D-PL-12111-01-01

CNAS L0447

Registration No.910917

TEST REPORT

Report No.: SRTC2014-H024-E0025

Product Name: GSM/GPRS/EDGE/UMTS Digital Mobile Phone with Bluetooth and WiFi

Product Model: 6037I

Applicant: TCT Mobile Limited

Manufacturer: TCT Mobile Limited

Specification: FCC Part 24E, Part 22H, Part 2 (April 25, 2013 edition)

FCC ID: RAD458

The State Radio_monitoring_center Testing Center (SRTC)

No.80 Beilishi Road Xicheng District Beijing, China

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

CONTENTS

1. General information 3
1.1 Notes of the test report 3
1.2 Information about the testing laboratory 3
1.3 Applicant's details 3
1.4 Manufacturer's details 3
1.5 Application details 4
1.6 Reference specification 4
1.7 Information of EUT 4
1.7.1 General information 4
1.7.2 EUT details 5
1.7.3 Auxiliary equipment details 5
2. Test information 7
2.1 Summary of the test results 7
2.2 Test result 8
2.2.1 WCDMA Band II 8
2.2.1.1 RF Power Output-FCC Part24.232(b) 8
2.2.1.2 Effective Isotropic Radiated Power-FCC Part24.232(b) 9
2.2.1.3 Occupied Bandwidth-FCC Part2.1049 12
2.2.1.4 Emission Bandwidth-FCC Part24.238(b) 16
2.2.1.5 Spurious Emissions at antenna terminal-FCC Part2.1051/24.238 17
2.2.1.6 Band Edges Compliance-FCC Part24.238(b) 21
2.2.1.7 Frequency Stability-FCC Part2.1055/24.235 24
2.2.1.8 Radiated Spurious Emissions-FCC Part2.1053/24.238 26
2.2.2 WCDMA Band V 31
2.2.2.1 RF Power Output-FCC Part22.913(a) 31
2.2.2.2 Effective Radiated Power-FCC Part22.913(a) 32
2.2.2.3 Occupied Bandwidth-FCC Part2.1049 35
2.2.2.4 Emission Bandwidth-FCC Part22.917(b) 39
2.2.2.5 Spurious Emissions at antenna terminal-FCC Part2.1051/22.917 40
2.2.2.6 Band Edges Compliance-FCC Part22.917(b) 44
2.2.2.7 Frequency Stability-FCC Part2.1055/22.355 47
2.2.2.8 Radiated Spurious Emissions-FCC Part2.1053/22.917(a) 49
2.3. List of test equipments 54
Appendix 55

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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
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Email: wangjf@srrc.org.cn / wangjunfeng@srtc.org.cn

1.3 Applicant's details

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

1.4 Manufacturer's details

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

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1.5 Application details

Date of reception of test sample: 31st March 2014
Date of test: 10th April 2014 to 23rd April 2014

1.6 Reference specification

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

1.7 Information of EUT

1.7.1 General information

Name of EUT	GSM/GPRS/EDGE/UMTS Digital Mobile Phone with Bluetooth and WiFi
FCC ID	RAD458
Frequency Range	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/16QAM (RX only)
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: 4.35V
HW Version	PIO
SW Version	v3EHG-US

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1.7.2 EUT details

Product Name	Product Model	IMEI
GSM/GPRS/EDGE/UMTS Digital Mobile Phone with Bluetooth and WiFi	6037I	864191020900314

1.7.3 Auxiliary equipment details

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

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

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

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

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

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

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

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

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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. Jiang Shuo Test engineer	Issued date: **2014.05.20**

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2.2 Test result

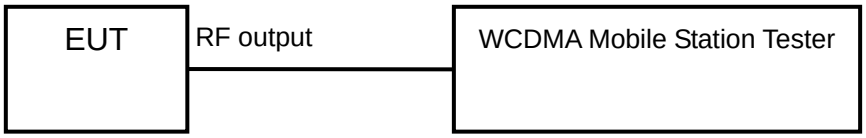
2.2.1 WCDMA Band II

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	≤24dBm

Test result:

WCDMA Mode:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
1852.4	9262	22.22
1880.0	9400	22.32
1907.6	9538	22.13

HSDPA/HSUPA Mode:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
1852.4	9262	18.00
1880.0	9400	18.70
1907.6	9538	18.10

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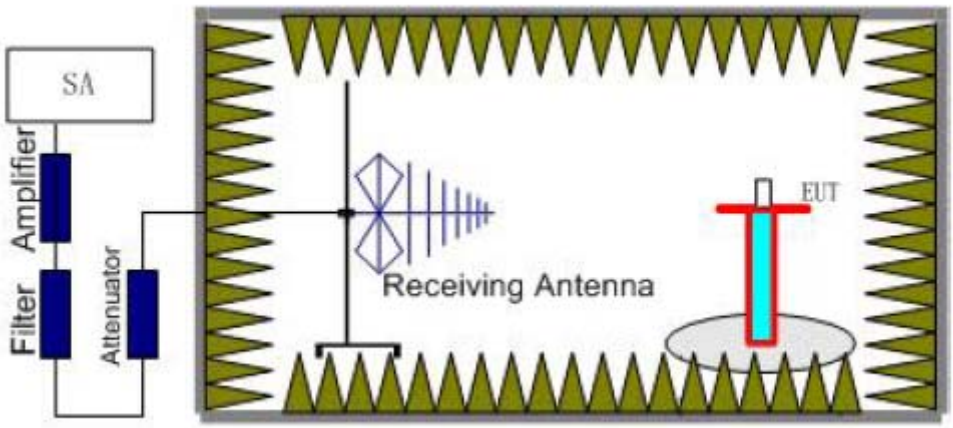
2.2.1.2 Effective Isotropic Radiated Power-FCC Part24.232(b)

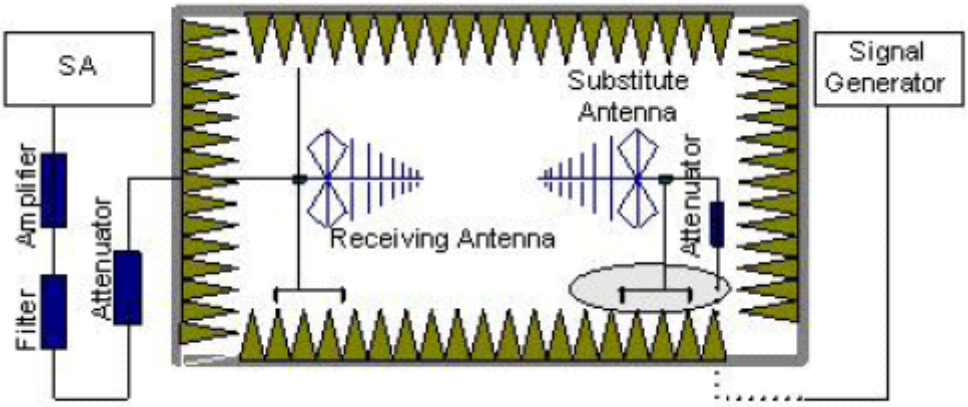
Ambient condition:

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

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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 (P_r).

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 (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).
The measurement results are obtained as described below:
Power (EIRP) = P_{mea}+ P_{ca}+ G_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	22.7	-5.0	8.6	19.1	Vertical
1880.0	22.9	-5.0	8.6	19.3	Vertical
1907.4	22.8	-5.0	8.6	19.2	Vertical

HSDPA/HSUPA Mode:

Frequency (MHz)	Peak EIRP(dBm)	Pca Cable loss	Ga Antenna Gain (dB)	Pmea (dBm)	Polarization
1852.6	18.6	-5.0	8.6	15.0	Vertical
1880.0	19.2	-5.0	8.6	15.6	Vertical
1907.4	18.8	-5.0	8.6	15.2	Vertical

Frequency: 1880.0MHz
Peak ERP(dBm) = Pmea(19.3dBm)+Pca(-5.0dB)+Ga(8.6dB) = 22.9dBm

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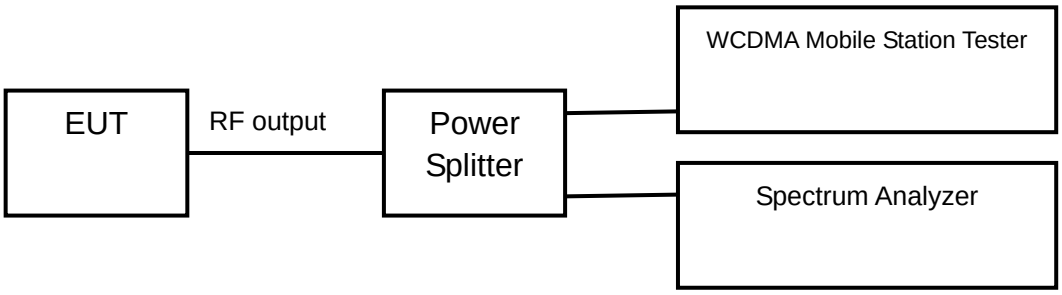
2.2.1.3 Occupied Bandwidth-FCC Part2.1049

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	4.1742
1880.0	9400	4.1551
1907.6	9538	4.1689

HSDPA/HSUPA Mode:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (MHz)
1852.4	9262	4.1504
1880.0	9400	4.1488
1907.6	9538	4.1624

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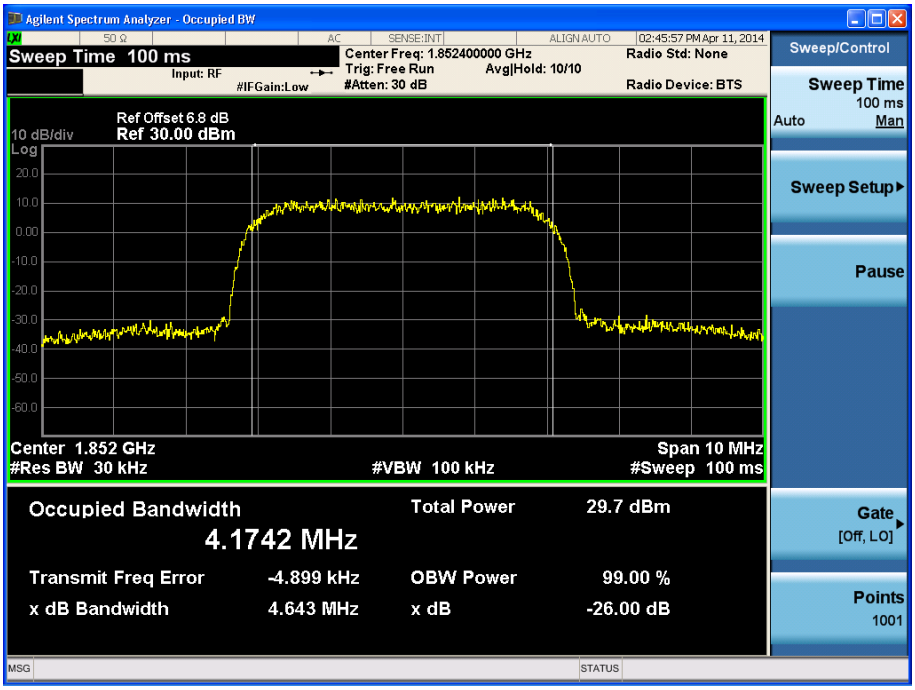
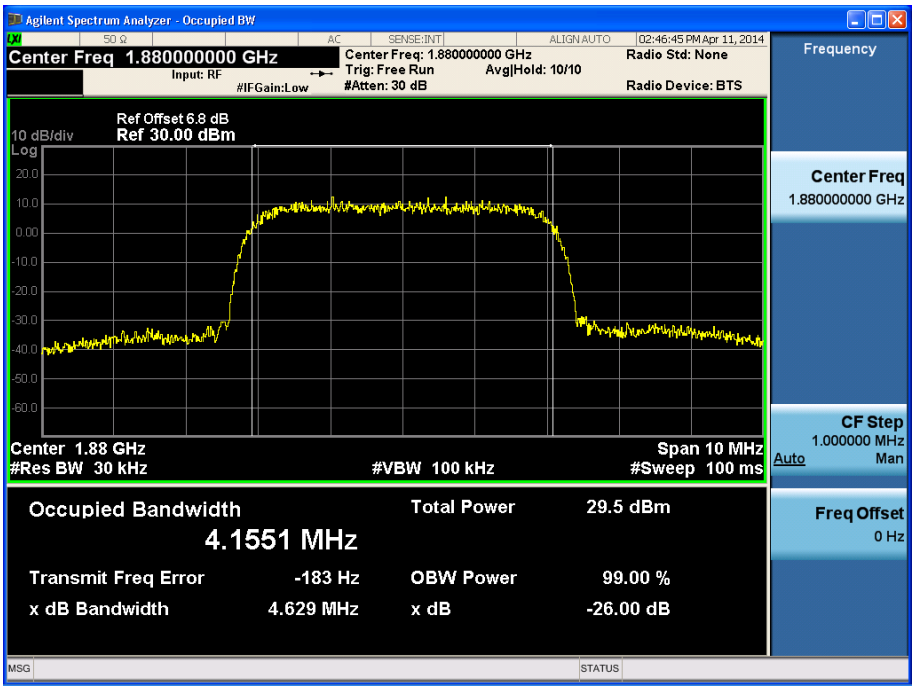
WCDMA Mode:



Channel 9262



Channel 9400

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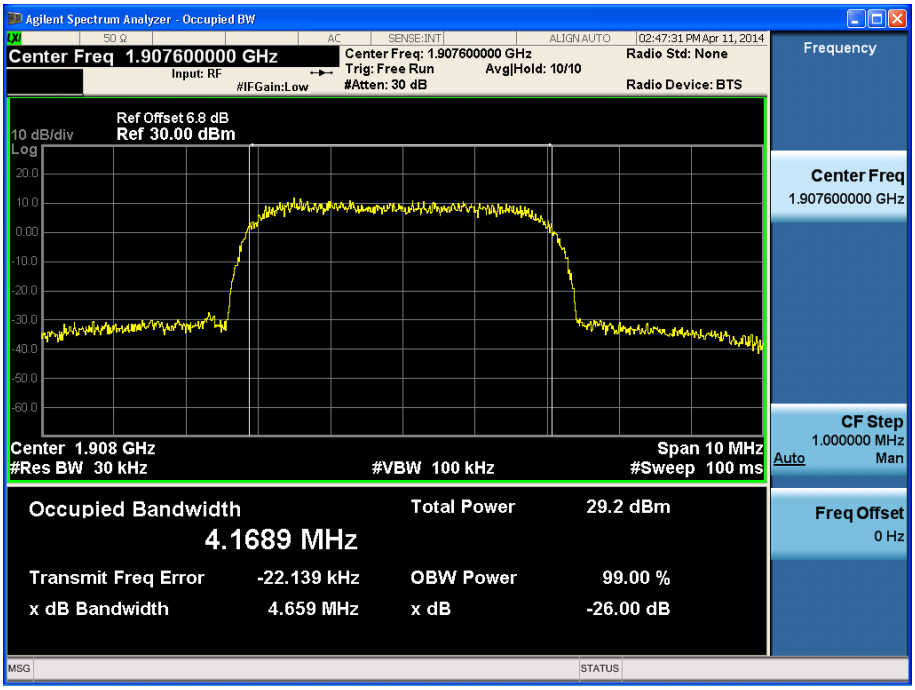
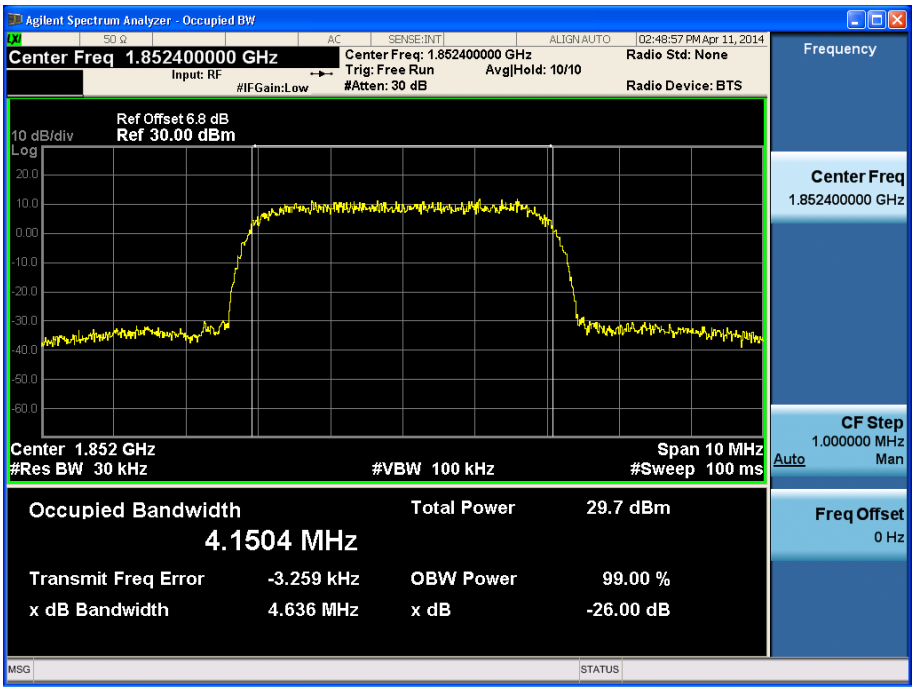


Channel 9538

HSDPA/HSUPA Mode:



Channel 9262

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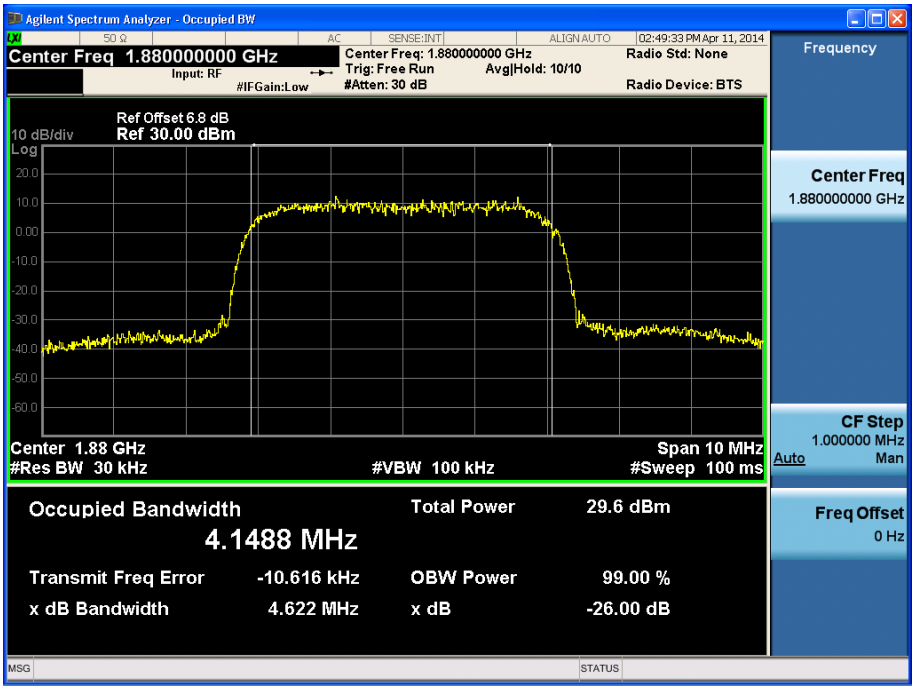
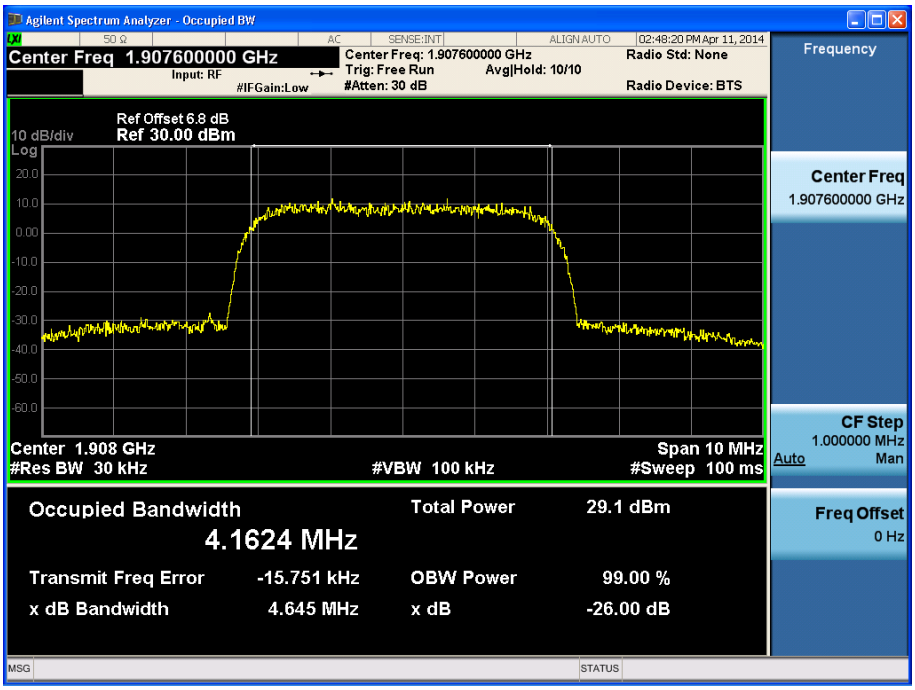


Channel 9400



Channel 9538

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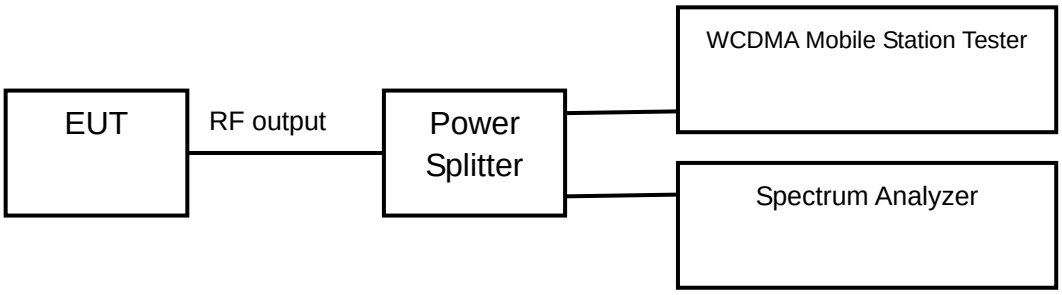
2.2.1.4 Emission Bandwidth-FCC Part24.238(b)

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	4.643
1880.0	9400	4.629
1907.6	9538	4.659

HSDPA/HSUPA Mode:

Carrier frequency (MHz)	Channel No.	Bandwidth of -26dBc Power (MHz)
1852.4	9262	4.636
1880.0	9400	4.622
1907.6	9538	4.645

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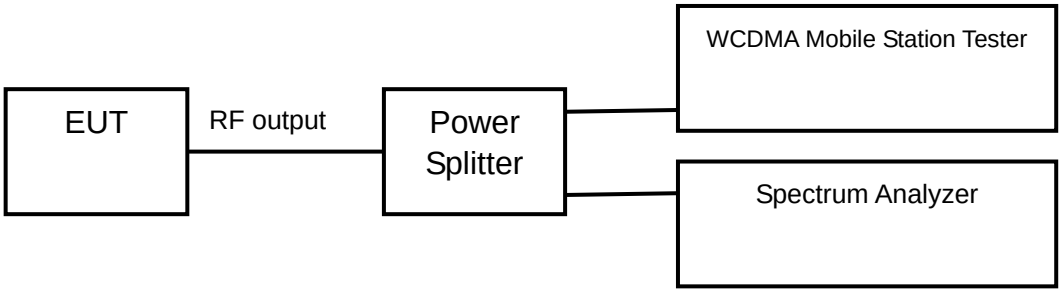
2.2.1.5 Spurious Emissions at antenna terminal-FCC Part2.1051/24.238

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	≤-13dBm

Test result:
Refer to the following figures.

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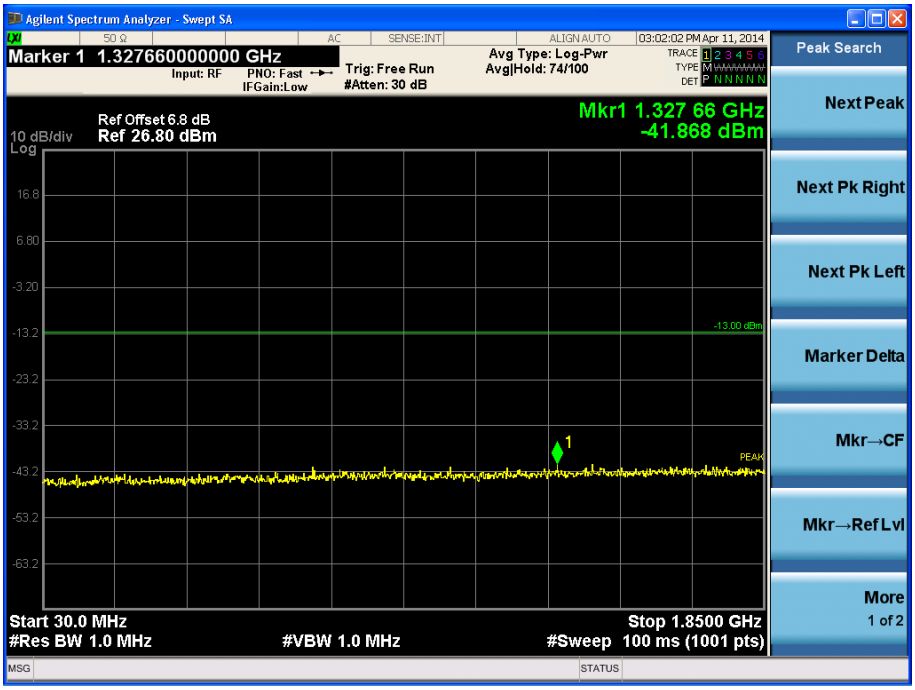
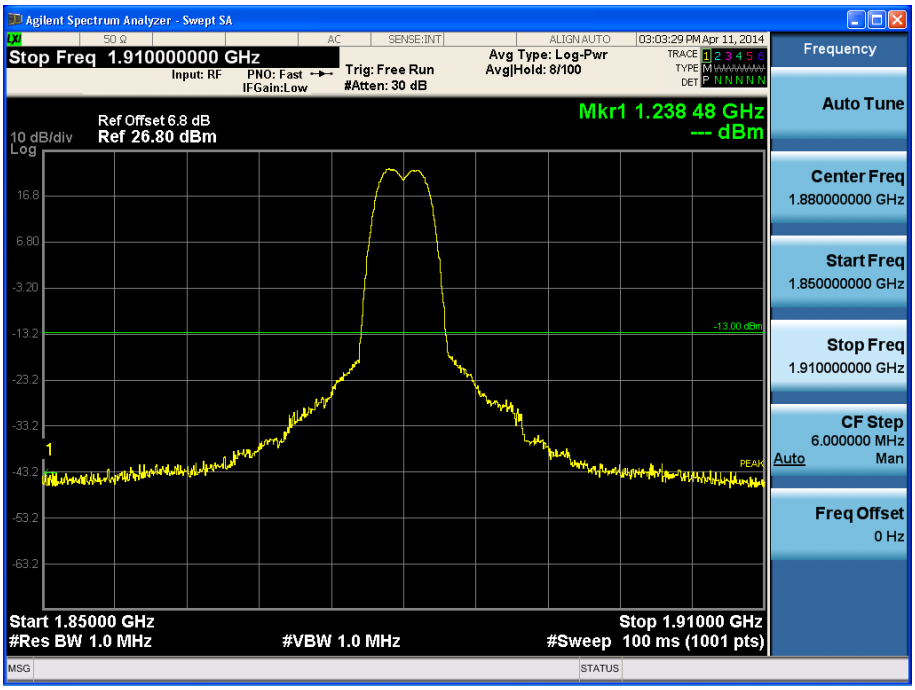
WCDMA Mode:



Channel 9400, 30MHz~1850MHz



Channel 9400, 1850MHz~1910MHz

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

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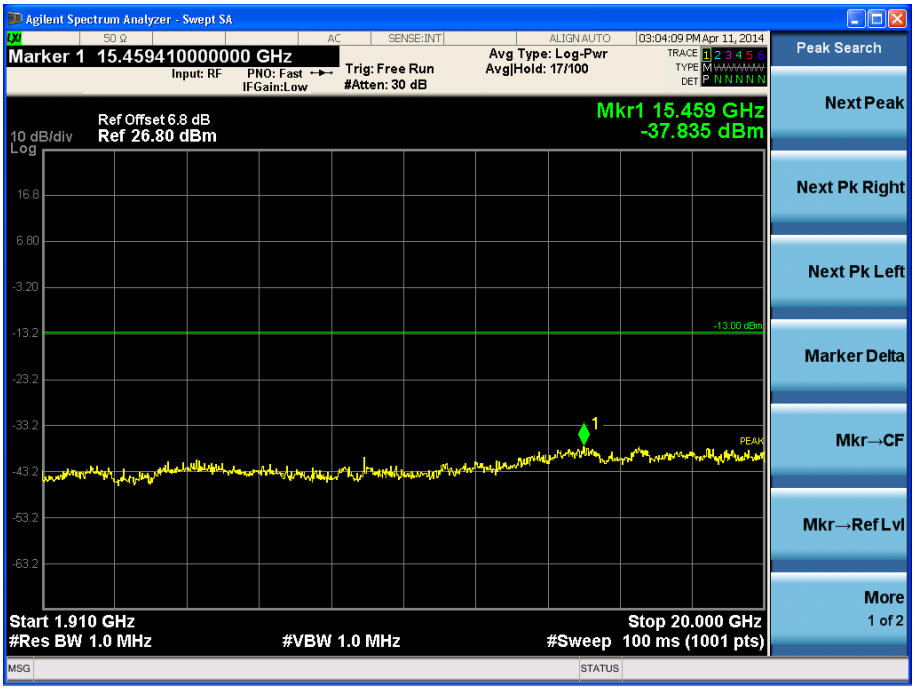
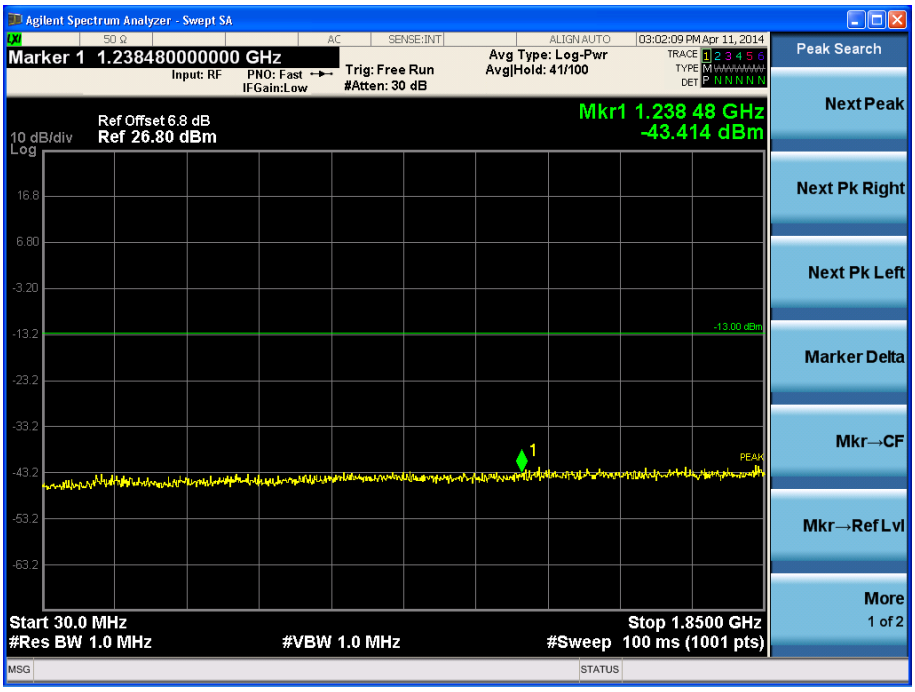


Channel 9400, 1910MHz~20GHz

HSDPA/HSUPA Mode:



Channel 9400, 30MHz~1850MHz

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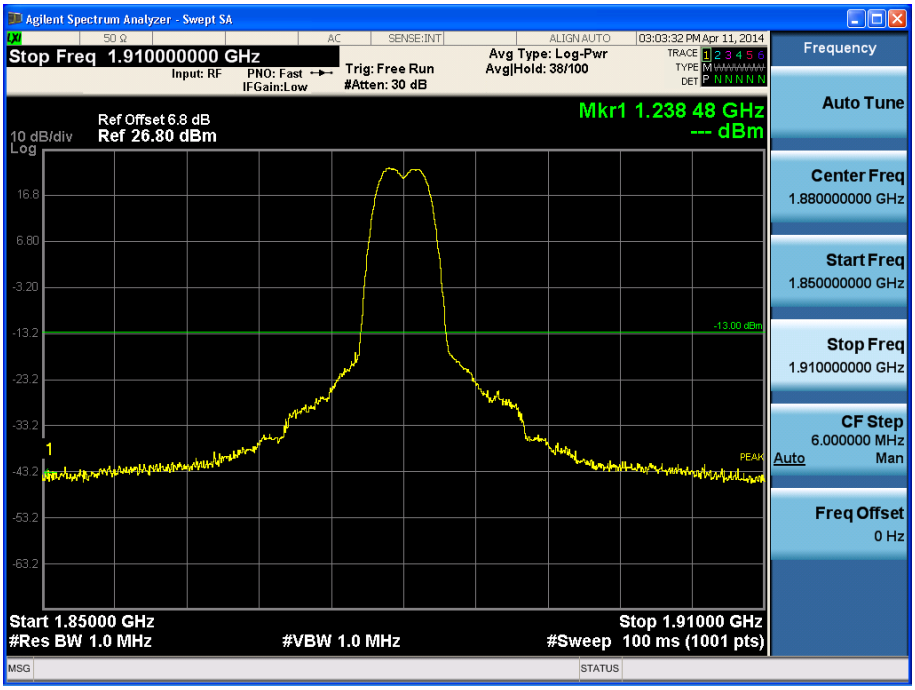

Channel 9400, 1850MHz~1910MHz

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

Channel 9400, 1910MHz~20GHz

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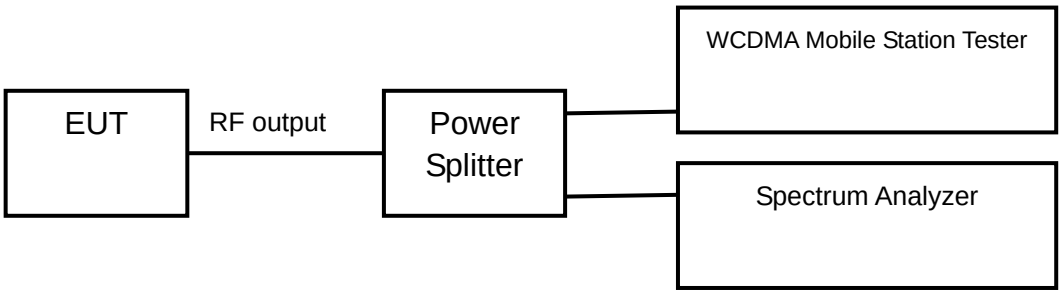
2.2.1.6 Band Edges Compliance-FCC Part24.238(b)

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	≤-13dBm

Test result:
Refer to the following figures.

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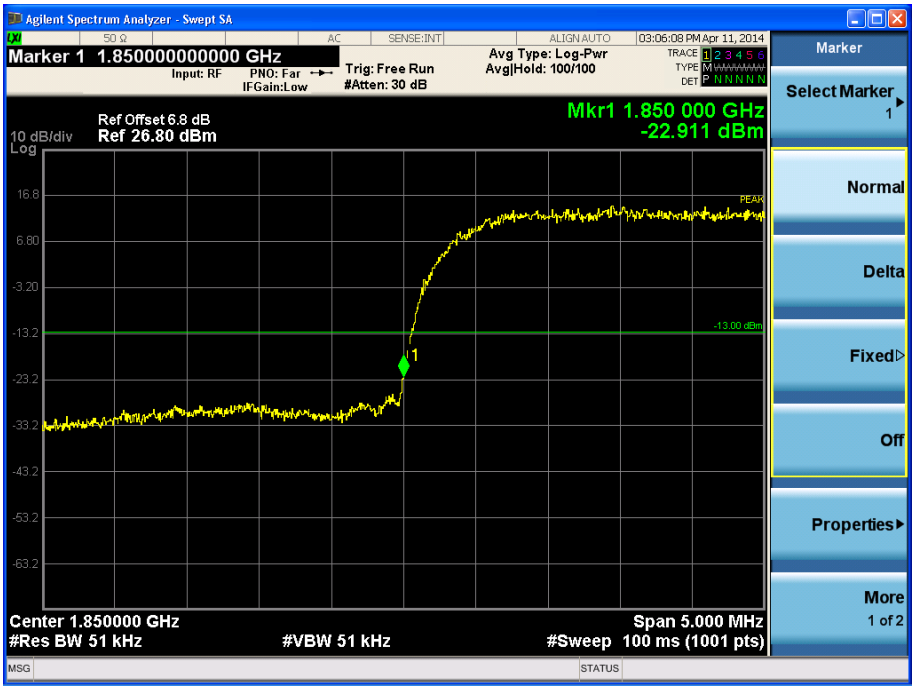
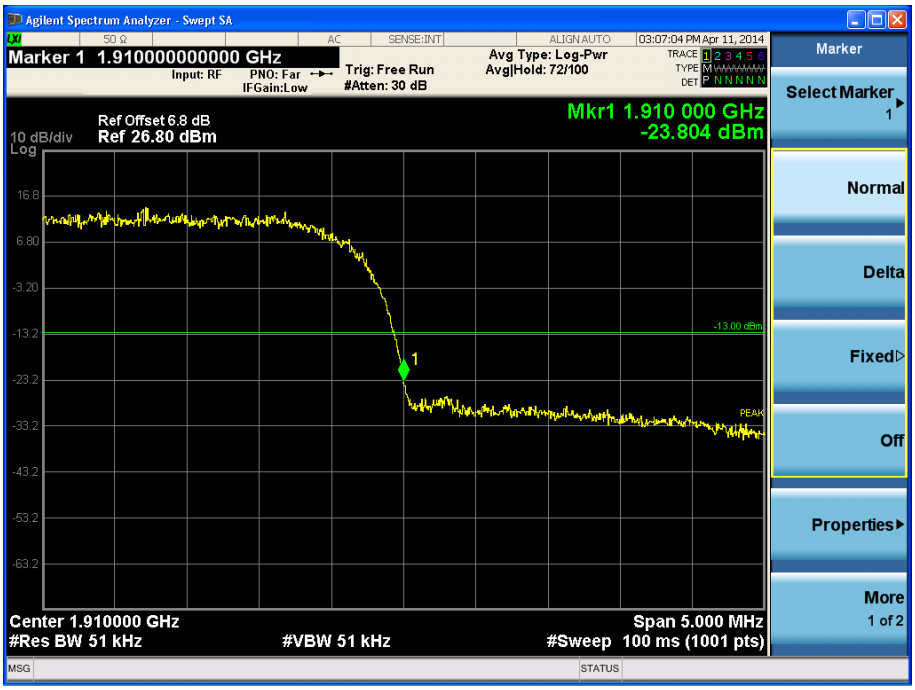
WCDMA Mode:



Channel 9262



Channel 9538

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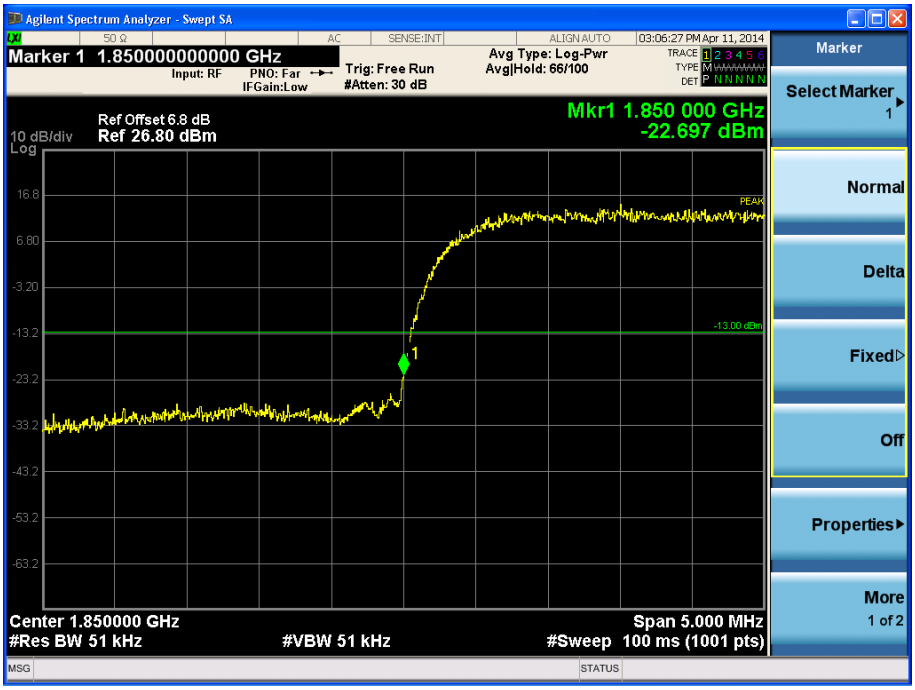
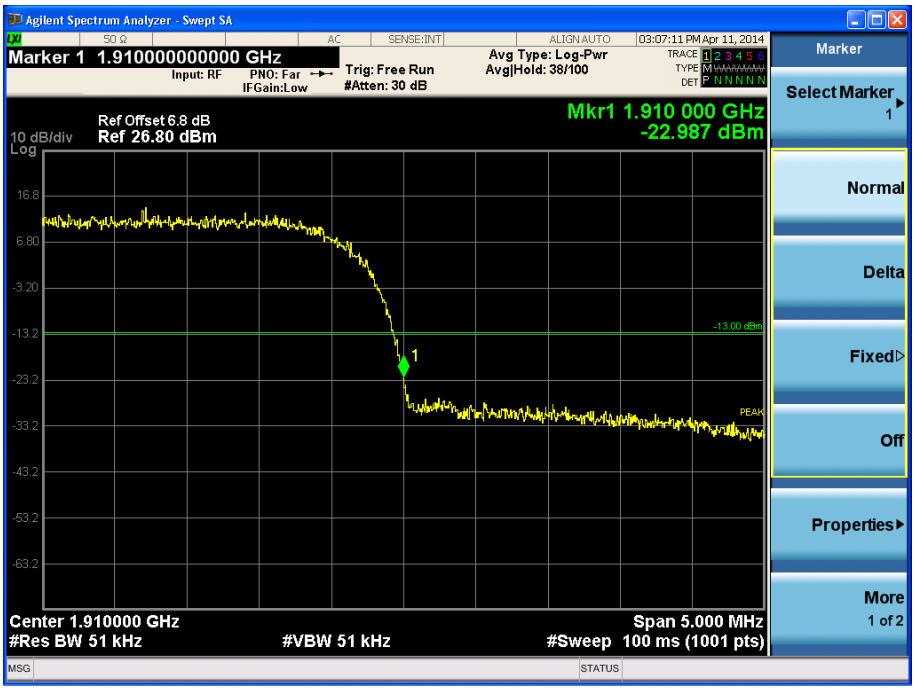
HSDPA/HSUPA Mode:



Channel 9262



Channel 9538

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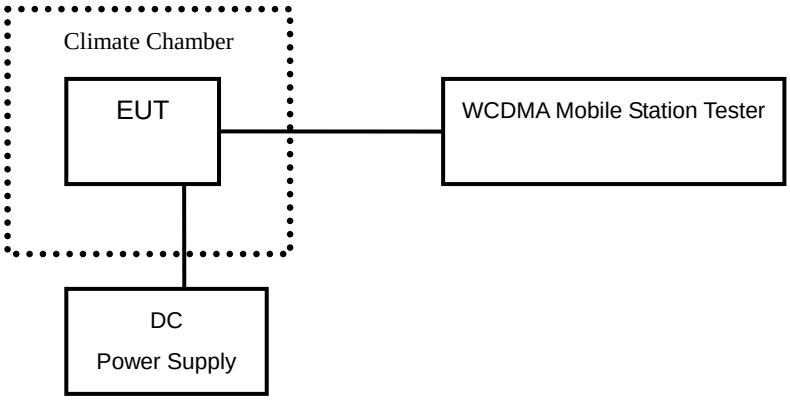
2.2.1.7 Frequency Stability-FCC Part2.1055/24.235

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 4.35V. 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.

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Test result:

WCDMA Mode:

Temperature(°C)	Test Result (ppm)@3.8V		
	Channel 9262	Channel 9400	Channel 9538
-30	0.002	0.001	0.001
-20	0.001	0.001	0.002
-10	0.001	0.002	0.001
0	0.001	0.001	0.001
+10	0.001	0.001	0.001
+20	0.001	0.001	0.001
+30	0.001	0.002	0.001
+40	0.001	0.001	0.002
+50	0.002	0.001	0.001

Voltage (V)	Test Result (ppm)@20°C		
	Channel 9262	Channel 9400	Channel 9538
3.5	0.001	0.001	0.001
4.35	0.001	0.002	0.001

HSDPA/HSUPA Mode:

Temperature(°C)	Test Result (ppm)@3.8V		
	Channel 9262	Channel 9400	Channel 9538
-30	0.001	0.001	0.001
-20	0.001	0.002	0.001
-10	0.001	0.001	0.002
0	0.002	0.001	0.002
+10	0.001	0.001	0.002
+20	0.001	0.001	0.001
+30	0.001	0.001	0.001
+40	0.002	0.002	0.001
+50	0.001	0.001	0.002

Voltage (V)	Test Result (ppm)@20°C		
	Channel 9262	Channel 9400	Channel 9538
3.5	0.002	0.001	0.002
4.35	0.001	0.001	0.001

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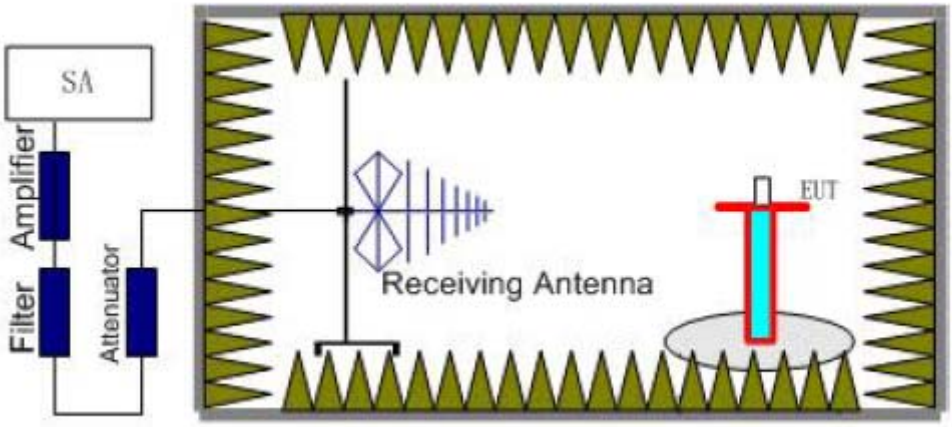
2.2.1.8 Radiated Spurious Emissions-FCC Part2.1053/24.238

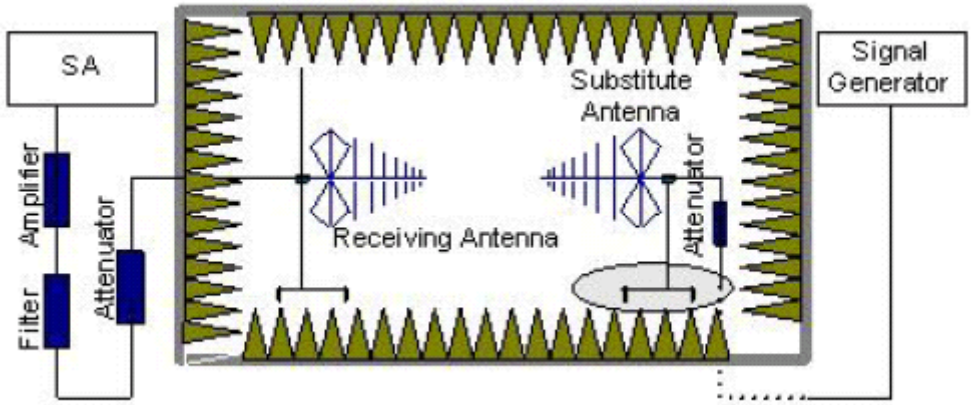
Ambient condition

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

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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:
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).

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

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

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
2452.74	-44.6	-5.6	8.6	-47.6	-13	Vertical
2775.38	-43.7	-5.8	8.9	-46.8	-13	Vertical
3735.27	-43.4	-6.9	9.1	-45.6	-13	Vertical
6687.31	-42.8	-8.9	11.2	-45.1	-13	Horizontal
9965.78	-38.9	-13.7	13.8	-39.0	-13	Vertical
17813.48	-31.4	-15.9	12.4	-27.9	-13	Vertical

Channel 9400

Frequency (MHz)	Power (dBm)	Pca Cable loss (dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2443.57	-44.7	-5.6	8.6	-47.7	-13	Vertical
2762.79	-43.6	-5.8	8.9	-46.7	-13	Vertical
3745.53	-43.2	-6.9	9.1	-45.4	-13	Vertical
6693.65	-42.5	-8.9	11.2	-44.8	-13	Vertical
9965.75	-38.2	-13.7	13.8	-38.3	-13	Vertical
17845.82	-31.3	-15.9	12.4	-27.8	-13	Vertical

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Channel 9538

Frequency (MHz)	Power (dBm)	Pca Cable loss (dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2463.53	-44.4	-5.6	8.6	-47.4	-13	Vertical
2802.43	-43.5	-5.8	8.9	-46.6	-13	Vertical
3753.38	-43.1	-6.9	9.1	-45.3	-13	Vertical
6674.85	-42.7	-8.9	11.2	-45.0	-13	Vertical
9985.86	-37.9	-13.7	13.8	-38.0	-13	Horizontal
17785.35	-31.8	-15.9	12.4	-28.3	-13	Vertical

HSDPA/HSUPA Mode:
Channel 9262

Frequency (MHz)	Power (dBm)	Pca Cable loss (dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2456.35	-44.5	-5.6	8.6	-47.5	-13	Horizontal
2765.37	-43.8	-5.8	8.9	-46.9	-13	Vertical
3768.84	-43.4	-6.9	9.1	-45.6	-13	Vertical
6696.71	-42.6	-8.9	11.2	-44.9	-13	Vertical
9978.68	-39.1	-13.7	13.8	-39.2	-13	Vertical
17823.78	-32.2	-15.9	12.4	-28.7	-13	Vertical

Channel 9400

Frequency (MHz)	Power (dBm)	Pca Cable loss (dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2457.82	-44.9	-5.6	8.6	-47.9	-13	Vertical
2774.49	-44.3	-5.8	8.9	-47.4	-13	Vertical
3763.77	-43.6	-6.9	9.1	-45.8	-13	Vertical
6686.58	-42.7	-8.9	11.2	-45.0	-13	Vertical
9975.35	-38.5	-13.7	13.8	-38.6	-13	Vertical
17821.61	-31.5	-15.9	12.4	-28.0	-13	Vertical

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Channel 9538

Frequency (MHz)	Power (dBm)	Pca Cable loss (dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
2464.38	-44.7	-5.6	8.6	-47.7	-13	Vertical
2745.13	-44.5	-5.8	8.9	-47.6	-13	Vertical
3769.73	-43.5	-6.9	9.1	-45.7	-13	Horizontal
6696.46	-42.6	-8.9	11.2	-44.9	-13	Vertical
9969.75	-37.9	-13.7	13.8	-38.0	-13	Vertical
17786.42	-32.1	-15.9	12.4	-28.6	-13	Vertical

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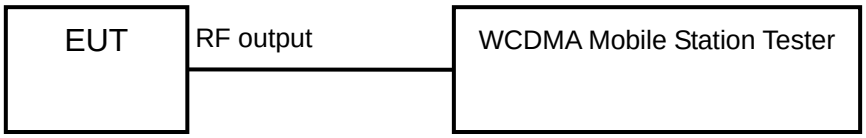
2.2.2 WCDMA Band V

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	≤24dBm

Test result:

WCDMA Mode:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
826.4	4132	22.64
836.6	4183	22.56
846.6	4233	22.66

HSDPA/HSUPA Mode:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
826.4	4132	21.80
836.6	4183	21.70
846.6	4233	21.30

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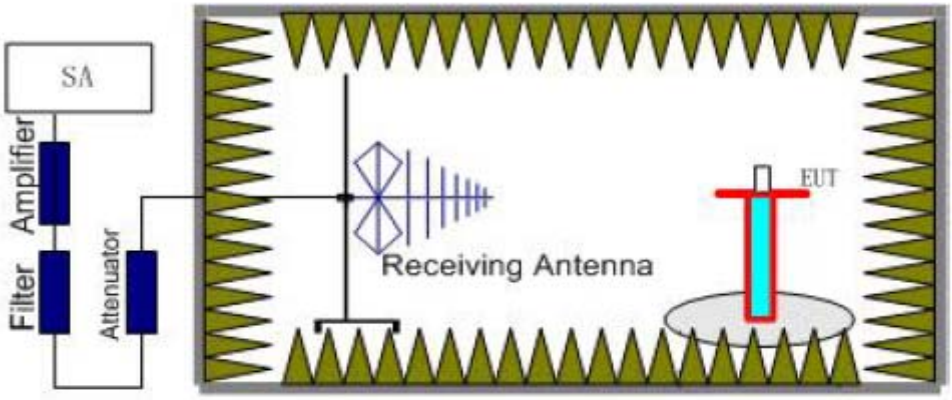
2.2.2.2 Effective Radiated Power-FCC Part22.913(a)

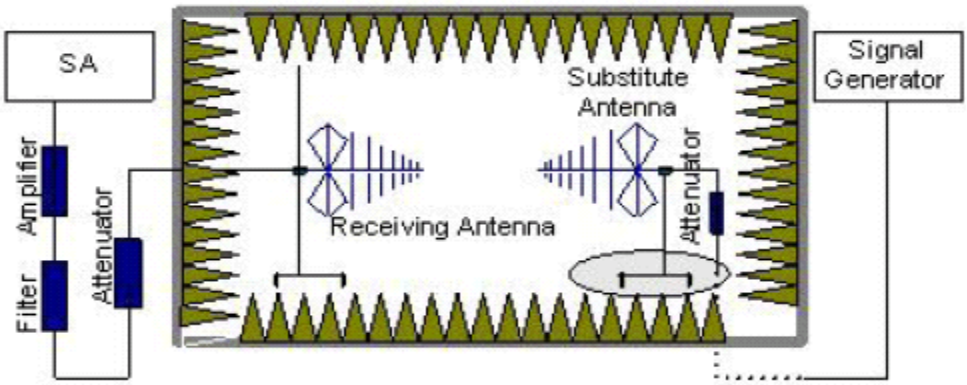
Ambient condition:

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

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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 (Pmea) 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 (Pmea) 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 (Pca) and the Substitution Antenna Gain (Ga).

The measurement results are obtained as described below:
Power (EIRP) = Pmea+ Pca+ Ga

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	20.85	-3.8	8.6	2.15	18.2	Vertical
836.6	20.95	-3.8	8.6	2.15	18.3	Vertical
846.6	20.65	-3.8	8.6	2.15	18.0	Vertical

HSDPA/HSUPA Mode:

Frequency (MHz)	Peak ERP (dBm)	Pca Cable loss (dB)	Ga Antenna Gain (dB)	Correction (dB)	Pmea (dBm)	Polarization
826.4	20.15	-3.8	8.6	2.15	17.5	Vertical
836.6	20.05	-3.8	8.6	2.15	17.4	Vertical
846.6	19.85	-3.8	8.6	2.15	17.2	Vertical

Frequency: 836.6MHz
Peak ERP(dBm) = Pmea(18.3dBm)+Pca(-3.8dB)+Ga(8.6dB)-2.15dB = 20.95dBm

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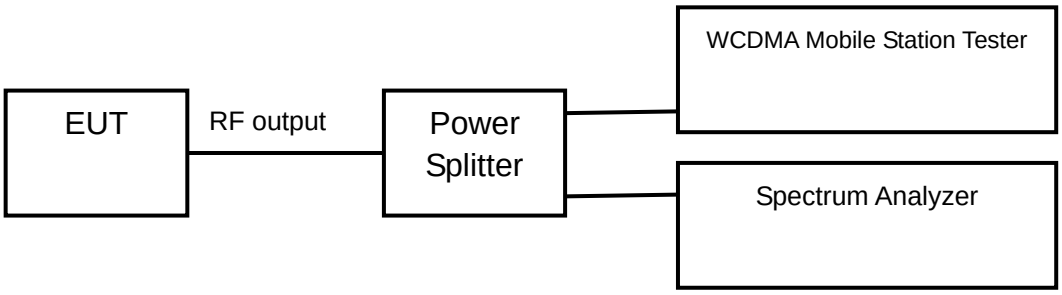
2.2.2.3 Occupied Bandwidth-FCC Part2.1049

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	4.1619
836.6	4183	4.1598
846.6	4233	4.1625

HSDPA/HSUPA Mode:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (MHz)
826.4	4132	4.1619
836.6	4183	4.1494
846.6	4233	4.1772

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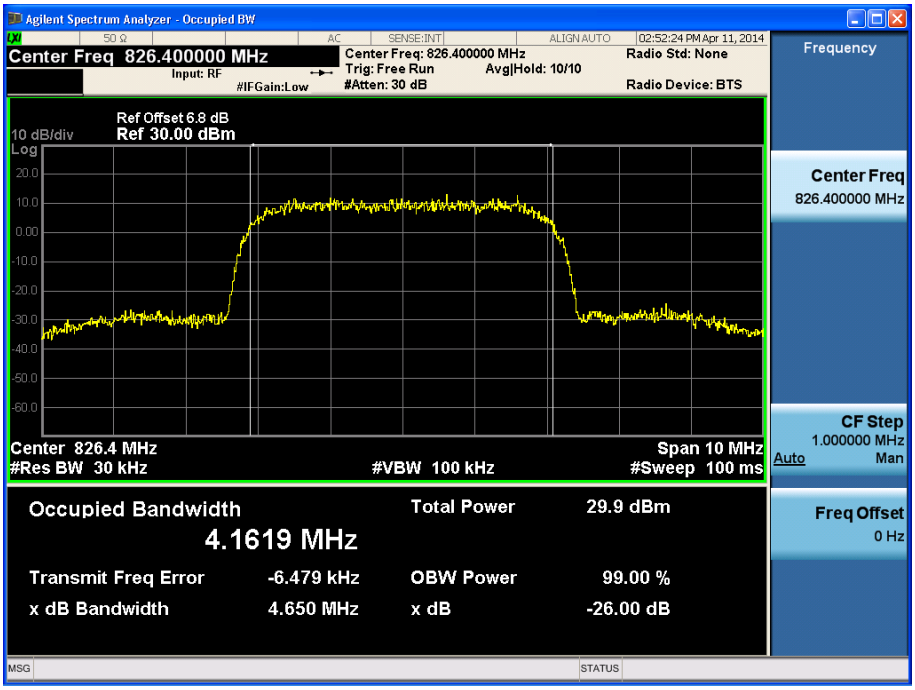
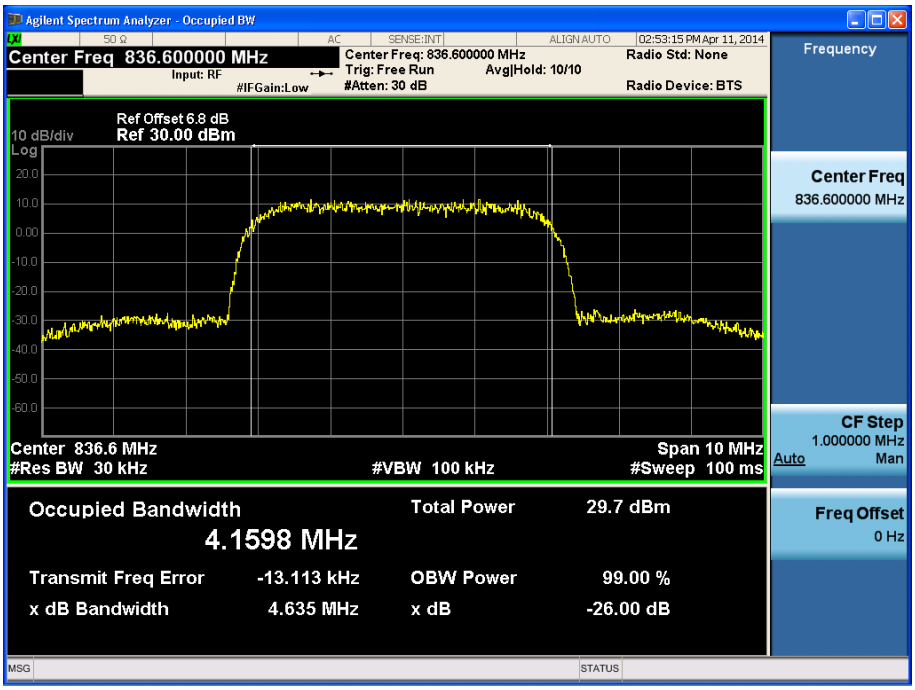
WCDMA Mode:



Channel 4132



Channel 4183

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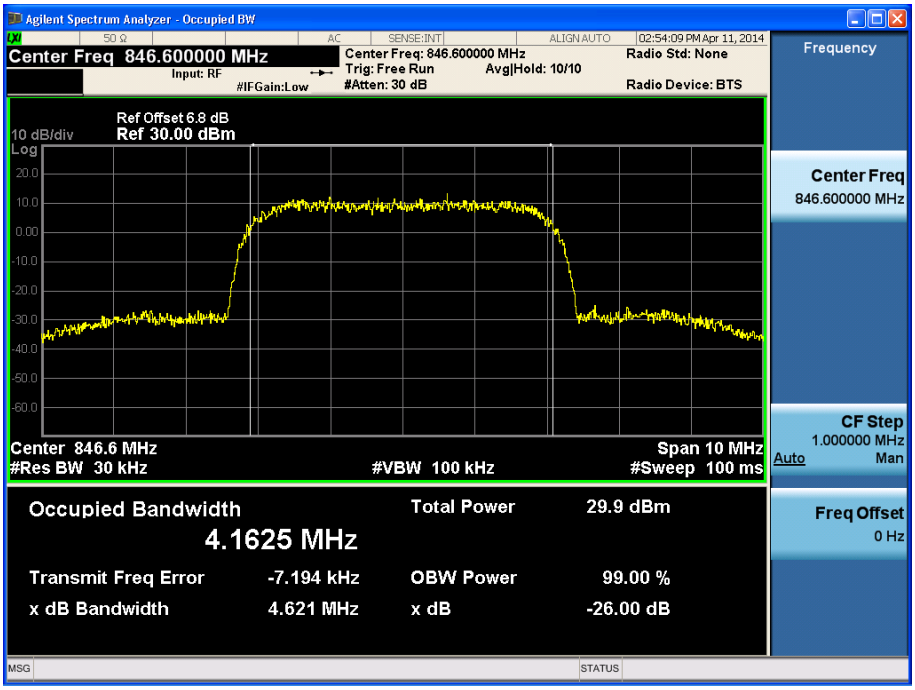
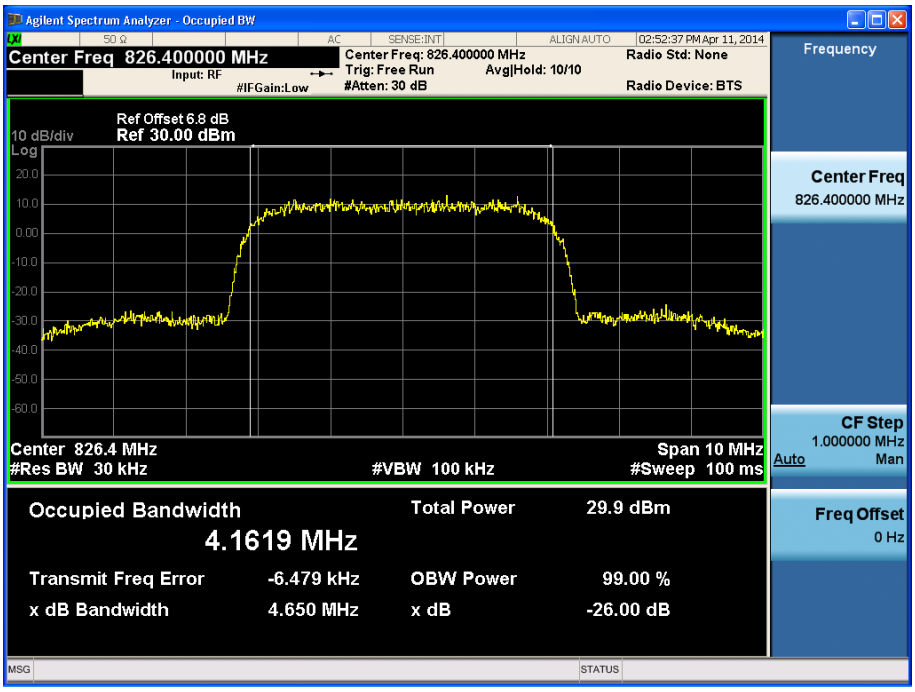


Channel 4233

HSDPA/HSUPA Mode:



Channel 4132

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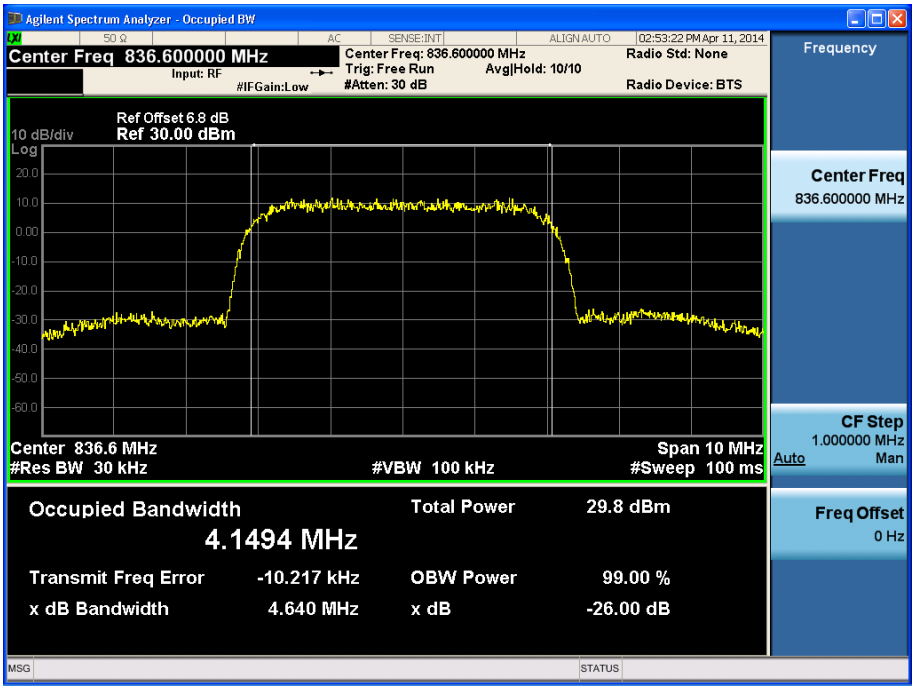
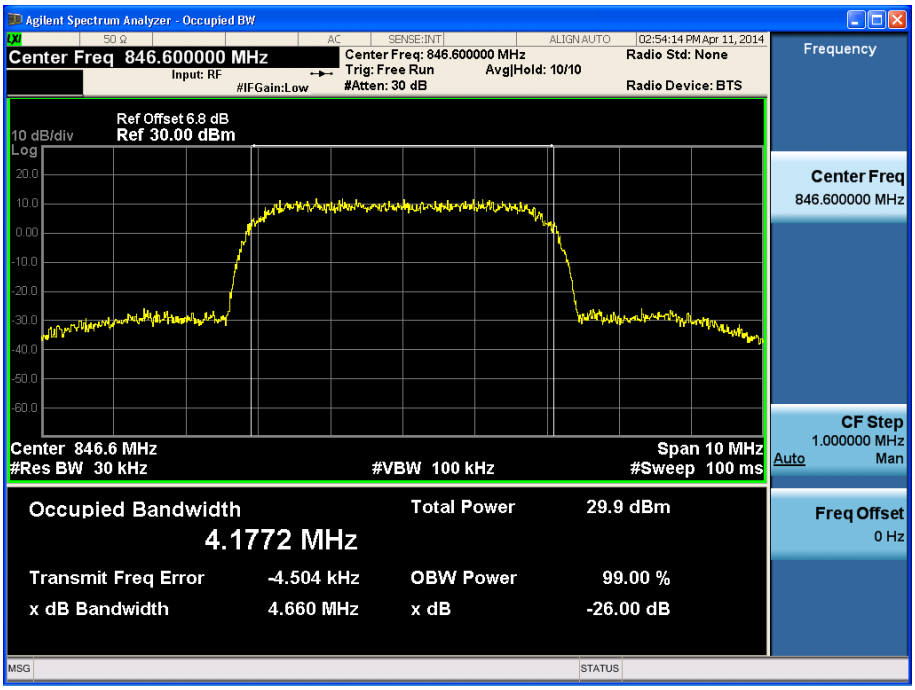


Channel 4183



Channel 4233

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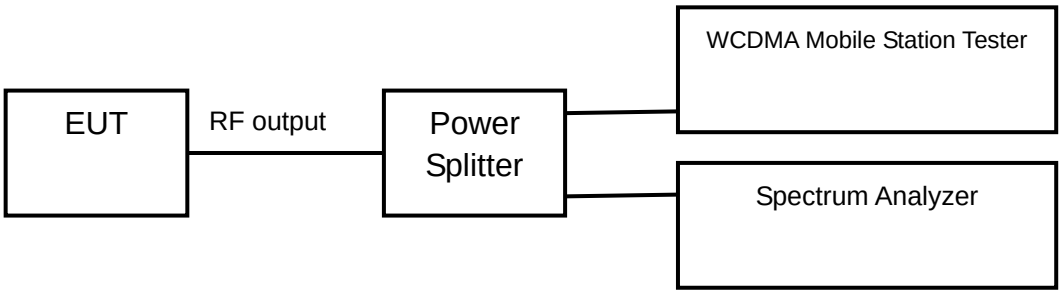
2.2.2.4 Emission Bandwidth-FCC Part22.917(b)

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	4.650
836.6	4183	4.635
846.6	4233	4.621

HSDPA/HSUPA Mode:

Carrier frequency (MHz)	Channel No.	Bandwidth of -26dBc Power (MHz)
826.4	4132	4.650
836.6	4183	4.640
846.6	4233	4.660

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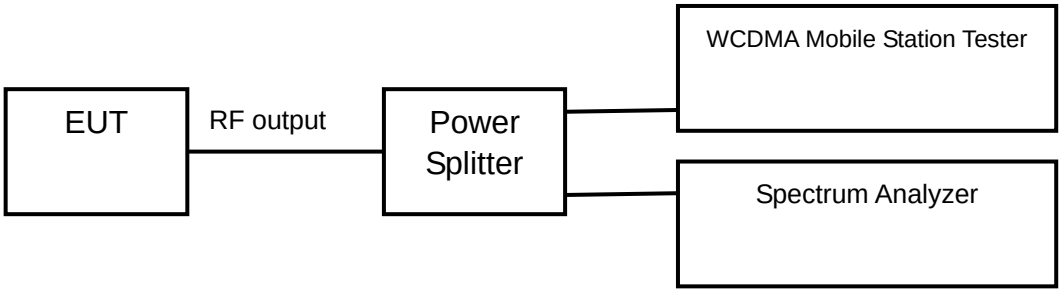
2.2.2.5 Spurious Emissions at antenna terminal-FCC Part2.1051/22.917

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	≤-13dBm

Test result:
Refer to the following figures.

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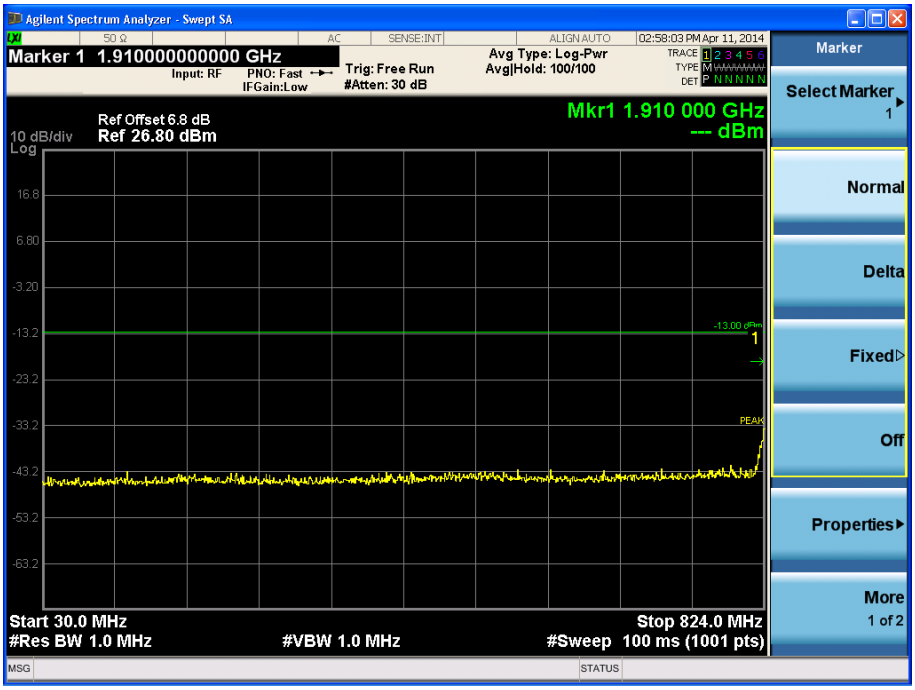
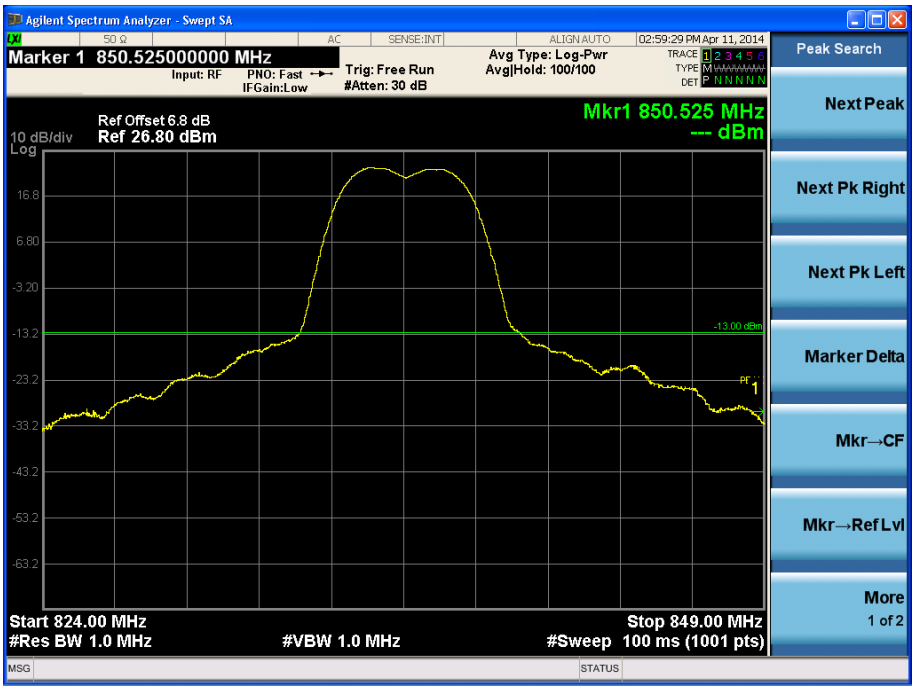
WCDMA Mode:



Channel 4183, 30MHz~824MHz



Channel 4183, 824MHz~849MHz

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

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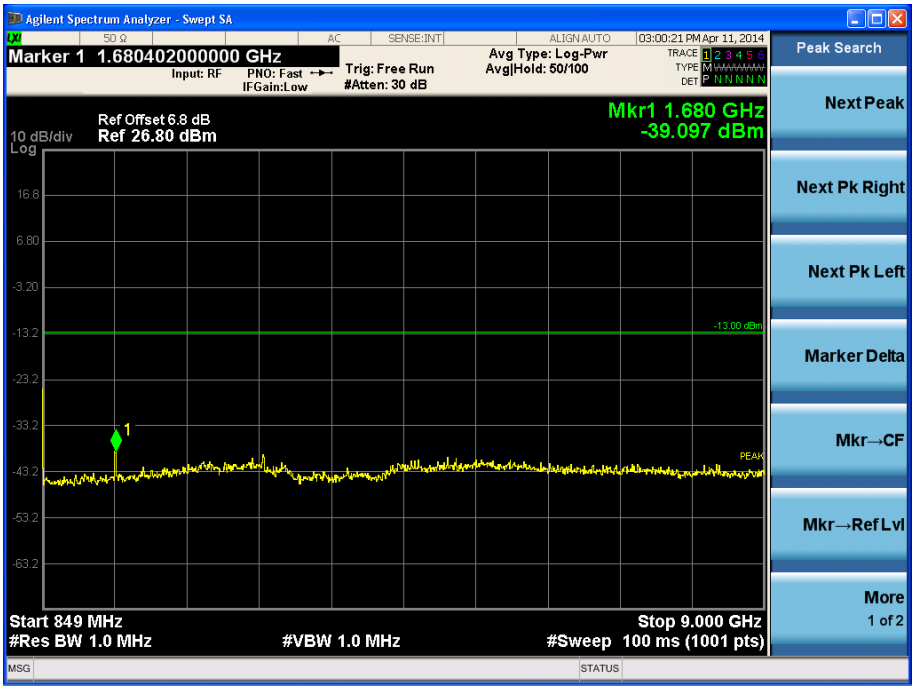
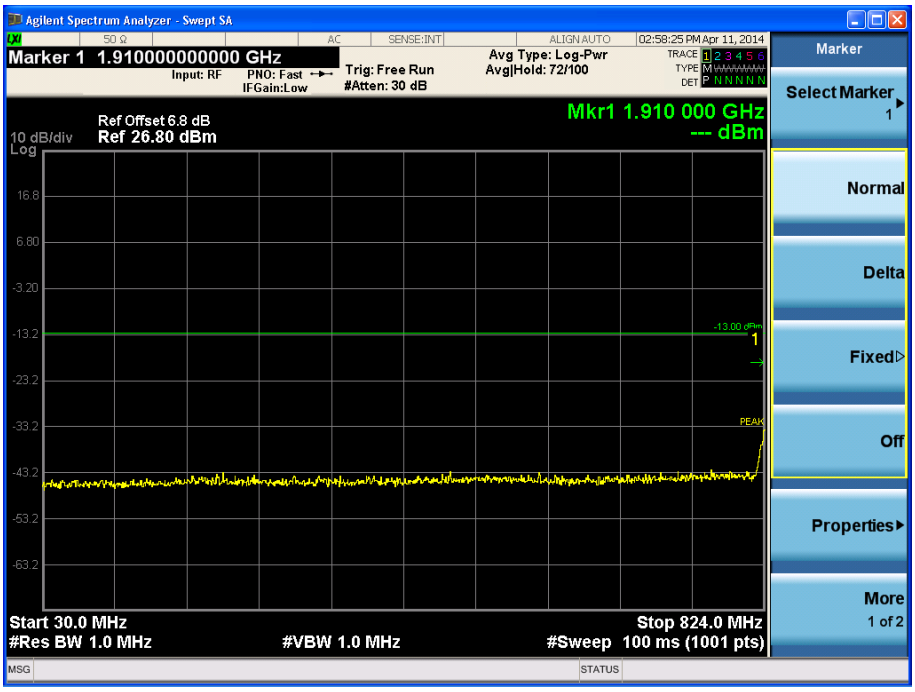


Channel 4183, 849MHz~9GHz

HSDPA/HSUPA Mode:



Channel 4183, 30MHz~824MHz

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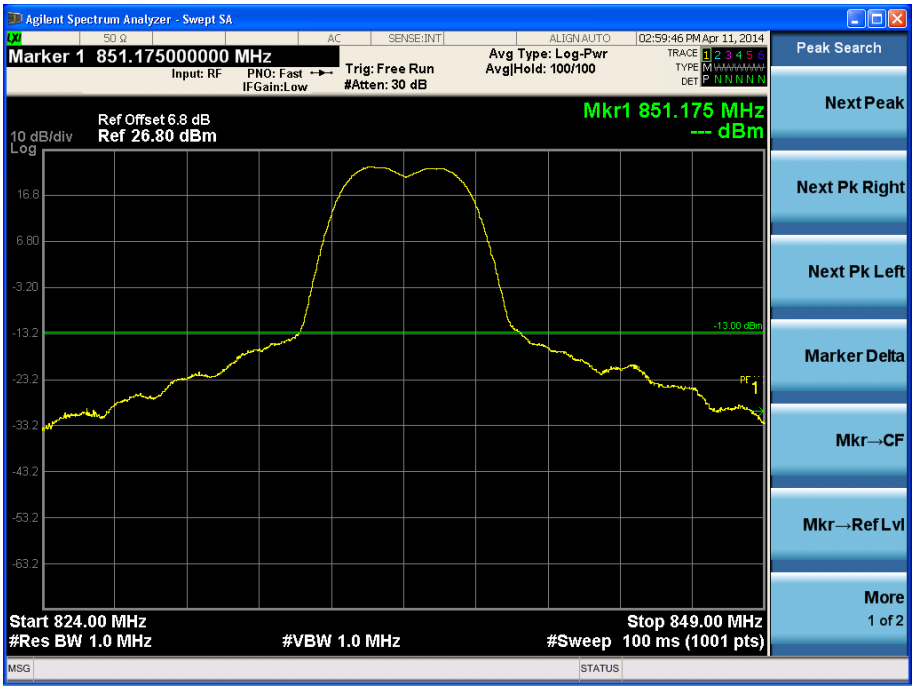
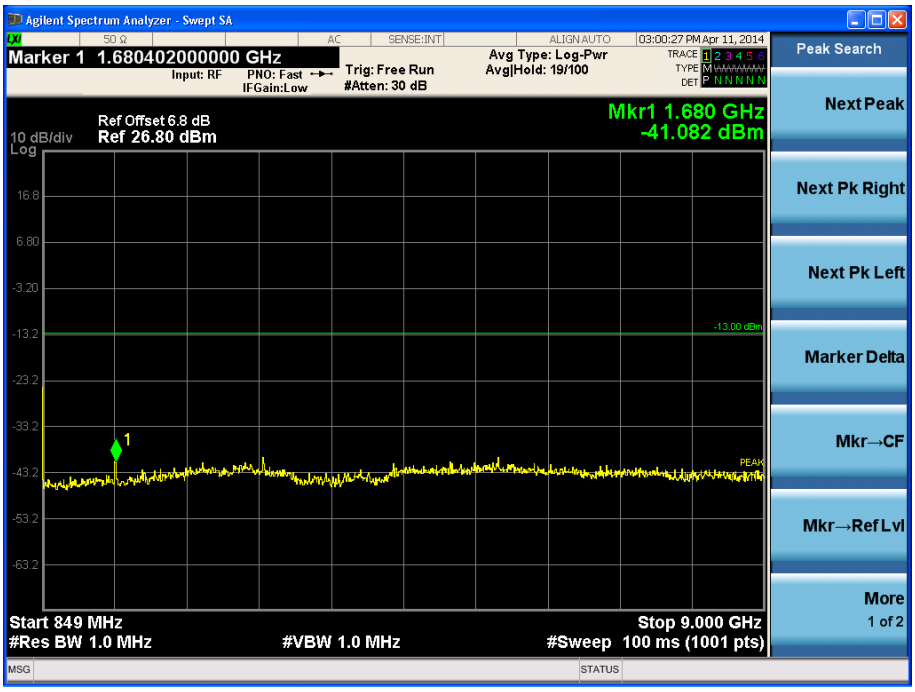


Channel 4183, 824MHz~849MHz

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



Channel 4183, 849MHz~9GHz

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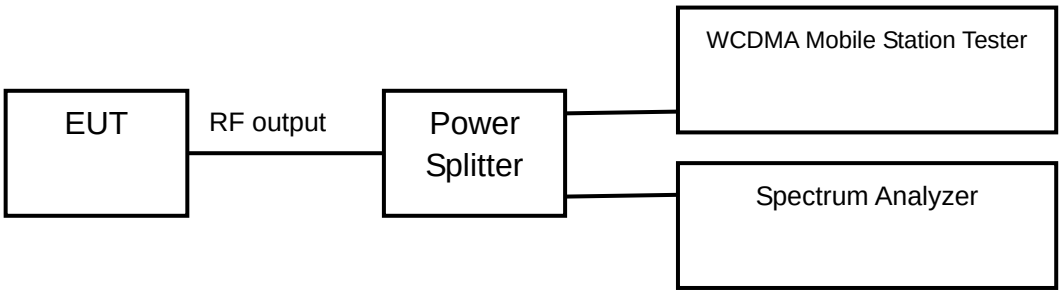
2.2.2.6 Band Edges Compliance-FCC Part22.917(b)

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	≤-13dBm

Test result:
Refer to the following figures.

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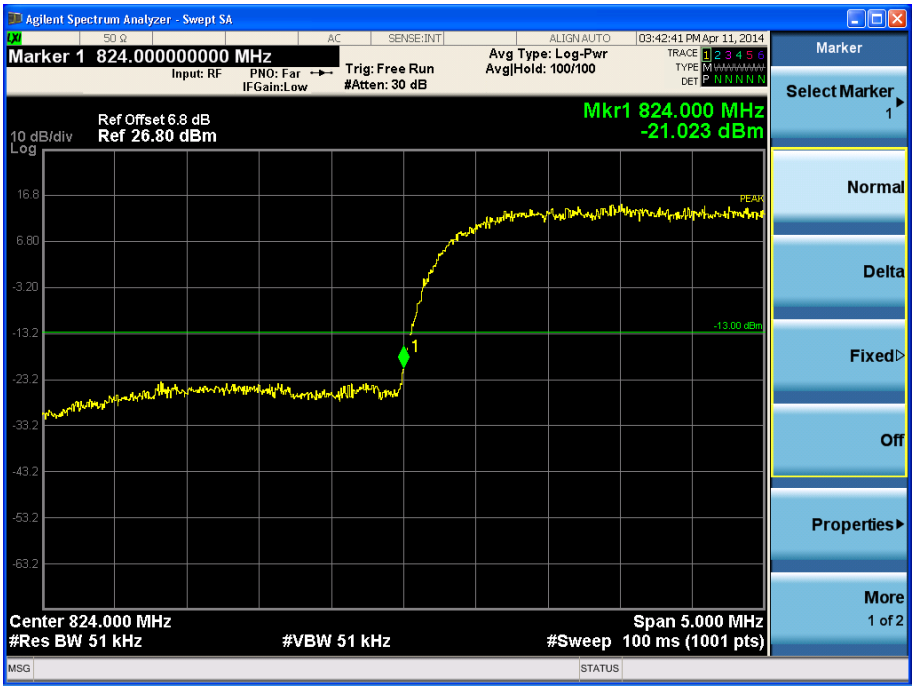
WCDMA Mode:



Channel 4132

Channel 4233

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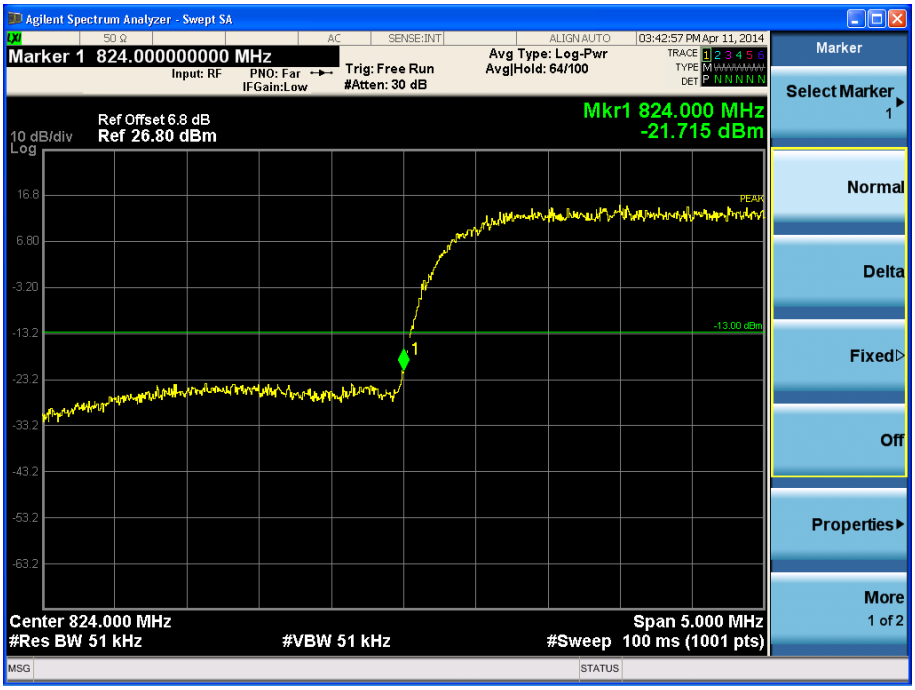
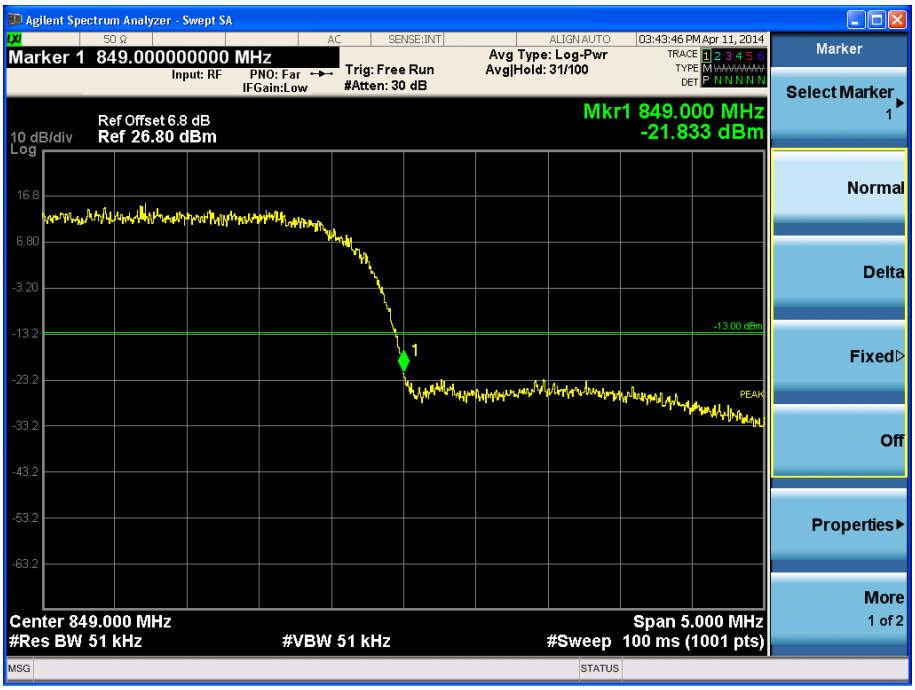
HSDPA/HSUPA Mode:



Channel 4132



Channel 4233

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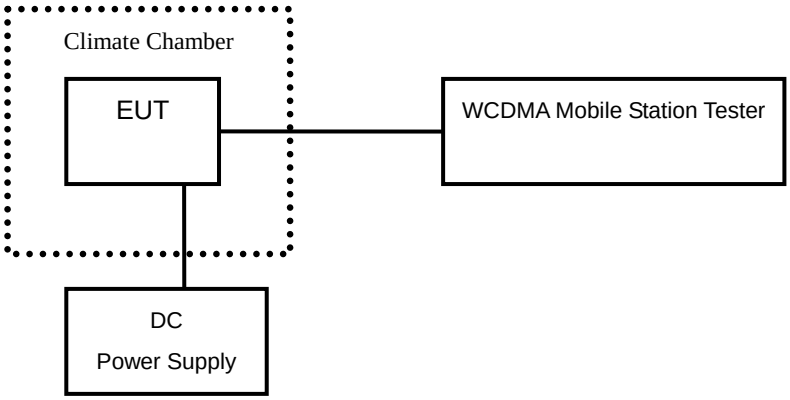
2.2.2.7 Frequency Stability-FCC Part2.1055/22.355

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 4.35V. 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.

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Test result:

WCDMA Mode:

Temperature(°C)	Test Result (ppm)@3.8V		
	Channel 4132	Channel 4183	Channel 4233
-30	0.002	0.002	0.001
-20	0.002	0.001	0.002
-10	0.001	0.001	0.001
0	0.001	0.002	0.001
+10	0.002	0.001	0.002
+20	0.001	0.001	0.001
+30	0.002	0.002	0.001
+40	0.001	0.001	0.002
+50	0.002	0.002	0.002

Voltage (V)	Test Result (ppm)@20°C		
	Channel 4132	Channel 4183	Channel 4233
3.5	0.001	0.001	0.001
4.35	0.001	0.001	0.001

HSDPA/HSUPA Mode:

Temperature(°C)	Test Result (ppm)@3.8V		
	Channel 4132	Channel 4183	Channel 4233
-30	0.002	0.002	0.001
-20	0.001	0.001	0.001
-10	0.002	0.001	0.002
0	0.001	0.001	0.001
+10	0.001	0.002	0.002
+20	0.001	0.001	0.001
+30	0.001	0.001	0.001
+40	0.002	0.001	0.002
+50	0.001	0.001	0.001

Voltage (V)	Test Result (ppm)@20°C		
	Channel 4132	Channel 4183	Channel 4233
3.5	0.001	0.001	0.002
4.35	0.001	0.002	0.001

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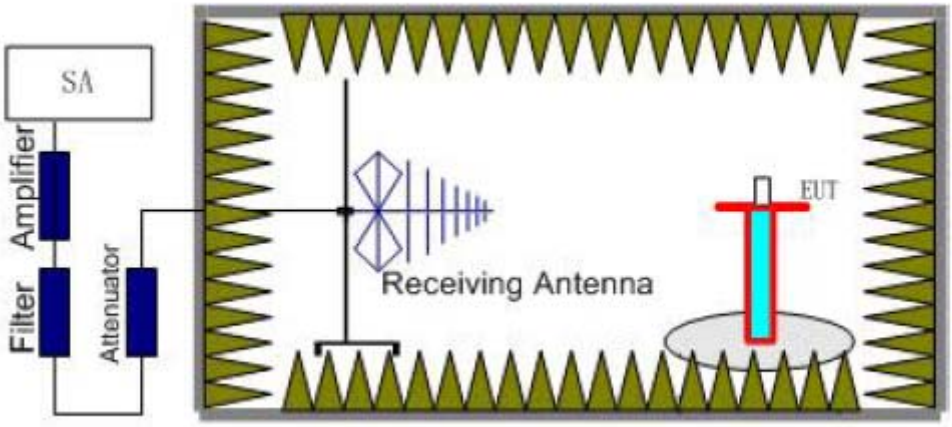
2.2.2.8 Radiated Spurious Emissions-FCC Part2.1053/22.917(a)

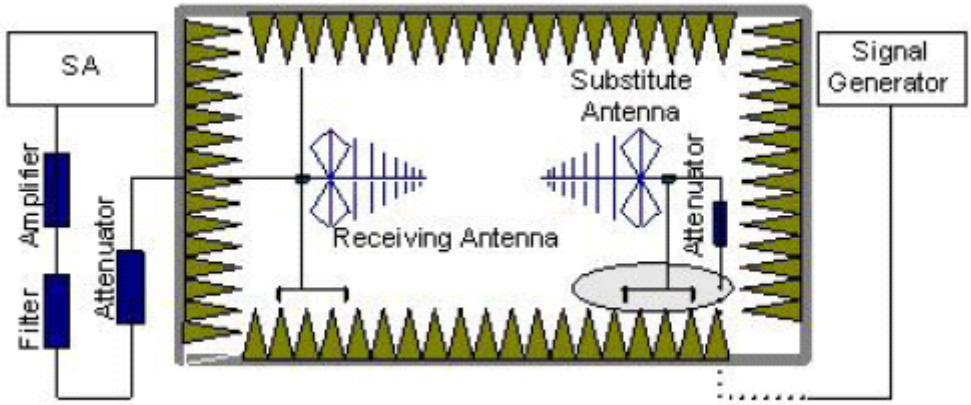
Ambient condition

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

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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:
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).

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

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

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
1625.47	-51.4	-4.6	8.3	-55.1	-13	Vertical
1674.86	-50.5	-4.8	8.3	-54.0	-13	Vertical
2534.53	-44.1	-5.7	8.9	-47.3	-13	Vertical
2565.78	-43.6	-5.9	8.9	-46.6	-13	Horizontal
8967.53	-40.4	-10.8	12.7	-42.3	-13	Vertical
9981.43	-36.4	-11.8	13.8	-38.4	-13	Vertical

Channel 4183

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1643.73	-51.7	-4.6	8.3	-55.4	-13	Vertical
1658.36	-50.6	-4.8	8.3	-54.1	-13	Horizontal
2532.69	-43.6	-5.7	8.9	-46.8	-13	Vertical
2571.83	-43.1	-5.9	8.9	-46.1	-13	Vertical
8965.36	-40.4	-10.8	12.7	-42.3	-13	Vertical
9976.63	-36.2	-11.8	13.8	-38.2	-13	Vertical

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Channel 4233

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1632.36	-52.2	-4.6	8.3	-55.9	-13	Vertical
1675.38	-51.5	-4.8	8.3	-55.0	-13	Vertical
2535.32	-43.9	-5.7	8.9	-47.1	-13	Horizontal
2568.54	-43.4	-5.9	8.9	-46.4	-13	Vertical
8978.69	-39.3	-10.8	12.7	-41.2	-13	Vertical
9974.34	-36.5	-11.8	13.8	-38.5	-13	Vertical

HSDPA/HSUPA Mode:
Channel 4132

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1643.75	-52.5	-4.6	8.3	-56.2	-13	Vertical
1665.42	-51.8	-4.8	8.3	-55.3	-13	Vertical
2554.76	-44.1	-5.7	8.9	-47.3	-13	Vertical
2568.46	-43.7	-5.9	8.9	-46.7	-13	Horizontal
8986.57	-40.1	-10.8	12.7	-42.0	-13	Vertical
9978.23	-36.4	-11.8	13.8	-38.4	-13	Vertical

Channel 4183

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1638.31	-52.4	-4.6	8.3	-56.1	-13	Vertical
1646.86	-51.6	-4.8	8.3	-55.1	-13	Vertical
2548.75	-45.1	-5.7	8.9	-48.3	-13	Vertical
2569.31	-43.8	-5.9	8.9	-46.8	-13	Vertical
8986.93	-40.2	-10.8	12.7	-42.1	-13	Vertical
9974.46	-36.3	-11.8	13.8	-38.3	-13	Vertical

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Channel 4233

Frequency (MHz)	Power (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Limited (dBm)	Polarization
1648.12	-52.8	-4.6	8.3	-56.5	-13	Vertical
1667.95	-51.5	-4.8	8.3	-55.0	-13	Vertical
2534.13	-44.1	-5.7	8.9	-47.3	-13	Vertical
2574.28	-43.5	-5.9	8.9	-46.5	-13	Vertical
8965.89	-39.4	-10.8	12.7	-41.3	-13	Horizontal
9968.67	-35.9	-11.8	13.8	-37.9	-13	Vertical

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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

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Appendix

Appendix1 Test Setup

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