



Part 22

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.

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GENERAL SUMMARY

Reference Standard(s)	FCC CFR47 Part 2 (2012) Frequency Allocations And Radio Treaty Matters; General Rules And Regulations FCC CFR 47 Part 22H (2012) Public Mobile Services(850MHz) 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

Weizhong Yang
Director

Revised by Lingling Kang

Lingling Kang
RF Manager

Performed by Yiqi Chen

Yiqi Chen
RF Engineer

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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.

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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

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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:			
Operating Mode(s):	GSM 850:(tested) WCDMA Band V;(tested)		
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.R.P.	GSM 850: 20.67 dBm WCDMA Band V: 9.90 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)	128 - 190 - 251 (GSM 850) 4132 - 4183 - 4233 (WCDMA Band V)		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	GSM850	824.2 ~ 848.8	869.2 ~ 893.8
	WCDMA Band V	826.4 ~ 846.6	871.4 ~ 891.6

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Auxiliary Equipment Details

AE1: Battery

Model: Mini Phone

Manufacture: Tian Yu Communication Technology (Kun Shan) CO.,Ltd

S/N: /

1.6. Test Date

The test is performed from March 6, 2014 to March 10, 2014.

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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 Radiated Power	22.913(a)(2)	PASS
3	Occupied Bandwidth	2.1049	PASS
4	Band Edge Compliance	22.917	PASS
5	Peak-to-Average Power Ratio	KDB 971168 D01(5.7)	PASS
6	Frequency Stability	2.1055 / 22.355	PASS
7	Spurious Emissions at Antenna Terminals	2.1051 / 22.917(a)	PASS
8	Radiates Spurious Emission	2.1053 / 22.917 (a)	PASS

PASS: The EUT complies with the essential requirements in the standard.

FAIL: The EUT does not comply with the essential requirements in the standard.

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2.2. RF Power Output

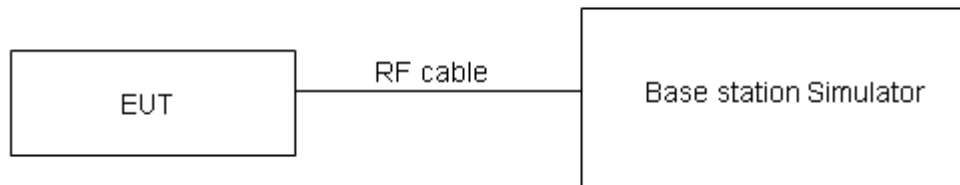
Ambient condition

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

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.

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Test Results

GSM 850		Conducted Power(dBm)		
		Channel 128	Channel 190	Channel 251
		824.2 (MHz)	836.6 (MHz)	848.8 (MHz)
GSM	Results	29.19	29.22	29.04
GPRS (GMSK)	1TXslot	29.17	29.19	29.09
	2TXslots	26.71	26.73	26.6
	3TXslots	24.69	24.71	24.62
	4TXslots	23.16	23.18	23.11
EGPRS (8-PSK)	1TXslot	27.03	27.21	27.06
	2TXslots	24.12	24.12	24.08
	3TXslots	23.05	23.08	23.07
	4TXslots	22.11	22.14	22.07

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 V		Conducted Power(dBm)		
		Channel 4132	Channel 4183	Channel 4233
		826.4(MHz)	836.6(MHz)	846.6(MHz)
RMC		20.20	20.39	20.45
HSDPA	Sub - Test 1	20.00	20.36	20.54
	Sub - Test 2	19.90	20.31	20.50
	Sub - Test 3	19.40	19.83	19.96
	Sub - Test 4	19.47	19.82	19.96
HSUPA	Sub - Test 1	19.19	19.60	19.87
	Sub - Test 2	18.03	18.33	18.50
	Sub - Test 3	18.30	18.69	18.86
	Sub - Test 4	18.05	18.44	18.63
	Sub - Test 5	18.96	19.34	19.52

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 - Test1 based on the maximum RF Output Power.

2.3. Effective 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. $ERP/EIRP = P_s + E_t - E_s + G_s = P_s + R_t - R_s + G_s$

P_s (dBm) : Input power to substitution antenna.

G_s (dBi or dBd) : Substitution antenna Gain.

$E_t = R_t + AF$

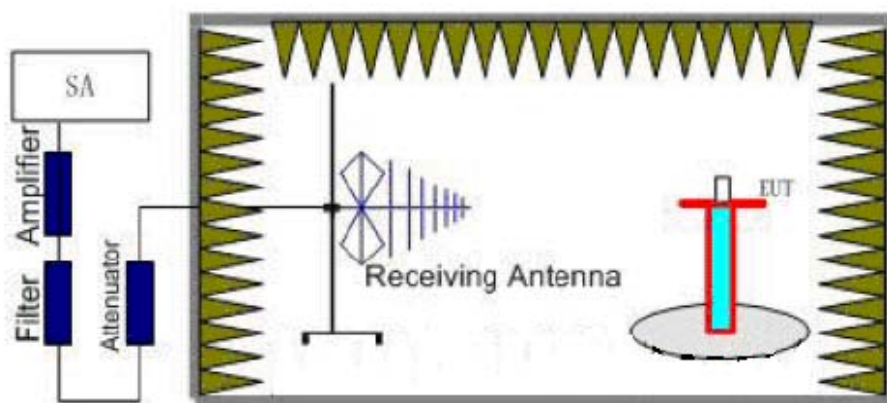
$E_s = R_s + AF$

AF (dB/m) : Receive antenna factor

R_t : The highest received signal in spectrum analyzer for EUT.

R_s : The highest received signal in spectrum analyzer for substitution antenna.

Test Setup



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Limits

Rule Part 22.913(a) specifies that "Mobile/portable stations are limited to 7 watts ERP".

Limit	$\leq 7\text{ W}$ (38.45 dBm)
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Measurement Uncertainty

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

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Test Results: Pass

GSM850					
Horizontal Polarization					
Frequency(MHz)	Rt(dBm)	Rs(dBm)	Ps(dBm)	Gs(dBd)	ERP(dBm)
824.2	-28.80	-45.53	0	-1.09	15.65
836.6	-27.76	-45.38	0	-0.91	16.71
848.8	-27.79	-45.37	0	-0.77	16.82
Vertical Polarization					
Frequency(MHz)	Rt(dBm)	Rs(dBm)	Ps(dBm)	Gs(dBd)	ERP(dBm)
824.2	-25.11	-45.65	0	-1.09	19.44
836.6	-23.96	-45.46	0	-0.91	20.59
848.8	-24.32	-45.49	0	-0.77	20.40
GPRS 850					
Horizontal Polarization					
Frequency(MHz)	Rt(dBm)	Rs(dBm)	Ps(dBm)	Gs(dBd)	ERP(dBm)
824.2	-28.81	-45.53	0	-1.09	15.63
836.6	-28.00	-45.38	0	-0.91	16.47
848.8	-27.64	-45.37	0	-0.77	16.96
Vertical Polarization					
Frequency(MHz)	Rt(dBm)	Rs(dBm)	Ps(dBm)	Gs(dBd)	ERP(dBm)
824.2	-24.99	-45.65	0	-1.09	19.57
836.6	-23.88	-45.46	0	-0.91	20.67
848.8	-24.18	-45.49	0	-0.77	20.54
EGPRS 850					
Horizontal Polarization					
Frequency(MHz)	Rt(dBm)	Rs(dBm)	Ps(dBm)	Gs(dBd)	ERP(dBm)
824.2	-30.49	-45.53	0	-1.09	13.95
836.6	-29.69	-45.38	0	-0.91	14.78
848.8	-29.54	-45.37	0	-0.77	15.06
Vertical Polarization					
Frequency(MHz)	Rt(dBm)	Rs(dBm)	Ps(dBm)	Gs(dBd)	ERP(dBm)
824.2	-26.60	-45.65	0	-1.09	17.96
836.6	-26.05	-45.46	0	-0.91	18.50
848.8	-26.10	-45.49	0	-0.77	18.62

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WCDMA Band V					
Horizontal Polarization					
Frequency(MHz)	Rt(dBm)	Rs(dBm)	Ps(dBm)	Gs(dBd)	ERP(dBm)
826.4	-38.75	-45.44	0	-1.09	5.67
836.6	-39.69	-45.38	0	-0.91	4.78
846.6	-39.66	-45.38	0	-0.77	4.92
Vertical Polarization					
Frequency(MHz)	Rt(dBm)	Rs(dBm)	Ps(dBm)	Gs(dBd)	ERP(dBm)
826.4	-34.62	-45.54	0	-1.09	9.90
836.6	-35.72	-45.46	0	-0.91	8.83
846.6	-35.65	-45.49	0	-0.77	9.04

Note: ERP = EIRP - 2.15

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2.4. Occupied Bandwidth

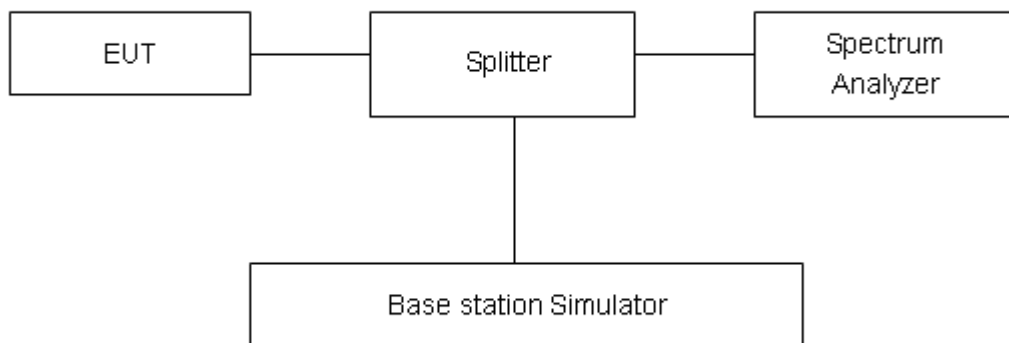
Ambient condition

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

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 850 and RBW is set to 51kHz,VBW is set to 100kHz for WCDMA Band V. 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 $k = 2$, $U = 624\text{Hz}$.

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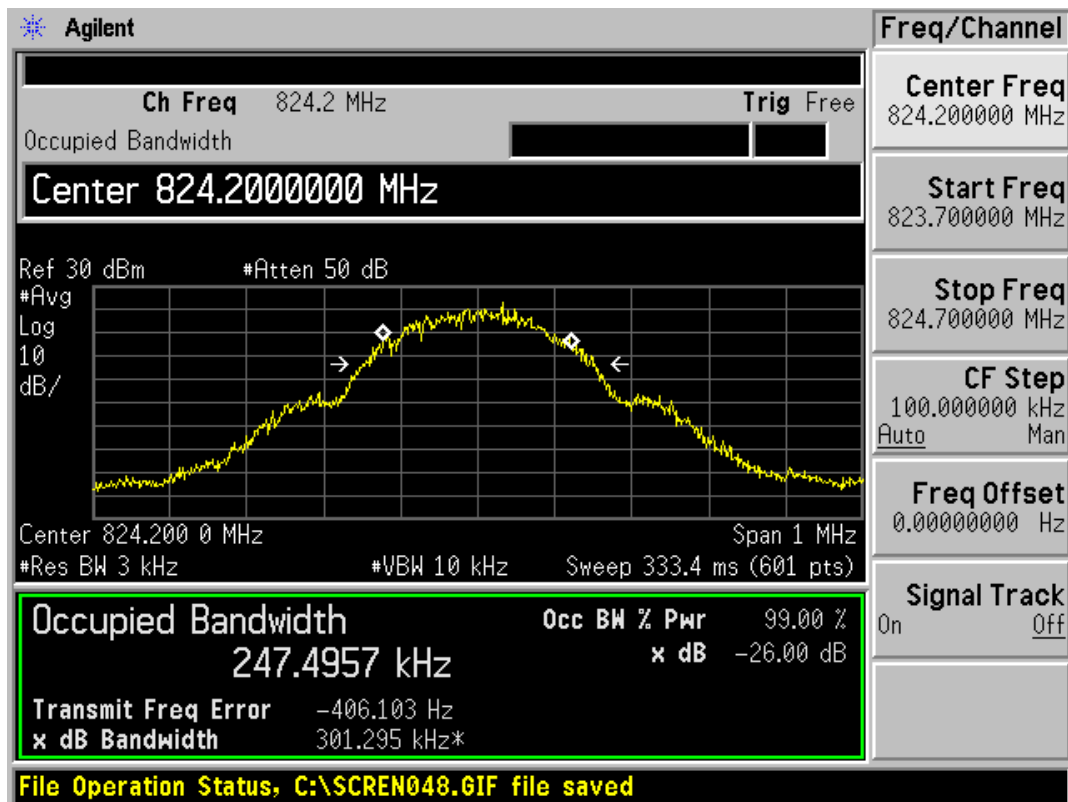
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Test Result

GSM 850	Channel	Frequency (MHz)	99% Power Bandwidth (kHz)	-26dBc Bandwidth(kHz)
GSM	128	824.2	247.4957	301.295
	190	836.6	248.7849	304.595
	251	848.8	246.1890	312.503
GPRS (GMSK)	128	824.2	243.9748	318.687
	190	836.6	246.1776	313.107
	251	848.8	245.8903	311.558
EGPRS (8-PSK)	128	824.2	241.7510	307.230
	190	836.6	241.1495	305.040
	251	848.8	242.6392	293.457

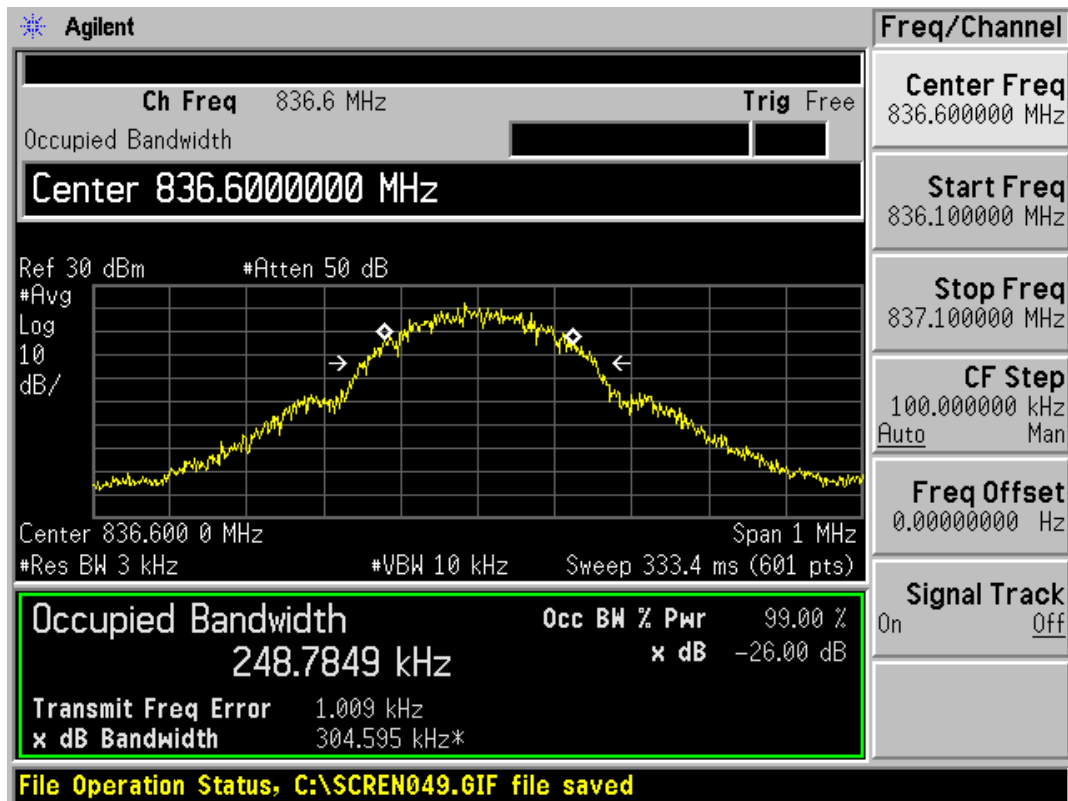


GSM 850 CH128 Occupied Bandwidth

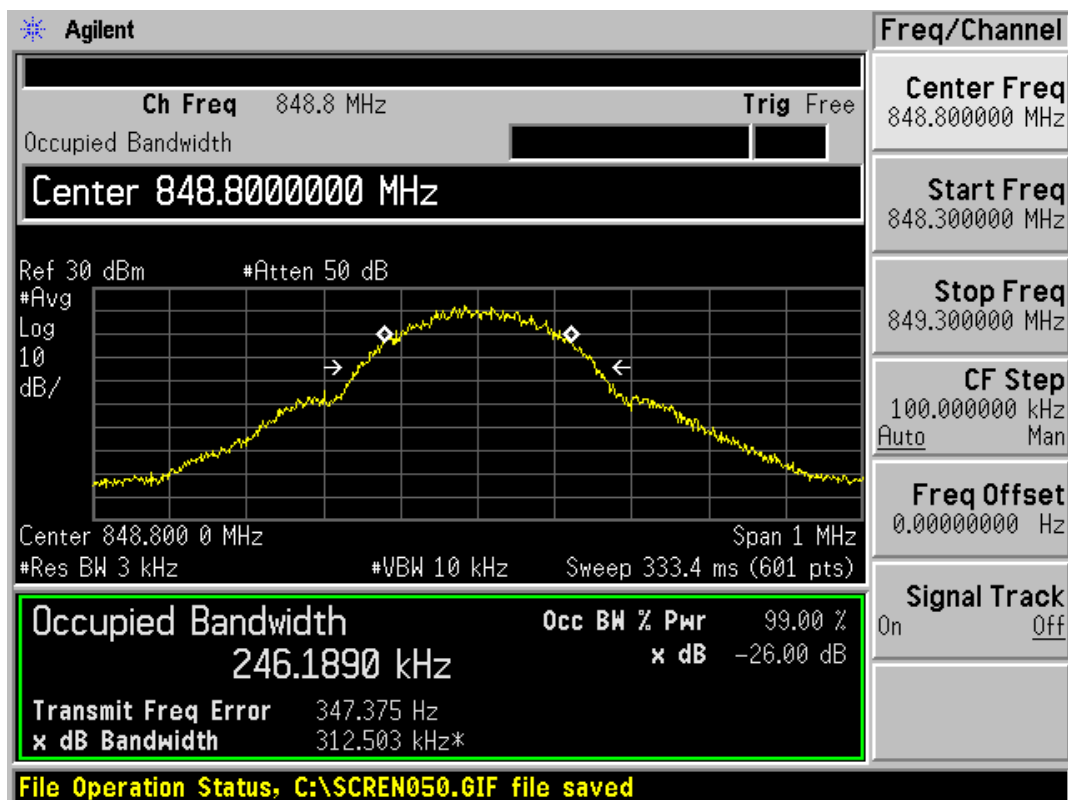
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GSM 850 CH190 Occupied Bandwidth

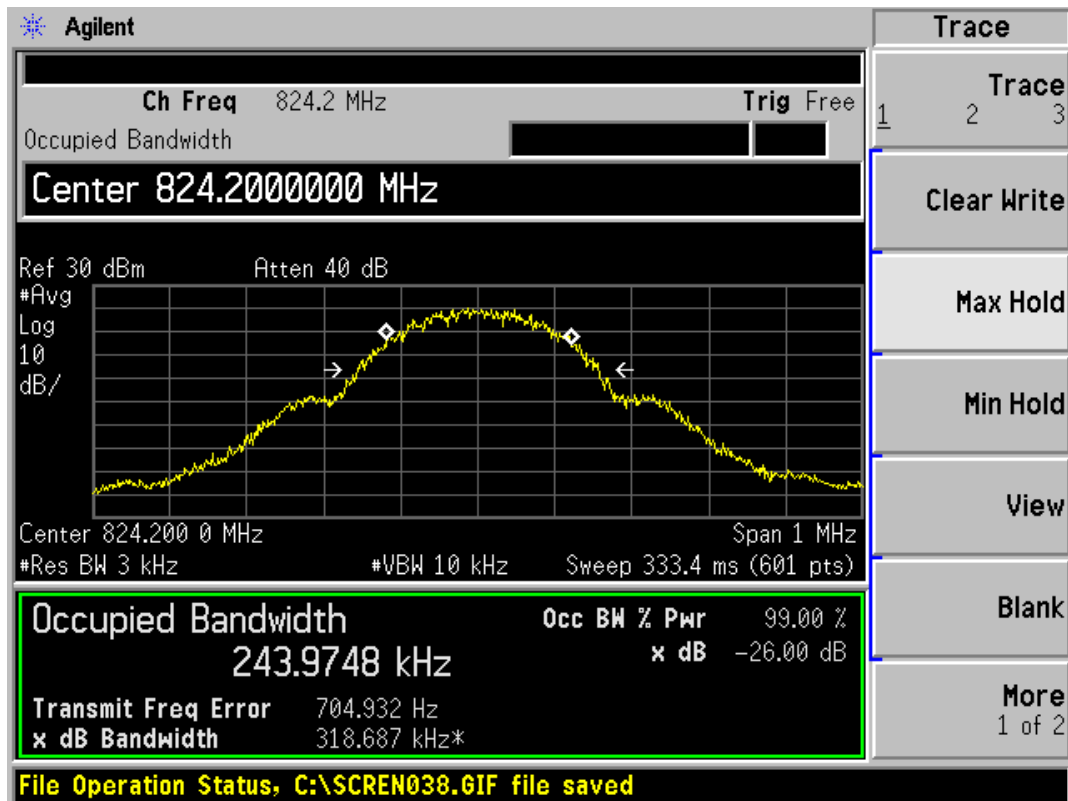


GSM 850 CH251 Occupied Bandwidth

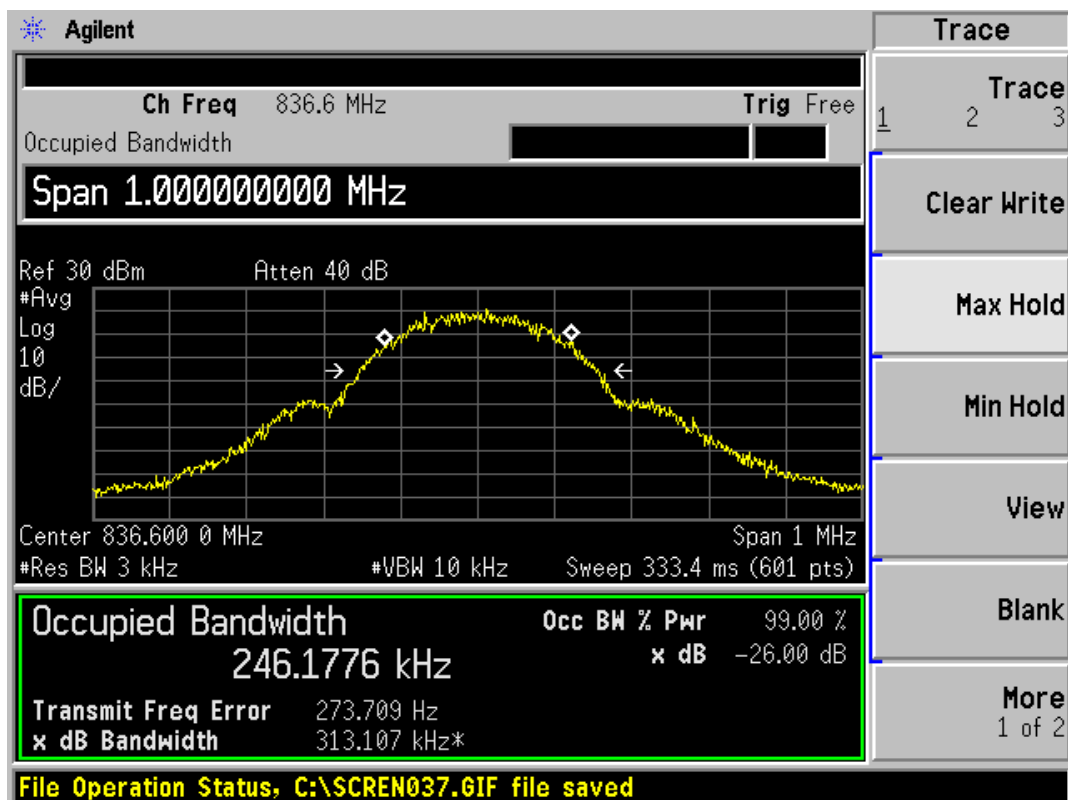
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GSM 850 GPRS CH128 Occupied Bandwidth

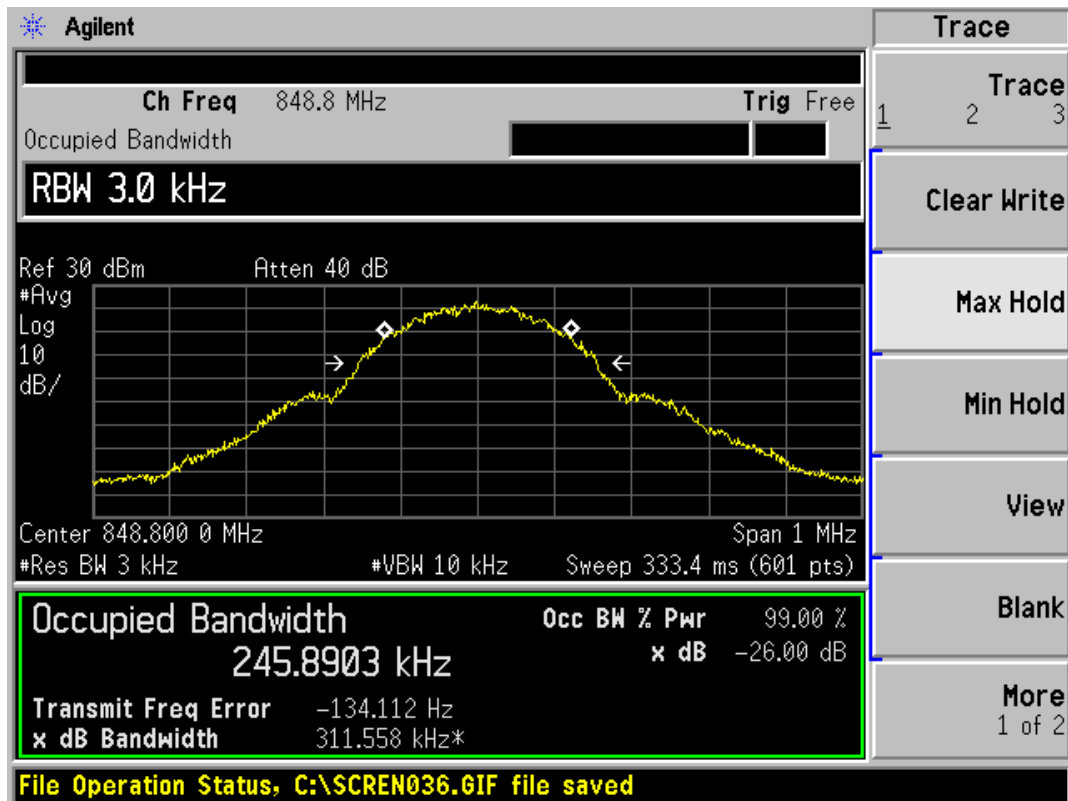


GSM 850 GPRS CH190 Occupied Bandwidth

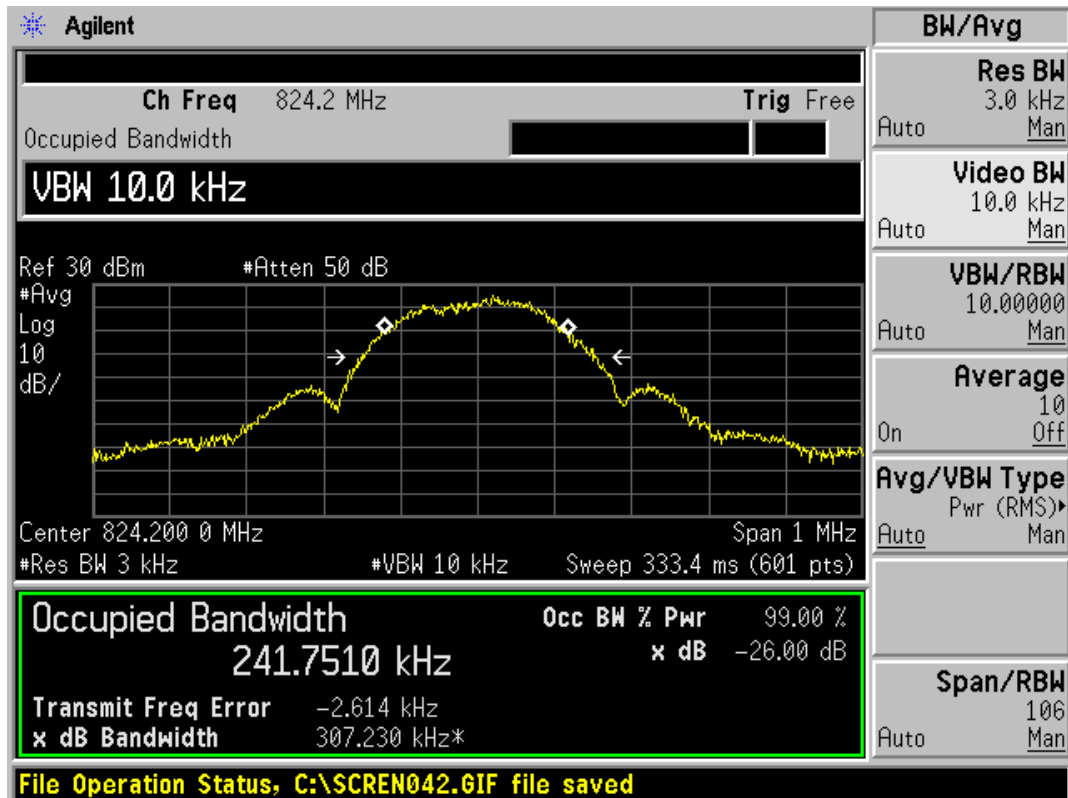
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GSM 850 GPRS CH251 Occupied Bandwidth

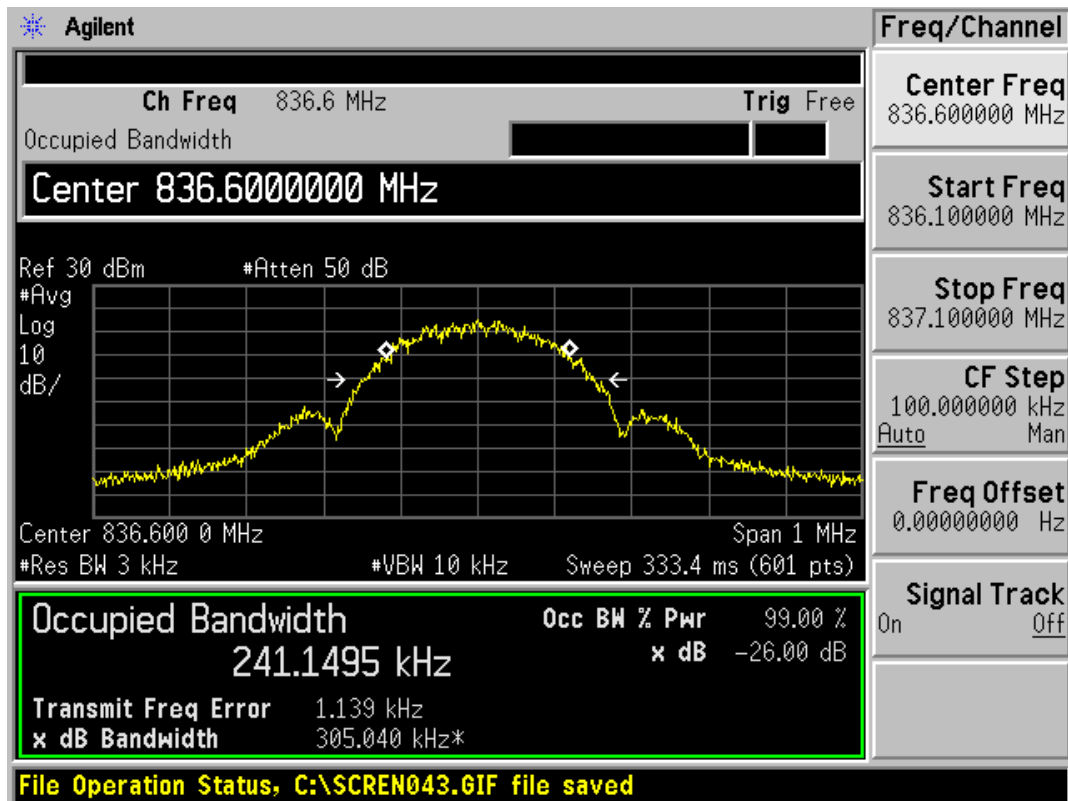


GSM 850 EGPRS CH128 Occupied Bandwidth

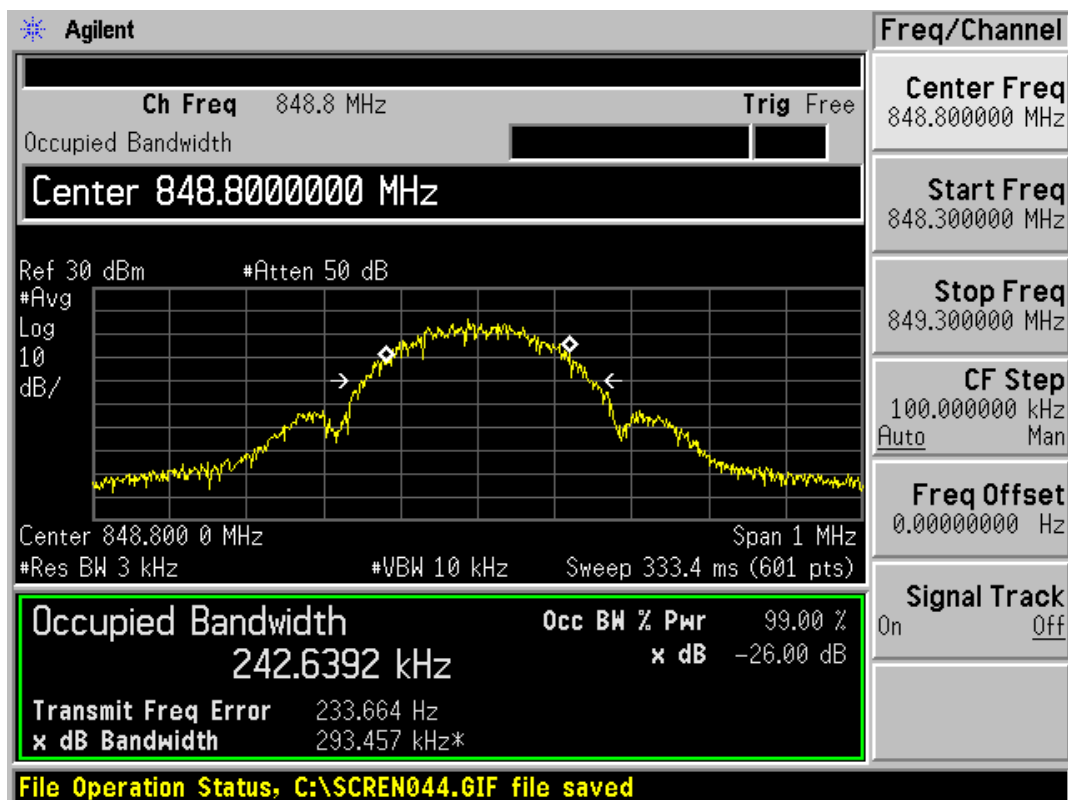
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GSM 850 EGPRS CH190 Occupied Bandwidth



GSM 850 EGPRS CH251 Occupied Bandwidth

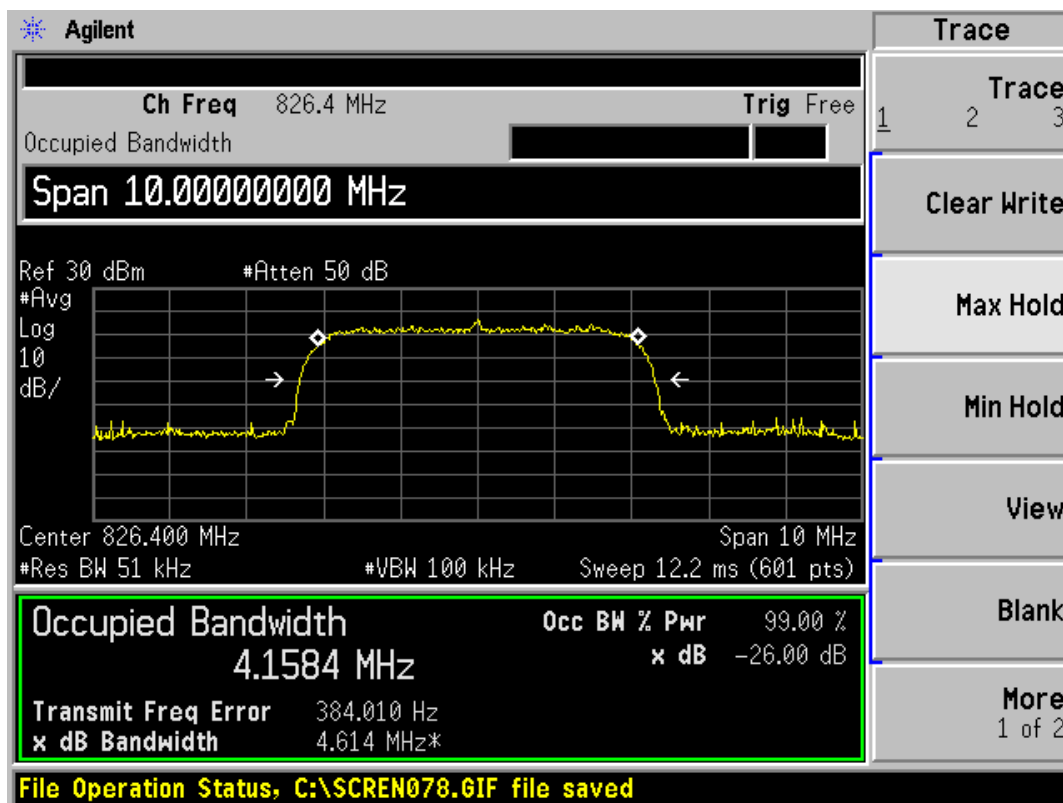
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WCDMA Band V	Channel	Frequency (MHz)	99% Power Bandwidth (MHz)	-26dBc Bandwidth(MHz)
RMC	4132	826.4	4.1584	4.614
	4183	836.6	4.1748	4.621
	4233	846.6	4.1617	4.641
HSDPA	4132	826.4	4.1495	4.633
	4183	836.6	4.1911	4.654
	4233	846.6	4.1606	4.645
HSUPA	4132	826.4	4.1544	4.612
	4183	836.6	4.1821	4.652
	4233	846.6	4.1739	4.651

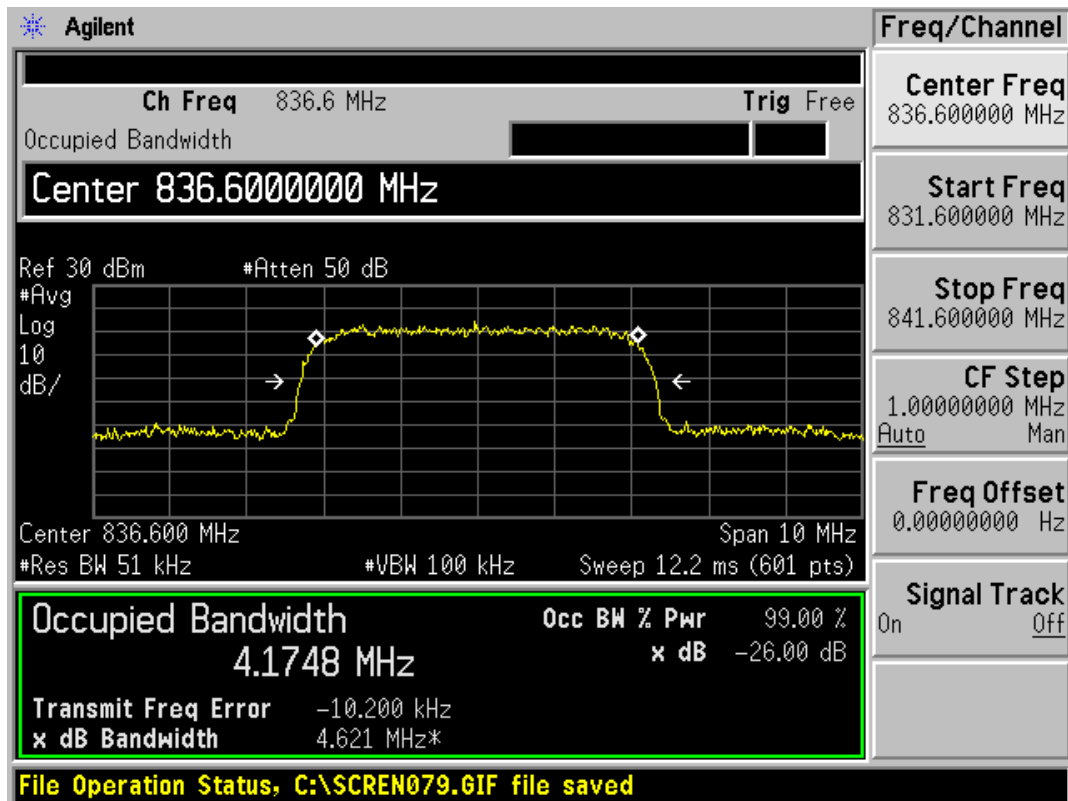


WCDMA Band V CH4132 Occupied Bandwidth

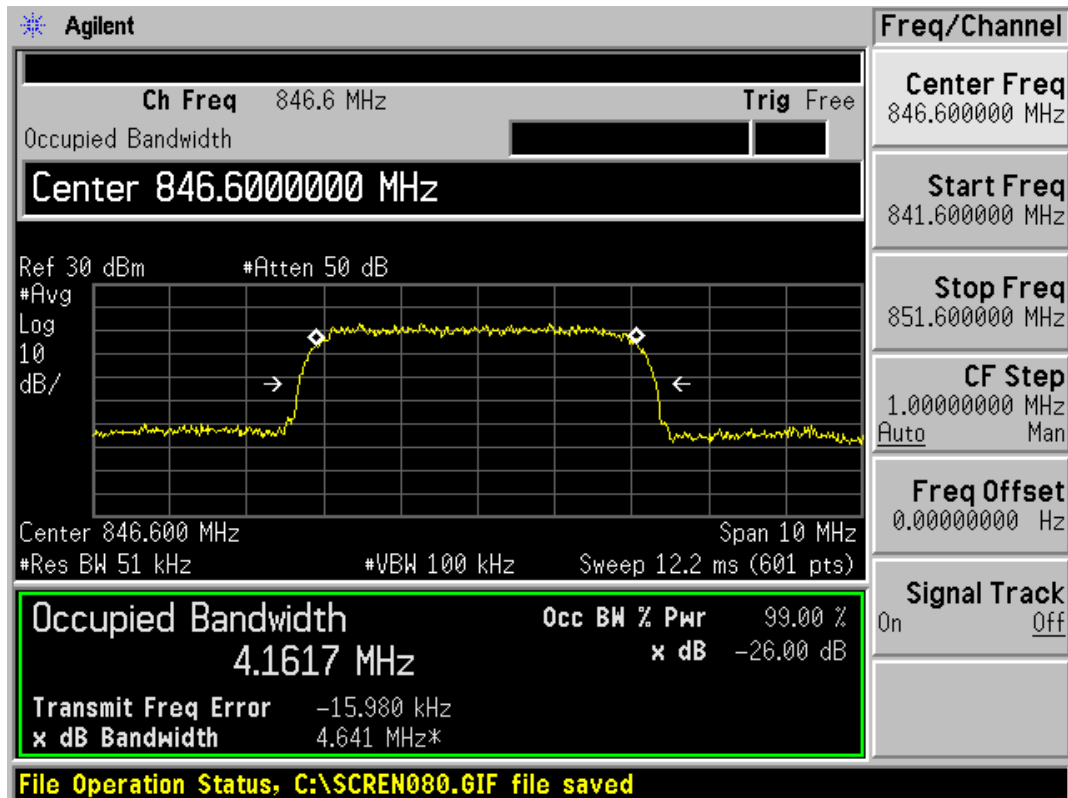
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WCDMA Band V CH4183 Occupied Bandwidth

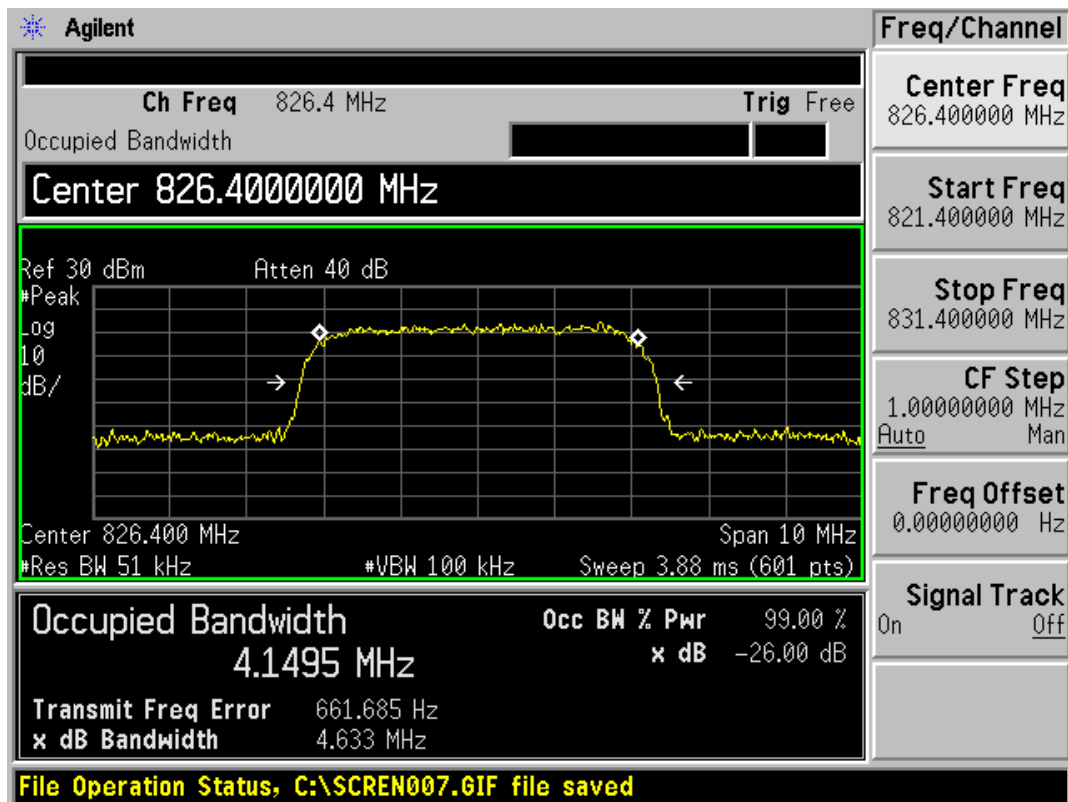


WCDMA Band V CH4233 Occupied Bandwidth

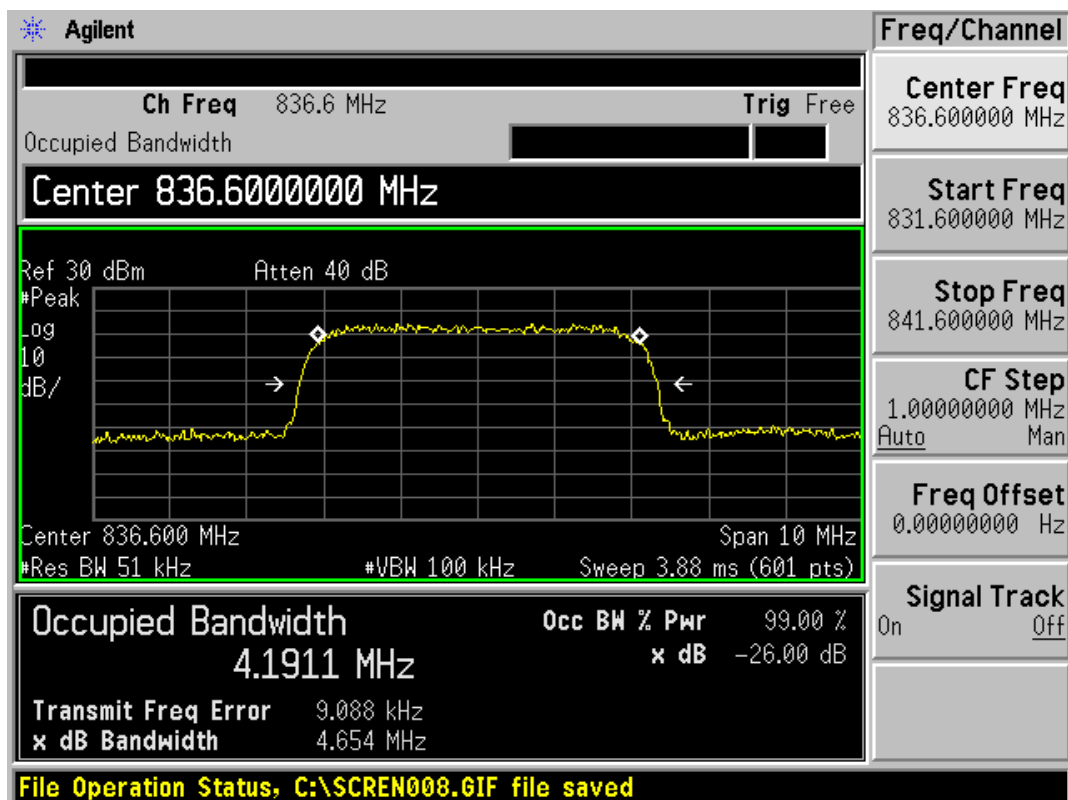
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WCDMA Band V HSDPA CH4132 Occupied Bandwidth

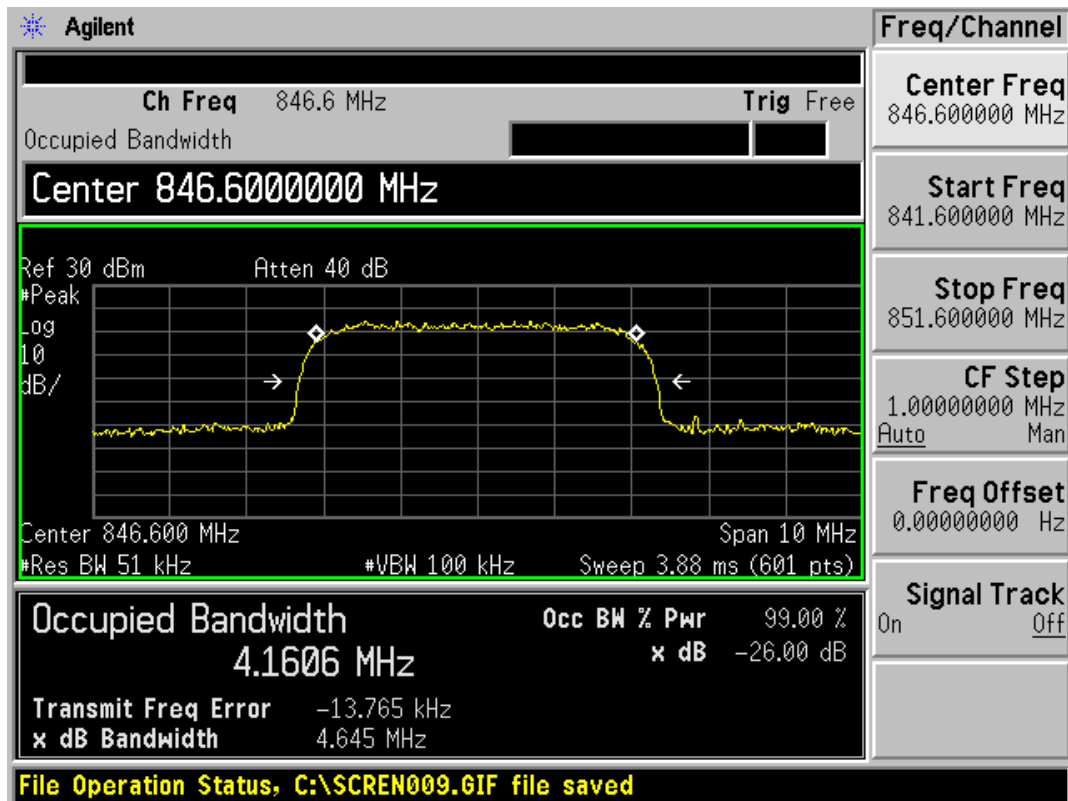


WCDMA Band V HSDPA CH4183 Occupied Bandwidth

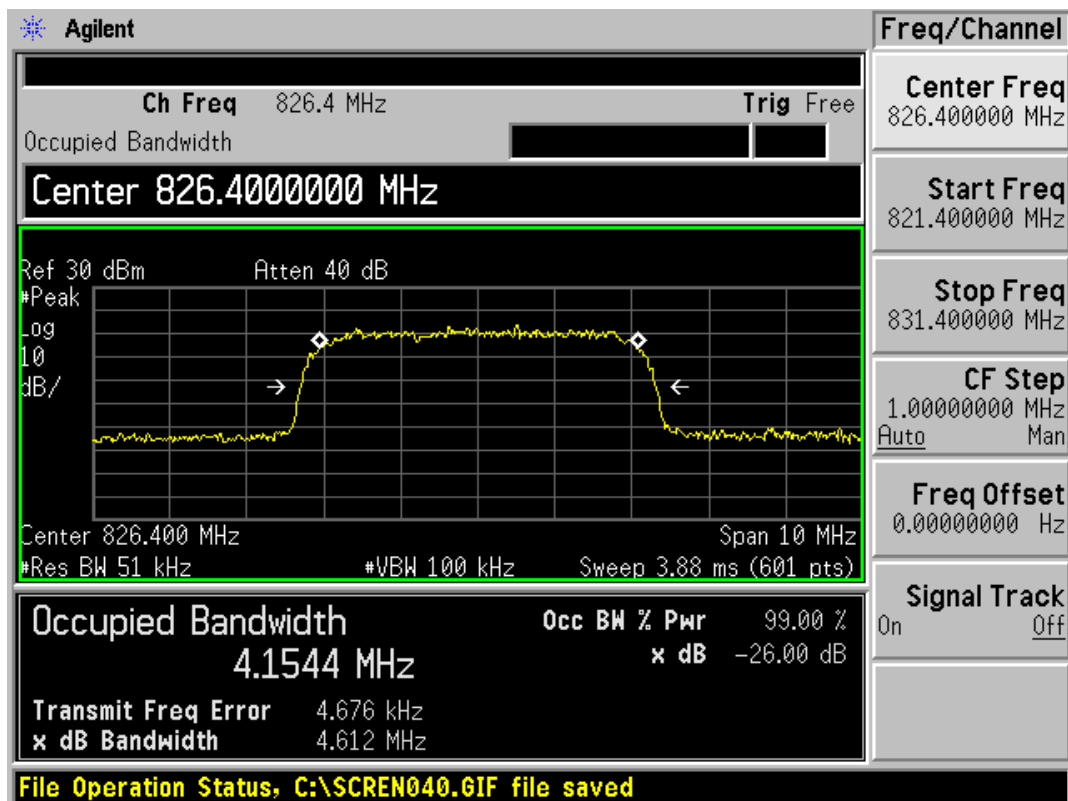
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WCDMA Band V HSDPA CH4233 Occupied Bandwidth

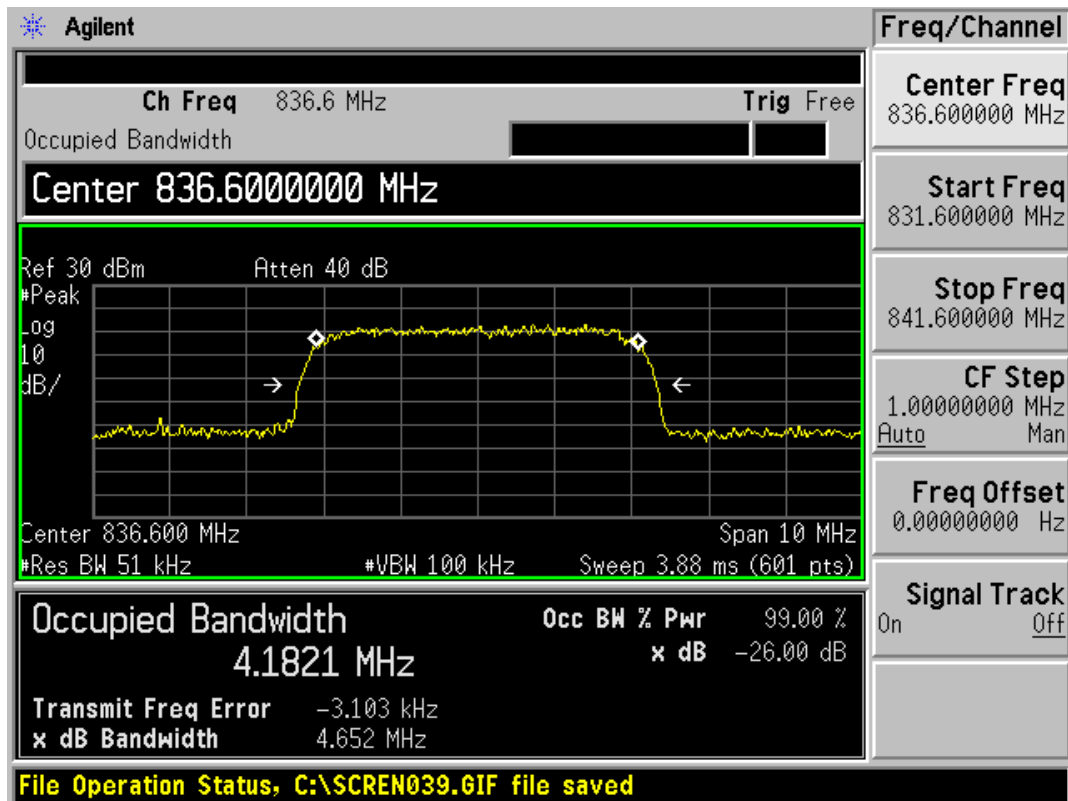


WCDMA Band V HSUPA CH4132 Occupied Bandwidth

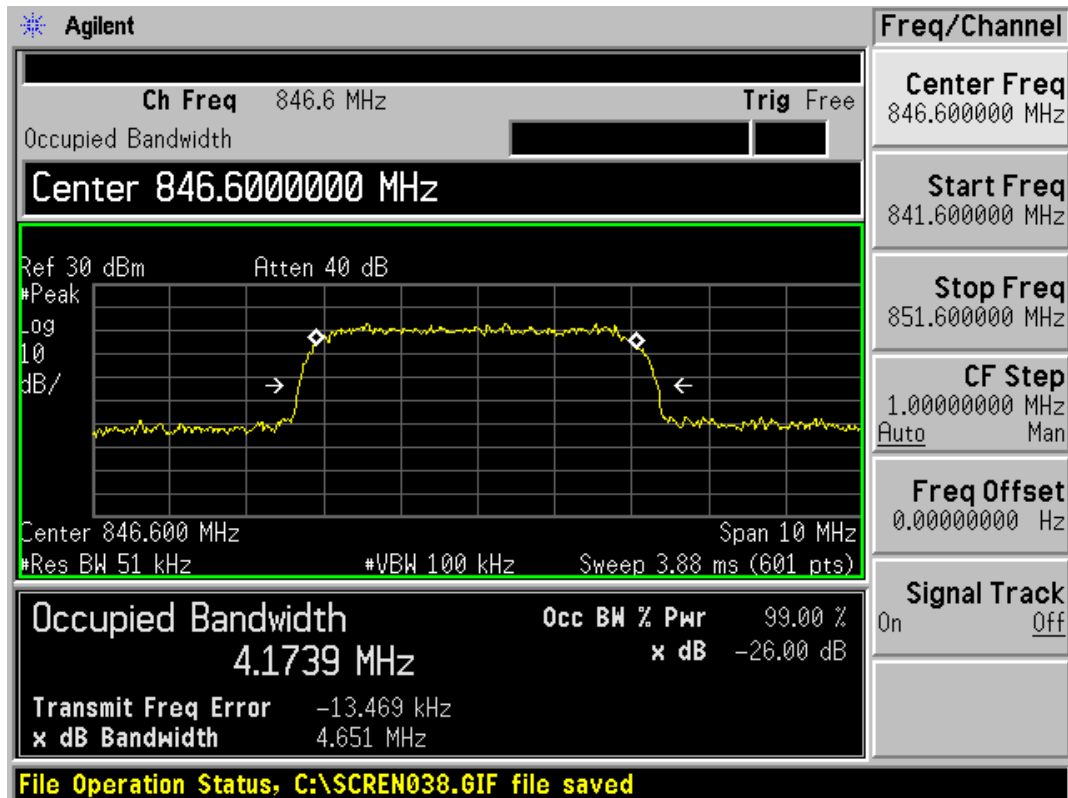
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WCDMA Band V HSPA CH4183 Occupied Bandwidth



WCDMA Band V HSPA CH4233 Occupied Bandwidth

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2.5. Band Edge Compliance

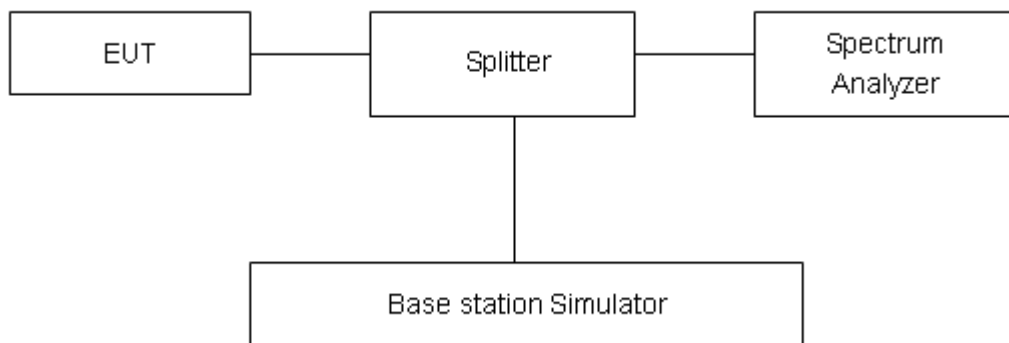
Ambient condition

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

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. RBW is set to 3kHz, VBW is set to 10kHz for GSM 850 and RBW is set to 51kHz, VBW is set to 100kHz for WCDMA Band V. Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

Rule Part 22.917(a) specifies that “The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.”

Limit	-13 dBm
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Measurement Uncertainty

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

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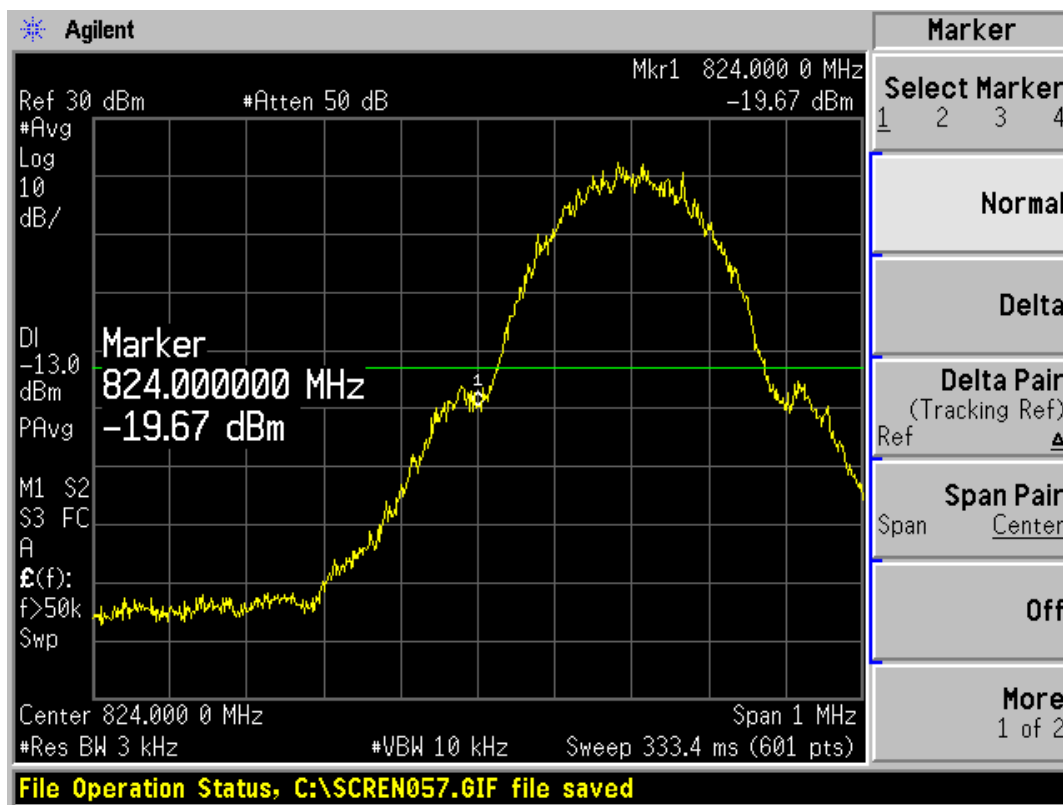
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Test Result:

GSM 850	Carrier frequency (MHz)	Reference value (dBm)	Limit (dBm)	Conclusion
GSM	824.0	-19.67	-13	PASS
	849.0	-17.86	-13	PASS
GPRS (GMSK)	824.0	-18.77	-13	PASS
	849.0	-18.93	-13	PASS
EGPRS (8-PSK)	824.0	-26.73	-13	PASS
	849.0	-27.23	-13	PASS

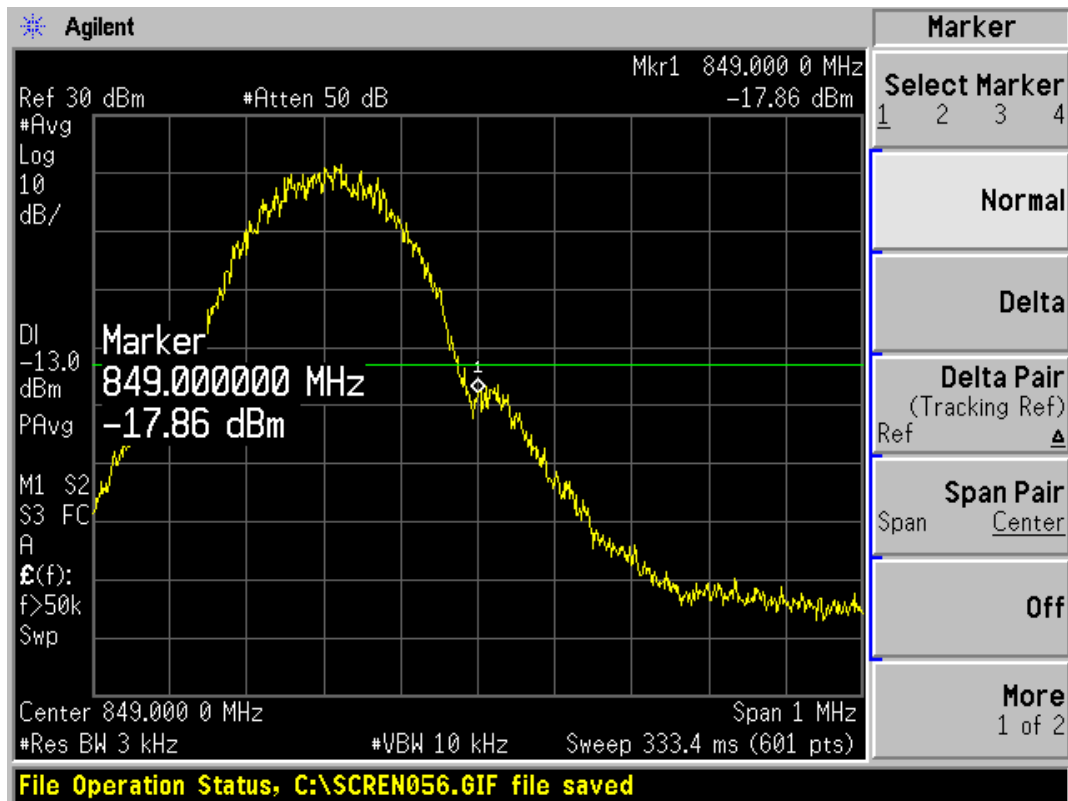


GSM 850 128 Channel

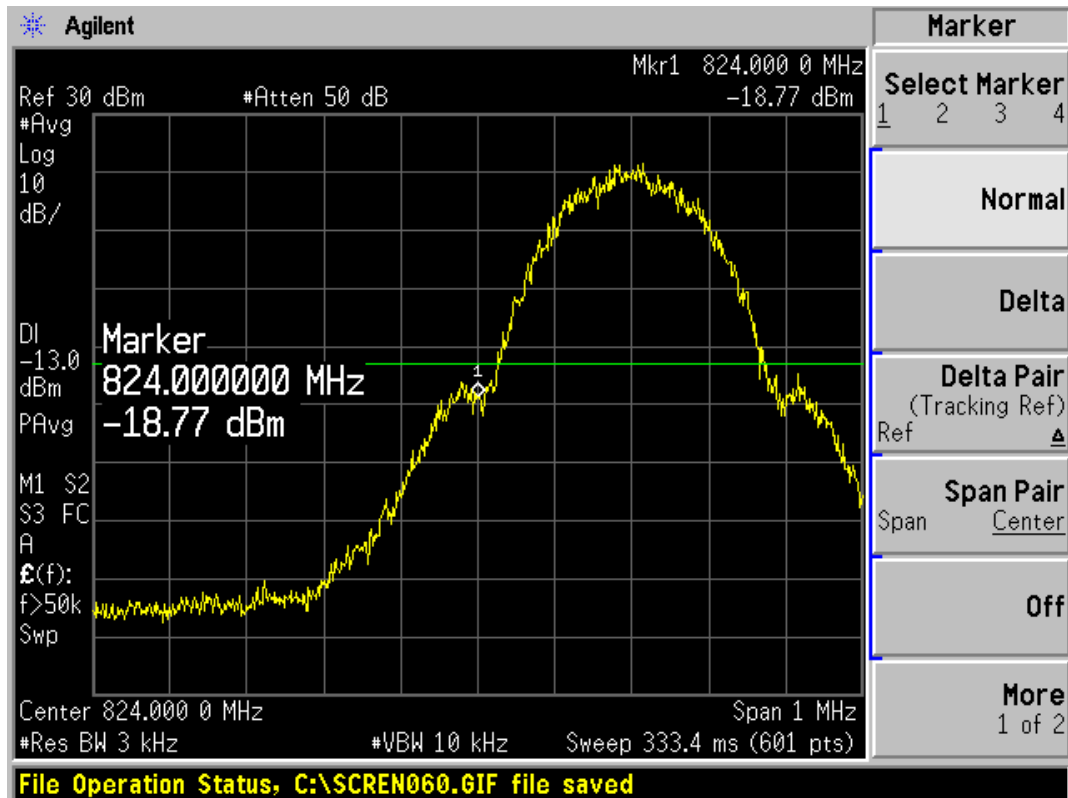
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GSM 850 251 Channel

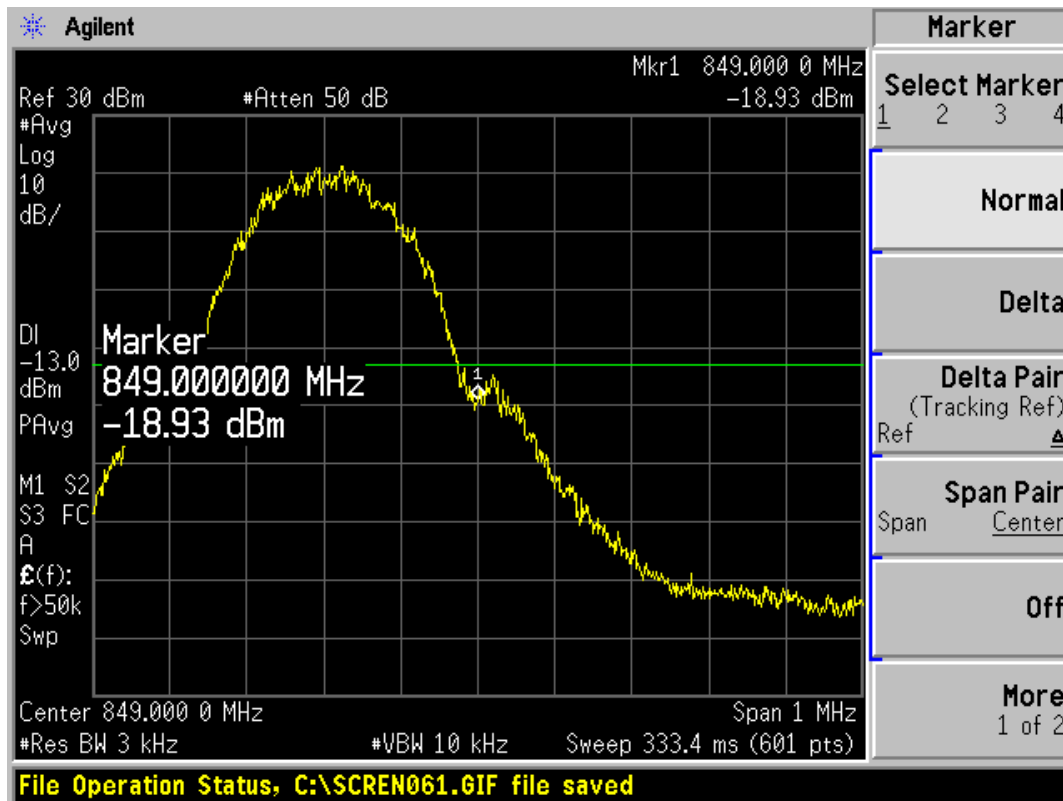


GSM 850 GPRS 128 Channel

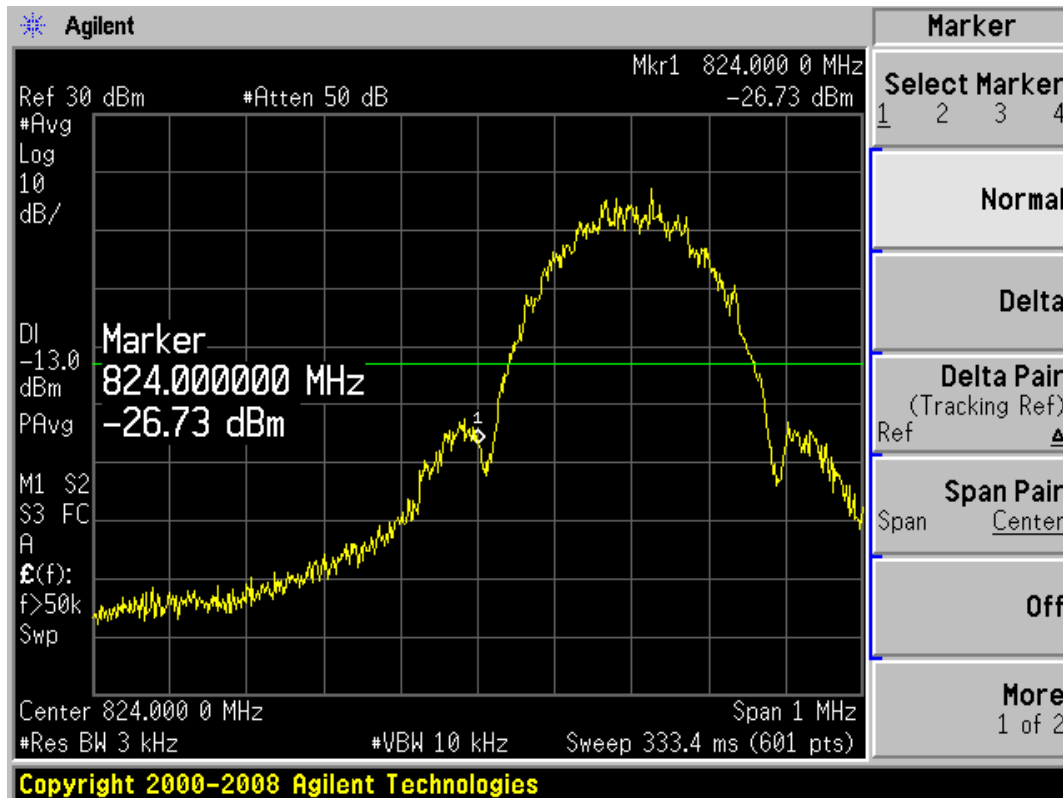
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GSM 850 GPRS 251 Channel

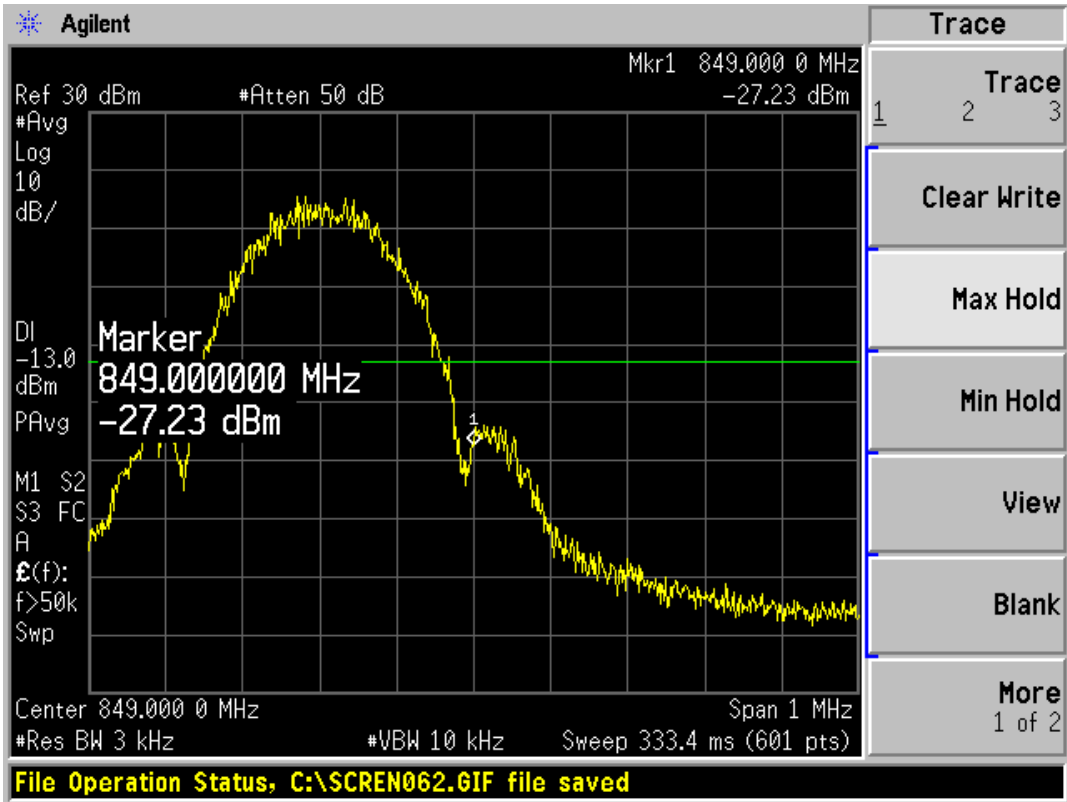


GSM 850 EGPRS 128 Channel

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GSM 850 EGPRS 251 Channel

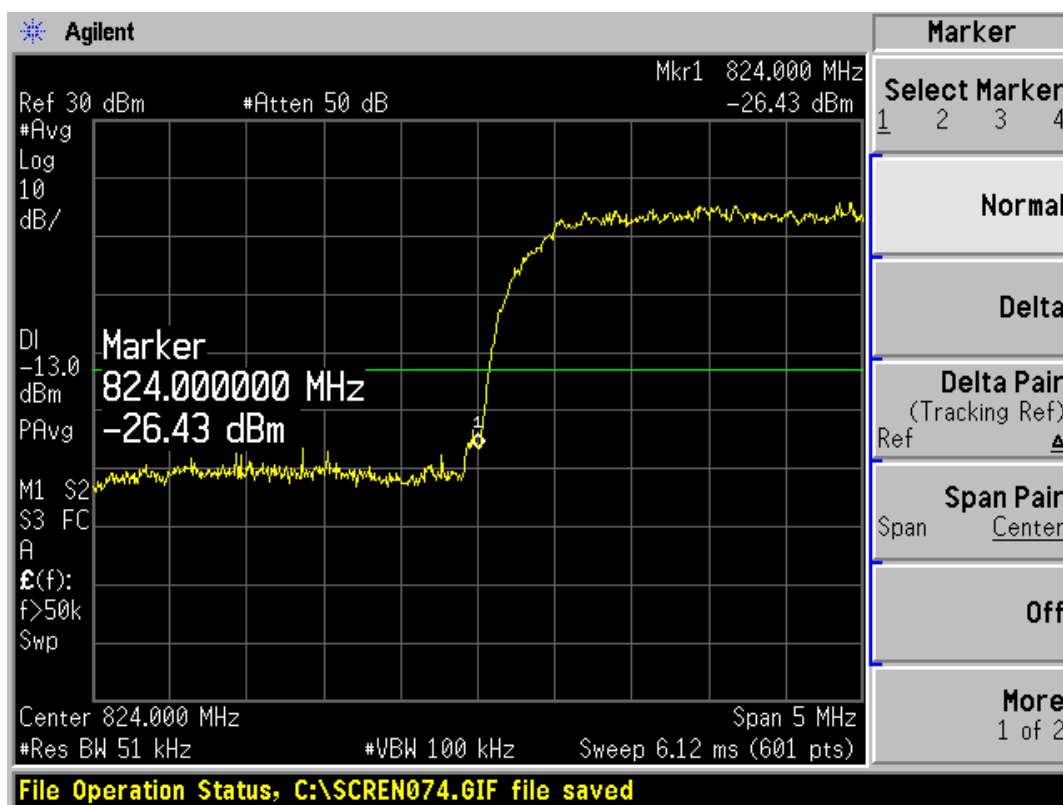
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WCDMA Band V	Carrier frequency (MHz)	Reference value (dBm)	Limit (dBm)	Conclusion
RMC	824	-26.43	-13	PASS
	849	-28.33	-13	PASS
HSDPA	824	-26.29	-13	PASS
	849	-26.49	-13	PASS
HSUPA	824	-30.16	-13	PASS
	849	-28.80	-13	PASS

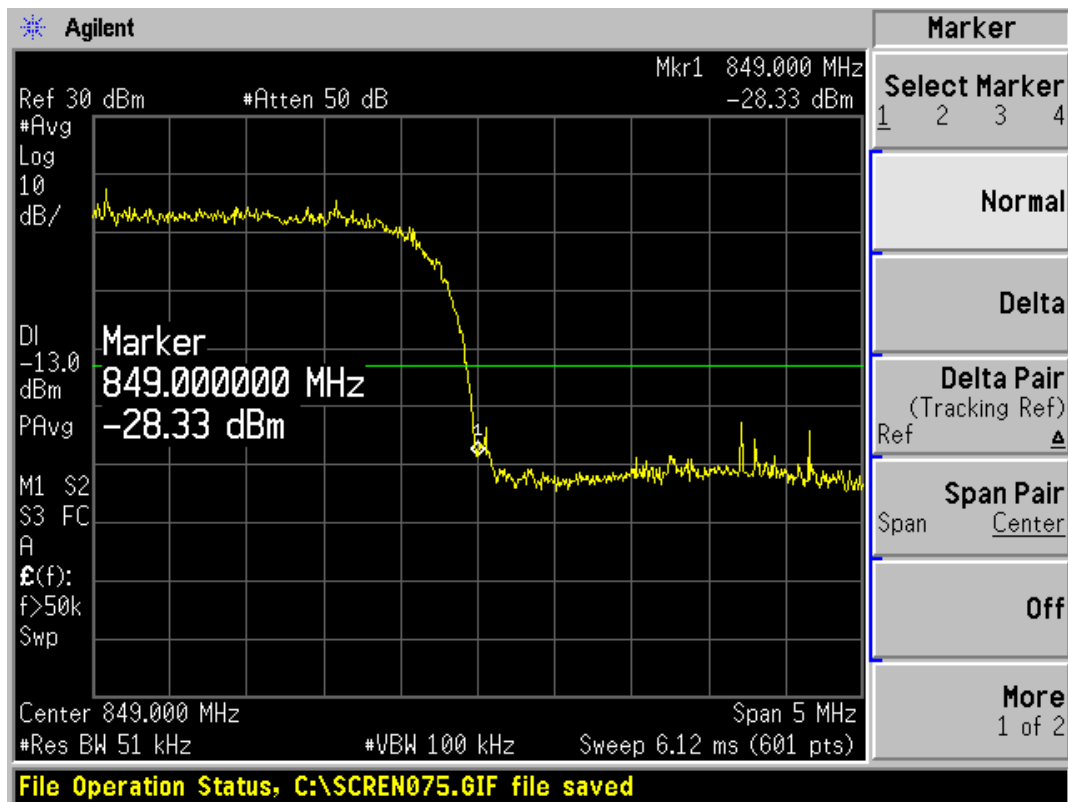


WCDMA Band V 4132 Channel

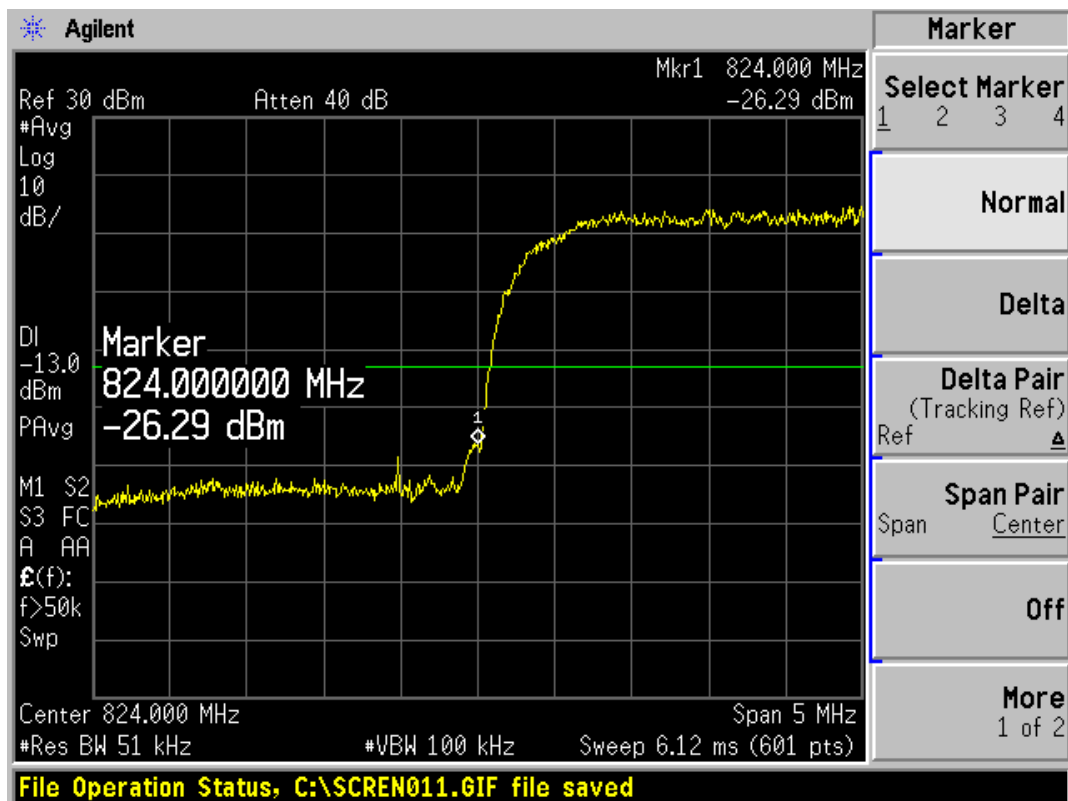
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WCDMA Band V 4233 Channel

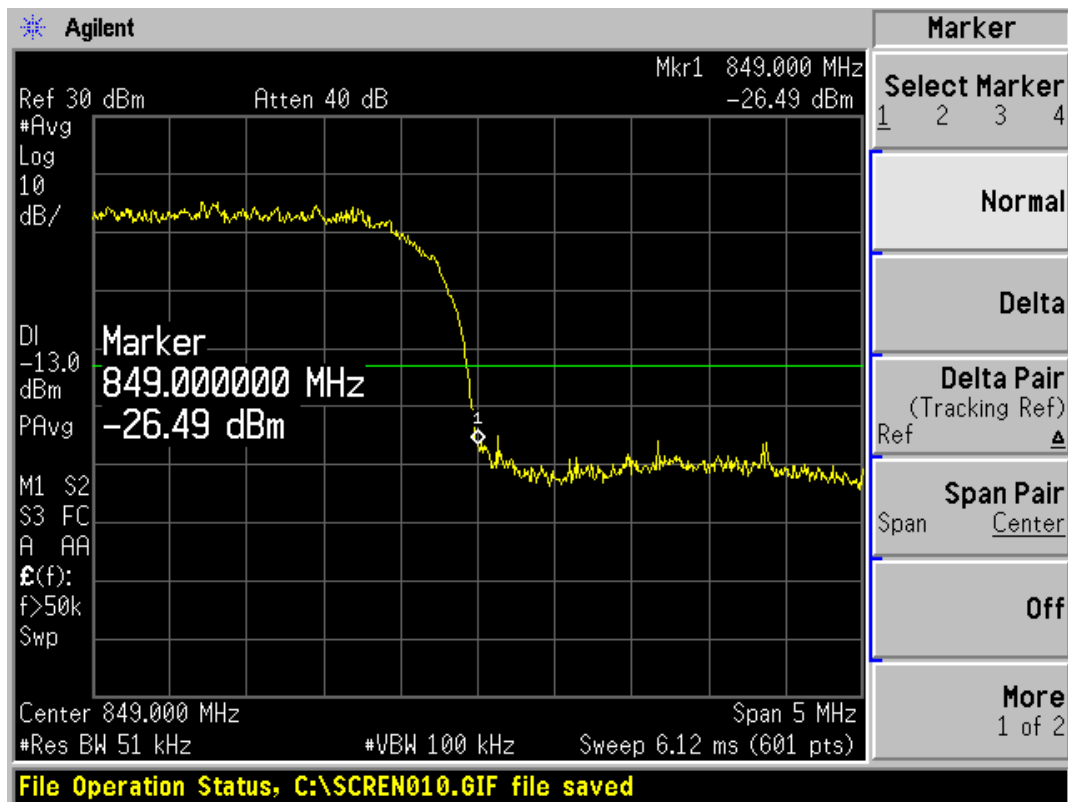


WCDMA Band V HSDPA 4132 Channel

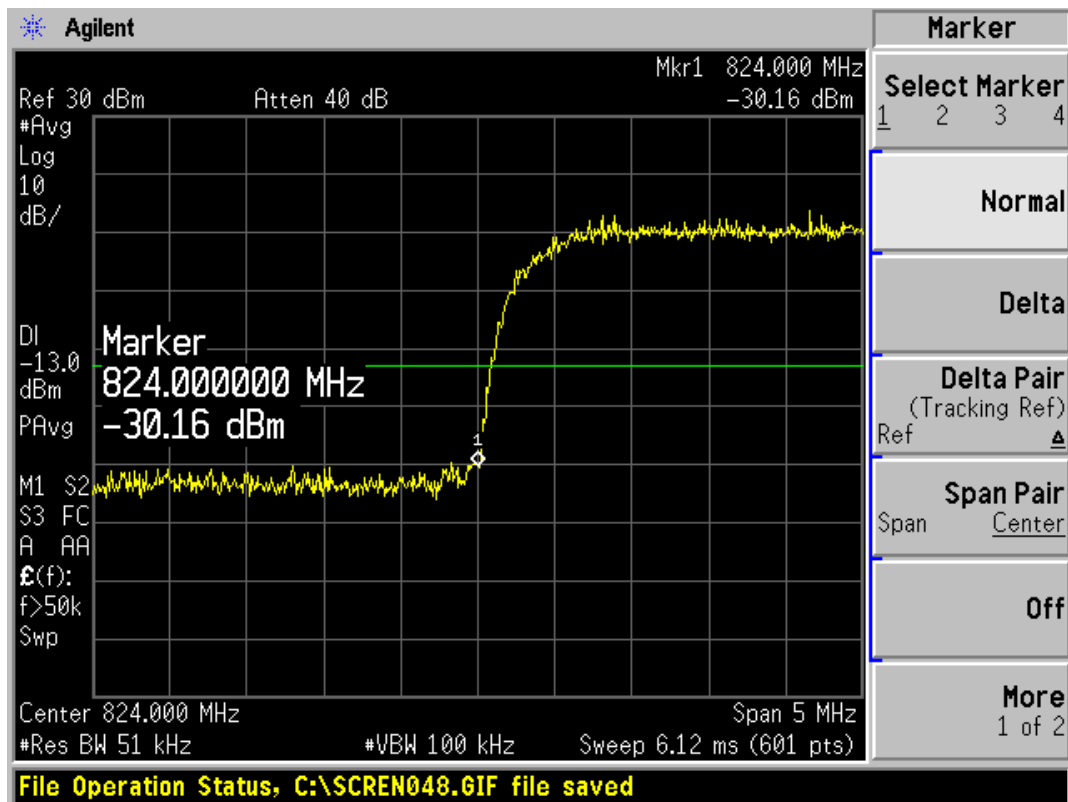
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WCDMA Band V HSDPA 4233 Channel

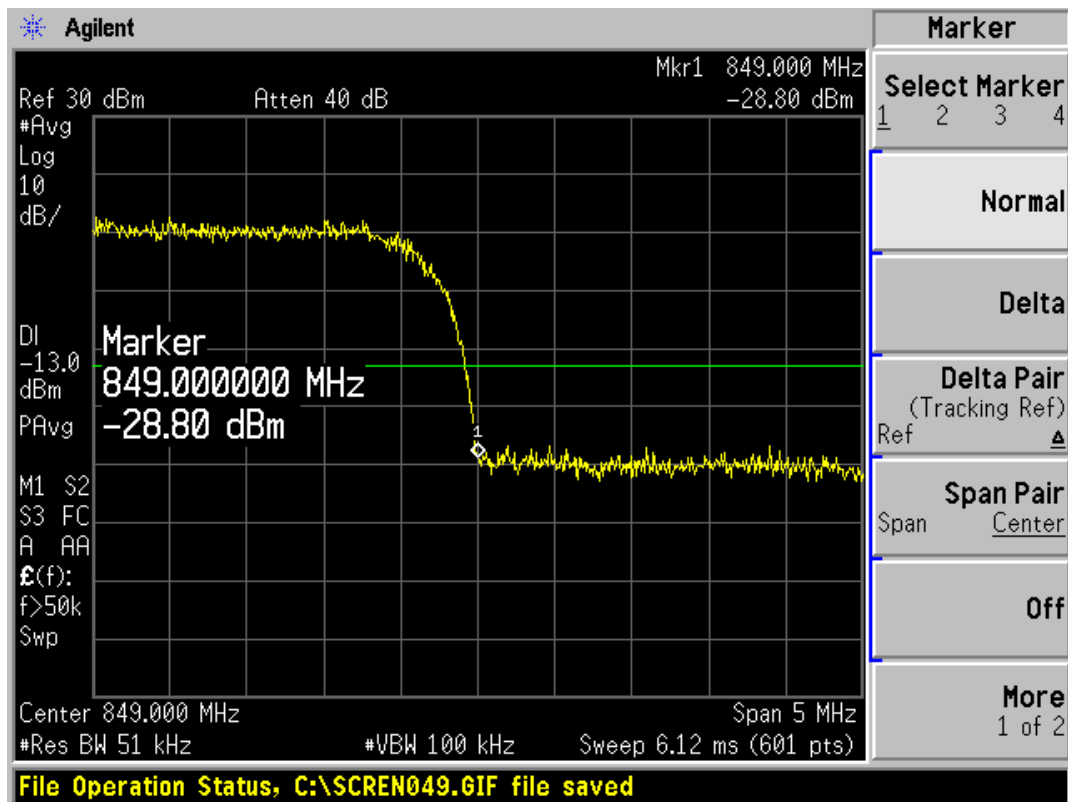


WCDMA Band V HSUPA 4132 Channel

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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.

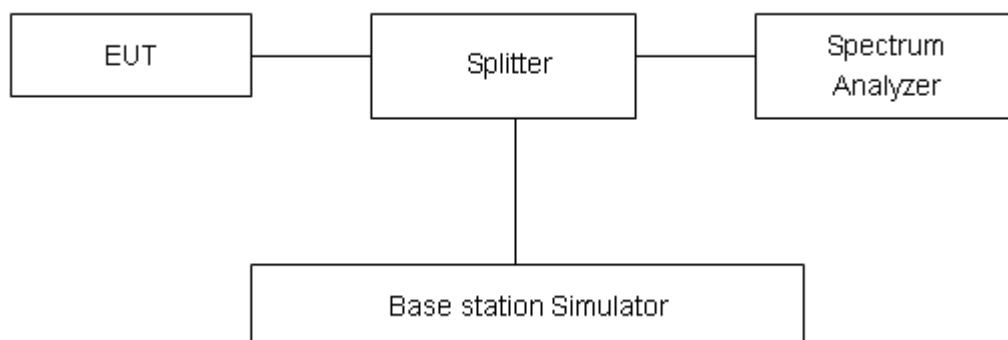
Step 1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.

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

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normal distribution is with the coverage factor $k = 2$, $U = 0.4$ dB.

Test Results

GSM 850	Channel	Frequency (MHz)	Peak(dBm)	Avg(dBm)	PAPR(dB)
GSM	128	824.2	29.92	29.19	0.73
	190	836.6	29.78	29.22	0.56
	251	848.8	29.66	29.04	0.62
GPRS	128	824.2	29.72	29.17	0.55
	190	836.6	29.68	29.19	0.49
	251	848.8	29.6	29.09	0.51
EGPRS(8PSK)	128	824.2	27.4	27.03	0.37
	190	836.6	27.63	27.21	0.42
	251	848.8	27.51	27.06	0.45

WCDMA Band V	Channel	Frequency (MHz)	Peak(dBm)	Avg(dBm)	PAPR(dB)
RMC	4132	826.4	23.44	20.2	3.24
	4183	836.6	23.68	20.39	3.29
	4233	846.6	23.74	20.45	3.29
HSDPA	4132	826.4	23.29	20.00	3.29
	4183	836.6	23.67	20.36	3.31
	4233	846.6	23.83	20.54	3.29
HSUPA	4132	826.4	22.45	19.19	3.26
	4183	836.6	22.85	19.6	3.25
	4233	846.6	23.16	19.87	3.29

2.7. Frequency Stability

Ambient condition

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

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)

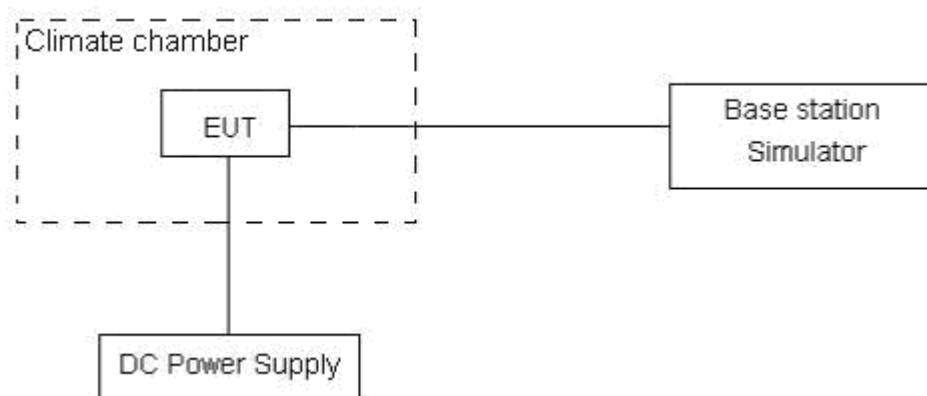
The frequency stability shall be measured with variation of primary supply voltage as follows:

(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



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Limits

According to the Sec. 22.355, the frequency stability of the carrier shall be accurate to within 2.5 ppm of the received frequency for mobile stations.

Limits	$\leq 2.5 \text{ ppm}$
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Measurement Uncertainty

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

Test Result

GSM850

Temperature (°C)	Test Results (ppm) / 3.8 V Power supply	
	Channel 190	
	GSM(GMSK)	EGPRS(8PSK)
-20	-0.027	-0.041
-10	-0.021	-0.039
0	-0.022	-0.033
10	-0.025	-0.034
20	-0.028	-0.037
30	-0.029	-0.031
40	-0.025	0.029
50	-0.026	-0.030
60	-0.024	-0.031

Voltage (V)	Test Results(ppm) / 20°C	
	Channel 190	
	GSM(GMSK)	EGPRS(8PSK)
3.5	-0.029	-0.027
3.8	-0.028	-0.031
4.2	-0.027	-0.029

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WCDMA Band V

Temperature (°C)	Test Results (ppm) / 3.8 V Power supply
	Channel 4183
-20	0.004
-10	0.001
0	-0.002
10	-0.002
20	-0.002
30	0.004
40	-0.003
50	0.003
60	0.004

Voltage (V)	Test Results(ppm) / 20°C
	Channel 4183
3.5	0.002
3.8	-0.002
4.2	0.001

2.8. Spurious Emissions at Antenna Terminals

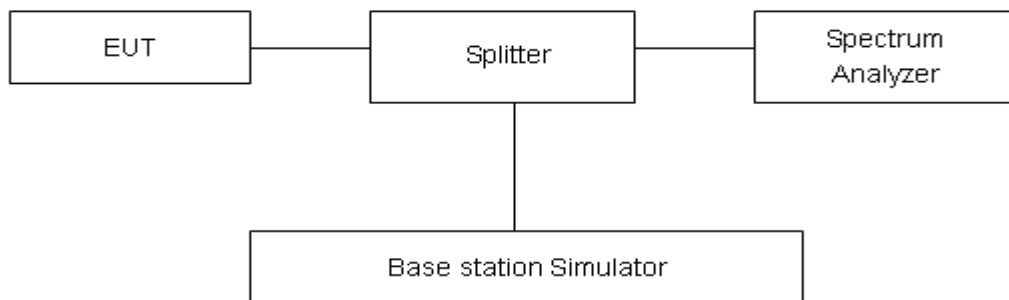
Ambient condition

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

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. The peak detector is used. For GSM 850, RBW and VBW are set to 100 kHz, Sweep is set to ATUO. For WCDMA Band V, 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 22.917(a) specifies that “The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.”

Limit	-13 dBm
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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

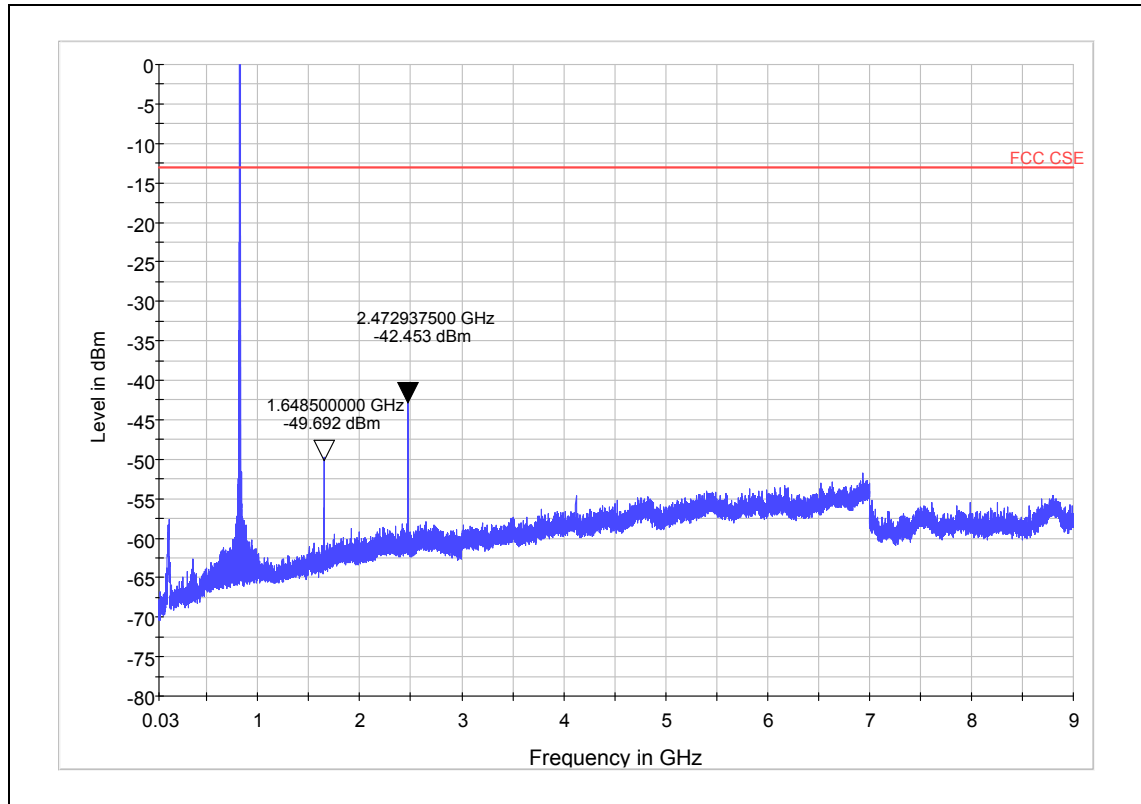
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Test Result

GSM 850 CH128



Note: The signal beyond the limit is carrier
GSM 850 128 Channel 30MHz~9GHz

Harmonic	TX ch.128 Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
2	1648.5	-49.692	-13	36.692
3	2472.937	-42.453	-13	29.453

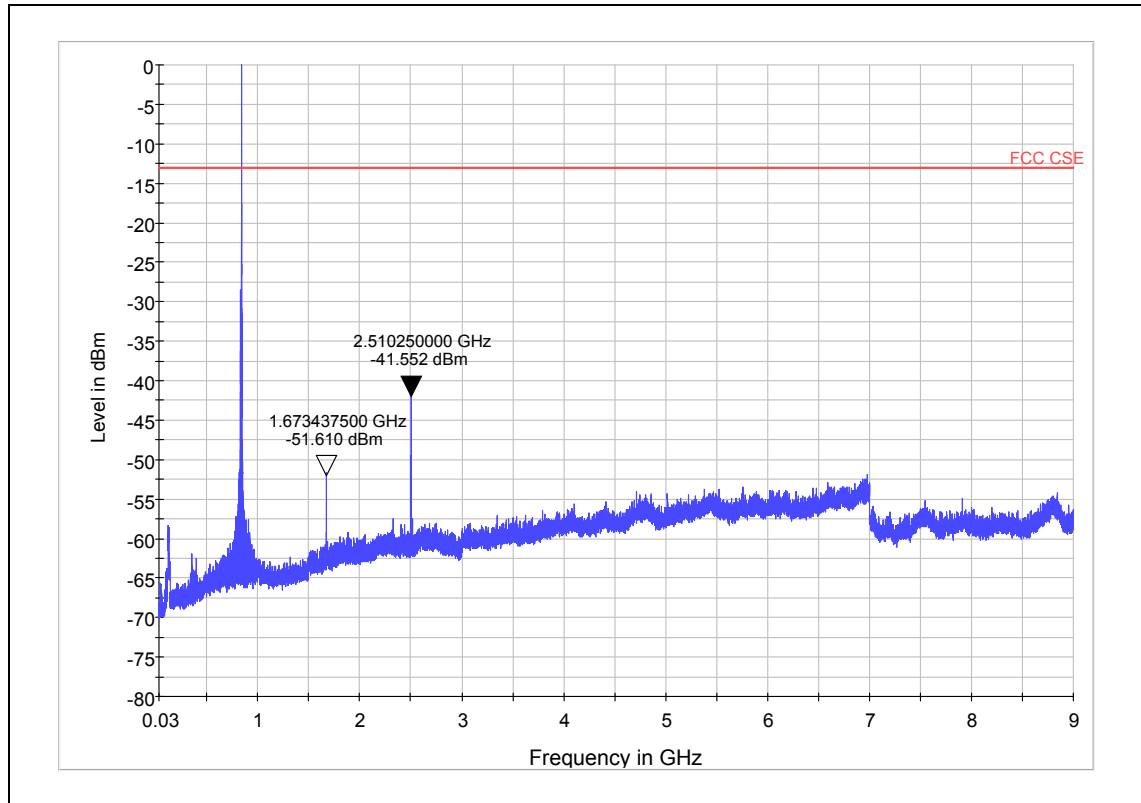
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GSM 850 CH190



Note: The signal beyond the limit is carrier
GSM 850 190 Channel 30MHz~9GHz

Harmonic	TX ch.190 Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
2	1673.4375	-51.610	-13	38.610
3	2510.25	-41.552	-13	28.552

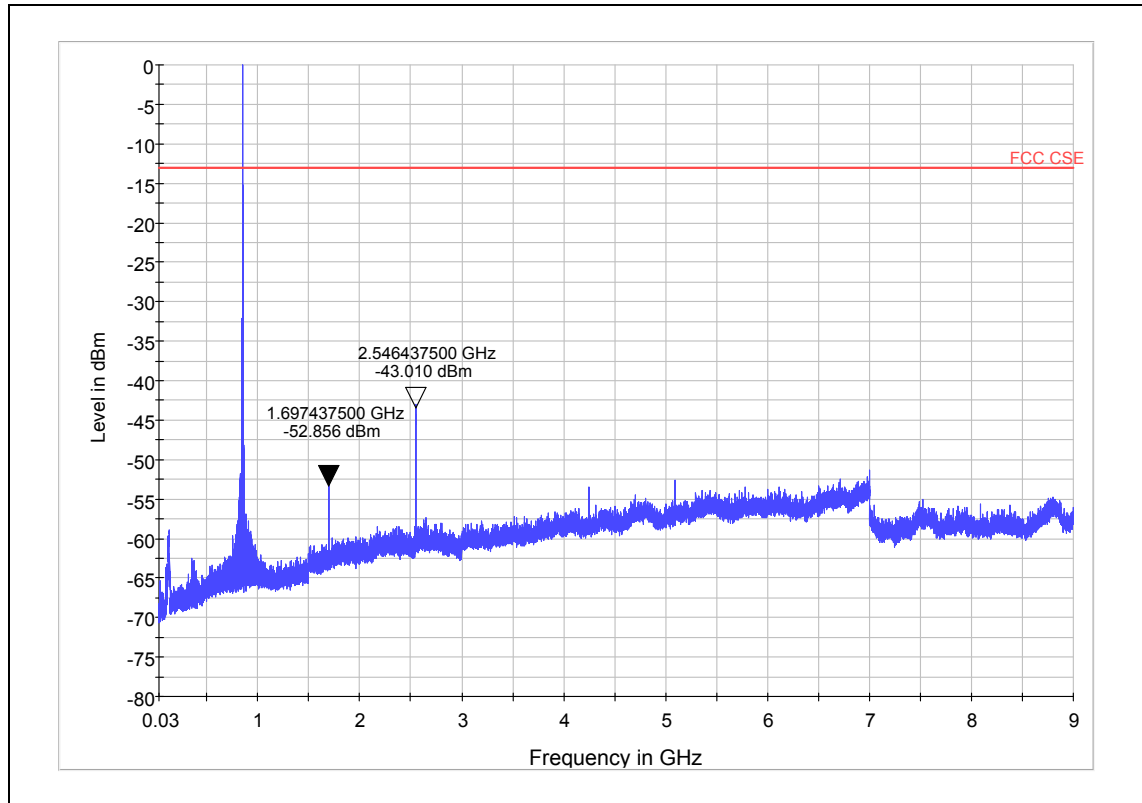
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GSM 850 CH251



Note: The signal beyond the limit is carrier
GSM 850 251 Channel 30MHz~9GHz

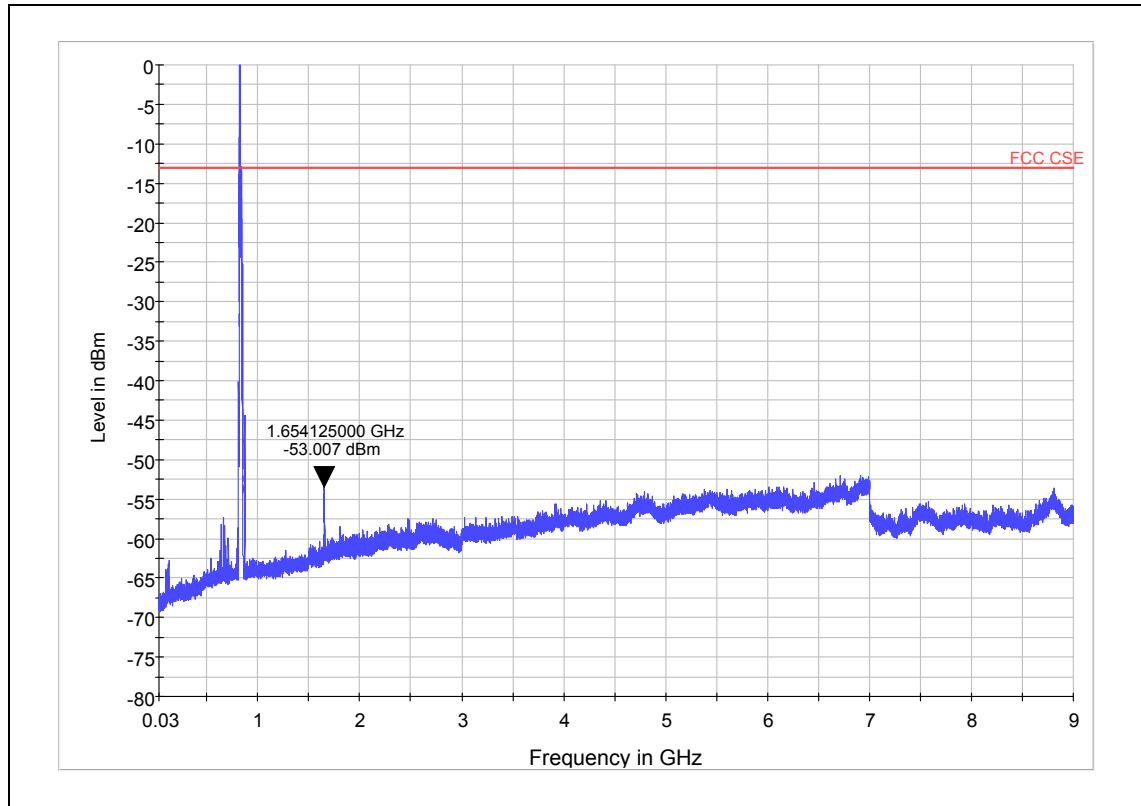
Harmonic	TX ch.251 Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
2	1697.4375	-52.856	-13	39.856
3	2546.4375	-43.010	-13	30.010

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WCDMA Band V CH4132



Note: The signal beyond the limit is carrier
WCDMA Band V 4132 Channel 30MHz~9GHz

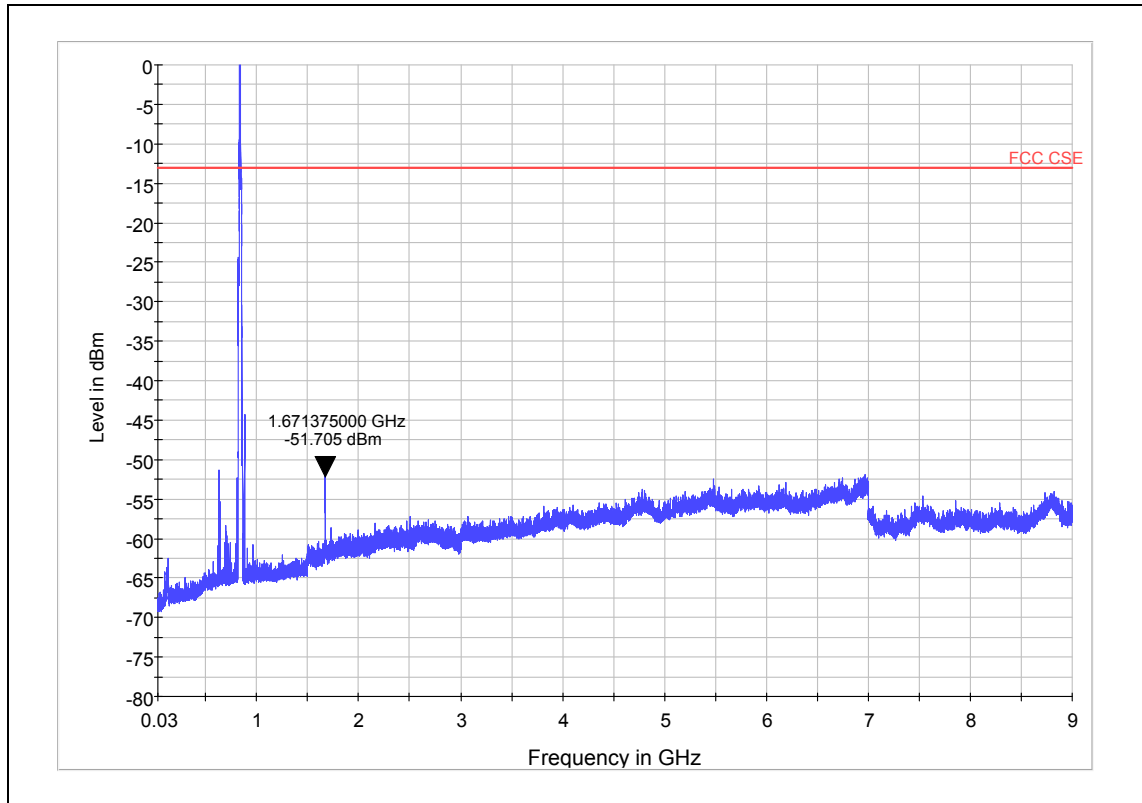
Harmonic	TX ch.4132 Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
2	1654.125	-53.007	-13	40.007

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WCDMA Band V CH4183



Note: The signal beyond the limit is carrier
WCDMA Band V 4183 Channel 30MHz~9GHz

Harmonic	TX ch.4183 Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
2	1671.375	-51.705	-13	38.705

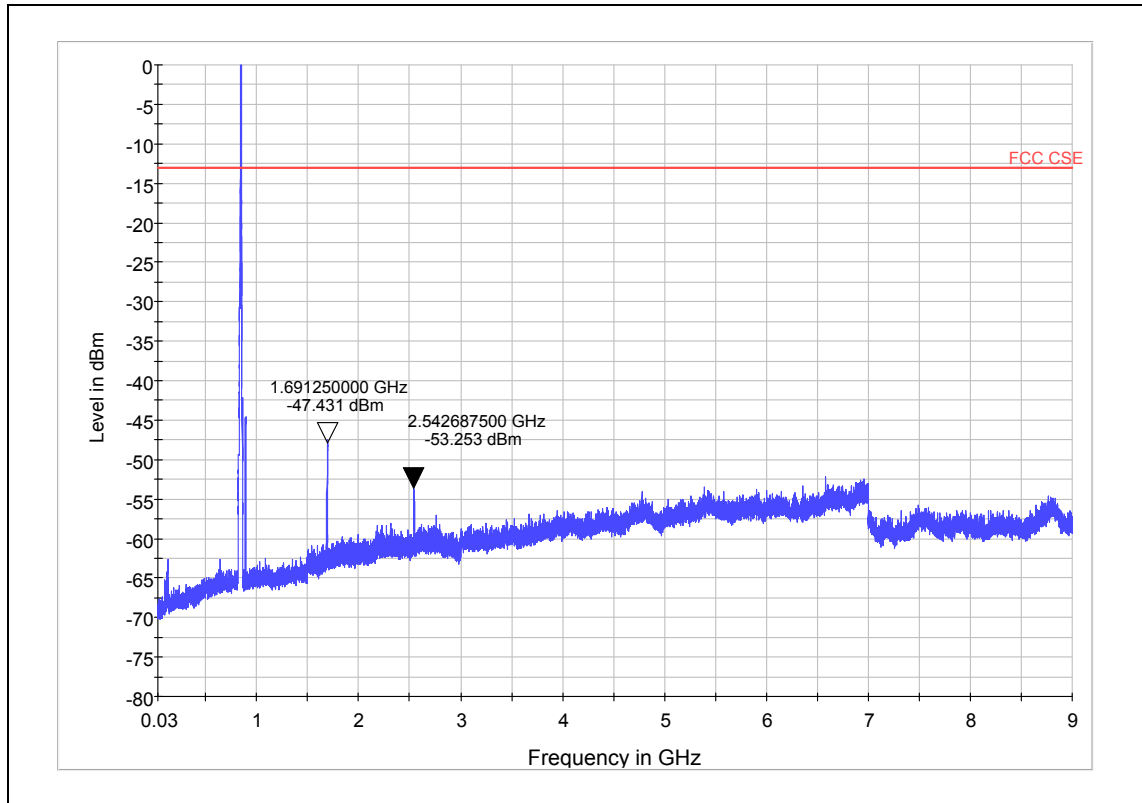
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WCDMA Band V CH4233



Note: The signal beyond the limit is carrier
WCDMA Band V 4233 Channel 30MHz~9GHz

Harmonic	TX ch.4233 Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
2	1691.25	-47.431	-13	34.431
3	2542.6875	-53.253	-13	40.253

2.9. Radiates Spurious Emission

Ambient condition

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

Method of Measurement

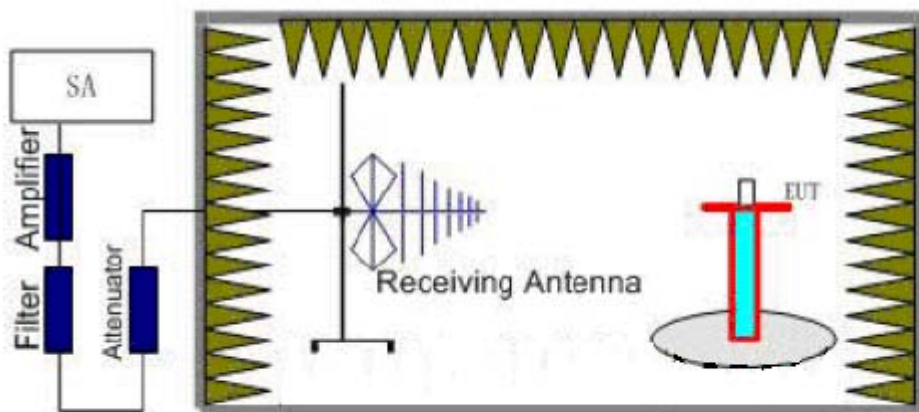
The measurements procedures in TIA -603C are used.

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.



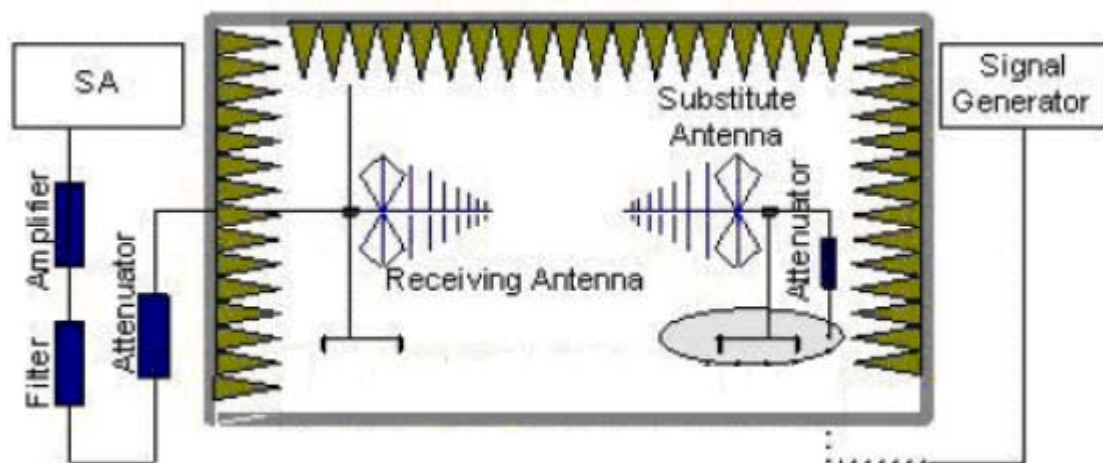
Step 2:

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.

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$E.R.P \text{ (peak power)} = S.G. - Tx \text{ Cable loss} + \text{Substitution antenna gain} - 2.15.$

$EIRP = E.R.P + 2.15$

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 22.917(a) specifies that “The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.”

Limit	-13 dBm
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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.

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Test Result

GSM 850 CH128

Harmonic	TX ch.128 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1647.8	-45.6	2	10.15	Vertical	-39.60	-13	26.60	0
3	2473.5	-40.35	2.51	11.35	Vertical	-33.66	-13	20.66	0
4	3296.3	-59.2	4.2	10.85	Vertical	-54.70	-13	41.70	135
5	4121.6	-55.9	5.2	11.35	Vertical	-51.90	-13	38.90	45
6	4945.1	-57.1	5.5	11.95	Vertical	-52.80	-13	39.80	180
7	5769.4	-61.76	5.7	13.55	Vertical	-56.06	-13	43.06	270
8	6256.5	-57.56	6.3	13.75	Vertical	-52.26	-13	39.26	270
9	7417.8	-61.08	6.8	13.85	Vertical	-56.18	-13	43.18	0
10	8242	-59.52	6.9	14.25	Vertical	-54.32	-13	41.32	180

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 850 CH190

Harmonic	TX ch.190 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673.4	-46.78	2	10.75	Vertical	-40.18	-13	27.18	135
3	2509.7	-39.89	2.51	11.05	Vertical	-33.50	-13	20.50	225
4	3346.4	-64.61	4.2	11.15	Vertical	-59.81	-13	46.81	180
5	4183.125	-56.17	5.2	11.15	Vertical	-52.37	-13	39.37	315
6	5019.6	-61.23	5.5	11.95	Vertical	-56.93	-13	43.93	0
7	5856.2	-62.70	5.7	13.55	Vertical	-57.00	-13	44.00	270
8	6692.8	-61.77	6.3	13.75	Vertical	-56.47	-13	43.47	180
9	7529.4	-60.26	6.8	13.85	Vertical	-55.36	-13	42.36	0
10	8366	-61.88	6.9	14.25	Vertical	-56.68	-13	43.68	90

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.

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GSM 850 CH251

Harmonic	TX ch.251 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1696.9	-48.03	2	10.15	Vertical	-42.03	-13	29.03	180
3	2546.6	-41.16	2.51	11.05	Vertical	-34.77	-13	21.77	225
4	3395.2	-64.16	4.2	11.15	Vertical	-59.36	-13	46.36	0
5	4244.6	-54.35	5.2	11.15	Vertical	-50.55	-13	37.55	225
6	5092.8	-62.89	5.5	11.95	Vertical	-58.59	-13	45.59	90
7	5941.6	-63.04	5.7	13.55	Vertical	-57.34	-13	44.34	0
8	6790.4	-60.84	6.3	13.75	Vertical	-55.54	-13	42.54	270
9	7639.2	-60.52	6.8	13.85	Vertical	-55.62	-13	42.62	180
10	8488	-62.22	6.9	14.25	Vertical	-57.02	-13	44.02	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 V CH4132

Harmonic	TX ch.4132 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1652.8	-69.24	2	10.15	Vertical	-63.24	-13	50.24	180
3	2479.2	-66.74	2.51	11.35	Vertical	-60.05	-13	47.05	135
4	3305.6	-64.45	4.2	10.85	Vertical	-59.95	-13	46.95	90
5	4132	-62.89	5.2	11.35	Vertical	-58.89	-13	45.89	180
6	4958.4	-63.43	5.5	11.95	Vertical	-59.13	-13	46.13	270
7	5784.8	-61.76	5.7	13.55	Vertical	-56.06	-13	43.06	0
8	6611.2	-61.10	6.3	13.75	Vertical	-55.80	-13	42.80	180
9	7437.6	-61.08	6.8	13.85	Vertical	-56.18	-13	43.18	90
10	8264	-61.86	6.9	14.25	Vertical	-56.66	-13	43.66	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.

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WCDMA Band V CH4183

Harmonic	TX ch.4183 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673.2	-66.58	2	10.75	Vertical	-59.98	-13	46.98	0
3	2509.8	-62.78	2.51	11.05	Vertical	-56.39	-13	43.39	90
4	3346.4	-64.61	4.2	11.15	Vertical	-59.81	-13	46.81	180
5	4183	-62.67	5.2	11.15	Vertical	-58.87	-13	45.87	270
6	5019.6	-61.23	5.5	11.95	Vertical	-56.93	-13	43.93	0
7	5856.2	-62.70	5.7	13.55	Vertical	-57.00	-13	44.00	180
8	6692.8	-61.77	6.3	13.75	Vertical	-56.47	-13	43.47	90
9	7529.4	-60.26	6.8	13.85	Vertical	-55.36	-13	42.36	0
10	8366	-61.88	6.9	14.25	Vertical	-56.68	-13	43.68	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 V CH4233

Harmonic	TX ch.4233 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1693.2	-60.63	2	10.15	Vertical	-54.63	-13	41.63	180
3	2539.8	-56.6	2.51	11.05	Vertical	-50.21	-13	37.21	270
4	3386.4	-64.16	4.2	11.15	Vertical	-59.36	-13	46.36	0
5	4233	-61.50	5.2	11.15	Vertical	-57.70	-13	44.70	180
6	5079.6	-62.89	5.5	11.95	Vertical	-58.59	-13	45.59	90
7	5926.2	-63.04	5.7	13.55	Vertical	-57.34	-13	44.34	0
8	6772.8	-60.84	6.3	13.75	Vertical	-55.54	-13	42.54	90
9	7619.4	-60.52	6.8	13.85	Vertical	-55.62	-13	42.62	0
10	8466	-62.22	6.9	14.25	Vertical	-57.02	-13	44.02	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.

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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	SCHWARZB ECK	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 BODY*******

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