Registration
No.910917

TEST REPORT FOR RF TESTING

Report No.: SRTC2016-9004(F)-0001

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

Product Model: Philips Xenium V787

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

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

Specification: FCC Part 24E, Part 22H, Part 2 (August 20, 2015 edition)

FCC ID: VQRCTV787

The State Radio_monitoring_center Testing Center (SRTC)

No.80 Beilishi Road Xicheng District Beijing, China

Tel: 86-10-57996181 Fax: 86-10-57996288

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1. GENERAL INFORMATION

1.1 Notes of the test report

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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
City:	Beijing
Country or Region:	P.R.China
Contacted person:	liujia
Tel:	+86 10 5799 6181
Fax:	+86 10 5799 6288
Email:	liujiaf@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:	linda zhang
Tel:	010-68300097
Fax:	010-68300097
Email:	linda.zhang@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:	linda zhang
Tel:	010-68300097
Fax:	010-68300097
Email:	linda.zhang@sangfei.com

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1.5 Test Environment

Date of Receipt of test sample at SRTC:	2016.01.21
Testing Start Date:	2016.01.22
Testing End Date:	2016.01.25

Environmental Data:	Temperature (°C)	Humidity (%)
Ambient	25	38
Maximum Extreme	55	80
Minimum Extreme	-10	---

Normal Supply Voltage (V d.c.):	3.80
Maximum Extreme Supply Voltage (V d.c.):	4.35
Minimum Extreme Supply Voltage (V d.c.):	3.50

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2 DESCRIPTION OF THE DEVICE UNDER TEST

2.1Final Equipment Build Status

Frequency Range	GSM850: Tx:824~849MHz Rx:869~894MHz PCS1900: Tx:1850~1910MHz Rx:1930~1990MHz
Rated Output Power	GSM850:32.5dBm PCS1900:29.5dBm
Modulation Type	GSM/GPRS:GMSK EDGE: GMSK(Uplink direction) 8PSK(Downlink direction)
Emission Designator	300KGXW 30K0GXW 300KG7W
Duplex Mode	FDD
Duplex Spacing	GSM850:45MHz PCS1900:80MHz
Antenna Type	Fixed Internal
Power Supply	Battery
HW Version	WMCVc
SW Version	Philips_V787_1553_V01_AG_FCC
IMEI	866636024833059

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2.2 Support Equipment

The following support equipment was used to exercise the DUT during testing:

Equipment	Battery
Manufacturer	Zhongshan Tianmao Battery Co.
Model Number	AB5000AWML
Serial Number	---

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3 REFERENCE SPECIFICATION

Specification	Version	Title
2.1046	July 7, 1998	Measurements required: RF power output.
2.1049	July 7, 1998	Measurements required: Occupied bandwidth.
2.1051	July 7, 1998	Measurements required: Spurious emissions at antenna terminals.
2.1053	July 7, 1998	Measurements required: Field strength of spurious radiation.
2.1055	Dec. 9, 2003	Measurements required: Frequency stability.
22.355	Oct. 17, 1996	Frequency tolerance.
22.913	Dec. 15, 2004	Effective radiated power limits.
22.917	Dec. 17, 2002	Emission limitations for cellular equipment.
24.232	May 2, 2008	Power and antenna height limits.
24.235	N/A	Frequency stability.
24.238	Dec. 17, 2002	Emission limitations for Broadband PCS equipment.

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4 KEY TO NOTES AND RESULT CODES

The following are the definition of the test result.

Code	Meaning
PASS	Test result shows that the requirements of the relevant specification have been met.
FAIL	Test result shows that the requirements of the relevant specification have not been met.
N/T	Test case is not tested.
NTC	Nominal voltage, Normal Temperature
HV	High voltage, Normal Temperature
LV	Low voltage, Normal Temperature
HTHV	high voltage, High Temperature
LTHV	High voltage, Low Temperature
HTLV	Low voltage, High Temperature
LTLV	Low voltage, Low Temperature

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5 RESULT SUMMARY

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

This Test Report Is Issued by: Mr.Tao Hongbo	Checked by: Mr.Li Boyu
Tested by: Mr. Jiang Shuo	Issued date: 2016/3/23

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6 TEST RESULT

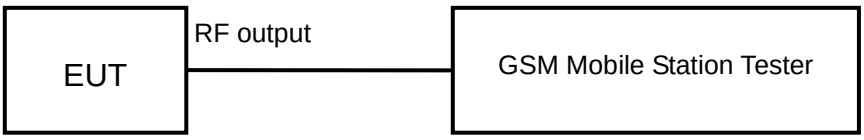
6.1 GSM850

6.1.1 RF Power Output-FCC Part2.1046

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. Then the test data can be read at the tester screen. The loss between RF output port of the EUT and the input port of the tester will be taken into consideration.
The measurement will be conducted at three channels No128, No189 and No251 (Bottom, middle and top channels of GSM850 band)

Limits	≤33.0dBm

Test result:
GSM/GPRS MODE:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
824.2	128	32.77
836.4	189	32.75
848.8	251	32.71

EDGE MODE:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
824.2	128	32.76
836.4	189	32.74
848.8	251	32.68

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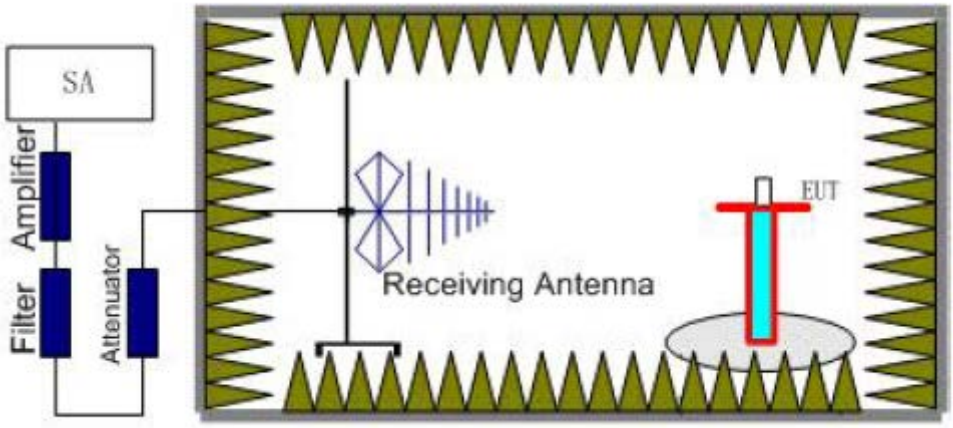
6.1.2 Effective Radiated Power-FCC Part22.913(a)

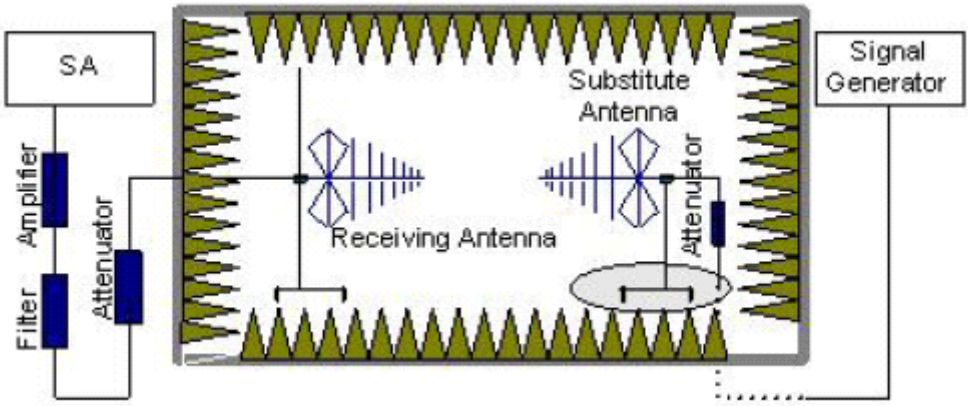
Ambient condition:

Temperature	Relative humidity	Pressure
20.8°C	36.5%	100.9kPa

Test setup:



Step 1



Step 2

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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 (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 No128, No189 and No251 (Bottom, middle and top channels of GSM850 band)

Limits:

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

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Test result:
GSM/GPRS MODE:

Frequency (MHz)	Power step	Peak ERP (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Correction (dB)	Pmea (dBm)	Polarization
824.2	5	29.57	-3.80	8.60	2.15	26.92	Vertical
836.6	5	30.51	-3.80	8.60	2.15	27.86	Vertical
848.8	5	30.28	-3.80	8.60	2.15	27.63	Vertical

EDGE MODE:

Frequency (MHz)	Power step	Peak ERP (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Correction (dB)	Pmea (dBm)	Polarization
824.2	5	29.09	-3.80	8.60	2.15	26.44	Vertical
836.6	5	29.67	-3.80	8.60	2.15	27.02	Vertical
848.8	5	29.44	-3.80	8.60	2.15	26.79	Vertical

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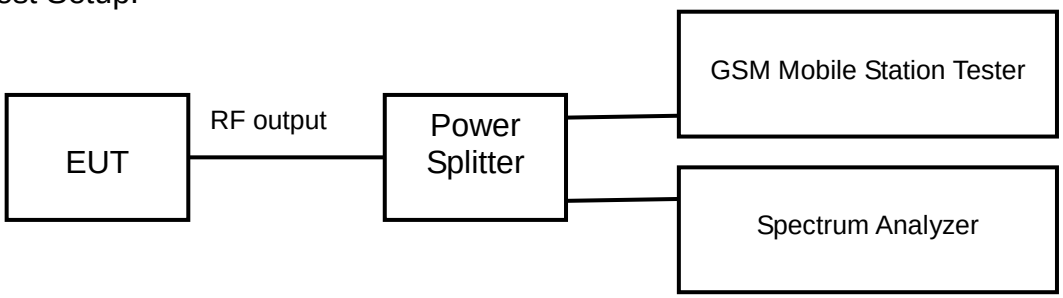
6.1.3 Occupied Bandwidth-FCC Part2.1049

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. The occupied bandwidth is measured using spectrum analyzer. RBW is set to 3kHz on spectrum analyzer. The bandwidth of 99% power can be read on spectrum analyzer.
The measurement will be conducted at three channels No128, No189 and No251 (Bottom, middle and top channels of GSM850 band)

Limits: No specific occupied bandwidth requirements in part 2.1049

Test result:
GSM/GPRS MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (kHz)
824.2	128	250
836.4	189	245
848.8	251	246

EDGE (GMSK) MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (kHz)
824.2	128	245
836.4	189	247
848.8	251	246

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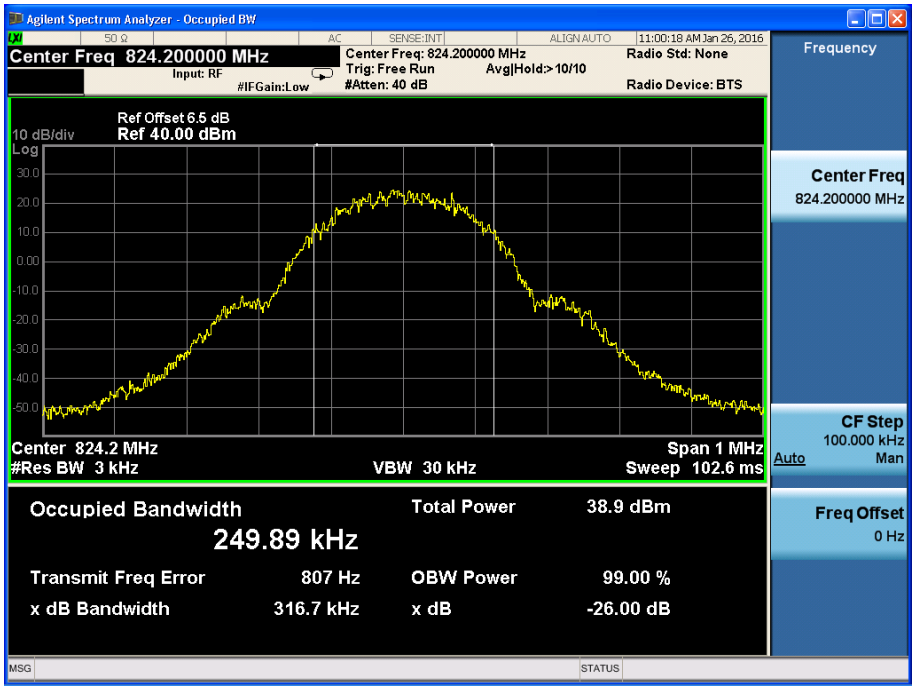
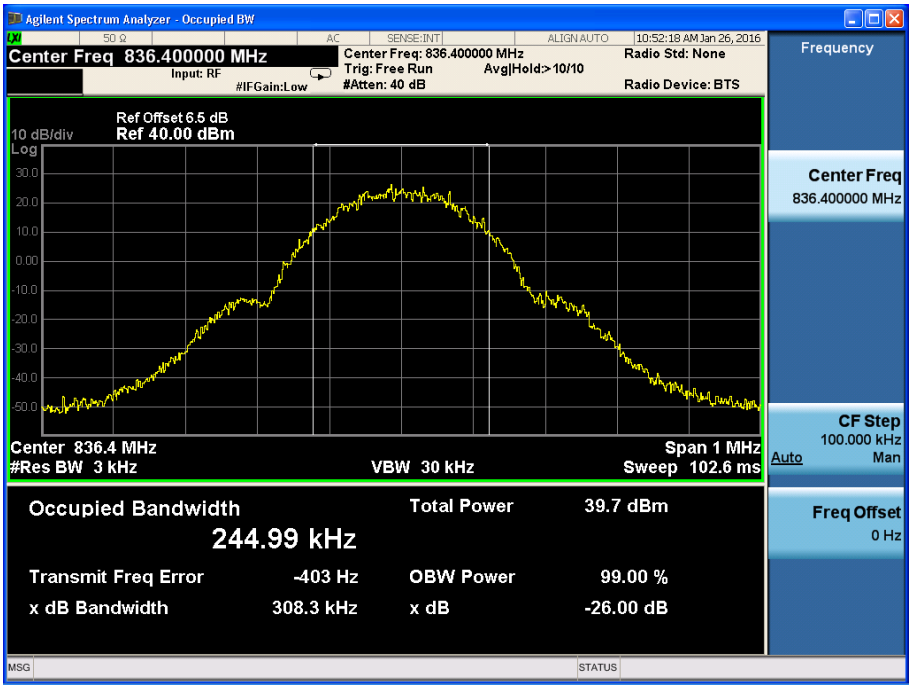
GSM/GPRS MODE:



Channel 128



Channel 189

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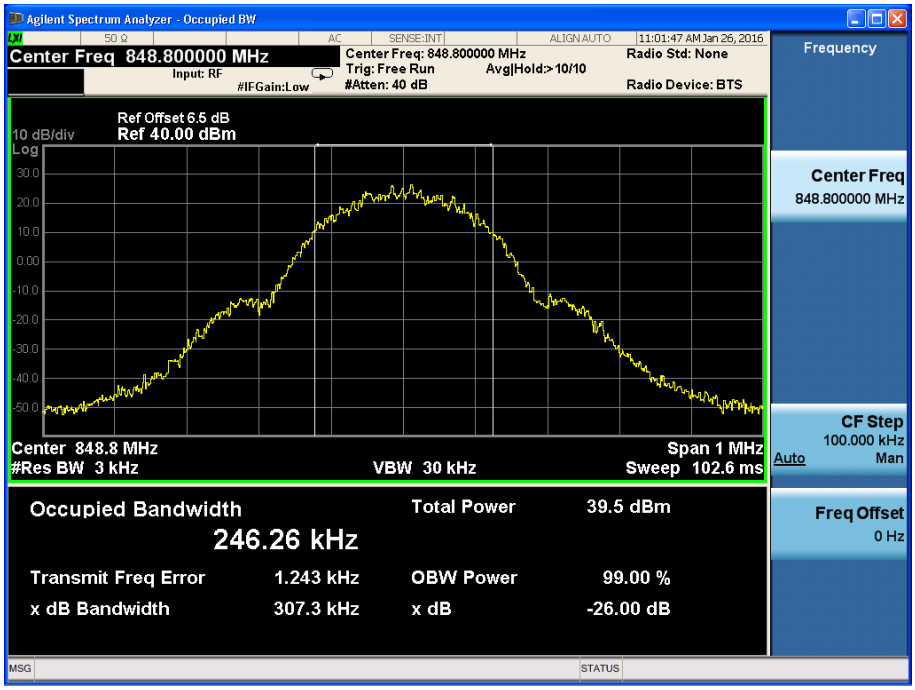
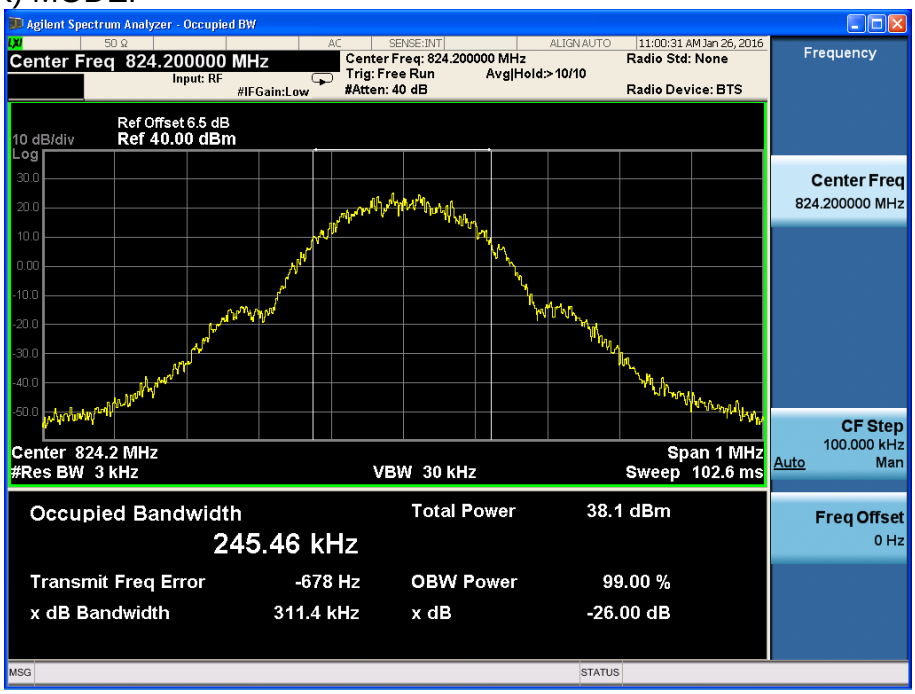


Channel 251

EDGE (GMSK) MODE:



Channel 128

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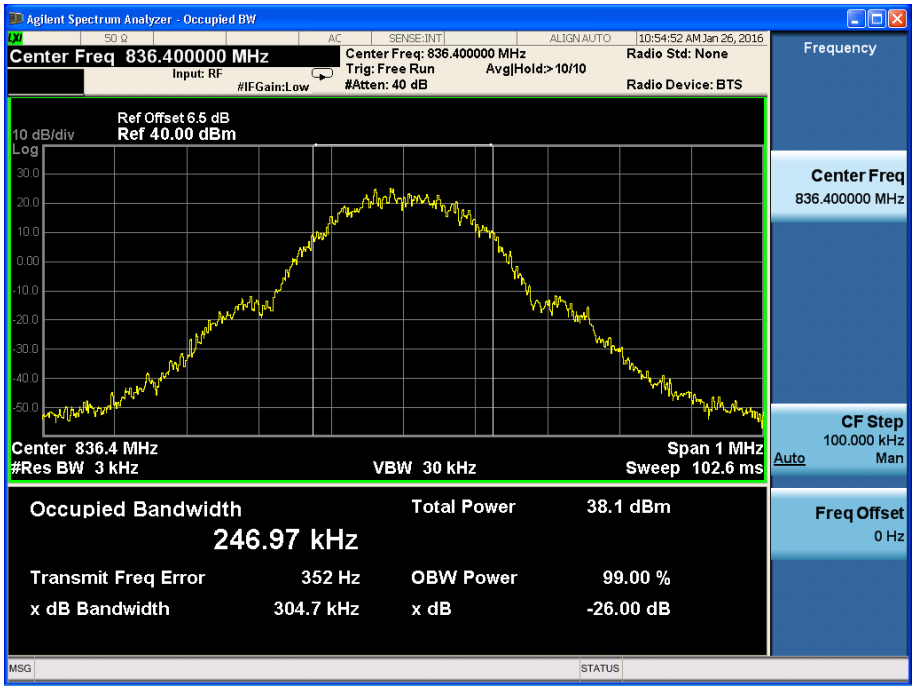
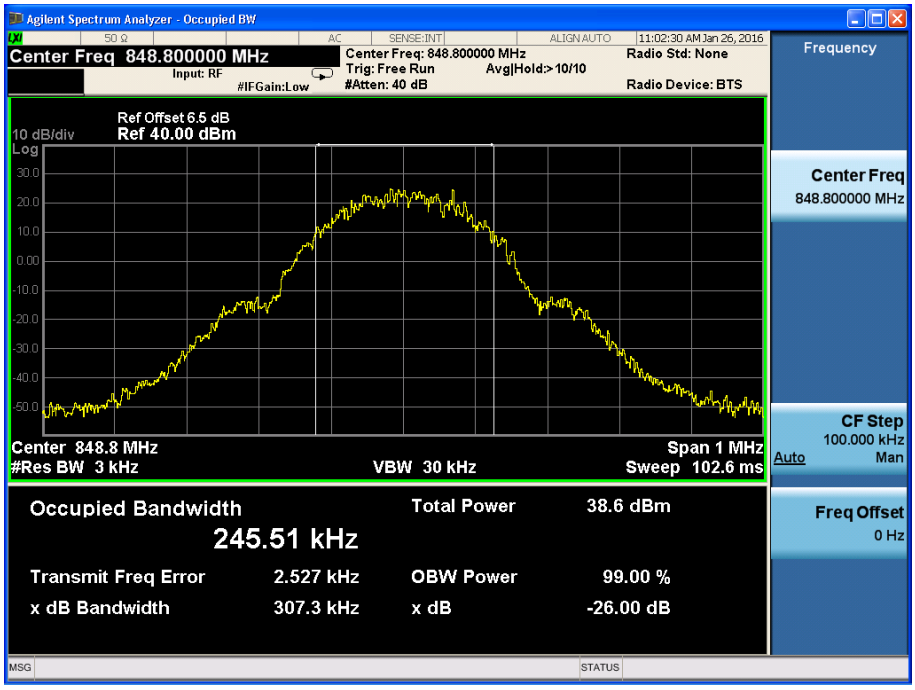


Channel 189



Channel 251

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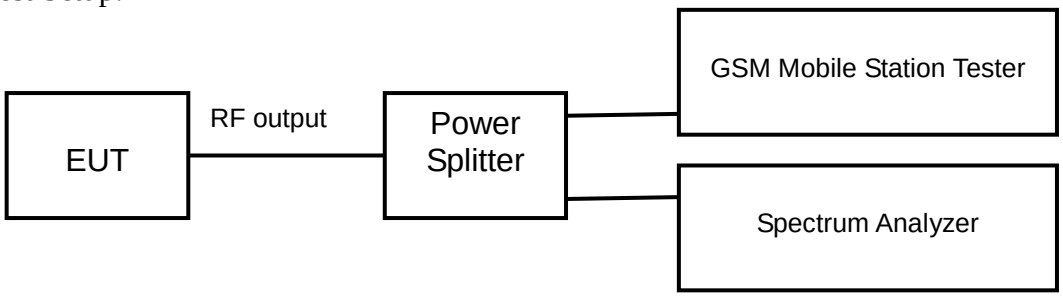
6.1.4 Emission Bandwidth-FCC Part22.917(b)

Ambient condition:

Temperature	Relative humidity	Pressure
23℃	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. The emission bandwidth is measured using spectrum analyzer. RBW is set to 3kHz on spectrum analyzer. The bandwidth of -26dB transmitter power can be read on spectrum analyzer.
The measurement will be conducted at three channels No128, No189 and No251 (Bottom, middle and top channels of GSM850 band)

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

Test result:
GSM/GPRS MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of -26dB transmitter power (kHz)
824.2	128	317
836.4	189	308
848.8	251	307

EDGE (GMSK) MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of -26dB transmitter power (kHz)
824.2	128	311
836.4	189	305
848.8	251	307

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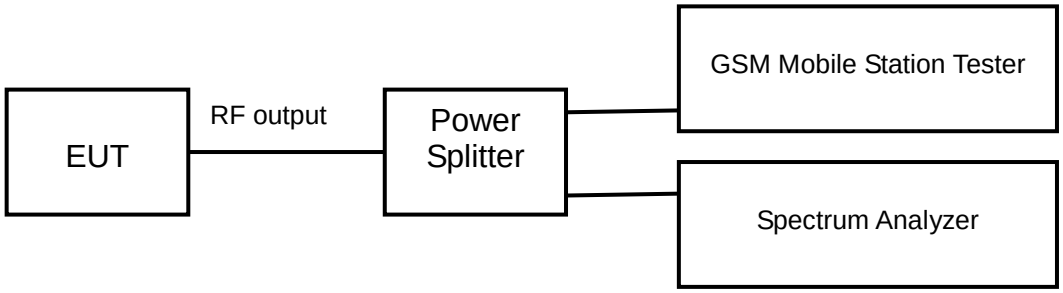
6.1.5 Spurious Emissions at antenna terminal-FCC Part2.1051/22.917(a)

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. The measurement is carried out using a spectrum analyzer. The spectrum analyzer scans from 30MHz to 9GHz (higher than the 10th harmonic of the carrier). The peak detector is used and RBW is set to 1MHz on spectrum analyzer.
The measurement will be conducted at one channel No189 (middle channel of GSM850 band)

Limits	≤-13.0dBm

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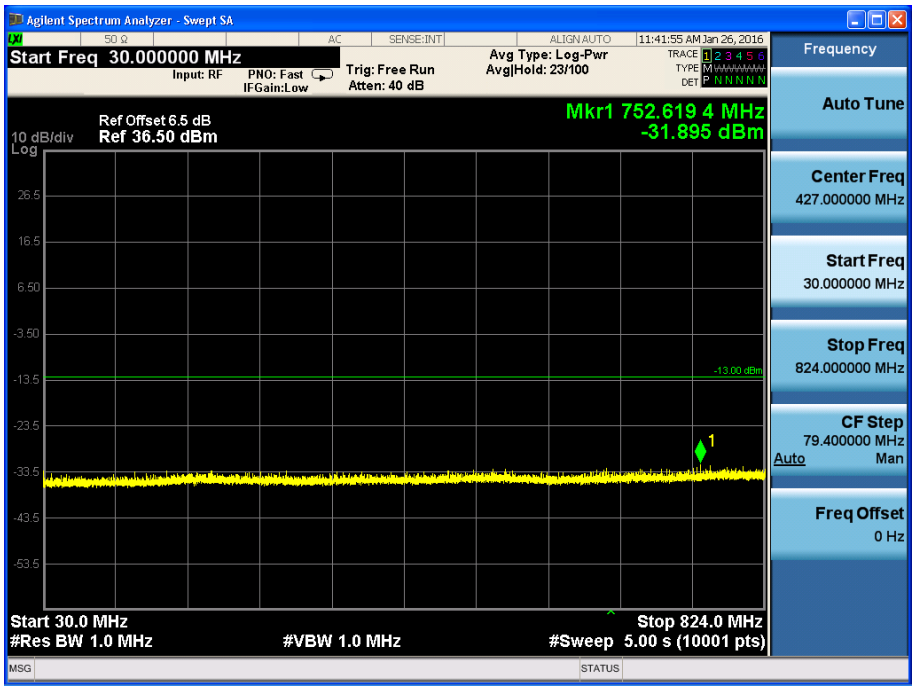
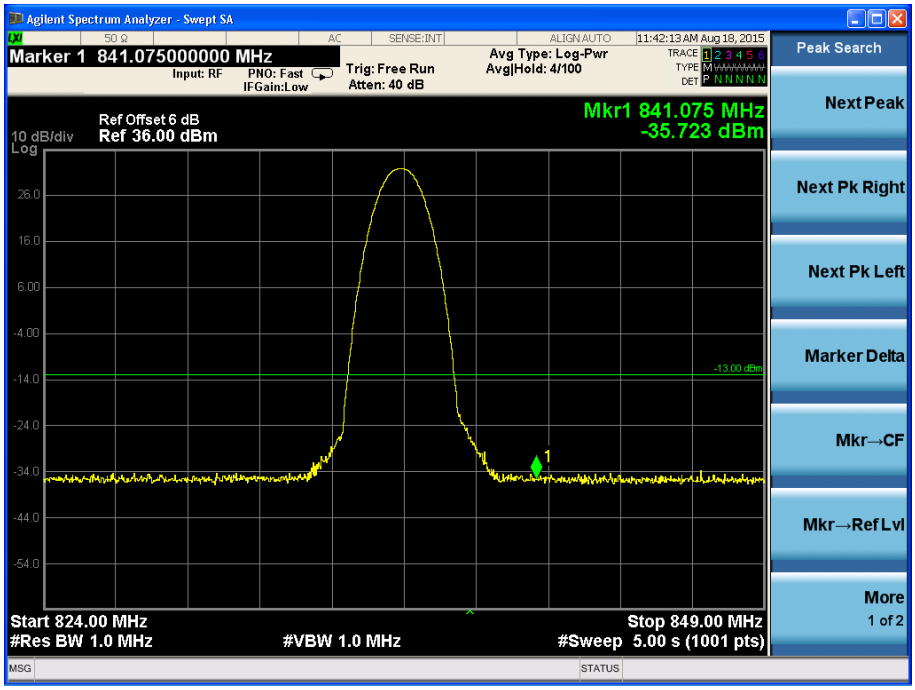
Test result:
Refer to the following figures.

GSM/GPRS MODE:



Channel 189, 30MHz~824MHz



Channel 189, 824MHz~849MHz

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

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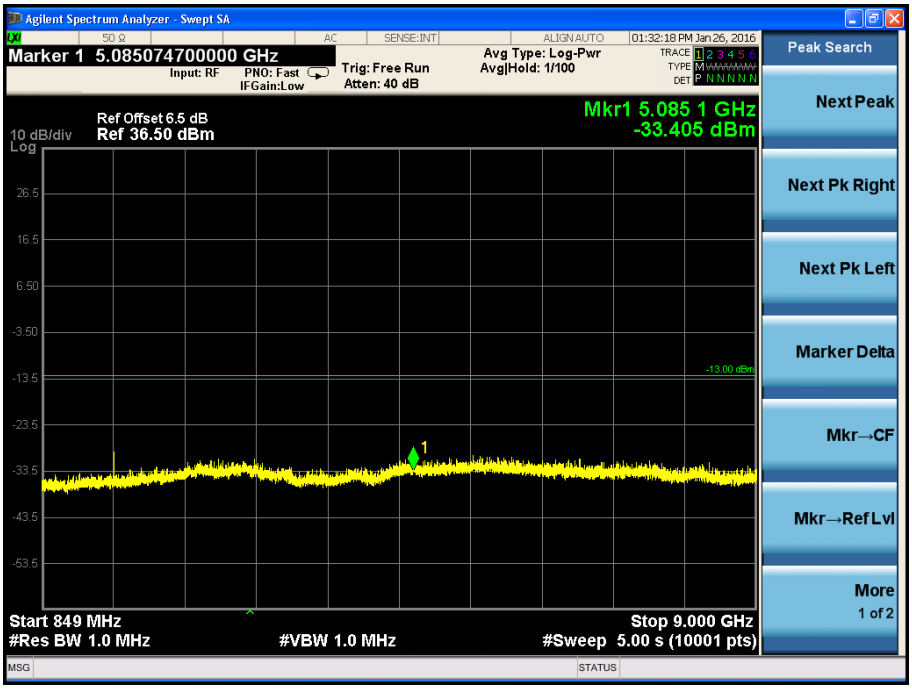
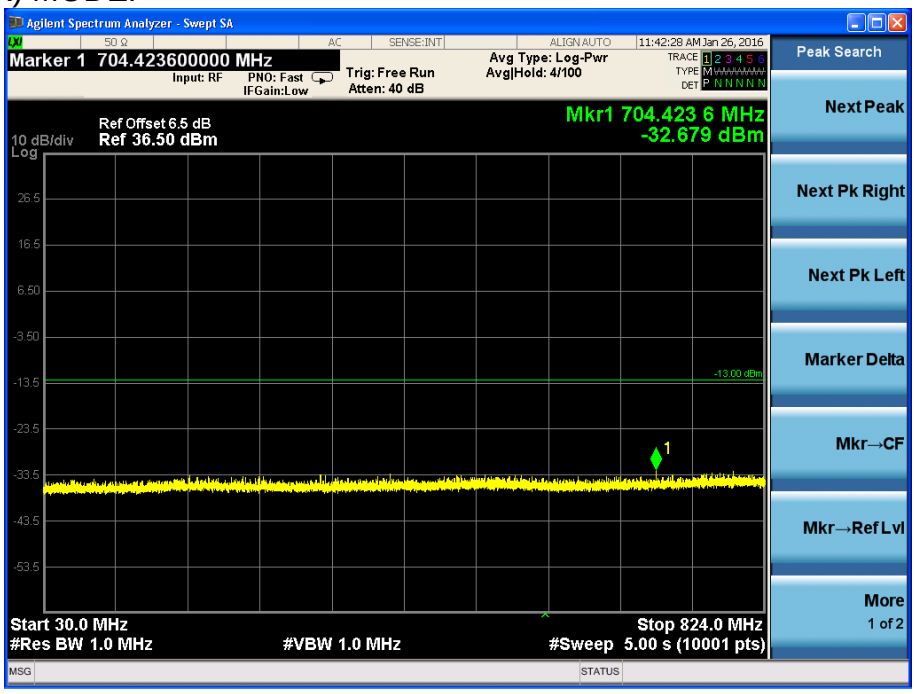


Channel 189, 849MHz~9GHz

EDGE (GMSK) MODE:



Channel 189, 30MHz~824MHz

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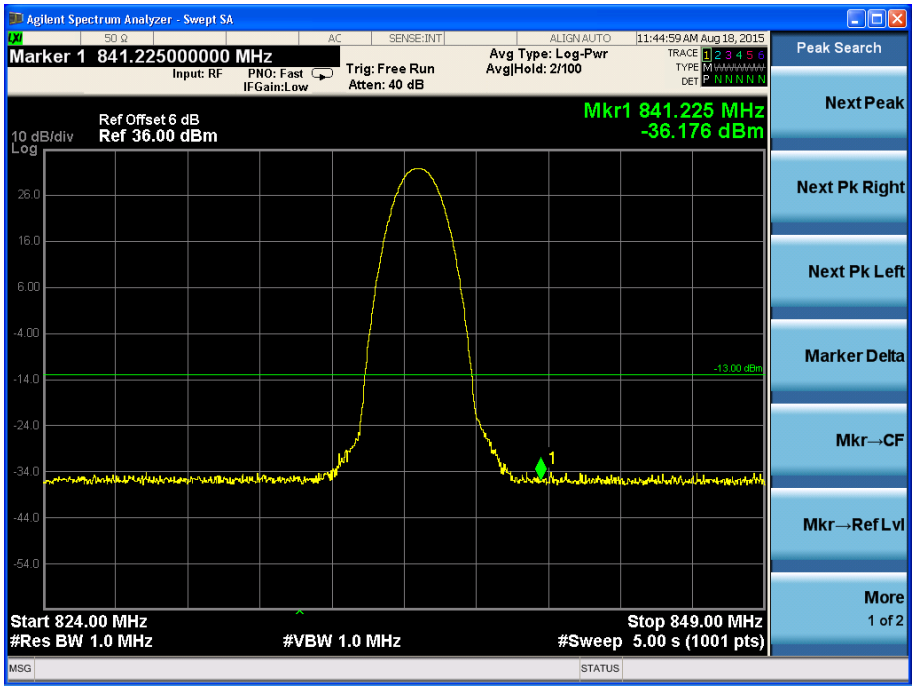

Channel 189, 824MHz~849MHz

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

Channel 189, 849MHz~9GHz

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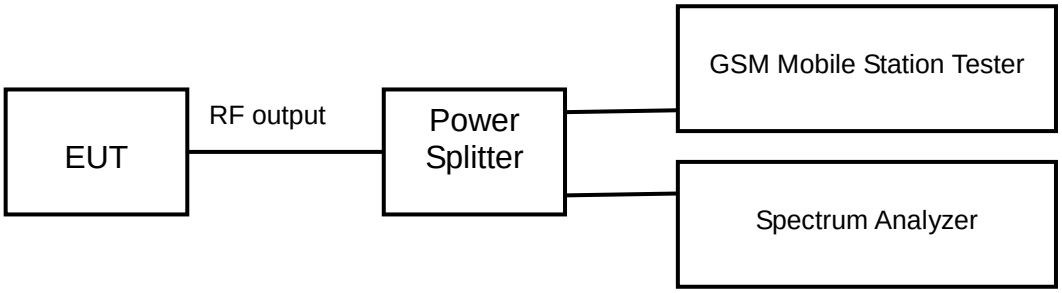
6.1.6 Band Edges Compliance-FCC Part2.1051/22.917(a)

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. The measurement is carried out using a spectrum analyzer. The peak detector is used and RBW is set to at least 1% of the emission bandwidth on spectrum analyzer.
The measurement will be conducted at two channels No128 and No251 (Bottom and top channels of GSM850 band)

Limits	≤-13.0dBm

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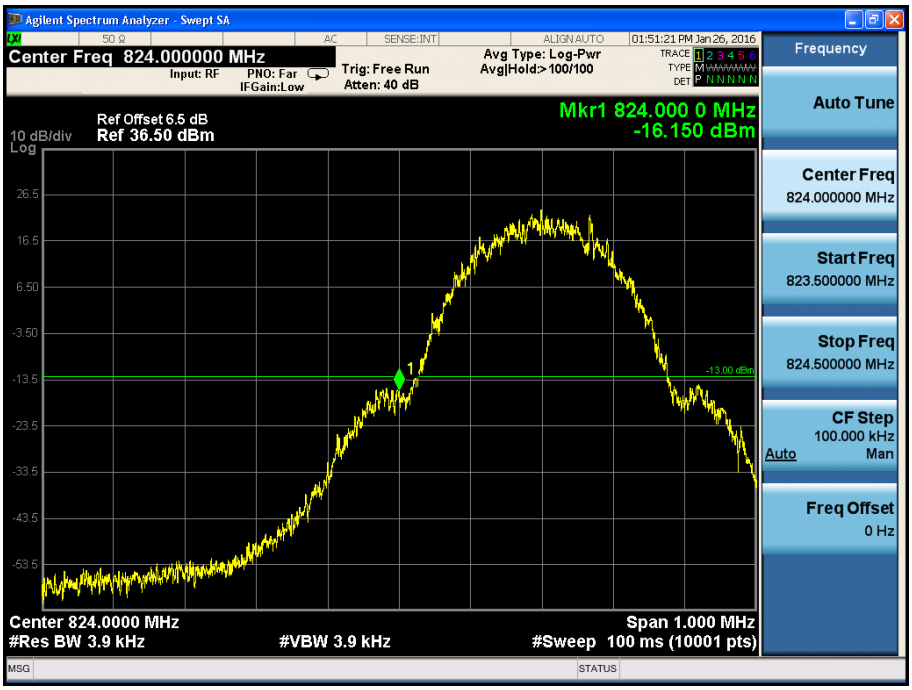
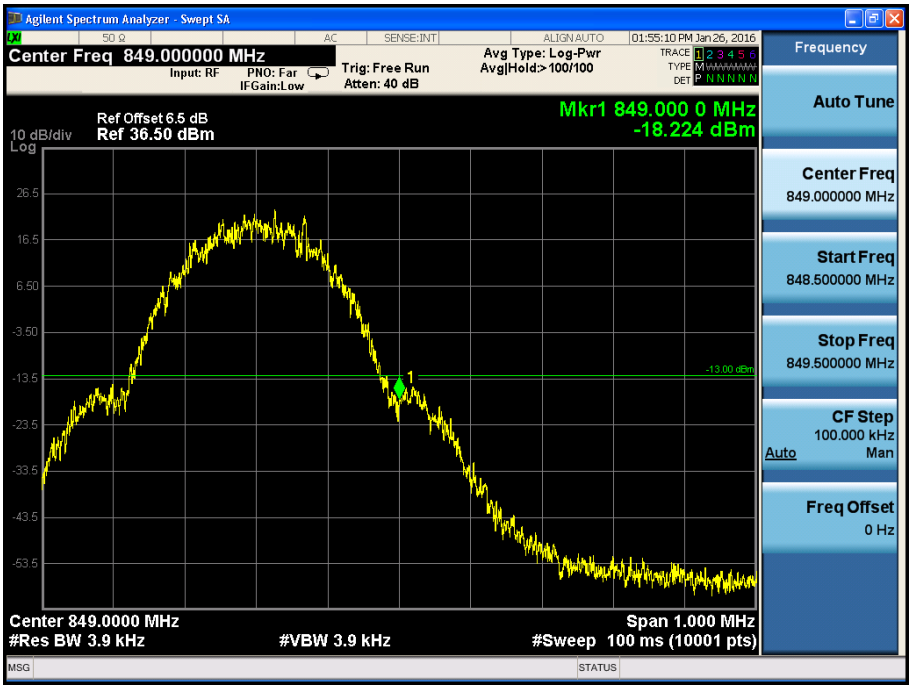
Test result:
Refer to the following figures.

GSM/GPRS MODE:



Channel 128



Channel 251

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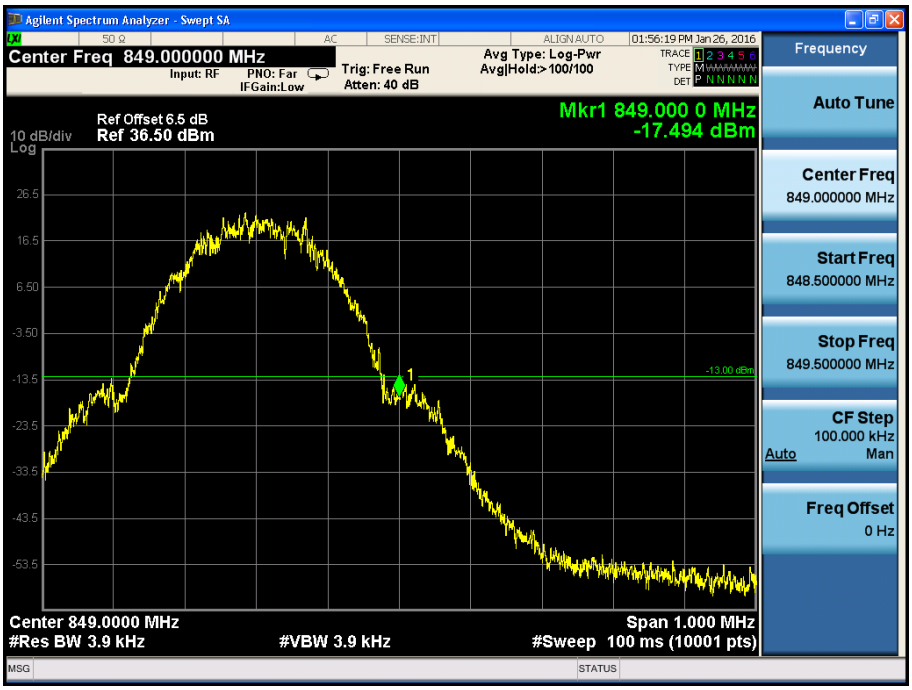
EDGE (GMSK) MODE:

Channel 128



Channel 251

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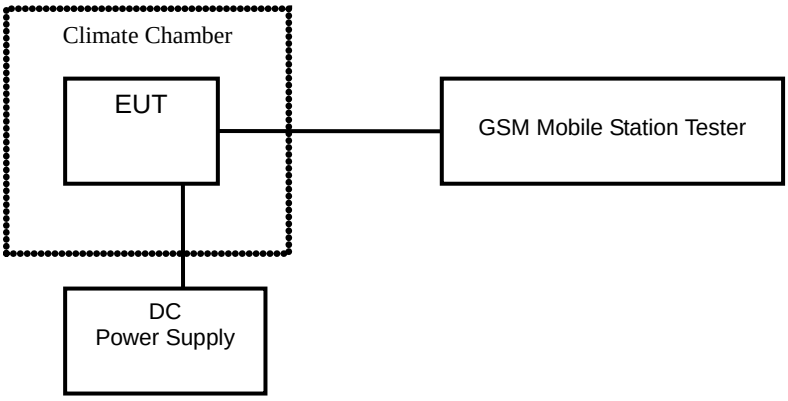
6.1.7 Frequency Stability-FCC Part2.1055/22.355

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test setup:



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

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

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Test result:
GSM/GPRS MODE:

Temperature(°C)	Test Result (ppm)@NV		
	Channel 128	Channel 189	Channel 251
-30	0.014	0.010	0.011
-20	0.016	0.011	0.012
-10	0.011	0.012	0.013
0	0.009	0.013	0.011
+10	0.012	0.014	0.015
+20	0.015	0.012	0.016
+30	0.013	0.014	0.014
+40	0.014	0.016	0.016
+50	0.013	0.015	0.016

Voltage	Test Result (ppm)@NT		
	Channel 128	Channel 189	Channel 251
LV	0.012	0.011	0.010
HV	0.012	0.014	0.012

EDGE (GMSK) MODE:

Temperature(°C)	Test Result (ppm)@NV		
	Channel 128	Channel 189	Channel 251
-30	0.013	0.011	0.012
-20	0.011	0.010	0.013
-10	0.014	0.013	0.013
0	0.012	0.014	0.013
+10	0.010	0.015	0.012
+20	0.015	0.015	0.011
+30	0.014	0.016	0.013
+40	0.016	0.013	0.011
+50	0.018	0.012	0.011

Voltage	Test Result (ppm)@NT		
	Channel 128	Channel 189	Channel 251
LV	0.012	0.013	0.016
HV	0.015	0.013	0.016

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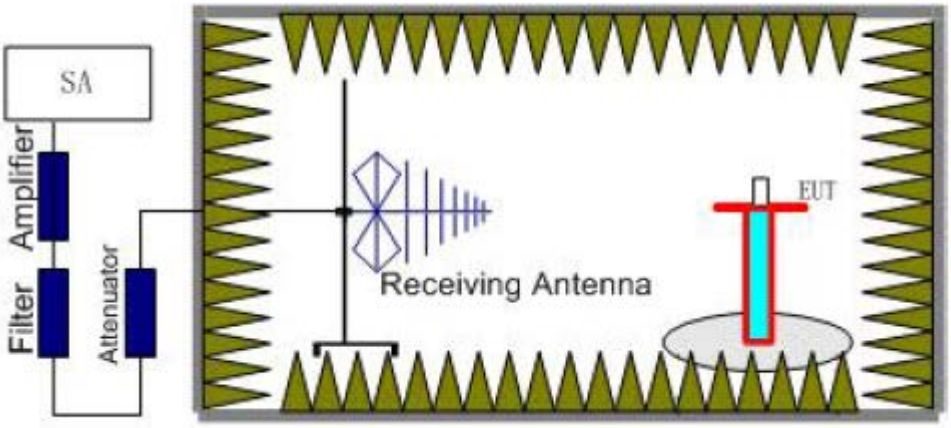
6.1.8 Radiated Spurious Emissions-FCC Part2.1053/22.917(a)

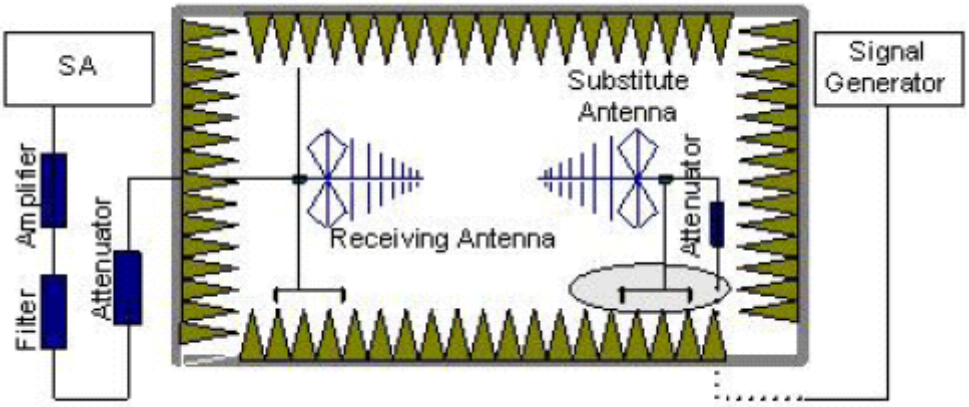
Ambient condition:

Temperature	Relative humidity	Pressure
20.8°C	36.5%	100.9kPa

Test Setup:



Step 1



Step 2

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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 (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).

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) = 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).

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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=Pmea+Pca+Ga=(-20dBm)+(-30dB)+(11dB)= -39dBm

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

Test result:

GSM/GPRS MODE Channel 128:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1651.15	-48.95	-13.0	Vertical
1669.69	-48.04	-13.0	Vertical
2530.48	-41.68	-13.0	Vertical
2572.57	-40.45	-13.0	Vertical
8966.59	-37.31	-13.0	Vertical
9968.08	-33.60	-13.0	Horizontal

EDGE (GMSK) MODE Channel 128:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1637.93	-52.69	-13.0	Vertical
2559.65	-51.65	-13.0	Vertical
2846.32	-44.03	-13.0	Vertical
3375.73	-43.55	-13.0	Vertical
7024.66	-39.24	-13.0	Vertical
9935.73	-36.19	-13.0	Vertical

GSM/GPRS MODE Channel 189:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1647.44	-49.07	-13.0	Vertical
1668.97	-47.46	-13.0	Vertical
2530.70	-40.30	-13.0	Vertical
2574.19	-40.72	-13.0	Vertical
8964.91	-37.62	-13.0	Vertical
9968.41	-34.52	-13.0	Vertical

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EDGE (GMSK) MODE Channel 189:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1649.25	-49.55	-13.0	Horizontal
1666.56	-47.80	-13.0	Vertical
2535.00	-40.92	-13.0	Vertical
2572.42	-39.96	-13.0	Vertical
8962.74	-37.99	-13.0	Vertical
9966.75	-33.33	-13.0	Vertical

GSM/GPRS MODE Channel 251:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1644.93	-48.57	-13.0	Vertical
1665.26	-47.62	-13.0	Vertical
2533.14	-41.17	-13.0	Vertical
2575.57	-40.08	-13.0	Vertical
8965.49	-37.49	-13.0	Vertical
9966.74	-33.03	-13.0	Horizontal

EDGE (GMSK) MODE Channel 251:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1648.04	-49.91	-13.0	Vertical
1667.85	-47.48	-13.0	Vertical
2536.47	-40.82	-13.0	Vertical
2570.49	-40.72	-13.0	Vertical
8963.96	-37.29	-13.0	Vertical
9971.74	-34.01	-13.0	Vertical

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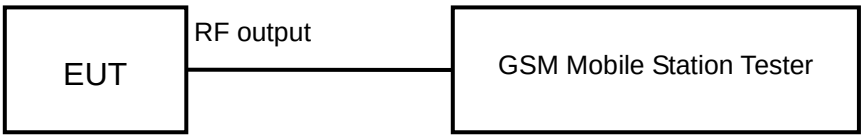
6.2 PCS1900

6.2.1 RF Power Output-FCC Part2.1046

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. Then the test data can be read at the tester screen. The loss between RF output port of the EUT and the input port of the tester will be taken into consideration.
The measurement will be conducted at three channels No512, No661 and No810 (Bottom, middle and top channels of PCS1900 band)

Limits	≤30.0dBm

Test result:
GSM/GPRS MODE:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
1850.2	512	29.99
1880.0	661	29.97
1909.8	810	29.91

EDGE MODE:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
1850.2	512	29.99
1880.0	661	29.97
1909.8	810	29.88

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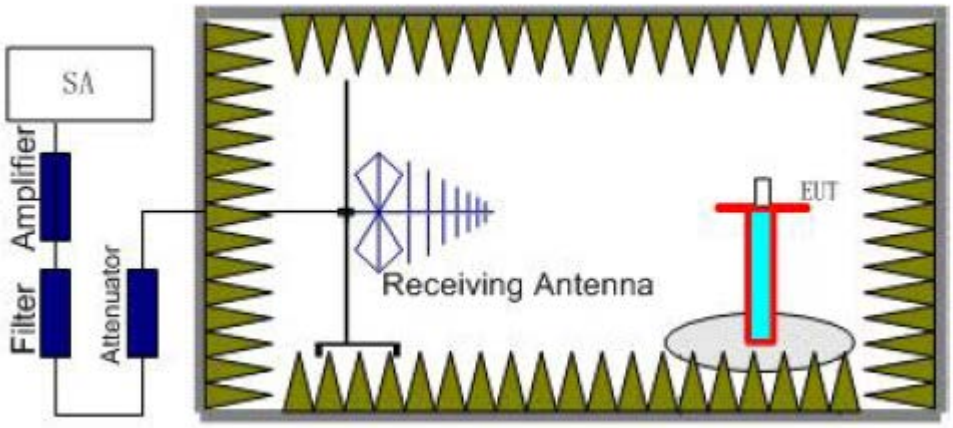
6.2.2 Effective Isotropic Radiated Power-FCC Part24.232(c)

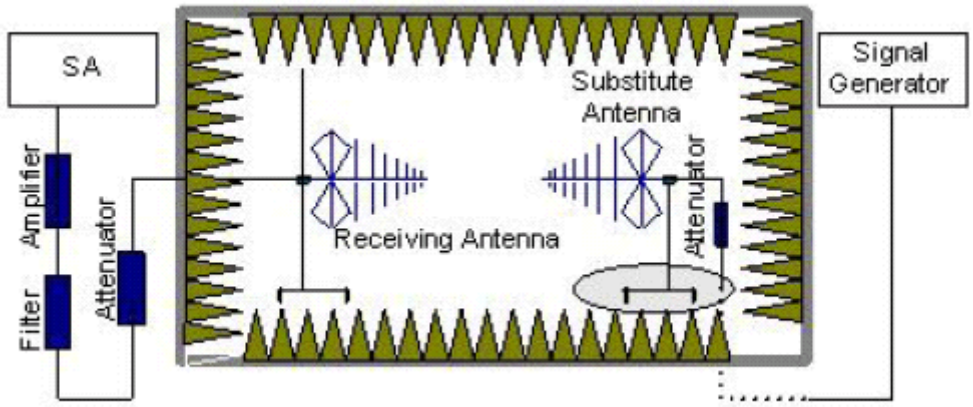
Ambient condition:

Temperature	Relative humidity	Pressure
20.8°C	36.5%	100.9kPa

Test setup:



Step 1



Step 2

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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 (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

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

Limits:

Operation Mode	Power Step	E.I.R.P. (dBm)
GSM	0	≤33.0
GPRS	3	≤33.0
EDGE	5	≤33.0

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Test result:

GSM/GPRS MODE:

Frequency (MHz)	Power step	Peak EIRP(dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Polarization
1850.2	0	25.79	-4.80	8.60	21.99	Vertical
1880.0	0	26.23	-4.80	8.60	22.43	Vertical
1909.8	0	26.60	-4.80	8.60	22.80	Vertical

EDGE MODE:

Frequency (MHz)	Power step	Peak EIRP(dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Polarization
1850.2	0	25.57	-4.80	8.60	21.77	Vertical
1880.0	0	25.90	-4.80	8.60	22.10	Vertical
1909.8	0	25.78	-4.80	8.60	21.98	Vertical

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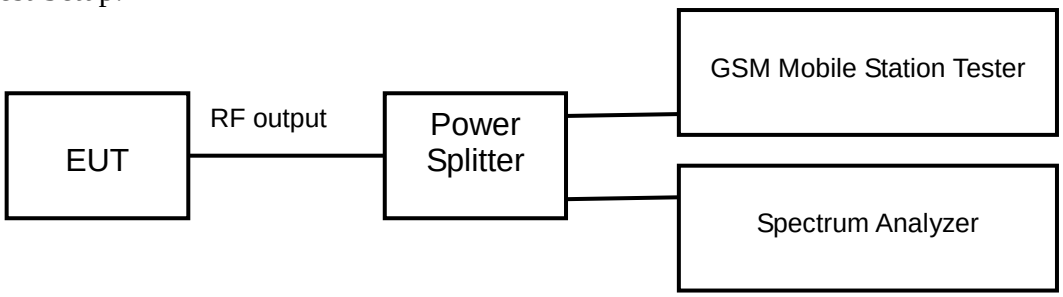
6.2.3 Occupied Bandwidth-FCC Part2.1049

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. The occupied bandwidth is measured using spectrum analyzer. RBW is set to 3kHz on spectrum analyzer. The bandwidth of 99% power can be read on spectrum analyzer.
The measurement will be conducted at three channels No512, No661 and No810 (Bottom, middle and top channels of PCS1900 band)

Limits: No specific occupied bandwidth requirements in part 2.1049

Test result:
GSM/GPRS MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (kHz)
1850.2	512	248
1880.0	661	245
1909.8	810	244

EDGE (GMSK) MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (kHz)
1850.2	512	244
1880.0	661	247
1909.8	810	243

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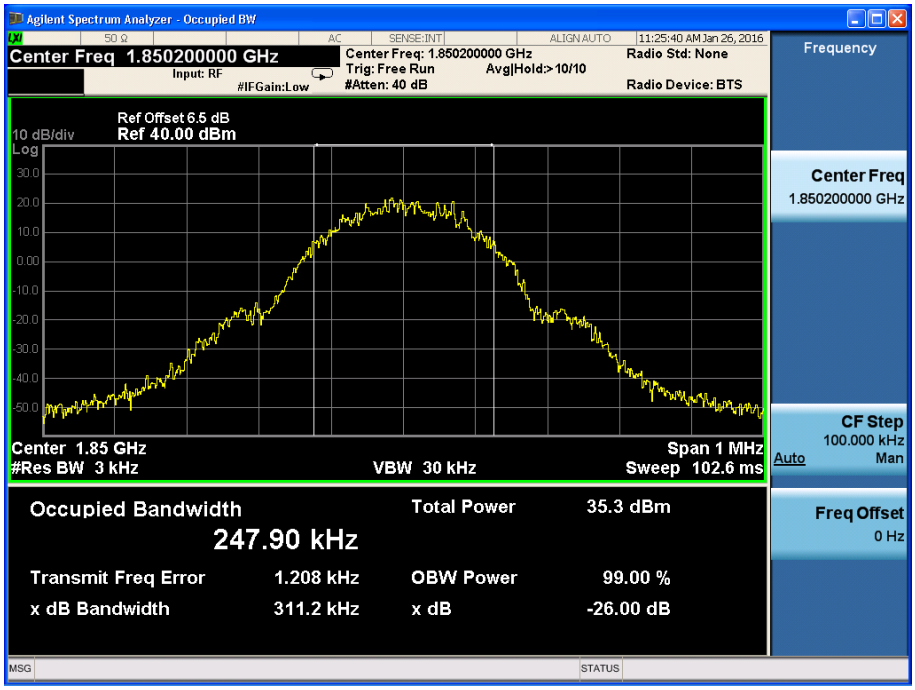
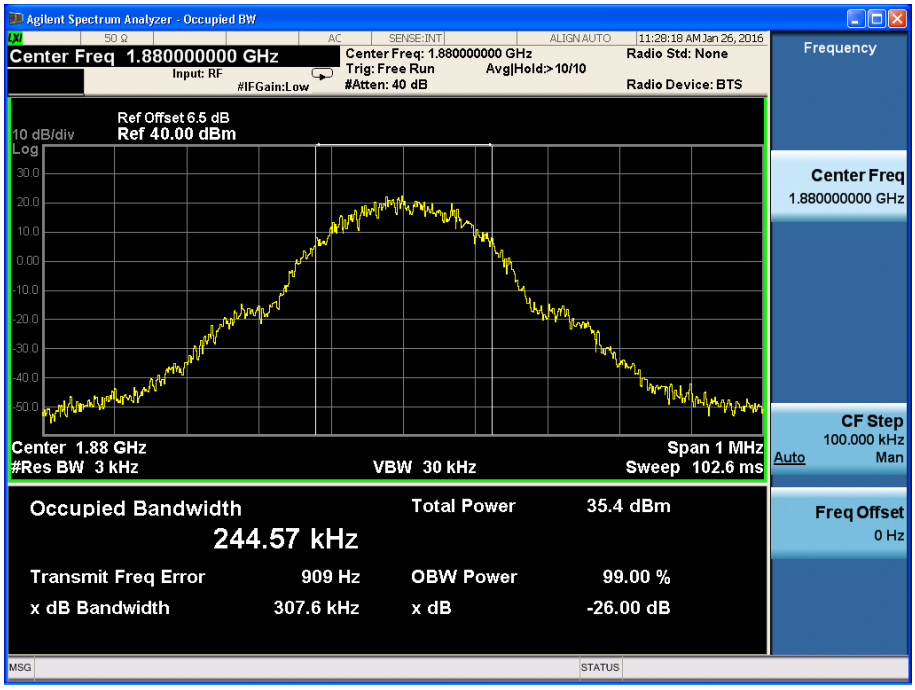
GSM/GPRS MODE:



Channel 512



Channel 661

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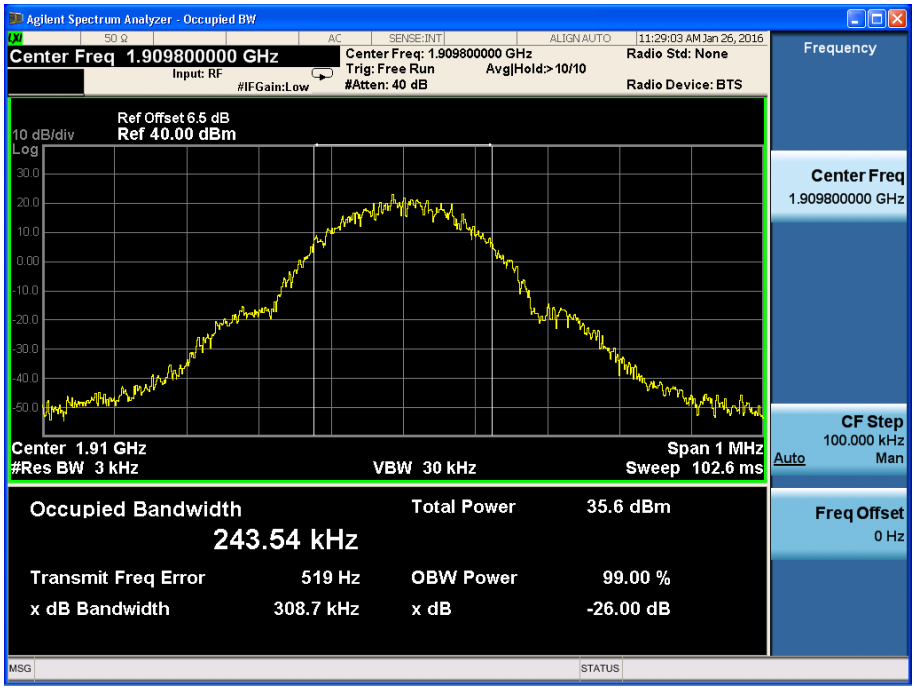
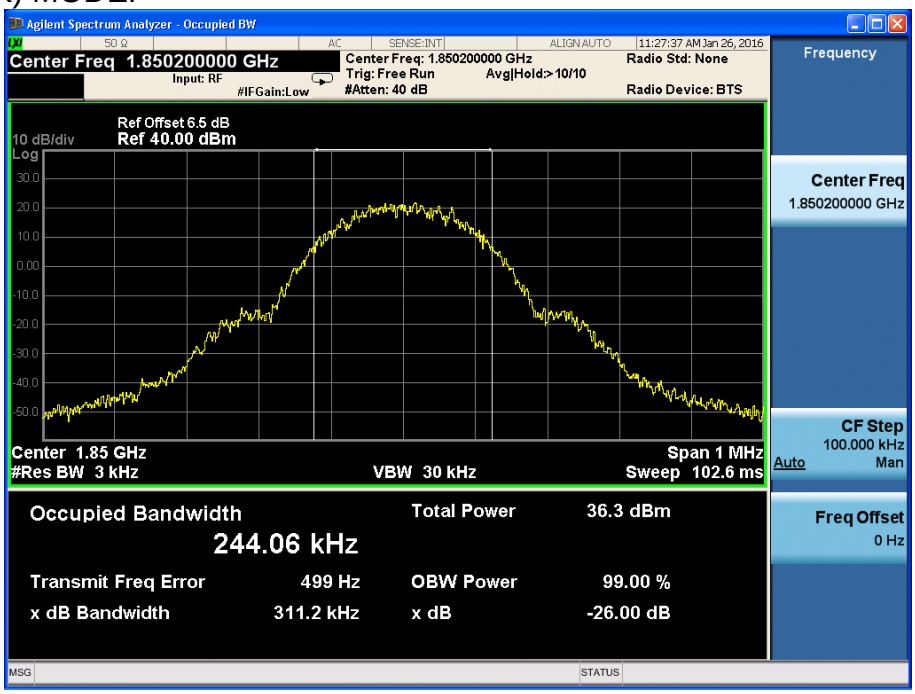


Channel 810

EDGE (GMSK) MODE:



Channel 512

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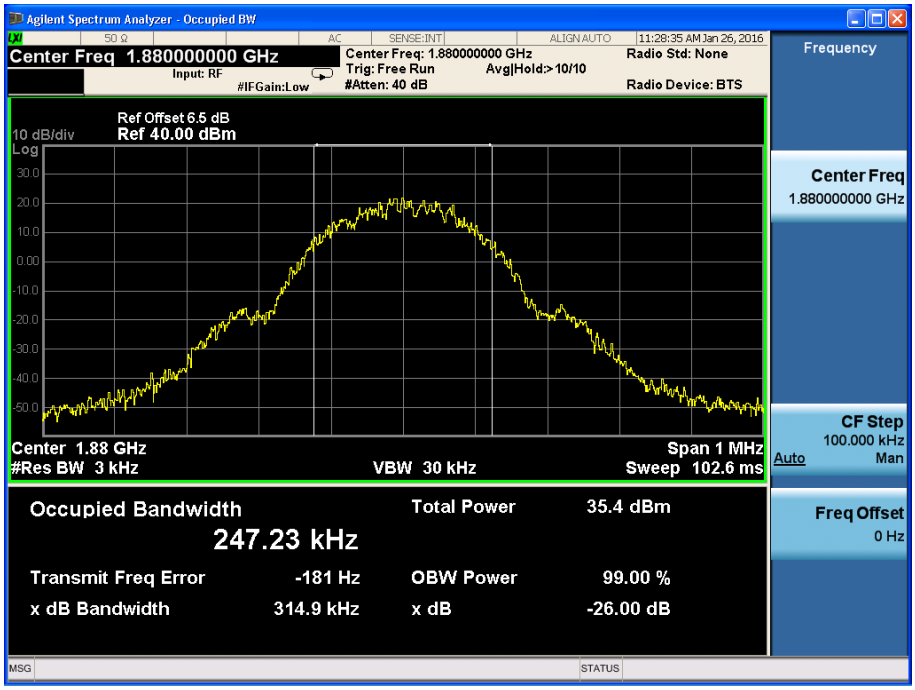
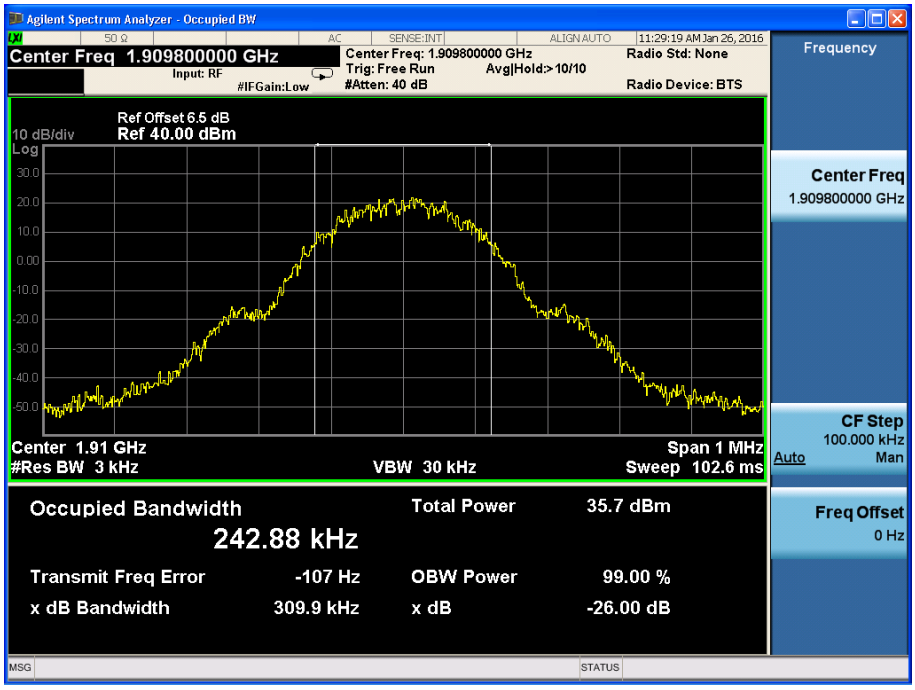


Channel 661



Channel 810

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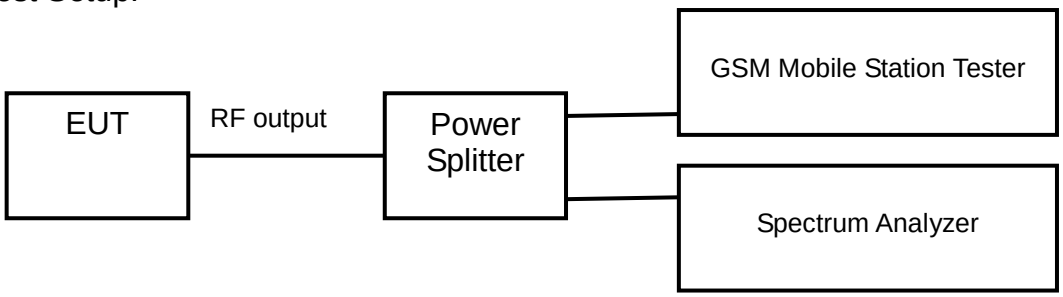
6.2.4 Emission Bandwidth-FCC Part24.238(b)

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. The emission bandwidth is measured using spectrum analyzer. RBW is set to 3kHz on spectrum analyzer. The bandwidth of -26dB transmitter power can be read on spectrum analyzer.
The measurement will be conducted at three channels No512, No661 and No810 (Bottom, middle and top channels of PCS1900 band)

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

Test result:
GSM/GPRS MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of -26dB transmitter power (kHz)
1850.2	512	311
1880.0	661	308
1909.8	810	309

EDGE (GMSK) MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of -26dB transmitter power (kHz)
1850.2	512	311
1880.0	661	315
1909.8	810	310

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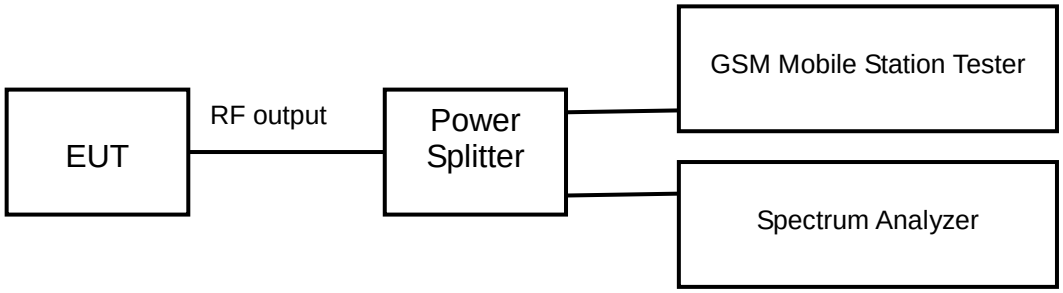
6.2.5 Spurious Emissions at antenna terminal-FCC Part2.1051/24.238(a)

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. The measurement is carried out using a spectrum analyzer. The spectrum analyzer scans from 30MHz to 20GHz (higher than the 10th harmonic of the carrier). The peak detector is used and RBW is set to 1MHz on spectrum analyzer.
The measurement will be conducted at one channel No661 (middle channel of PCS1900 band)

Limits	≤-13.0dBm

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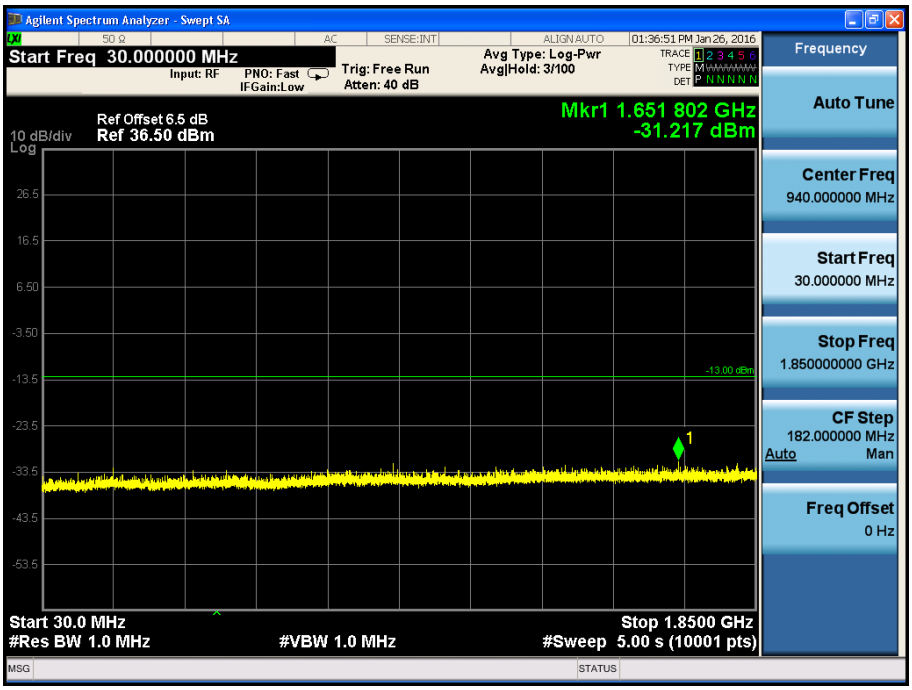
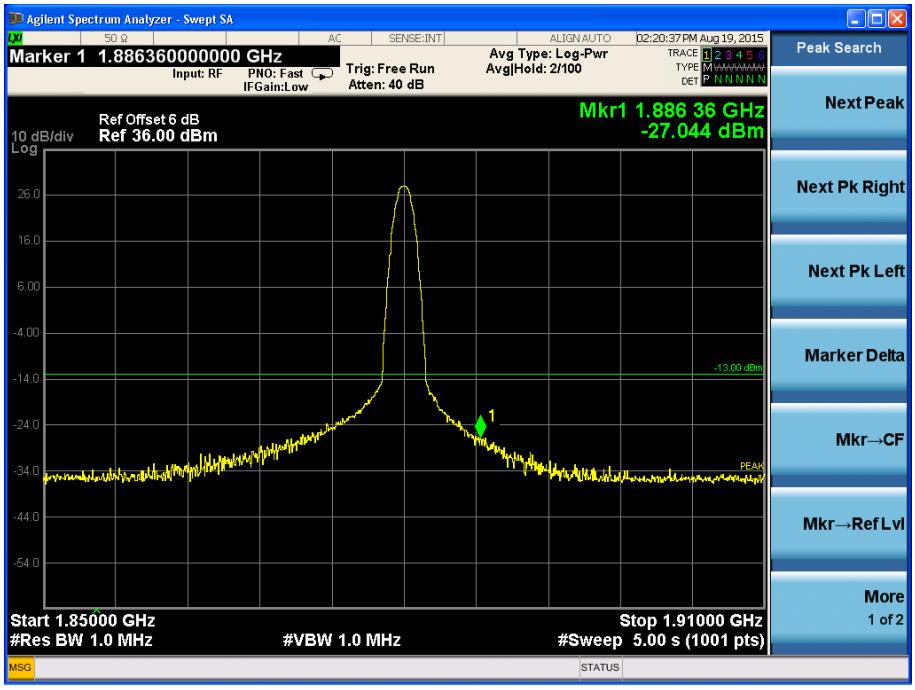
Test result:
Refer to the following figures.

GSM/GPRS MODE:



Channel 661, 30MHz~1850MHz



Channel 661, 1850MHz~1910MHz

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

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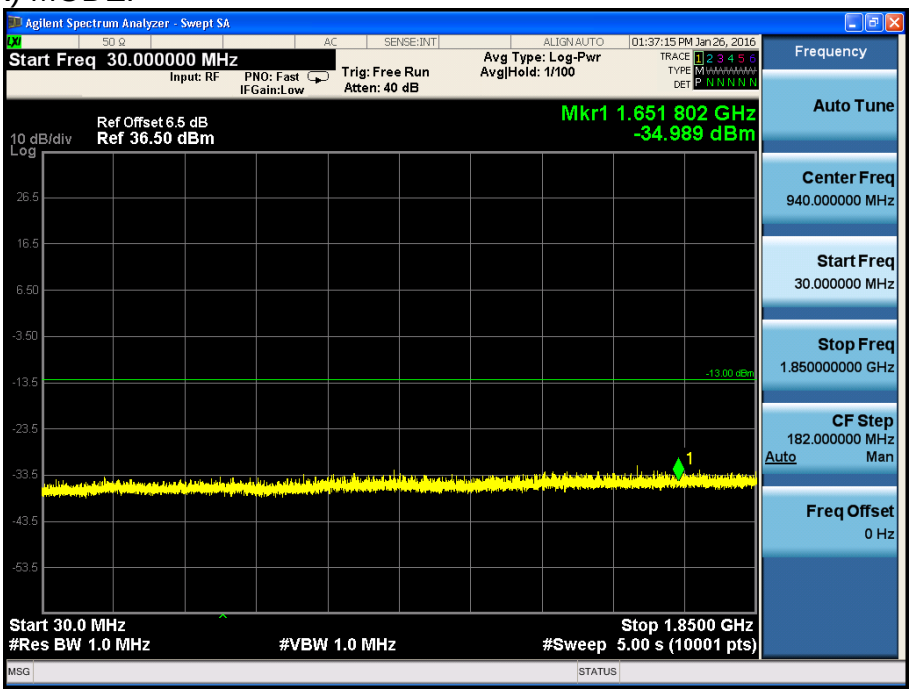
Channel 661, 1910MHz~20GHz

EDGE (GMSK) MODE:



Channel 661, 30MHz~1850MHz

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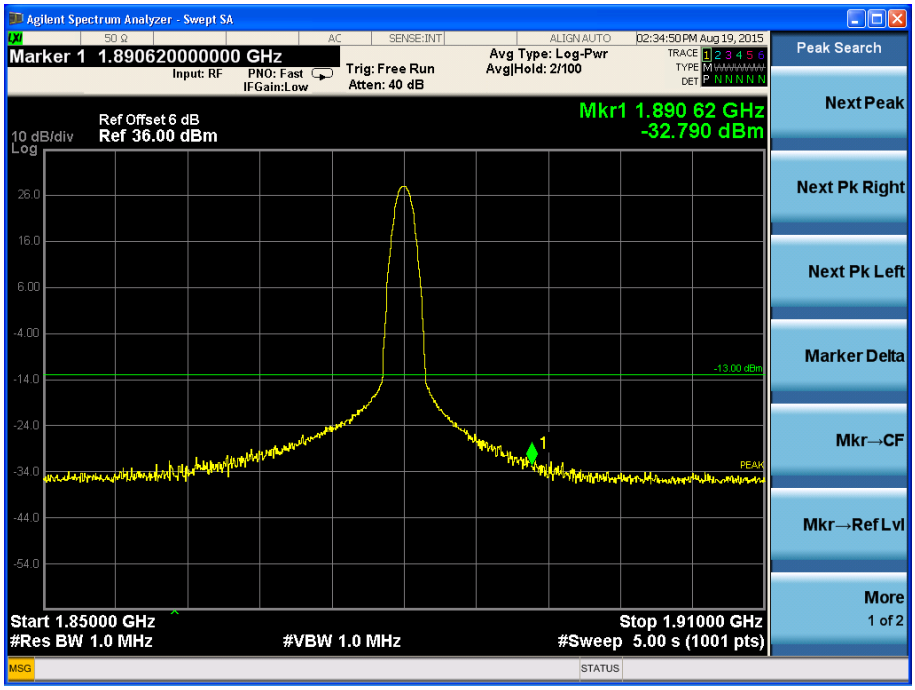

Channel 661, 1850MHz~1910MHz

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

Channel 661, 1910MHz~20GHz

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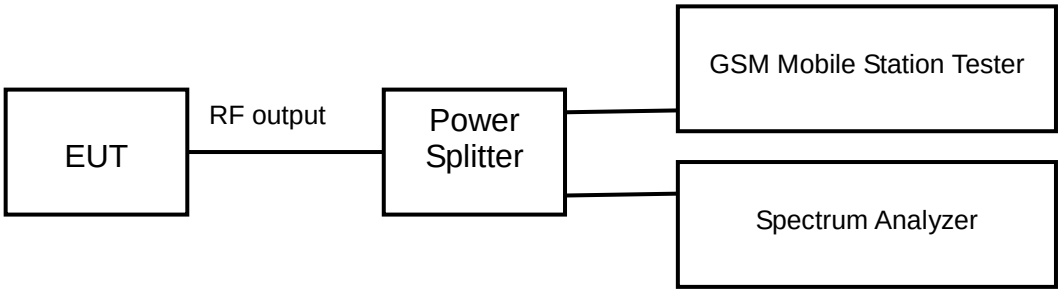
6.2.6 Band Edges Compliance-FCC Part2.1051/24.238(a)

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. The measurement is carried out using a spectrum analyzer. The peak detector is used and RBW is set to at least 1% of the emission bandwidth on spectrum analyzer.
The measurement will be conducted at two channels No512 and No810 (Bottom and top channels of PCS1900 band)

Limits	≤-13.0dBm

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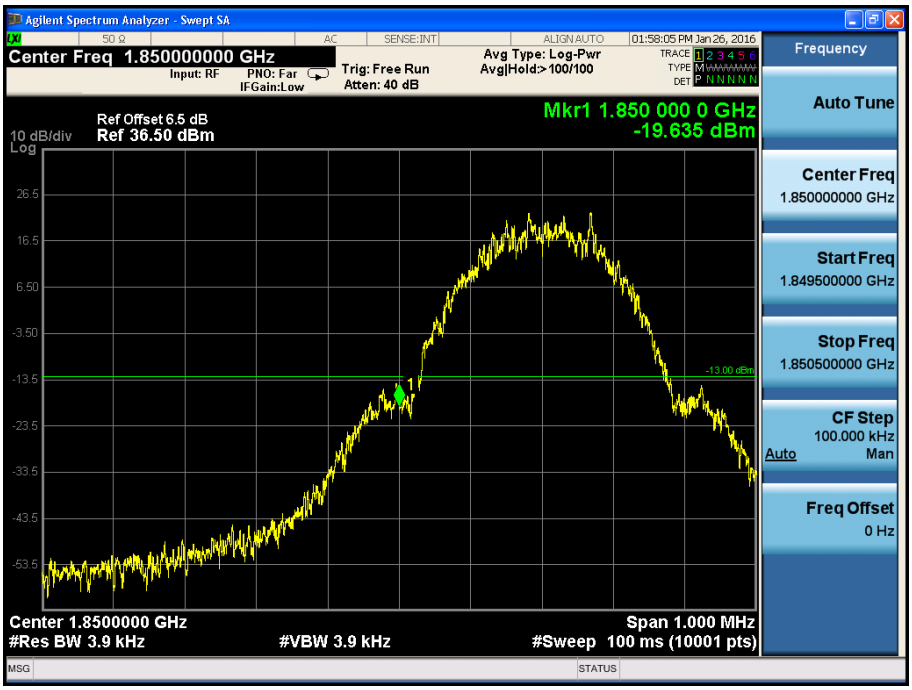
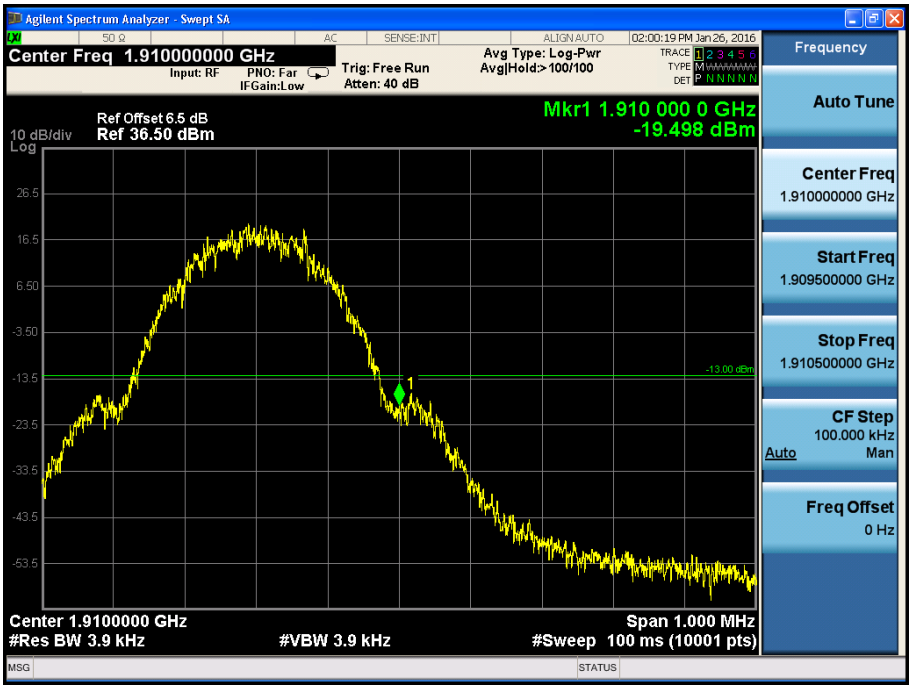
Test result:
Refer to the following figures.

GSM/GPRS MODE:



Channel 512



Channel 810

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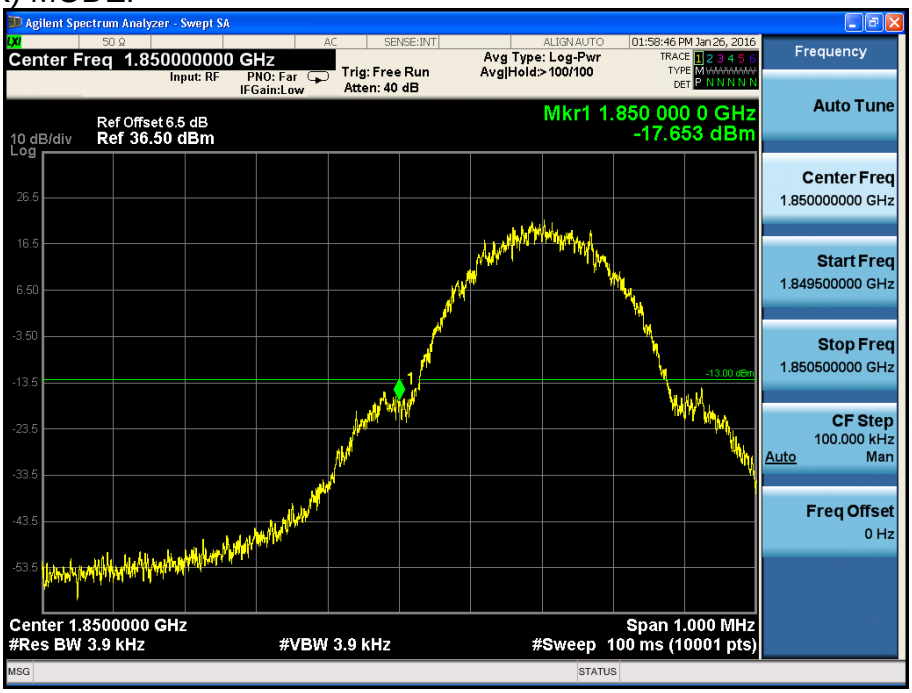
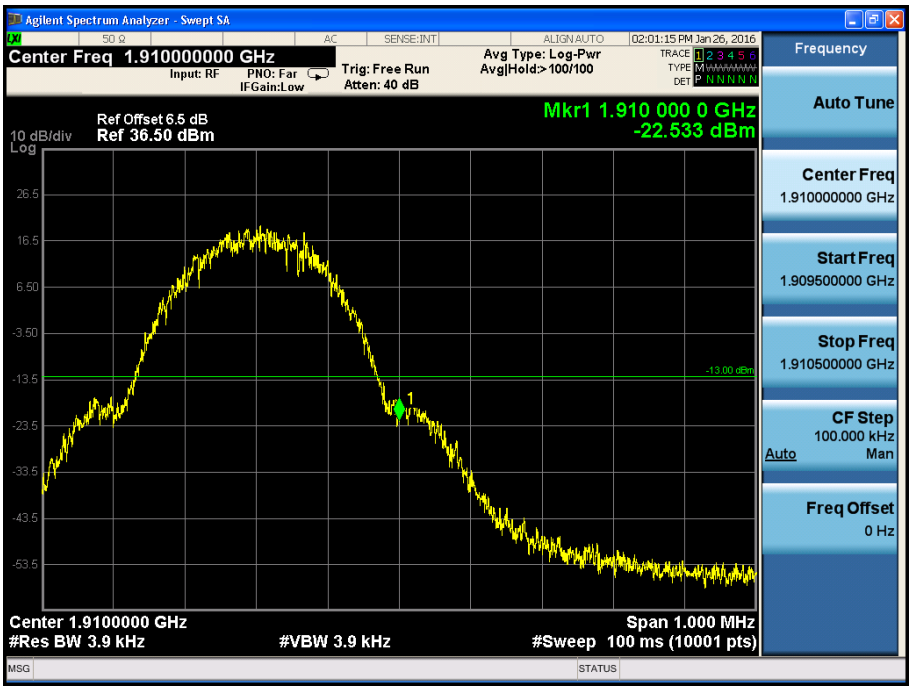
EDGE (GMSK) MODE:



Channel 512



Channel 810

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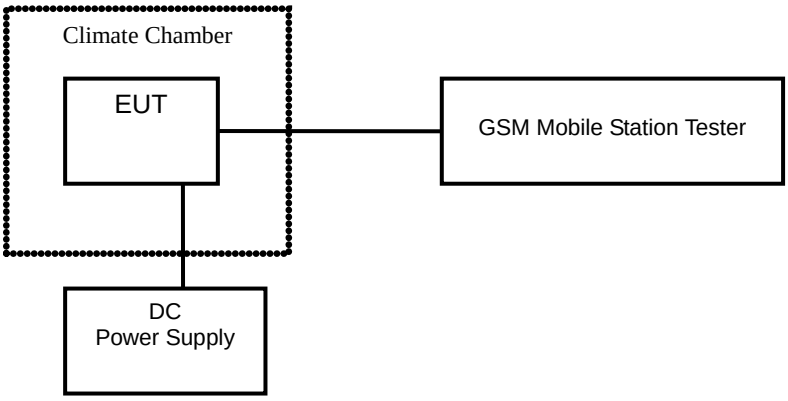
6.2.7 Frequency Stability-FCC Part2.1055/24.235

Ambient condition:

Temperature	Relative humidity	Pressure
23°C	42%	101.9kPa

Test setup:



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

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

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Test result:

GSM/GPRS MODE:

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

Voltage	Test Result (ppm)@NT		
	Channel 512	Channel 661	Channel 810
LV	0.012	0.012	0.015
HV	0.012	0.013	0.016

EDGE (GMSK) MODE:

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

Voltage	Test Result (ppm)@NT		
	Channel 512	Channel 661	Channel 810
LV	0.012	0.013	0.016
HV	0.012	0.013	0.018

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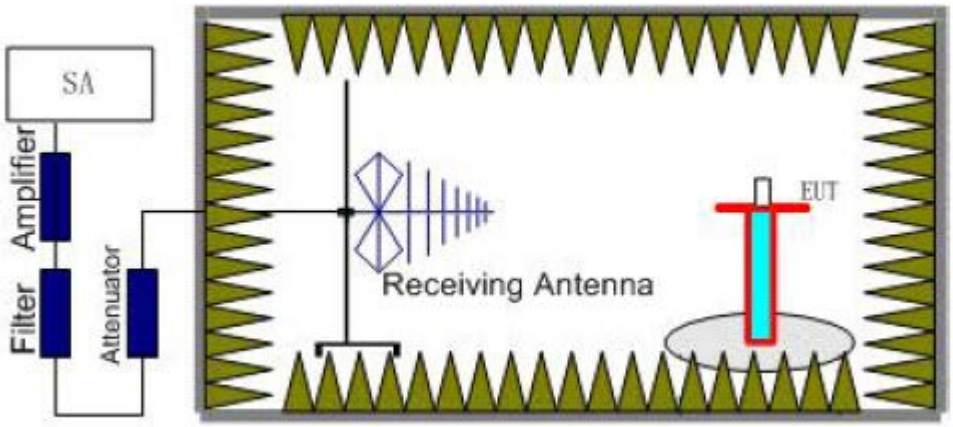
6.2.8 Radiated Spurious Emissions-FCC Part2.1053/24.238(a)

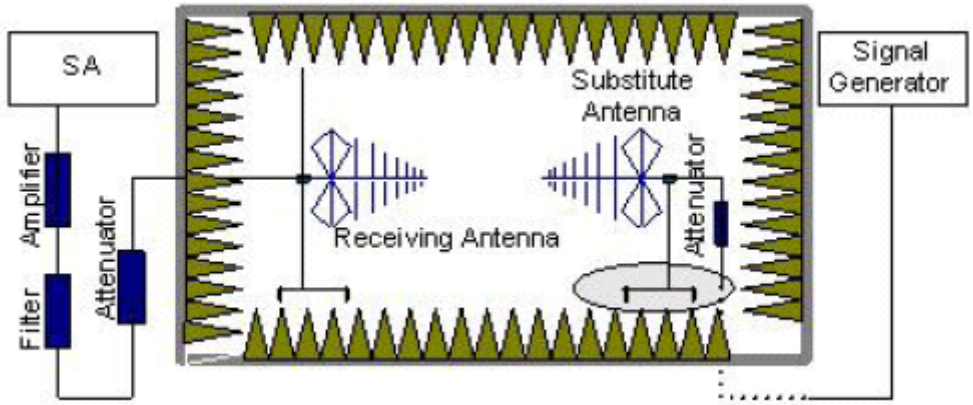
Ambient condition:

Temperature	Relative humidity	Pressure
20.8°C	36.5%	100.9kPa

Test Setup:



Step 1



Step 2

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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 (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).

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) = 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).

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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=Pmea+Pca+Ga=(-20dBm)+(-30dB)+(11dB)= -39dBm

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

Test result:

GSM/GPRS MODE Channel 512

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1648.92	-49.30	-13.0	Vertical
1666.16	-47.44	-13.0	Vertical
2537.05	-40.88	-13.0	Vertical
2572.80	-40.60	-13.0	Vertical
8965.37	-37.81	-13.0	Vertical
9966.59	-33.33	-13.0	Vertical

EDGE (GMSK) MODE Channel 512:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1647.50	-49.72	-13.0	Vertical
1670.71	-48.30	-13.0	Vertical
2536.32	-40.77	-13.0	Vertical
2576.85	-40.71	-13.0	Vertical
8962.67	-37.81	-13.0	Vertical
9972.48	-34.15	-13.0	Horizontal

GSM/GPRS MODE Channel 661:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1648.33	-49.46	-13.0	Vertical
1665.30	-48.51	-13.0	Vertical
2537.44	-41.60	-13.0	Vertical
2573.57	-40.28	-13.0	Vertical
8965.69	-37.61	-13.0	Vertical
9971.39	-33.57	-13.0	Vertical

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EDGE (GMSK) MODE Channel 661:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1649.26	-49.23	-13.0	Vertical
1667.15	-47.36	-13.0	Vertical
2536.18	-41.16	-13.0	Vertical
2576.70	-40.64	-13.0	Vertical
8963.79	-37.55	-13.0	Vertical
9967.87	-33.37	-13.0	Vertical

GSM/GPRS MODE Channel 810:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1645.63	-48.84	-13.0	Vertical
1665.94	-48.63	-13.0	Vertical
2532.31	-41.13	-13.0	Vertical
2574.79	-39.80	-13.0	Vertical
8964.83	-37.45	-13.0	Vertical
9970.56	-33.76	-13.0	Vertical

EDGE (GMSK) MODE Channel 810:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1648.11	-49.65	-13.0	Vertical
1666.52	-48.41	-13.0	Vertical
2531.92	-40.31	-13.0	Vertical
2574.45	-40.03	-13.0	Vertical
8963.83	-37.78	-13.0	Vertical
9967.46	-34.05	-13.0	Horizontal

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7 MEASUREMENT UNCERTAINTIES

Items	Uncertainty	
RF Power Output	0.60 dB	
Occupied Bandwidth	3kHz	
Spurious Emissions	9kHz~2GHz	1.20dB
	2G~3.6GHz	1.40dB
	3.6G~8GHz	2.20dB
	8G~12.75GHz	2.70dB
Band Edges Compliance	1.20dB	
Frequency Stability	48 Hz	

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8 TEST EQUIPMENTS

No.	Name/Model	Manufacturer	S/N	Calibration Due Date
1	E5515C(8960) Mobile Station Tester	Agilent	MY48367401	2016.08.20
2	N9020A Spectrum Analyzer	Agilent	MY48010771	2016.08.20
3	DC Power Supply E3645A	Agilent	MY40000740	2016.08.20
4	Power Splitter 11850C	Agilent	026057	2016.08.20
5	Temperature chamber SH241	ESPEC	92000390	2016.08.20
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	2016.08.20
10	HL562 Ultra log antenna	R&S	100016	2016.08.20
11	3160-09 Receive antenna	SCHWARZ-BECK	002058-002	2016.08.20
12	ESI 40 EMI test receiver	R&S	100015	2016.08.20
13	Radio tester	CMU 200	114667	2016.08.20

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APPENDIX

Appendix Test Setup

---End of Test Report---

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