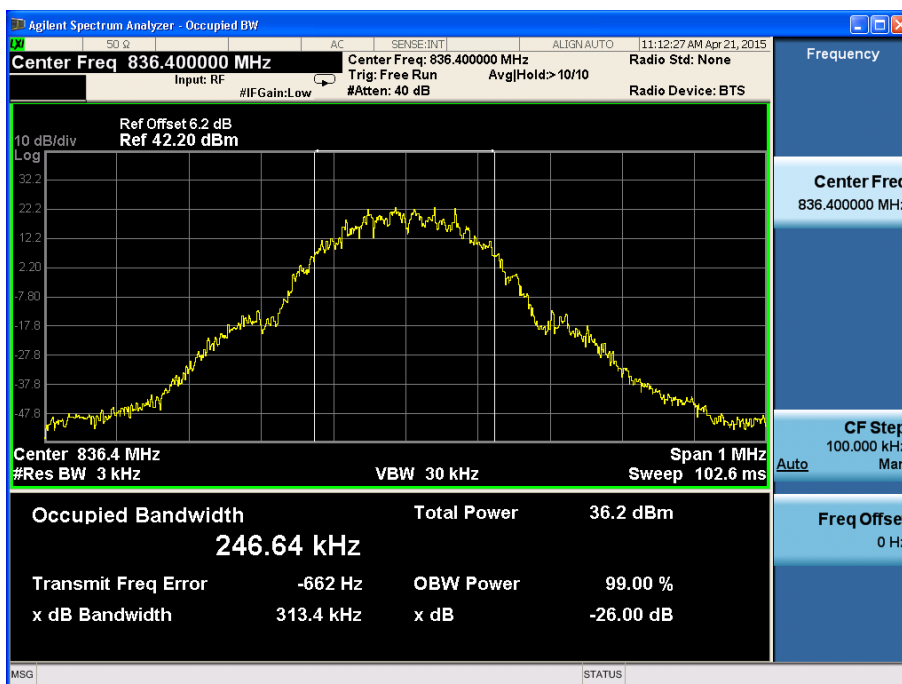


Channel 251

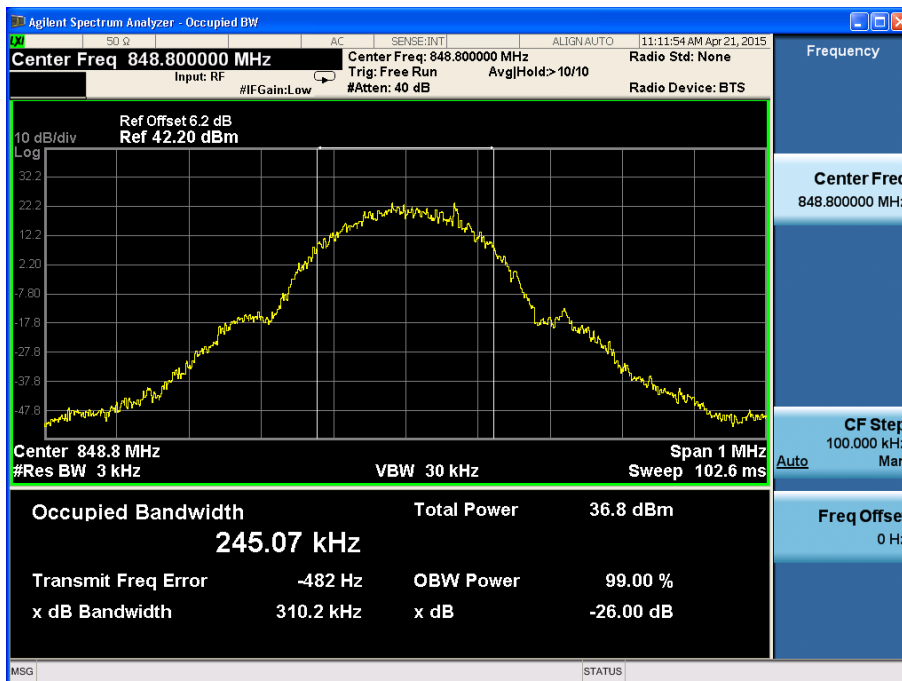
GPRS MODE:



Channel 128



Channel 189



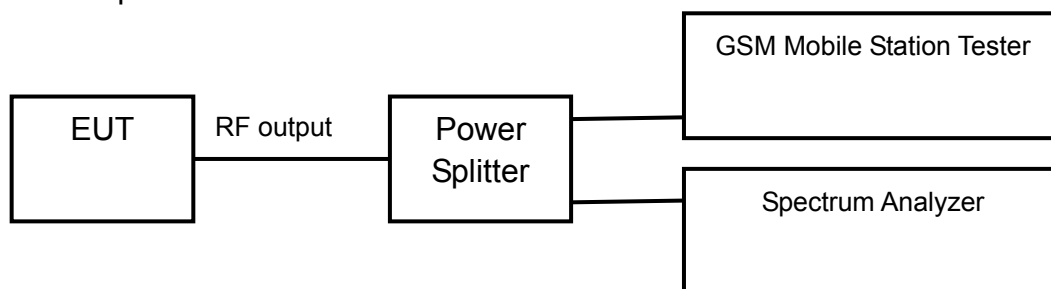
Channel 251

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 3 kHz 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 MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of -26dB transmitter power (kHz)
824.2	128	313.8
836.4	189	314.6
848.8	251	311.9

GPRS MODE:

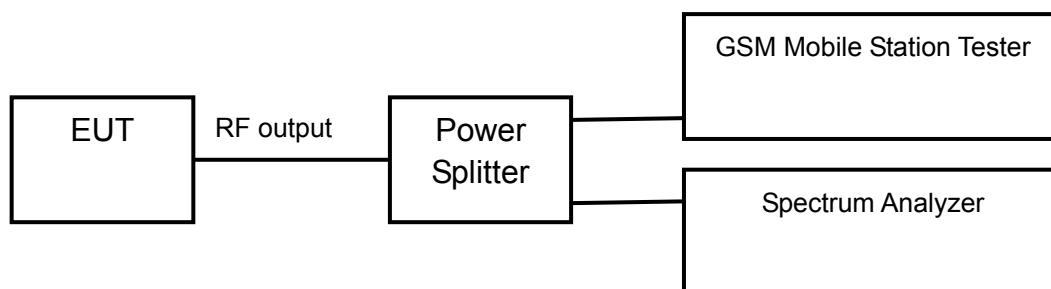
Carrier frequency (MHz)	Channel No.	Bandwidth of -26dB transmitter power (kHz)
824.2	128	309.9
836.4	189	313.4
848.8	251	310.2

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.

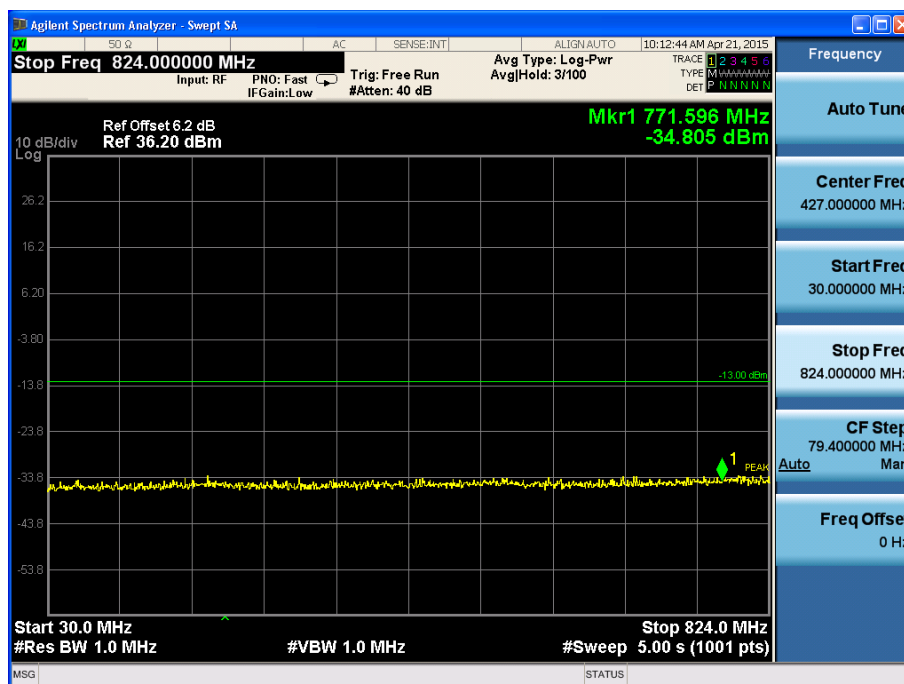
The measurement will be conducted at one channel No189 (middle channel of GSM850 band)

Limits	$\leq -13\text{dBm}$
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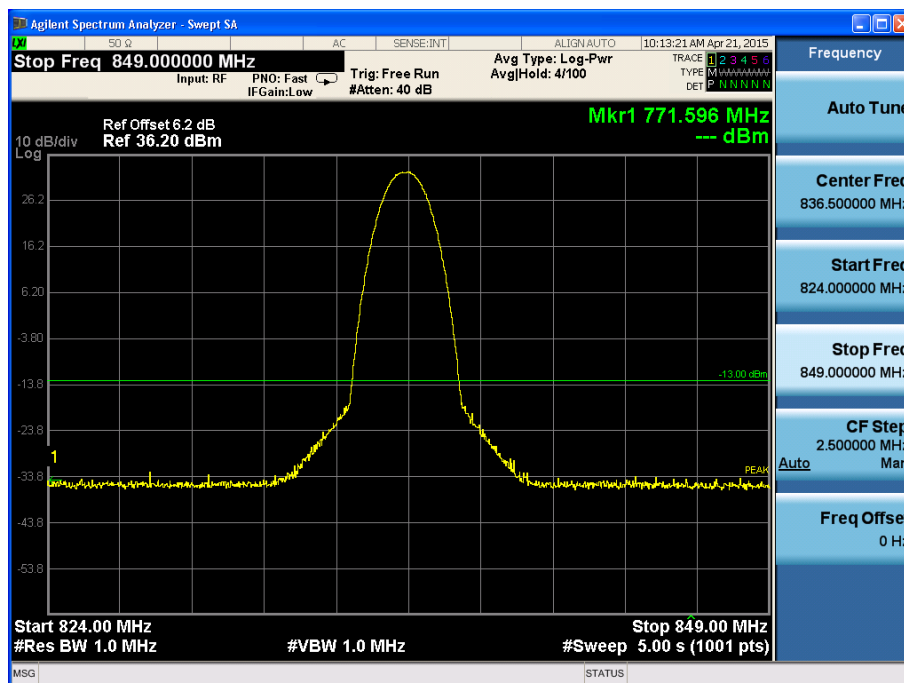
Test result:

Refer to the following figures.

GSM MODE:

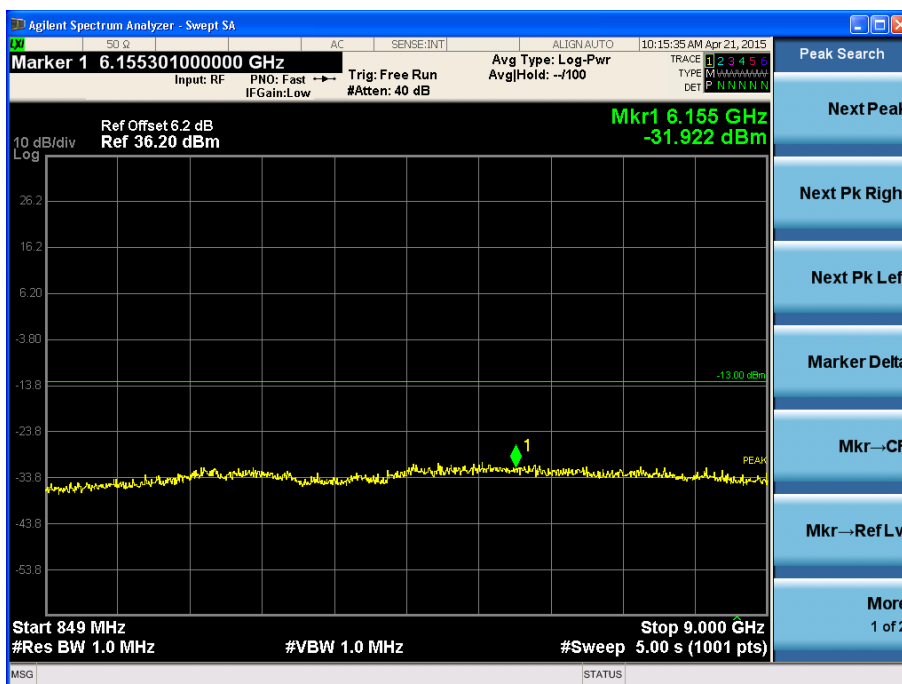


Channel 189, 30MHz~824MHz



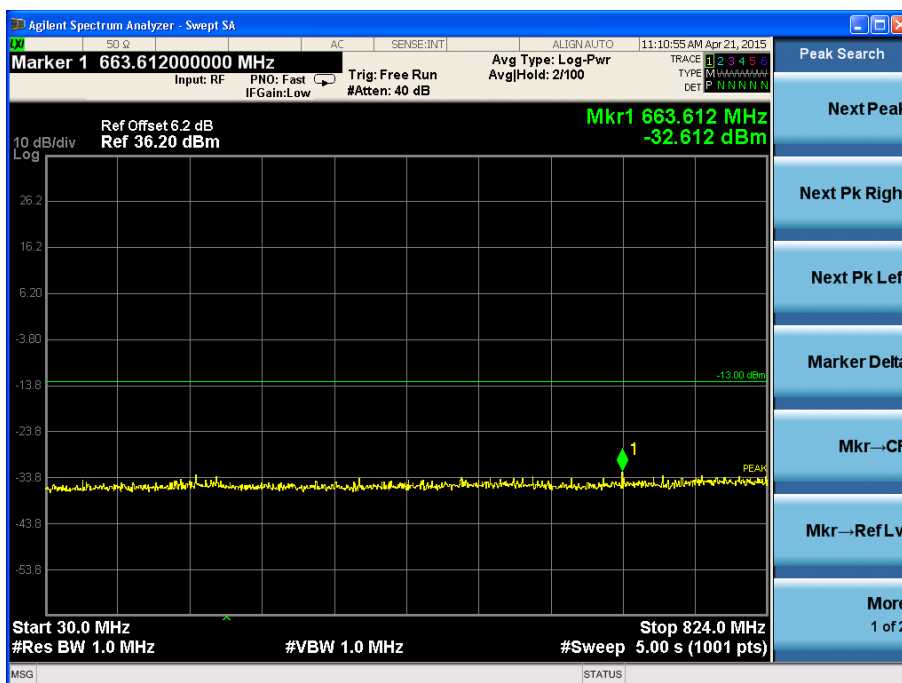
Channel 189, 824MHz~849MHz

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

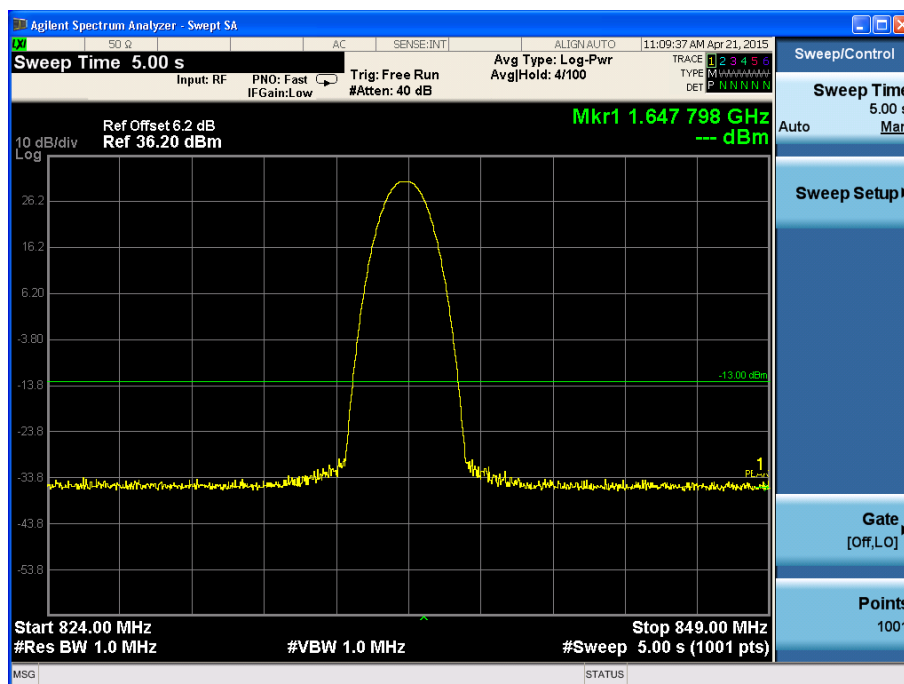


Channel 189, 849MHz~9GHz

GPRS MODE:

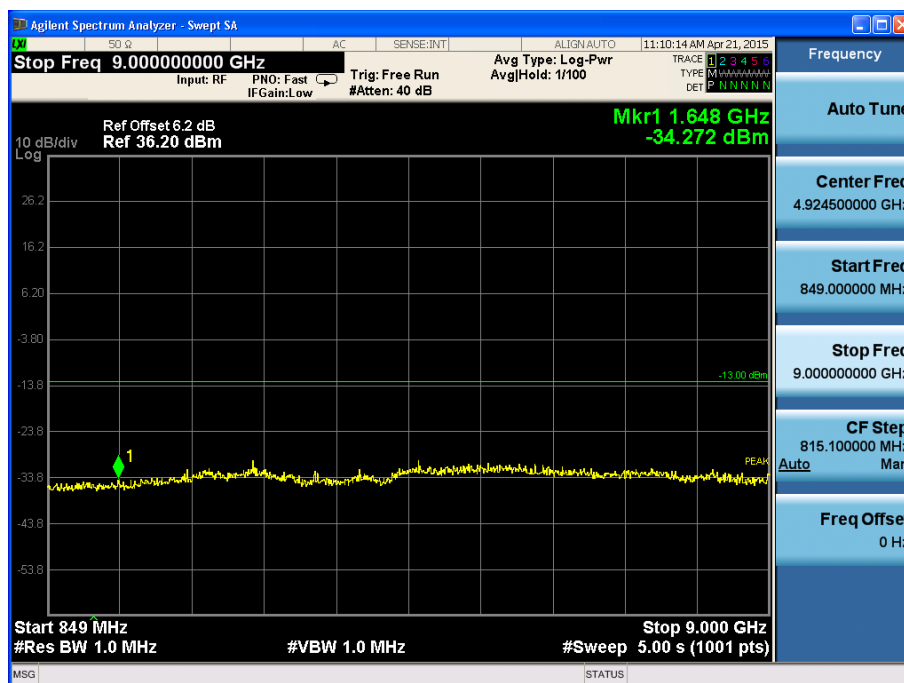


Channel 189, 30MHz~824MHz



Channel 189, 824MHz~849MHz

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



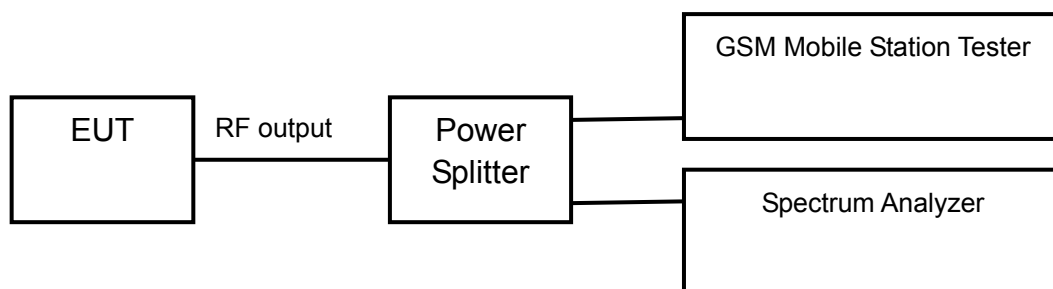
Channel 189, 849MHz~9GHz

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.

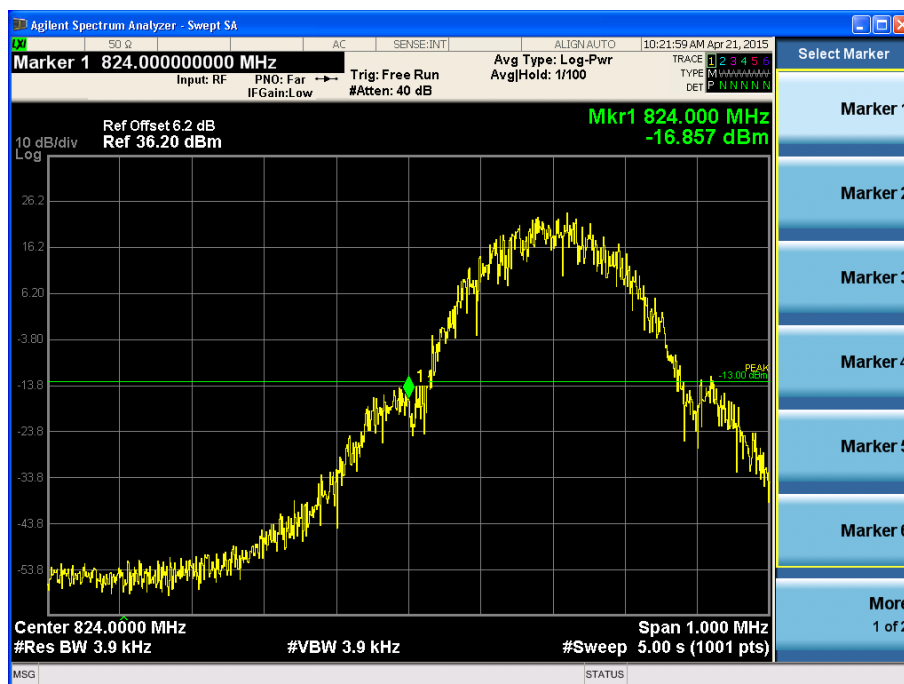
The measurement will be conducted at two channels No128 and No251 (Bottom and top channels of GSM850 band)

Limits	$\leq -13\text{dBm}$
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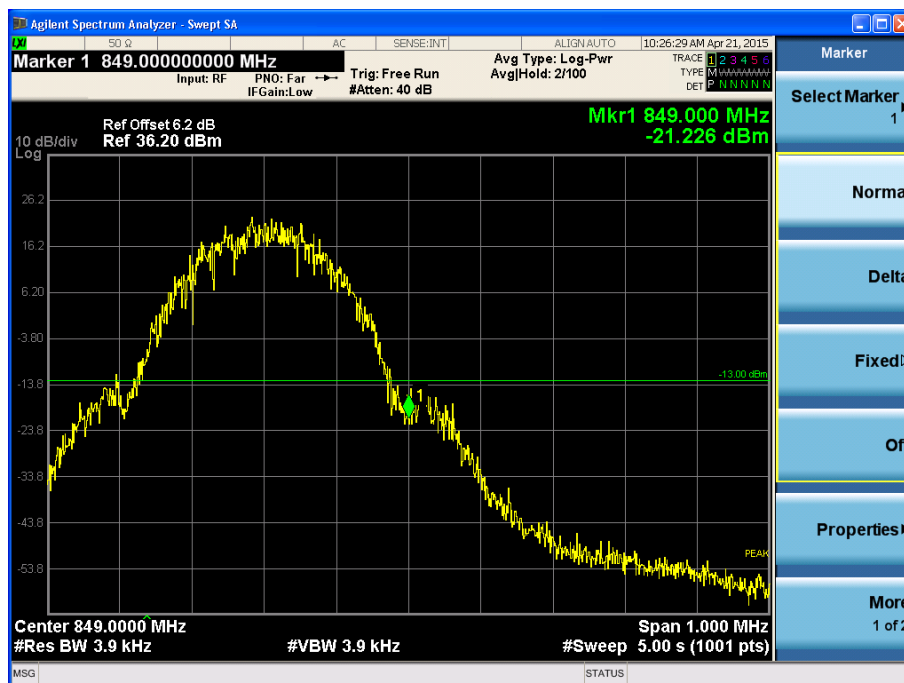
Test result:

Refer to the following figures.

GSM MODE:

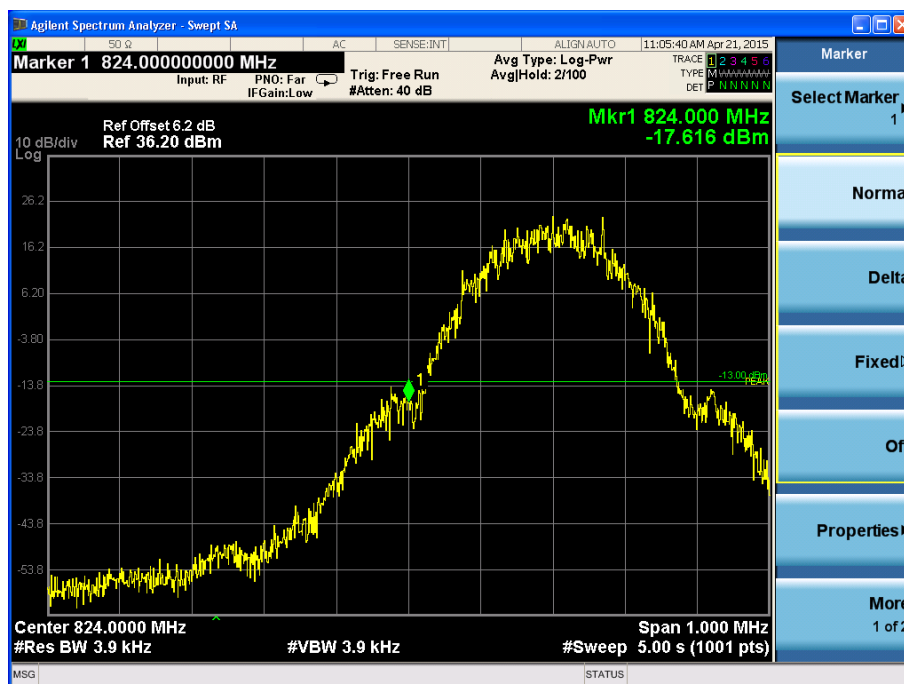


Channel 128

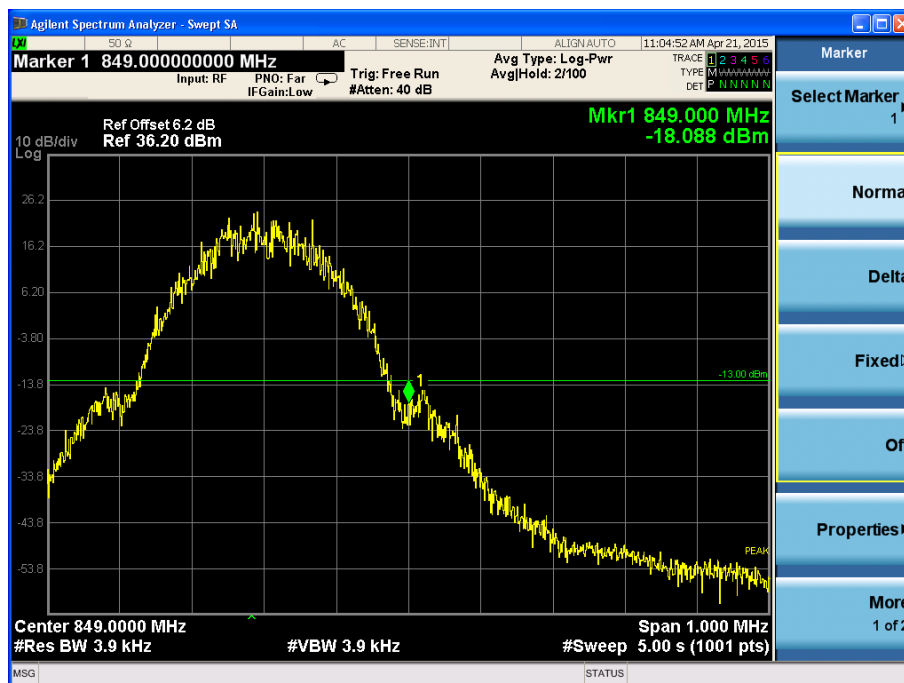


Channel 251

GPRS MODE:



Channel 128



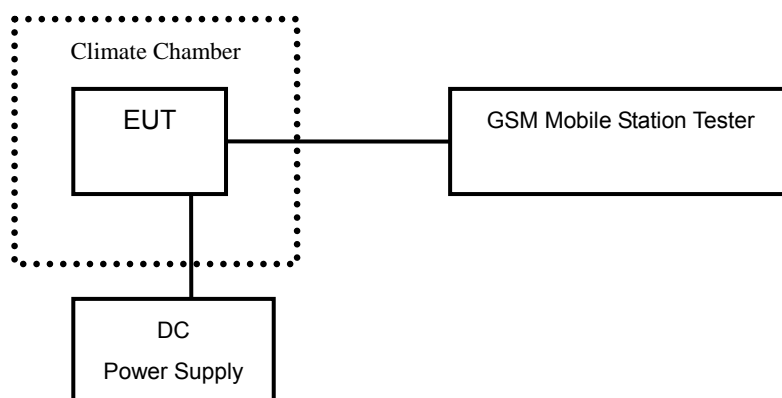
Channel 251

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 4.2V. 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 MODE:

Temperature(°C)	Test Result (ppm)@3.7		
	Channel 128	Channel 189	Channel 251
-30	0.007	0.008	0.010
-20	0.009	0.010	0.012
-10	0.010	0.012	0.009
0	0.010	0.008	0.010
+10	0.007	0.012	0.010
+20	0.009	0.012	0.008
+30	0.009	0.011	0.009
+40	0.011	0.011	0.011
+50	0.010	0.009	0.012

Voltage (V)	Test Result (ppm)@20°C		
	Channel 128	Channel 189	Channel 251
3.5	0.009	0.008	0.010
4.2	0.010	0.007	0.011

GPRS MODE:

Temperature(°C)	Test Result (ppm)@3.7V		
	Channel 128	Channel 189	Channel 251
-30	0.011	0.011	0.011
-20	0.011	0.010	0.012
-10	0.011	0.012	0.013
0	0.008	0.013	0.009
+10	0.009	0.011	0.012
+20	0.011	0.011	0.010
+30	0.009	0.010	0.011
+40	0.009	0.011	0.011
+50	0.009	0.010	0.012

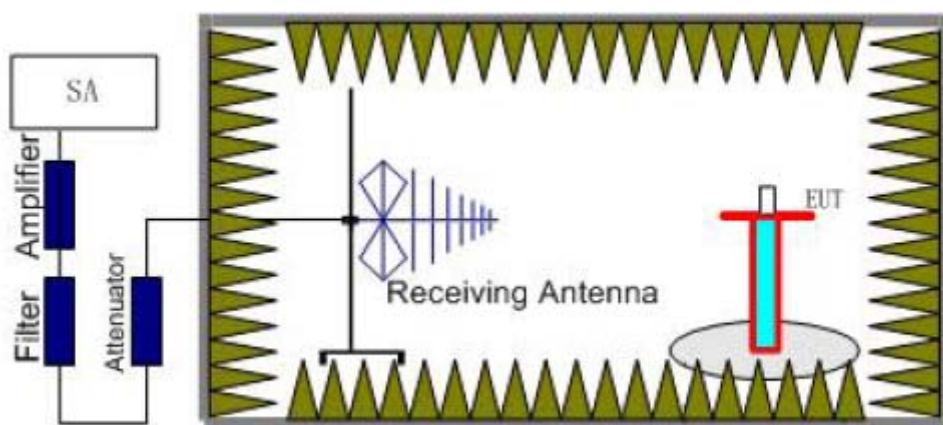
Voltage (V)	Test Result (ppm)@20°C		
	Channel 128	Channel 189	Channel 251
3.5	0.011	0.012	0.013
4.2	0.008	0.012	0.013

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

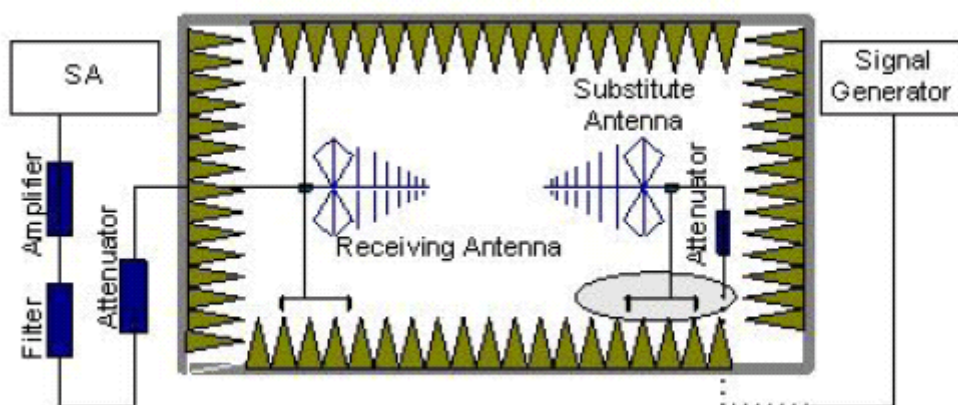
Ambient condition:

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
1623.73	-41.24	-4.6	8.3	-44.94	-13	Vertical
2566.76	-43.33	-5.9	8.9	-46.33	-13	Vertical
2766.33	-43.84	-5.9	8.9	-46.84	-13	Horizontal
3310.91	-51.55	-7.5	10.2	-54.25	-13	Vertical
7021.96	-52.74	-9.4	12	-55.34	-13	Horizontal
9921.32	-54.26	-11.4	13.8	-56.66	-13	Vertical

GSM/GPRS MODE Channel 189

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1635.65	-40.82	-4.6	8.3	-44.52	-13	Vertical
2556.31	-42.31	-5.9	8.9	-45.31	-13	Vertical
2821.85	-42.78	-5.9	8.9	-45.78	-13	Vertical
3313.96	-52.93	-7.5	10.2	-55.63	-13	Vertical
6980.88	-54.22	-9.4	12.0	-56.82	-13	Vertical
9974.48	-54.34	-11.4	13.8	-56.74	-13	Vertical

GSM/GPRS MODE Channel 251

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1637.70	-41.13	-4.6	8.3	-44.83	-13	Vertical
2563.43	-41.53	-5.9	8.9	-44.53	-13	Vertical
2857.91	-43.31	-5.9	8.9	-46.31	-13	Vertical
3345.99	-54.18	-7.5	10.2	-56.88	-13	Vertical
7027.37	-54.51	-9.4	12.0	-57.11	-13	Vertical
9974.75	-54.68	-11.4	13.8	-57.08	-13	Horizontal

Single SIM

GSM/GPRS MODE Channel 189

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1634.22	-41.05	-4.6	8.3	-44.75	-13	Vertical
2553.07	-42.66	-5.9	8.9	-45.66	-13	Vertical
2831.49	-43.32	-5.9	8.9	-46.32	-13	Vertical
3300.30	-53.38	-7.5	10.2	-56.08	-13	Vertical
6989.02	-54.55	-9.4	12.0	-57.15	-13	Vertical
9969.90	-54.87	-11.4	13.8	-57.27	-13	Vertical

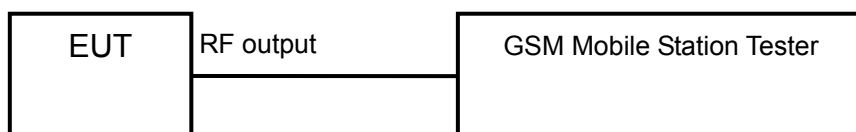
2.2.2 PCS1900

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	$\leq 30\text{dBm}$
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Test result:

GSM MODE:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
1850.2	512	29.50
1880.0	661	29.39
1909.8	810	29.44

GPRS MODE:

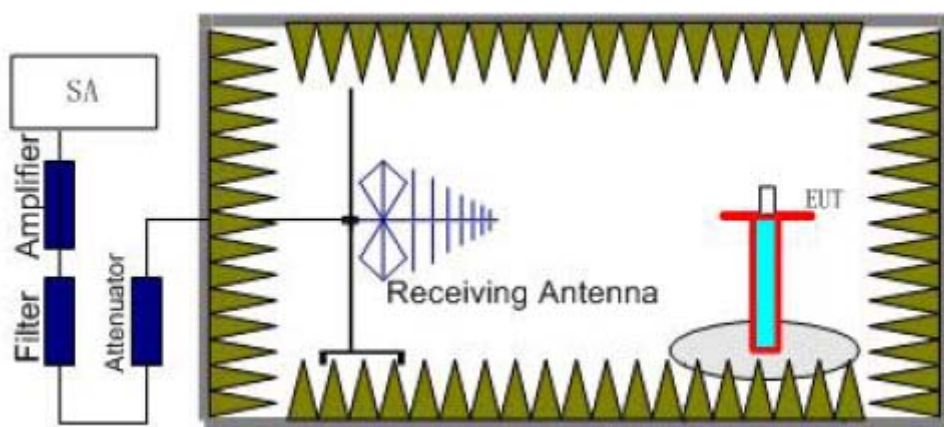
Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
1850.2	512	29.57
1880.0	661	29.46
1909.8	810	29.47

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

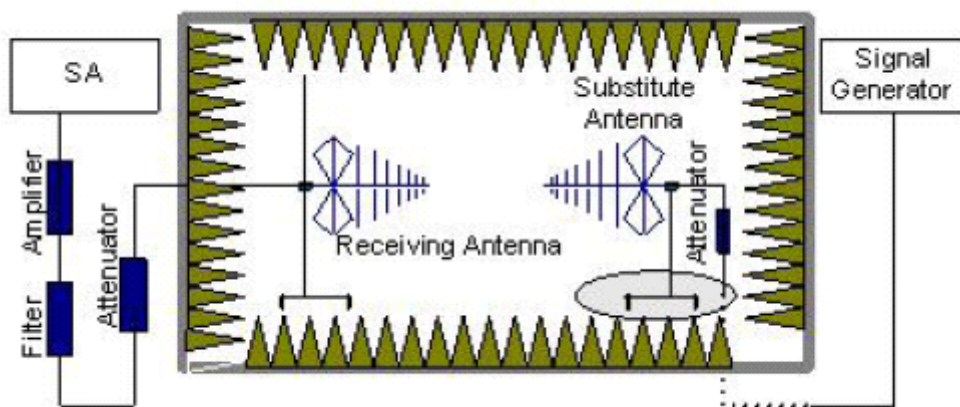
Ambient condition:

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 (Ga).

The measurement results are obtained as described below:

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

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

Test result:
GSM MODE

Frequency (MHz)	Peak EIRP(dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Polarization
1850.2	29.25	-4.8	8.6	25.45	Vertical
1880.0	29.15	-4.8	8.6	25.35	Vertical
1909.8	29.11	-4.8	8.6	25.31	Vertical

GPRS MODE

Frequency (MHz)	Peak EIRP(dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Polarization
1850.2	29.35	-4.8	8.6	25.55	Vertical
1880.0	29.23	-4.8	8.6	25.43	Vertical
1909.8	29.29	-4.8	8.6	25.49	Vertical

Single SIM

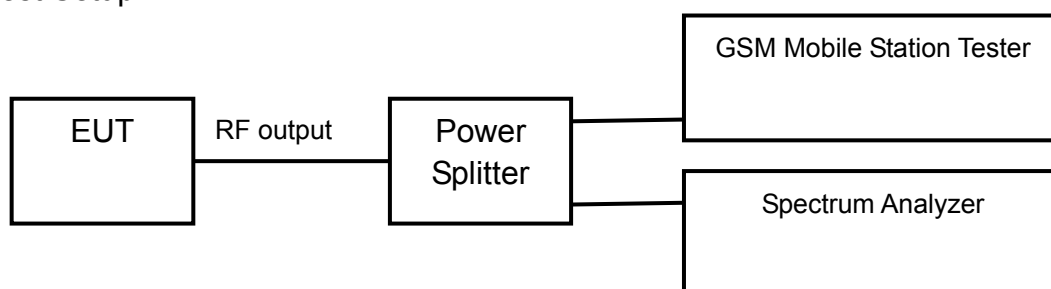
Frequency (MHz)	Peak EIRP(dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Polarization
1850.2	29.30	-4.8	8.6	25.50	Vertical

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 3 kHz 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:

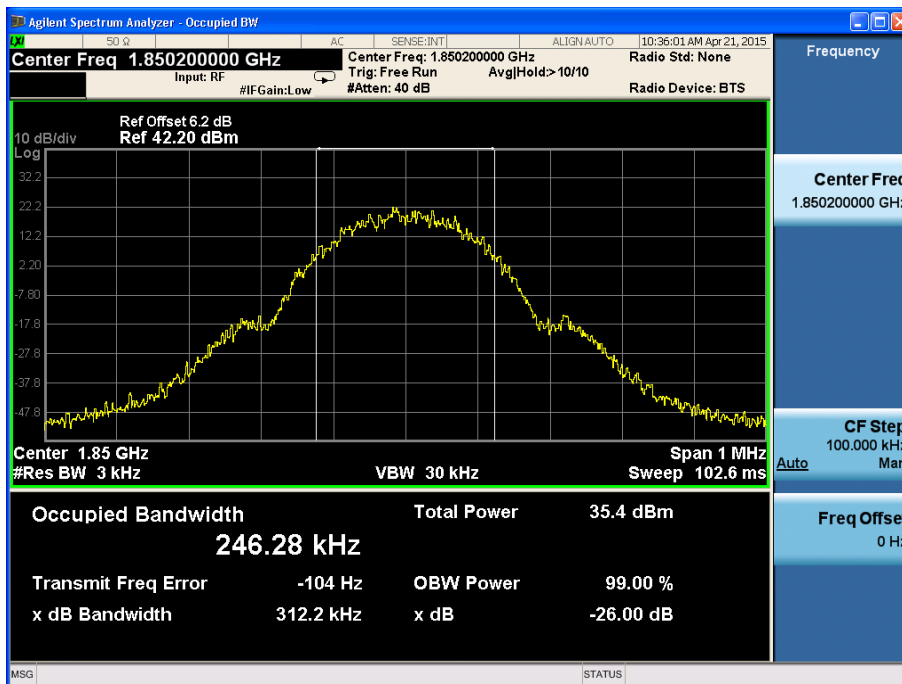
GSM MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (kHz)
1850.2	512	246.28
1880.0	661	244.04
1909.8	810	242.19

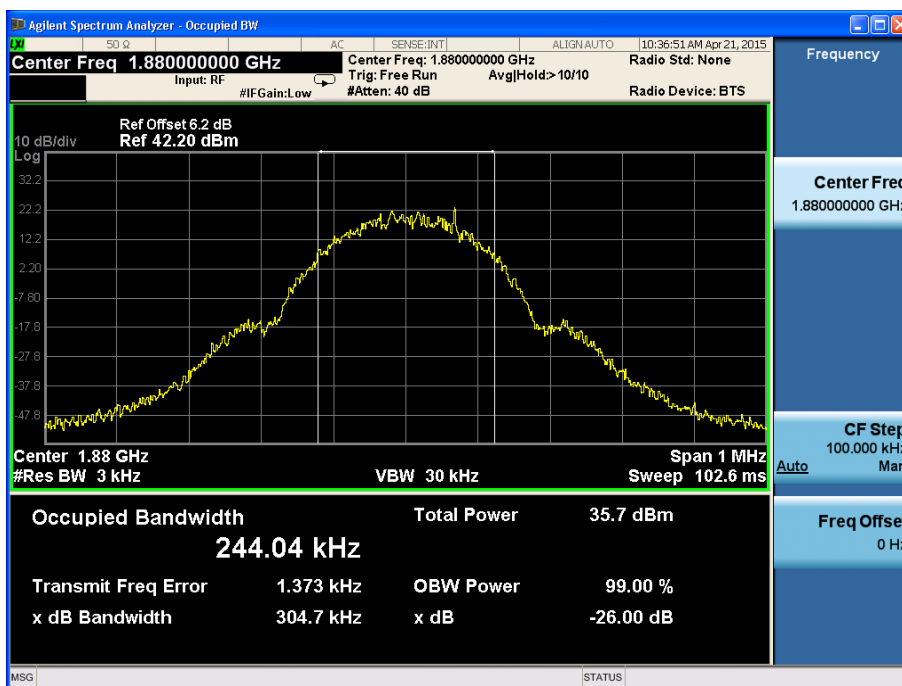
GPRS MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (kHz)
1850.2	512	247.84
1880.0	661	245.53
1909.8	810	246.75

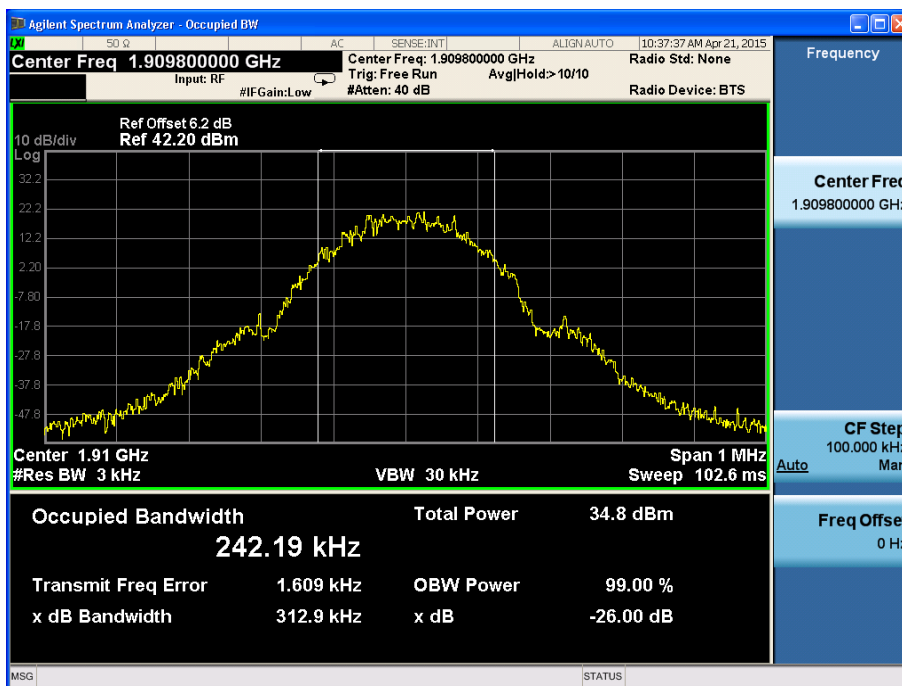
GSM MODE:



Channel 512

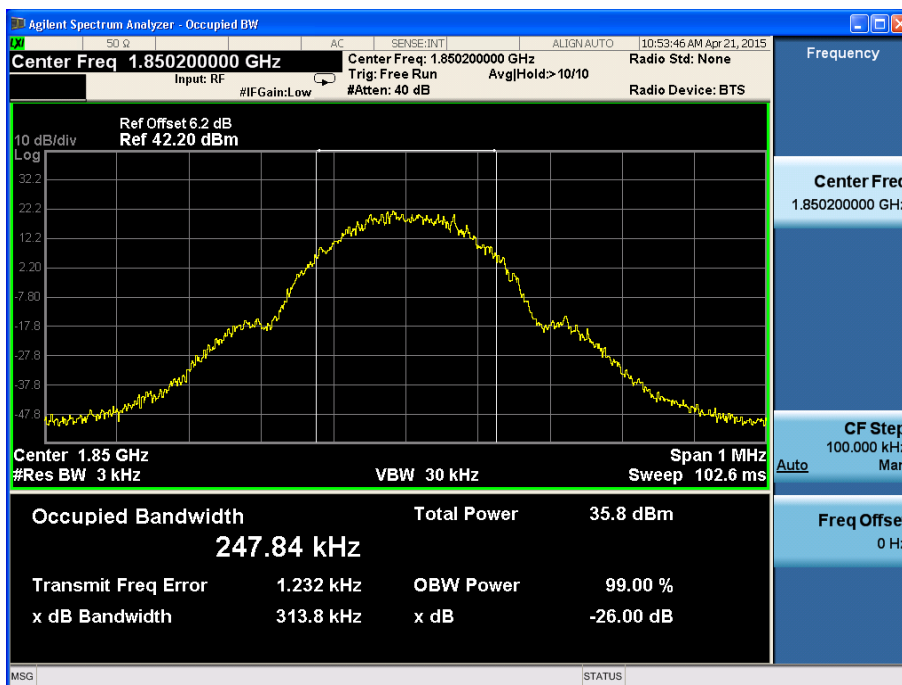


Channel 661

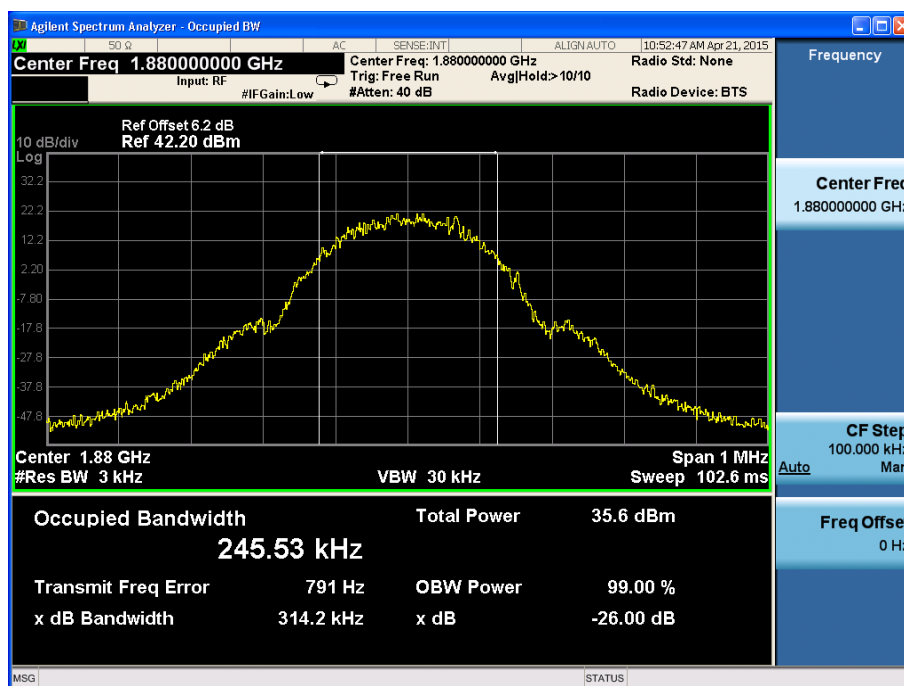


Channel 810

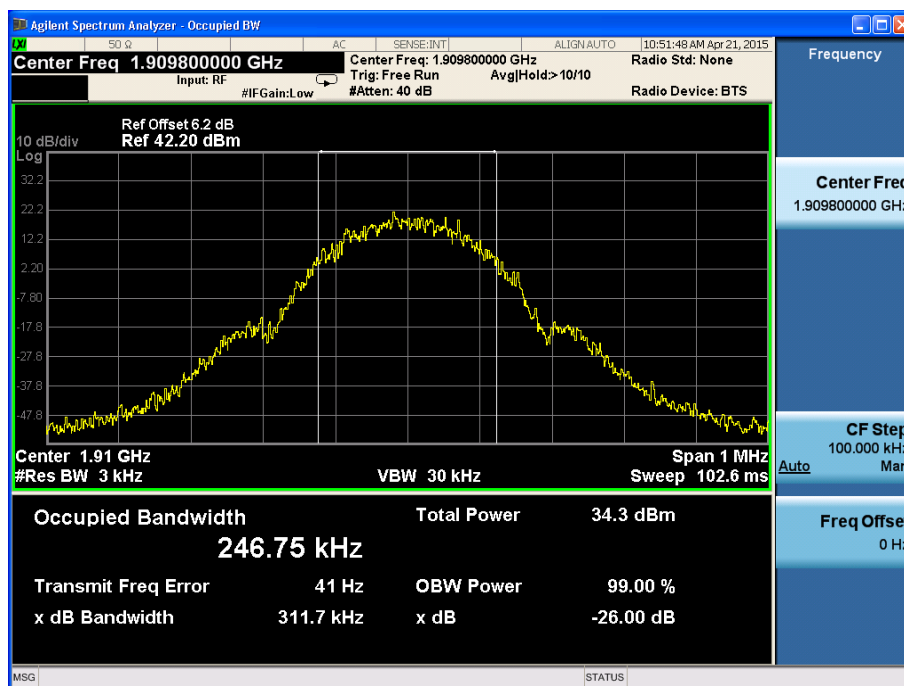
GPRS MODE:



Channel 512



Channel 661



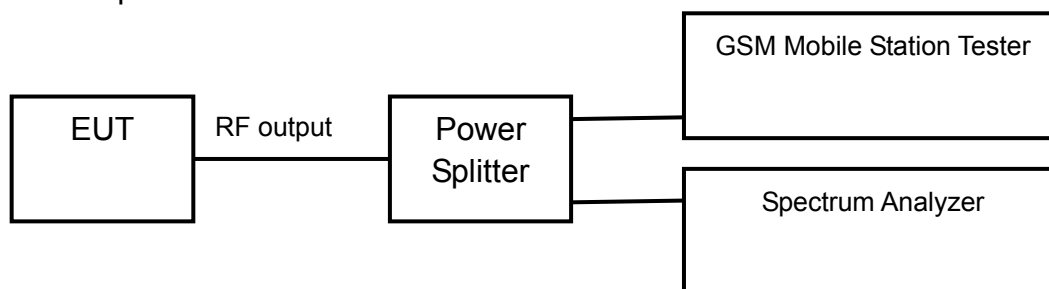
Channel 810

2.2.2.4 Emission Bandwidth-FCC Part24.238(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 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 MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of -26dB transmitter power (kHz)
1850.2	512	312.2
1880.0	661	304.7
1909.8	810	312.9

GPRS MODE:

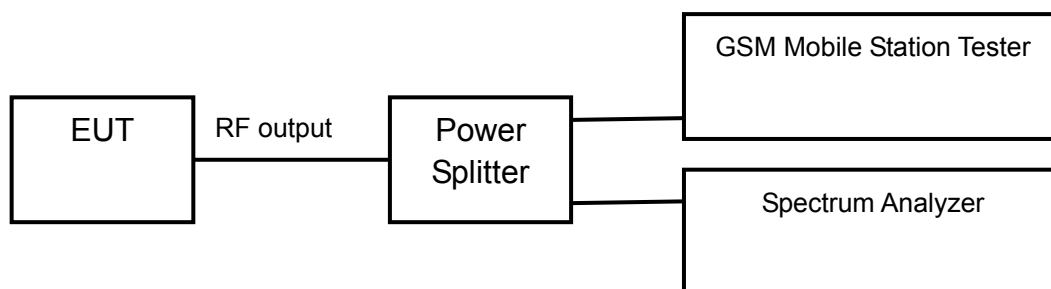
Carrier frequency (MHz)	Channel No.	Bandwidth of -26dB transmitter power (kHz)
1850.2	512	313.8
1880.0	661	314.2
1909.8	810	311.7

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.

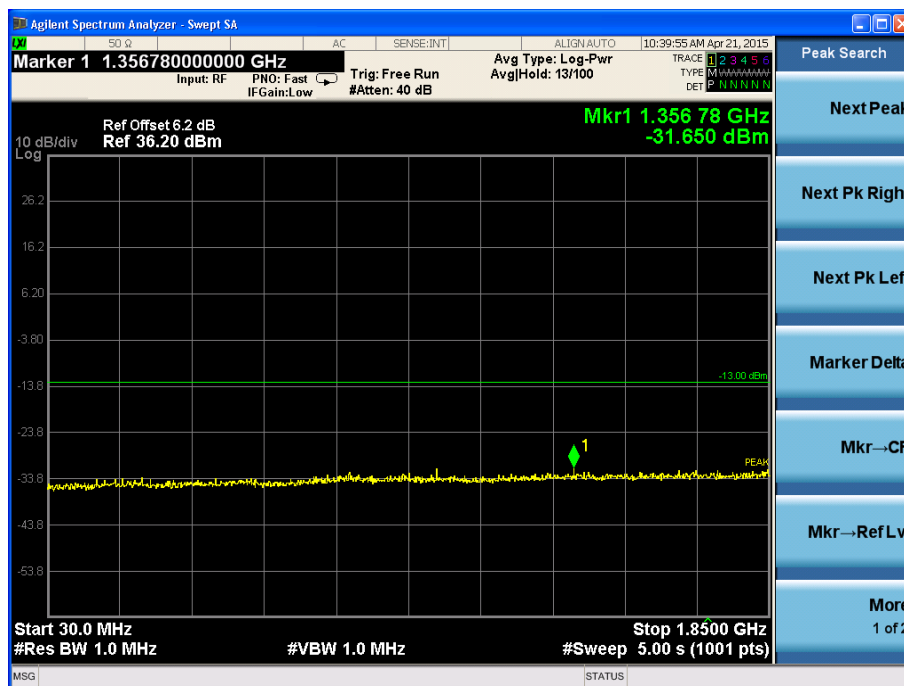
The measurement will be conducted at one channel No661 (middle channel of PCS1900 band)

Limits	$\leq -13\text{dBm}$
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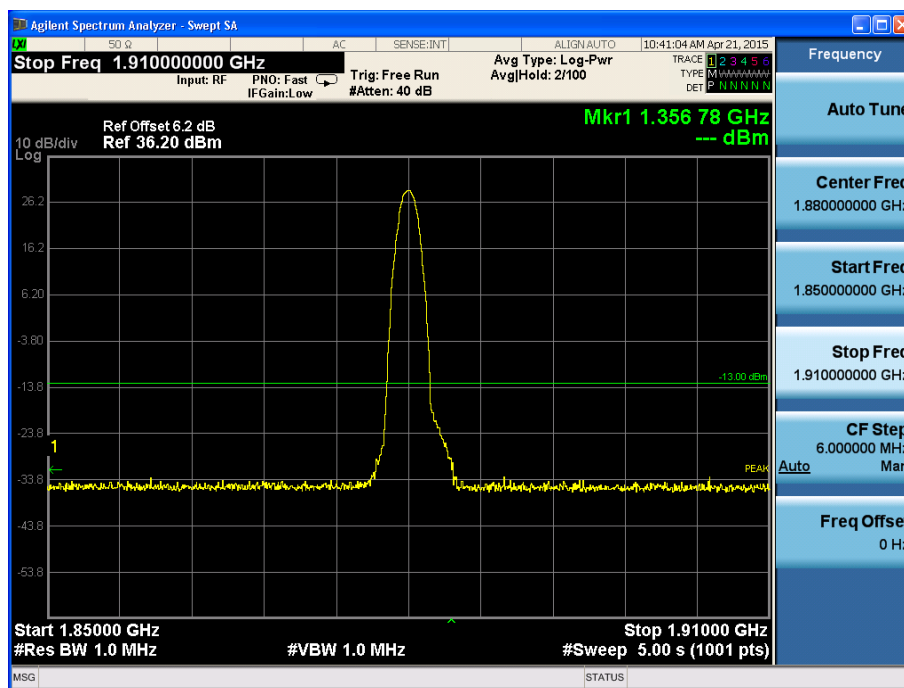
Test result:

Refer to the following figures.

GSM MODE:



Channel 661, 30MHz~1850MHz



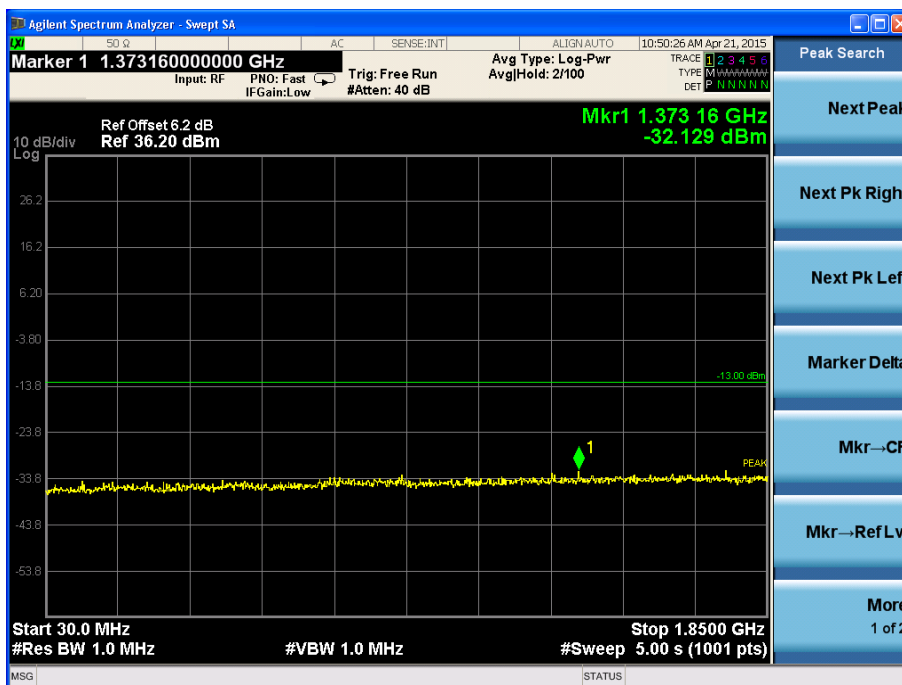
Channel 661, 1850MHz~1910MHz

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

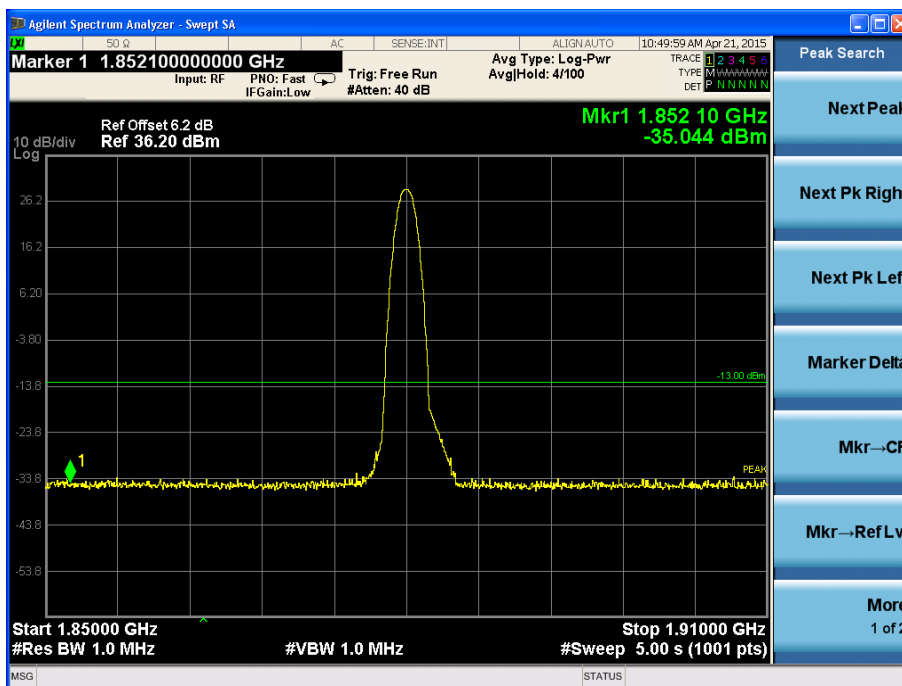


Channel 661, 1910MHz~20GHz

GPRS MODE:

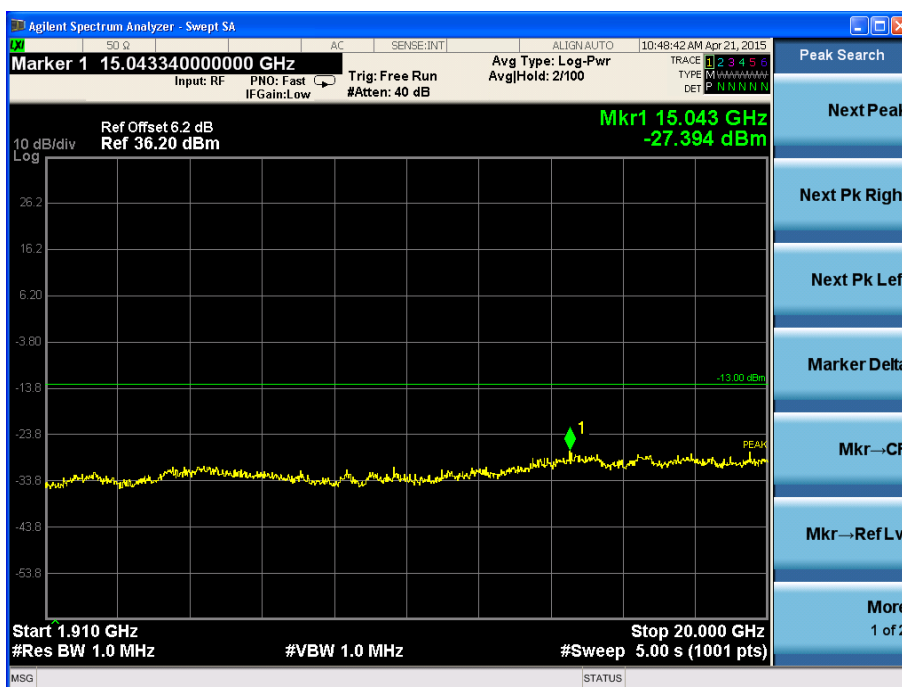


Channel 661, 30MHz~1850MHz



Channel 661, 1850MHz~1910MHz

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



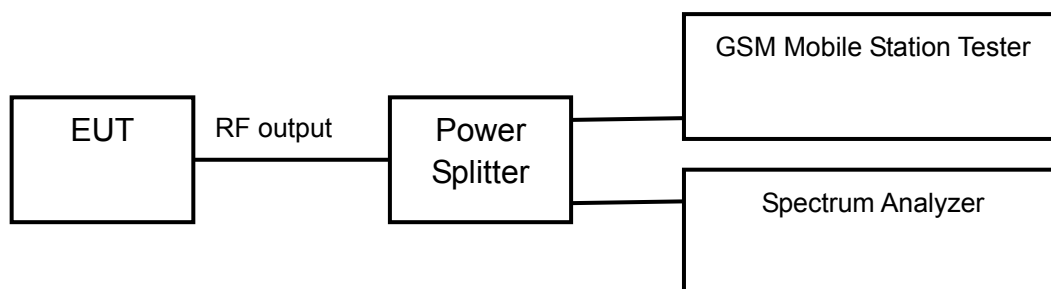
Channel 661, 1910MHz~20GHz

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.

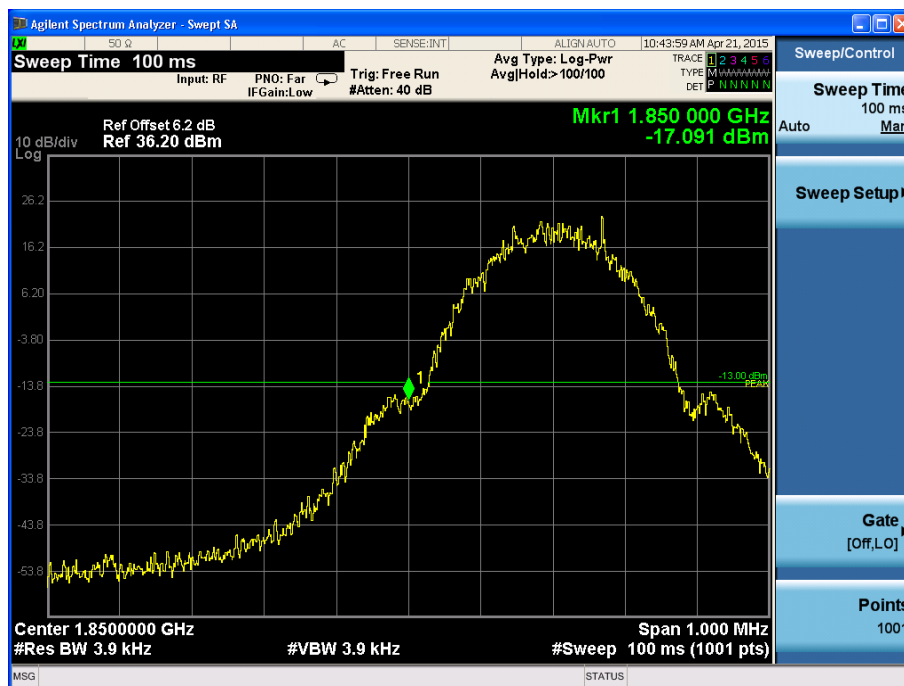
The measurement will be conducted at two channels No512 and No810 (Bottom and top channels of PCS1900 band)

Limits	$\leq -13\text{dBm}$
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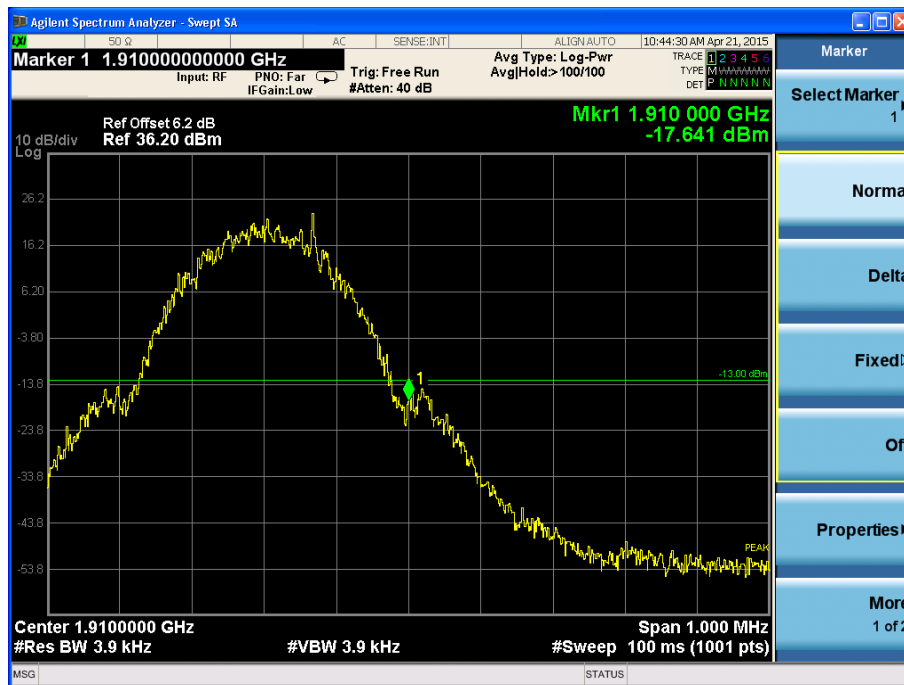
Test result:

Refer to the following figures.

GSM MODE:

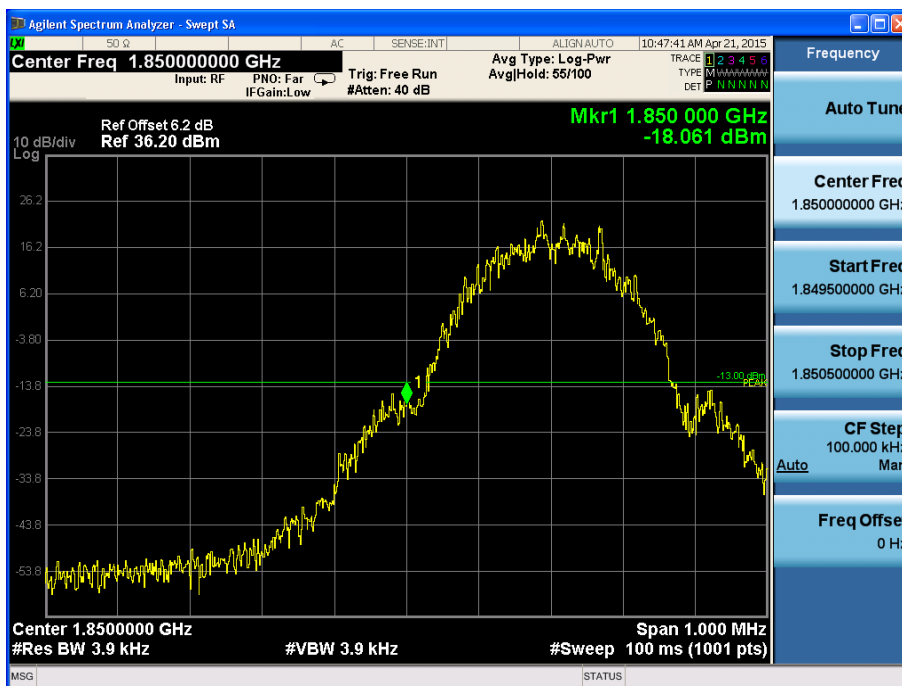


Channel 512

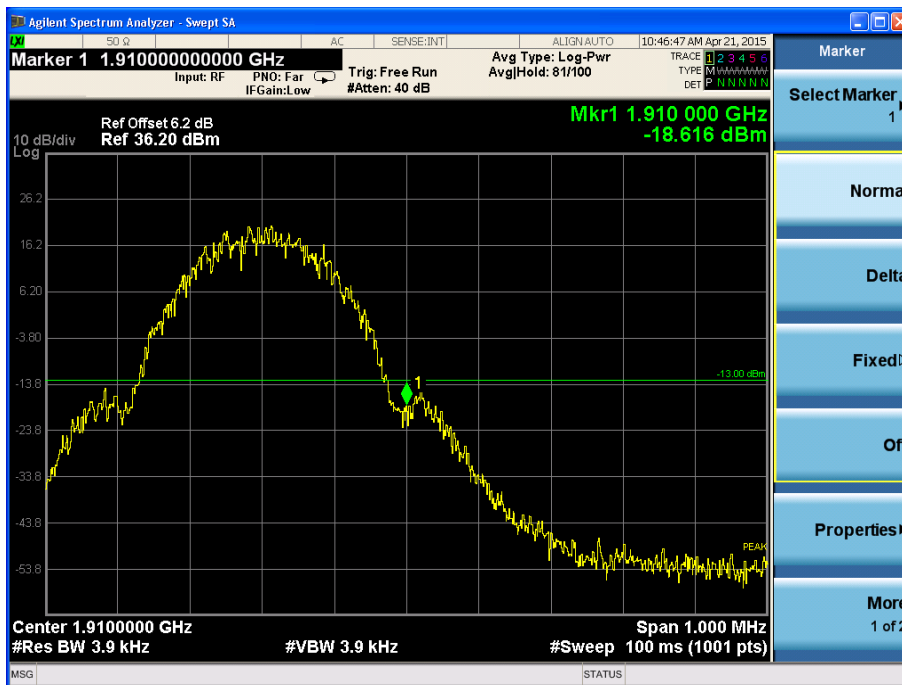


Channel 810

GPRS MODE:



Channel 512



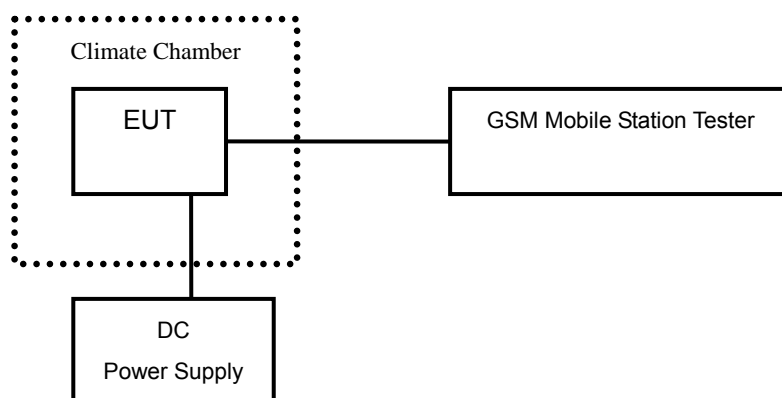
Channel 810

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 4.2V. 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 MODE:

Temperature(°C)	Test Result (ppm)@3.7V		
	Channel 512	Channel 661	Channel 810
-30	0.014	0.017	0.017
-20	0.014	0.016	0.016
-10	0.014	0.017	0.015
0	0.013	0.012	0.014
+10	0.011	0.013	0.011
+20	0.012	0.012	0.011
+30	0.012	0.015	0.012
+40	0.010	0.013	0.013
+50	0.010	0.013	0.014

Voltage (V)	Test Result (ppm)@20°C		
	Channel 512	Channel 661	Channel 810
3.5	0.011	0.010	0.013
4.2	0.011	0.012	0.012

GPRS MODE:

Temperature(°C)	Test Result (ppm)@3.7V		
	Channel 512	Channel 661	Channel 810
-30	0.021	0.015	0.014
-20	0.017	0.012	0.015
-10	0.019	0.012	0.016
0	0.016	0.012	0.014
+10	0.013	0.014	0.015
+20	0.015	0.015	0.016
+30	0.013	0.015	0.013
+40	0.013	0.013	0.014
+50	0.014	0.014	0.015

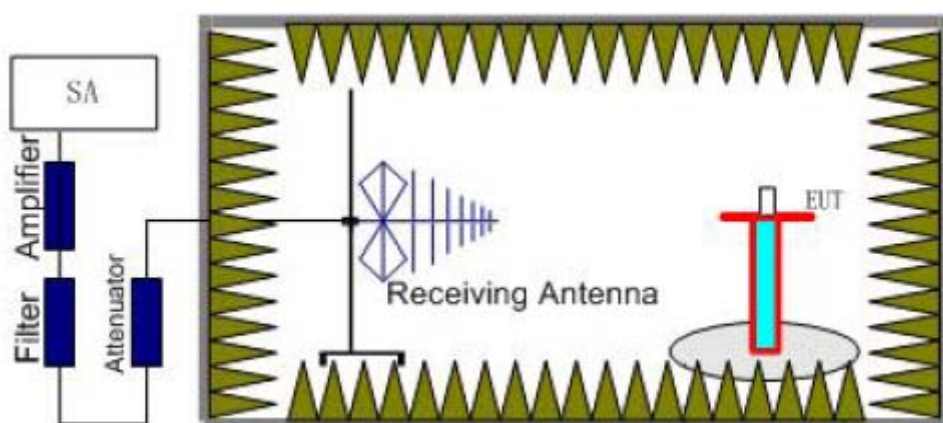
Voltage (V)	Test Result (ppm)@20°C		
	Channel 512	Channel 661	Channel 810
3.5	0.014	0.011	0.012
4.2	0.011	0.011	0.013

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

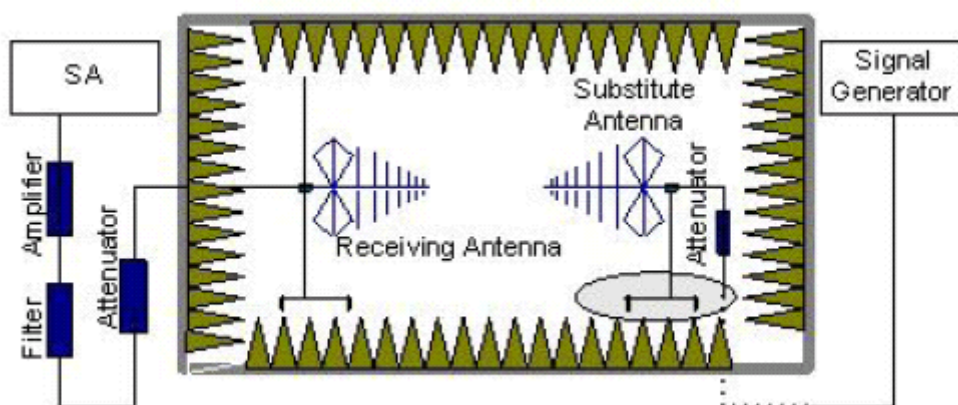
Ambient condition:

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 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
2847.78	-53.02	-5.8	8.9	-56.12	-13	Vertical
2869.70	-54.04	-5.8	8.9	-57.14	-13	Vertical
3671.06	-54.84	-7.9	10.4	-57.34	-13	Vertical
6978.73	-53.89	-9.4	12.0	-56.49	-13	Horizontal
7558.46	-55.39	-10.8	12.0	-56.59	-13	Vertical
17351.71	-56.46	-13.9	12.3	-54.86	-13	Vertical

GSM/GPRS MODE Channel 661

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2826.12	-52.11	-5.8	8.9	-55.21	-13	Vertical
2879.09	-52.48	-5.8	8.9	-55.58	-13	Horizontal
3711.90	-53.00	-7.9	10.4	-55.50	-13	Vertical
6957.54	-54.11	-9.4	12.0	-56.71	-13	Vertical
7555.48	-53.62	-10.8	12.0	-54.82	-13	Vertical
17355.46	-54.46	-13.9	12.3	-52.86	-13	Vertical

GSM/GPRS MODE Channel 810

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2847.87	-52.79	-5.8	8.9	-55.89	-13	Vertical
2859.79	-52.88	-5.8	8.9	-55.98	-13	Vertical
3756.24	-53.52	-7.9	10.4	-56.02	-13	Horizontal
6990.30	-54.24	-9.4	12.0	-56.84	-13	Vertical
7545.71	-54.81	-10.8	12.0	-56.01	-13	Vertical
17339.43	-57.18	-13.9	12.3	-55.58	-13	Vertical

Single SIM

GSM/GPRS MODE Channel 661

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2824.69	-52.34	-4.6	8.3	-56.04	-13	Vertical
2875.85	-52.83	-5.9	8.9	-55.83	-13	Horizontal
3721.54	-53.54	-5.9	8.9	-56.54	-13	Vertical
6943.88	-54.56	-7.5	10.2	-57.26	-13	Vertical
7563.62	-53.95	-9.4	12.0	-56.55	-13	Vertical
17350.88	-54.99	-11.4	13.8	-57.39	-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	2015.8
2	N9020A Spectrum Analyzer	Agilent	MY48010771	2015.8
3	DC Power Supply E3645A	Agilent	MY40000740	2015.8
4	Power Splitter 11850C	Agilent	026057	2015.8
5	Temperature chamber SH241	ESPEC	92000390	2015.8
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	2015.8
10	HL562 Ultra log antenna	R&S	100016	2015.8
11	3160-09 Receive antenna	SCHWARZ-BECK	002058-002	2015.8
12	ESI 40 EMI test receiver	R&S	100015	2015.8
13	Radio tester	CMU 200	114667	2015.8

Appendix

Appendix1 Test Setup