TESTING
No. L2264

Part 24

TEST REPORT

Product Name	Neptune pine
FCC ID	2ABWUP312
Model	P312
Client	NEPTUNE COMPUTER INC.
Manufacturer	NEPTUNE COMPUTER INC.
Date of issue	June 10, 2014

TA Technology (Shanghai) Co., Ltd.

GENERAL SUMMARY

Reference Standard(s)	**FCC CFR47 Part 2 (2012)** Frequency Allocations And Radio Treaty Matters; General Rules And Regulations **FCC CFR47 Part 24E (2012)** Personal Communications Services **ANSI/TIA-603-C(2004)** Land mobile FM or PM Communications Equipment Measurements and Performance Standards. **KDB 971168 D01 Power Meas License Digital Systems v02r01** Measurement Guidance for Certification of Licensed Digital Transmitters
Conclusion	This portable wireless equipment has been measured in all cases requested by the relevant standards. Test results in Chapter 2 of this test report are below limits specified in the relevant standards. General Judgment: **Pass**
Comment	The test result only responds to the measured sample.

Approved by Weizhong Yang	**Revised by** Lingling Kang	**Performed by** Yiqi Chen
Weizhong Yang	Lingling Kang	Yiqi Chen
Director	RF Manager	RF Engineer

TABLE OF CONTENT

1. General Information

1.1. Notes of the test report

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS), and accreditation number: L2264.

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements. The site recognition number is 428261.

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement. The site recognition number is 8510A.

TA Technology (Shanghai) Co., Ltd. guarantees the reliability of the data presented in this test report, which is the results of measurements and tests performed for the items under test on the date and under the conditions stated in this test report and is based on the knowledge and technical facilities available at TA Technology (Shanghai) Co., Ltd. at the time of execution of the test.

TA Technology (Shanghai) Co., Ltd. is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the items under test and the results of the test. The sample under test was selected by the Client. This report only refers to the item that has undergone the test.

This report alone does not constitute or imply by its own an approval of the product by the certification Bodies or competent Authorities. This report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of **TA Technology (Shanghai) Co., Ltd.** and the Accreditation Bodies, if it applies.

If the electronic report is inconsistent with the printed one, it should be subject to the latter.

1.2. Testing laboratory

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong
City:	Shanghai
Post code:	201201
Country:	P. R. China
Contact:	Yang Weizhong
Telephone:	+86-021-50791141/2/3
Fax:	+86-021-50791141/2/3-8000
Website:	http://www.ta-shanghai.com
E-mail:	yangweizhong@ta-shanghai.com

1.3. Applicant Information

Company:	NEPTUNE COMPUTER INC.
Address:	666 SHERBROOKE ST. W., SUITE 1000
City:	MONTREAL
Postal Code:	H3A 1E7
Country:	CANADA

1.4. Manufacturer Information

Company:	NEPTUNE COMPUTER INC.
Address:	666 SHERBROOKE ST. W., SUITE 1000
City:	MONTREAL
Postal Code:	H3A 1E7
Country:	CANADA

1.5. Information of EUT

General information

Name of EUT:	Neptune pine		
IMEI:	354727049900715		
Hardware Version:	P1		
Software Version:	JB_V0.29		
Antenna Type:	Internal Antenna		
Device Operating Configurations:			
Test Mode(s):	GSM1900; WCDMA Band II;		
Test Modulation:	(GSM)GMSK,8PSK; (WCDMA)QPSK		
GPRS Multislot Class:	12		
EGPRS Multislot Class:	12		
HSDPA UE Category:	8		
HSUPA UE Category:	6		
Maximum E.I.R.P.	GSM 1900: 29.32 dBm WCDMA Band II: 20.56 dBm		
Power Supply:	Battery or Charger(AC adaptor)		
Rated Power Supply Voltage:	3.8V		
Extreme Voltage:	Minimum: 3.5V Maximum: 4.2V		
Extreme Temperature:	Lowest: -20°C Highest: +60°C		
Test Channel: (Low - Middle - High)	512 - 661 - 810 (GSM 1900) 9262 – 9400 – 9538 (WCDMA Band II)		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	GSM1900	1850.2 ~ 1909.8	1930.2 ~ 1989.8
	WCDMA Band II	1852.4 ~ 1907.6	1932.4 ~ 1987.6

Auxiliary equipment details

AE1: Battery

Model:	Mini Phone
Manufacturer:	Tian Yu Communication Technology (Kun Shan) CO.,Ltd
S/N:	/

1.6. Test Date

The test is performed from March 8, 2014 to March 12, 2014.

2. Test Information

2.1. Summary of test results

Number	Test Case	Clause in FCC rules	Verdict
1	RF power output	2.1046	PASS
2	Effective Isotropic Radiated power	24.232	PASS
3	Occupied Bandwidth	2.1049	PASS
4	Band Edge Compliance	24.238	PASS
5	Peak-to-Average Power Ratio	KDB 971168 D01(5.7)	PASS
6	Frequency Stability	2.1055 / 24.235	PASS
7	Spurious Emissions at Antenna Terminals	2.1051 / 24.238	PASS
8	Radiates Spurious Emission	2.1053 / 24.238	PASS

2.2. RF Power Output

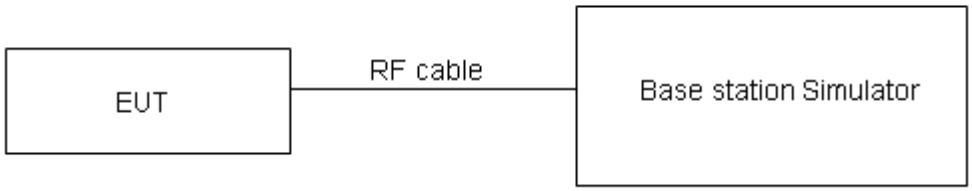
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT is controlled by the Base Station Simulator to ensure max power transmission and proper modulation.

Test Setup



The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.

Limits

No specific RF power output requirements in part 2.1046.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.4 dB.

Test Results

GSM 1900		Conducted Power(dBm)		
		Channel 512	Channel 661	Channel 810
		1850.2(MHz)	1880(MHz)	1909.8(MHz)
GSM	Results	28.59	28.58	28.42
GPRS (GMSK)	1TXslot	28.56	28.55	28.48
	2TXslots	25.47	25.47	25.41
	3TXslots	23.57	23.57	23.51
	4TXslots	22.56	22.56	22.5
EGPRS (8-PSK)	1TXslot	23.9	24.03	23.92
	2TXslots	22.38	22.54	22.42
	3TXslots	21.38	21.52	21.43
	4TXslots	20.87	21.02	20.91

Note:

1) The maximum RF Output Power numbers are marks in bold.

2)The following testing in GPRS/EGPRS is set to 1TXslot based on the maximum RF Output Power.

WCDMA Band II		Conducted Power(dBm)		
		Channel 9262	Channel 9400	Channel 9538
		1852.4(MHz)	1880(MHz)	1907.6(MHz)
RMC		19.84	19.81	19.74
HSDPA	Sub - Test 1	**19.85**	**19.53**	**19.48**
	Sub - Test 2	19.85	19.44	19.53
	Sub - Test 3	19.35	19.1	19.12
	Sub - Test 4	19.41	19.09	19.12
HSUPA	Sub - Test 1	19.41	18.63	18.96
	Sub - Test 2	17.89	17.99	17.54
	Sub - Test 3	18.78	18.21	18.11
	Sub - Test 4	18.09	17.92	18.3
	Sub - Test 5	**20.19**	**18.84**	**19.09**

Note:

1) The maximum RF Output Power numbers are marks in bold.

2)The following testing in HSDPA/HSUPA is set to Sub - Test 1/ Sub - Test 5 based on the maximum RF Output Power.

2.3. Effective Isotropic Radiated Power

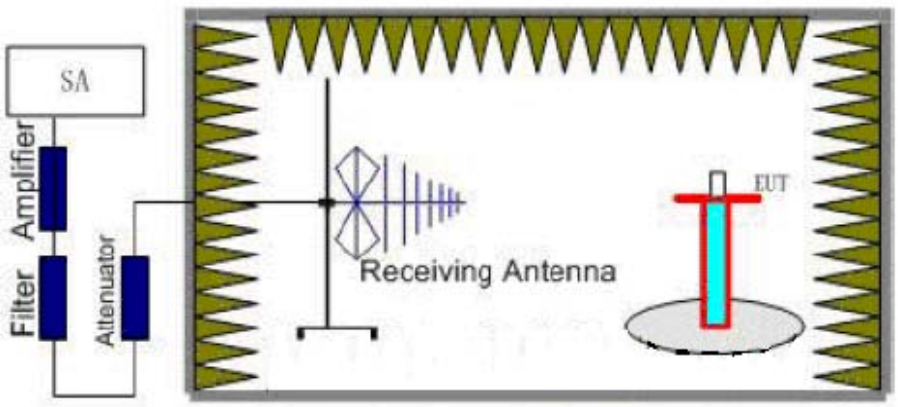
Ambient condition

Temperature	Relative humidity
21°C ~25°C	40%~60%

Methods of Measurement

The measurement procedures in TIA- 603C are used.
1. The EUT was placed on a turntable with 1.5 meter height in a fully anechoic chamber.
2. The EUT was set at 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. GSM operating modes: Set RBW= 1MHz, VBW= 3MHz, RMS detector over burst;
UMTS operating modes: Set RBW= 100 KHz, VBW= 300 KHz, RMS detector over frame, and use channel power option with bandwidth=5MHz, per section 4.0 of KDB 971168 D01.
4. The table was rotated 360 degrees to determine the position of the highest radiated power.
5. The height of the receiving antenna is adjusted to look for the maximum ERP/EIRP.
6. Taking the record of maximum ERP/EIRP.
7. A dipole antenna was substituted in place of the EUT and was driven by a signal generator.
8. The conducted power at the terminal of the dipole antenna is measured.
9. Repeat step 3 to step 5 to get the maximum ERP/EIRP of the substitution antenna.
10. ERP/EIRP = Ps + Et – Es + Gs = Ps + Rt – Rs + Gs
Ps (dBm)：Input power to substitution antenna.
Gs (dBi or dBd)：Substitution antenna Gain.
Et = Rt + AF
Es = Rs + AF
AF (dB/m)：Receive antenna factor
Rt：The highest received signal in spectrum analyzer for EUT.
Rs：The highest received signal in spectrum analyzer for substitution antenna.

Test Setup



Limits

Rule Part 24.232(b) specifies that "Mobile/portable stations are limited to 2 watts EIRP. Peak power" and Rule Part 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage".

Limit (EIRP)	≤ 2 W (33 dBm)

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 1.19 dB

Test Results:Pass

GSM1900					
Horizontal Polarization					
Frequency(MHz)	**Rt(dBm)**	**Rs(dBm)**	**Ps(dBm)**	**Gs(dBi)**	**EIRP(dBm)**
1850.2	-29.44	-53.21	0	1.92	25.69
1880	-30.41	-53.42	0	1.94	24.95
1909.8	-31.29	-53.67	0	1.90	24.28
Vertical Polarization					
Frequency(MHz)	**Rt(dBm)**	**Rs(dBm)**	**Ps(dBm)**	**Gs(dBi)**	**EIRP(dBm)**
1850.2	-26.81	-53.70	0	1.92	28.81
1880	-27.16	-53.91	0	1.94	28.69
1909.8	-27.41	-54.55	0	1.90	29.04
GPRS 1900					
Horizontal Polarization					
Frequency(MHz)	**Rt(dBm)**	**Rs(dBm)**	**Ps(dBm)**	**Gs(dBi)**	**EIRP(dBm)**
1850.2	-29.70	-53.21	0	1.92	25.43
1880	-30.24	-53.42	0	1.94	25.12
1909.8	-31.23	-53.67	0	1.90	24.34
Vertical Polarization					
Frequency(MHz)	**Rt(dBm)**	**Rs(dBm)**	**Ps(dBm)**	**Gs(dBi)**	**EIRP(dBm)**
1850.2	-26.96	-53.70	0	1.92	28.66
1880	-27.13	-53.91	0	1.94	28.72
1909.8	-27.13	-54.55	0	1.90	29.32
EGPRS 1900					
Horizontal Polarization					
Frequency(MHz)	**Rt(dBm)**	**Rs(dBm)**	**Ps(dBm)**	**Gs(dBi)**	**EIRP(dBm)**
1850.2	-34.01	-53.21	0	1.92	21.12
1880	-34.52	-53.42	0	1.94	20.84
1909.8	-35.22	-53.67	0	1.90	20.35
Vertical Polarization					
Frequency(MHz)	**Rt(dBm)**	**Rs(dBm)**	**Ps(dBm)**	**Gs(dBi)**	**EIRP(dBm)**
1850.2	-31.27	-53.70	0	1.92	24.35
1880	-31.57	-53.91	0	1.94	24.28
1909.8	-31.59	-54.55	0	1.90	24.86

WCDMA Band II					
Horizontal Polarization					
Frequency(MHz)	**Rt(dBm)**	**Rs(dBm)**	**Ps(dBm)**	**Gs(dBi)**	**EIRP(dBm)**
1852.4	-37.70	-53.19	0	1.92	17.41
1880	-38.86	-53.42	0	1.94	16.50
1907.6	-39.76	-53.66	0	1.92	15.82
Vertical Polarization					
Frequency(MHz)	**Rt(dBm)**	**Rs(dBm)**	**Ps(dBm)**	**Gs(dBi)**	**EIRP(dBm)**
1852.4	-35.05	-53.69	0	1.92	20.56
1880	-35.85	-53.91	0	1.94	20.00
1907.6	-35.99	-54.54	0	1.92	20.47

2.4. Occupied Bandwidth

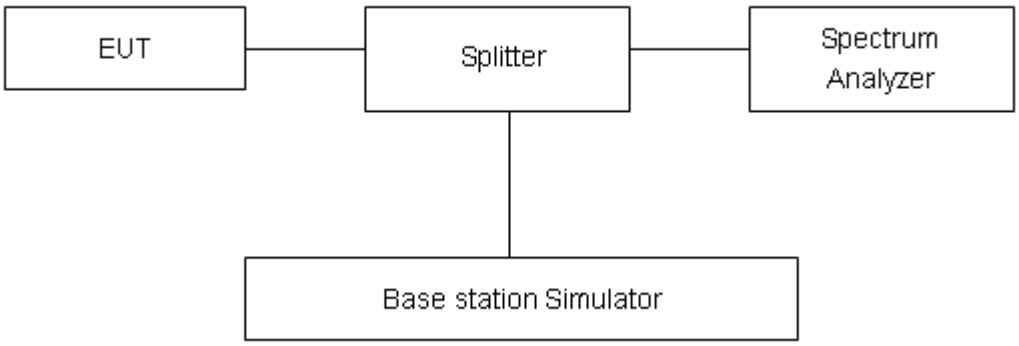
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The occupied bandwidth is measured using spectrum analyzer. RBW is set to 3kHz,VBW is set to 10kHz for GSM 1900 and RBW is set to 51kHz,VBW is set to 100kHz for WCDMA Band II.99% power and -26dBc occupied bandwidths are recorded. Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

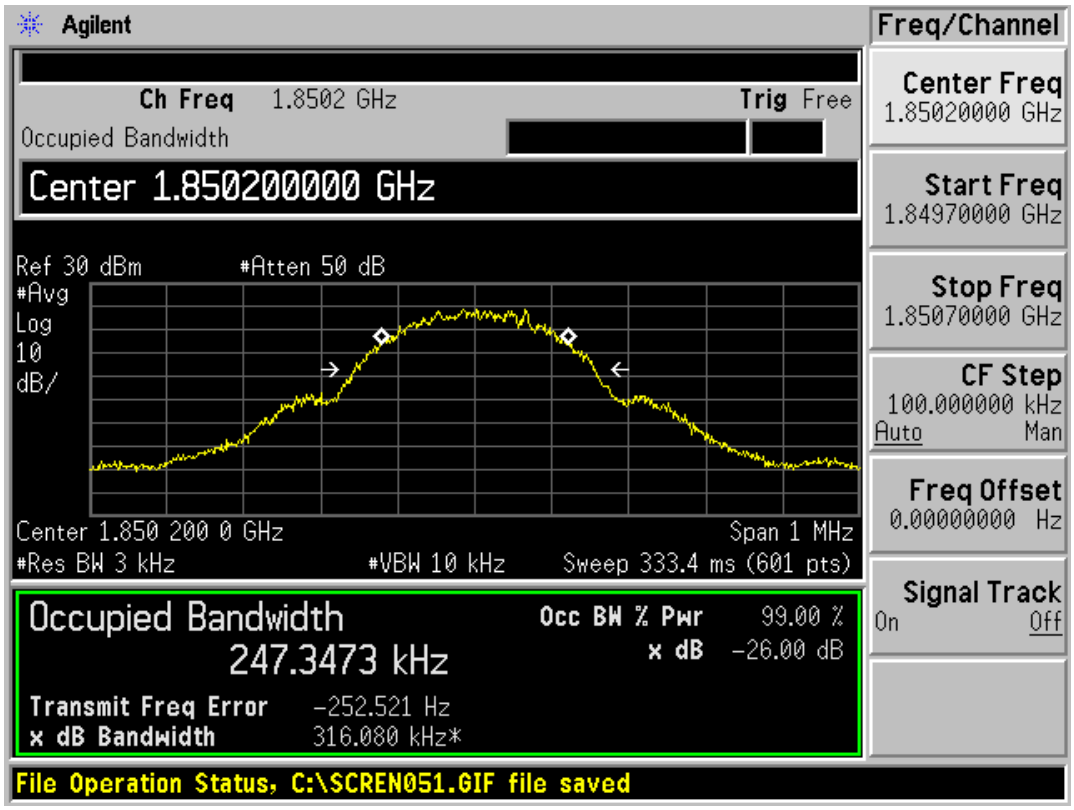
No specific occupied bandwidth requirements in part 2.1049.

Measurement Uncertainty

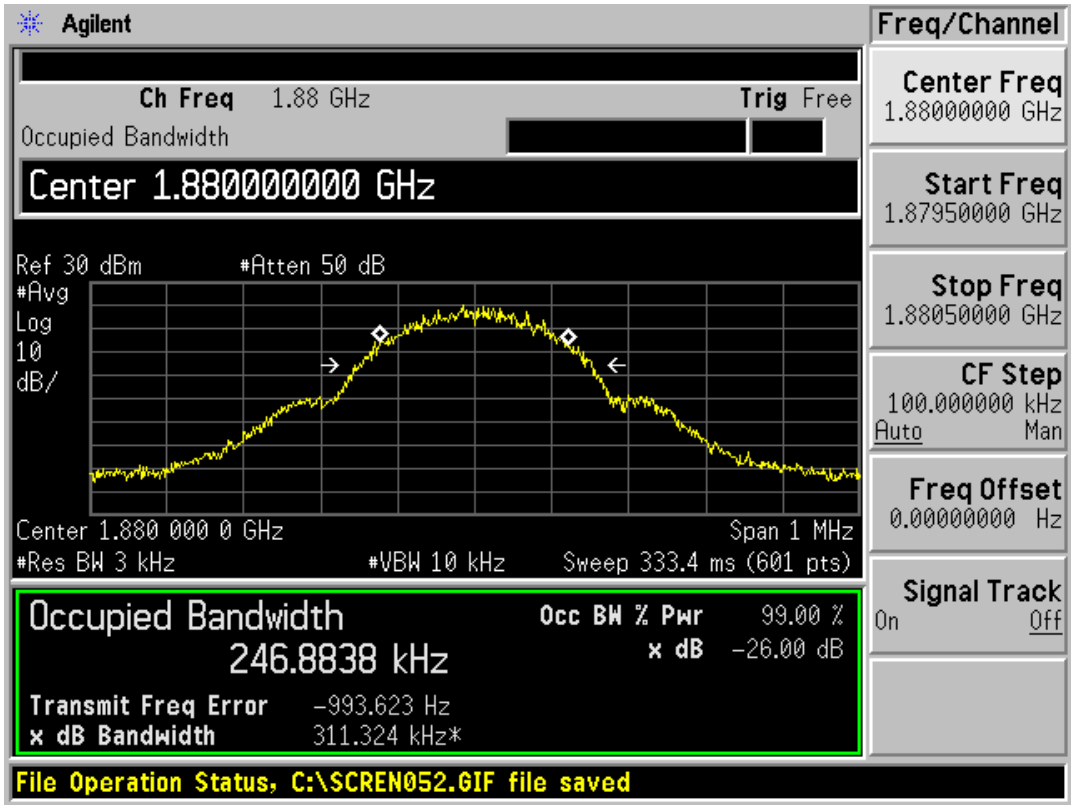
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 624Hz.

Test Result

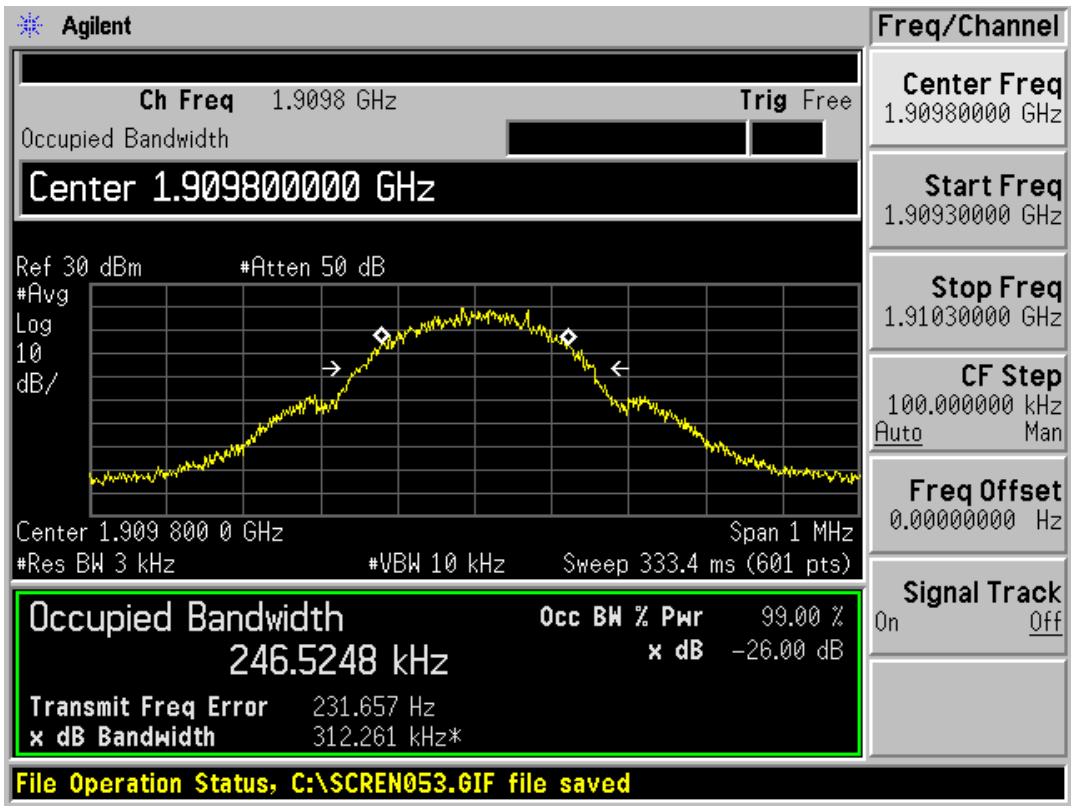
GSM 1900	Channel	Frequency (MHz)	99% Power Bandwidth (kHz)	-26dBc Bandwidth(kHz)
GSM	512	1850.2	247.3473	316.080
	661	1880.0	246.8838	311.324
	810	1909.8	246.5248	312.261
GPRS (GMSK)	512	1850.2	246.3067	309.765
	661	1880.0	245.0662	309.367
	810	1909.8	245.3627	313.725
EGPRS (8-PSK)	512	1850.2	252.4723	317.433
	661	1880.0	242.7558	310.978
	810	1909.8	240.3818	301.934



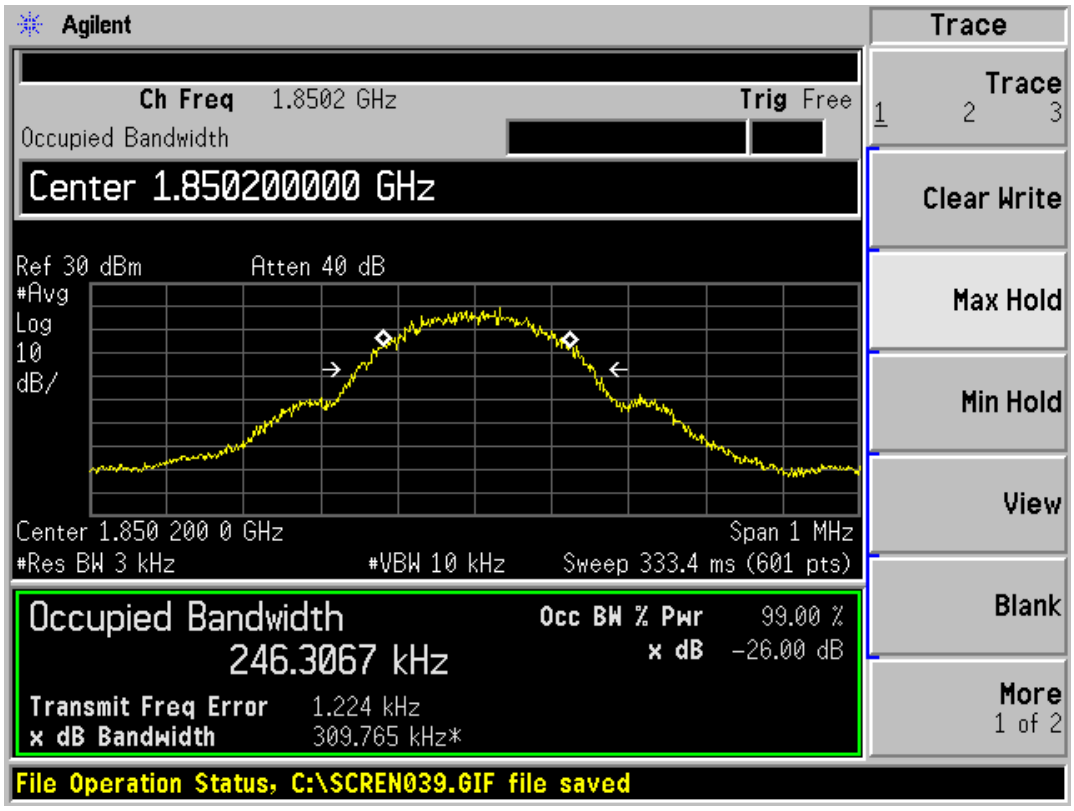
GSM1900 CH512 Occupied Bandwidth



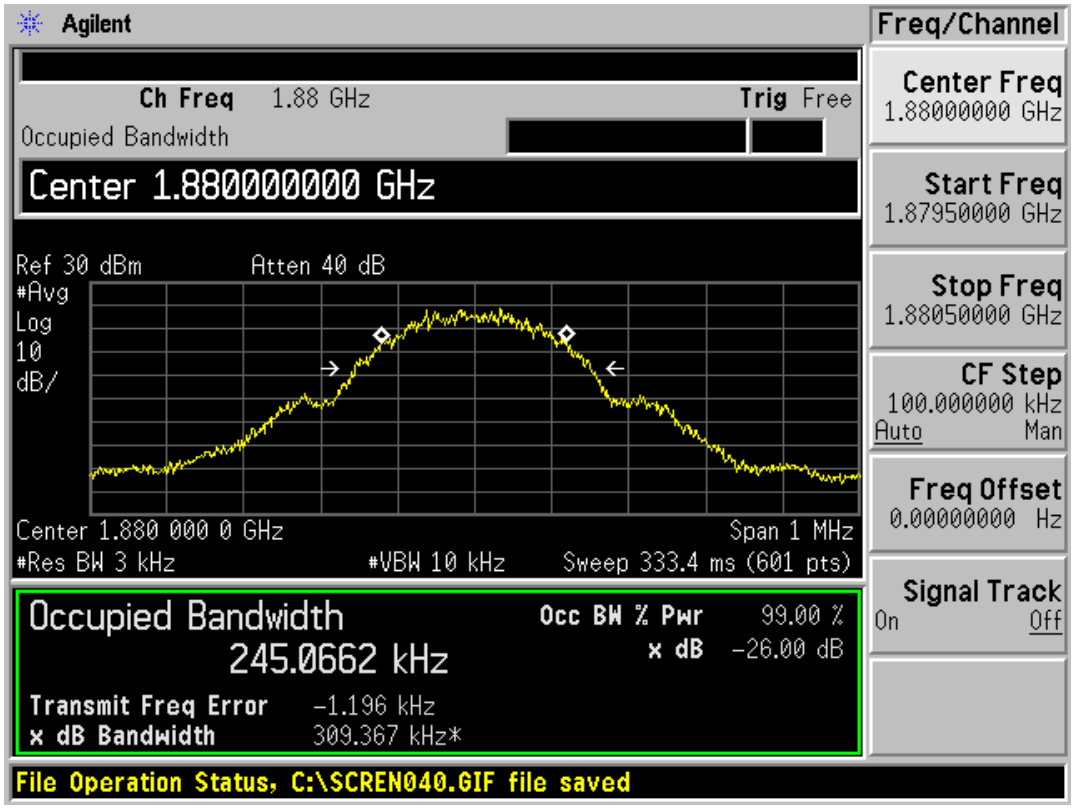
GSM 1900 CH661 Occupied Bandwidth



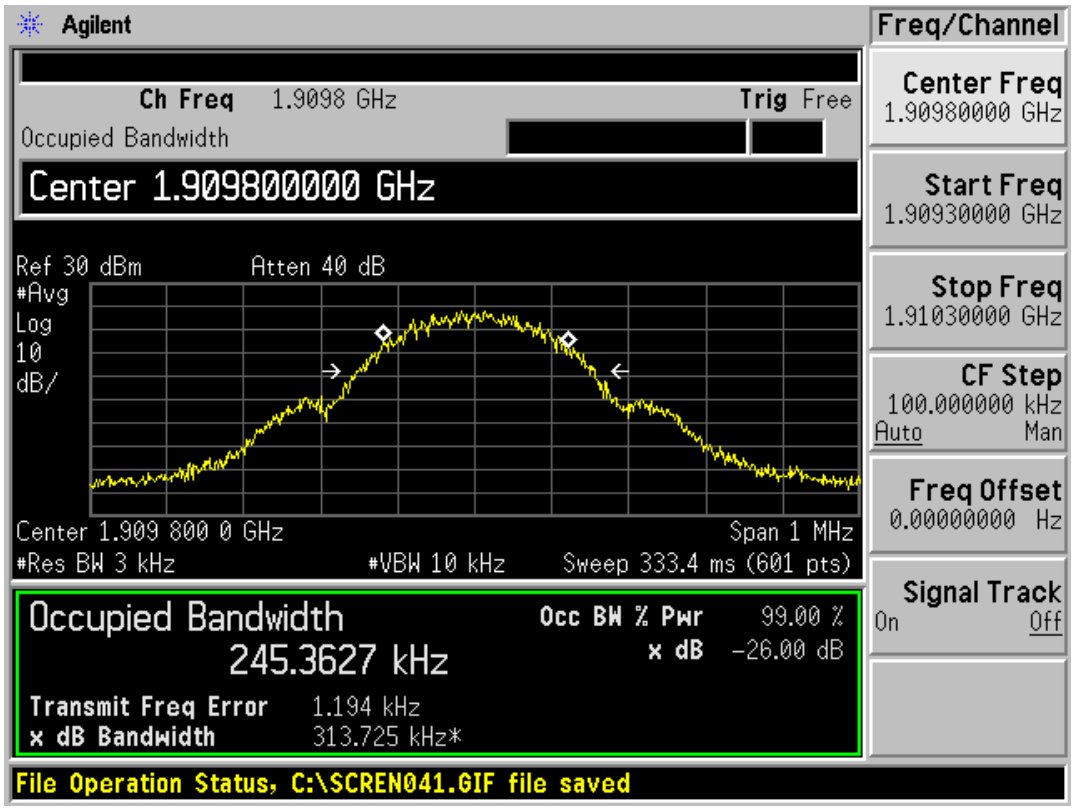
GSM 1900 CH810 Occupied Bandwidth



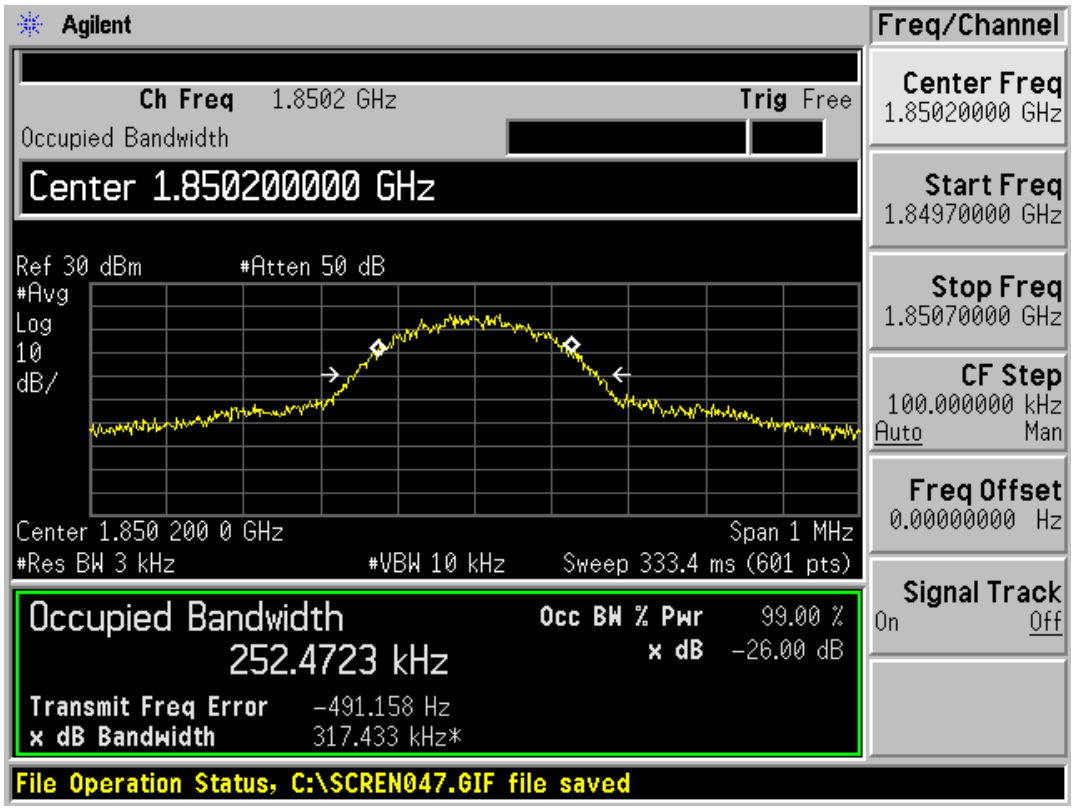
GSM1900 GPRS CH512 Occupied Bandwidth



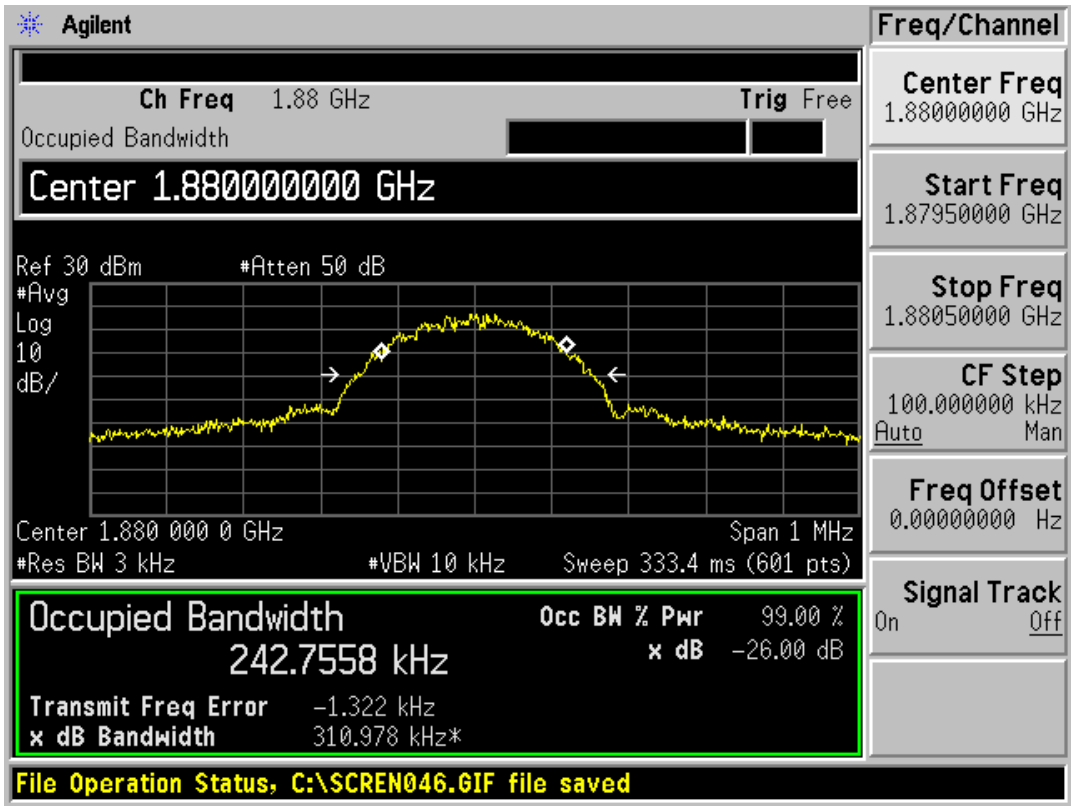
GSM 1900 GPRS CH661 Occupied Bandwidth



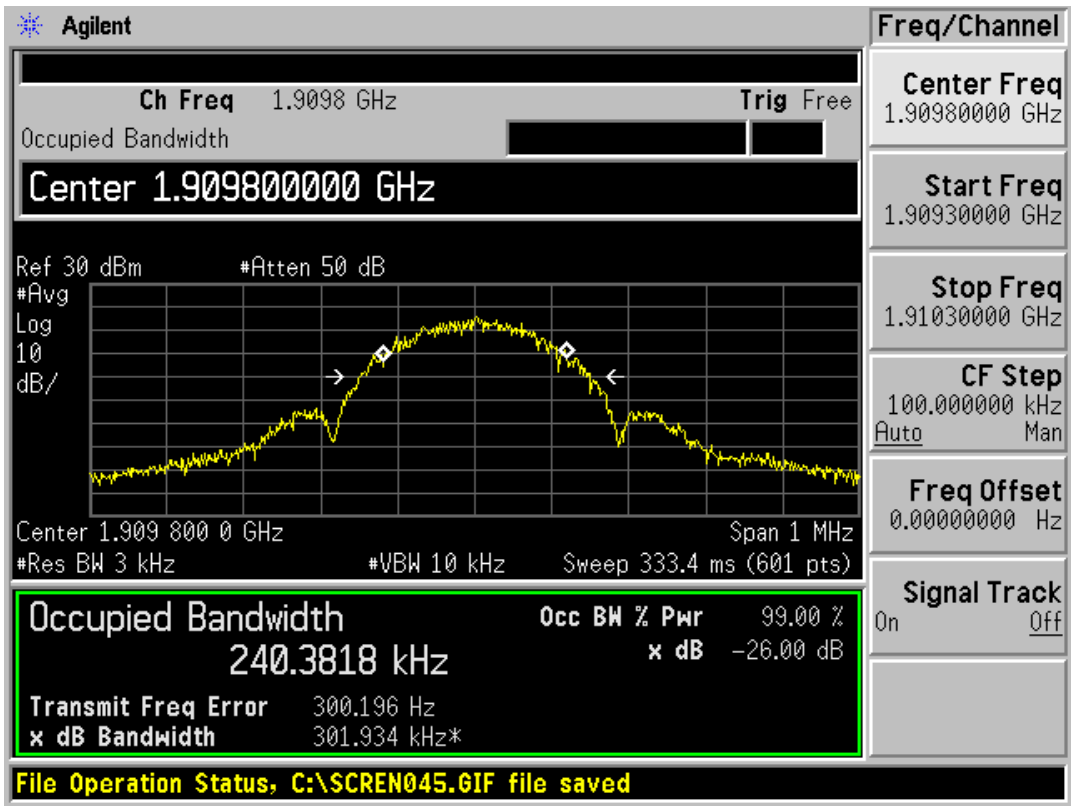
GSM 1900 GPRS CH810 Occupied Bandwidth



GSM1900 EGPRS CH512 Occupied Bandwidth

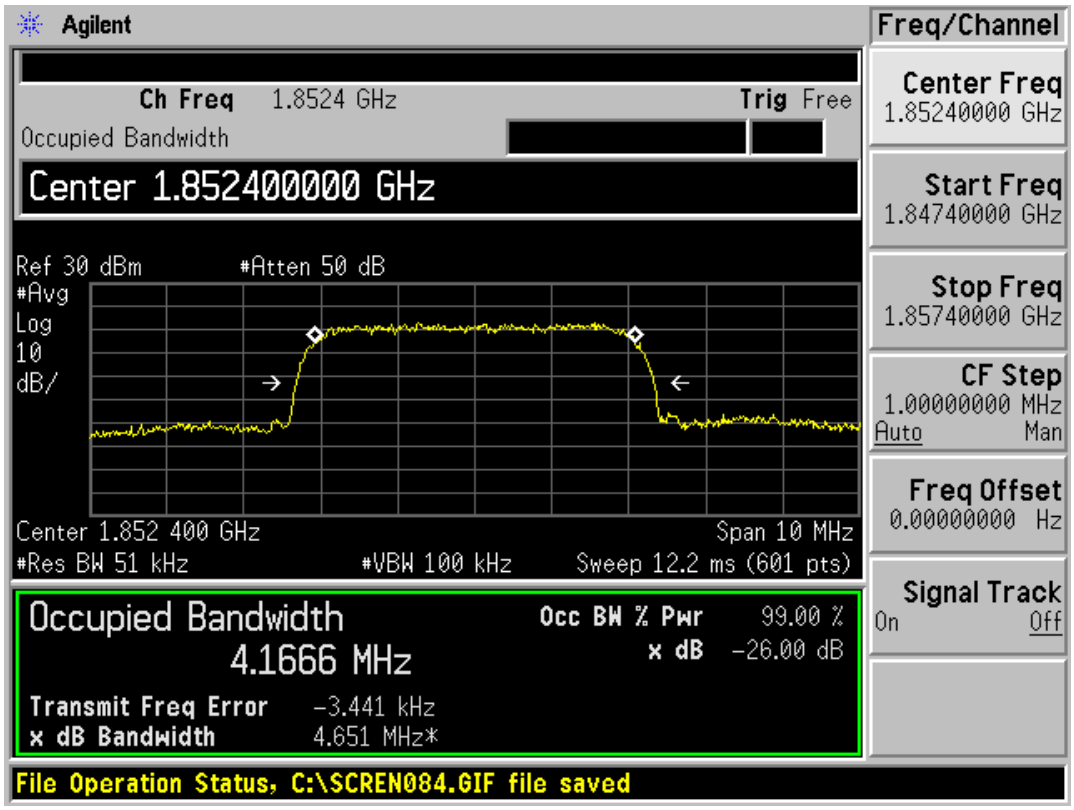


GSM 1900 EGPRS CH661 Occupied Bandwidth

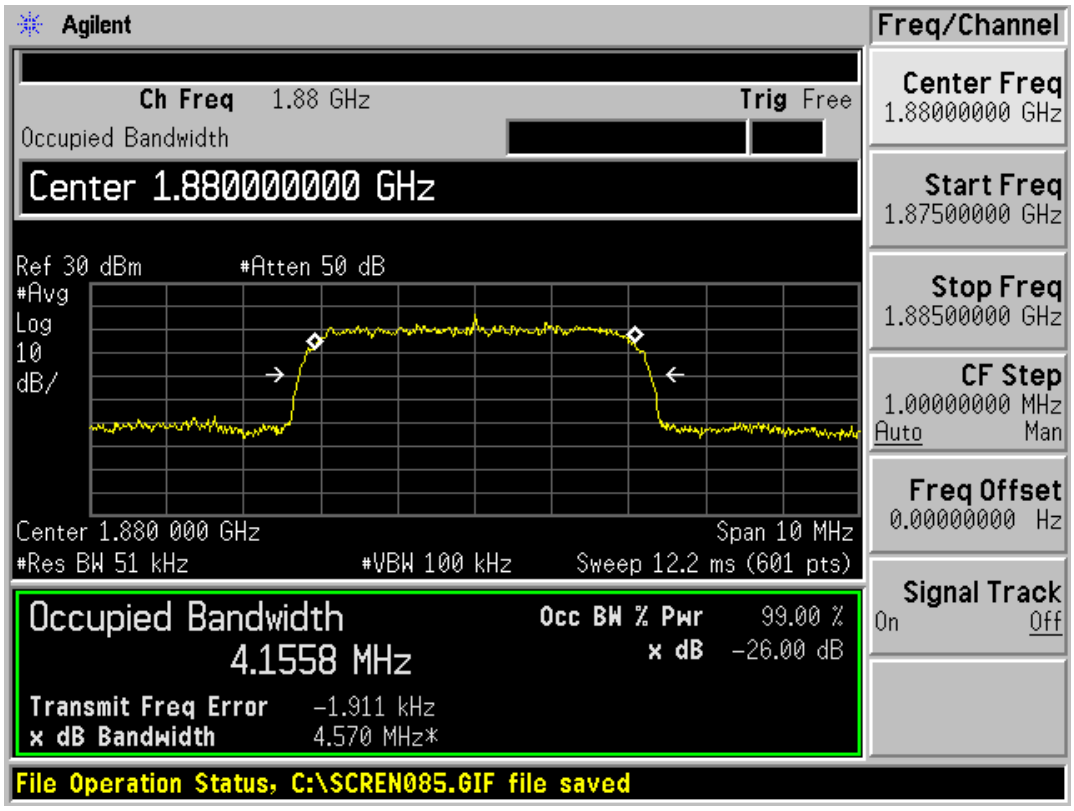


GSM 1900 EGPRS CH810 Occupied Bandwidth

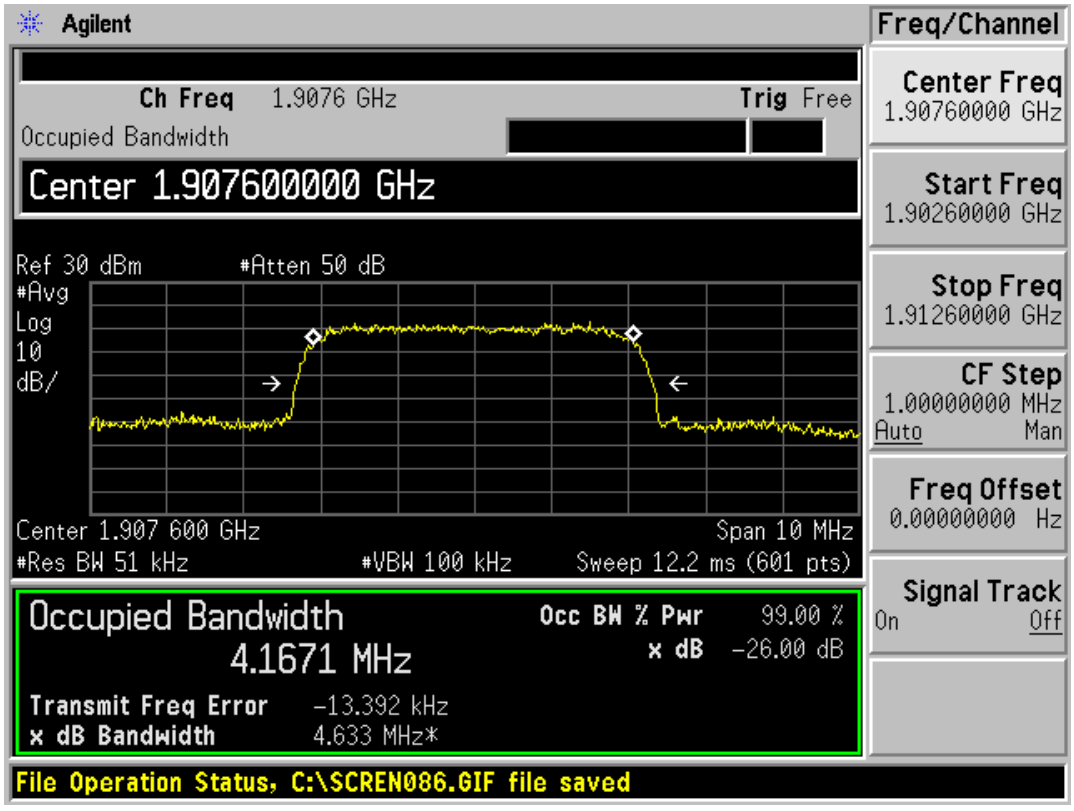
WCDMA Band II	Channel	Frequency (MHz)	99% Power Bandwidth (MHz)	-26dBc Bandwidth(MHz)
RMC	9262	1852.4	4.1666	4.651
	9400	1880	4.1558	4.570
	9538	1907.6	4.1671	4.633
HSDPA	9262	1852.4	4.1665	4.633
	9400	1880	4.1683	4.632
	9538	1907.6	4.1488	4.639
HSUPA	9262	1852.4	4.1743	4.630
	9400	1880	4.1790	4.666
	9538	1907.6	4.1708	4.656



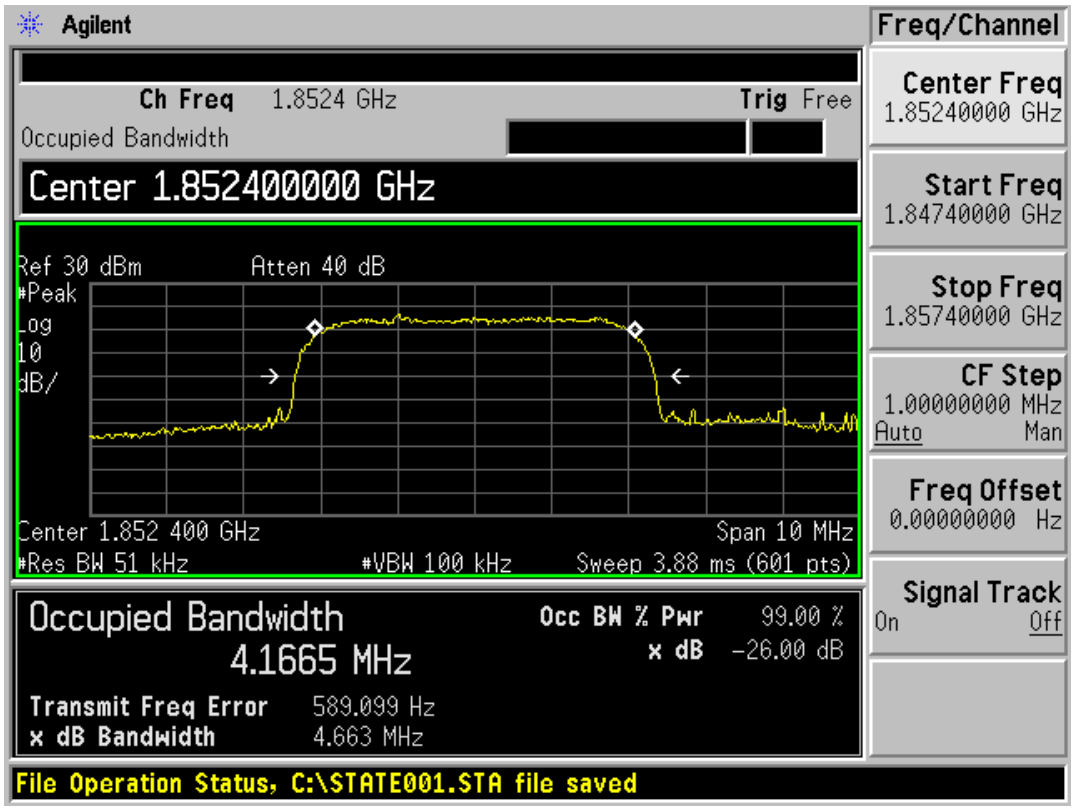
WCDMA Band II CH9262 Occupied Bandwidth



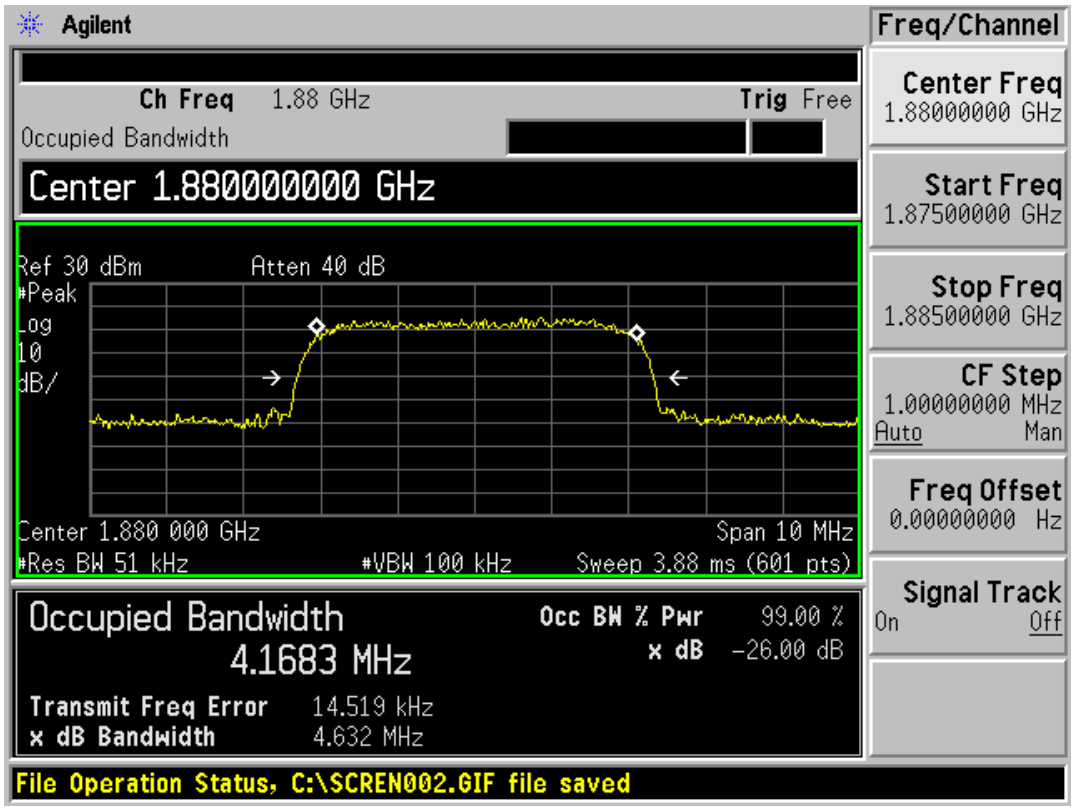
WCDMA Band II CH9400 Occupied Bandwidth



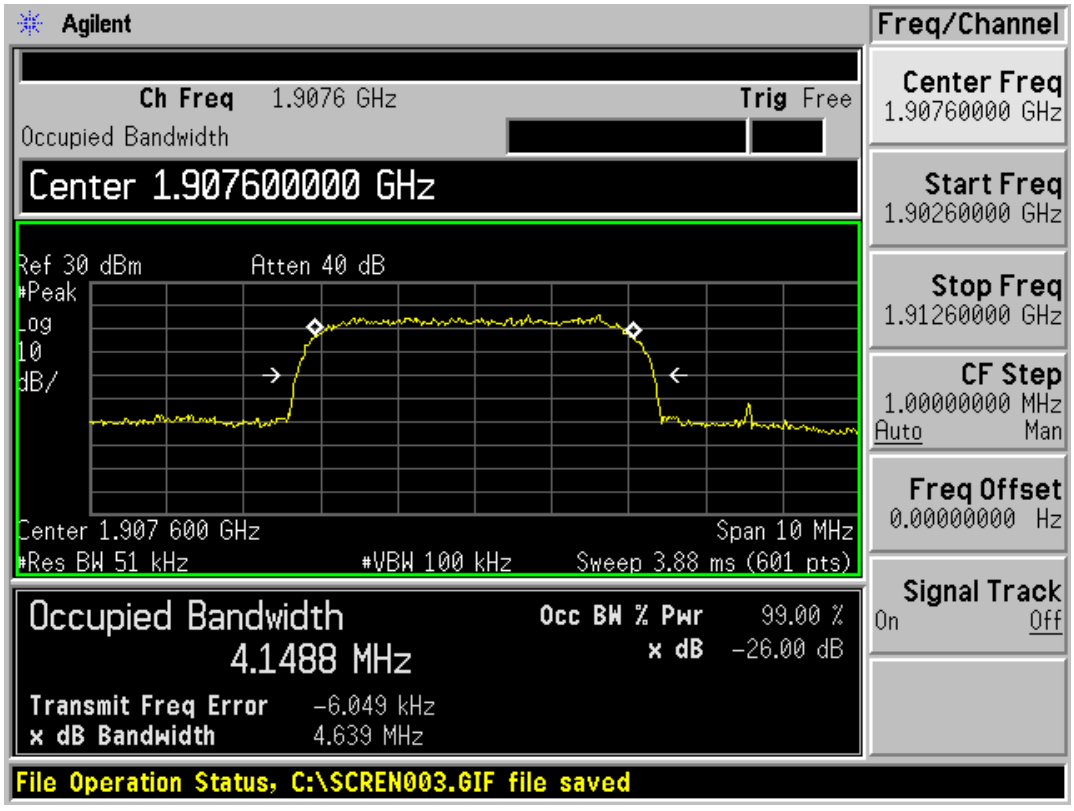
WCDMA Band II CH9538 Occupied Bandwidth



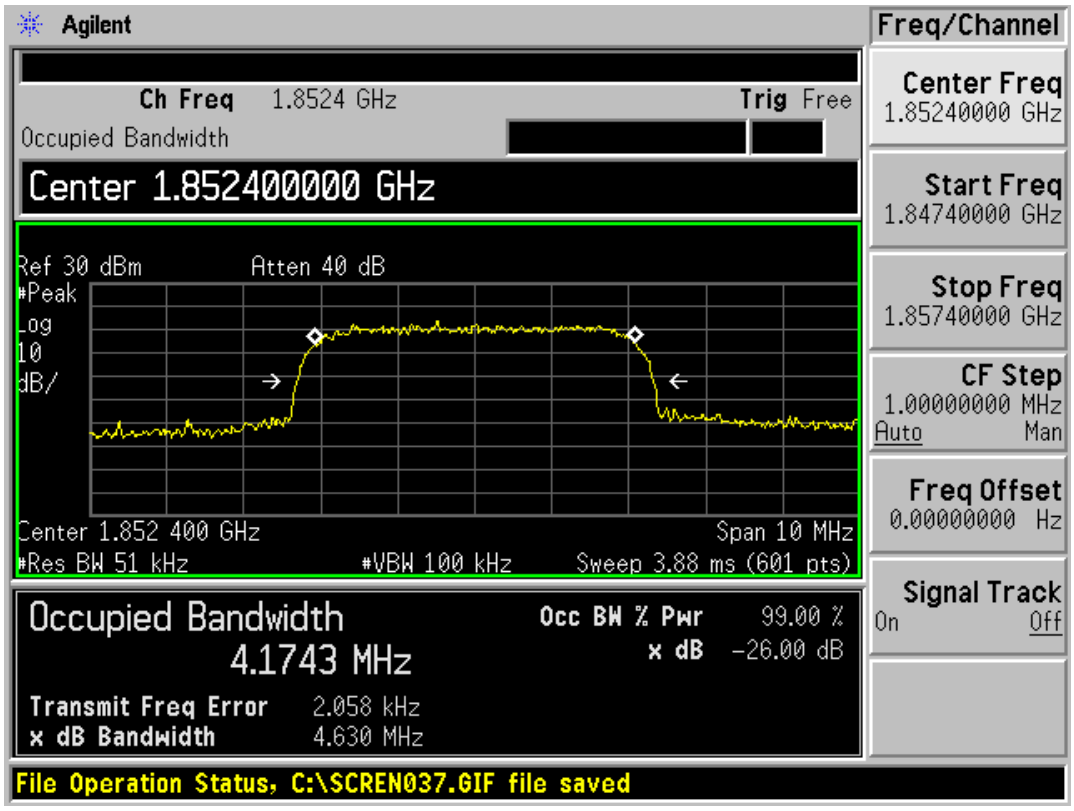
WCDMA Band II HSDPA CH9262 Occupied Bandwidth



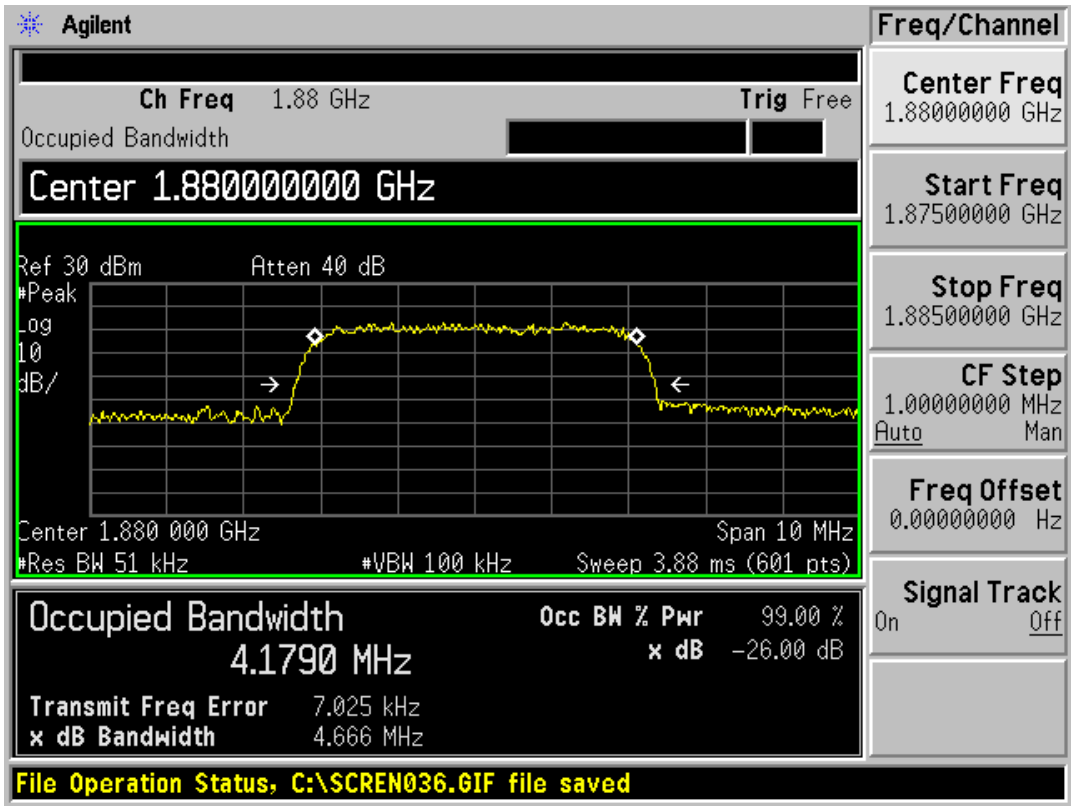
WCDMA Band II HSDPA CH9400 Occupied Bandwidth



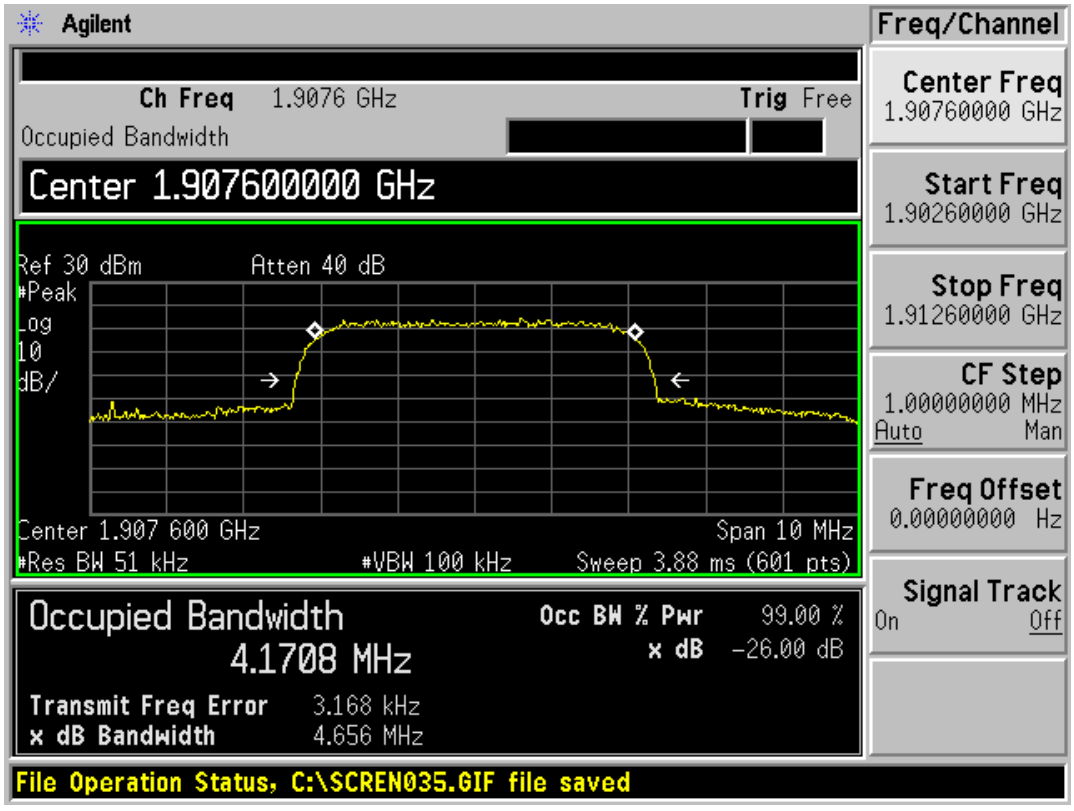
WCDMA Band II HSDPA CH9538 Occupied Bandwidth



WCDMA Band II HSUPA CH9262 Occupied Bandwidth



WCDMA Band II HSUPA CH9400 Occupied Bandwidth



WCDMA Band II HSUPA CH9538 Occupied Bandwidth

2.5. Band Edge Compliance

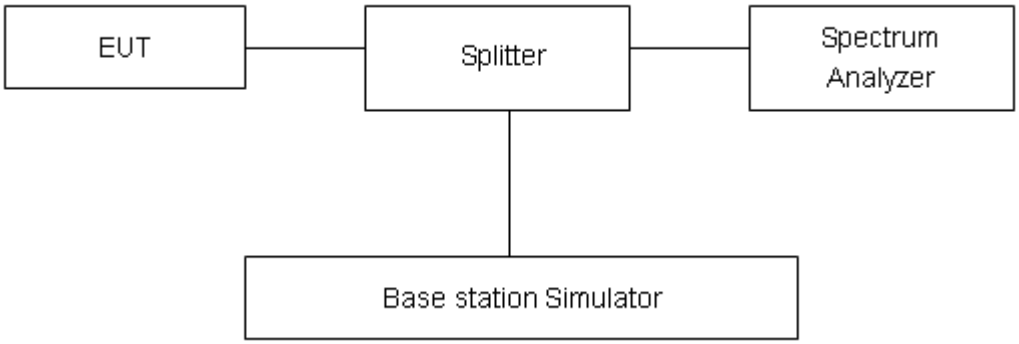
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The band edge of the lowest and highest channels were measured. The Average detector is used and RBW is set to 3kHz,VBW is set to 10kHz for GSM 1900 and RBW is set to 51kHz,VBW is set to 100kHz for WCDMA Band II. Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

Rule Part 24.238(a) specifies that “on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log10 (P) dB.”

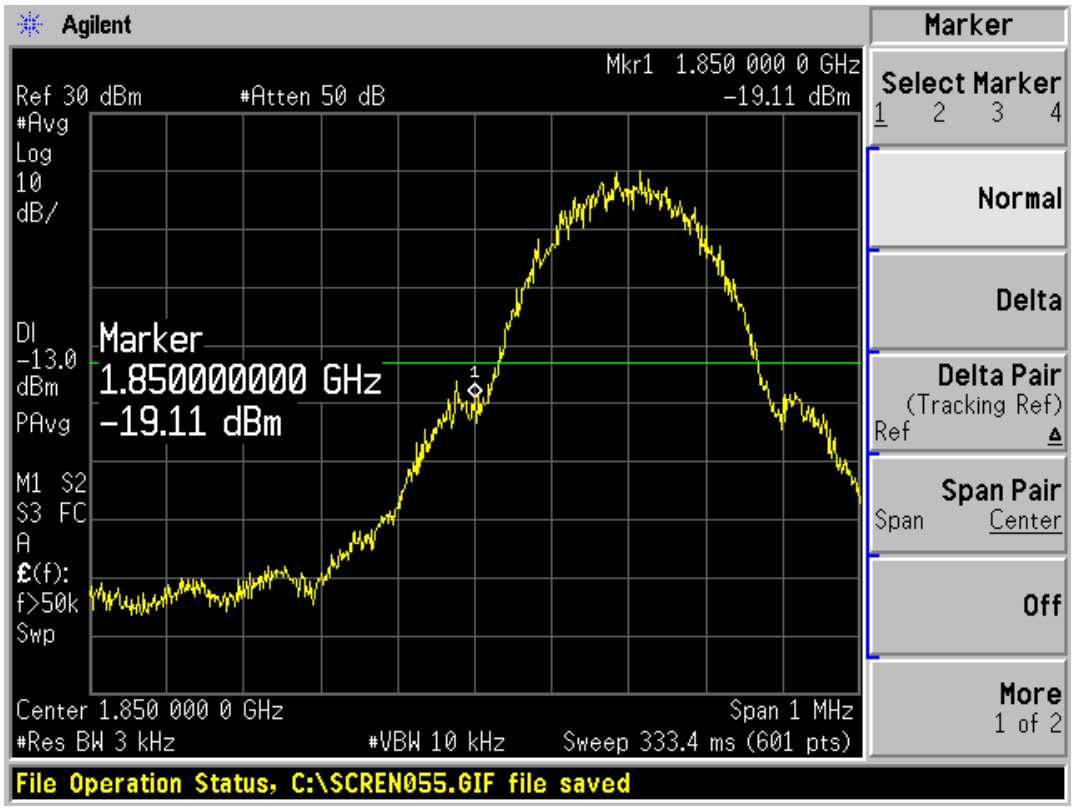
Limit	-13 dBm

Measurement Uncertainty

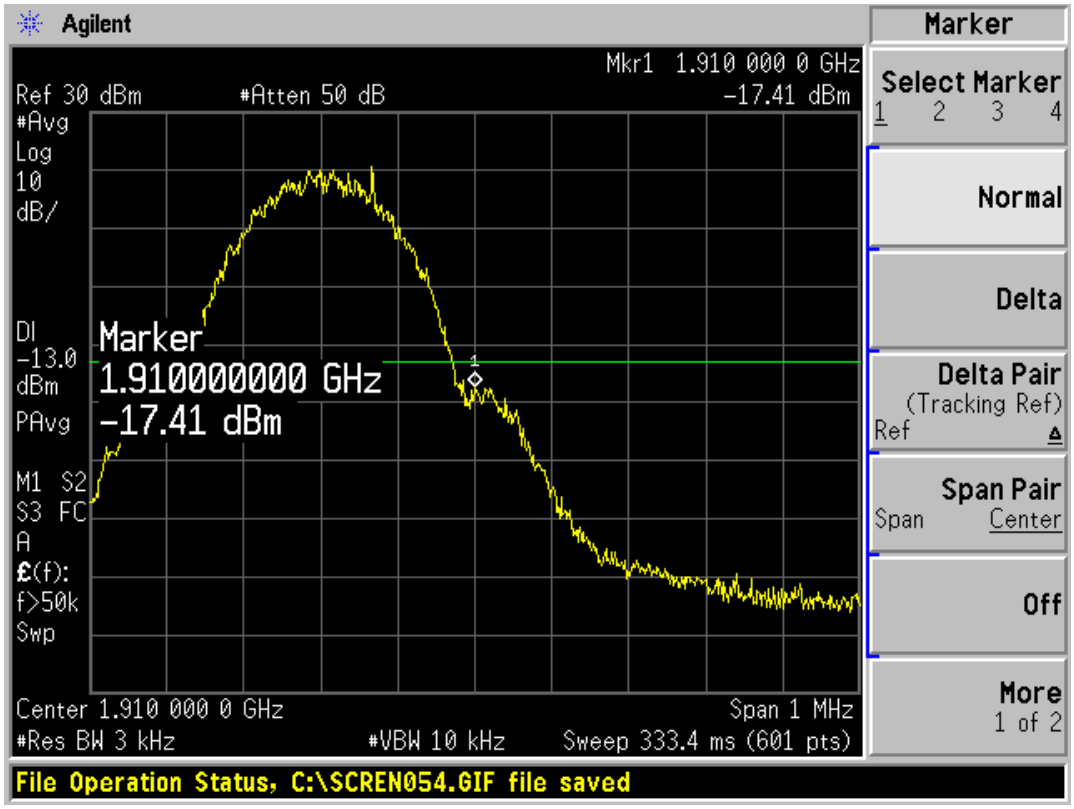
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96, U=0.684dB.

Test Result:

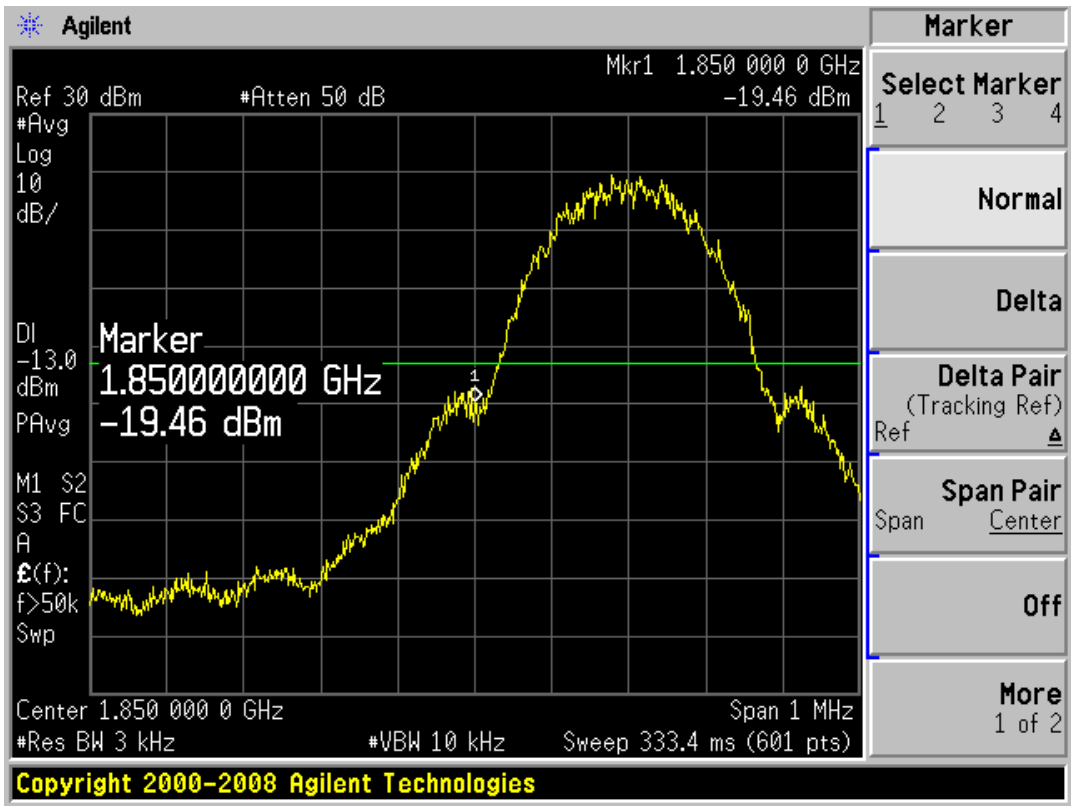
GSM 1900	Carrier frequency (MHz)	Reference value (dBm)	Limit (dBm)	Conclusion
GSM	1850.0	-19.11	-13	PASS
	1910.0	-17.41	-13	PASS
GPRS (GMSK)	1850.0	-19.46	-13	PASS
	1910.0	-22.50	-13	PASS
EGPRS (8-PSK)	1850.0	-25.46	-13	PASS
	1910.0	-28.32	-13	PASS



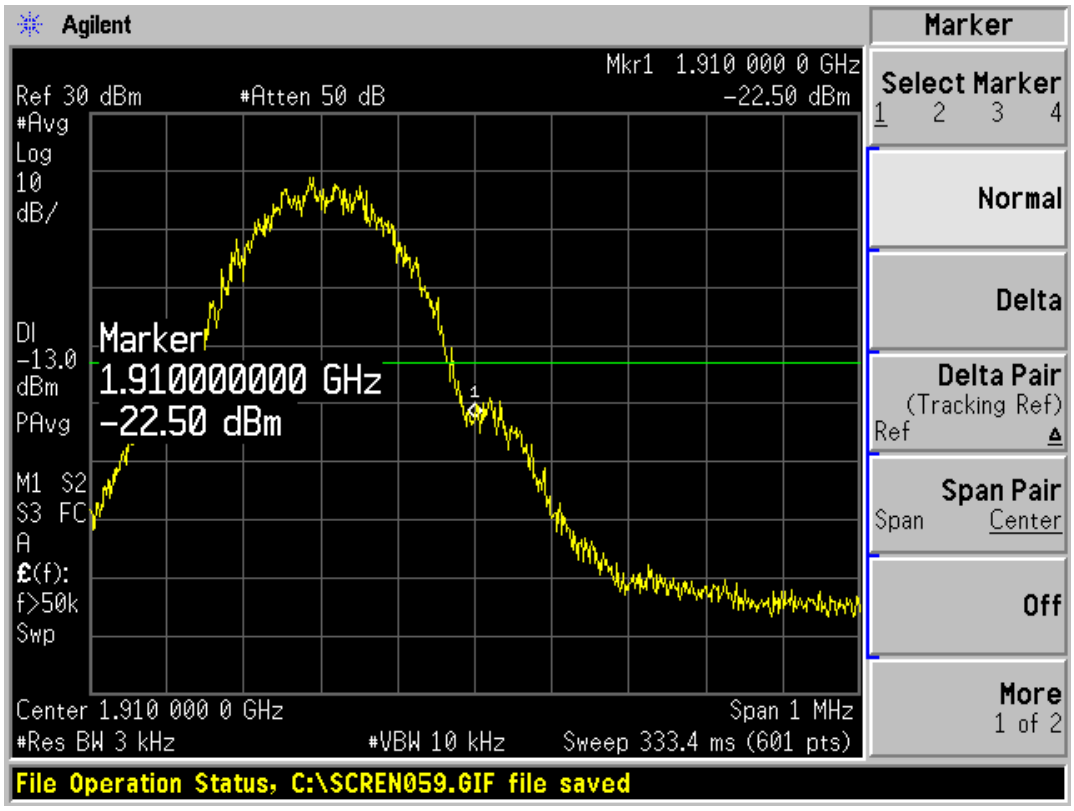
GSM 1900 512 Channel



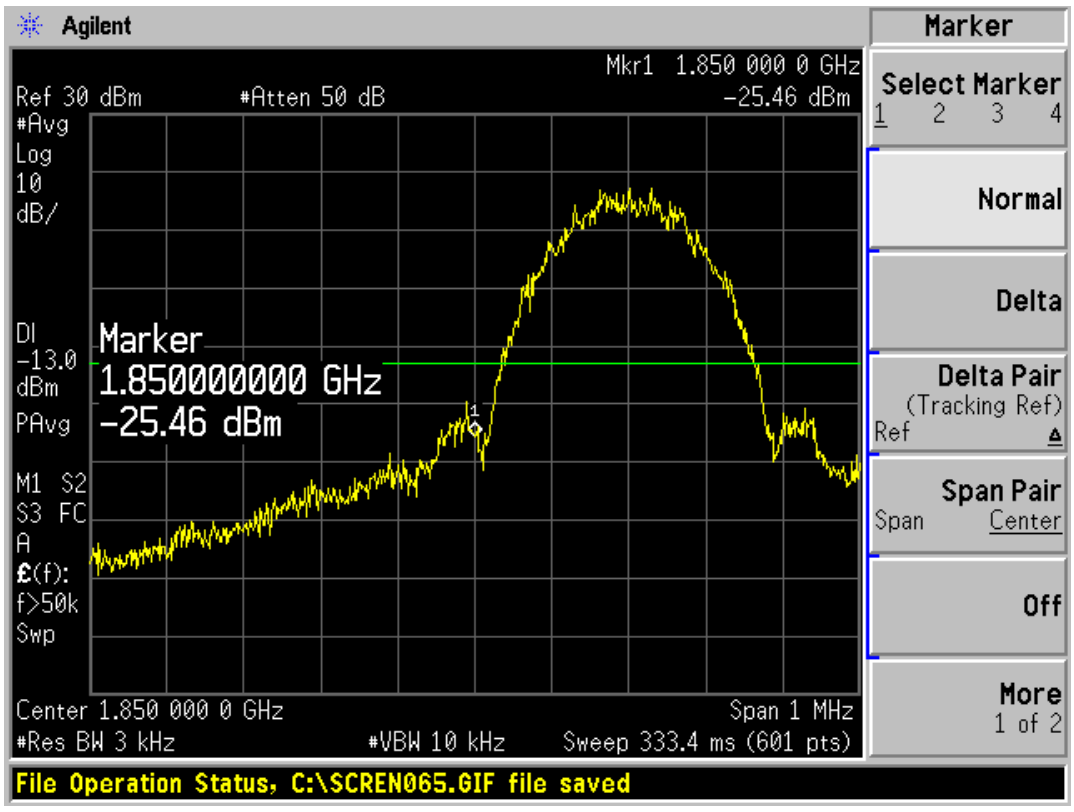
GSM1900 810 Channel



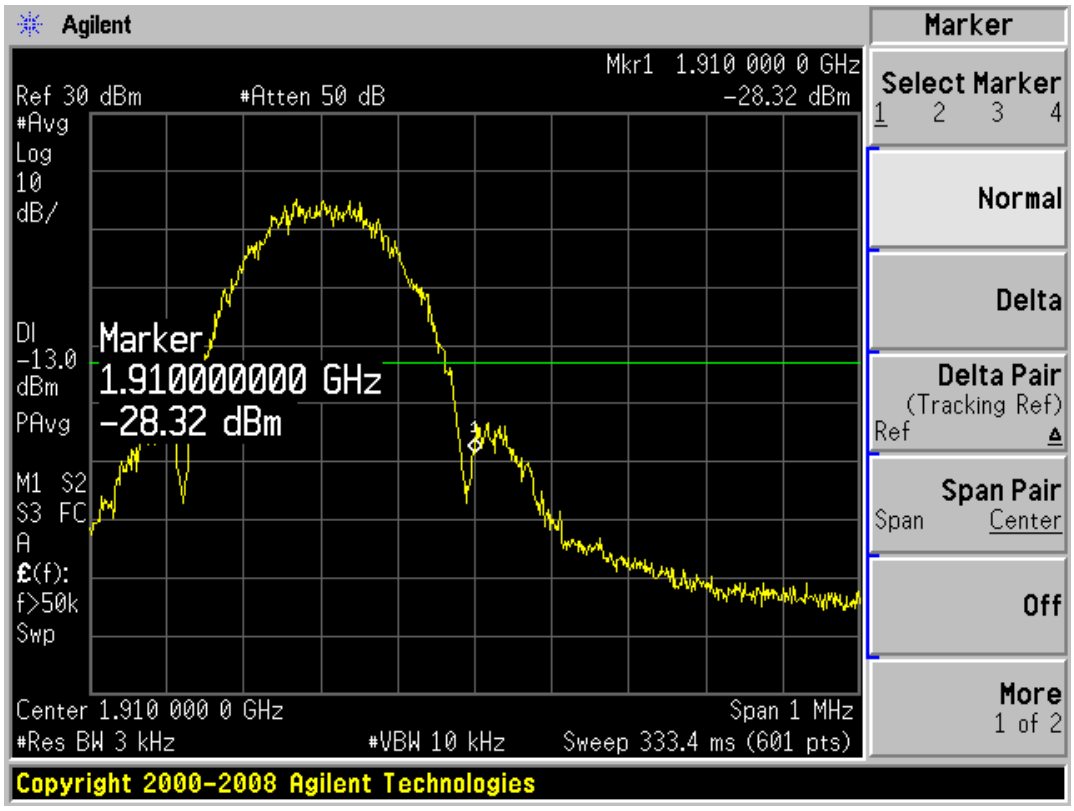
GSM 1900 GPRS 512 Channel



GSM1900 GPRS 810 Channel

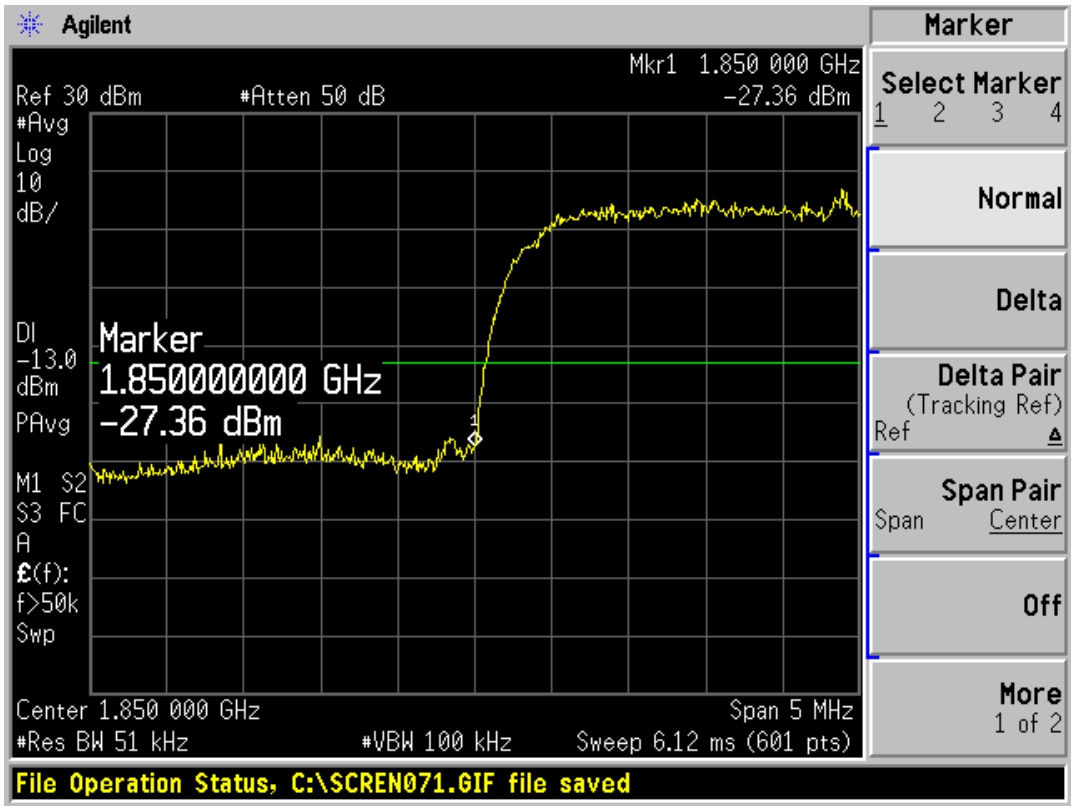


GSM 1900 EGPRS 512 Channel

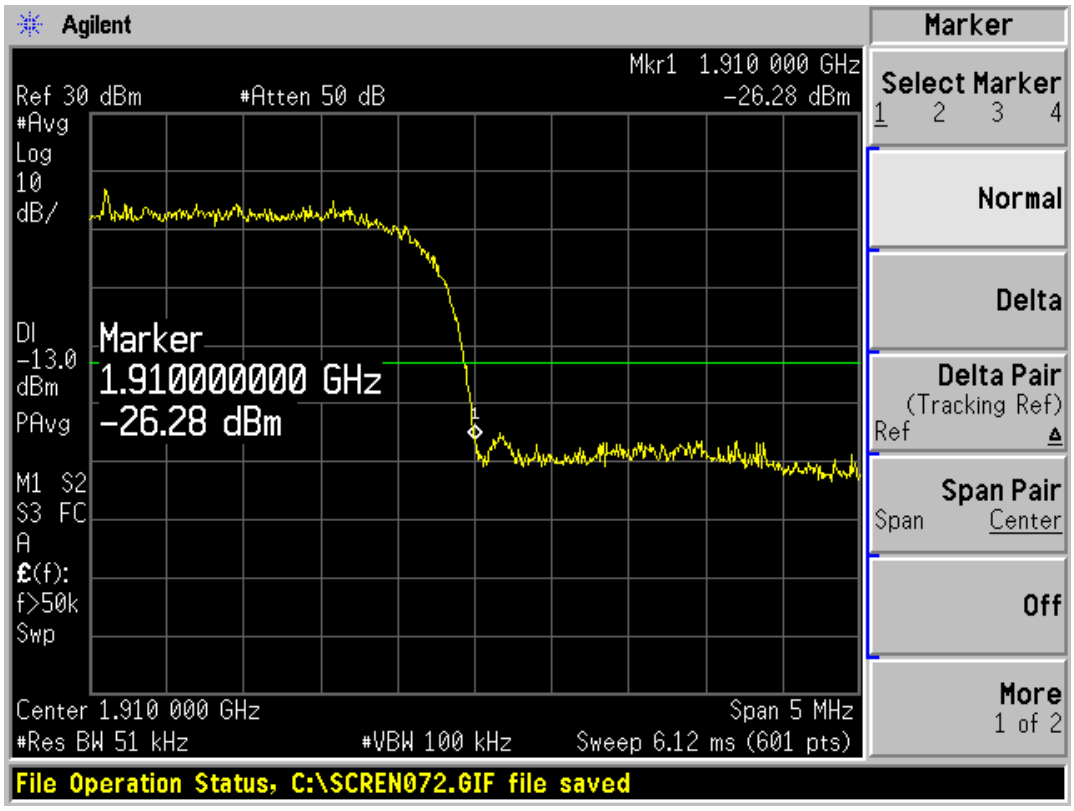


GSM1900 EGPRS 810 Channel

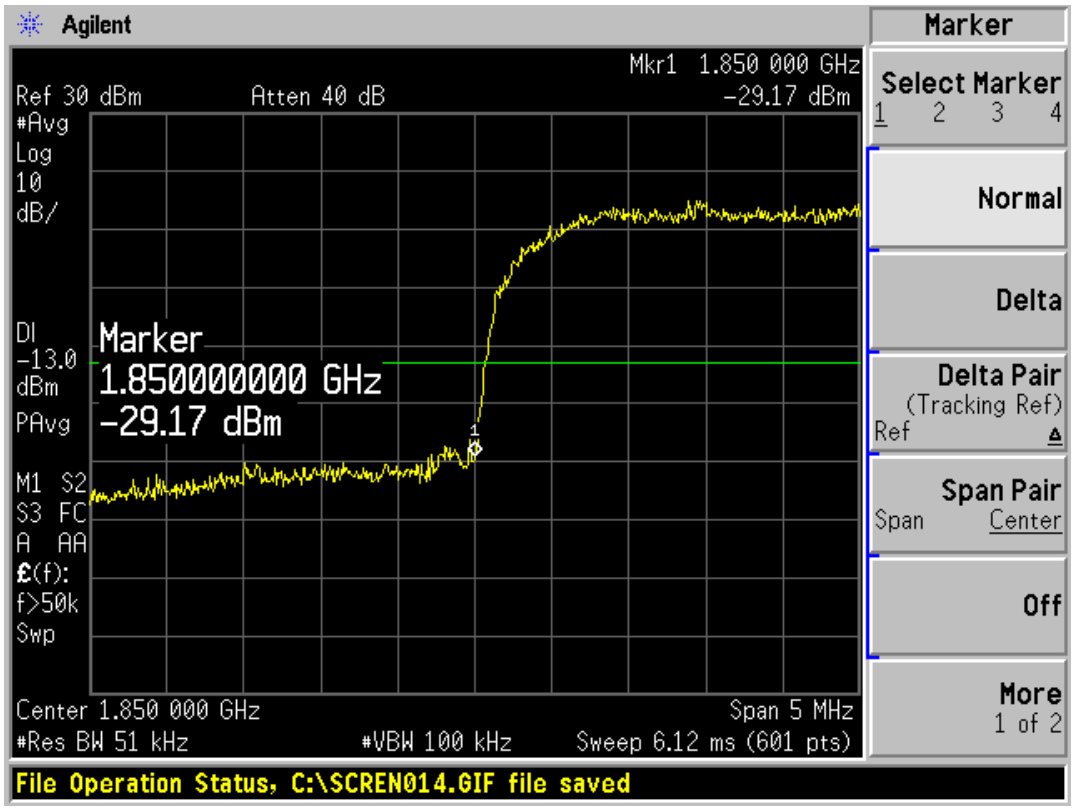
WCDMA Band II	Carrier frequency (MHz)	Reference value (dBm)	Limit (dBm)	Conclusion
RMC	1850	-27.36	-13	PASS
	1910	-26.28	-13	PASS
HSDPA	1850	-29.17	-13	PASS
	1910	-27.20	-13	PASS
HSUPA	1850	-29.15	-13	PASS
	1910	-21.84	-13	PASS



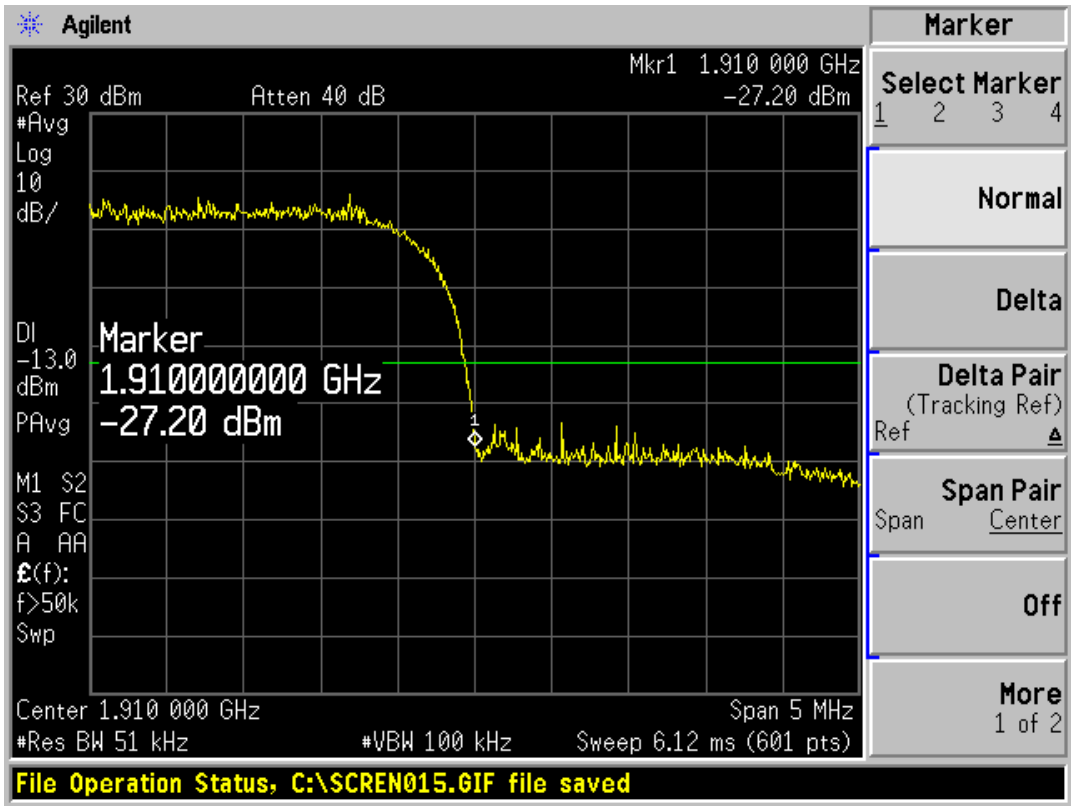
WCDMA Band II 9262 Channel



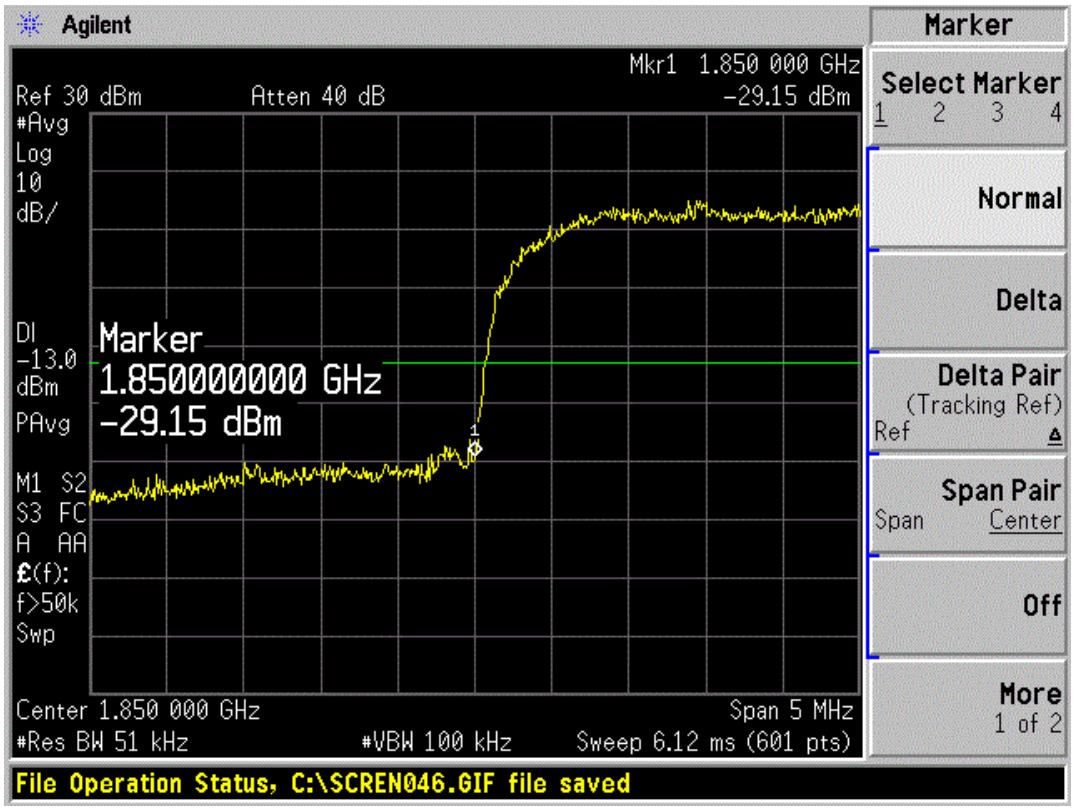
WCDMA Band II 9538 Channel



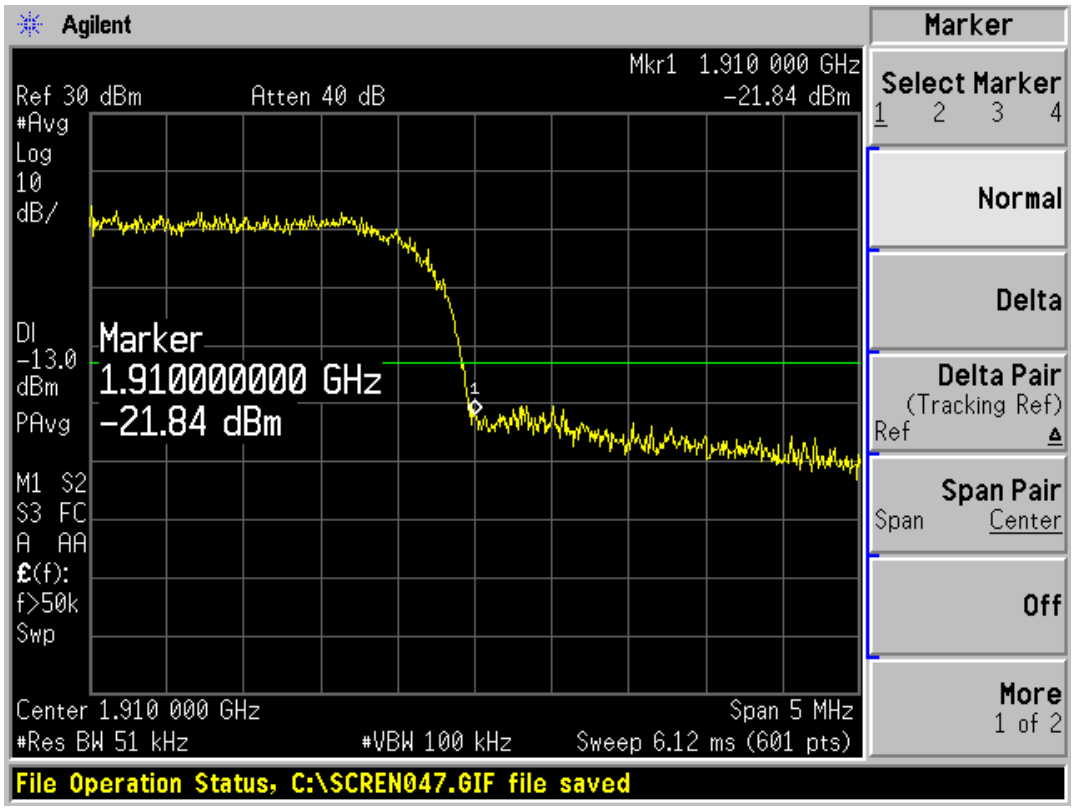
WCDMA Band II HSDPA 9262 Channel



WCDMA Band II HSDPA 9538 Channel



WCDMA Band II HSUPA 9262 Channel



WCDMA Band II HSUPA 9538 Channel

2.6. Peak-to-Average Power Ratio (PAPR)

Ambient condition

Temperature	Relative humidity
21°C ~25°C	40%~60%

Methods of Measurement

For WCDMA test, which OBW is more than 1MHz, the measurement procedures in KDB971168 are used.

The inherent randomness of the power peaks in a noise-like signal makes it difficult to quantify the peak power using traditional measurement techniques for determining the peak power of an analog signal. The peak power of a digitally-modulated signal is predictable only on a statistical basis. Thus, for these types of signals, a statistical measurement of the peak power is necessary.

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth.

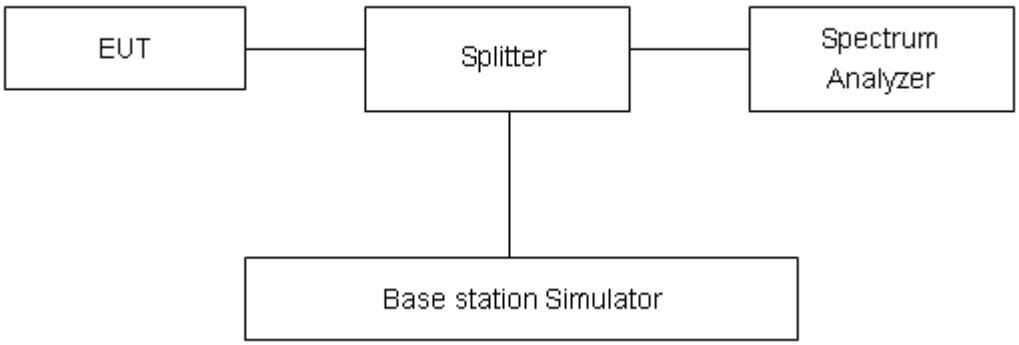
Step 1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.

Step 2. Set the CCDF option in Spectrum analyzer.

Step 3. Record the maximum PAPR level associated with a probability of 0.1%.

For GSM PAPR test, the peak power and the average power were measured separately via the spectrum analyzer.

Test Setup



Limits

No specific Peak-to-Average Ratio requirements in KDB 971168.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.4 dB.

Test Results

GSM 1900	Channel	Frequency (MHz)	Peak(dBm)	Avg(dBm)	PAPR(dB)
GSM	512	1850.2	29.12	28.59	0.53
	661	1880	29.24	28.58	0.66
	810	1909.8	28.99	28.42	0.57
GPRS	512	1850.2	29.05	28.56	0.49
	661	1880	29.06	28.55	0.51
	810	1909.8	29.02	28.48	0.54
EGPRS(8PSK)	512	1850.2	24.26	23.9	0.36
	661	1880	24.46	24.03	0.43
	810	1909.8	24.39	23.92	0.47

WCDMA Band II	Channel	Frequency (MHz)	Peak(dBm)	Avg(dBm)	PAPR(dB)
RMC	9262	1852.4	23	19.84	3.16
	9400	1880	23.31	19.81	3.5
	9538	1907.6	23.01	19.74	3.27
HSDPA	9262	1852.4	23.03	19.85	3.18
	9400	1880	22.99	19.53	3.46
	9538	1907.6	22.77	19.48	3.29
HSUPA	9262	1852.4	23.36	20.19	3.17
	9400	1880	22.3	18.84	3.46
	9538	1907.6	22.35	19.09	3.26

2.7. Frequency Stability

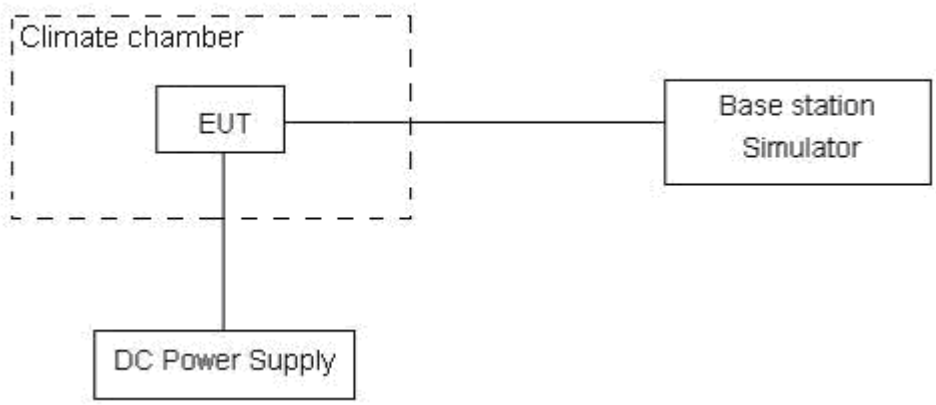
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

1. Frequency Stability (Temperature Variation)
   The temperature inside the climate chamber is varied from -20°C to +50°C in 10°C step size,
   (1) With all power removed, the temperature was decreased to -20°C and permitted to stabilize for three hours.
   (2) Measure the carrier frequency with the test equipment in a “call mode”. These measurements should be made within 1 minute of powering up the mobile station, to prevent significant self warming.
   (3) Repeat the above measurements at 10°C increments from -20°C to +50°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements.
2. Frequency Stability (Voltage Variation)
   The frequency stability shall be measured with variation of primary supply voltage as follows:
   (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
   (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery-operating end point which shall be specified by the manufacturer.
   This transceiver is specified to operate with an input voltage of between 3.5 V and 4.2 V, with a nominal voltage of 3.8V.

Test setup



Limits

No specific frequency stability requirements in part 24.235

Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75％ confidence level for the normal distribution is with the coverage factor *k* = 3, U= 0.01ppm.

Test Result

GSM1900

Temperature (° C)	Test Results (ppm) / 3.8 V Power supply	
	Channel 661	
	GSM(GMSK)	EGPRS(8PSK)
-20	-0.0212	-0.031
-10	-0.0226	-0.031
0	-0.0272	-0.034
10	-0.0292	-0.031
20	-0.0210	-0.035
30	-0.0213	-0.031
40	-0.0228	-0.039
50	-0.0233	-0.021
60	-0.0150	-0.028

Voltage (V)	Test Results(ppm) / 20°C	
	Channel 661	
	GSM(GMSK)	EGPRS(8PSK)
3.5	-0.0183	-0.031
3.8	-0.0210	-0.032
4.2	-0.0172	-0.033

WCDMA Band II

Temperature (°C)	Test Results (ppm) / 3.8 V Power supply
	Channel 9400
-20	-0.0007
-10	0.0008
0	0.0001
10	-0.0001
20	-0.0015
30	0.0008
40	0.0021
50	0.0037
60	0.0017

Voltage (V)	Test Results(ppm) / 20°C
	Channel 9400
3.5	0.0012
3.8	-0.0015
4.2	0.0020

2.8. Spurious Emissions at Antenna Terminals

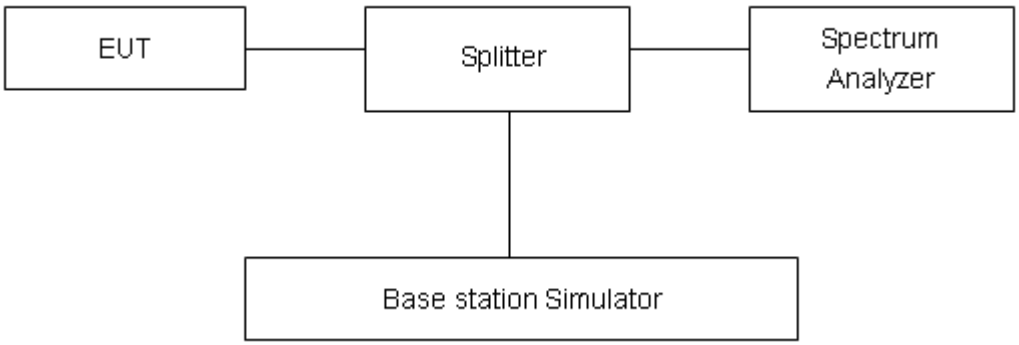
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The measurement is carried out using a spectrum analyzer. The spectrum analyzer scans from 30MHz to the 10th harmonic of the carrier. For GSM 1900,RBW and VBW are set to 100 kHz, Sweep is set to ATUO.For WCDMA Band II, RBW and VBW are set to 100 kHz for the carrier frequency, or RBW and VBW are set to 1MHz(other frequency), Sweep is set to ATUO.

Test setup



Limits

Rule Part 24.238(a) specifies that “on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log10 (P) dB.”

Limit	-13 dBm

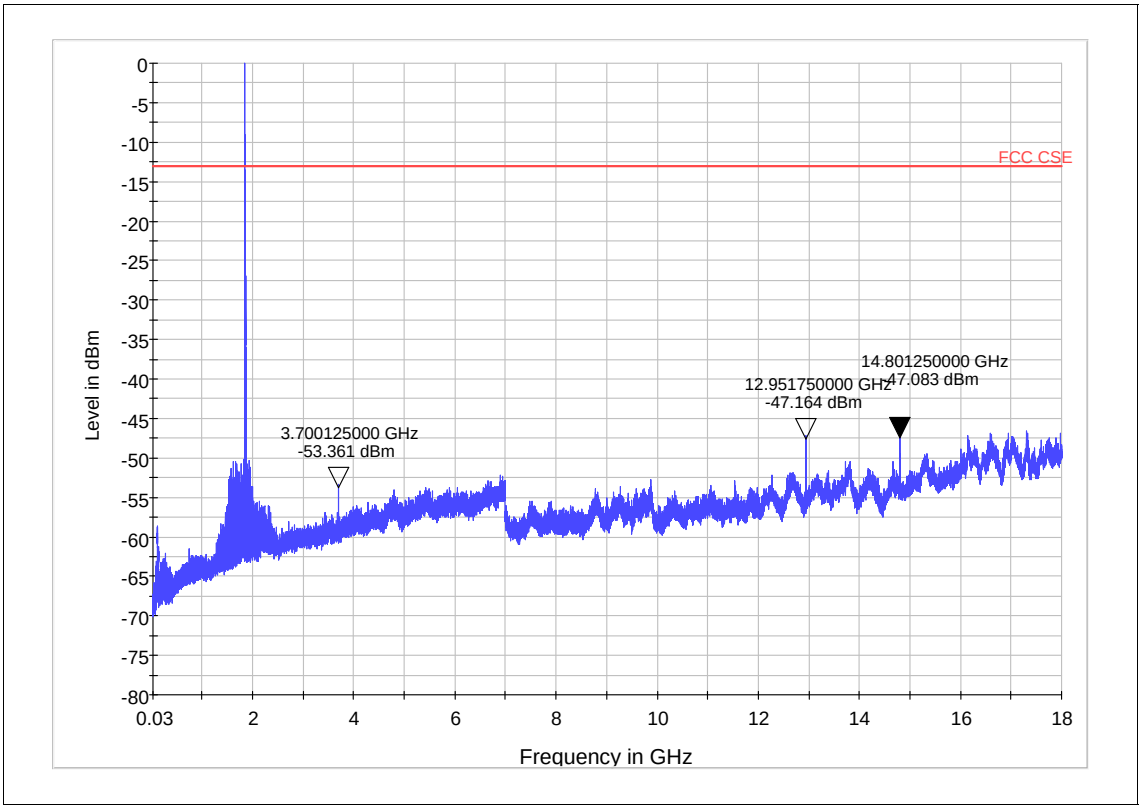
Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75％ confidence level for the normal distribution is with the coverage factor *k* = 1.96.

Frequency	Uncertainty
100kHz-2GHz	0.684 dB
2GHz-12.75GHz	1.407 dB

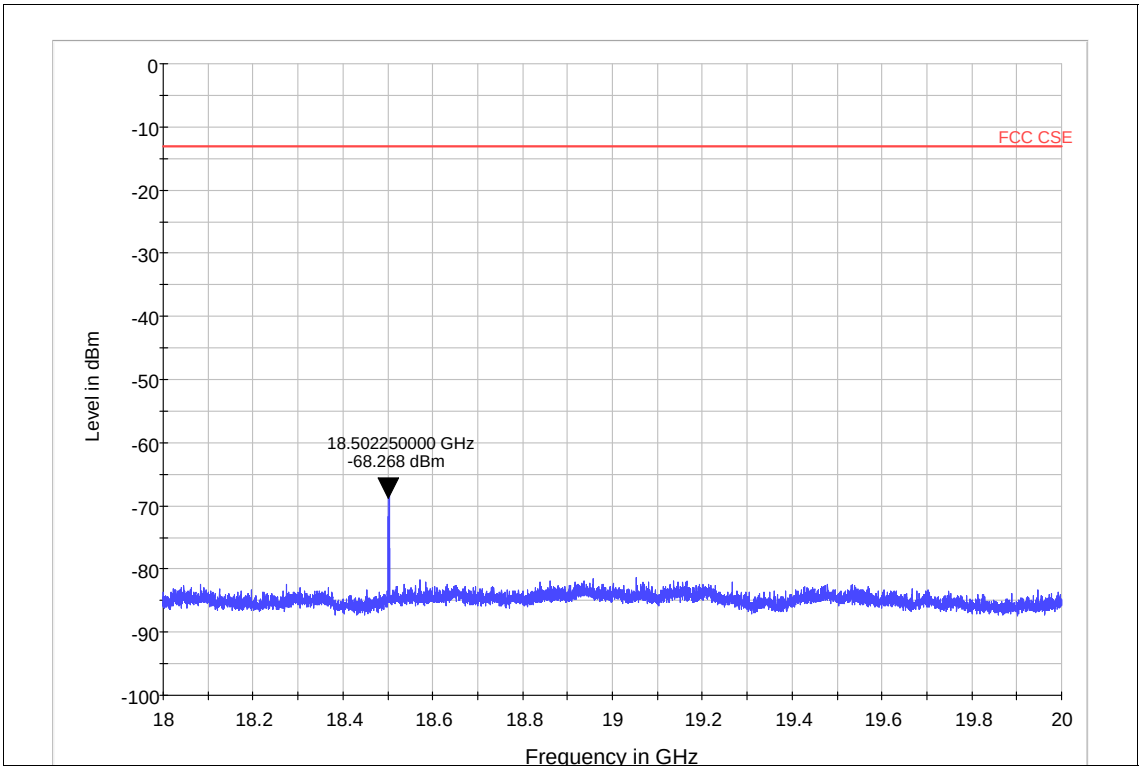
Test Result

GSM 1900 CH 512



Note: The signal beyond the limit is carrier.

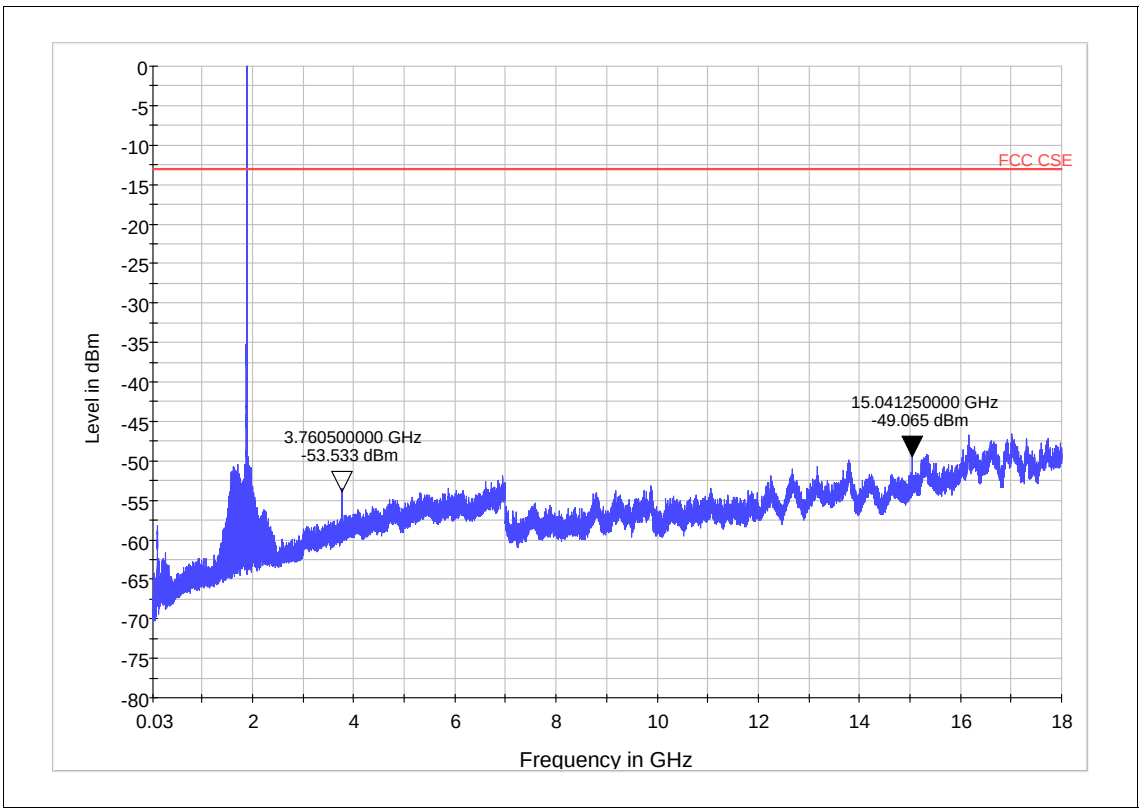
GSM 1900 512 Channel 30MHz~18GHz



GSM 1900 512 Channel 18GHz ~20GHz

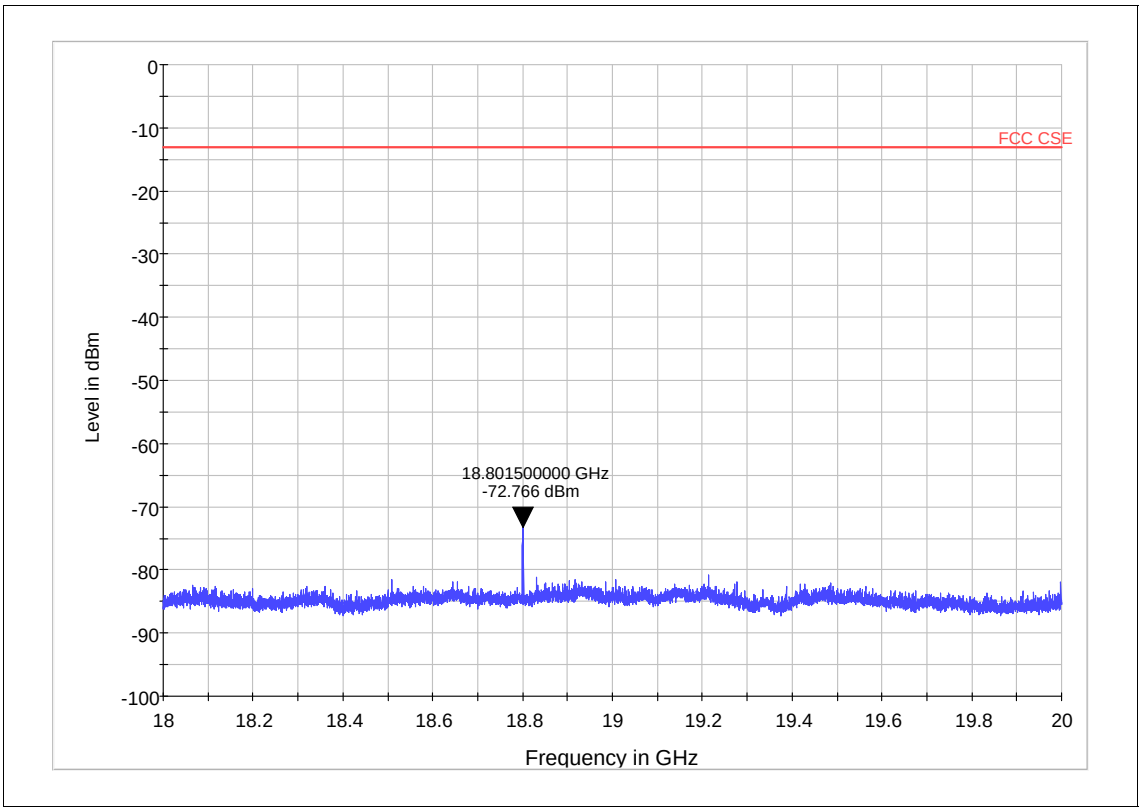
Harmonic	TX ch.512 Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
2	3700.1	-53.36	-13	40.36
7	12951.8	-47.16	-13	34.16
8	14801.3	-47.08	-13	34.08
10	18502.3	-68.27	-13	55.27

GSM 1900 CH 661



Note: The signal beyond the limit is carrier.

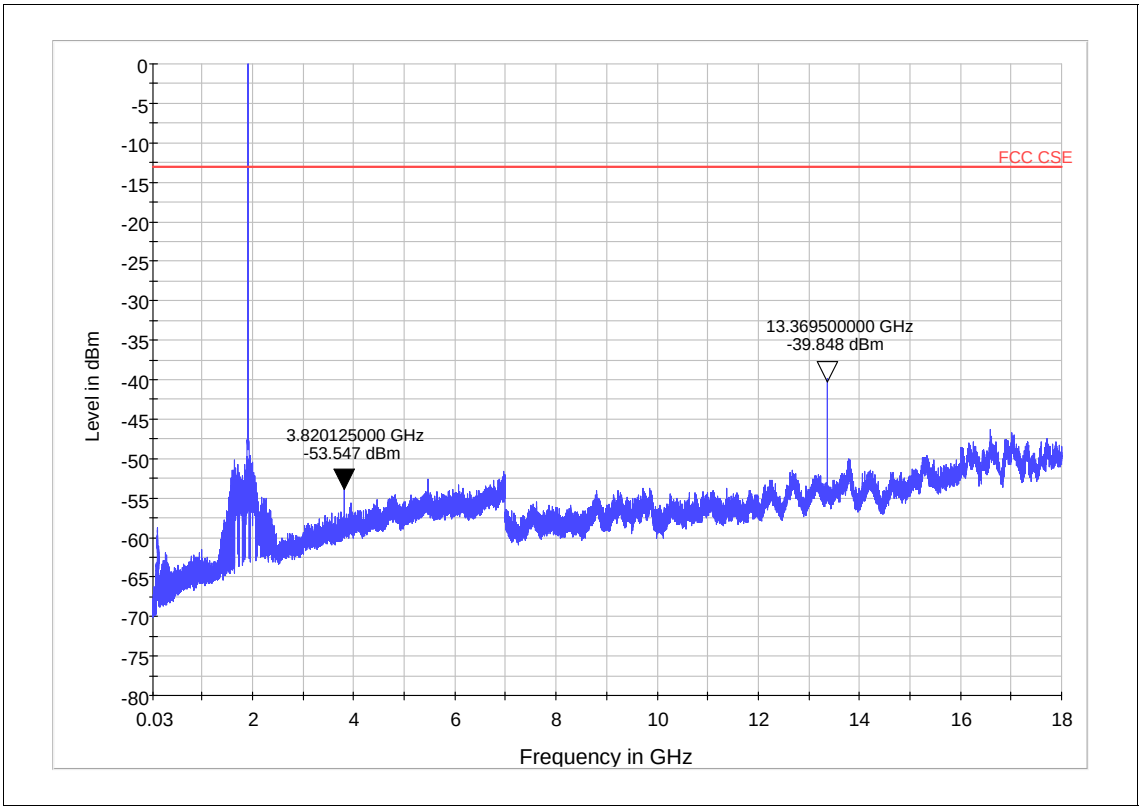
GSM 1900 661 Channel 30MHz~18GHz



GSM 1900 661 Channel 18GHz ~20GHz

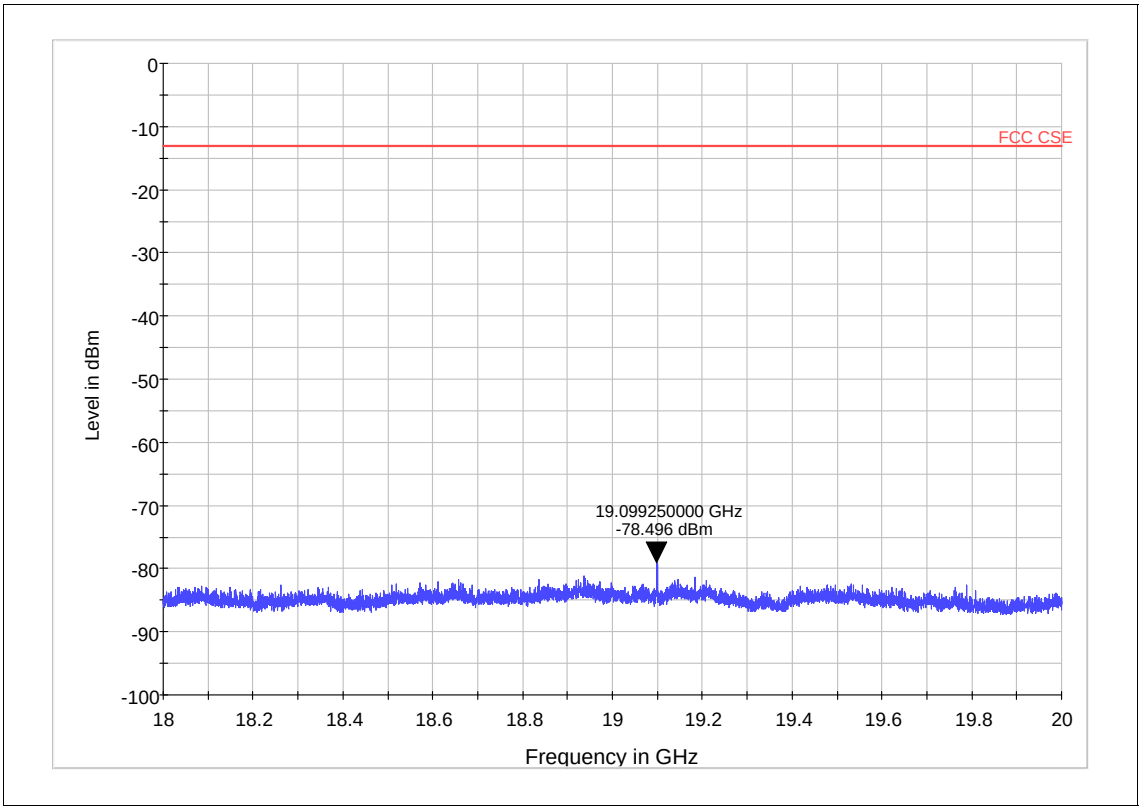
Harmonic	TX ch.661 Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
2	3760.5	-53.53	-13	40.53
8	15041.3	-49.07	-13	36.07
10	18801.5	-72.77	-13	59.77

GSM 1900 CH 810



Note: The signal beyond the limit is carrier.

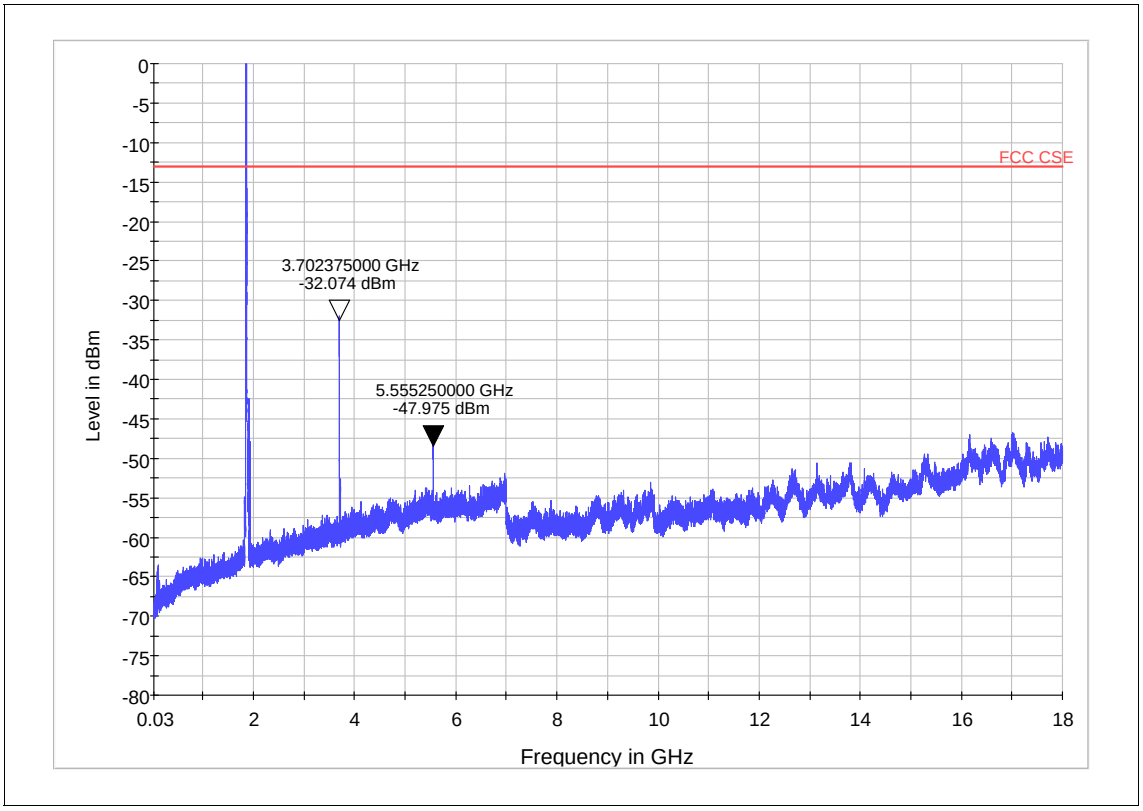
GSM 1900 810 Channel 30MHz~18GHz



GSM 1900 810 Channel 18GHz ~20GHz

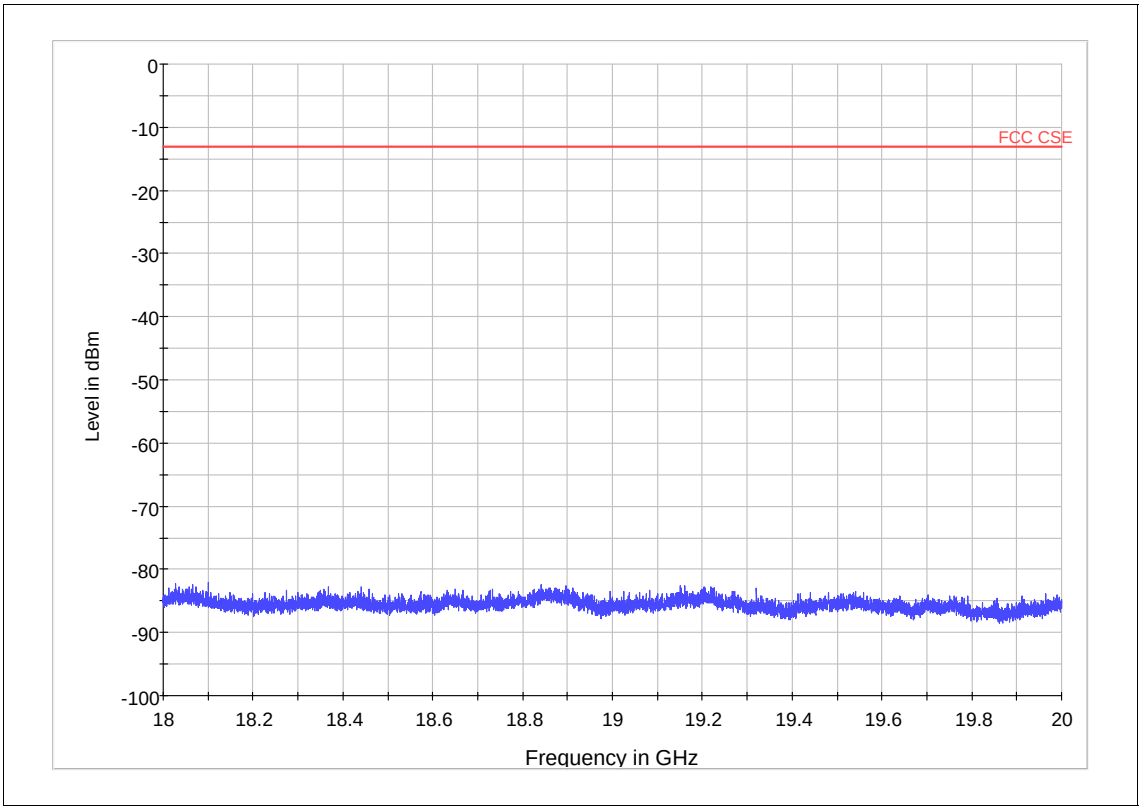
Harmonic	TX ch.810 Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
2	3820.1	-53.55	-13	40.55
7	13369.5	-39.85	-13	26.85
10	19099.3	-78.50	-13	65.50

WCDMA Band II CH9262



Note: The signal beyond the limit is carrier.

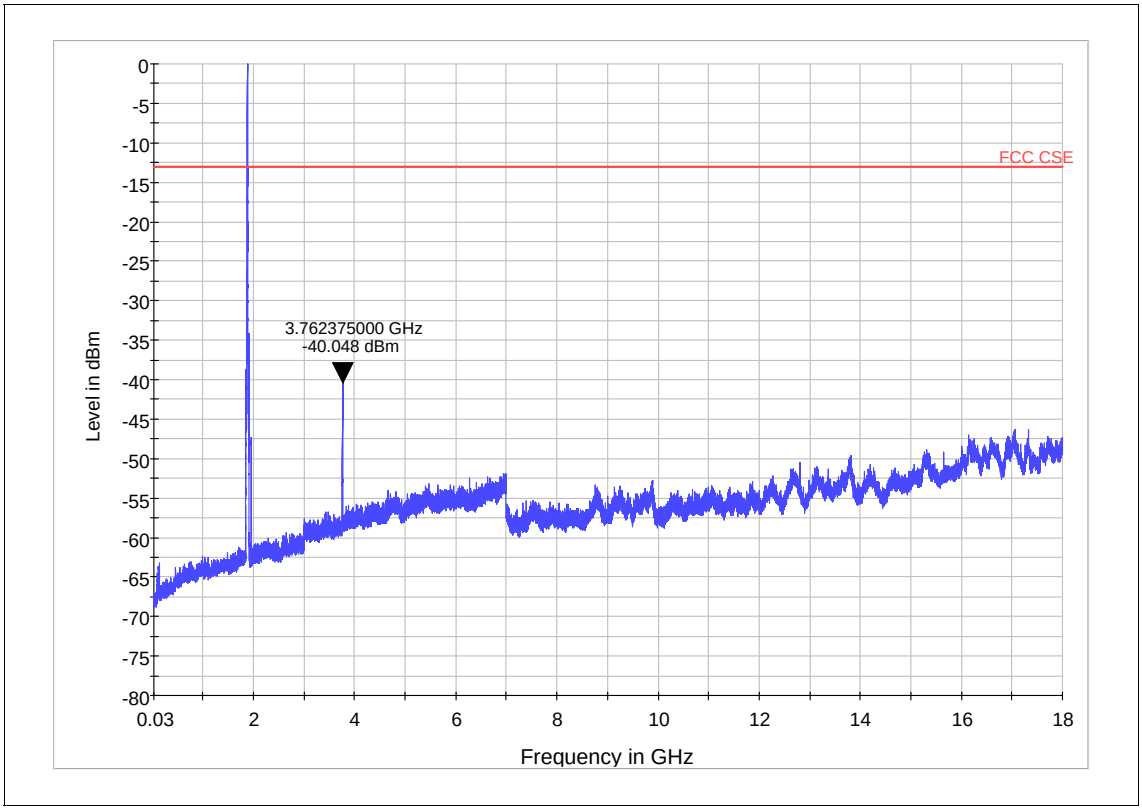
WCDMA Band II 9262 Channel 30MHz~18GHz



WCDMA Band II 9262 Channel 18GHz ~20GHz

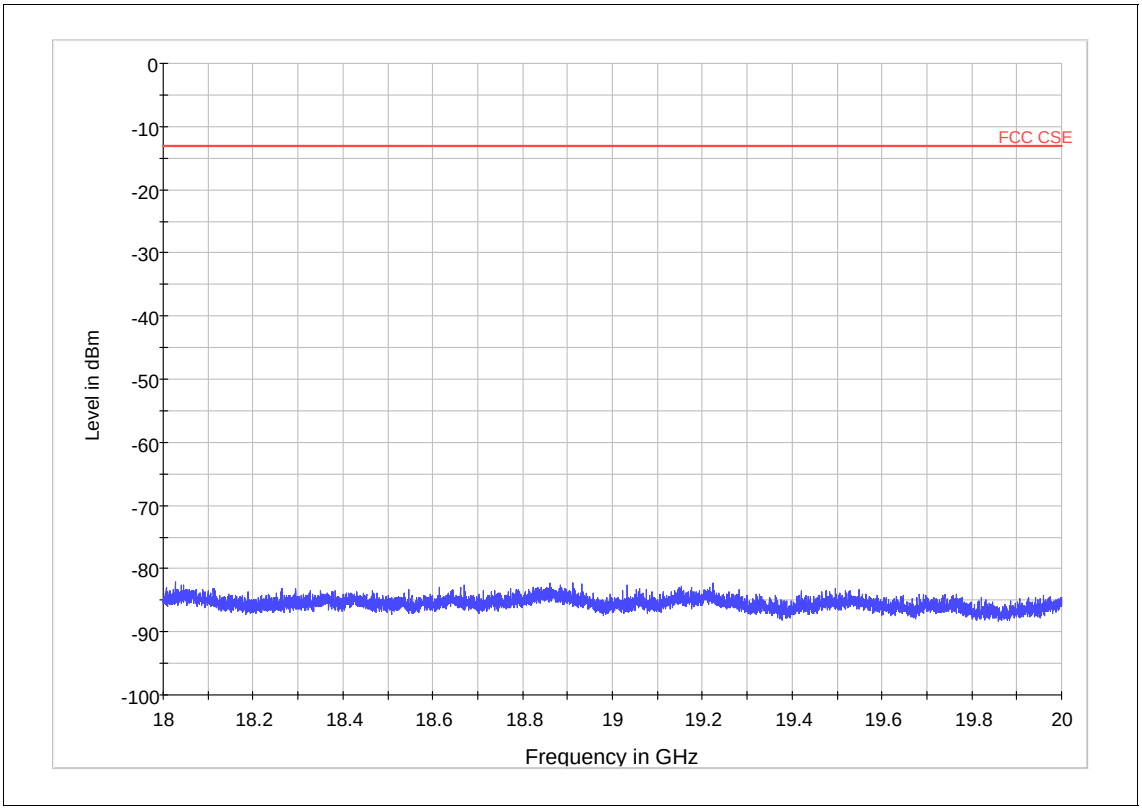
Harmonic	TX ch.9262 Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
2	3702.4	-32.07	-13	19.07
3	5555.0	-47.98	-13	34.98

WCDMA Band II CH9400



Note: The signal beyond the limit is carrier.

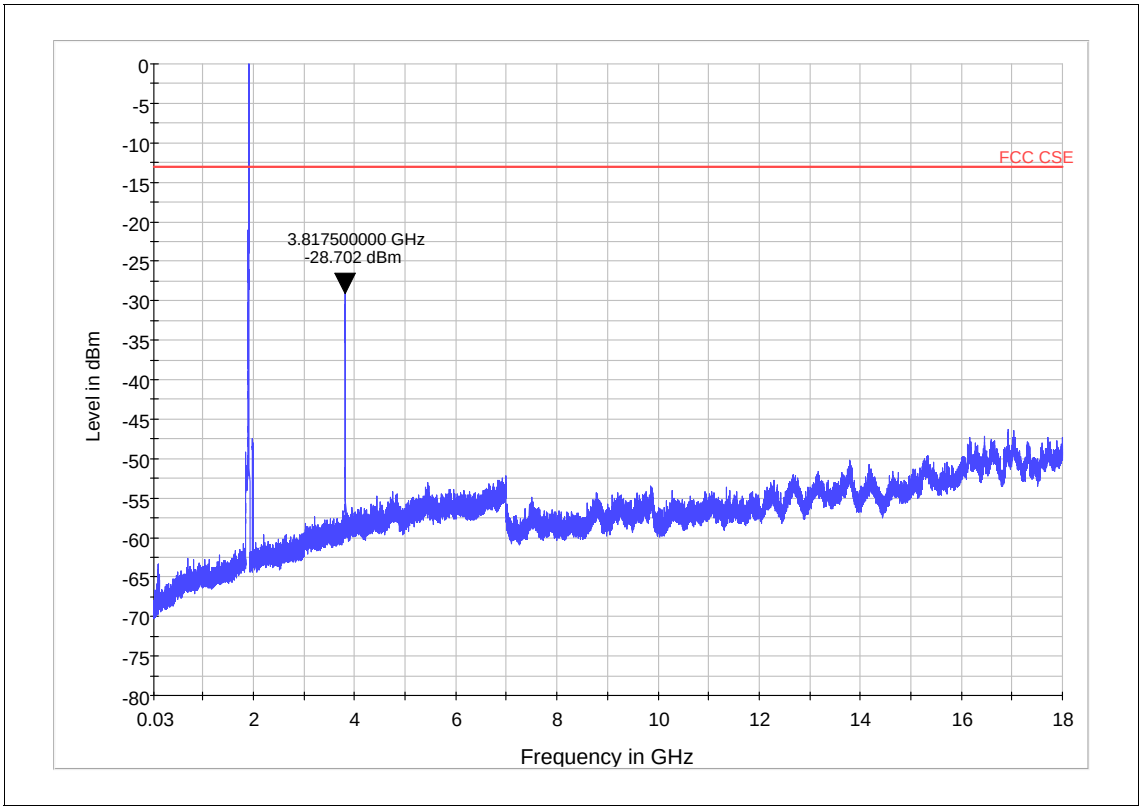
WCDMA Band II 9400 Channel 30MHz~18GHz



WCDMA Band II 9400 Channel 18GHz ~20GHz

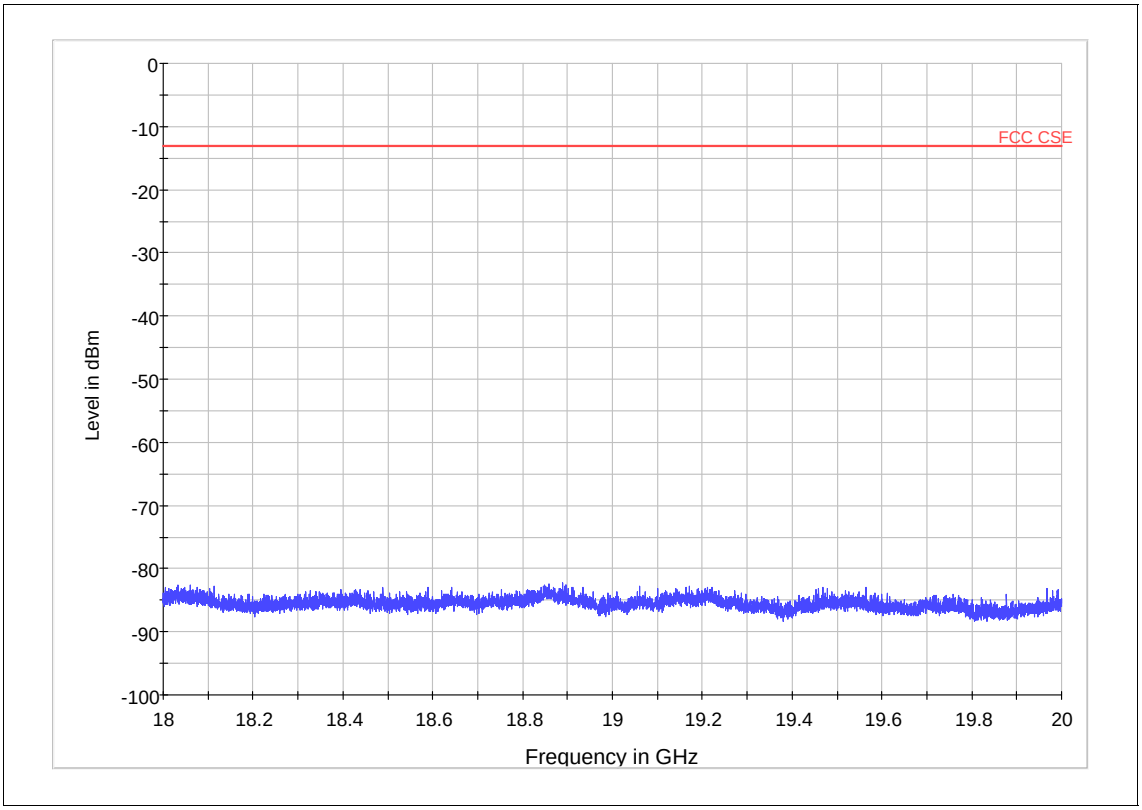
Harmonic	TX ch.9400 Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
2	3762.4	-40.05	-13	27.05

WCDMA Band II CH9538



Note: The signal beyond the limit is carrier.

WCDMA Band II 9538 Channel 30MHz~18GHz



WCDMA Band II 9538 Channel 18GHz ~20GHz

Harmonic	TX ch.9538 Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
2	3817.5	-28.70	-13	15.70

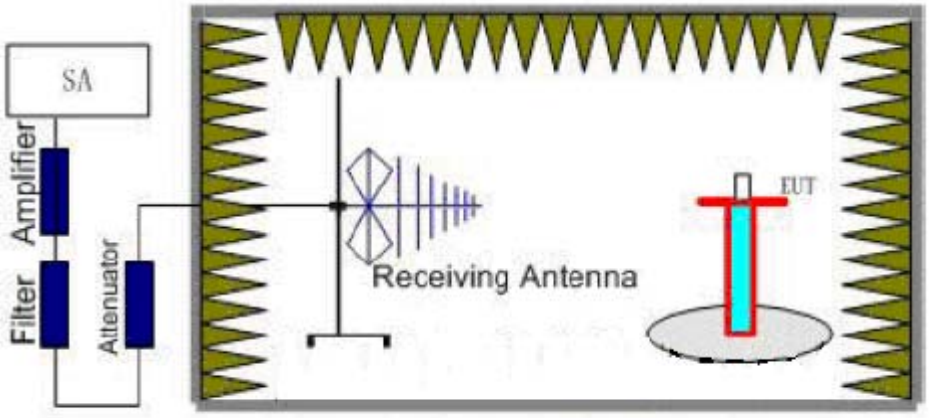
2.9. Radiates Spurious Emission

Ambient condition

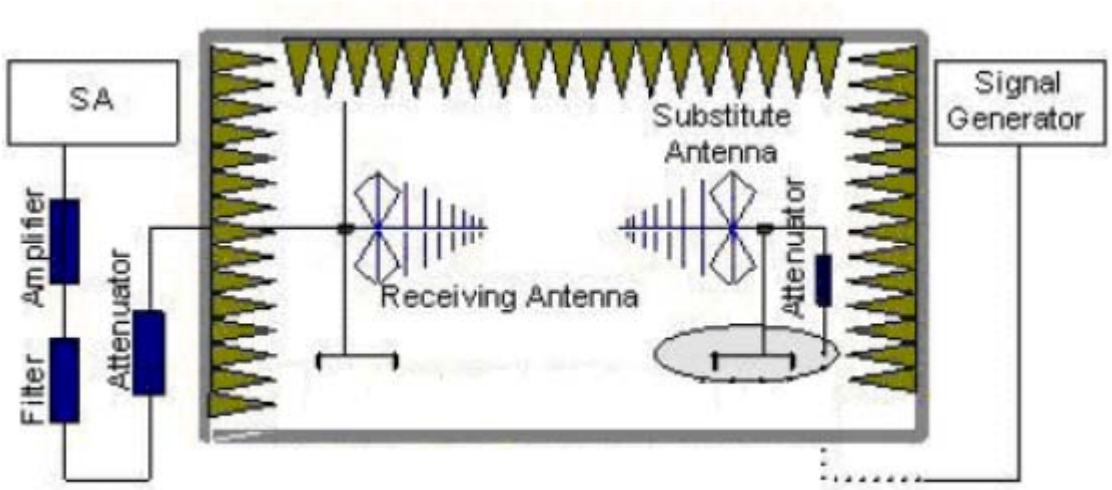
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The measurements procedures in TIA -603C are used.
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment.
The procedure of Radiates Spurious Emission is as follows:
Step 1:
The measurement is carried out in the semi-anechoic chamber. EUT was placed on a 1.5 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. 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 while RBW and VBW are both set to 3MHz. During the measurement, the highest emission was recorded from analyzer power level (LVL) from the 360 degrees rotation of the turntable and the test antenna moved up and down over a range from 1 to 4 meters in both horizontally and vertically polarized orientations. The test setup refers to figure below.



Step 2:
A dipole antenna shall be substituted in place of the EUT. The antenna will be driven by a signal generator with a adjustable S.G. applied through a Tx cable. Adjust the level of the signal generator output until the value of the receiver reach the previously recorded analyzer power level (LVL).Then The E.R.P. /E.I.R.P. of the EUT can be calculated through the level of the signal generator, Tx cable loss and the gain of the substitution antenna. The test setup refers to figure below.



E.R.P（peak power）=S.G. - Tx Cable loss + Substitution antenna gain – 2.15.
EIRP= E.R.P+2.15

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the antenna is vertical.

Of those disturbances below (limit – 20 dB), the mark is not required for the EUT.

Limits

Rule Part 24.238(a) specifies that “on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log10 (P) dB.”

Limit	-13 dBm

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95％ confidence level for the normal distribution is with the coverage factor k = 1.96, U= 3.55 dB.

Test Result

GSM 1900 CH 512

Harmonic	TX ch.512 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3700.5	-56.42	2	10.15	Vertical	-50.42	-13	37.42	45
3	5550.8	-58.63	2.51	11.35	Vertical	-51.94	-13	38.94	225
4	7400.8	-60.30	4.2	10.85	Vertical	-55.80	-13	42.80	90
5	9251	-58.25	5.2	11.35	Vertical	-54.25	-13	41.25	180
6	11101.2	-58.00	5.5	11.95	Vertical	-53.70	-13	40.70	270
7	12952.5	-46.45	5.7	13.55	Vertical	-40.75	-13	27.75	315
8	14802.0	-43.02	6.3	13.75	Vertical	-37.72	-13	24.72	270
9	16651.8	-45.72	6.8	13.85	Vertical	-40.82	-13	27.82	90
10	18502	-43.34	6.9	14.25	Vertical	-38.14	-13	25.14	0

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2.The worst emission was found in the antenna is vertical position.

GSM 1900 CH 661

Harmonic	TX ch.661 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3760.1	-56.84	2	10.75	Vertical	-50.24	-13	37.24	45
3	5640.4	-58.95	2.51	11.05	Vertical	-52.56	-13	39.56	225
4	7520	-58.56	4.2	11.15	Vertical	-53.76	-13	40.76	180
5	9400	-60.62	5.2	11.15	Vertical	-56.82	-13	43.82	270
6	11280	-58.89	5.5	11.95	Vertical	-54.59	-13	41.59	0
7	13160.6	-42.87	5.7	13.55	Vertical	-37.17	-13	24.17	180
8	15040.9	-46.62	6.3	13.75	Vertical	-41.32	-13	28.32	135
9	16920	-44.48	6.8	13.85	Vertical	-39.58	-13	26.58	0
10	18800	-42.30	6.9	14.25	Vertical	-37.10	-13	24.10	270

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2.The worst emission was found in the antenna is vertical position.

GSM 1900 CH 810

Harmonic	TX ch.810 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3819.8	-56.35	2	10.15	Vertical	-50.35	-13	37.35	45
3	5729.4	-55.95	2.51	11.05	Vertical	-49.56	-13	36.56	270
4	7639.2	-60.22	4.2	11.15	Vertical	-55.42	-13	42.42	0
5	9549	-60.60	5.2	11.15	Vertical	-56.80	-13	43.80	180
6	11458.8	-59.97	5.5	11.95	Vertical	-55.67	-13	42.67	90
7	133698.8	-50.33	5.7	13.55	Vertical	-44.63	-13	31.63	135
8	15278.4	-52.24	6.3	13.75	Vertical	-46.94	-13	33.94	90
9	17188.2	-47.90	6.8	13.85	Vertical	-43.00	-13	30.00	0
10	19098	-43.22	6.9	14.25	Vertical	-38.02	-13	25.02	0

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is vertical position.

WCDMA Band II CH9262

Harmonic	TX ch.9262 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3706.9	-40.7	2.1	10.15	Vertical	-34.80	-13	21.80	90
3	5553.7	-56.27	2.4	11.35	Vertical	-49.47	-13	36.47	90
4	7409.6	-59.36	4.3	10.85	Vertical	-54.96	-13	41.96	90
5	9263.6	-50.15	5.2	11.35	Vertical	-46.15	-13	33.15	180
6	11114.4	-58.00	5.5	11.95	Vertical	-53.70	-13	40.70	270
7	12966.8	-60.72	5.7	13.55	Vertical	-55.02	-13	42.02	0
8	14819.2	-54.59	6.5	13.75	Vertical	-49.49	-13	36.49	180
9	16671.6	-45.72	6.8	13.85	Vertical	-40.82	-13	27.82	90
10	18524	-43.00	6.9	14.25	Vertical	-37.80	-13	24.80	0

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2.The worst emission was found in the antenna is vertical position.

WCDMA Band II CH9400

Harmonic	TX ch.9400 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3762.0	-47.5	2.1	10.75	Vertical	-41.00	-13	28.00	180
3	5637.4	-52.84	2.4	11.05	Vertical	-46.34	-13	33.34	225
4	7520	-59.96	4.3	11.15	Vertical	-55.26	-13	42.26	180
5	9400	-60.62	5.2	11.15	Vertical	-56.82	-13	43.82	270
6	11280	-58.89	5.5	11.95	Vertical	-54.59	-13	41.59	0
7	13169.6	-49.3	5.7	13.55	Vertical	-43.60	-13	30.60	90
8	15040	-53.04	6.5	13.75	Vertical	-47.94	-13	34.94	90
9	16920	-45.17	6.8	13.85	Vertical	-40.27	-13	27.27	0
10	18800	-41.74	6.9	14.25	Vertical	-36.54	-13	23.54	270

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2.The worst emission was found in the antenna is vertical position.

WCDMA Band II CH9538

Harmonic	TX ch.9538 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3817.9	-38.33	2.1	10.15	Vertical	-32.43	-13	19.43	90
3	5726.6	-54.78	2.4	11.05	Vertical	-48.28	-13	35.28	90
4	7630.4	-59.26	4.3	11.15	Vertical	-54.56	-13	41.56	0
5	9538	-59.76	5.2	11.15	Vertical	-55.96	-13	42.96	180
6	11445.6	-60.57	5.5	11.95	Vertical	-56.27	-13	43.27	90
7	13363.1	-49.18	5.7	13.55	Vertical	-43.48	-13	30.48	180
8	15260.8	-50.99	6.5	13.75	Vertical	-45.89	-13	32.89	90
9	17168.4	-48.89	6.8	13.85	Vertical	-43.99	-13	30.99	0
10	19076	-44.89	6.9	14.25	Vertical	-39.69	-13	26.69	0

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2.The worst emission was found in the antenna is vertical position.

3. Main Test Instruments

No.	Name	Type	Manufacturer	Serial Number	Calibration Date	Valid Period
01	Base Station Simulator	CMU200	R&S	118133	2013-06-29	One year
02	Power Splitter	SHX-GF2-2-13	Hua Xiang	10120101	NA	NA
03	Spectrum Analyzer	E4445A	Agilent	MY46181146	2013-06-29	One year
04	Universal Radio Communication Tester	E5515C	Agilent	MY48367192	2013-06-29	One year
05	Signal Analyzer	FSV30	R&S	100815	2013-06-29	One year
06	Signal generator	SMB 100A	R&S	102594	2013-06-29	One year
07	EMI Test Receiver	ESCI	R&S	100948	2013-06-29	One year
08	Trilog Antenna	VUBL 9163	SCHWARZBECK	9163-201	2013-06-19	Three years
09	Horn Antenna	HF907	R&S	100126	2012-07-01	Three years
10	Climatic Chamber	PT-30B	Re Ce	20101891	2013-09-09	Three years

*******END OF REPORT *******

ANNEX A: EUT Appearance and Test Setup

A.1 EUT Appearance

Picture 1 EUT and Auxiliary

A.2 Test Setup

Picture 2: Radiated Spurious Emissions Test setup