



TEST REPORT

Report No.: SRTC2014-H024-E0033

Product Name: GSM/GPRS/EDGE/UMTS

Digital Mobile Phone with Bluetooth and WiFi

Product Model: Philips I928

Applicant: Shenzhen Sang Fei Consumer Communications
Co., Ltd.

Manufacturer: Shenzhen Sang Fei Consumer Communications
Co., Ltd.

Specification: FCC Part 24E, Part 22H, Part 2
(October 1, 2013 edition)

FCC ID: VQRCTI928

The State Radio_monitoring_center Testing Center (SRTC)

No.80 Beilishi Road Xicheng District Beijing, China

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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@srrc.org.cn / wangjunfeng@srtc.org.cn

1.3 Applicant's details

Company: Shenzhen Sang Fei Consumer Communications Co., Ltd.
Address: 11 Science & Technology Rd., Shenzhen Hi-tech Industrial
Park, Nanshan District
City: Shenzhen
Country or Region: China
Grantee Code: VQR
Contacted person: Helen.Lin
Tel: 86-755-33308888
Fax: 86-755-26614979
Email: Helen.Lin@sangfei.com

1.4 Manufacturer's details

Company: Shenzhen Sang Fei Consumer Communications Co., Ltd.
Address: 11 Science & Technology Rd., Shenzhen Hi-tech Industrial
Park, Nanshan District
City: Shenzhen
Country or Region: China
Contacted person: Helen.Lin
Tel: 86-755-33308888
Fax: 86-755-26614979
Email: Helen.Lin@sangfei.com

1.5 Application details

Date of reception of test sample: 10th June 2014

Date of test: 13th June 2014 to 4th July 2014

1.6 Reference specification

FCC Part 24E, Part22H, Part 2 (October 1, 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	VQRCTI928
Frequency Range	WCDMA Band II: Tx:1850~1910MHz Rx:1930~1990MHz WCDMA Band V: Tx:824~849MHz Rx:869~894MHz
Rated Output Power	WCDMA Band II:24.0dBm WCDMA Band V:24.0dBm
Modulation Type	QPSK
Emission Designator	4M50F9W
Duplex Mode	FDD
Duplex Spacing	WCDMA Band II:80MHz WCDMA Band V:45MHz
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: 4.2V
HW Version	TMBHb
SW Version	I928_M6592_1418_00_V01A_T01_AG

1.7.2 EUT details

Product Name	Product Model	IMEI
GSM/GPRS/EDGE/UMTS Digital Mobile Phone with Bluetooth and WiFi	Philips I928	864359020039884

1.7.3 Auxiliary equipment details

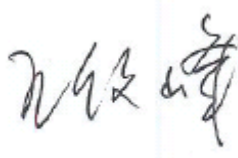
Equipment	Charger
Manufacturer	Salcomp (Shenzhen) Co., Ltd
Model Number	S14B08
Input Voltage	100V-240V a.c.
Output Voltage	5.0V d.c.
Frequency	50/60Hz

Equipment	Battery
Manufacturer	harbin coslight powerco.,ltd
Model Number	AB3000BWMC
Capacity	3000mAh
Rated Voltage	3.8V d.c.

2. Test information

2.1 Summary of the test results

No.	Test case	FCC reference	Verdict
1	RF Power Output	22.913(a)/24.232(b)	Pass
2	Effective Radiated Power and Effective Isotropic Radiated Power	22.913(a)/24.232(b)	Pass
3	Occupied Bandwidth	2.1049	Pass
4	Emission Bandwidth	22.917(b)/24.238(b)	Pass
5	Spurious Emissions at antenna terminal	2.1051/22.917/24.238	Pass
6	Band Edges Compliance	22.917(b)/24.238(b)	Pass
7	Frequency Stability	2.1055/22.355/24.235	Pass
8	Radiated Spurious Emissions	2.1053/22.917(a)/24.238	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. Zhang Wentao Test engineer 	Issued date: 2014.07.22

2.2 Test result

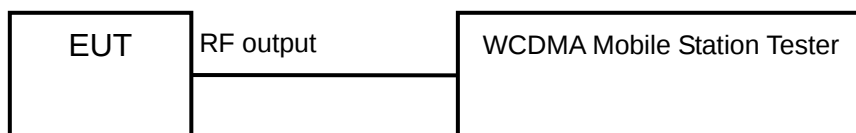
2.2.1 WCDMA Band II

2.2.1.1 RF Power Output-FCC Part24.232(b)

Ambient condition:

Temperature	Relative humidity	Pressure
19.3°C	41.3%	100.7kPa

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 No9262, No9400 and No9538 (Bottom, middle and top channels of WCDMA band II)

Limits	$\leq 24\text{dBm}$
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Test result:

WCDMA Mode:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
1852.4	9262	21.67
1880.0	9400	21.77
1907.6	9538	20.55

HSDPA/HSUPA Mode:

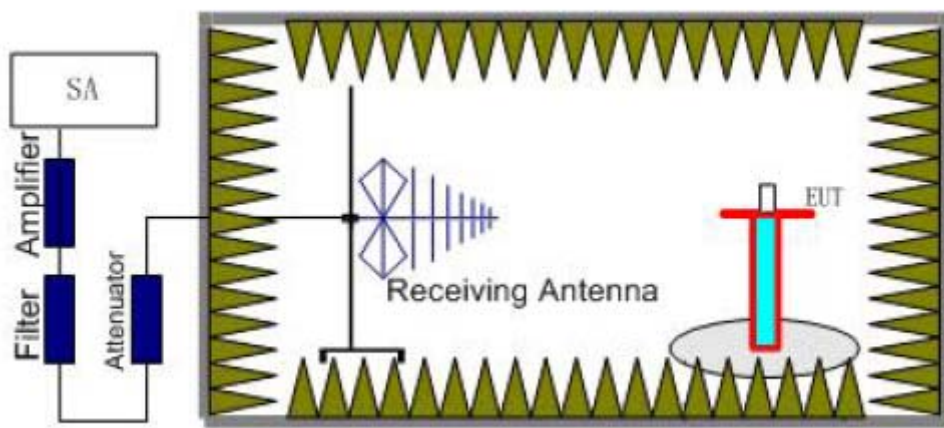
Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
1852.4	9262	21.00
1880.0	9400	21.10
1907.6	9538	20.00

2.2.1.2 Effective Isotropic Radiated Power-FCC Part24.232(b)

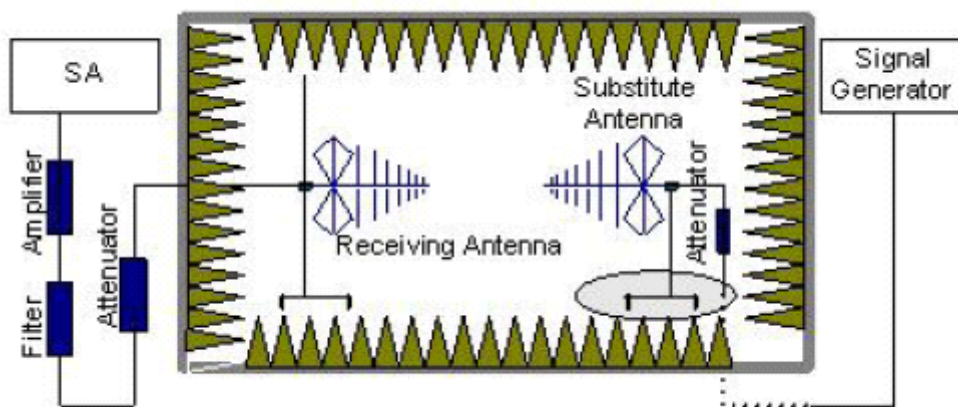
Ambient condition:

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:

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

The measurement will be done at three channels No9262, No9400 and No9538 (Bottom, middle and top channels of WCDMA band II).

Limits	≤33dBm
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Test result:

WCMDA Mode:

Frequency (MHz)	Peak EIRP(dBm)	Pca Cable loss	Ga Antenna Gain (dB)	Pmea (dBm)	Polarization
1852.6	20.98	-5.0	8.6	17.38	Vertical
1880.0	20.59	-5.0	8.6	16.99	Vertical
1907.4	20.54	-5.0	8.6	16.94	Vertical

HSDPA/HSUPA Mode:

Frequency (MHz)	Peak EIRP(dBm)	Pca Cable loss	Ga Antenna Gain (dB)	Pmea (dBm)	Polarization
1852.6	20.82	-5.0	8.6	17.22	Vertical
1880.0	20.29	-5.0	8.6	16.69	Vertical
1907.4	20.40	-5.0	8.6	16.80	Vertical

Frequency: 1852.6MHz

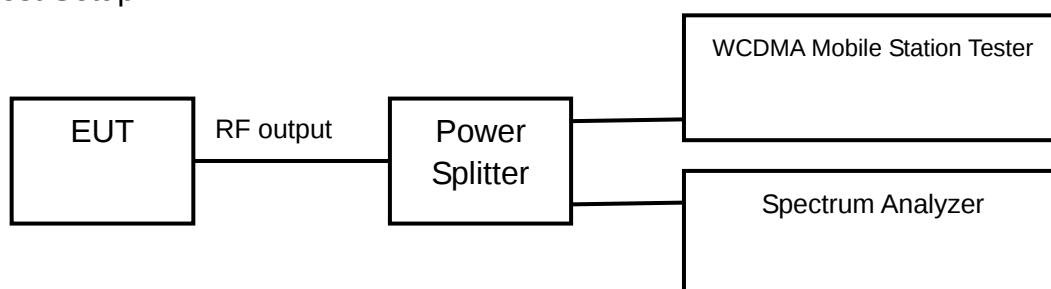
Peak ERP(dBm) = Pmea(17.38dBm)+Pca(-5.0dB)+Ga(8.6dB) = 20.98dBm

2.2.1.3 Occupied Bandwidth-FCC Part2.1049

Ambient condition:

Temperature	Relative humidity	Pressure
21°C	44%	101.5kPa

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 30kHz on spectrum analyzer. The bandwidth of 99% power can be read on spectrum analyzer.

The measurement will be conducted at three channels No9262, No9400 and No9538 (Bottom, middle and top channels of WCDMA band II)

Limits: No specific occupied bandwidth requirements in part 2.1049

Test result:

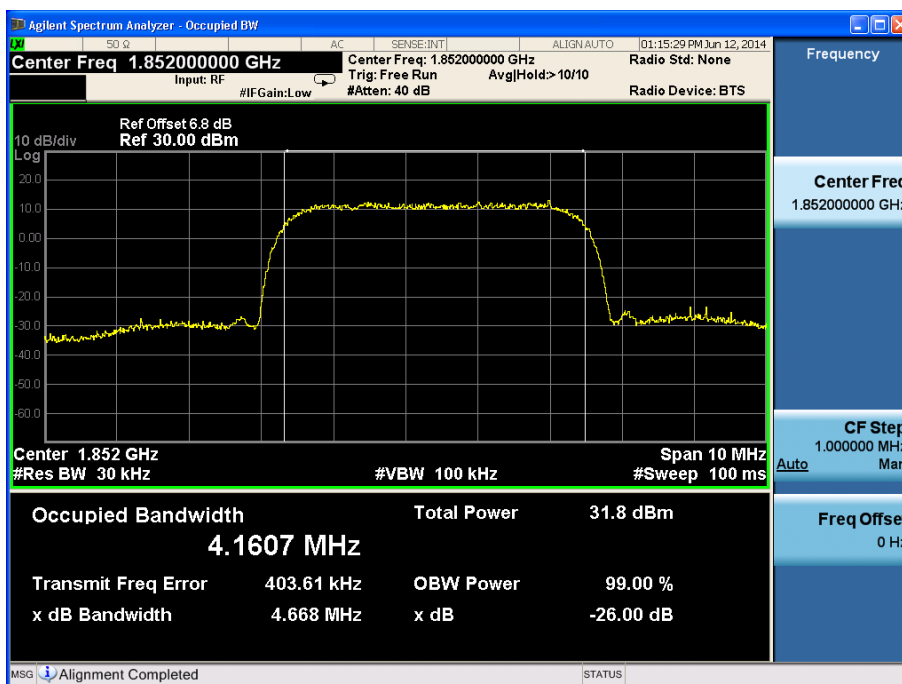
WCDMA Mode:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (MHz)
1852.4	9262	4.1607
1880.0	9400	4.1620
1907.6	9538	4.1645

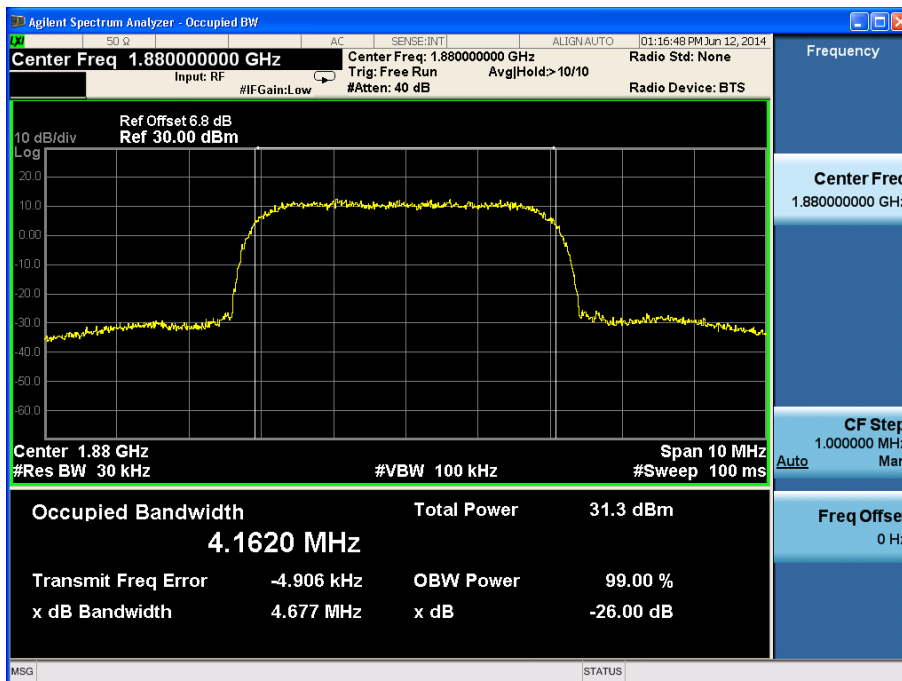
HSDPA/HSUPA Mode:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (MHz)
1852.4	9262	4.1602
1880.0	9400	4.1603
1907.6	9538	4.1709

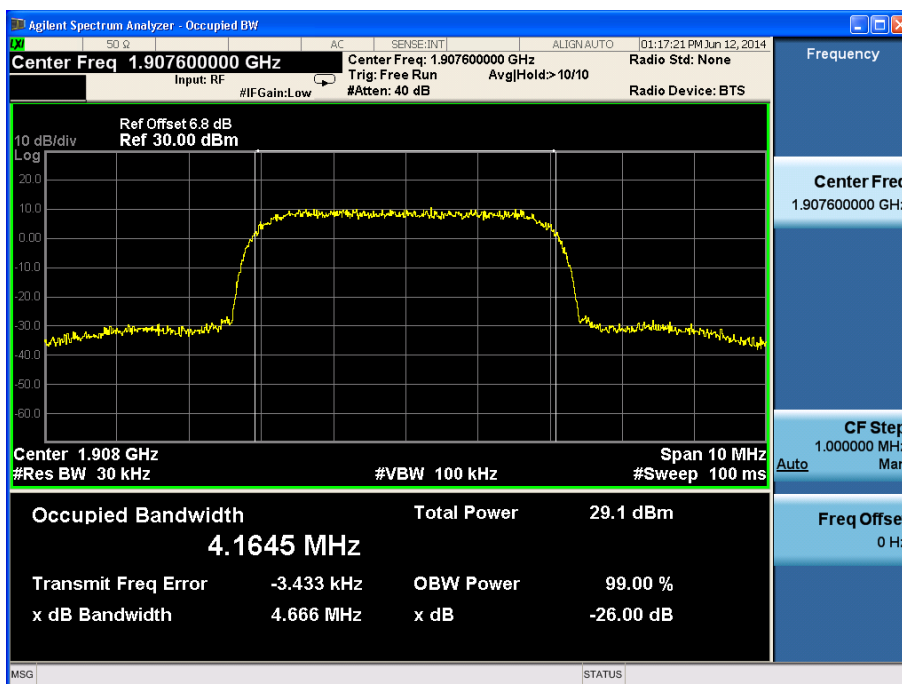
WCDMA Mode:



Channel 9262

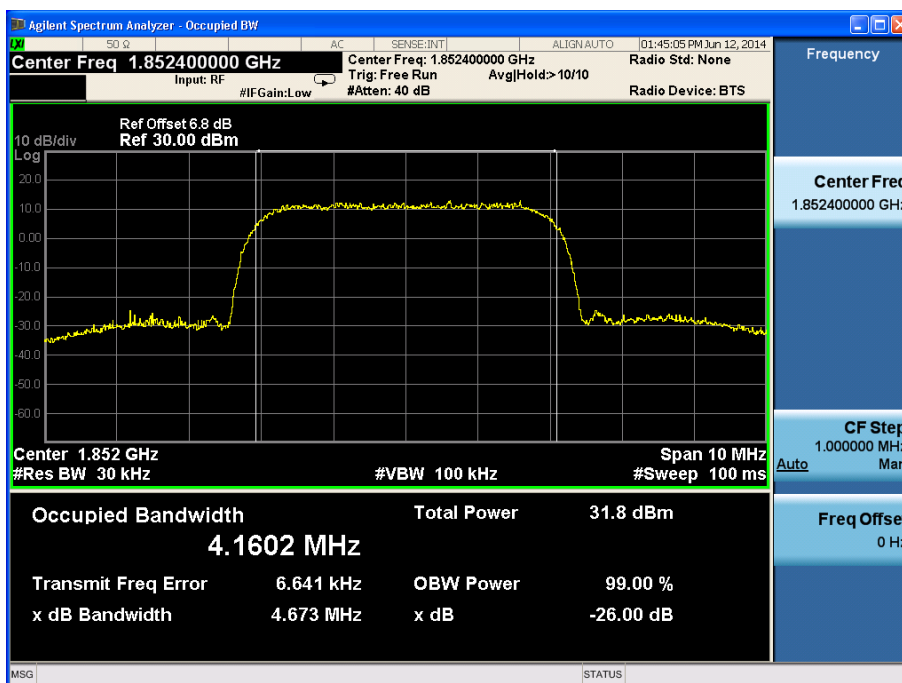


Channel 9400

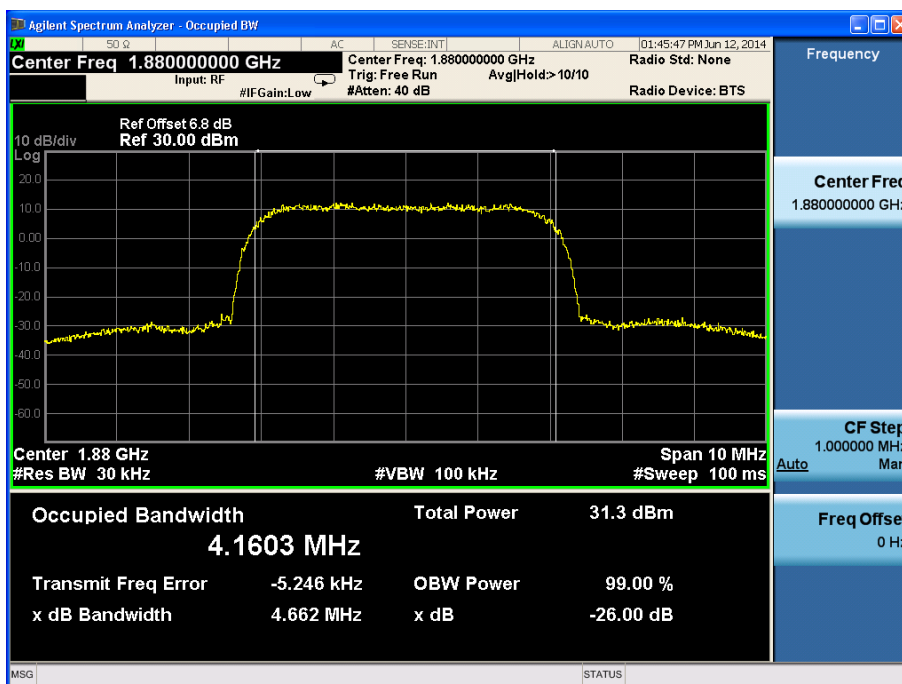


Channel 9538

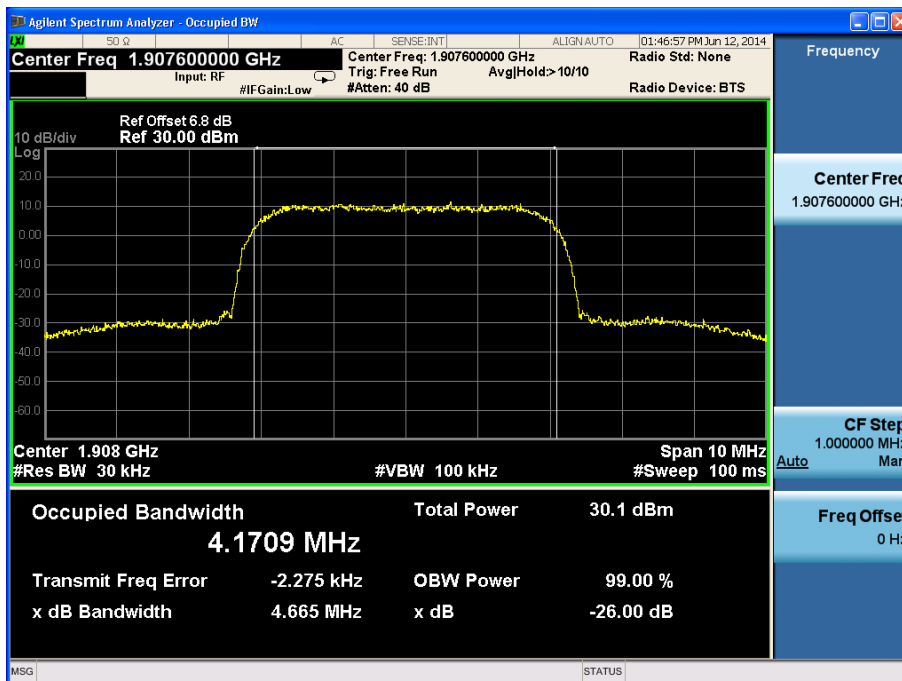
HSDPA/HSUPA Mode:



Channel 9262



Channel 9400



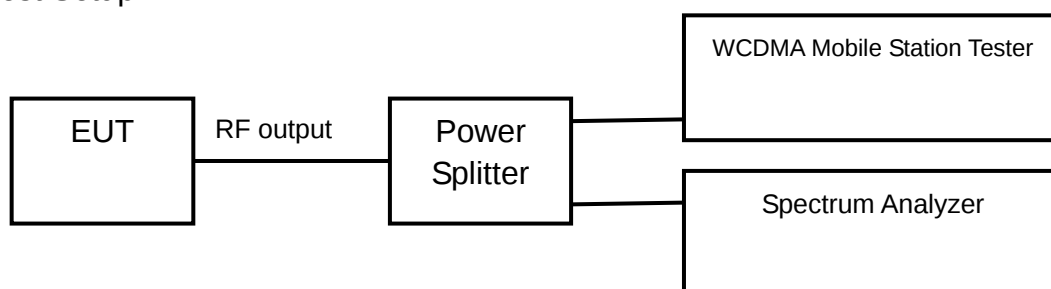
Channel 9538

2.2.1.4 Emission Bandwidth-FCC Part24.238(b)

Ambient condition:

Temperature	Relative humidity	Pressure
21°C	44%	101.5kPa

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 30kHz on spectrum analyzer. The bandwidth of -26dBc power can be read on spectrum analyzer.

The measurement will be conducted at three channels No9262, No9400 and No9538 (Bottom, middle and top channels of WCDMA band II)

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

Test result:

WCDMA Mode:

Carrier frequency (MHz)	Channel No.	Bandwidth of -26dBc Power (MHz)
1852.4	9262	4.668
1880.0	9400	4.677
1907.6	9538	4.666

HSDPA/HSUPA Mode:

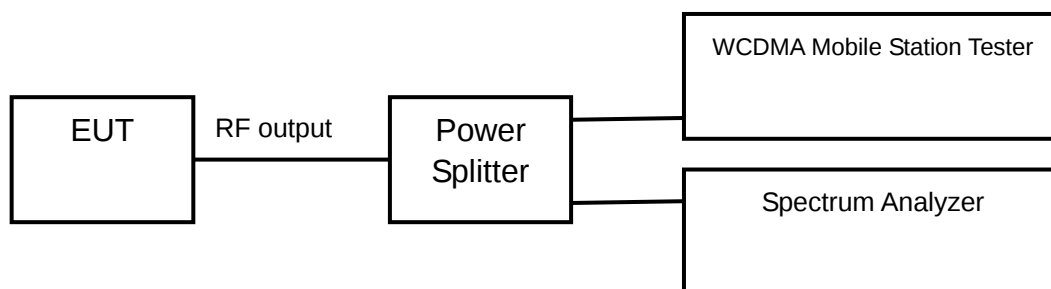
Carrier frequency (MHz)	Channel No.	Bandwidth of -26dBc Power (MHz)
1852.4	9262	4.673
1880.0	9400	4.662
1907.6	9538	4.665

2.2.1.5 Spurious Emissions at antenna terminal-FCC Part2.1051/24.238

Ambient condition:

Temperature	Relative humidity	Pressure
21°C	44%	101.5kPa

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.

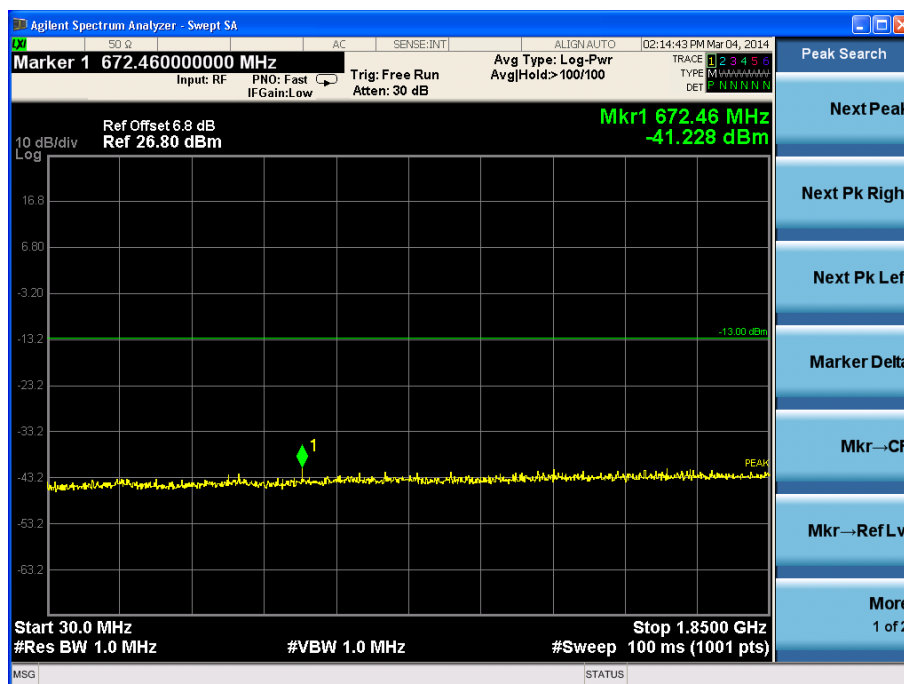
The measurement will be conducted at one channel No9400 (middle channel of WCDMA band II)

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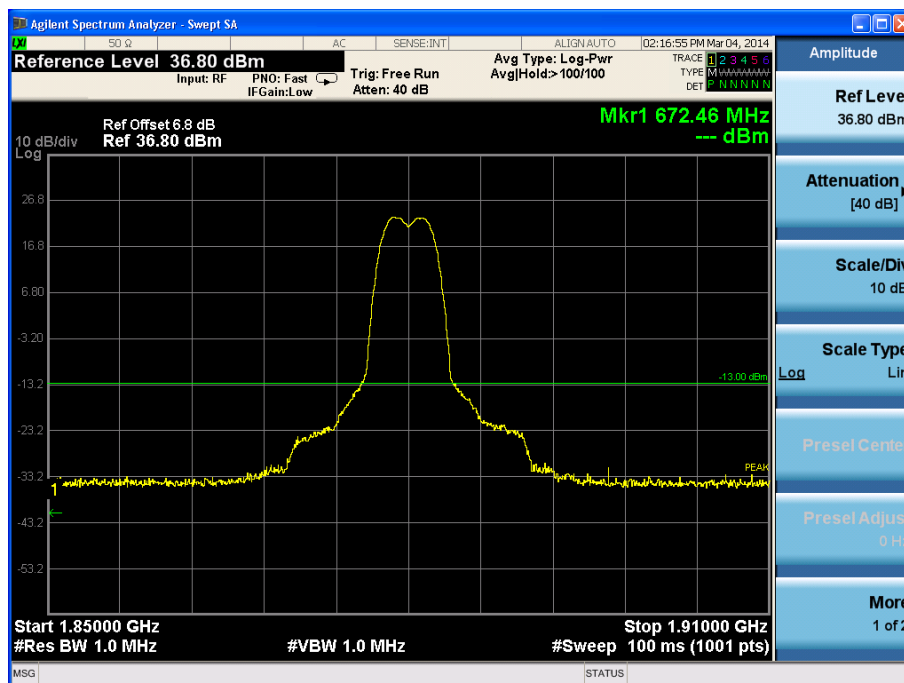
Test result:

Refer to the following figures.

WCDMA Mode:

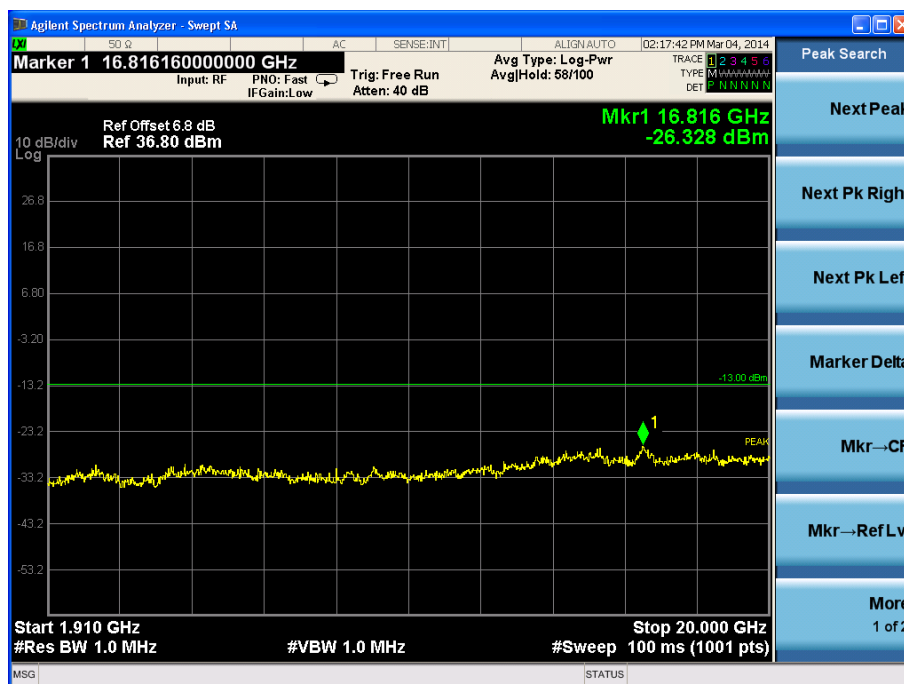


Channel 9400, 30MHz~1850MHz



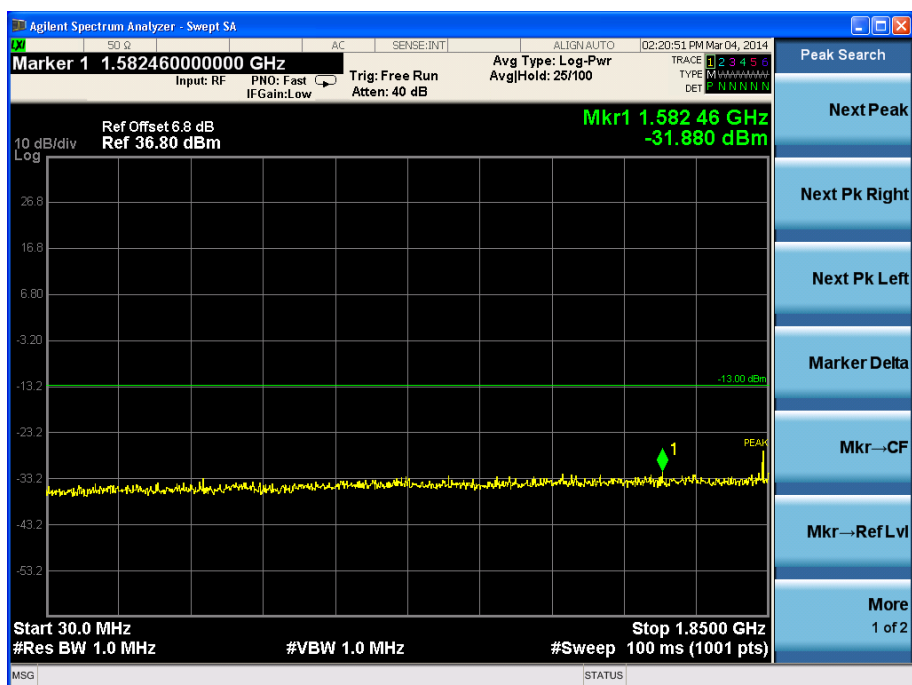
Channel 9400, 1850MHz~1910MHz

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

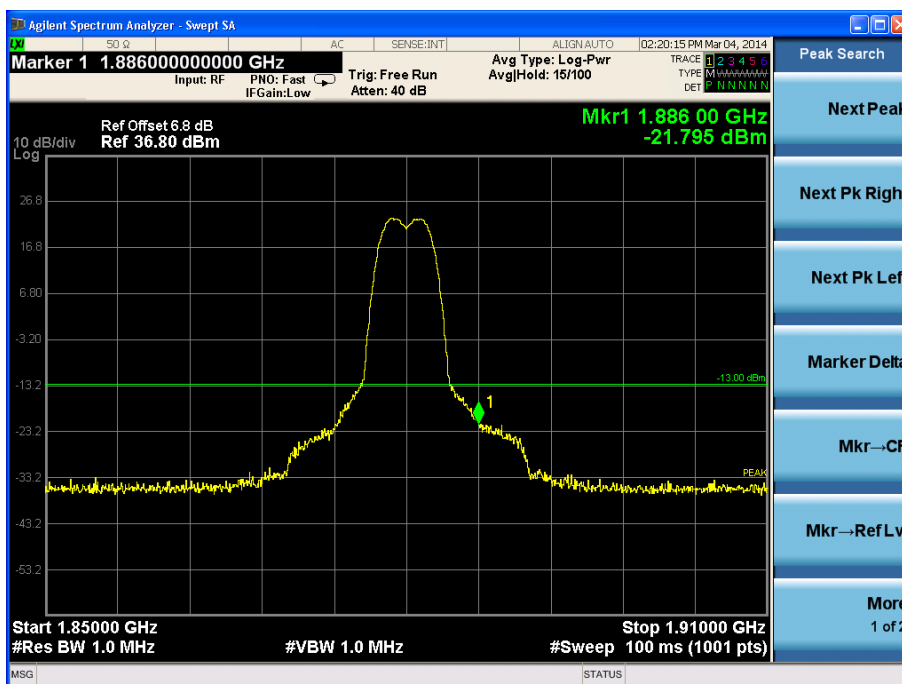


Channel 9400, 1910MHz~20GHz

HSDPA/HSUPA Mode:

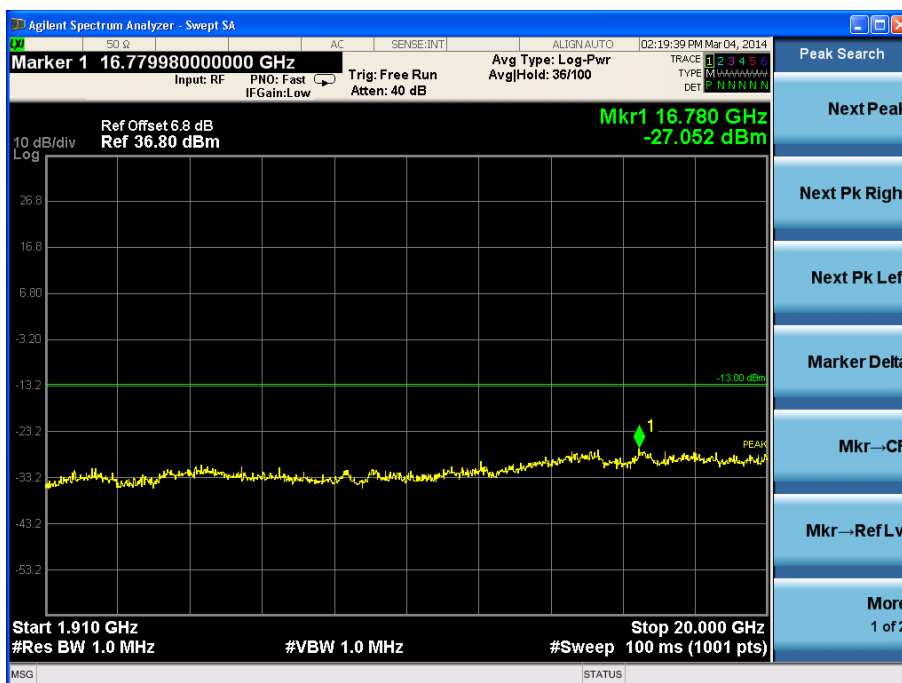


Channel 9400, 30MHz~1850MHz



Channel 9400, 1850MHz~1910MHz

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



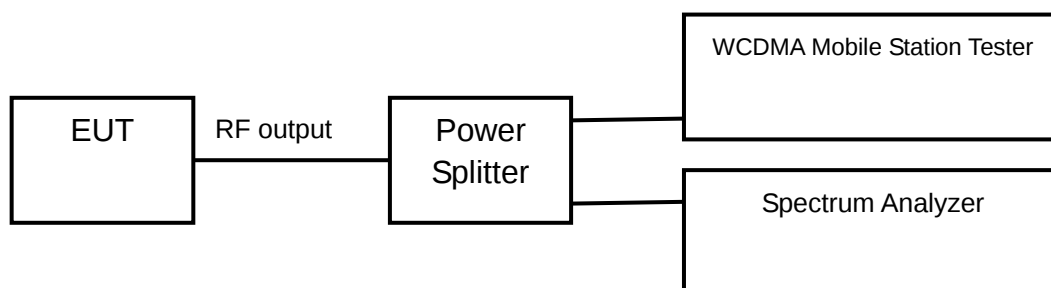
Channel 9400, 1910MHz~20GHz

2.2.1.6 Band Edges Compliance-FCC Part24.238(b)

Ambient condition:

Temperature	Relative humidity	Pressure
21°C	44%	101.5kPa

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.

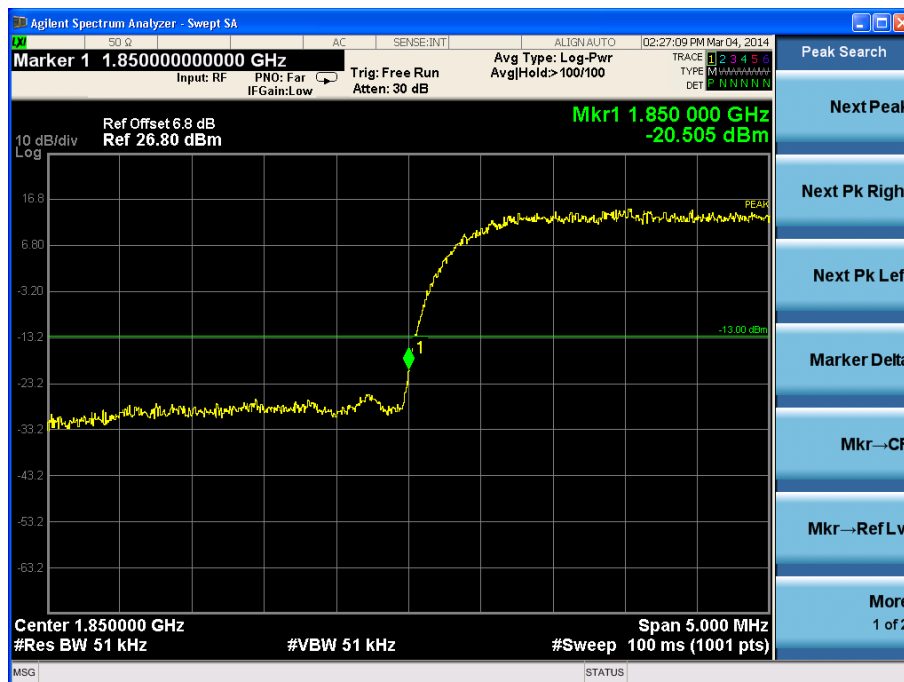
The measurement will be conducted at two channels No9262 and No9538 (Bottom and top channels of WCDMA band II)

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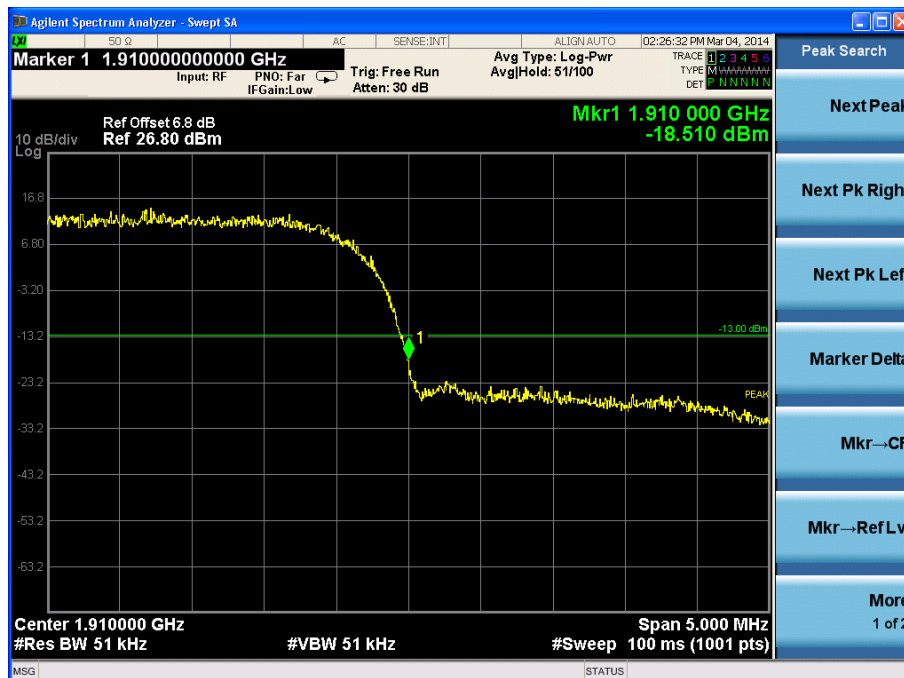
Test result:

Refer to the following figures.

WCDMA Mode:

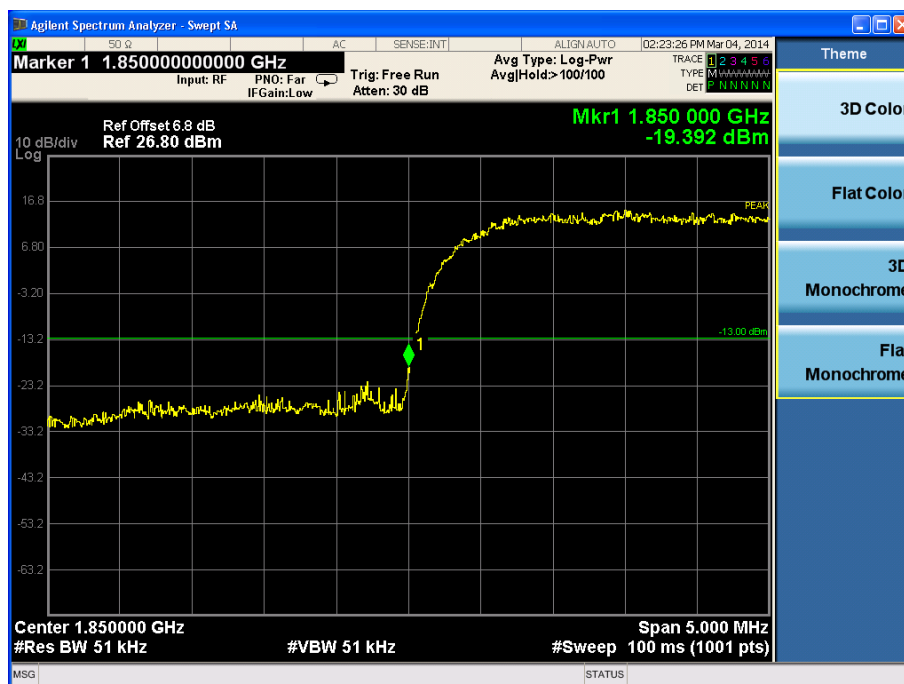


Channel 9262

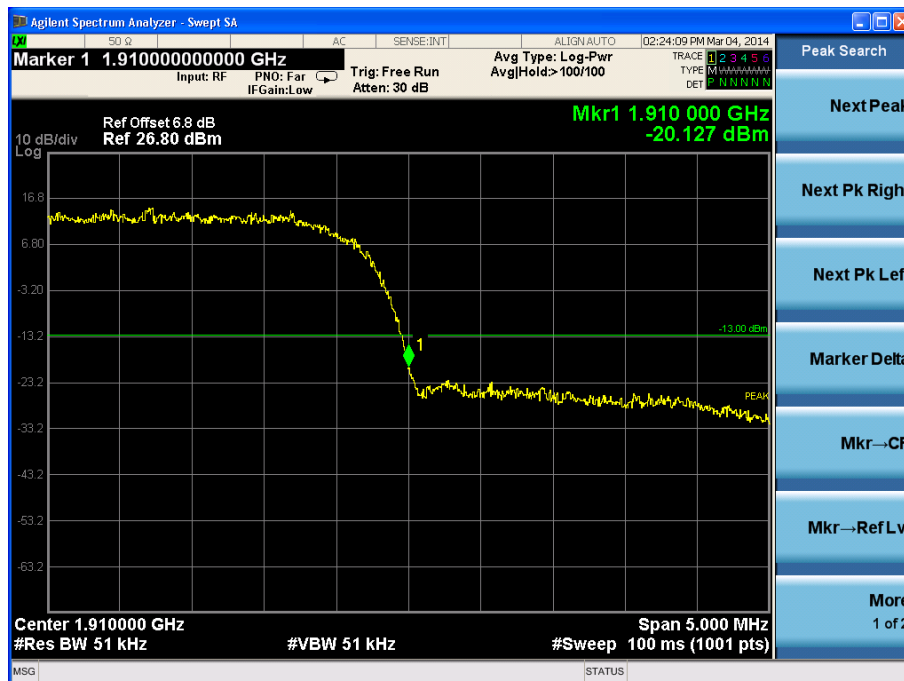


Channel 9538

HSDPA/HSUPA Mode:



Channel 9262



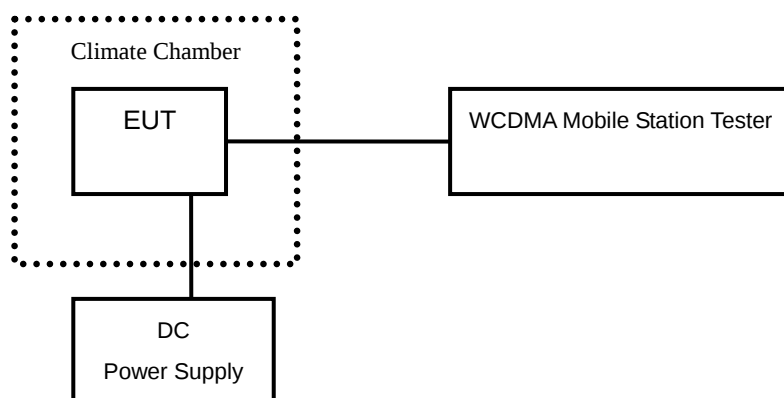
Channel 9538

2.2.1.7 Frequency Stability-FCC Part2.1055/24.235

Ambient condition:

Temperature	Relative humidity	Pressure
21°C	44%	101.5kPa

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 No9262, No9400 and No9538 (Bottom, middle and top channels of WCDMA band II).

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

Test result:

WCDMA Mode:

Temperature(°C)	Test Result (ppm)@3.8V		
	Channel 9262	Channel 9400	Channel 9538
-30	0.011	0.010	0.011
-20	0.012	0.011	0.010
-10	0.011	0.012	0.012
0	0.010	0.011	0.009
+10	0.011	0.010	0.011
+20	0.012	0.011	0.010
+30	0.010	0.012	0.011
+40	0.012	0.011	0.012
+50	0.010	0.010	0.012

Voltage (V)	Test Result (ppm)@20°C		
	Channel 9262	Channel 9400	Channel 9538
3.5	0.012	0.011	0.010
4.2	0.010	0.012	0.011

HSDPA/HSUPA Mode:

Temperature(°C)	Test Result (ppm)@3.8V		
	Channel 9262	Channel 9400	Channel 9538
-30	0.011	0.010	0.011
-20	0.012	0.011	0.010
-10	0.013	0.009	0.012
0	0.012	0.011	0.010
+10	0.010	0.012	0.011
+20	0.012	0.011	0.012
+30	0.011	0.013	0.013
+40	0.012	0.011	0.012
+50	0.011	0.011	0.011

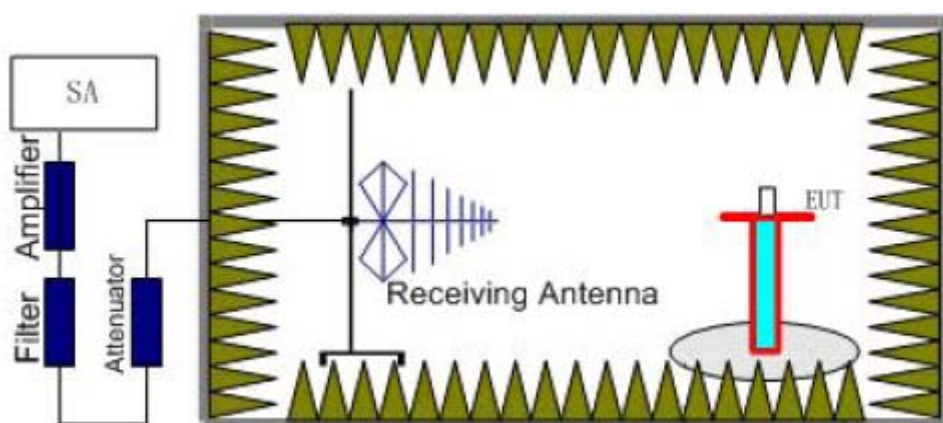
Voltage (V)	Test Result (ppm)@20°C		
	Channel 9262	Channel 9400	Channel 9538
3.5	0.011	0.012	0.011
4.2	0.012	0.011	0.013

2.2.1.8 Radiated Spurious Emissions-FCC Part2.1053/24.238

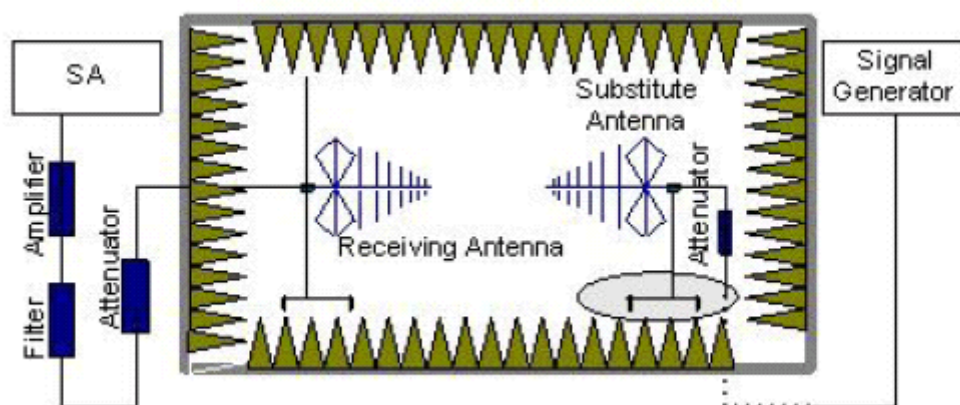
Ambient condition

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 9262), middle (Channel 9400) and top (Channel 9538) channels of WCDMA band II.

Test result:

WCDMA MODE:

Channel 9262

Frequency (MHz)	Power (dBm)	Pca Cable loss (dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2451.22	-44.86	-5.6	8.6	-47.86	-13	Vertical
2774.52	-43.50	-5.8	8.9	-46.60	-13	Vertical
3734.08	-42.96	-6.9	9.1	-45.16	-13	Vertical
6686.29	-42.50	-8.9	11.2	-44.80	-13	Horizontal
9966.39	-38.68	-13.7	13.8	-38.78	-13	Vertical
17812.24	-31.14	-15.9	12.4	-27.64	-13	Vertical

Channel 9400

Frequency (MHz)	Power (dBm)	Pca Cable loss (dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2443.16	-44.73	-5.6	8.6	-47.73	-13	Vertical
2760.62	-43.29	-5.8	8.9	-46.39	-13	Vertical
3744.82	-43.51	-6.9	9.1	-45.71	-13	Vertical
6695.33	-42.97	-8.9	11.2	-45.27	-13	Vertical
9966.52	-38.30	-13.7	13.8	-38.40	-13	Vertical
17846.33	-30.99	-15.9	12.4	-27.49	-13	Vertical

Channel 9538

Frequency (MHz)	Power (dBm)	Pca Cable loss (dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2463.07	-44.47	-5.6	8.6	-47.47	-13	Vertical
2801.13	-43.39	-5.8	8.9	-46.49	-13	Vertical
3753.82	-43.53	-6.9	9.1	-45.73	-13	Vertical
6676.56	-42.69	-8.9	11.2	-44.99	-13	Vertical
9984.54	-37.97	-13.7	13.8	-38.07	-13	Horizontal
17786.51	-31.33	-15.9	12.4	-27.83	-13	Vertical

HSDPA/HSUPA Mode:

Channel 9262

Frequency (MHz)	Power (dBm)	Pca Cable loss (dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2455.14	-44.07	-5.6	8.6	-47.07	-13	Horizontal
2763.73	-43.39	-5.8	8.9	-46.49	-13	Vertical
3769.05	-43.36	-6.9	9.1	-45.56	-13	Vertical
6696.55	-42.41	-8.9	11.2	-44.71	-13	Vertical
9977.76	-38.93	-13.7	13.8	-39.03	-13	Vertical
17825.53	-32.12	-15.9	12.4	-28.62	-13	Vertical

Channel 9400

Frequency (MHz)	Power (dBm)	Pca Cable loss (dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2459.28	-45.37	-5.6	8.6	-48.37	-13	Vertical
2774.08	-44.77	-5.8	8.9	-47.87	-13	Vertical
3762.13	-43.62	-6.9	9.1	-45.82	-13	Vertical
6684.90	-42.90	-8.9	11.2	-45.20	-13	Vertical
9974.98	-38.80	-13.7	13.8	-38.90	-13	Vertical
17823.81	-31.35	-15.9	12.4	-27.85	-13	Vertical

Channel 9538

Frequency (MHz)	Power (dBm)	Pca Cable loss (dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2464.00	-45.04	-5.6	8.6	-48.04	-13	Vertical
2743.34	-44.51	-5.8	8.9	-47.61	-13	Vertical
3767.94	-43.87	-6.9	9.1	-46.07	-13	Horizontal
6698.70	-42.61	-8.9	11.2	-44.91	-13	Vertical
9971.40	-37.64	-13.7	13.8	-37.74	-13	Vertical
17788.09	-32.49	-15.9	12.4	-28.99	-13	Vertical

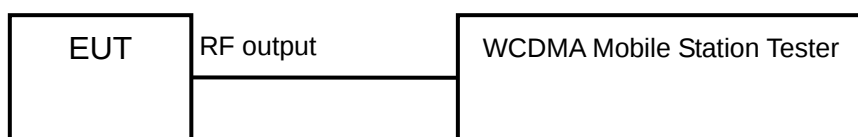
2.2.2 WCDMA Band V

2.2.2.1 RF Power Output-FCC Part22.913(a)

Ambient condition:

Temperature	Relative humidity	Pressure
19.3°C	41.3%	100.7kPa

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 No4132, No4183 and No4233 (Bottom, middle and top channels of WCDMA band V)

Limits	$\leq 24\text{dBm}$
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Test result:

WCDMA Mode:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
826.4	4132	20.98
836.6	4183	21.70
846.6	4233	19.00

HSDPA/HSUPA Mode:

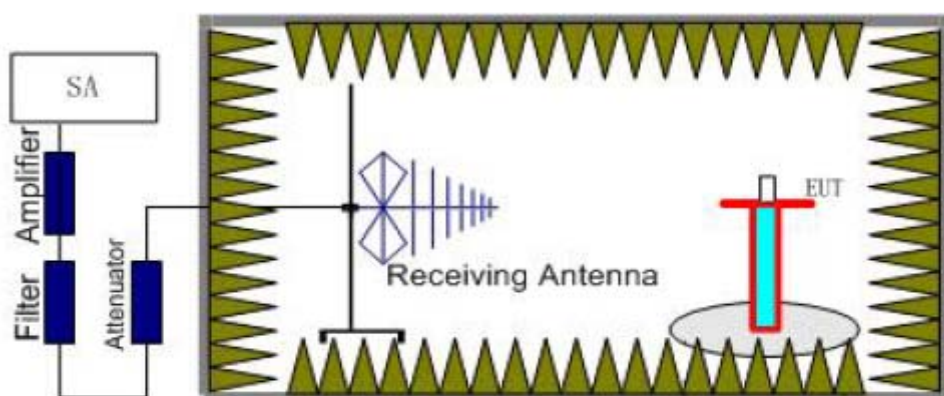
Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
826.4	4132	20.30
836.6	4183	20.80
846.6	4233	18.20

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

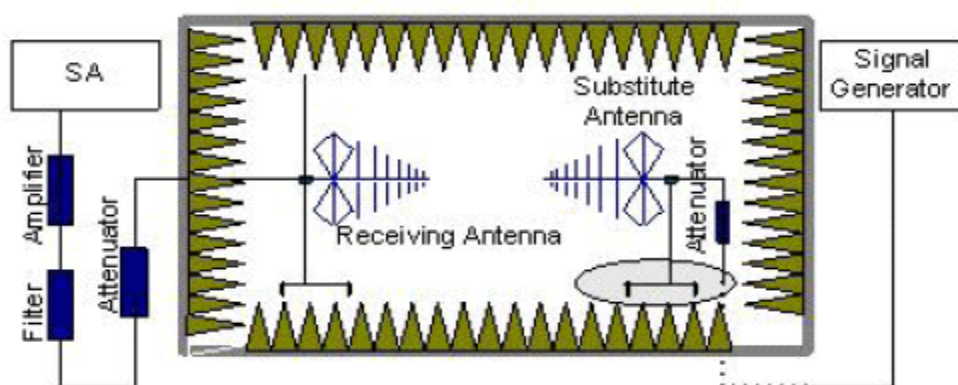
Ambient condition:

Temperature	Relative humidity	Pressure
21.4°C	37.4%	100.2kPa

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:

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 No4132, No4183 and No4233 (Bottom, middle and top channels of WCDMA band V)

Limits	≤38.5dBm
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Test result:

WCDMA Mode:

Frequency (MHz)	Peak ERP (dBm)	Pca Cable loss (dB)	Ga Antenna Gain (dB)	Correction (dB)	Pmea (dBm)	Polarization
826.4	20.46	-3.8	8.6	2.15	17.81	Vertical
836.6	21.22	-3.8	8.6	2.15	18.57	Vertical
846.6	20.30	-3.8	8.6	2.15	17.65	Vertical

HSDPA/HSUPA Mode:

Frequency (MHz)	Peak ERP (dBm)	Pca Cable loss (dB)	Ga Antenna Gain (dB)	Correction (dB)	Pmea (dBm)	Polarization
826.4	20.05	-3.8	8.6	2.15	17.40	Vertical
836.6	20.27	-3.8	8.6	2.15	17.62	Vertical
846.6	19.58	-3.8	8.6	2.15	16.93	Vertical

Frequency: 836.6MHz

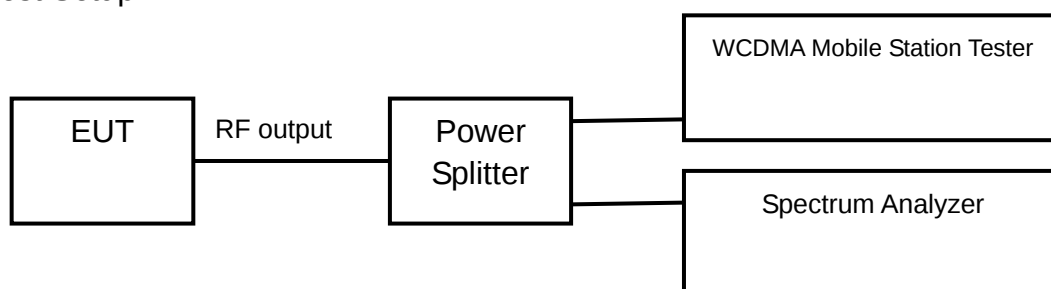
Peak ERP(dBm) = Pmea(18.57dBm)+Pca(-3.8dB)+Ga(8.6dB)-2.15dB = 21.22dBm

2.2.2.3 Occupied Bandwidth-FCC Part2.1049

Ambient condition:

Temperature	Relative humidity	Pressure
21°C	44%	101.5kPa

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 30kHz on spectrum analyzer. The bandwidth of 99% power can be read on spectrum analyzer.

The measurement will be conducted at three channels No4132, No4183 and No4233 (Bottom, middle and top channels of WCDMA band V)

Limits: No specific occupied bandwidth requirements in part 2.1049

Test result:

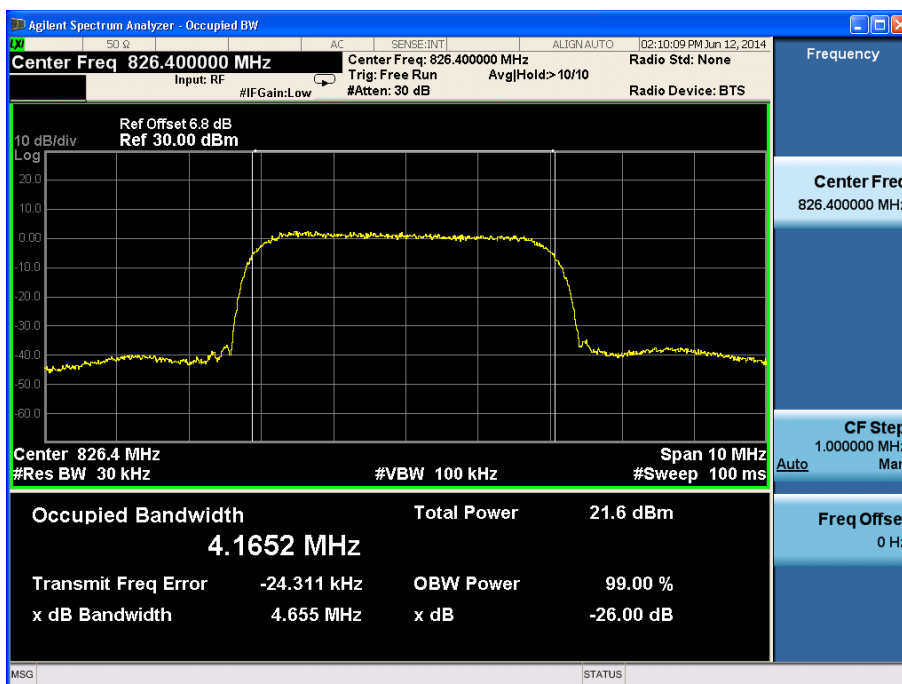
WCDMA Mode:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (MHz)
826.4	4132	4.1652
836.6	4183	4.1293
846.6	4233	4.1798

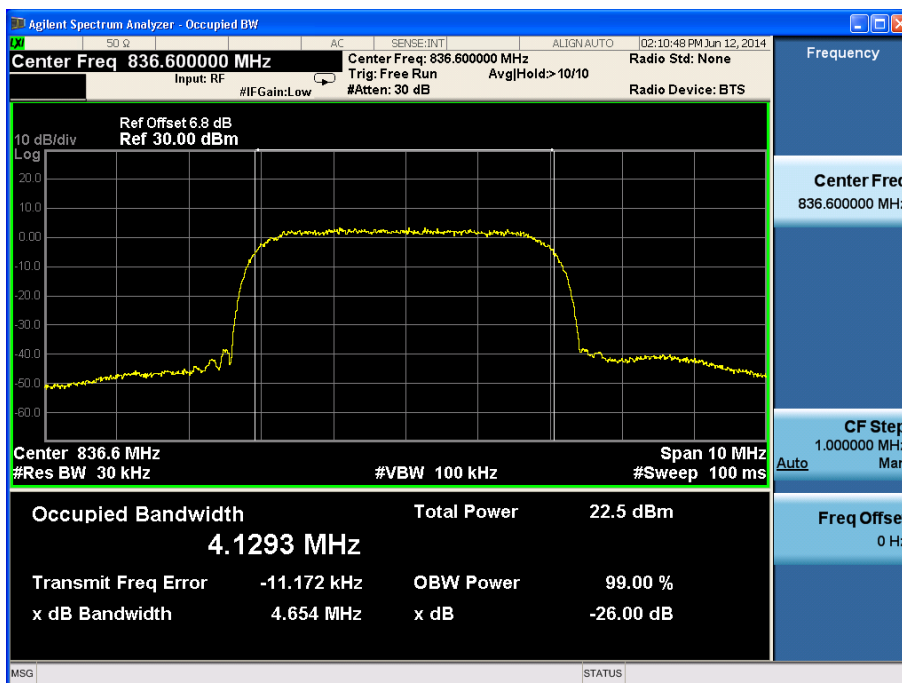
HSDPA/HSUPA Mode:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (MHz)
826.4	4132	4.1831
836.6	4183	4.1269
846.6	4233	4.1743

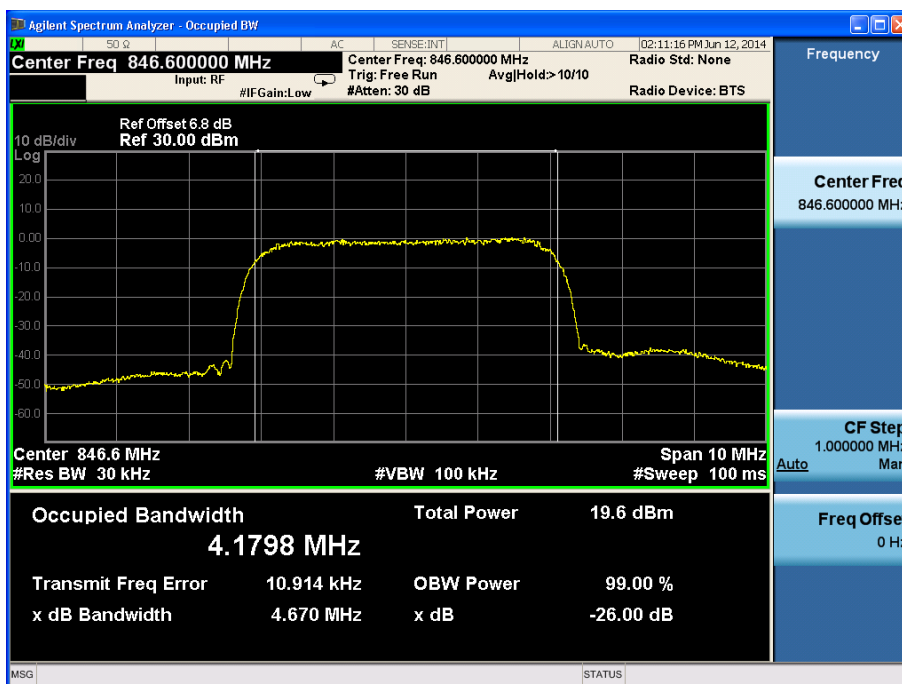
WCDMA Mode:



Channel 4132

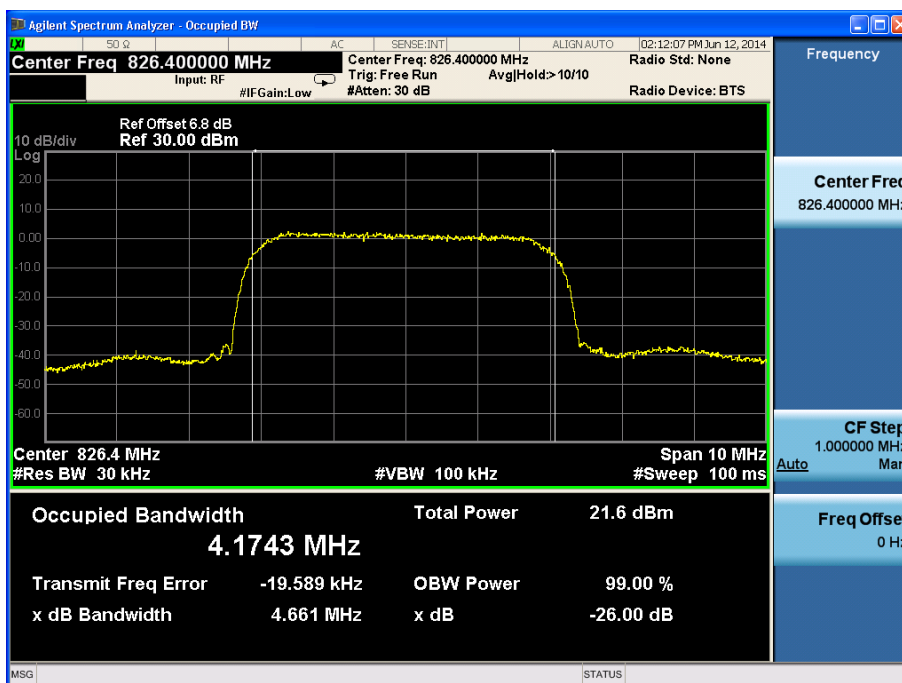


Channel 4183

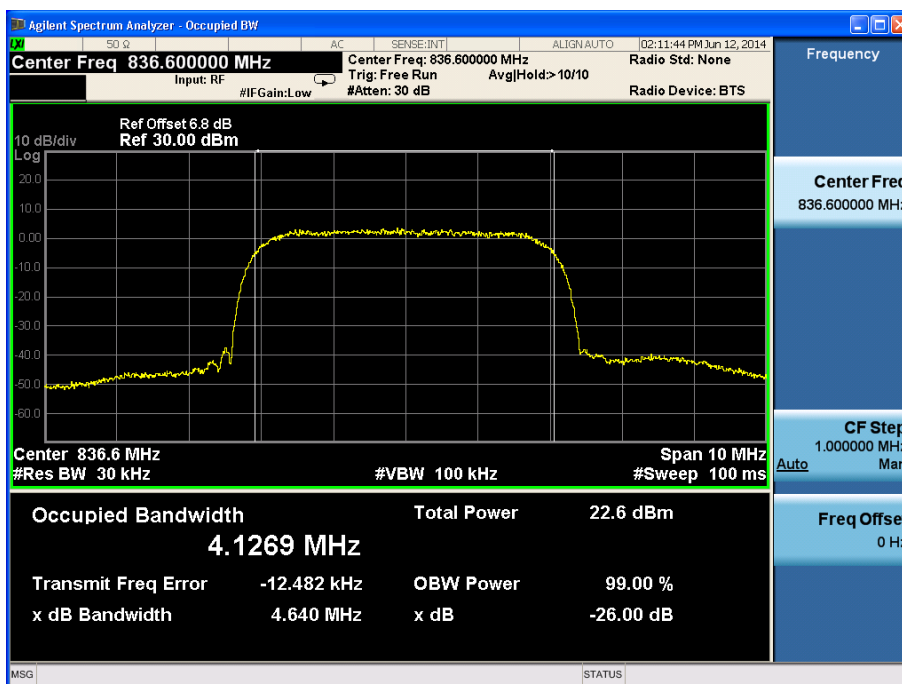


Channel 4233

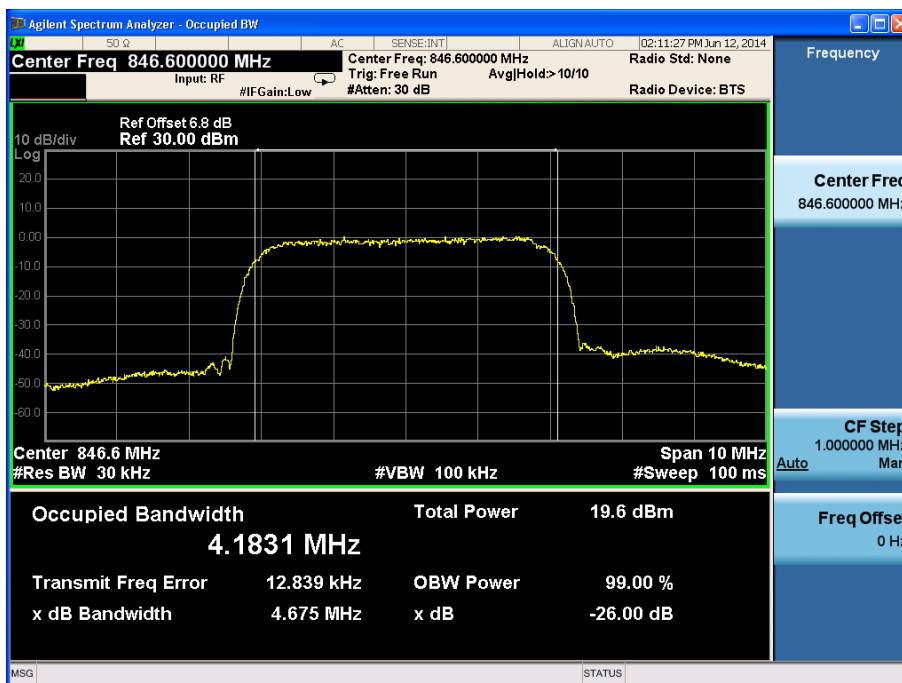
HSDPA/HSUPA Mode:



Channel 4132



Channel 4183



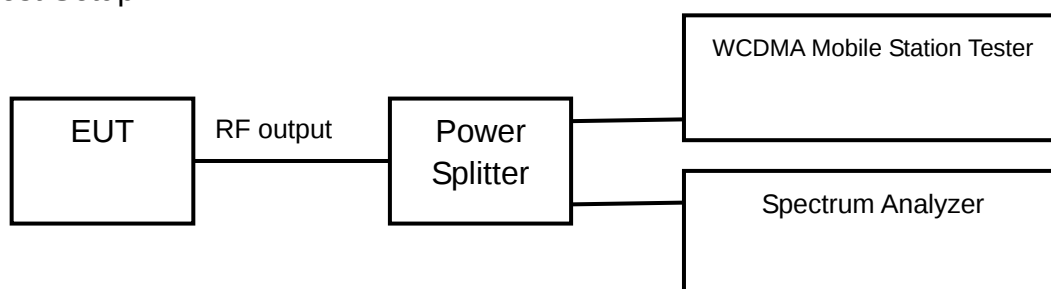
Channel 4233

2.2.2.4 Emission Bandwidth-FCC Part22.917(b)

Ambient condition:

Temperature	Relative humidity	Pressure
21.4°C	37.4%	100.2kPa

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 30kHz on spectrum analyzer. The bandwidth of -26dBc power can be read on spectrum analyzer.

The measurement will be conducted at three channels No9262, No9400 and No9538 (Bottom, middle and top channels of WCDMA band V)

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

Test result:

WCDMA Mode:

Carrier frequency (MHz)	Channel No.	Bandwidth of -26dBc Power (MHz)
826.4	4132	4.655
836.6	4183	4.654
846.6	4233	4.670

HSDPA/HSUPA Mode:

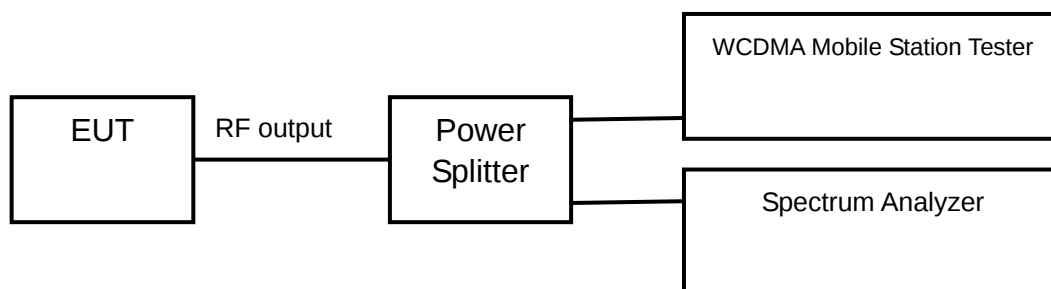
Carrier frequency (MHz)	Channel No.	Bandwidth of -26dBc Power (MHz)
826.4	4132	4.675
836.6	4183	4.640
846.6	4233	4.661

2.2.2.5 Spurious Emissions at antenna terminal-FCC Part2.1051/22.917

Ambient condition:

Temperature	Relative humidity	Pressure
21°C	44%	101.5kPa

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.

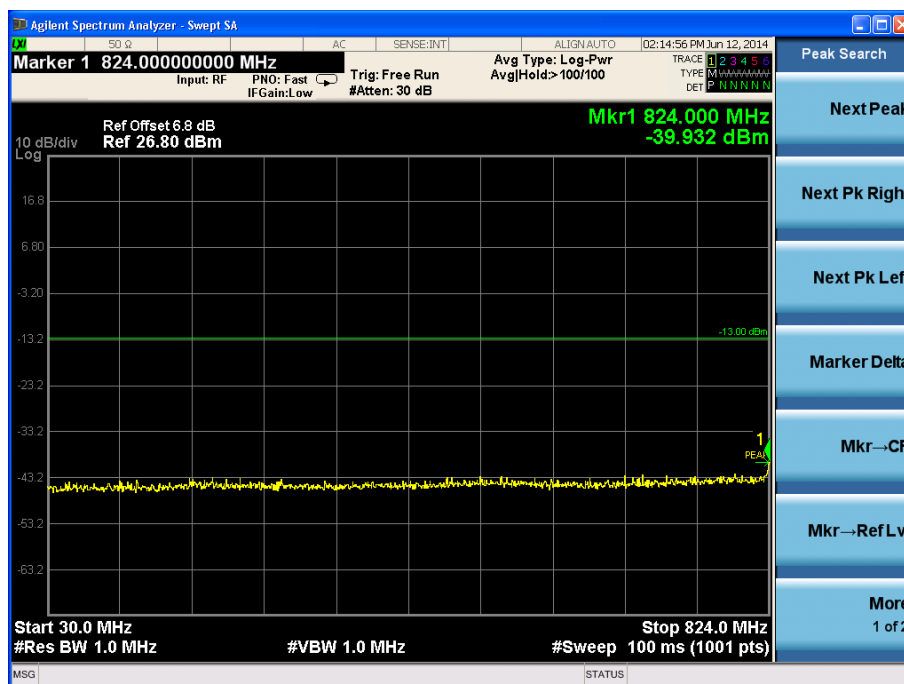
The measurement will be conducted at one channel No4183 (middle channel of WCDMA band V)

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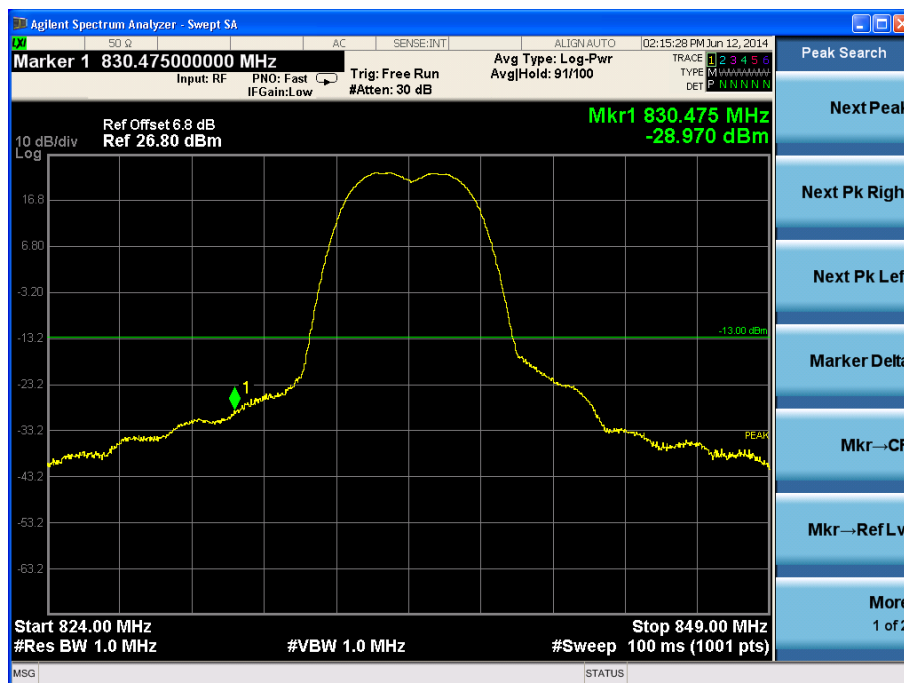
Test result:

Refer to the following figures.

WCDMA Mode:

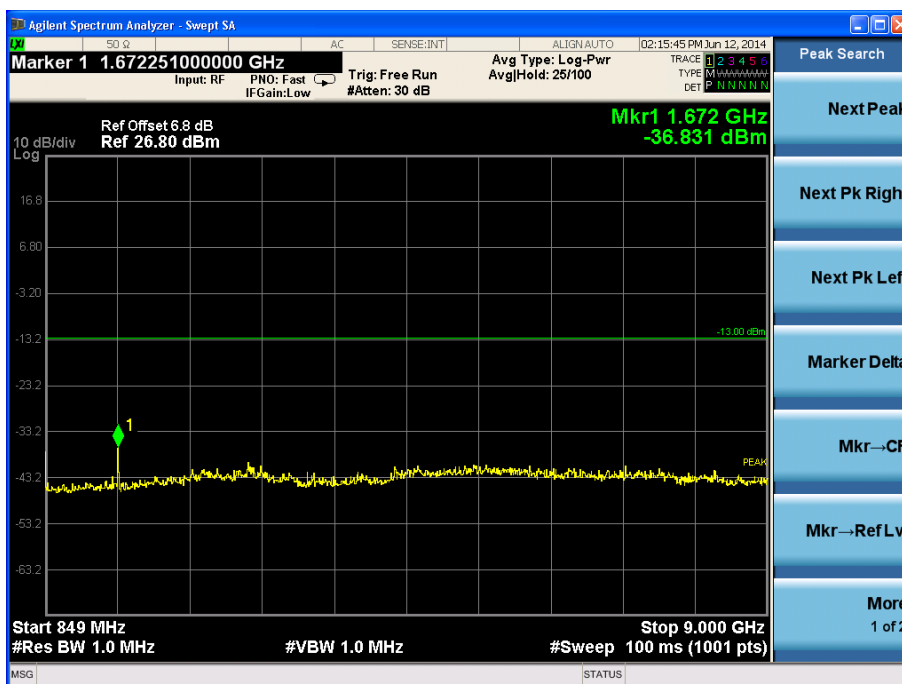


Channel 4183, 30MHz~824MHz



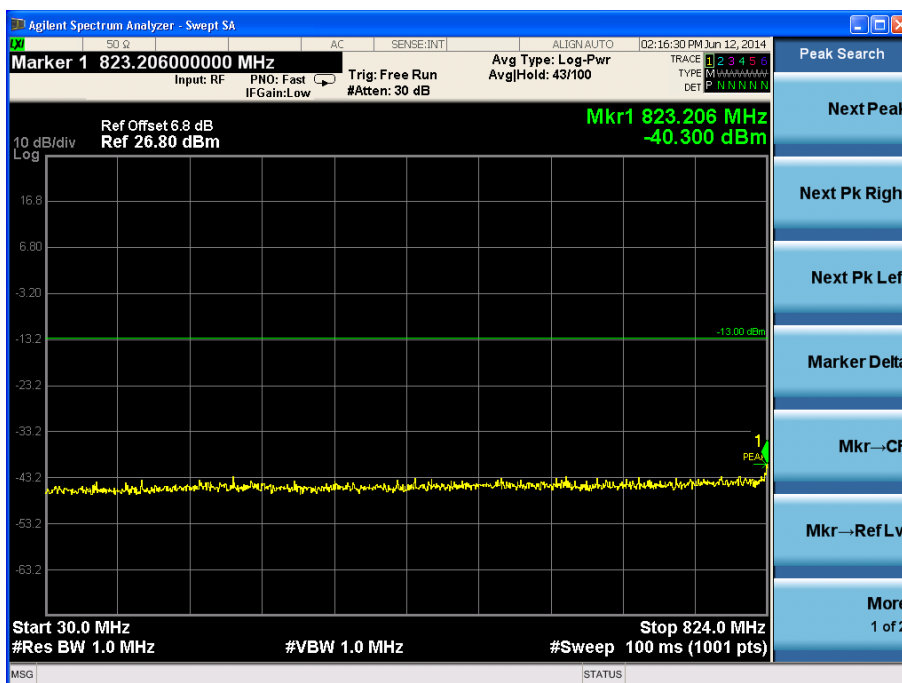
Channel 4183, 824MHz~849MHz

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

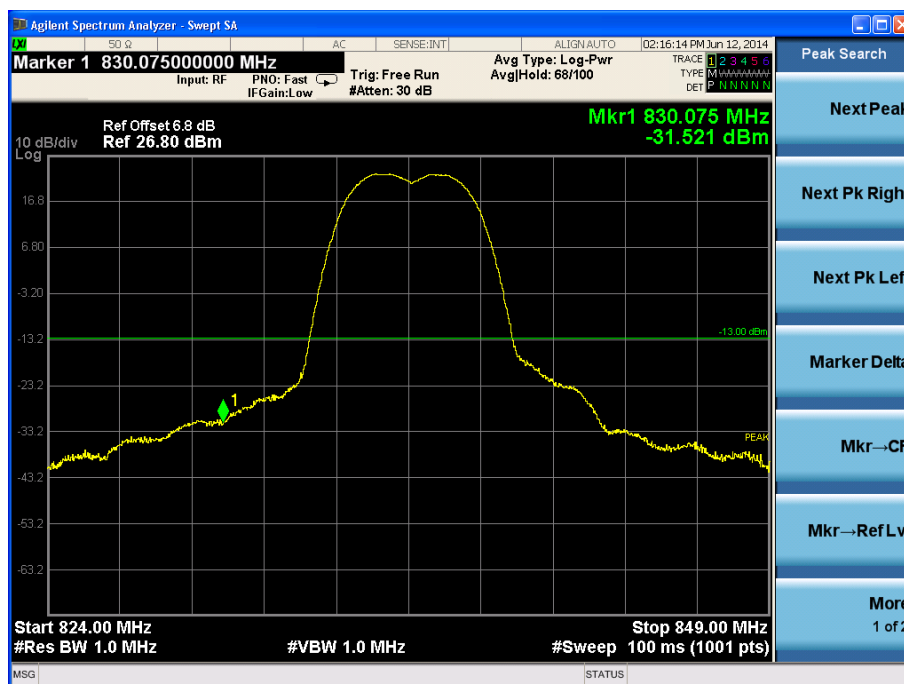


Channel 4183, 849MHz~9GHz

HSDPA/HSUPA Mode:

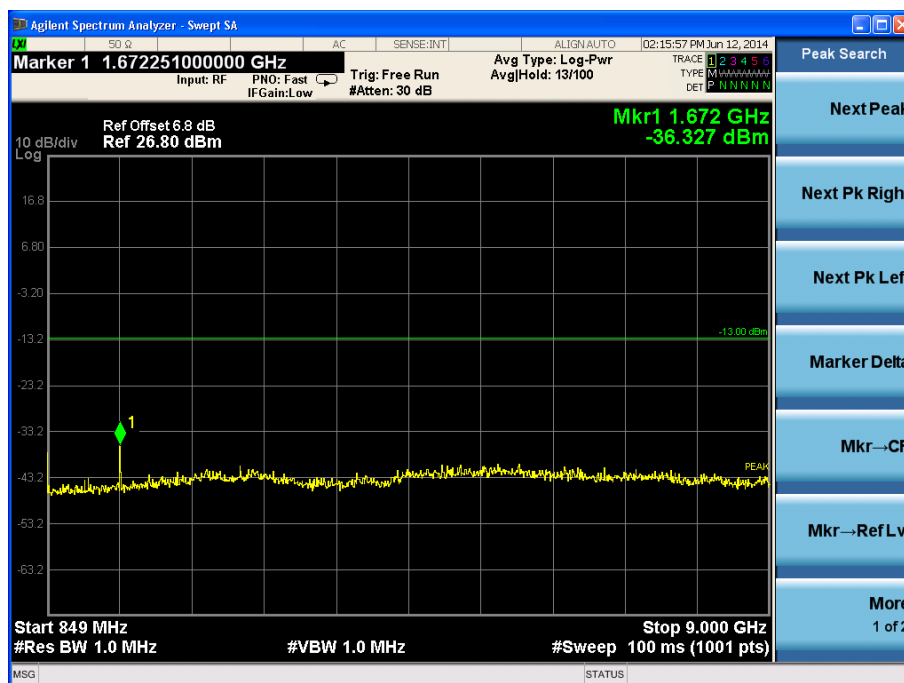


Channel 4183, 30MHz~824MHz



Channel 4183, 824MHz~849MHz

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



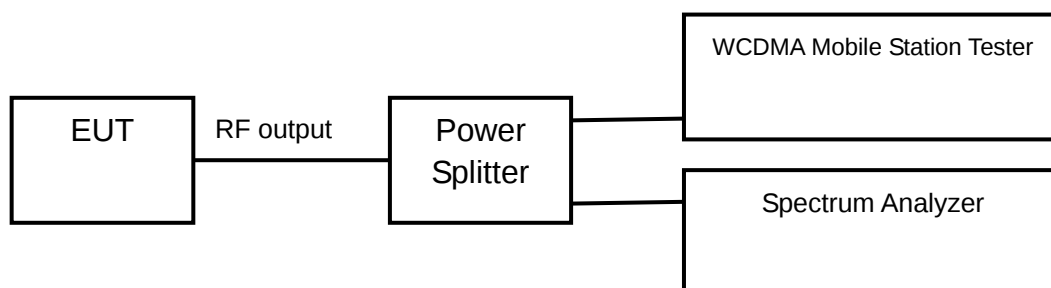
Channel 4183, 849MHz~9GHz

2.2.2.6 Band Edges Compliance-FCC Part22.917(b)

Ambient condition:

Temperature	Relative humidity	Pressure
21°C	44%	101.5kPa

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.

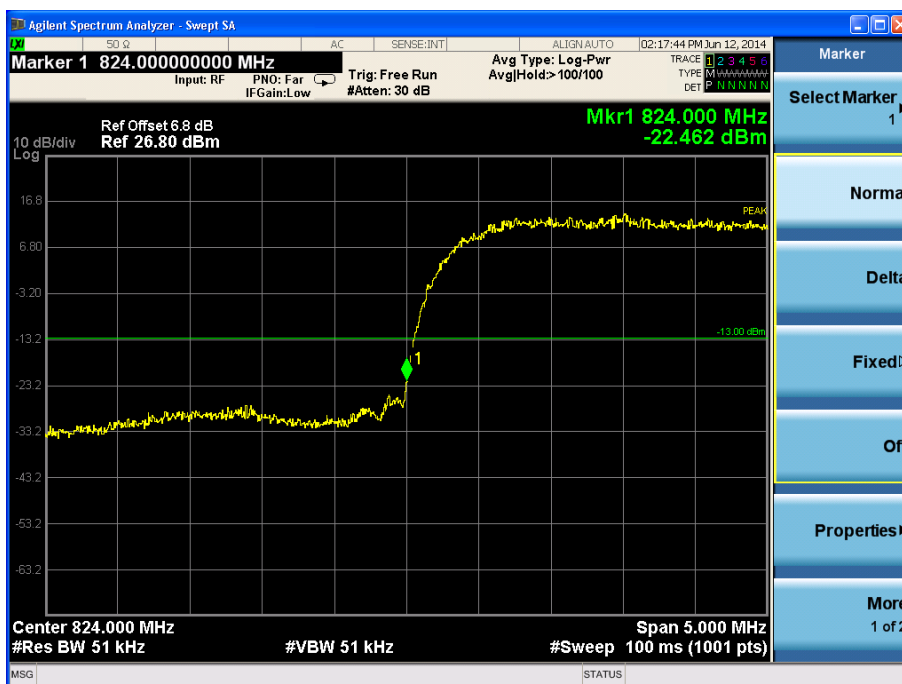
The measurement will be conducted at two channels No4132 and No4233 (Bottom and top channels of WCDMA band V)

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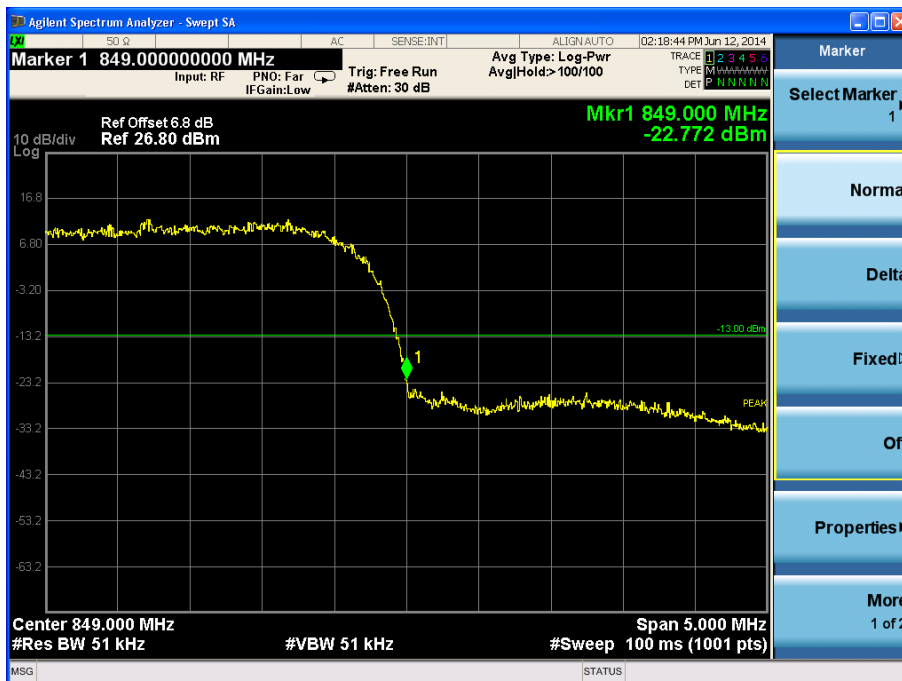
Test result:

Refer to the following figures.

WCDMA Mode:

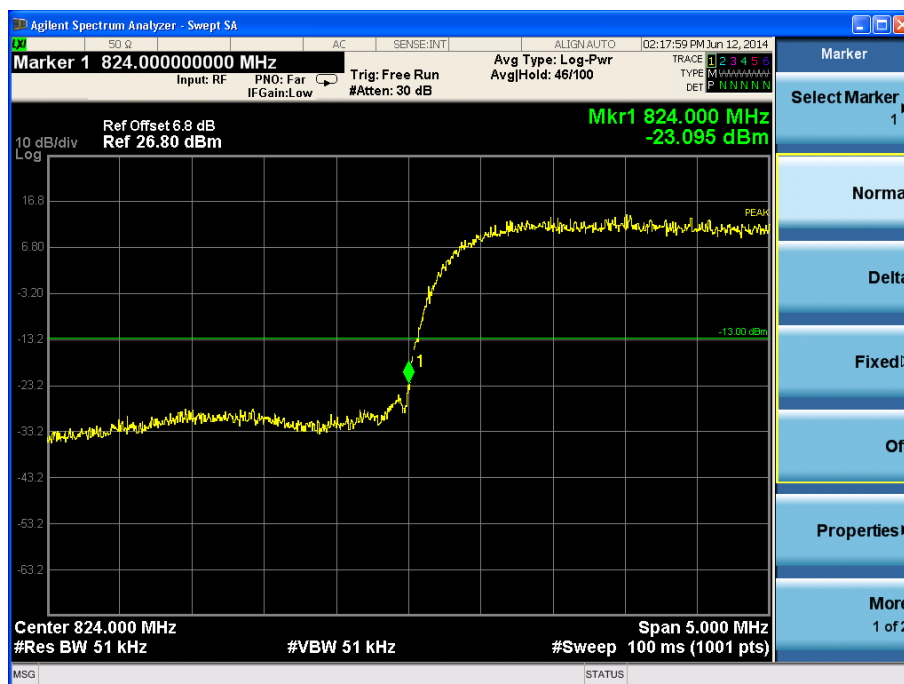


Channel 4132

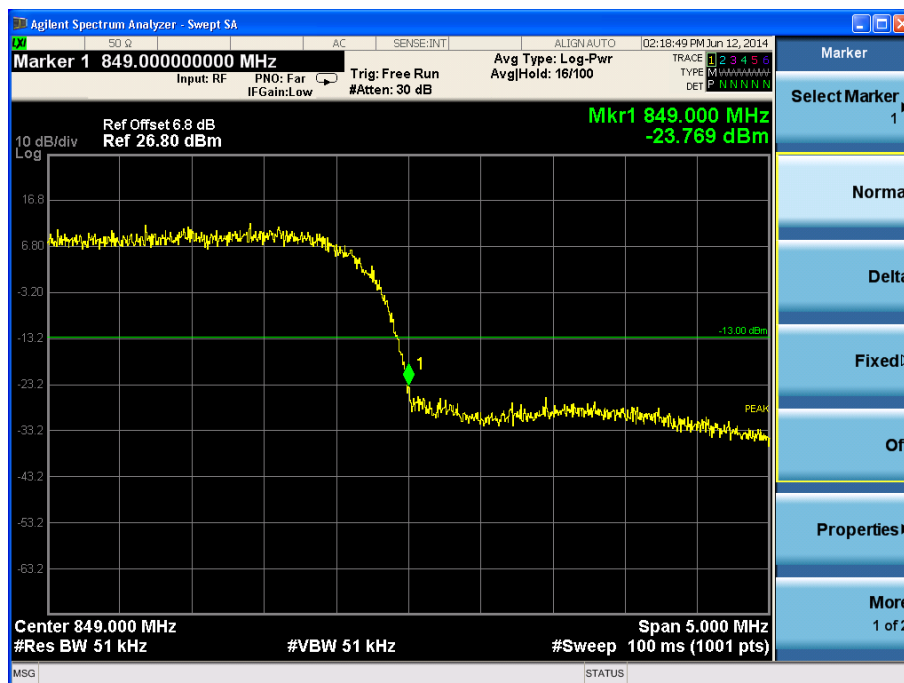


Channel 4233

HSDPA/HSUPA Mode:



Channel 4132



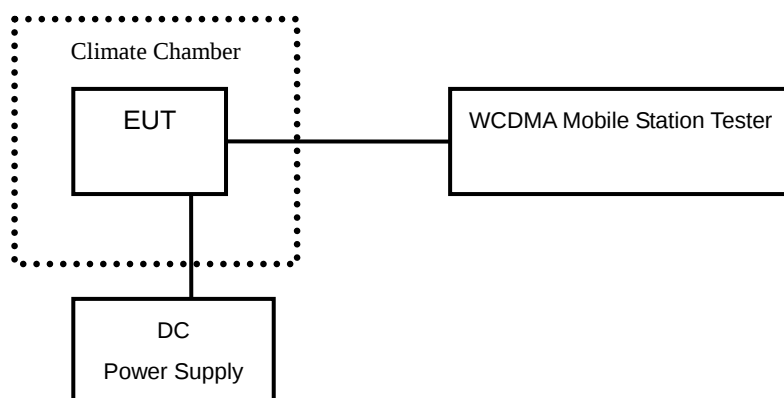
Channel 4233

2.2.2.7 Frequency Stability-FCC Part2.1055/22.355

Ambient condition:

Temperature	Relative humidity	Pressure
21°C	44%	101.5kPa

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 No4132, No4183 and No4233 (Bottom, middle and top channels of WCDMA band V).

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

Test result:

WCDMA Mode:

Temperature(°C)	Test Result (ppm)@3.8V		
	Channel 4132	Channel 4183	Channel 4233
-30	0.022	0.022	0.019
-20	0.023	0.023	0.019
-10	0.021	0.021	0.020
0	0.025	0.023	0.019
+10	0.024	0.025	0.021
+20	0.021	0.024	0.018
+30	0.021	0.022	0.019
+40	0.023	0.022	0.019
+50	0.022	0.021	0.019

Voltage (V)	Test Result (ppm)@20°C		
	Channel 4132	Channel 4183	Channel 4233
3.5	0.021	0.020	0.018
4.2	0.025	0.022	0.020

HSDPA/HSUPA Mode:

Temperature(°C)	Test Result (ppm)@3.8V		
	Channel 4132	Channel 4183	Channel 4233
-30	0.021	0.021	0.020
-20	0.025	0.023	0.018
-10	0.024	0.025	0.021
0	0.021	0.024	0.018
+10	0.021	0.022	0.017
+20	0.021	0.021	0.020
+30	0.025	0.023	0.018
+40	0.024	0.025	0.021
+50	0.021	0.024	0.018

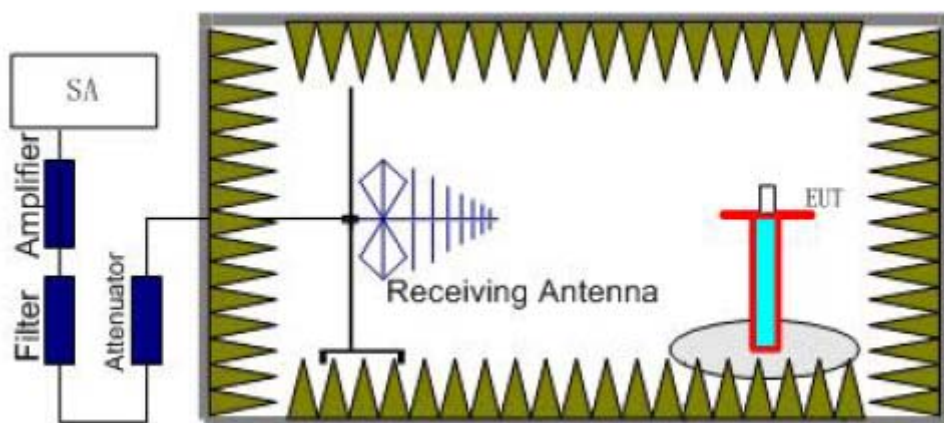
Voltage (V)	Test Result (ppm)@20°C		
	Channel 4132	Channel 4183	Channel 4233
3.5	0.021	0.021	0.020
4.2	0.025	0.023	0.018

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

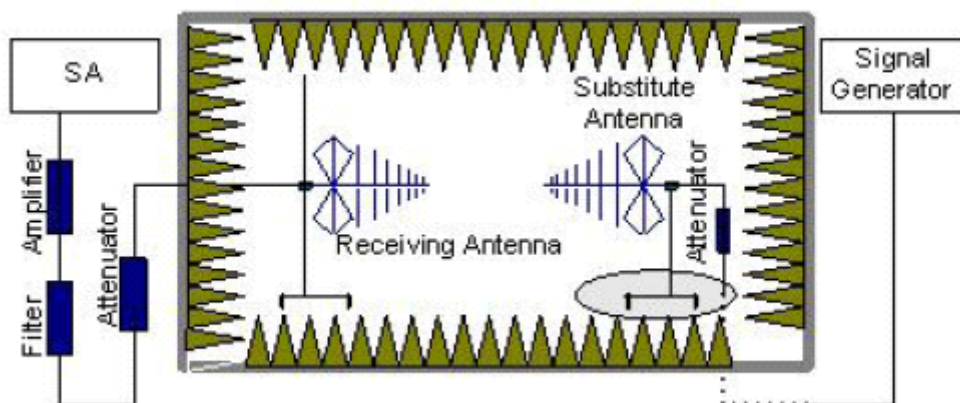
Ambient condition

Temperature	Relative humidity	Pressure
21.4°C	37.4%	100.2kPa

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 4132), middle (Channel 4183) and top (Channel 4233) channels of WCDMA band V.

Test result:

WCDMA Mode:

Channel 4132

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1627.34	-51.65	-4.6	8.3	-55.35	-13	Vertical
1674.32	-50.89	-4.8	8.3	-54.39	-13	Vertical
2536.02	-44.08	-5.7	8.9	-47.28	-13	Vertical
2565.10	-43.24	-5.9	8.9	-46.24	-13	Horizontal
8967.74	-40.05	-10.8	12.7	-41.95	-13	Vertical
9981.58	-36.64	-11.8	13.8	-38.64	-13	Vertical

Channel 4183

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1643.82	-51.57	-4.6	8.3	-55.27	-13	Vertical
1656.88	-50.33	-4.8	8.3	-53.83	-13	Horizontal
2534.13	-43.10	-5.7	8.9	-46.30	-13	Vertical
2569.61	-43.35	-5.9	8.9	-46.35	-13	Vertical
8964.00	-40.51	-10.8	12.7	-42.41	-13	Vertical
9976.19	-36.66	-11.8	13.8	-38.66	-13	Vertical

Channel 4233

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1630.34	-52.68	-4.6	8.3	-56.38	-13	Vertical
1677.48	-51.95	-4.8	8.3	-55.45	-13	Vertical
2534.30	-44.28	-5.7	8.9	-47.48	-13	Horizontal
2568.01	-42.97	-5.9	8.9	-45.97	-13	Vertical
8979.82	-39.03	-10.8	12.7	-40.93	-13	Vertical
9974.01	-36.89	-11.8	13.8	-38.89	-13	Vertical

HSDPA/HSUPA Mode:

Channel 4132

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1642.66	-52.26	-4.6	8.3	-55.96	-13	Vertical
1667.64	-51.59	-4.8	8.3	-55.09	-13	Vertical
2556.56	-43.85	-5.7	8.9	-47.05	-13	Vertical
2570.90	-43.87	-5.9	8.9	-46.87	-13	Horizontal
8985.80	-40.00	-10.8	12.7	-41.90	-13	Vertical
9976.57	-36.31	-11.8	13.8	-38.31	-13	Vertical

Channel 4183

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1637.68	-52.37	-4.6	8.3	-56.07	-13	Vertical
1648.93	-51.50	-4.8	8.3	-55.00	-13	Vertical
2550.42	-45.34	-5.7	8.9	-48.54	-13	Vertical
2570.13	-44.06	-5.9	8.9	-47.06	-13	Vertical
8984.96	-40.42	-10.8	12.7	-42.32	-13	Vertical
9973.20	-36.55	-11.8	13.8	-38.55	-13	Vertical

Channel 4233

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1645.97	-52.32	-4.6	8.3	-56.02	-13	Vertical
1666.85	-51.23	-4.8	8.3	-54.73	-13	Vertical
2534.75	-43.99	-5.7	8.9	-47.19	-13	Vertical
2573.56	-43.83	-5.9	8.9	-46.83	-13	Vertical
8965.40	-39.09	-10.8	12.7	-40.99	-13	Horizontal
9968.00	-36.20	-11.8	13.8	-38.20	-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