



Part 22 TEST REPORT

Product Name	3G Quad Band HSDPA/HSUPA PoC enabled mobile phone
Model Name	Sonim XP5520-A-R1, Sonim XP5520-A-R2, Sonim XP5530-A-R1, Sonim XP5560-A-R1, Sonim XP5560-A-R2, Sonim XP5560-A-R3, Sonim XP5570-A-R1 (P35F008AA)
Marketing Name	Sonim XP5520 BOLT
FCC ID	WYPP35F008AA
IC	8090A-P35F008AA
Client	Sonim Technologies, Inc.

TA Technology (Shanghai) Co., Ltd.

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GENERAL SUMMARY

Product Name	3G Quad Band HSDPA/HSUPA PoC enabled mobile phone	Marketing Name	Sonim XP5520 BOLT
Model Name	Sonim XP5520-A-R1, Sonim XP5520-A-R2, Sonim XP5530-A-R1, Sonim XP5560-A-R1, Sonim XP5560-A-R2, Sonim XP5560-A-R3, Sonim XP5570-A-R1 (P35F008AA)		
FCC ID	WYPP35F008AA		
IC	8090A-P35F008AA		
Report No.	RZA1109-1686RF02R1		
Client	Sonim Technologies, Inc.		
Manufacturer	Sonim Technologies, Inc.		
Reference Standard(s)	<p>FCC CFR47 Part 2 (2010-12) Frequency Allocations And Radio Treaty Matters;General Rules And Regulations</p> <p>FCC CFR 47 Part 22H (2010-12) Public Mobile Services(850MHz)</p> <p>ANSI/TIA-603-C(2004) Land mobile FM or PM Communications Equipment Measurements and Performance Standards.</p> <p>RSS-132 Issue 2 (2005-9) Cellular Telephones Employing New Technologies Operating in the Bands 824-849 MHz and 869-894 MHz</p> <p>RSS-Gen Issue 2 (2007-6) General Requirements and Information for the Certification of Radio communication Equipment</p>		
Conclusion	<p>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.</p> <p>General Judgment: Pass</p> <p style="text-align: right;">(Stamp) Date of issue: November 25th, 2011</p>		
Comment	The test result only responds to the measured sample.		

Approved by 初伟中
Director

Revised by 徐凯
RF Manager

Performed by 李
RF Engineer

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1. General Information

1.1. Notes of the test report

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. This report only refers to the item that has undergone the test.

This report standalone dose 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 electrical 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

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1.3. Applicant Information

Company: Sonim Technologies, Inc.
Address: 1875 S. Grant Street, Suite 620
City: San Mateo
Postal Code: Ca 94420
Country: U.S.A
Contact: Sabrina Payonk
Telephone: +1 650 353 9851
Fax: +1 650 378 8190

1.4. Manufacturer Information

Company: Sonim Technologies, Inc.
Address: 1875 S. Grant Street, Suite 620
City: San Mateo
Postal Code: Ca 94420
Country: U.S.A
Telephone: +1 650 353 9851
Fax: +1 650 378 8190

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1.5. Information of EUT

General information

Name of EUT:	3G Quad Band HSDPA/HSUPA PoC enabled mobile phone		
IMEI :	001080000529504		
Hardware Version:	A		
Software Version:	11.0.0-12.0.2-4100-00.0		
Antenna Type:	Internal Antenna		
Device Operating Configurations:			
Operating Mode(s):	GSM 850:(tested) WCDMA Band V;(tested)		
Test Modulation:	(GSM)GMSK; (WCDMA)QPSK		
GPRS Multislot Class:	12		
EGPRS Multislot Class:	12		
Maximum E.R.P.	GSM 850: 31.6391 dBm WCDMA Band V: 21.071 dBm		
Power Supply:	Battery or Charger (AC adaptor)		
Rated Power Supply Voltage:	3.7V		
Extreme Voltage:	Minimum: 3.5V Maximum: 4.2V		
Extreme Temperature:	Lowest: -20°C Highest: +60°C		
Test Channel: (Low - Middle - High)	128 - 190 - 251 4132 - 4183 - 4233	(GSM 850) (WCDMA Band V)	(tested) (tested)
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:	BAT-01950-01S
Manufacture:	Sonim Technologies, Inc.
S/N:	S1105000105

Equipment Under Test (EUT) is 3G Quad Band HSDPA/HSUPA PoC enabled mobile phone with internal antenna. The EUT is tested GSM 850 band in this report.

The sample under test was selected by the Client.

Components list please refer to documents of the manufacturer.

1.6. Test Date

The test is performed from October 8, 2011 to October 12, 2011.

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2. Test Information

2.1. Summary of test results

Number	Test Case	Clause in FCC rules	Clause in IC rules	Verdict
1	RF power output	2.1046	4.4	PASS
2	Effective Radiated Power	22.913(a)(2)	/	PASS
3	Occupied Bandwidth	2.1049	/	PASS
4	Band Edge Compliance	22.917	4.5	PASS
5	Frequency Stability	2.1055 / 22.355	4.3	PASS
6	Spurious Emissions at Antenna Terminals	2.1051 / 22.917(a)	/	PASS
7	Radiates Spurious Emission	2.1053 / 22.917 (a)	/	PASS
8	Receiver Spurious Emissions	/	4.6	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.

2.2. RF Power Output

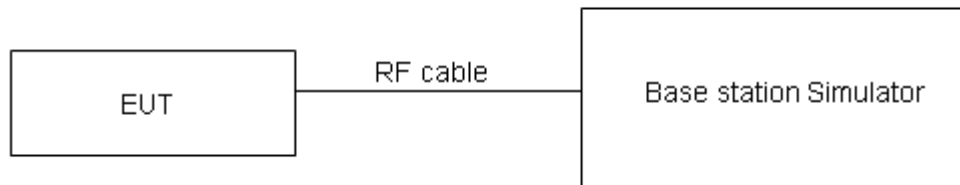
Ambient condition

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	33.1	33.06	33.03
GPRS (GMSK)	1TXslot	33.04	32.96	32.95
	2TXslots	32.86	32.65	32.77
	3TXslots	30.9	30.62	30.73
	4TXslots	29.57	29.32	29.41
EGPRS (8PSK)	1TXslot	25.83	25.86	25.75
	2TXslots	24.78	24.84	25.75
	3TXslots	22.88	22.76	22.75
	4TXslots	21.75	21.71	21.68

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)
12.2kbps RMC		22.54	22.5	22.42
64kbps RMC		22.51	22.35	22.4
144kbps RMC		22.45	22.41	22.32
384kbps RMC		22.44	22.15	22.34

Note:

- 1) The maximum RF Output Power numbers are marks in bold.
- 2) The following testing in WCDMA Band is set to 12.2kbps RMC based on the maximum RF Output Power.

2.3. Effective Radiated Power

Ambient condition

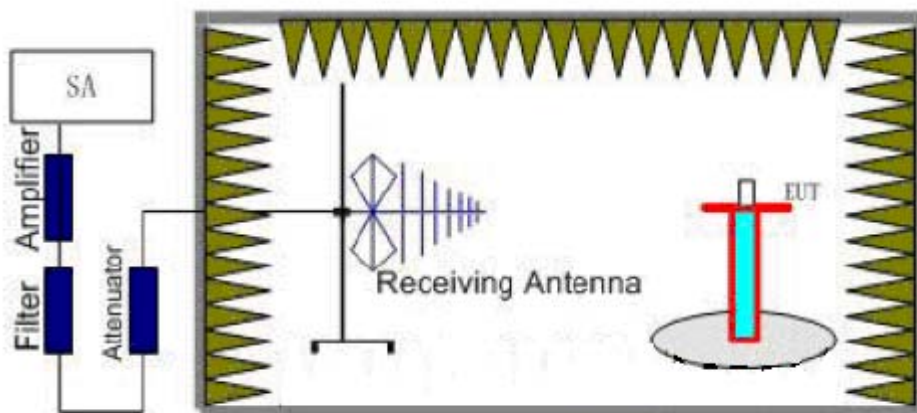
Temperature	Relative humidity
21°C ~25°C	40%~60%

Methods of Measurement

The measurement procedures in TIA- 603C are used.

Step 1:

The measurement is carried out in the semi-anechoic chamber. EUT was placed on a 0.8 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.



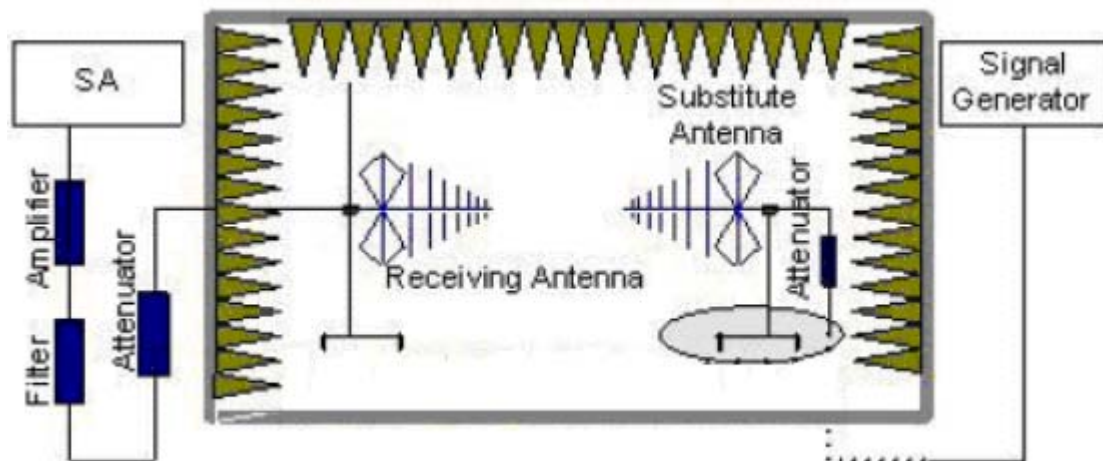
Step 2:

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 30dB amplifier and a Tx cable. Then the Analyzer reading which is equal to LVL is recorded while the antenna was moving up and down. 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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$$E.R.P = S.G + 30 - Tx \text{ Cable loss} + \text{Substitution antenna gain} - 2.15.$$

$$EIRP = E.R.P + 2.15$$

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

	Channel	Polarization	LVL (dBm)	SG+30 (dBm)	Gain (dBi)	Cable Loss (dBm)	E.R.P. (dBm)
GSM 850	128	Vertical	-25.79	45.93	1.06	15.17	29.6695
	190	Vertical	-24.56	46.43	1.24	15.2	30.1515
	251	Vertical	-25.79	46.98	1.38	15.24	30.7173
GSM 850 GPRS(GMSK)	128	Vertical	-23.04	46.77	1.06	15.17	30.4502
	190	Vertical	-24.56	47.02	1.24	15.2	31.011
	251	Vertical	-25.79	47.71	1.38	15.24	31.6391
GSM 850 EGPRS(8-PSK)	128	Vertical	-23.04	43.77	1.06	15.17	27.5149
	190	Vertical	-23.04	43.67	1.24	15.2	27.4086
	251	Vertical	-24.56	43.37	1.38	15.24	27.0946
WCDMA Band V	4132	Vertical	-25.79	36.23	1.06	15.17	20.1872
	4183	Vertical	-23.04	37.03	1.24	15.2	21.071
	4233	Vertical	-24.56	35.83	1.38	15.24	19.8177

Note: 1. E.R.P = S.G+30. - Tx Cable loss + Substitution antenna gain – 2.15.

2. EIRP= E.R.P+2.15

2.4. Occupied Bandwidth

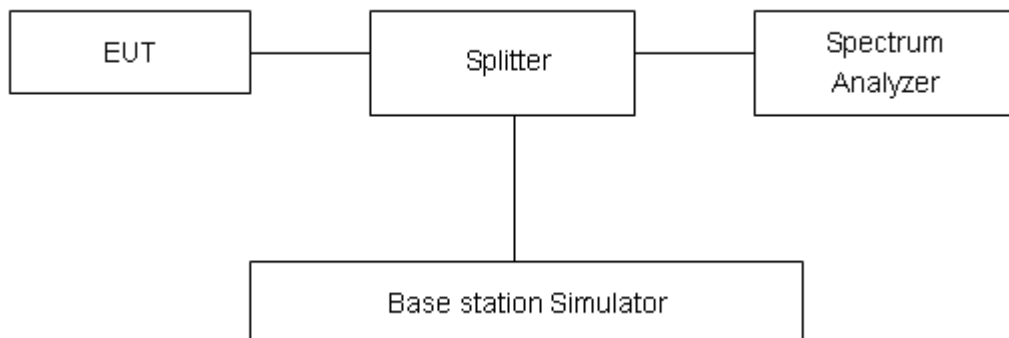
Ambient condition

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 $k = 2$, $U = 624\text{Hz}$.

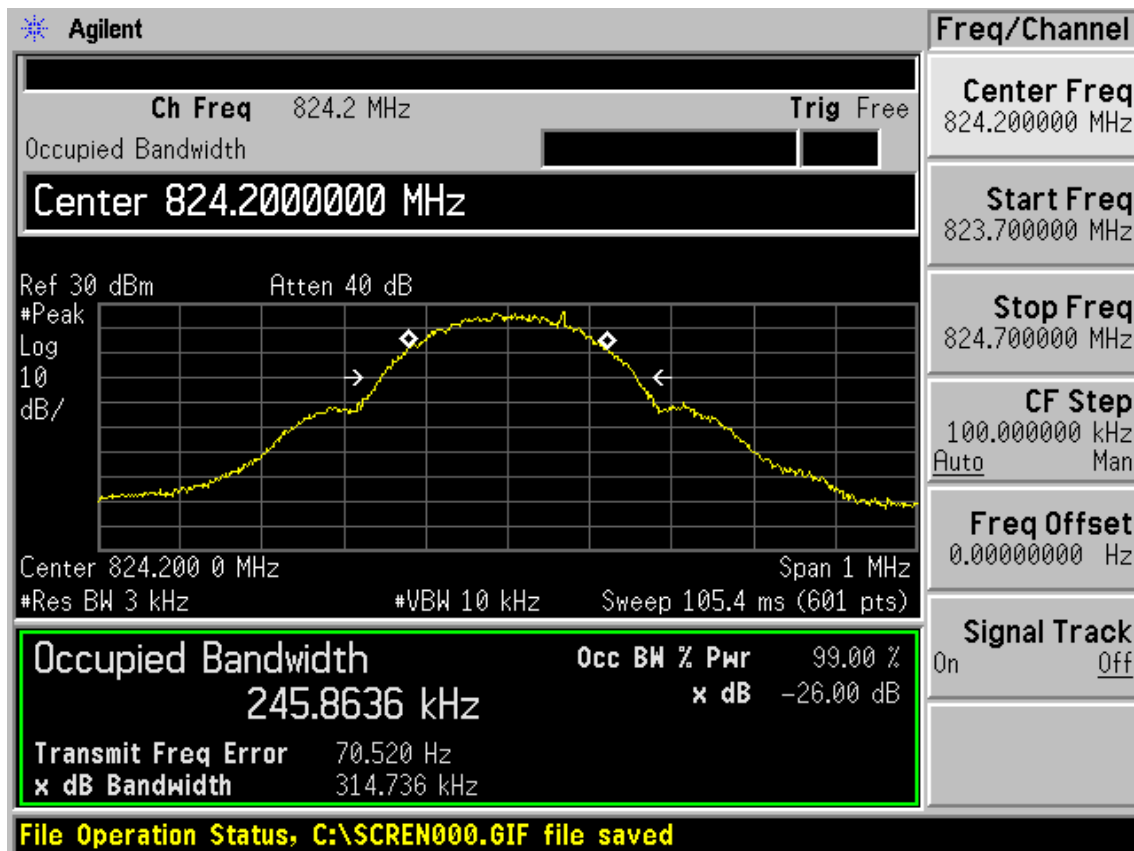
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Test Result

	Channel	Frequency (MHz)	99% Power Bandwidth (kHz)	-26dBc Bandwidth(kHz)
GSM 850	128	824.2	245.8636	314.736
	190	836.6	245.7247	307.173
	251	848.8	246.7997	311.369
GSM 850+GPRS	128	824.2	247.4966	312.472
	190	836.6	246.9839	311.929
	251	848.8	248.0150	305.551
GSM 850+EGPRS	128	824.2	249.7787	314.172
	190	836.6	248.5538	316.029
	251	848.8	246.2031	310.184

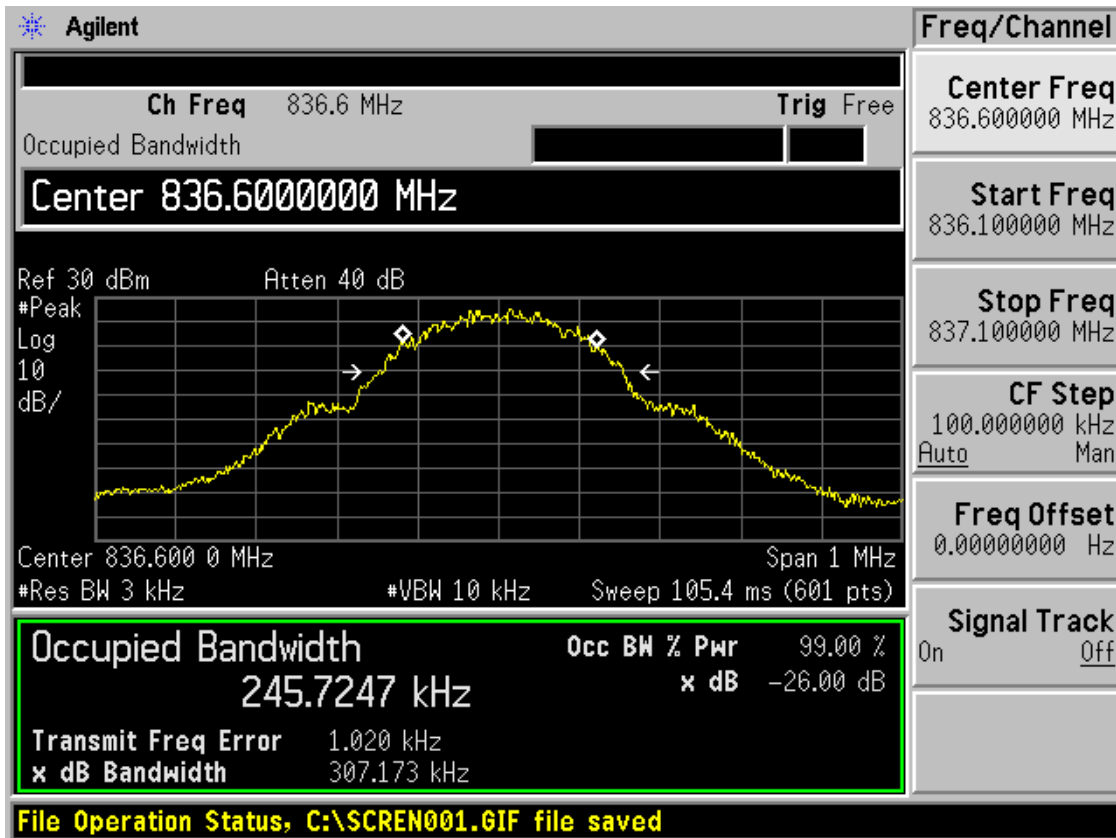


GSM 850 CH128 Occupied Bandwidth

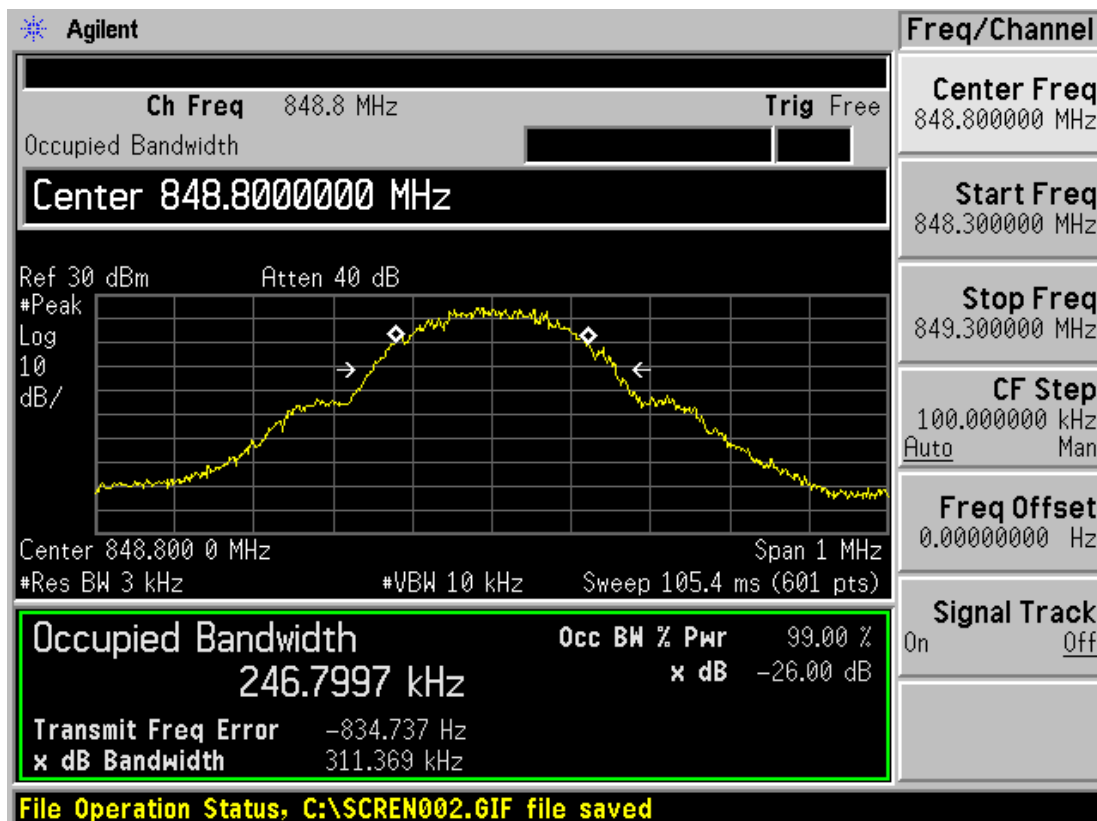
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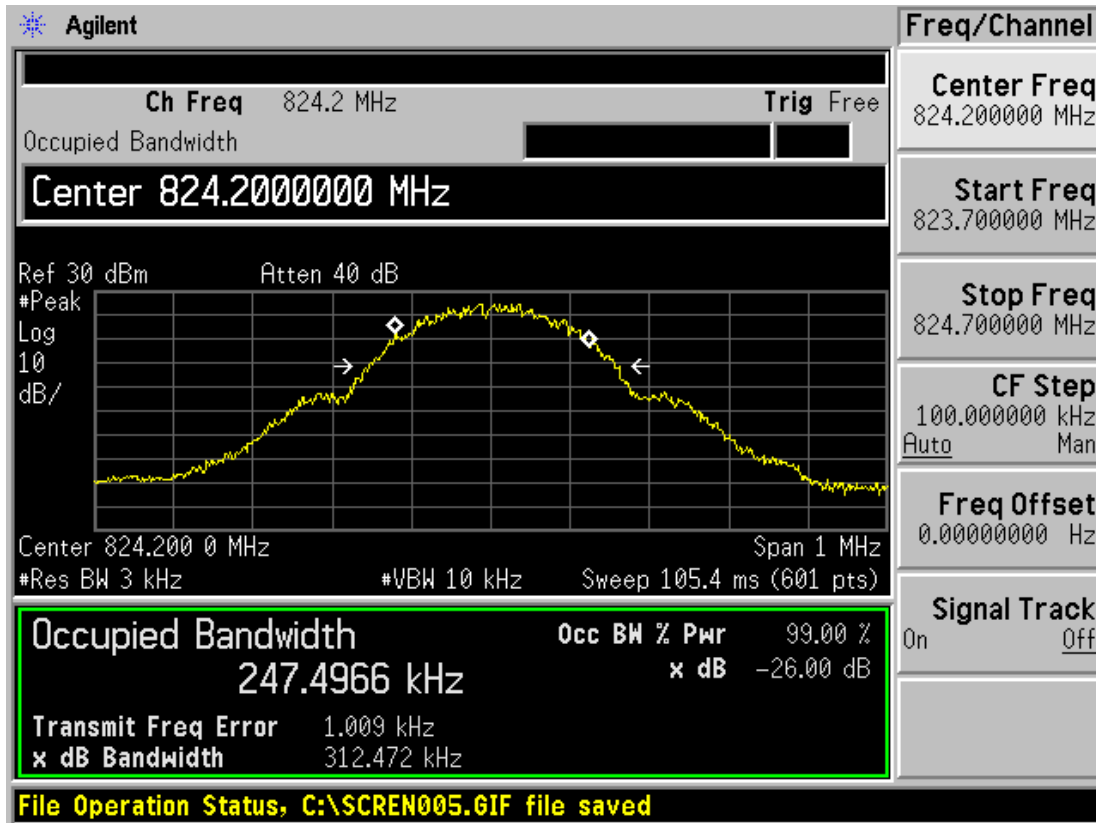


GSM 850 CH190 Occupied Bandwidth

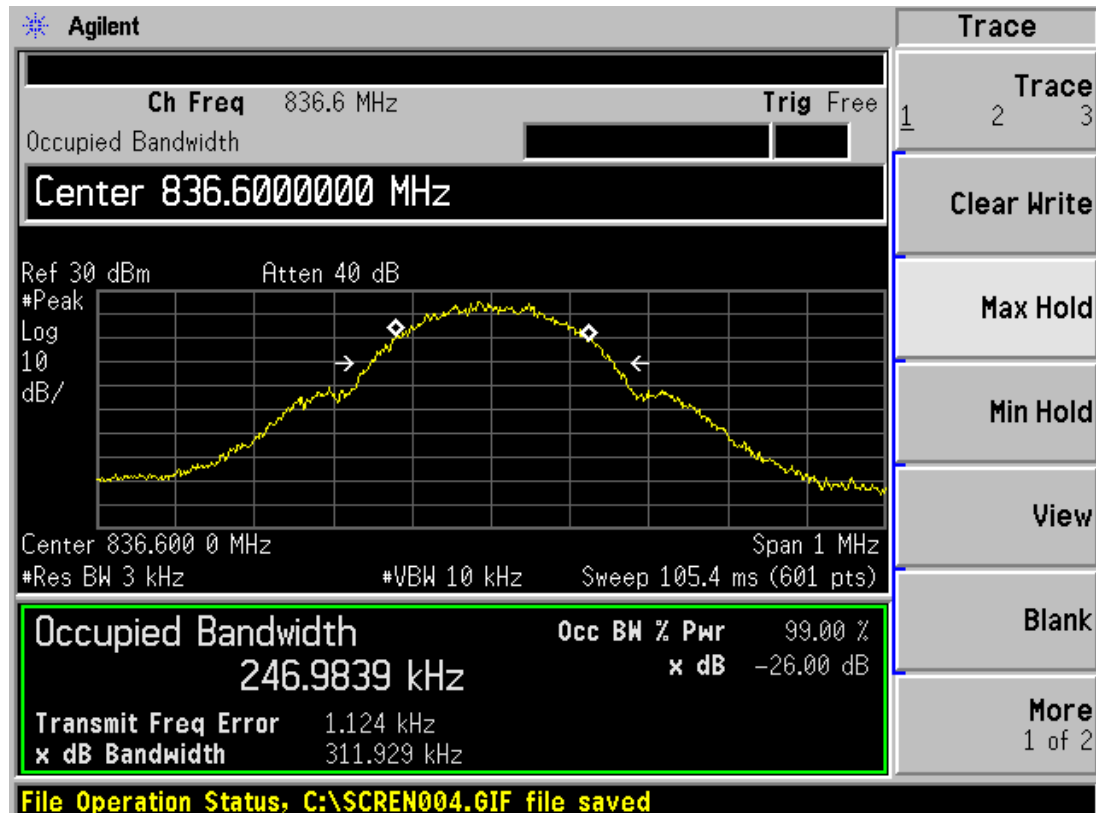


GSM 850 CH251 Occupied Bandwidth

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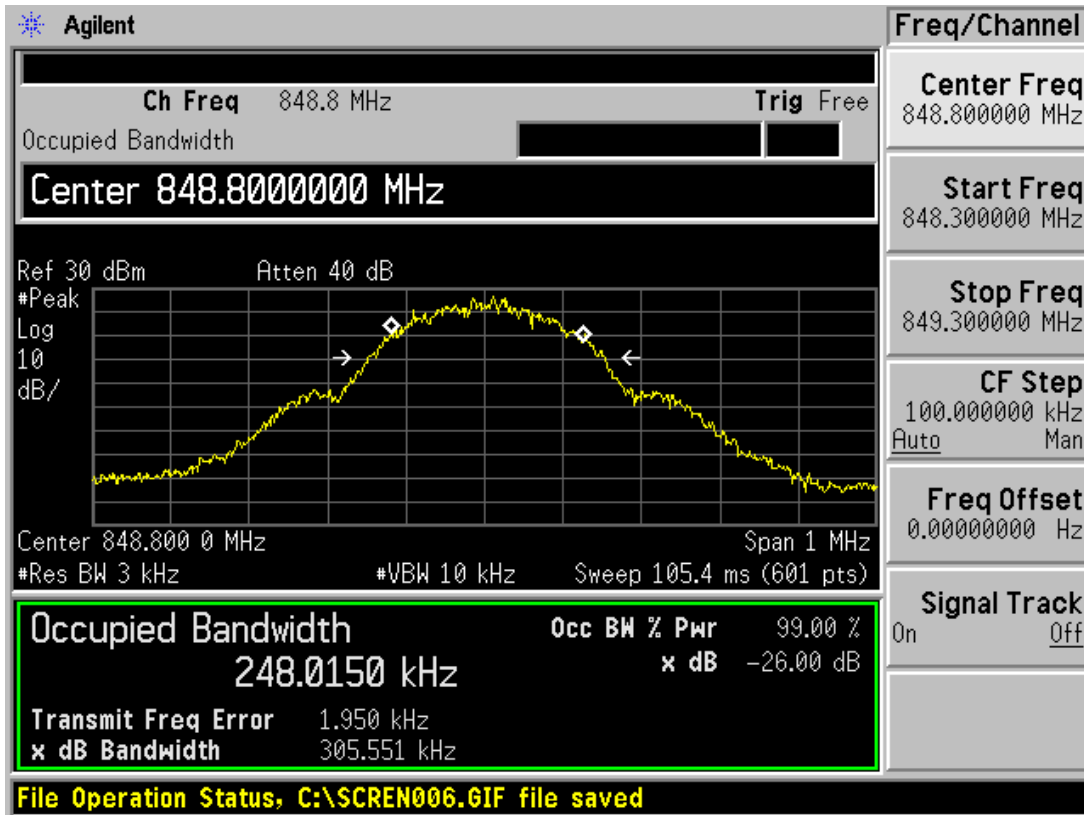


GSM 850 GPRS CH128 Occupied Bandwidth

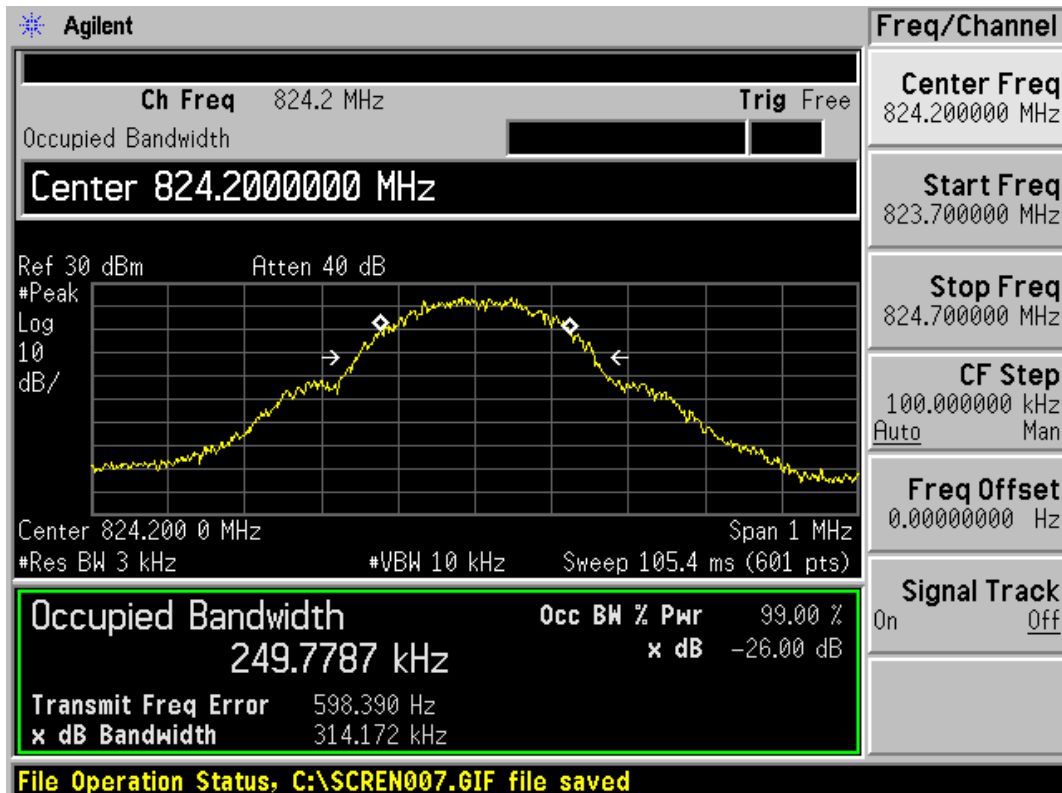


GSM 850 GPRS CH190 Occupied Bandwidth

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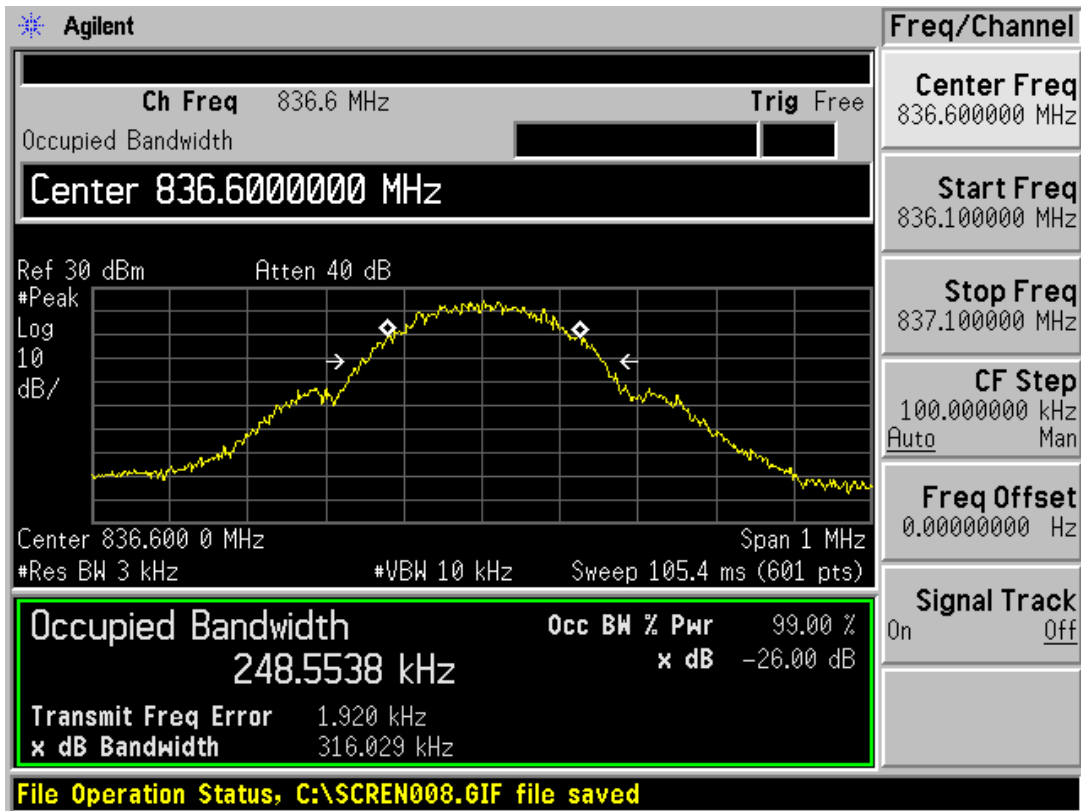


GSM 850 GPRS CH251 Occupied Bandwidth

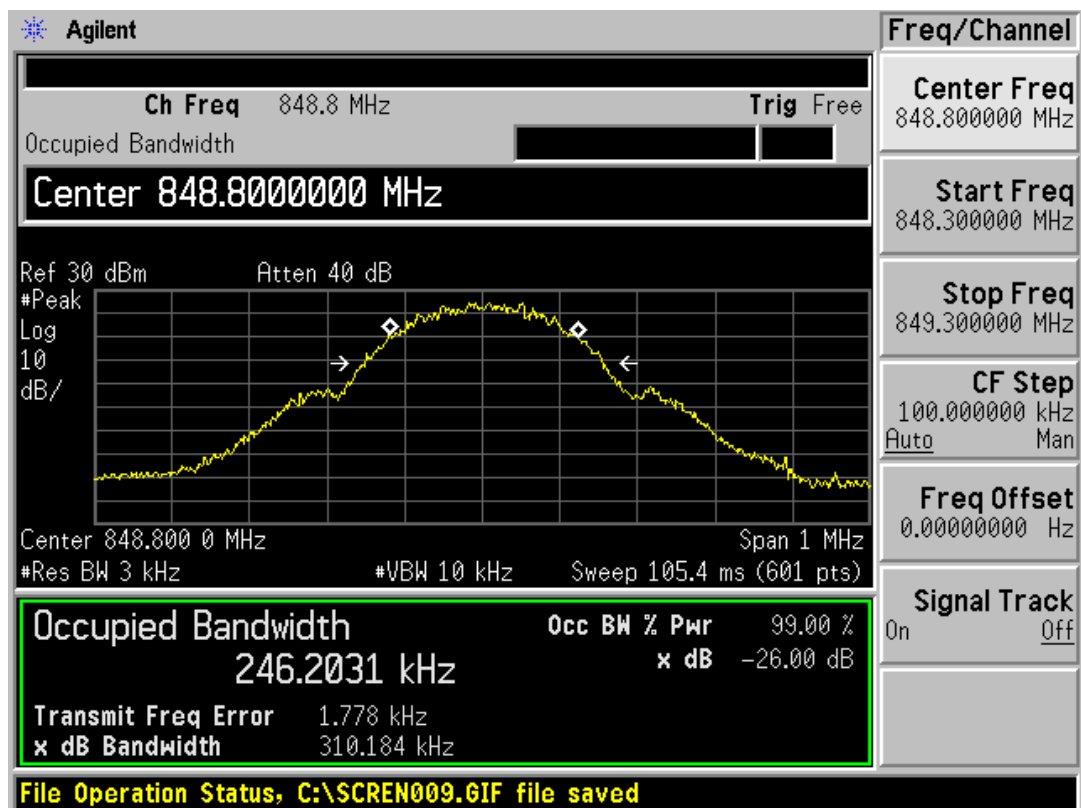


GSM 850 EGPRS CH128 Occupied Bandwidth

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GSM 850 EGPRS CH190 Occupied Bandwidth



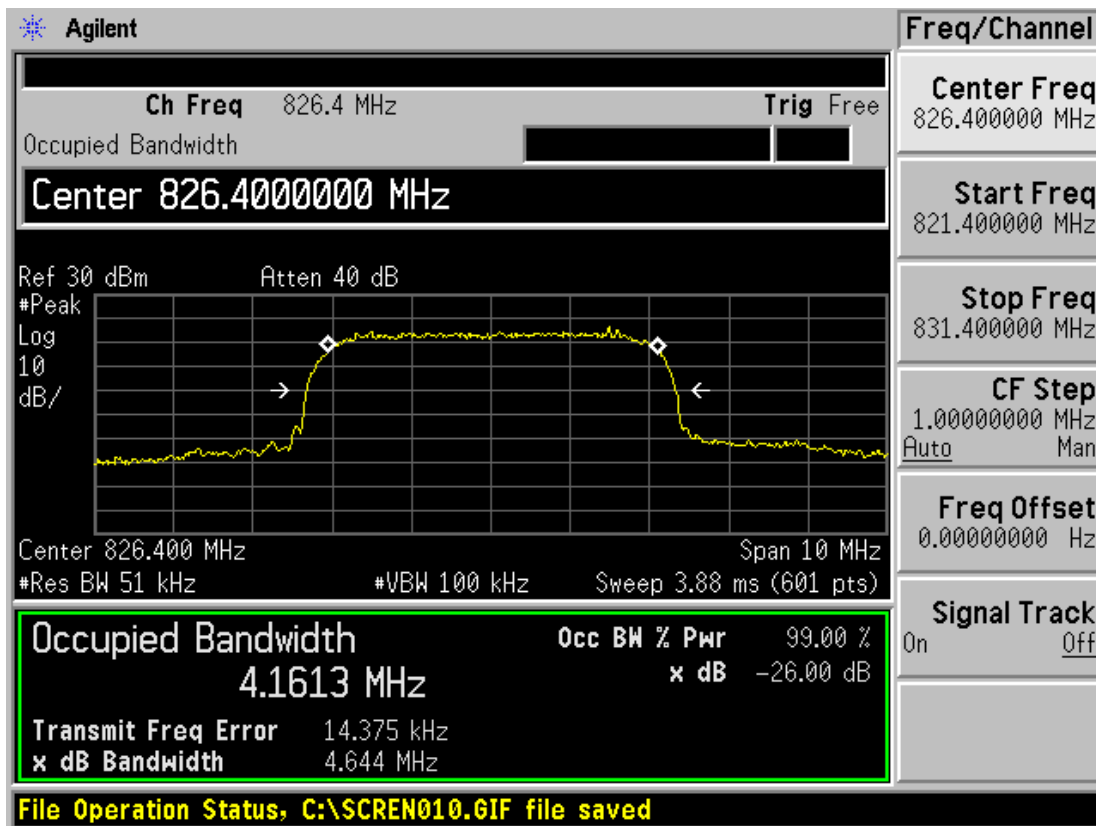
GSM 850 EGPRS CH251 Occupied Bandwidth

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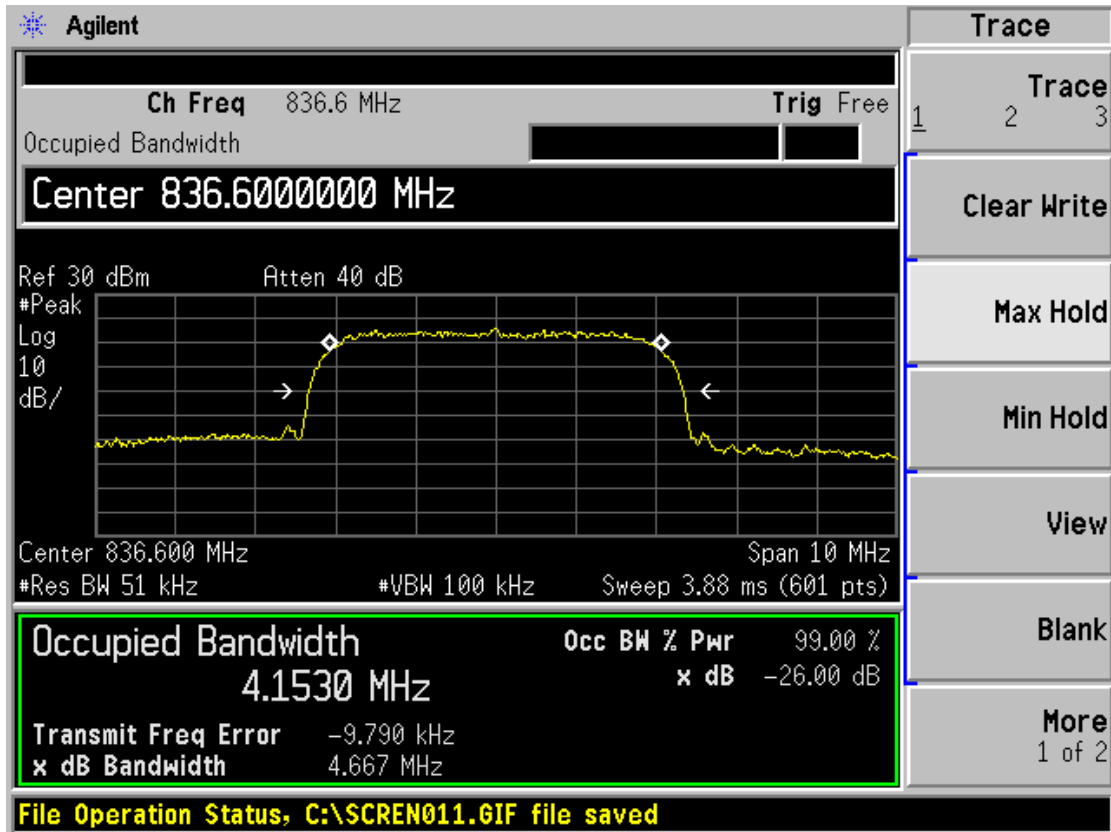
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	Channel	Frequency (MHz)	99% Power Bandwidth (MHz)	-26dBc Bandwidth(MHz)
WCDMA Band V	4132	826.4	4.1613	4.644
	4183	836.6	4.1530	4.667
	4233	846.6	4.1534	4.665

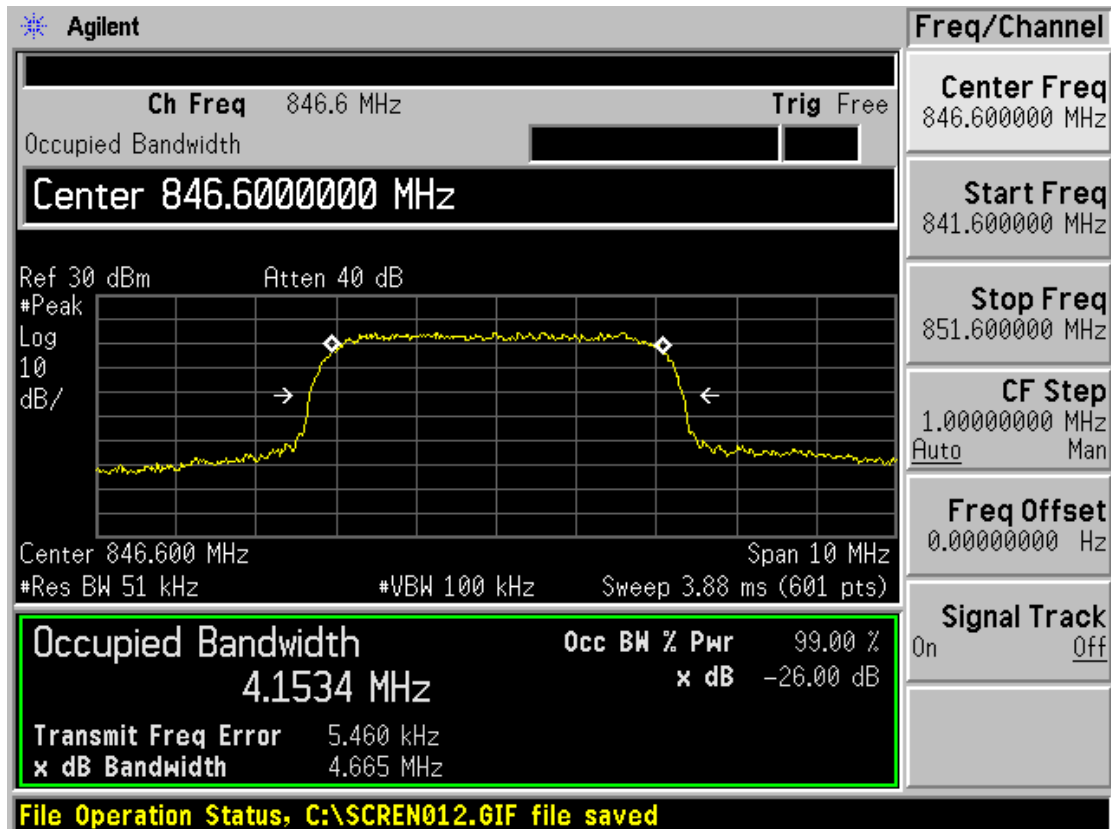


WCDMA Band V CH4132 Occupied Bandwidth

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WCDMA Band V CH4183 Occupied Bandwidth



WCDMA Band V CH4233 Occupied Bandwidth

2.5. Band Edge Compliance

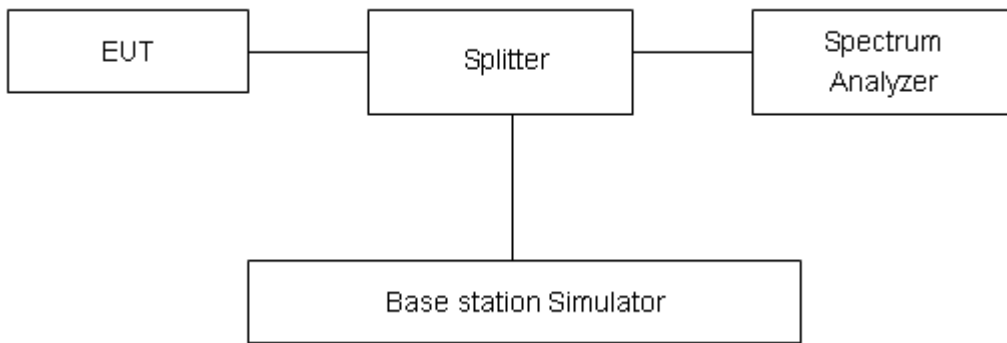
Ambient condition

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.

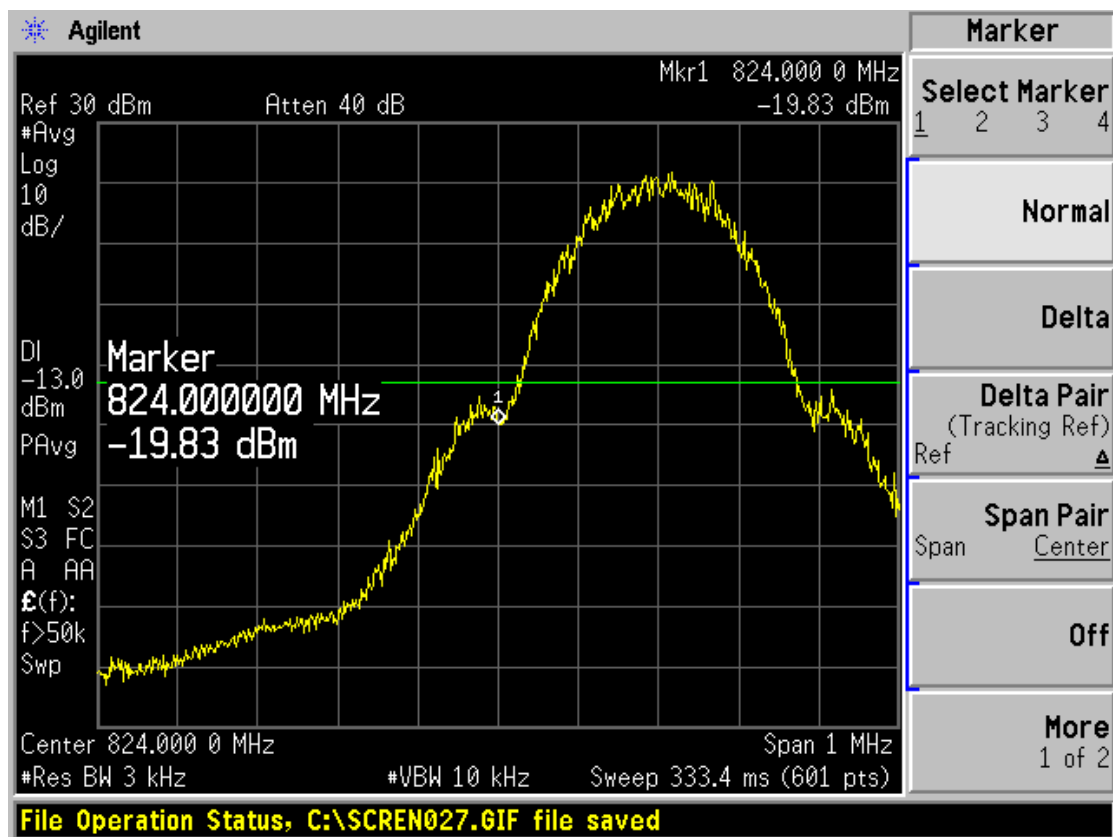
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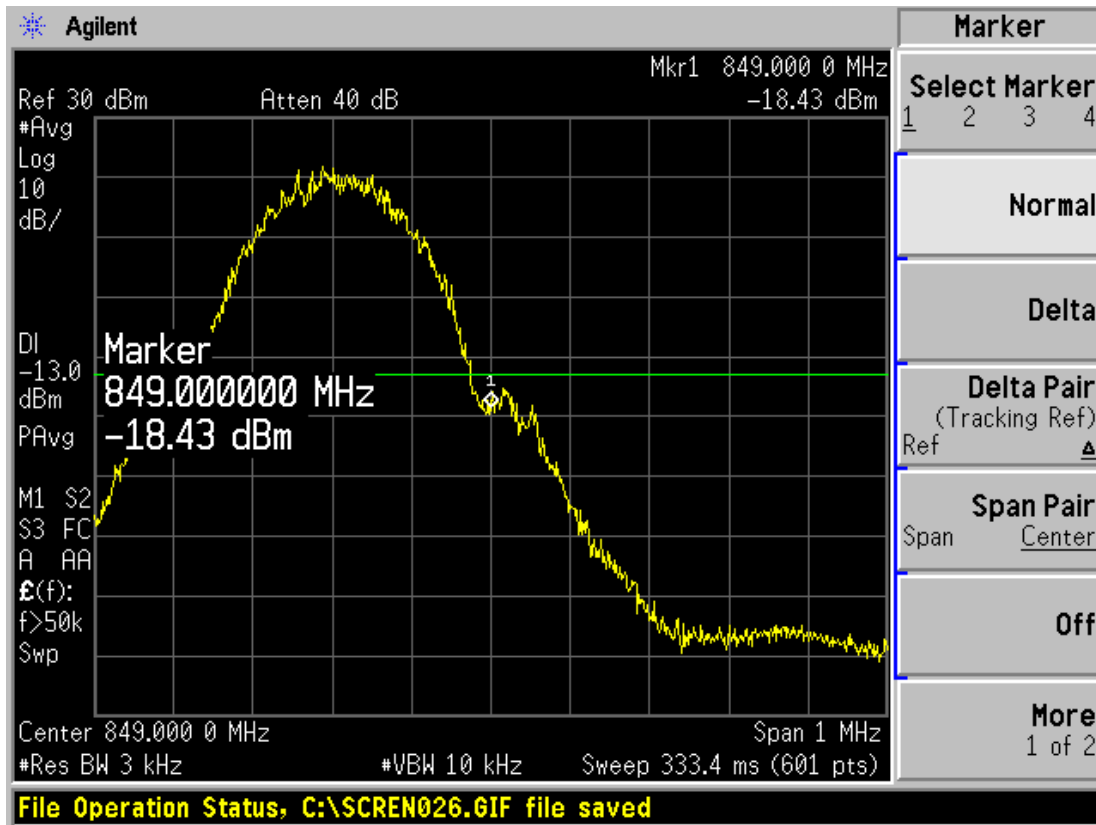
Test Result:

	Carrier frequency (MHz)	Reference value (dBm)	Limit	Conclusion
GSM 850	824.0	-19.83	-13	PASS
	849.0	-18.43	-13	PASS
GSM 850+GPRS	824.0	-18.33	-13	PASS
	849.0	-16.78	-13	PASS
GSM 850+EGPRS	824.0	-31.00	-13	PASS
	849.0	-29.01	-13	PASS

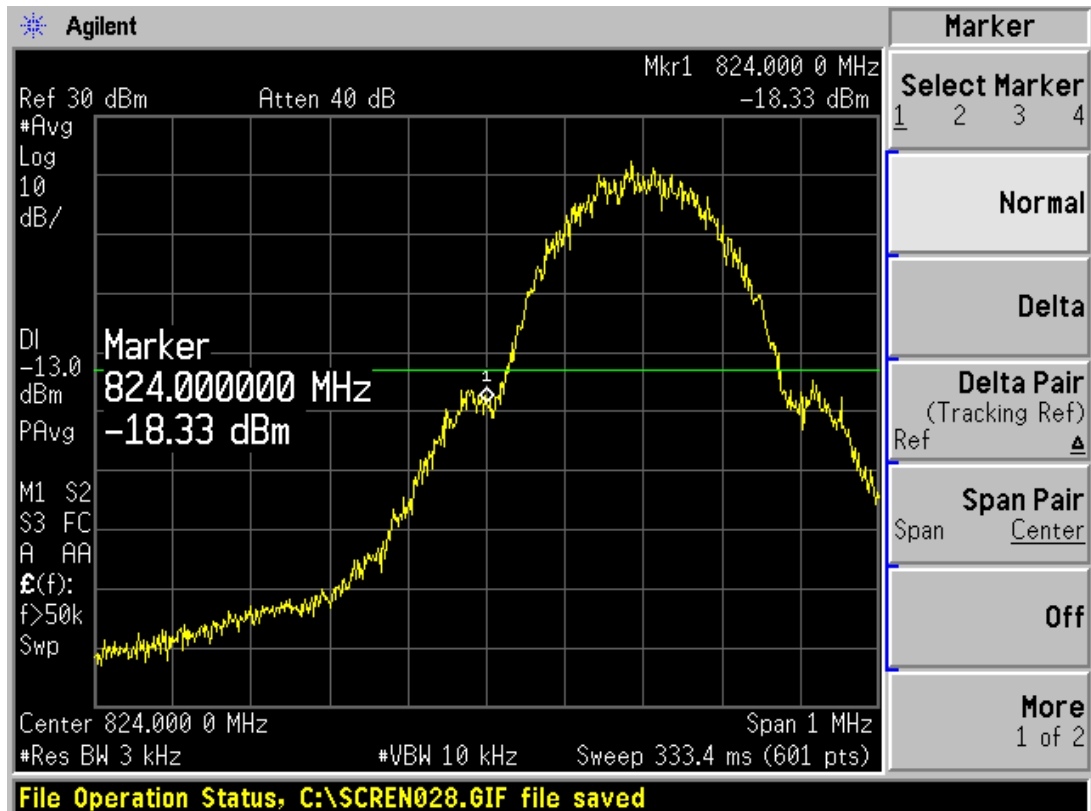


GSM 850 128 Channel

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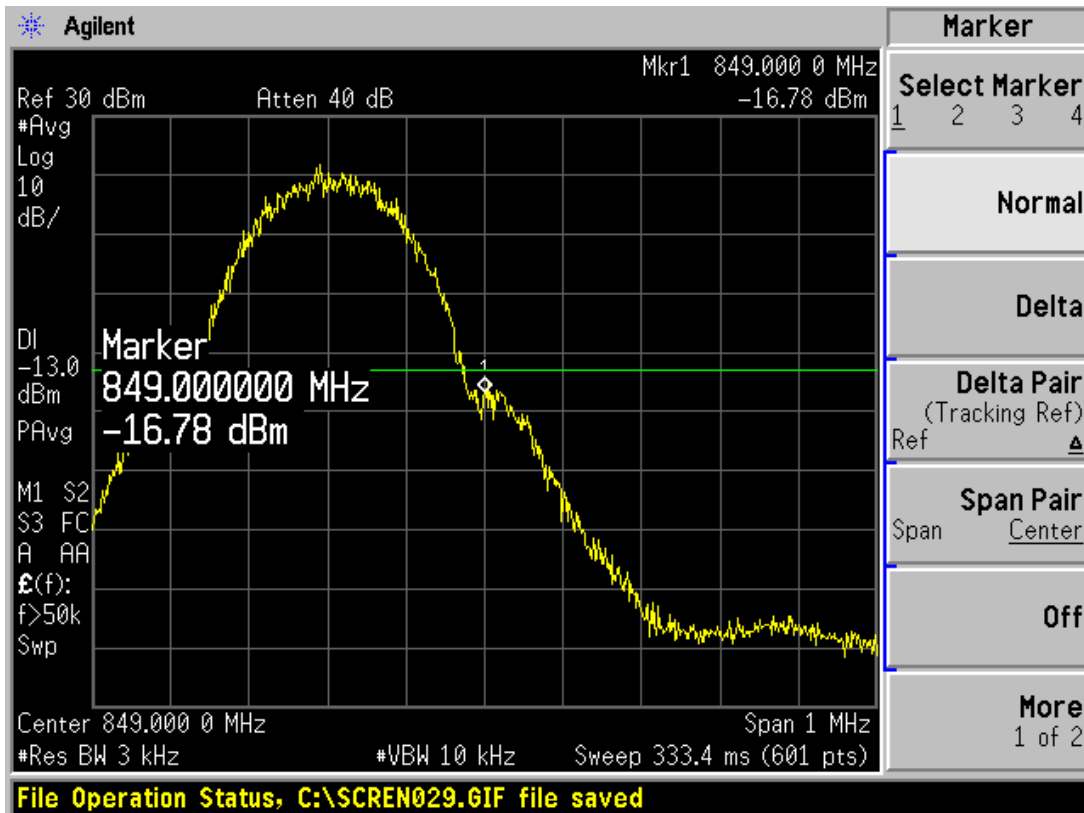


GSM 850 251 Channel

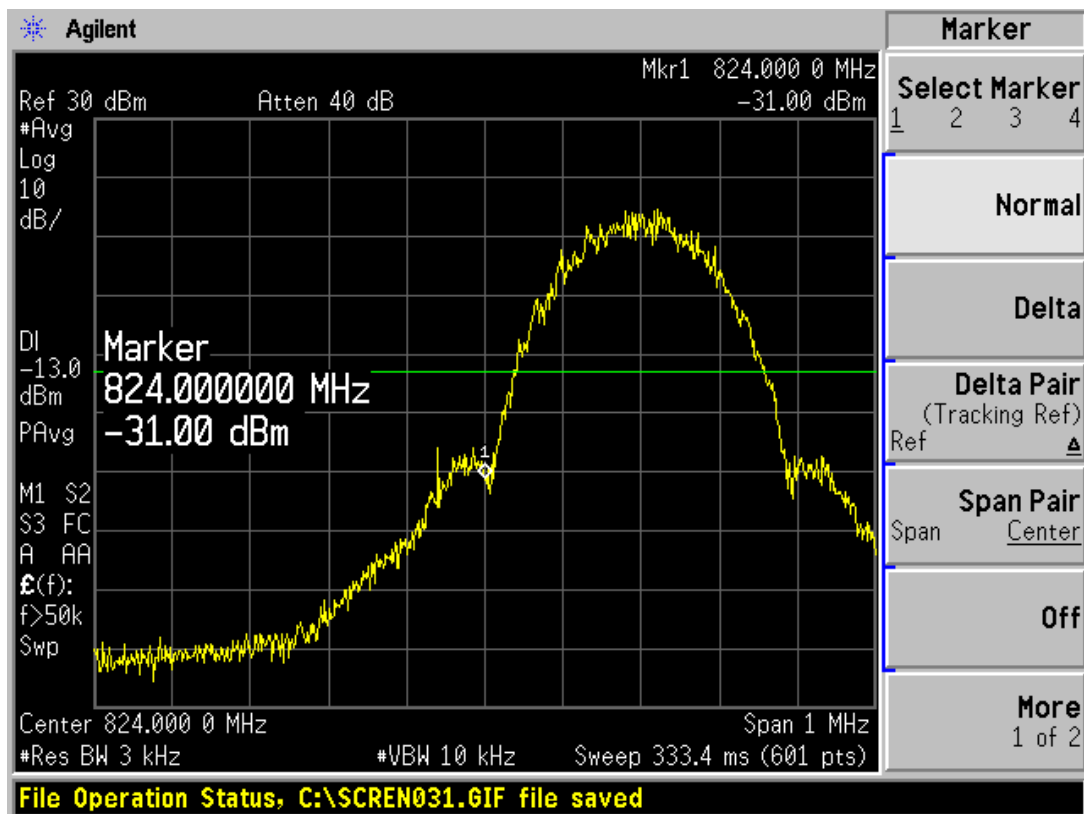


GSM 850 GPRS 128 Channel

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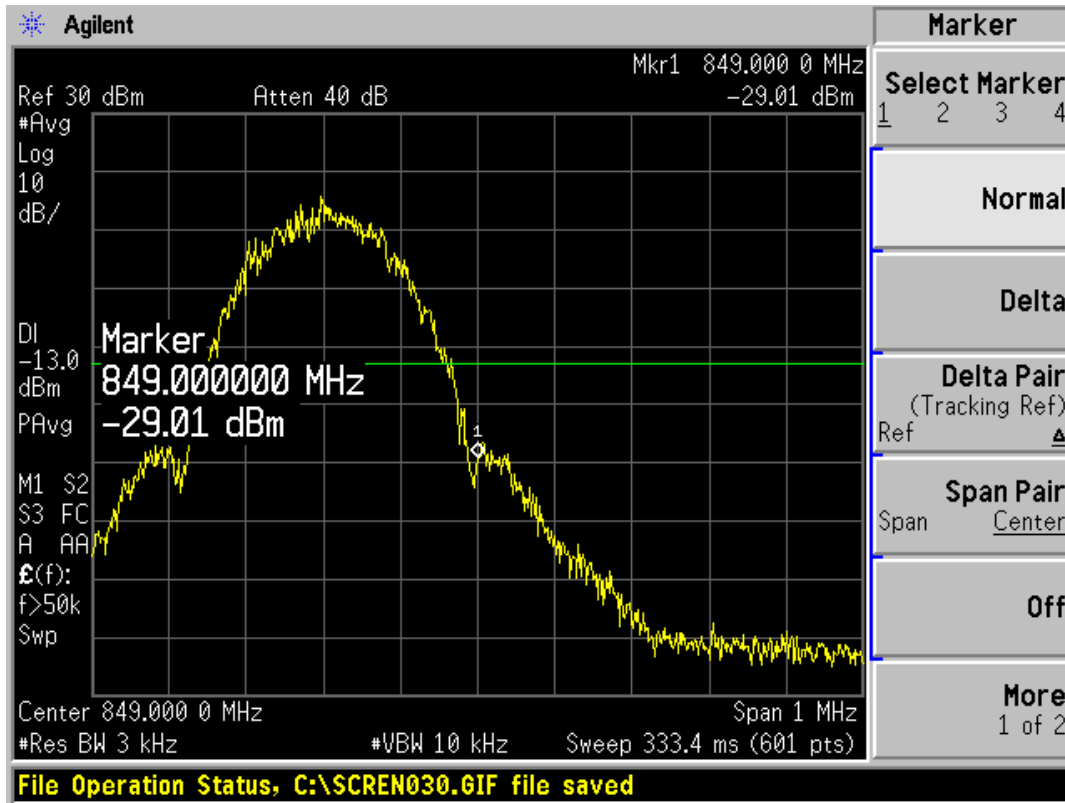


GSM 850 GPRS 251 Channel



GSM 850 EGPRS 128 Channel

TA Technology (Shanghai) Co., Ltd.
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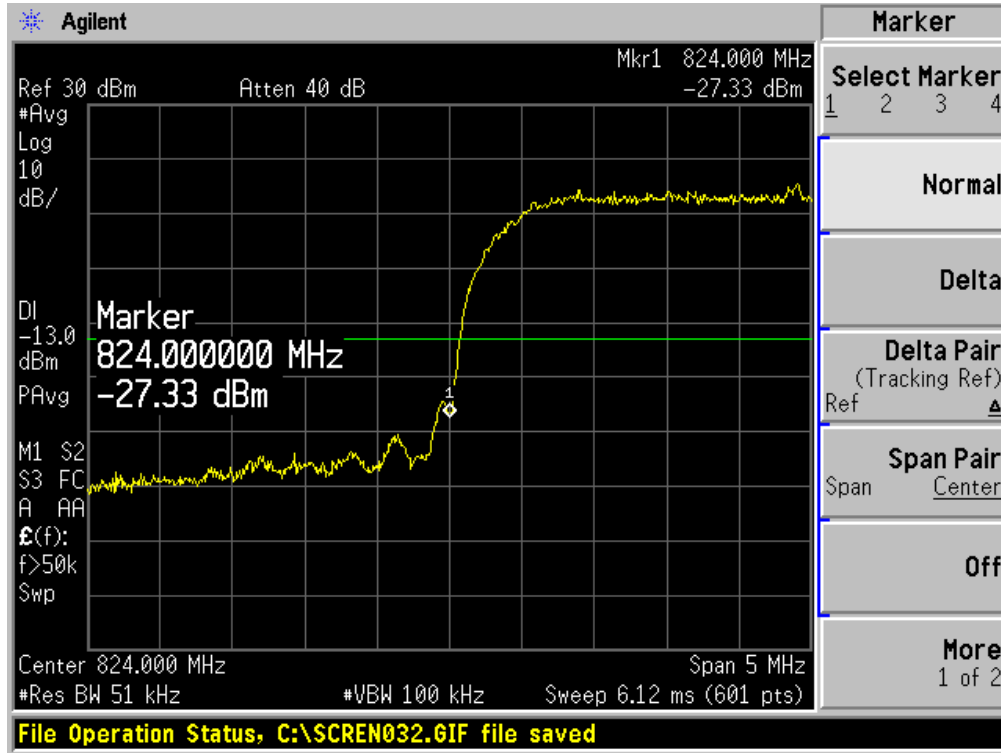
GSM 850 EGPRS 251 Channel

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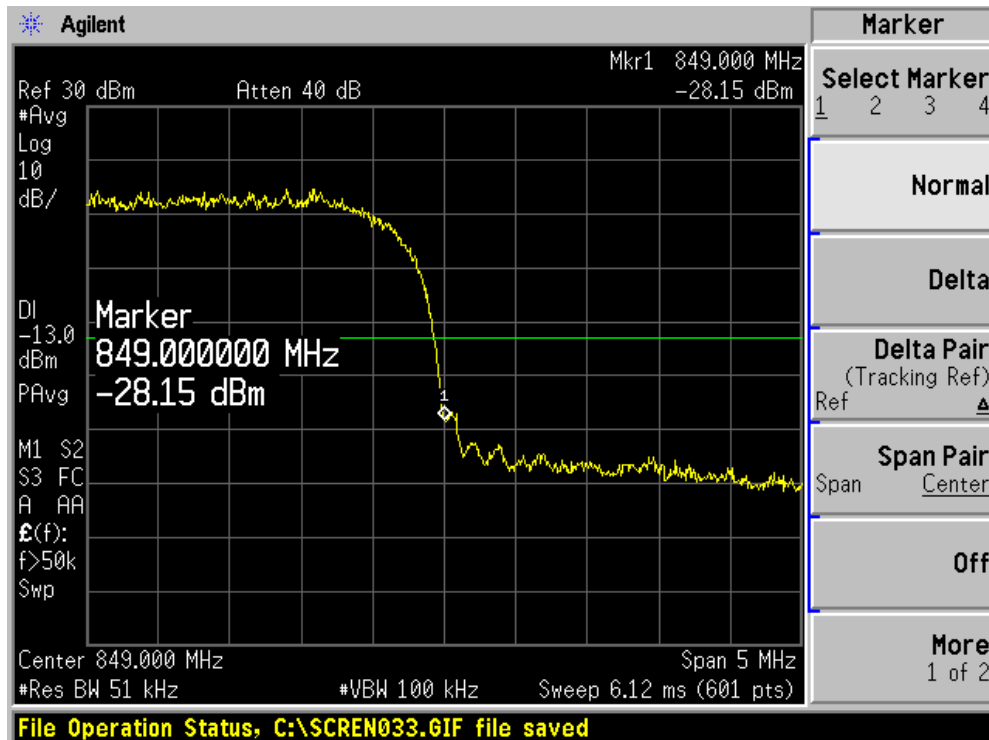
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	Carrier frequency (MHz)	Reference value (dBm)	Limit	Conclusion
WCDMA Band V	824	-27.33	-13	PASS
	849	-28.15	-13	PASS



WCDMA Band V 4132 Channel



WCDMA Band V 4233 Channel

2.6. 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 -30°C to +50°C in 10°C step size,

(1) With all power removed, the temperature was decreased to -30°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 -30°C to +50°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements.

2. Frequency Stability (Voltage Variation)

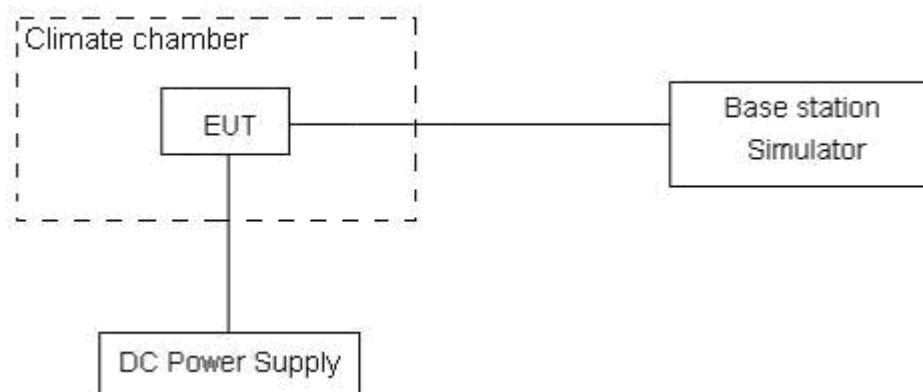
The frequency stability shall be measured with variation of primary supply voltage as follows:

(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 3.7V.

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 from the base station.

Limits	≤ 2.5 ppm
--------	----------------

Measurement Uncertainty

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

Test Result

Temperature (°C)	Test Results (ppm) / 3.7 V Power supply
	Channel 190
-30	0.00462
-20	0.00357
-10	0.00283
0	0.00078
10	0.0034
20	0.00291
30	0.00293
40	0.00321
50	0.00379

Voltage (V)	Test Results(ppm) / 20°C
	Channel 190
3.5	0.00287
3.7	0.00291
4.2	0.00403

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WCDMA Band V

Temperature (°C)	Test Results (ppm) / 3.7 V Power supply
	Channel 4183
-30	0.00334
-20	0.00277
-10	0.00193
0	0.00064
10	0.00370
20	0.00286
30	0.00298
40	0.00374
50	0.00423

Voltage (V)	Test Results(ppm) / 20°C
	Channel 4183
3.5	0.00302
3.7	0.00286
4.2	0.00387

2.7. Spurious Emissions at Antenna Terminals

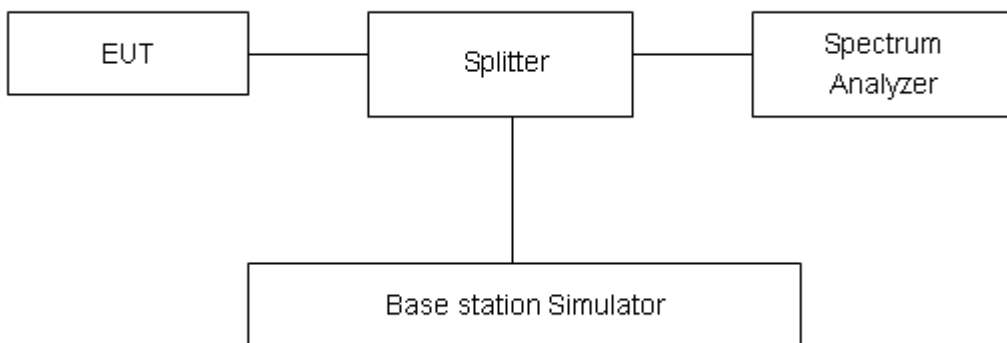
Ambient condition

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
-------	---------

Measurement Uncertainty

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

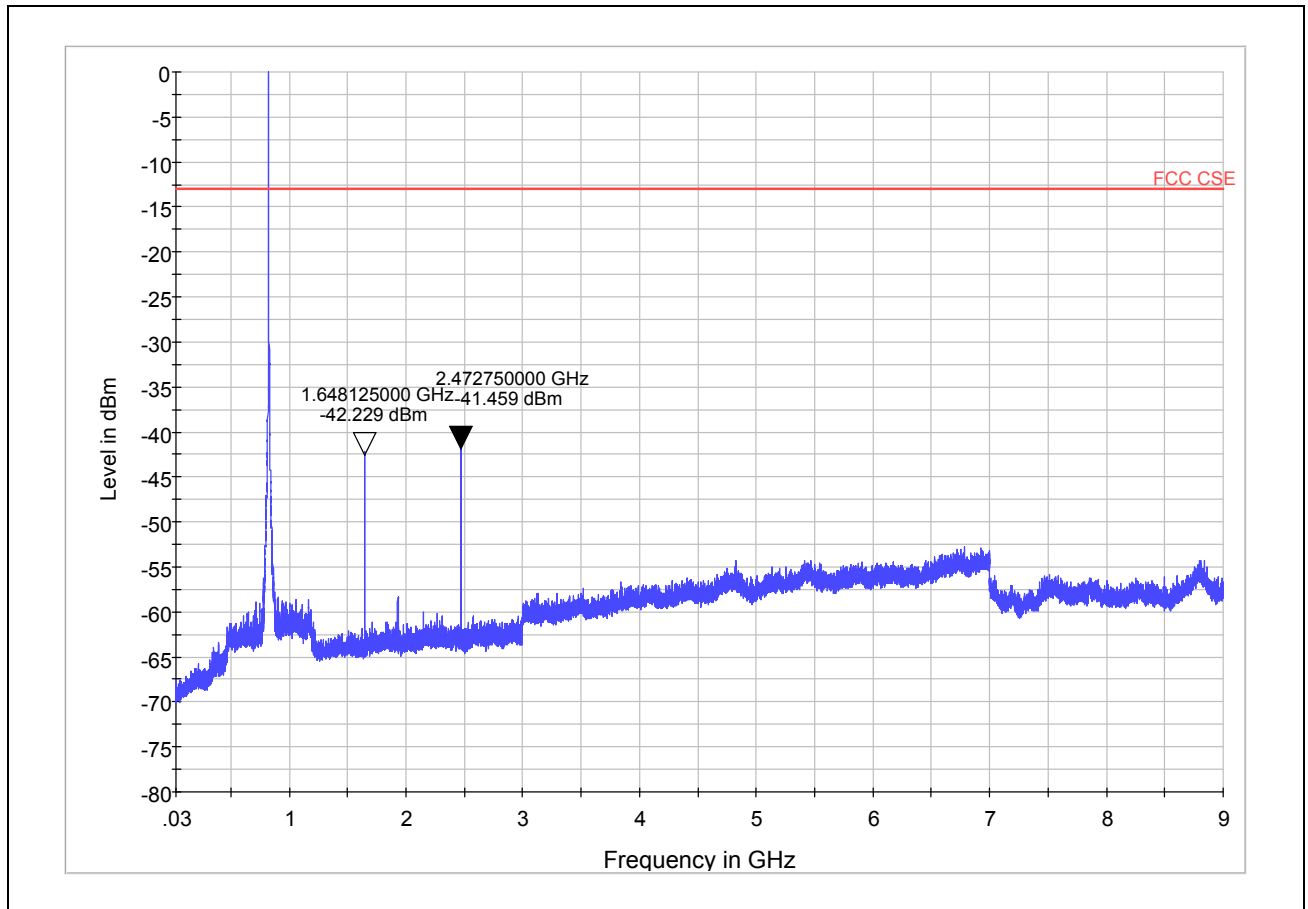
Frequency	Uncertainty
100kHz-2GHz	0.684 dB
2GHz-12.75GHz	1.407 dB

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Test Result

GSM 850 CH128



Note: The signal beyond the limit is carrier

GSM 850 128 Channel 30MHz~9GHz

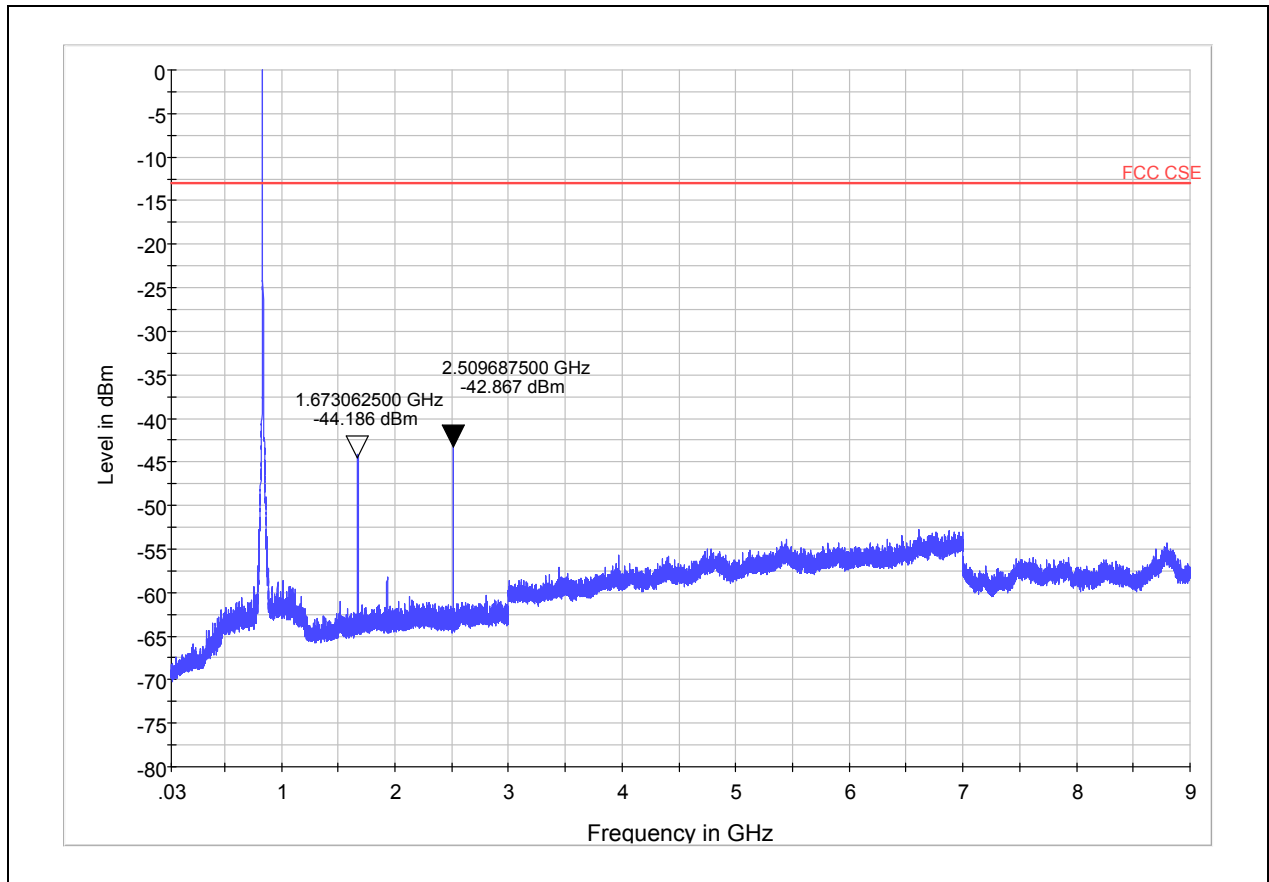
Harmonic	TX ch.128 Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
2	1648.125	-42.229	-13	29.229
3	2472.75	-41.459	-13	28.459
4	3296.8	Nf	-13	/
5	4121	Nf	-13	/
6	4945.2	Nf	-13	/
7	5769.4	Nf	-13	/
8	6593.6	Nf	-13	/
9	7417.8	Nf	-13	/
10	8242	Nf	-13	/

Nf: noise floor

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

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GSM 850 CH190



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

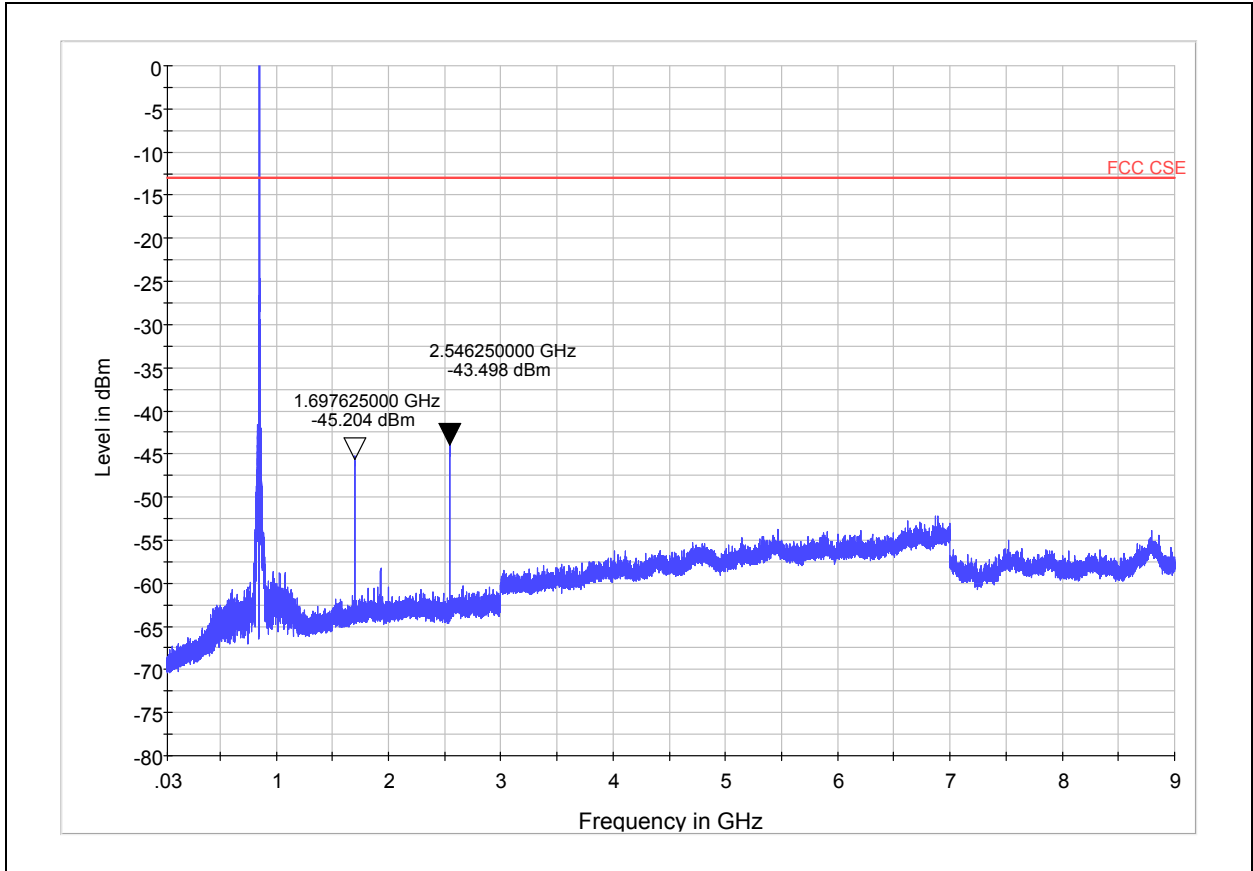
Harmonic	TX ch.190 Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
2	1673.0625	-44.186	-13	31.186
3	2509.6875	-42.867	-13	29.867
4	3346.4	Nf	-13	/
5	4183	Nf	-13	/
6	5019.6	Nf	-13	/
7	5856.2	Nf	-13	/
8	6692.8	Nf	-13	/
9	7529.4	Nf	-13	/
10	8366	Nf	-13	/

Nf: noise floor

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

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GSM 850 CH251



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

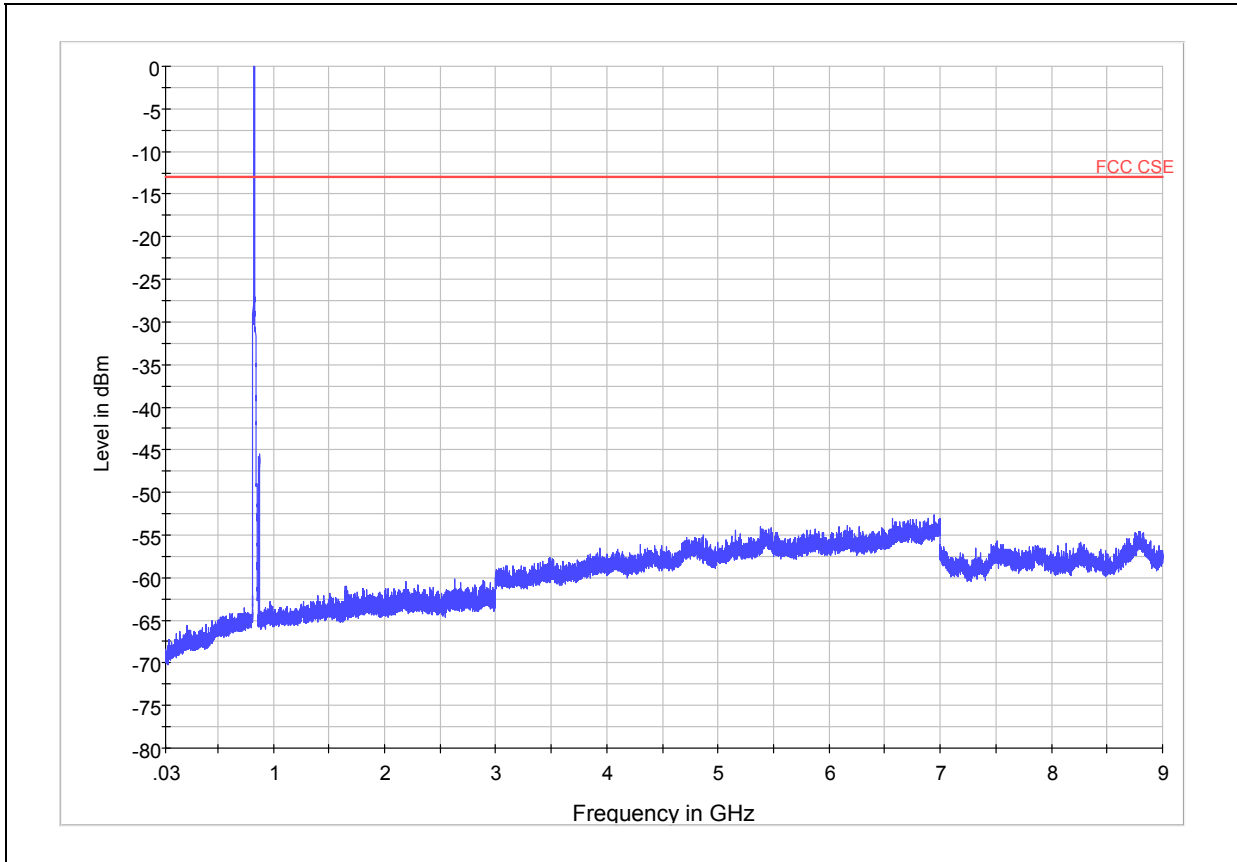
Harmonic	TX ch.251 Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
2	1697.625	-45.204	-13	32.204
3	2546.25	-43.498	-13	30.498
4	3395.2	Nf	-13	/
5	4244	Nf	-13	/
6	5092.8	Nf	-13	/
7	5941.6	Nf	-13	/
8	6790.4	Nf	-13	/
9	7639.2	Nf	-13	/
10	8488	Nf	-13	/

Nf: noise floor

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

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WCDMA Band V CH4132



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

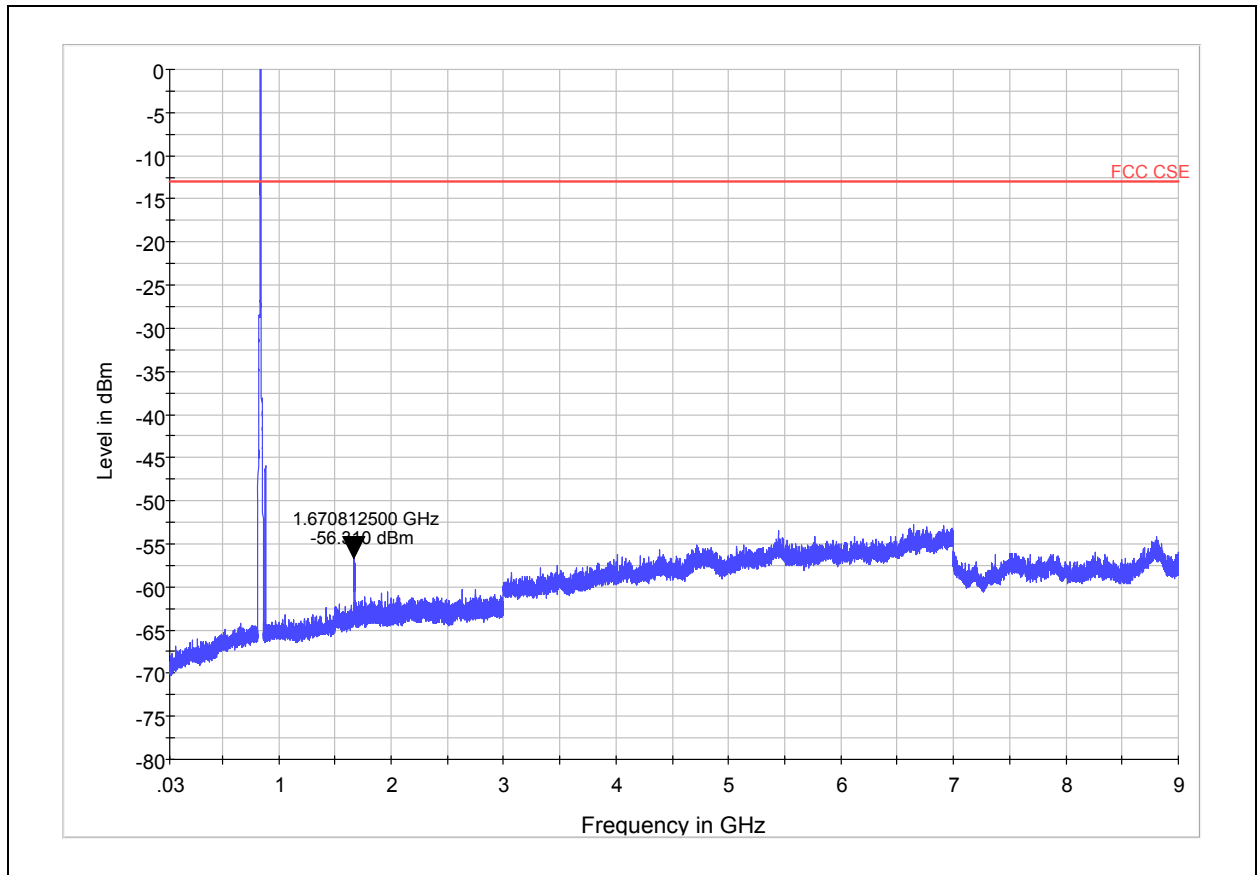
Harmonic	TX ch.4132 Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
2	1652.8	Nf	-13	/
3	2479.2	Nf	-13	/
4	3305.6	Nf	-13	/
5	4132	Nf	-13	/
6	4958.4	Nf	-13	/
7	5784.8	Nf	-13	/
8	6611.2	Nf	-13	/
9	7437.6	Nf	-13	/
10	8264	Nf	-13	/

Nf: noise floor

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

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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	1670.8125	-56.31	-13	43.31
3	2509.8	Nf	-13	/
4	3346.4	Nf	-13	/
5	4183	Nf	-13	/
6	5019.6	Nf	-13	/
7	5856.2	Nf	-13	/
8	6692.8	Nf	-13	/
9	7529.4	Nf	-13	/
10	8366	Nf	-13	/

Nf: noise floor

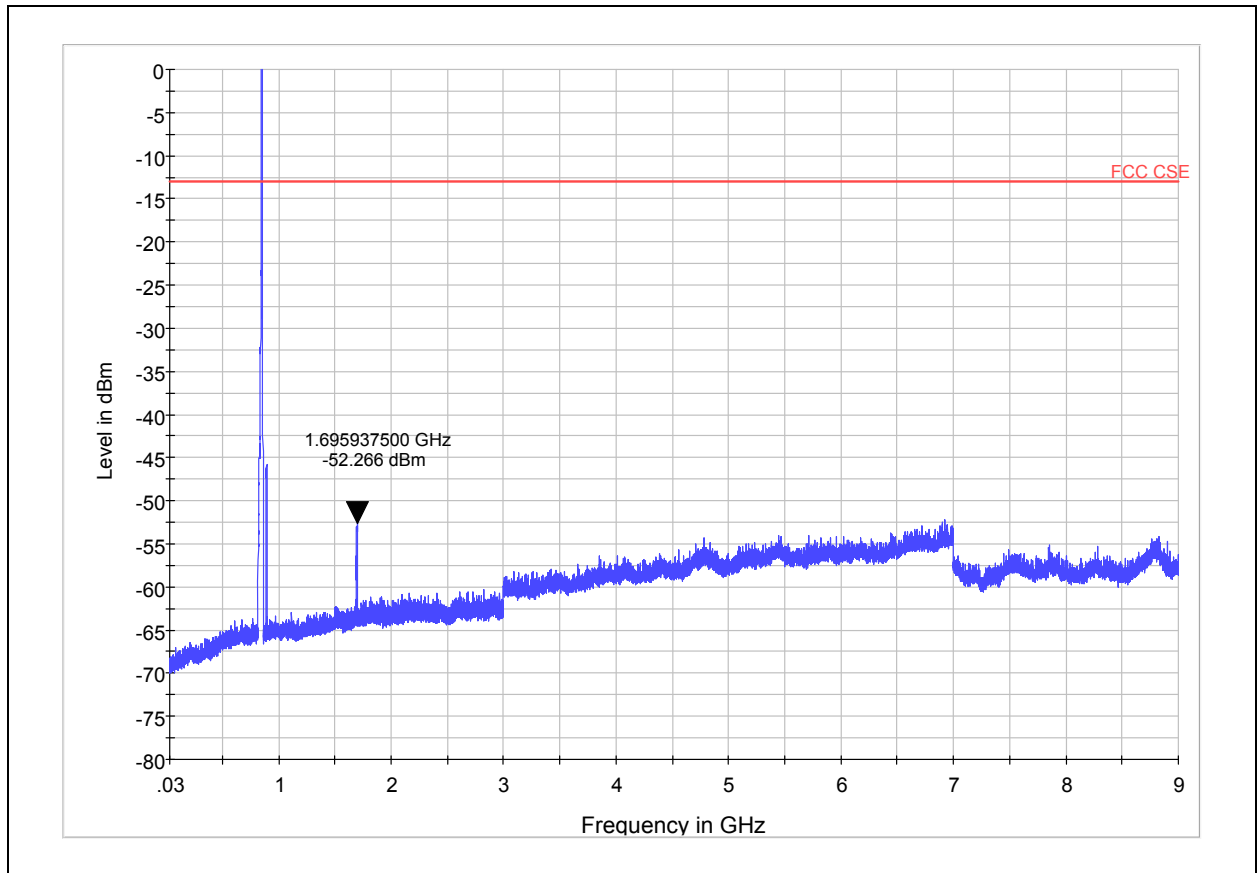
Note: The other Spurious RF conducted emissions level is no more than noise floor.

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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	1695.9375	-52.266	-13	39.266
3	2539.8	Nf	-13	/
4	3386.4	Nf	-13	/
5	4233	Nf	-13	/
6	5079.6	Nf	-13	/
7	5926.2	Nf	-13	/
8	6772.8	Nf	-13	/
9	7619.4	Nf	-13	/
10	8466	Nf	-13	/

Nf: noise floor

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

2.8. Radiates Spurious Emission

Ambient condition

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

Method of Measurement

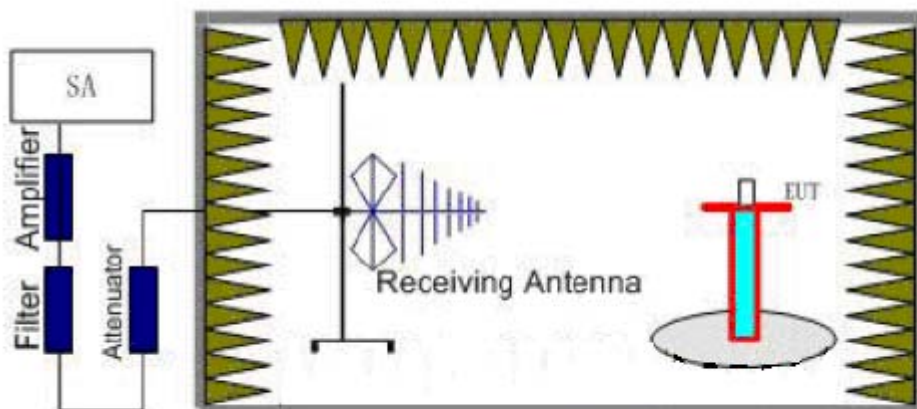
The measurements procedures in TIA -603C are used.

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:

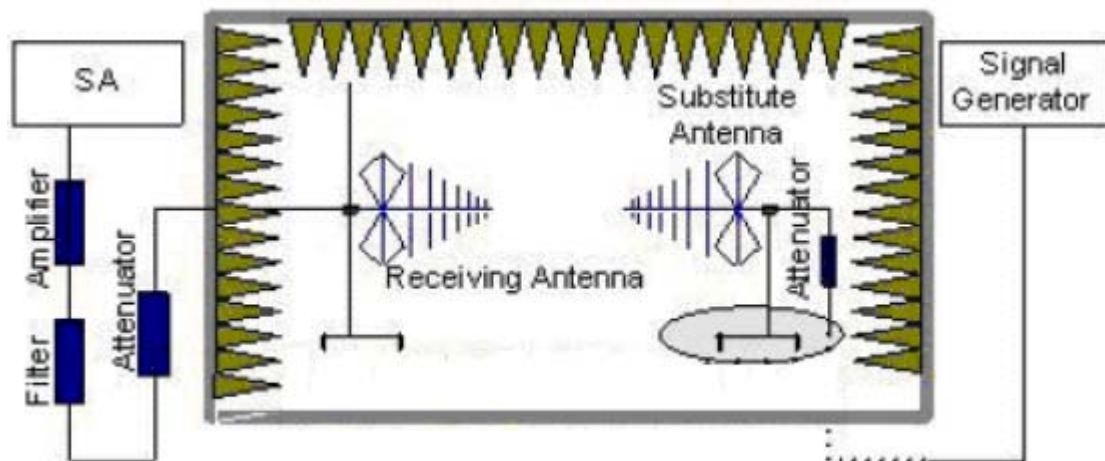
Step 1:

The measurement is carried out in the semi-anechoic chamber.. EUT was placed on a 0.8 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.



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

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.

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)	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1648.4	-57.36	2	10.15	-49.21	-13	36.21	180
3	2472.6	-61.92	2.51	11.35	-53.08	-13	40.08	135
4	3296.8	/	/	/	Nf	-13	/	/
5	4233.4	/	/	/	Nf	-13	/	/
6	4945.5	/	/	/	Nf	-13	/	/
7	5769.8	/	/	/	Nf	-13	/	/
8	6593.6	/	/	/	Nf	-13	/	/
9	7417.8	/	/	/	Nf	-13	/	/
10	8242	/	/	/	Nf	-13	/	/

Nf: noise floor

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

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GSM 850 CH190

Harmonic	TX ch.190 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673.2	-57.36	2	10.75	-48.61	-13	35.61	180
3	2509.8	-60.90	2.51	11.05	-52.36	-13	39.36	135
4	3346.4	/	/	/	Nf	-13	/	/
5	4245.8	/	/	/	Nf	-13	/	/
6	5019.0	/	/	/	Nf	-13	/	/
7	5856.8	/	/	/	Nf	-13	/	/
8	6692.8	/	/	/	Nf	-13	/	/
9	7529.4	/	/	/	Nf	-13	/	/
10	8366	/	/	/	Nf	-13	/	/

Nf: noise floor

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

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GSM 850 CH251

Harmonic	TX ch.251 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1697.6	-58.58	2	10.15	-50.43	-13	37.43	225
3	2546.4	-59.51	2.51	11.05	-50.97	-13	37.97	135
4	3395.2	/	/	/	Nf	-13	/	/
5	4244	/	/	/	Nf	-13	/	/
6	5092.8	/	/	/	Nf	-13	/	/
7	5941.6	/	/	/	Nf	-13	/	/
8	6790.4	/	/	/	Nf	-13	/	/
9	7639.2	/	/	/	Nf	-13	/	/
10	8488	/	/	/	Nf	-13	/	/

Nf: noise floor

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

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WCDMA Band V CH4132

Harmonic	TX ch.4132 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1652.8	/	/	/	Nf	-13	/	/
3	2479.2	/	/	/	Nf	-13	/	/
4	3305.6	/	/	/	Nf	-13	/	/
5	4132	/	/	/	Nf	-13	/	/
6	4958.4	/	/	/	Nf	-13	/	/
7	5784.8	/	/	/	Nf	-13	/	/
8	6611.2	/	/	/	Nf	-13	/	/
9	7437.6	/	/	/	Nf	-13	/	/
10	8264	/	/	/	Nf	-13	/	/

Nf: noise floor

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

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WCDMA Band V CH4183

Harmonic	TX ch.4183 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673.2	/	/	/	Nf	-13	/	/
3	2509.8	/	/	/	Nf	-13	/	/
4	3346.4	/	/	/	Nf	-13	/	/
5	4183	/	/	/	Nf	-13	/	/
6	5019.6	/	/	/	Nf	-13	/	/
7	5856.2	/	/	/	Nf	-13	/	/
8	6692.8	/	/	/	Nf	-13	/	/
9	7529.4	/	/	/	Nf	-13	/	/
10	8366	/	/	/	Nf	-13	/	/

Nf: noise floor

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

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WCDMA Band V CH4233

Harmonic	TX ch.4233 Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1693.2	/	/	/	Nf	-13	/	/
3	2539.8	/	/	/	Nf	-13	/	/
4	3386.4	/	/	/	Nf	-13	/	/
5	4233	/	/	/	Nf	-13	/	/
6	5079.6	/	/	/	Nf	-13	/	/
7	5926.2	/	/	/	Nf	-13	/	/
8	6772.8	/	/	/	Nf	-13	/	/
9	7619.4	/	/	/	Nf	-13	/	/
10	8466	/	/	/	Nf	-13	/	/
Nf: noise floor								

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

2.9. Receiver Spurious Emissions

Ambient condition

Temperature	Relative humidity	Pressure
24°C~26°C	45%~50%	102.5kPa

Methods of Measurement

The EUT is placed on a non-metallic table 0.8m above the horizontal metal reference ground plane. The distance between EUT and receive antenna should be 3 meters. During the test, the EUT was operating in its typical mode. The test method is according to RSS-GEN (2007). Sweep the whole frequency band through the range from 30MHz to 6GHz. During the test, 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 of radiated emission signal level. The measurements shall be repeated with orthogonal polarization of the test antenna.

The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing. During the test, the EUT is worked at maximum output power.

Set the spectrum analyzer in the following:

Below 1GHz(detector: Peak and Quasi-Peak):

RBW=100kHz / VBW=300kHz / Sweep=AUTO

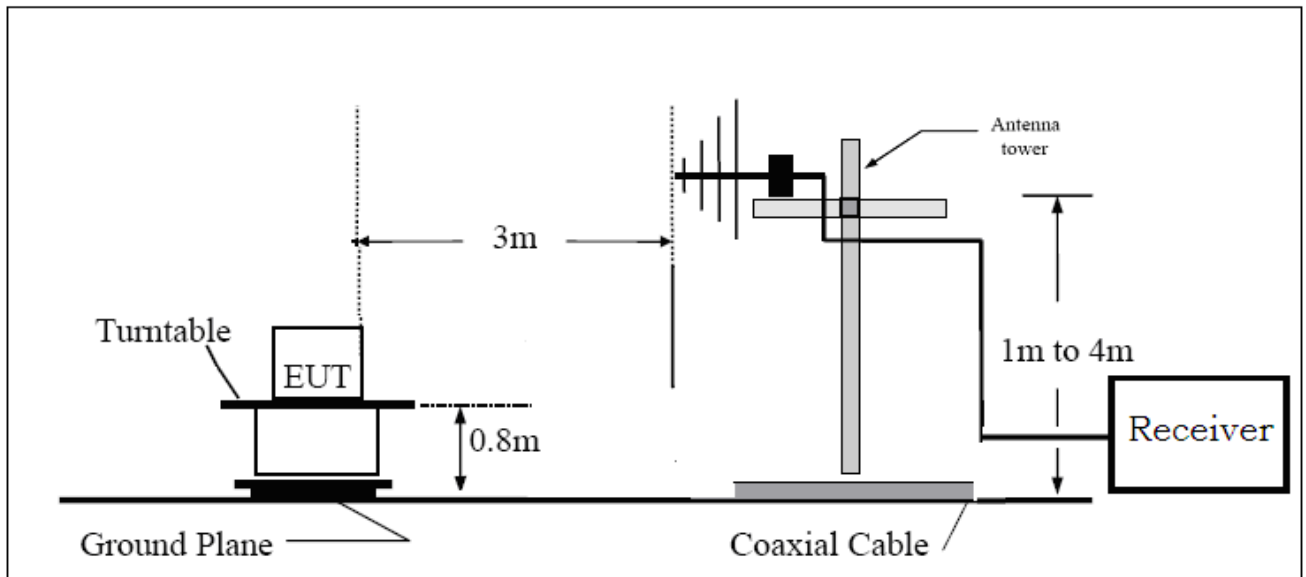
Above 1GHz(detector: Peak):

(a) PEAK: RBW=1MHz VBW=3MHz/ Sweep=AUTO

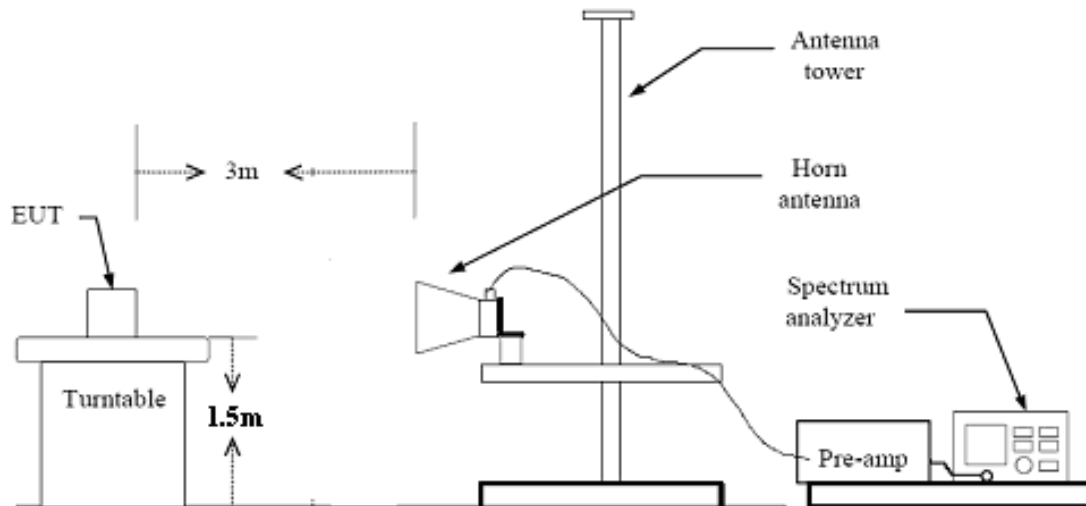
(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO

Test Setup

Below 1GHz



Above 1GHz



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Limits

Frequency (MHz)	Field Strength (dBμV/m)	Detector
30 -88	40.0	Quasi-peak
88-216	43.5	Quasi-peak
216 – 960	46.0	Quasi-peak
960-1000	54.0	Quasi-peak
1000-5 th harmonic of the highest frequency or 40GHz, which is lower	54 74	Average Peak

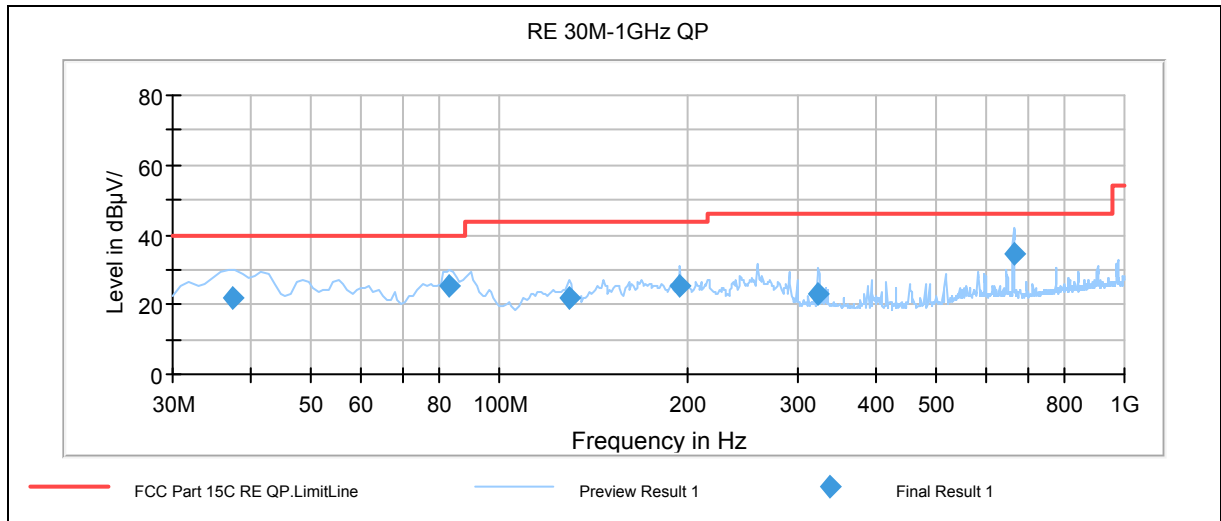
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$. $U = 3.92$ dB.

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Test Results

GSM 850



Radiated Emission from 30MHz to 1GHz

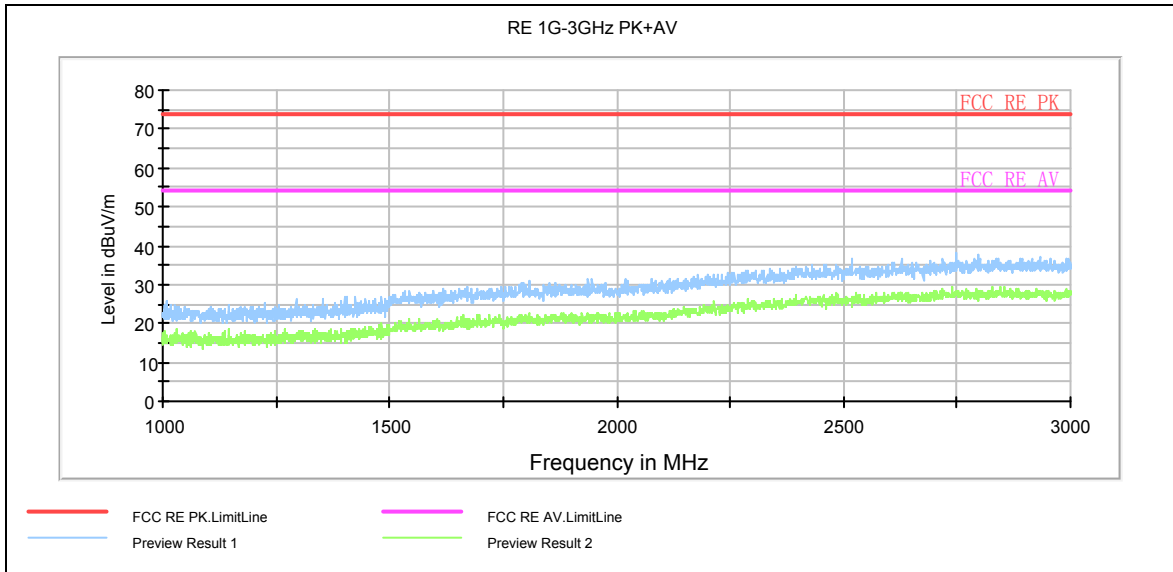
Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
37.360000	22.1	100.0	V	22.0	44.6	-22.5	17.9	40.0
83.390000	25.0	175.0	V	34.0	54	-29.0	15.0	40.0
129.420000	21.8	100.0	V	13.0	52	-30.2	21.7	43.5
194.700000	25.2	221.0	V	12.0	53.9	-28.7	18.3	43.5
323.470000	23.3	175.0	V	157.0	48.2	-24.9	22.7	46.0
663.940000	34.7	100.0	V	194.0	53.1	-18.4	11.3	46.0

Remark: 1. Quasi-Peak = Reading value + Correction factor

2. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

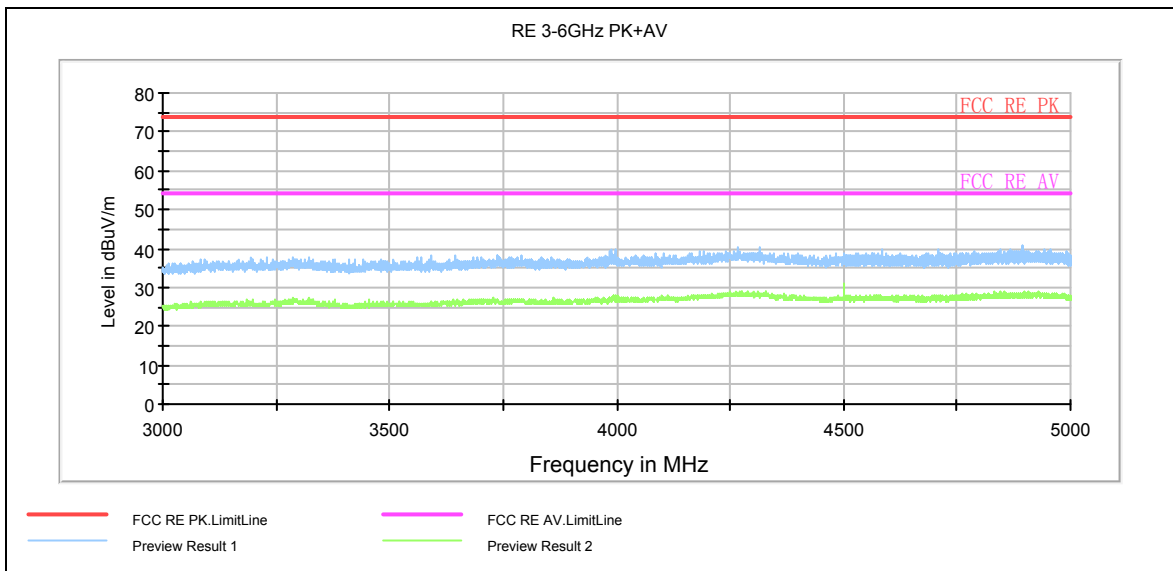
3. Margin = Limit – Quasi-Peak

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Note: Blue trace uses the peak detection Green trace uses the average detection

Radiated Emission from 1GHz to 3GHz

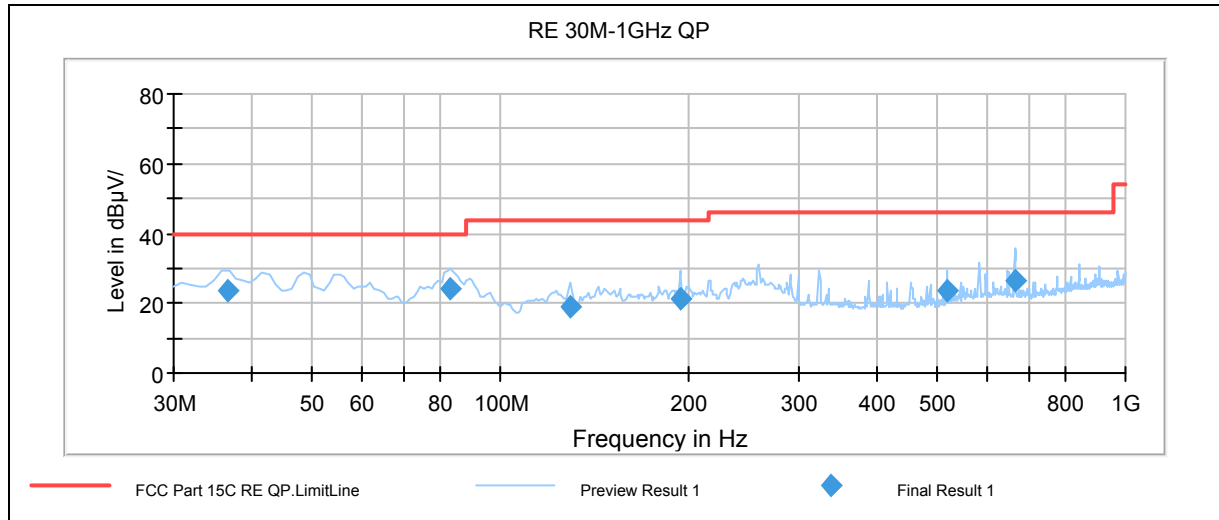


Note: Blue trace uses the peak detection Green trace uses the average detection

Radiated Emission from 3GHz to 5GHz

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WCDMA Band V

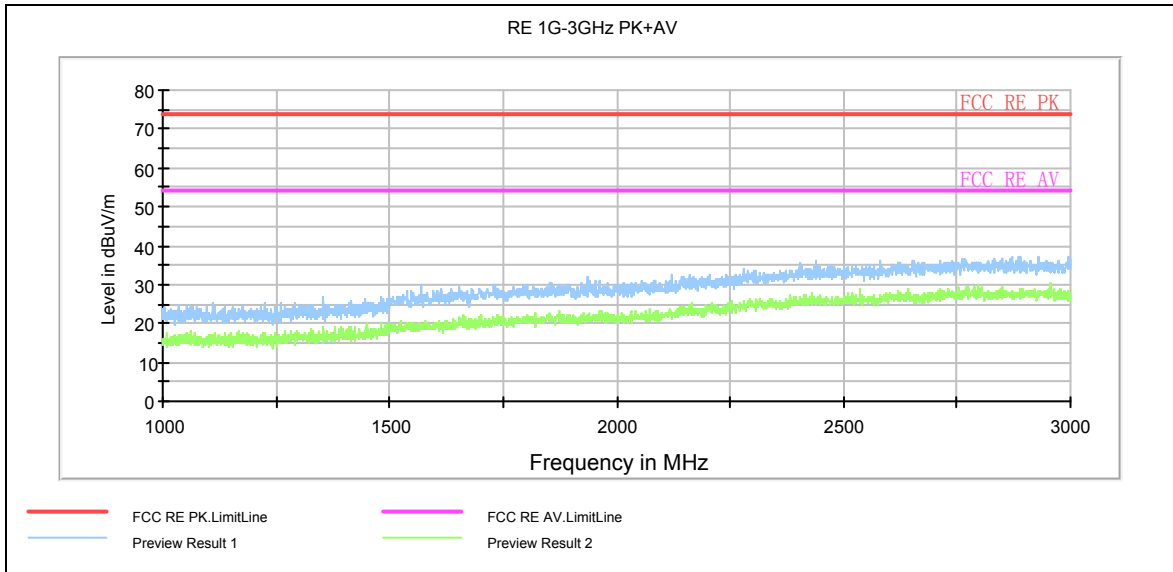


Radiated Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
36.590000	23.6	100.0	V	353.0	46.2	-22.6	16.4	40.0
83.030000	24.3	175.0	V	63.0	53.4	-29.1	15.7	40.0
129.420000	19.2	100.0	V	148.0	49.4	-30.2	24.3	43.5
194.130000	21.5	100.0	V	143.0	50.2	-28.7	22.0	43.5
519.320000	23.7	100.0	V	157.0	44.5	-20.8	22.3	46.0
666.040000	26.6	100.0	V	178.0	45	-18.4	19.4	46.0

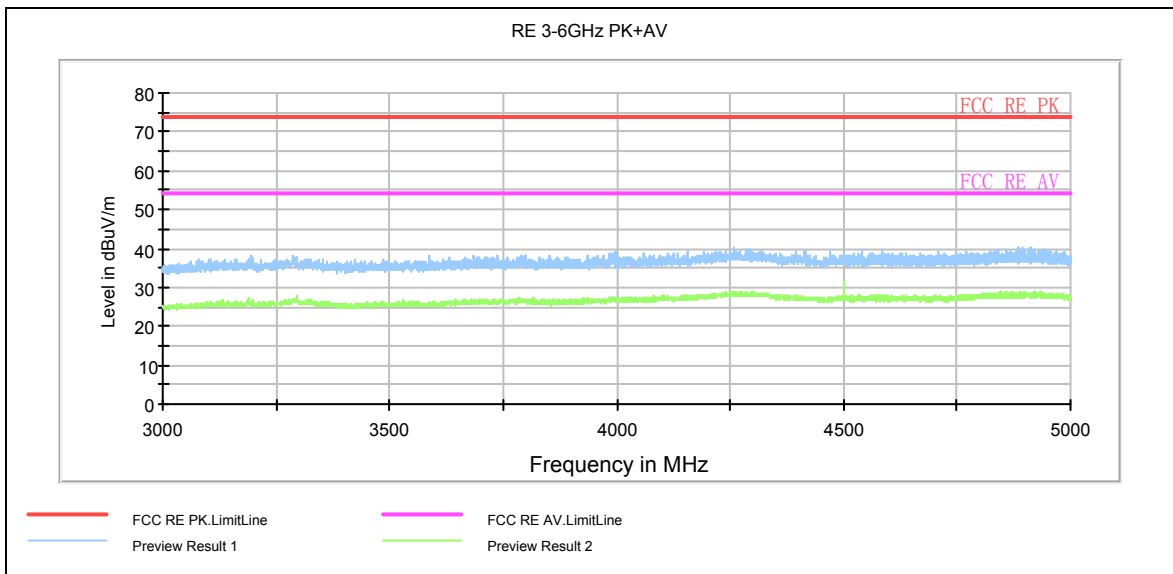
- Remark:**
1. Quasi-Peak = Reading value + Correction factor
 2. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)
 3. Margin = Limit – Quasi-Peak

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Note: Blue trace uses the peak detection Green trace uses the average detection

Radiated Emission from 1GHz to 3GHz



Note: Blue trace uses the peak detection Green trace uses the average detection

Radiated Emission from 3GHz to 5GHz

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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	2011-05-26	One year
02	Power Splitter	SHX-GF2-2-13	Hua Xiang	10120101	NA	NA
03	Spectrum Analyzer	E4445A	Agilent	MY46181146	2011-06-07	One year
04	Universal Radio Communication Tester	E5515C	Agilent	MY48367192	2011-06-03	One year
05	Signal Analyzer	FSV	R&S	100815	2011-06-27	One year
06	Signal generator	SMR27	R&S	1606.6000.02	2011-06-27	One year
07	EMI Test Receiver	ESCI	R&S	100948	2011-06-30	One year
08	Trilog Antenna	VUBL 9163	SCHWARZB ECK	9163-201	2010-06-29	Two years
09	Horn Antenna	HF907	R&S	100126	2011-07-01	Two years
10	Climatic Chamber	PT-30B	Re Ce	20101891	2010-09-10	Three years
11	Semi-Anechoic Chamber	9.6*6.7*6.6m	ETS-Lindgren	NA	NA	NA
12	EMI test software	ES-K1	R&S	NA	NA	NA

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