



Report No.: RZA2009-1146-2



Part 22

TEST REPORT

Product Name CDMA Mobile phone

FCC ID QMNRH-128

Model RH-128

Applicant Nokia Inc.

TA Technology (Shanghai) Co., Ltd.



GENERAL SUMMARY

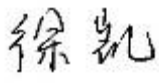
Product Name	CDMA Mobile phone	Model	RH-128
FCC ID	QMNRH-128	Report No.	RZA2009-1146-2
Client	Nokia Inc.		
Manufacturer	Nokia Inc.		
Reference Standard(s)	FCC Part 2 Frequency allocations and radio treaty matters; general rules and regulation. (V10.1.06) FCC Part 22 Public Mobile Services. (V10.1.06) ANSI/TIA-603-C Land mobile FM or PM Communications Equipment Measurements and Performance Standards.(2004)		
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 (Stamp) Date of issue: September 8th, 2009 		
Comment	The test result only responds to the measured sample.		

Approved by



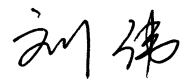
Yang Weizhong

Revised by



Xu kai

Performed by



Liu Wei

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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.

1.2. Testing laboratory

Company: TA Technology (Shanghai) Co., Ltd.
Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong
City: Shanghai
Post code: 201210
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: Nokia Inc.
Address: 12278 Scripps Summit Drive 92131
City: San Diego, CA
Postal Code: 92131
Country: USA
Telephone: +1 858 831 5000
Fax: +1 858 831 6500

1.4. Manufacturer Information

Company: Nokia Inc.
Address: 12278 Scripps Summit Drive 92131
City: San Diego, CA
Postal Code: 92131
Country: USA
Telephone: +1 858 831 5000
Fax: +1 858 831 6500

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1.5. Information of EUT

General information

Device type:	Portable device		
Name of EUT:	CDMA Mobile phone		
Device operating configurations:			
ESN:	A000000195C0B8		
Operating mode(s):	CDMA Cellular: （tested）		
Test modulation:	QPSK		
E.R.P	21.37dBm		
Emission Designator	1M25F9W		
Antenna type:	internal antenna		
Power supply:	Battery or Charger		
Rated Power Supply Voltage:	3.7V		
Extreme Voltage:	Minimum: 3.4V Maximum: 4.2V		
Extreme Temperature:	Lowest: -30°C Highest: +50°C		
Operating frequency range(s)	Band	Tx (MHz)	Rx (MHz)
	CDMA Cellular	824.7 ~ 848.31	869.7 ~ 893.31
Hardware version:	2000		
Software version:	CL_0700B11_R800_TLC		

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Auxiliary equipment details

AE1:Battery

Model: BL-4C
Manufacture: Nokia Inc.
IMEI or SN: 0670389462040Q154D21817380

AE2: Travel Adaptor

Model: AC-6U
Manufacture: Nokia Inc.
IMEI or SN: 40904991239614026010675591

AE3:USB Cable

Model: CA-101
IMEI or SN: 07306359124T1206467

AE4: Headset

Model: WH-101 HS-105
Manufacture: 06942879184E2602758

Equipment Under Test (EUT) is CDMA Digital Mobile phone with internal antenna. It consists of mobile phone, battery and adaptor (see ANNEX A.1) and the detail about these is in chapter 1.5 in this report. The EUT supports CDMA Cellular.

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 September 6, 2009 to September 8, 2009.

1.7. Test report revision

Date	Report No	Revision	Description
Sept. 8 ,2009	RZA2009-1146	0	First Revision
Sept. 10 ,2009	RZA2009-1146-1	1	1 add change history at beginning of the report 2 specify the RC/SO combination and add test conditions (temperature, humidity and pressure) to all test cases

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			3 delete the Reference Standards ANSI C63.4 4 change the Applicant to Nokia Inc 5 add list Emission Designator 6 in AE3: change USB Label, to USB cable 7 specify the summary of Test results 8 change the words "No specific RF power output requirements in part 2.1046" 9 RF power output Test results follow the RC-SO test report 10 specify the methods of the ERP measurement e.g distance between EUT and antenna, setting of RBW and VBW and the test results e.g .antenna gain, cable loss, etc. 11 re-test and update. The Band Edge test case 12,ensure the high middle low voltage and limit for Frequency stability test case 13 add the words"The data of cable loss and antenna Gain has been calibrated in full testing frequency range before the testing."in CSE 14measured dates for CSE have been put together in a table	
Sept. 11 ,2009	RZA2009-1146-2	2	1. Put ERP somewhere in the front of page 6. 2. Note why can not get more readings from the measurement of RSE.	

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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(a)	PASS
5	Frequency Stability	2.1055 / 22.355	PASS
6	Spurious Emissions at Antenna Terminals	2.1051 / 22.917(a)	PASS
7	Radiates Spurious Emission	2.1053 / 22.917 (a)	PASS

2.2. RF Power Output

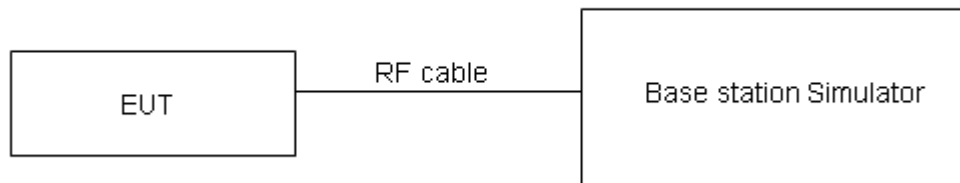
Ambient condition

Temperature	Relative humidity	Pressure
25°C	60%	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. These measurements have been tested at following channels: 1013, 384, 777 for CDMA Cellular.

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

CDMA Cellular RC1

Channel	Frequency (MHz)	Test Mode	RF Output Power (dBm)
1013	824.7	SO2	24.20
		SO55	24.22
384	836.52	SO2	24.35
		SO55	24.33
777	848.31	SO2	24.55
		SO55	24.59

CDMA Cellular RC3

Channel	Frequency (MHz)	Test Mode	RF Output Power (dBm)
1013	824.7	SO2	24.30
		SO55	24.37
384	836.52	SO2	24.35
		SO55	24.36
777	848.31	SO2	24.55
		SO55	24.55

2.3. Effective Radiated power

Ambient condition:

Temperature	Relative humidity	Pressure
22°C	50%	101.5kPa

Methods of Measurement

The measurement procedures in TIA- 603C are used.

The radiated power was measured using ETS-LINDGREN OTA Chamber in “Peak” mode.

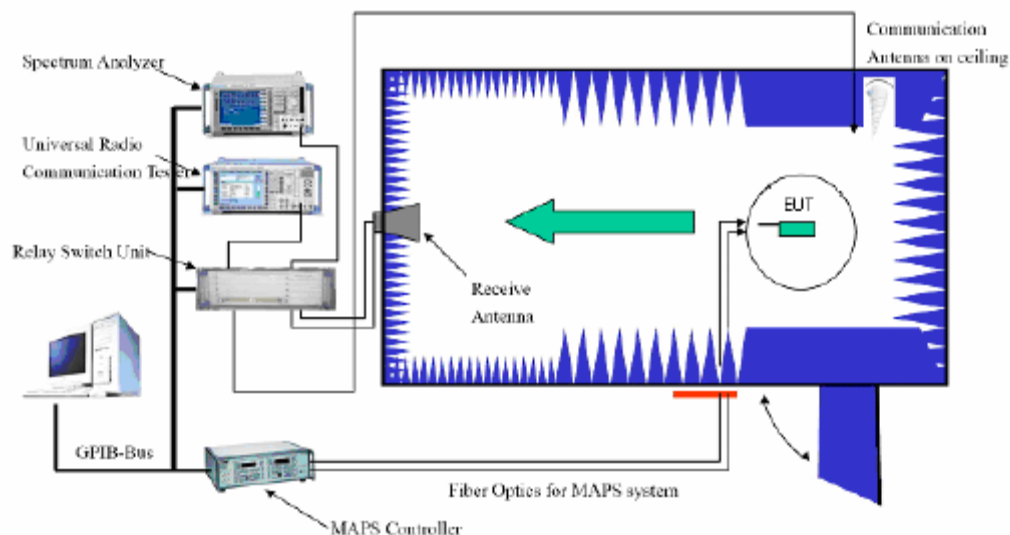
1. In an fully anechoic chamber, a sleeve dipole antenna for the frequency band of interest is placed on the reference centre of the turntable at a 5 meters test distance from the test receive antenna. An RF signal source is connected to the dipole with a Tx cable that has been constructed to not interfere with radiation pattern of the antenna. A known (measured) power (P_{in}) is applied to input of dipole, and the power received (P_r) is recorded from the spectrum analyzer.
2. The EUT substituted for the dipole at the reference centre of the chamber. A radio link shall be established between EUT and the Base Station Simulator. The EUT is controlled to ensure at its maximum power level and proper modulation.
3. A scan is performed to obtain the radiation pattern. A peak detector is used while RBW and VBW are both set to 3MHz. From these measurements, the maximum radiated power (P_{er}) was recorded from the spectrum analyzer from the 360 degrees rotation of the turntable and in both horizontally and vertically polarized orientations of the test antenna.

The Reference Path loss = $P_{in} - P_r - \text{Tx cable loss} + \text{Substitution antenna gain}$

$EIRP = P_{er} + \text{Path loss}$

4. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15 \text{ dBi}$.
5. The measurement will be conducted at three channels No.1013, No.384 and No.777 (Bottom, middle and top channels of CDMA 1X band) in RC3/SO55 test mode.

Test Setup



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Limits

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

CDMA Cellular (ERP)	$\leq 7\text{ W}$ (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 $k = 2$. $U = 1.19\text{ dB}$

Test Results

CDMA Cellular –RC3/SO55

Channel	Frequency (MHz)	P_{er} (EUT)	P_{in}	Gain (dBi)	Cable Loss	P_r (dBm)	Path loss (dBm)	EIRP (dBm)	ERP (dBm)
1013	824.7	-25.37	0	1.06	14.7	-60.38	46.74	21.37	19.22
384	836.52	-25.69	0	1.20	14.72	-60.30	46.78	21.09	18.94
777	848.31	-25.67	0	1.38	14.77	-60.27	46.88	21.21	19.06

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2.4. Occupied Bandwidth

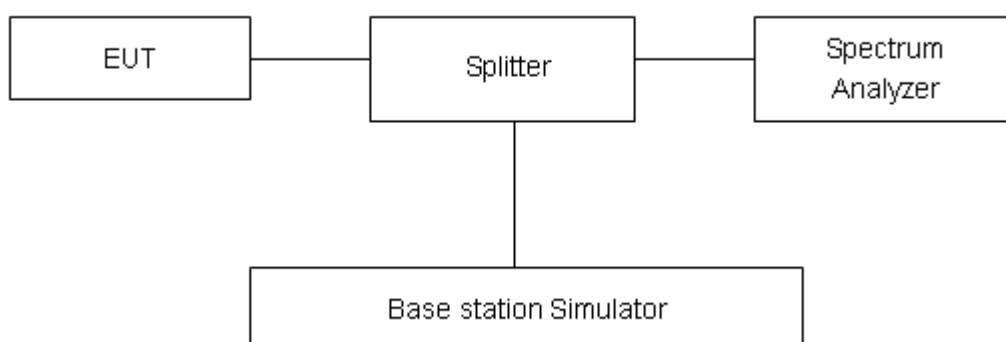
Ambient condition:

Temperature	Relative humidity	Pressure
25°C	60%	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 30 kHz on spectrum analyzer. 99% power and -26dBc occupied bandwidths are recorded. Spectrum analyzer plots are included on the following pages. The measurement will be conducted at three channels No.1013, No.384 and No.777 (Bottom, middle and top channels of CDMA 1X band) in RC3/SO55. test mode.

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

Test Result

CDMA Cellular –RC3/SO55

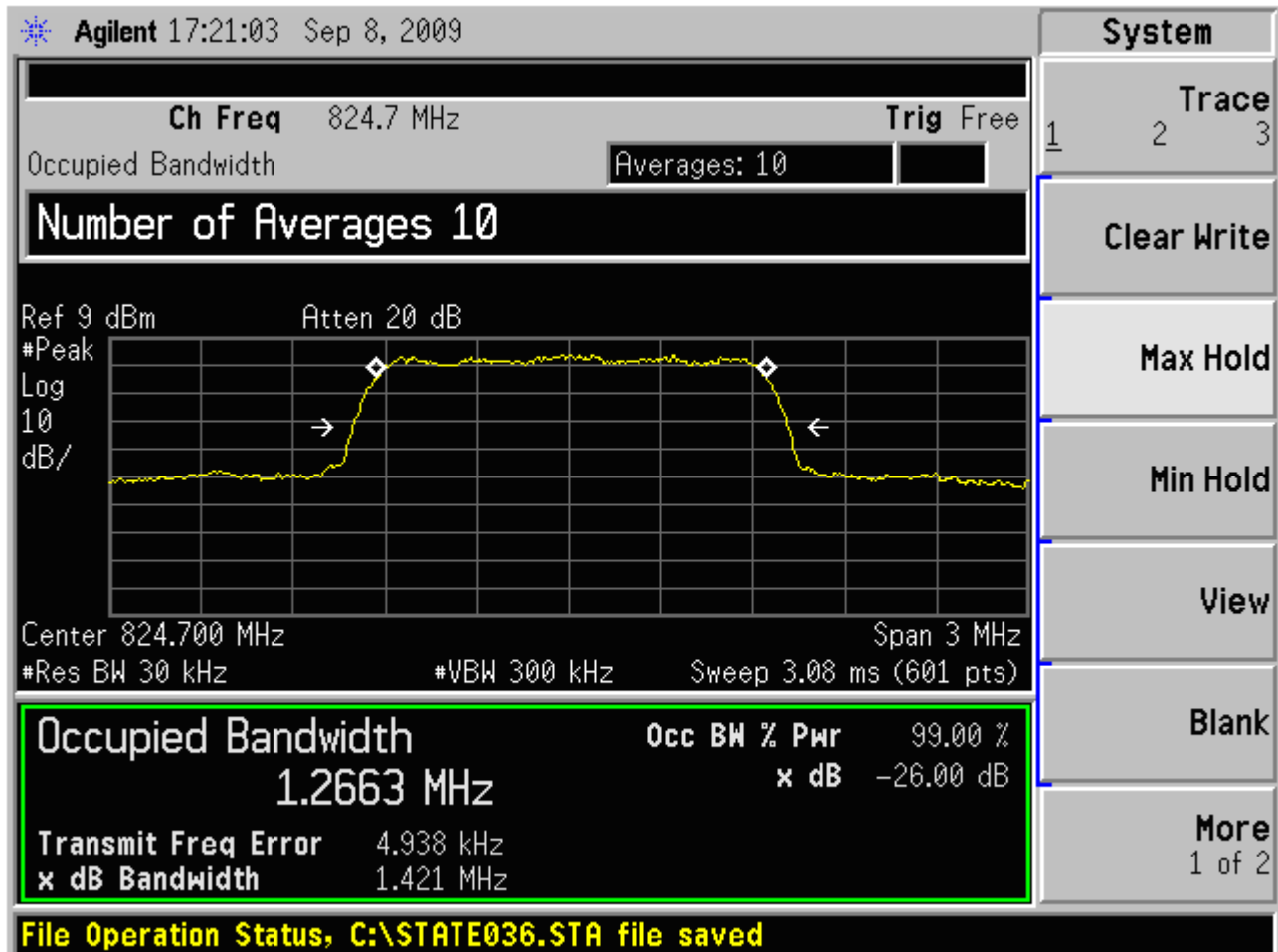
Channel	Frequency (MHz)	99% Power Bandwidth (MHz)	-26dBc Bandwidth(MHz)
1013	824.7	1.2663	1.421
384	836.52	1.2690	1.422
777	848.31	1.2683	1.421

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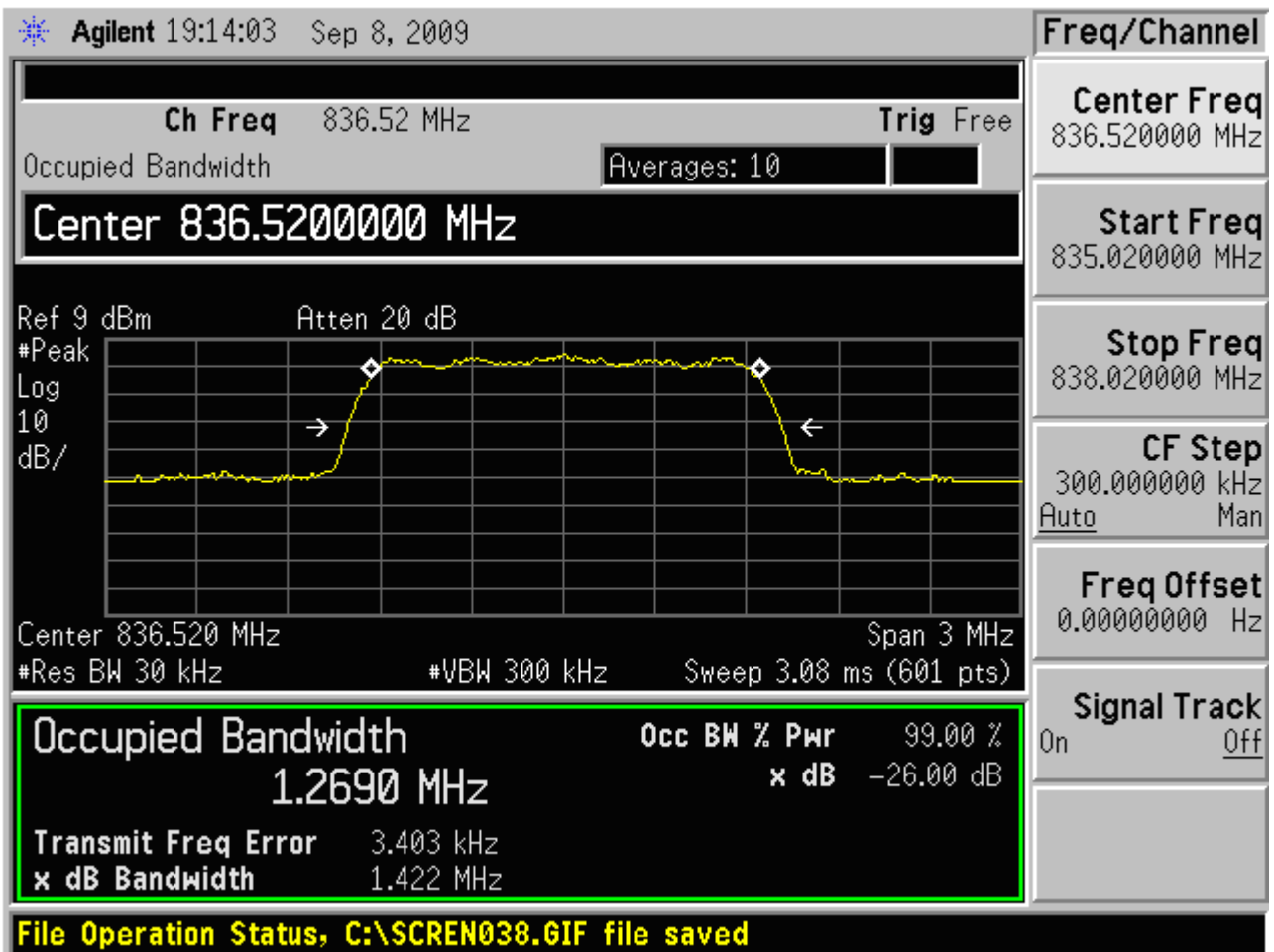
CDMA Cellular CH1013 Occupied Bandwidth

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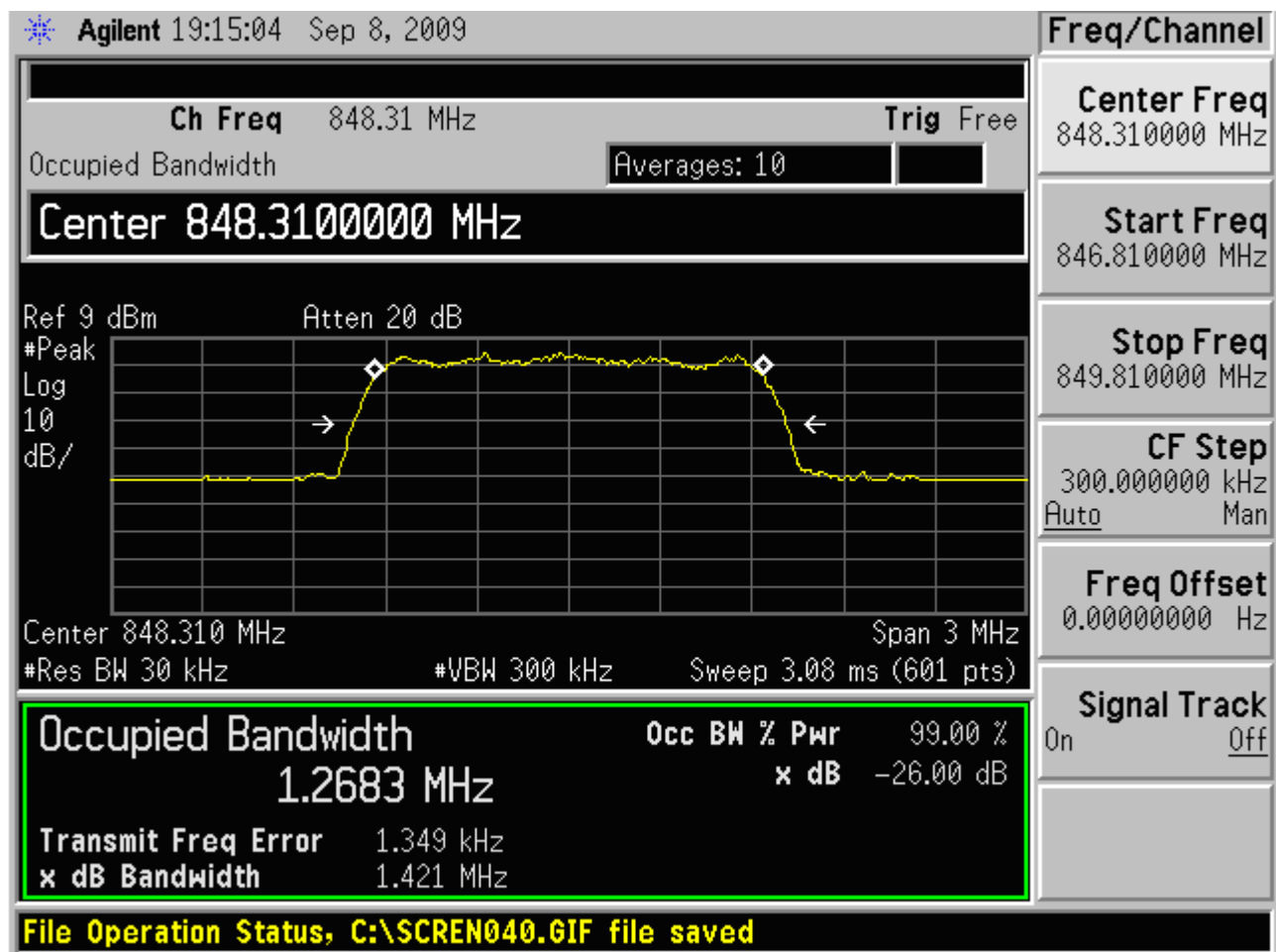
CDMA Cellular CH 384 Occupied Bandwidth

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CDMA Cellular CH777 Occupied Bandwidth

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2.5. Band Edge Compliance

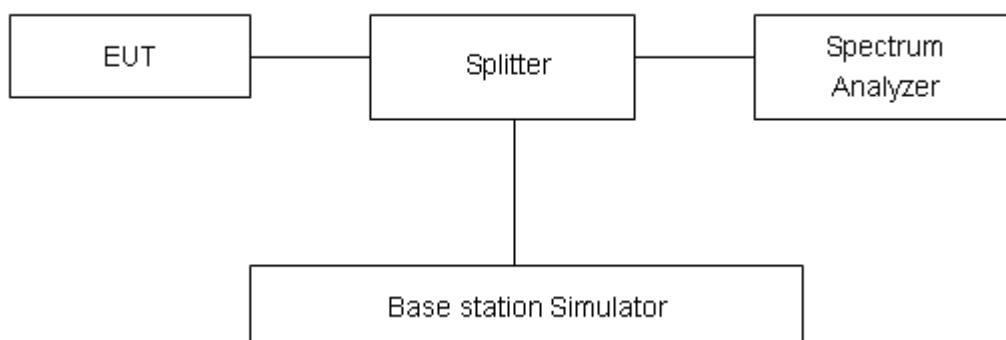
Ambient condition:

Temperature	Relative humidity	Pressure
25°C	60%	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 peak detector is used and RBW is set to 30kHz on spectrum analyzer. Spectrum analyzer plots are included on the following pages. The measurement will be conducted at three channels No.1013, No.384 and No.777 (Bottom, middle and top channels of CDMA 1X band) in RC3/SO55.

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 $k = 1.96$. $U=0.684\text{dB}$

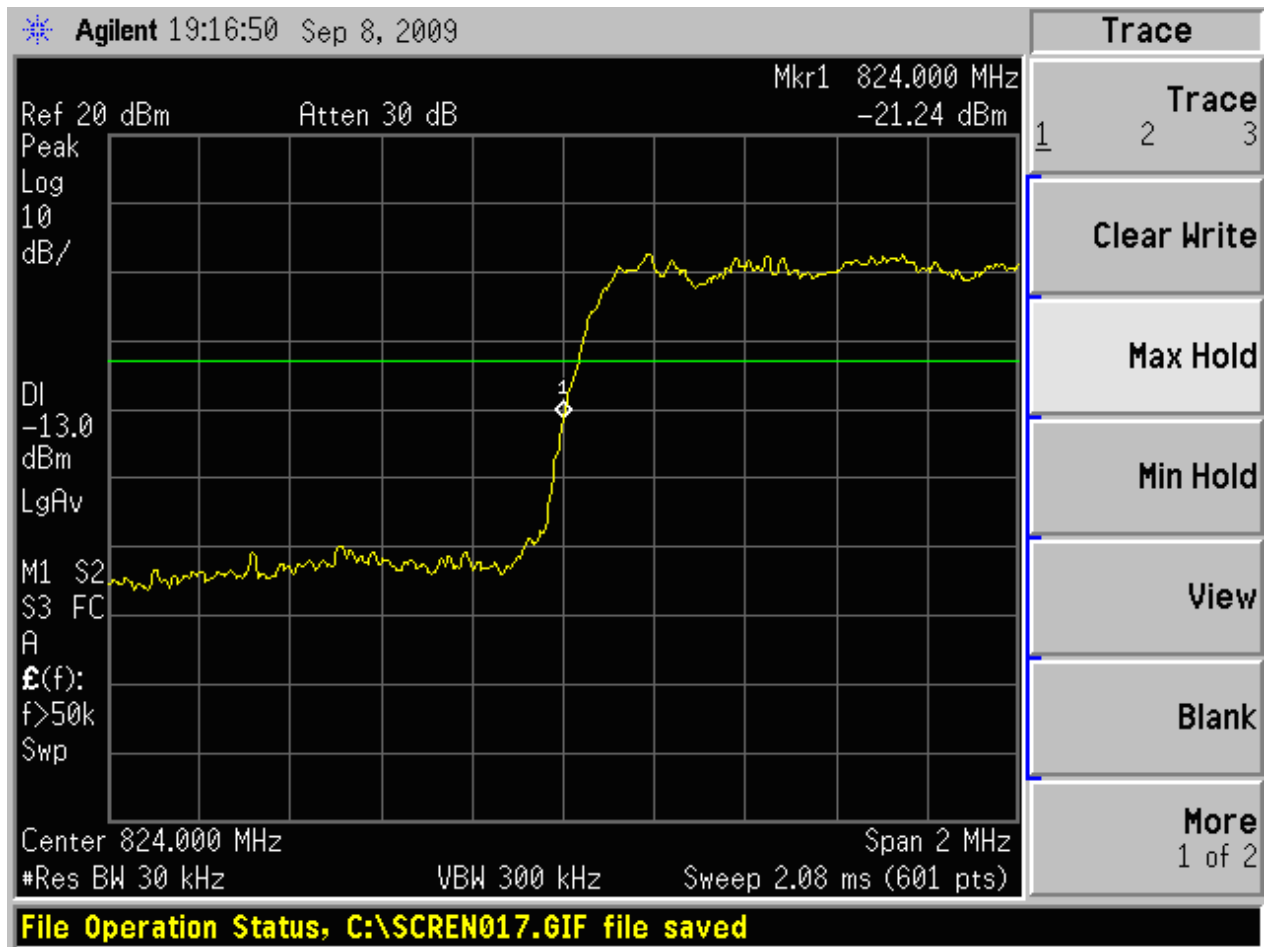
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Test Result



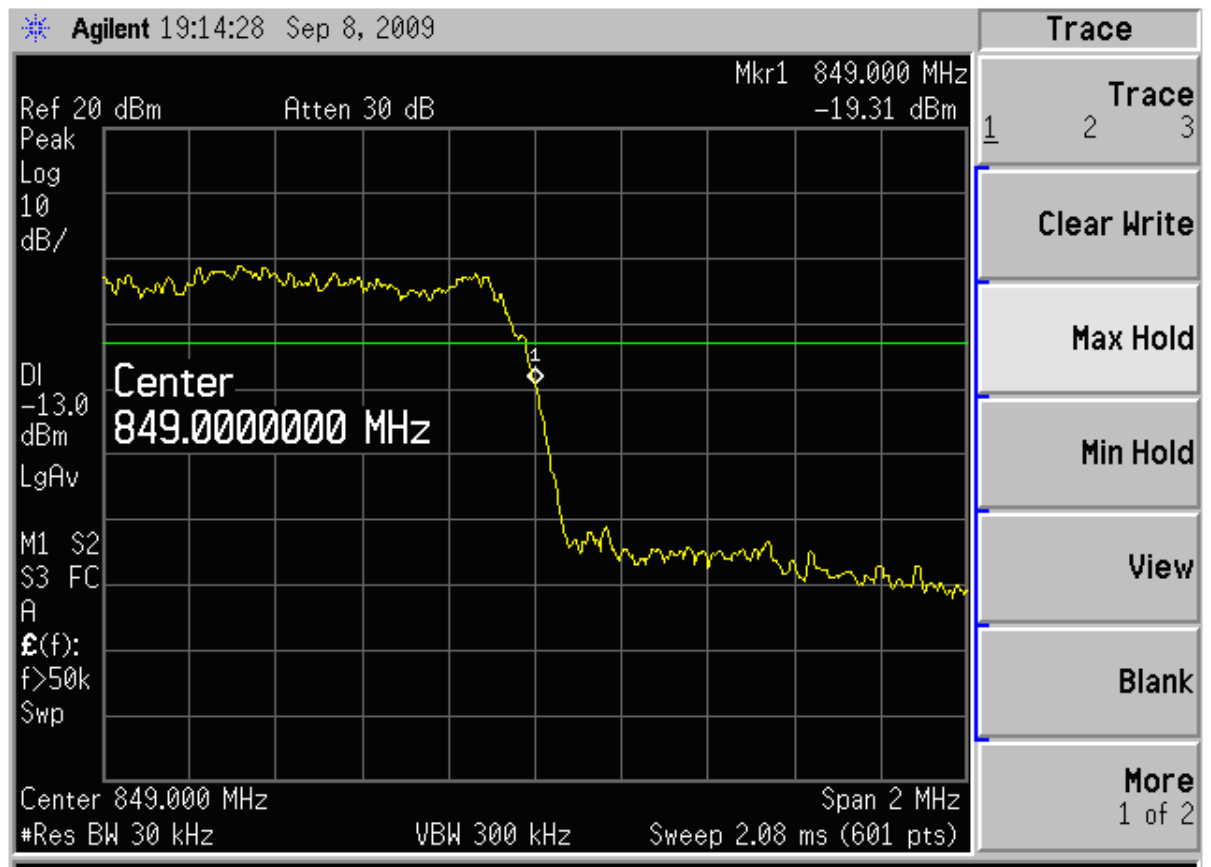
CDMA Cellular 1013 Channel

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CDMA Cellular 777 Channel

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2.6. Frequency Stability

Ambient condition

Temperature	Relative humidity	Pressure
25°C	60%	101.5kPa

Method of Measurement

1. Frequency Stability (Temperature Variation)

The temperature inside the climate chamber is varied from -30 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)

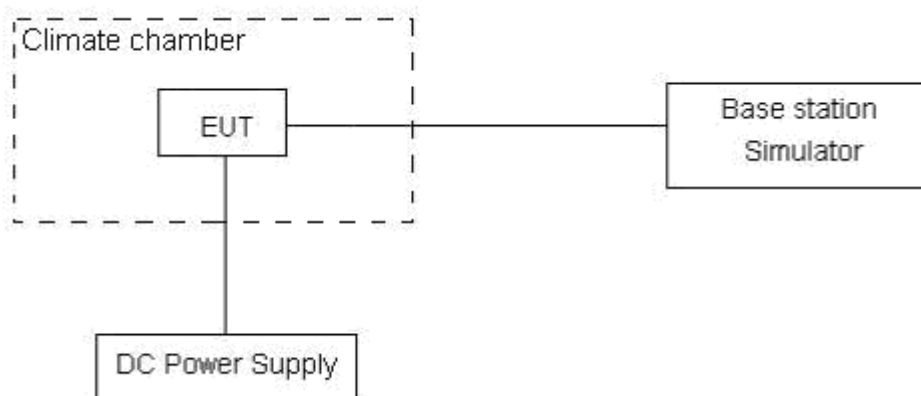
The frequency stability shall be measured with variation of primary supply voltage as follows:

- (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 3.4 V and 4.2 V, with a nominal voltage of 3.7V.

The measurement will be conducted at three channels No.1013, No.384 and No.777 (Bottom, middle and top channels of CDMA 1X band) in RC3/SO55.

Test setup



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Limits

The frequency stability of the carrier shall be accurate to within 2.5 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 22.355 Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

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 $k = 3$. $U = 0.01\text{ppm}$.

Test Result

Temperature (° C)	Test Results (ppm) / 3.7 V Power supply		
	Channel 1013	Channel 384	Channel 777
-30	-0.012	-0.012	-0.008
-20	-0.01	0.008	0.006
-10	0.006	-0.007	0.007
0	0.012	0.011	0.007
10	-0.012	0.006	-0.006
20	0.007	0.006	0.006
30	0.007	0.006	0.007
40	0.006	0.006	0.006
50	0.006	-0.007	-0.006

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Voltage (V)	Test Results(ppm) / 20° C		
	Channel 1013	Channel 384	Channel 777
4.2	0.006	0.005	-0.005
3.4	0.007	-0.008	0.008

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2.7. Spurious Emissions at Antenna Terminals

Ambient condition

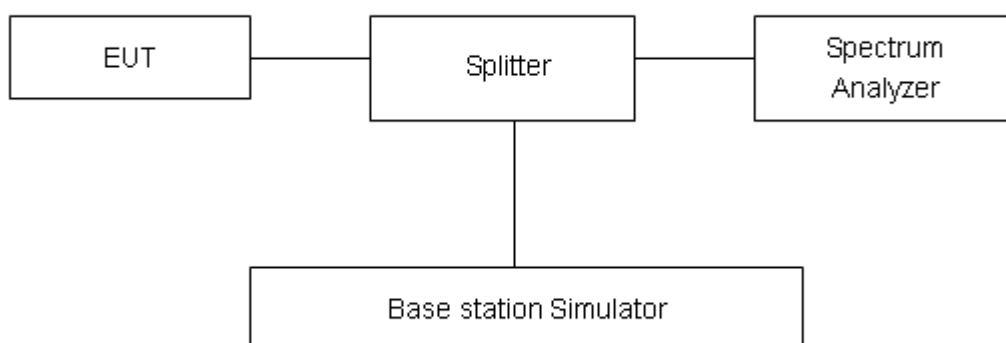
Temperature	Relative humidity	Pressure
22°C	50%	102.5kPa

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. The peak detector is used and RBW is set to 1MHz on spectrum analyzer.

The measurement will be conducted at three channels No.1013, No.384 and No.777 (Bottom, middle and top channels of CDMA 1X band) in RC3/SO55.

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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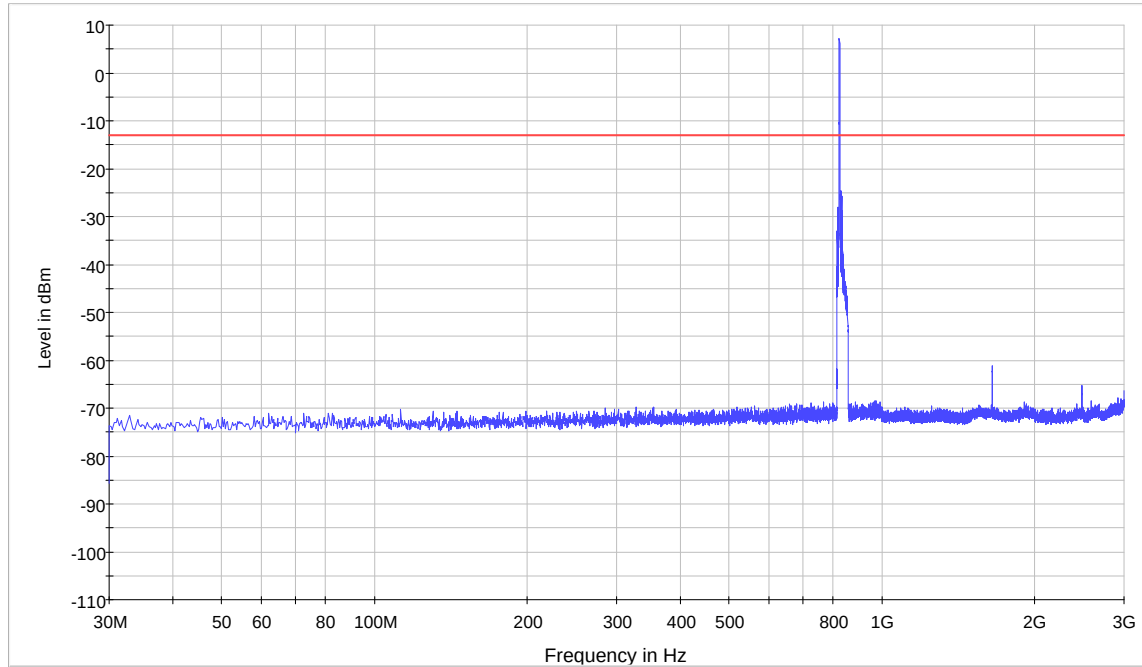
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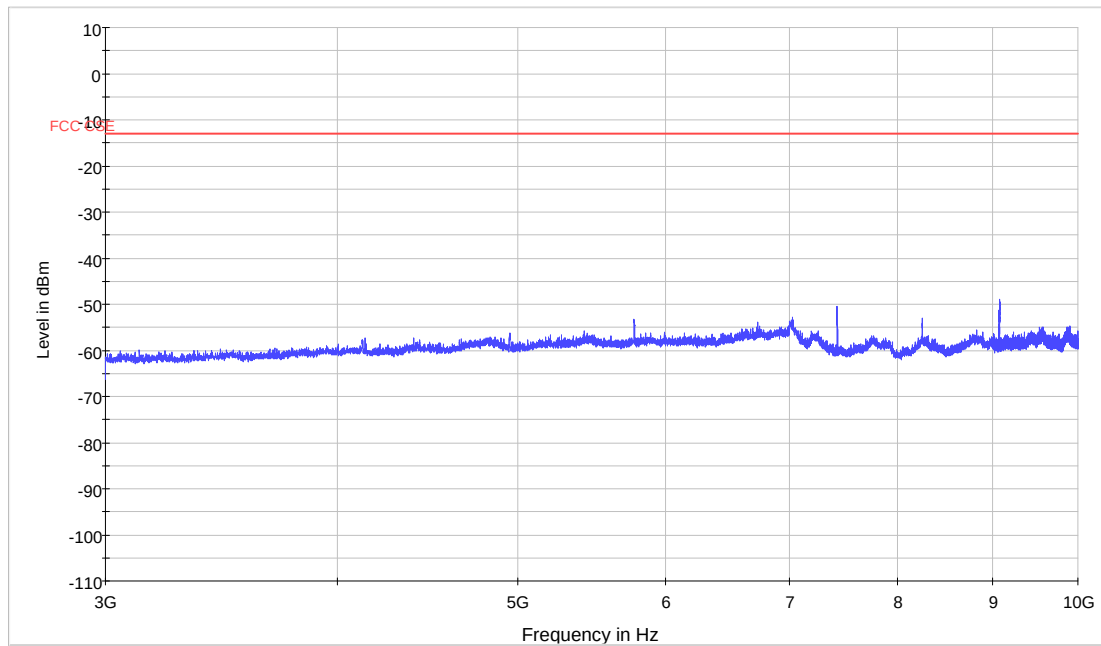
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Test Result



Note: The signal beyond the limit is carrier.

CDMA Cellular Channel 1013 30 MHz ~3 GHz



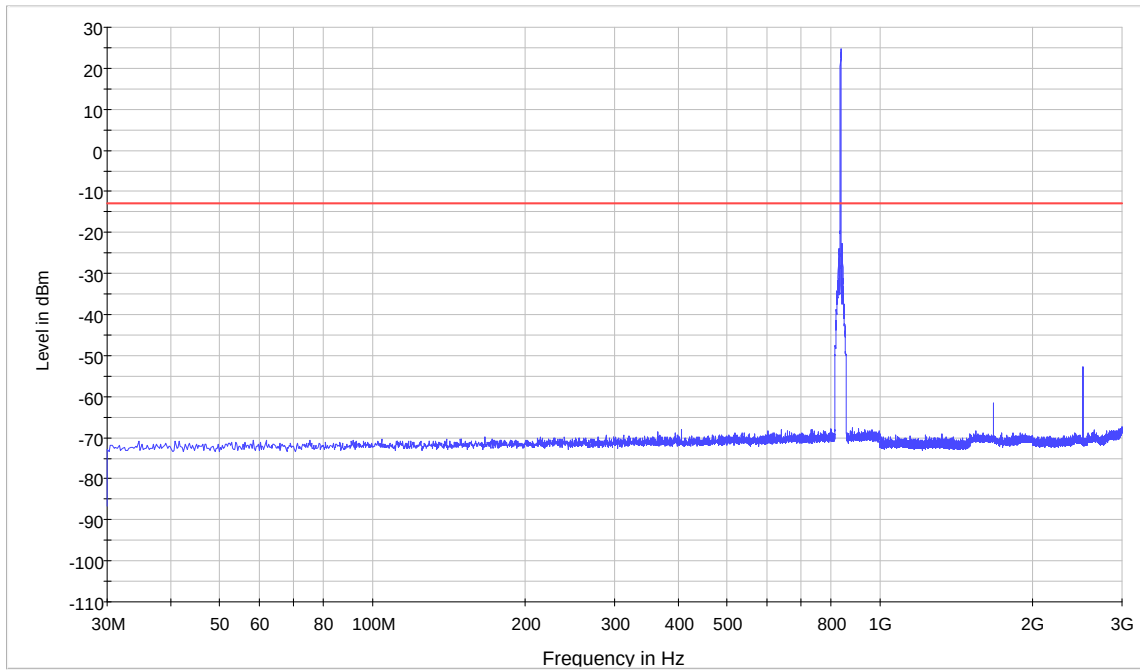
CDMA Cellular Channel 1013 3 GHz ~10 GHz

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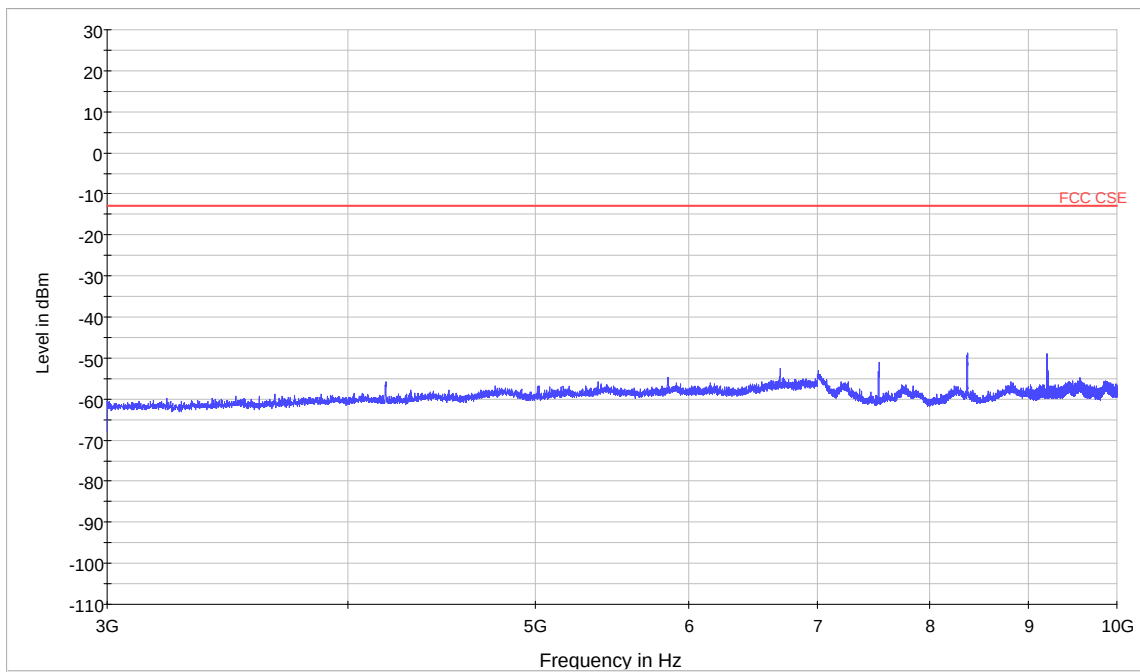
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Note: The signal beyond the limit is carrier.

CDMA Cellular Channel 384 30 MHz ~3 GHz



CDMA Cellular Channel 384 3GHz ~10 GHz

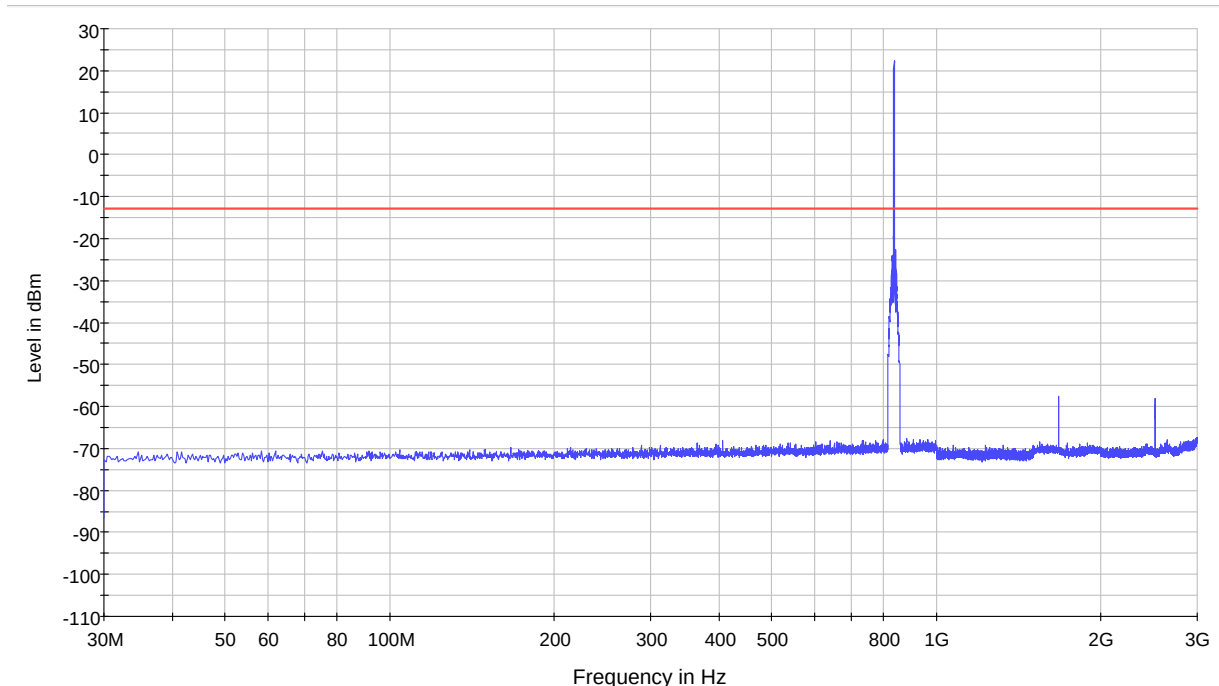
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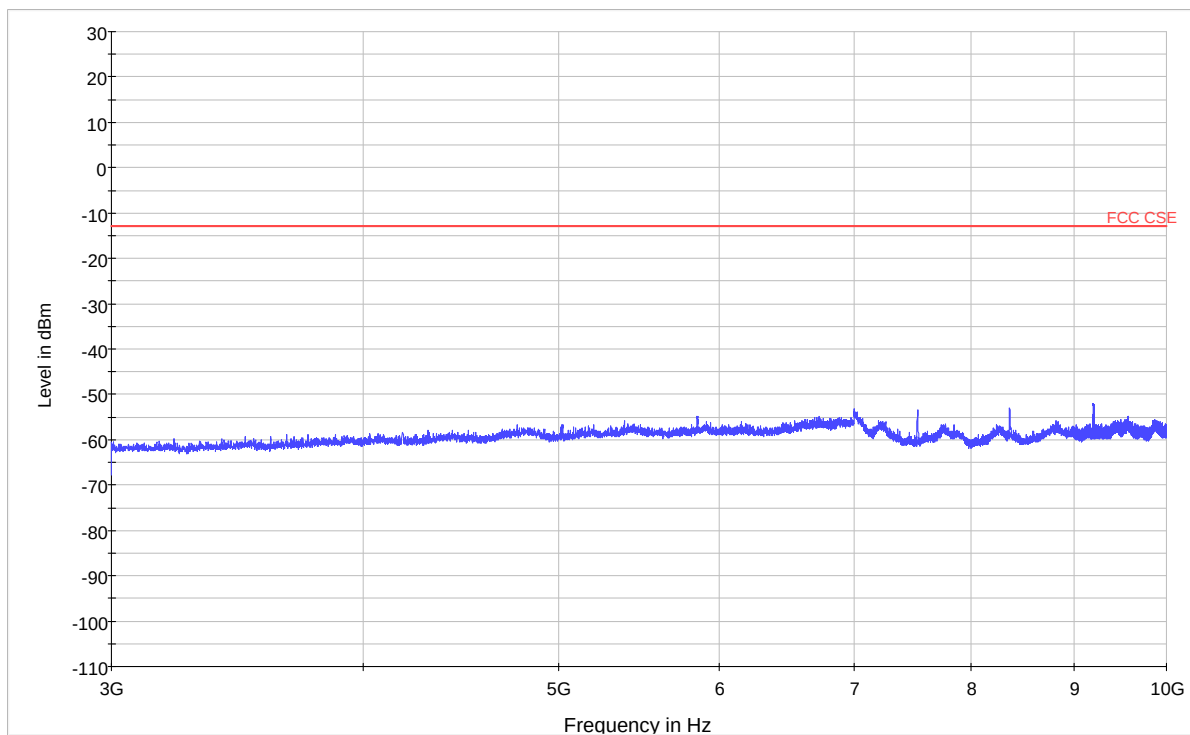
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Note: The signal beyond the limit is carrier.

CDMA Cellular Channel 777 30MHz ~3 GHz



CDMA Cellular Channel 777 3 GHz ~10 GHz

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[illegible]

2.8. Radiates Spurious Emission

Ambient condition:

Temperature	Relative humidity	Pressure
22°C	50%	102.5kPa

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 measurement will be conducted at three channels No.1013, No.384 and No.777 (Bottom, middle and top channels of CDMA 1X band) in RC3/SO55.

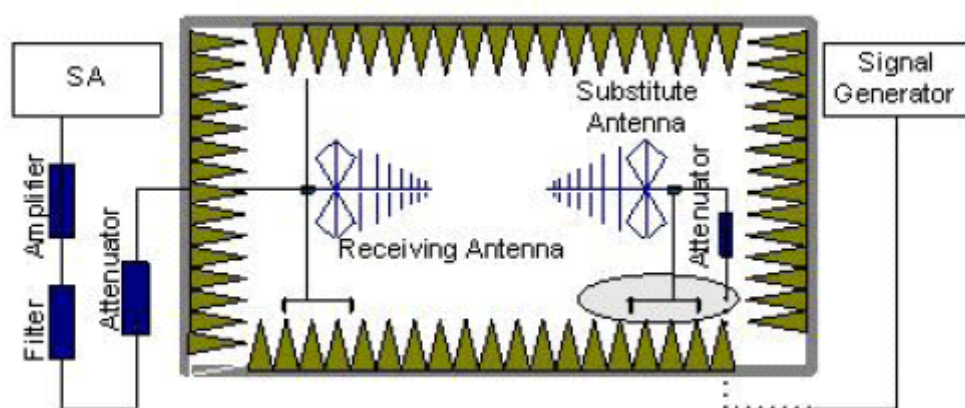
The data of cable loss and antenna Gain has been calibrated in full testing frequency range before the testing.

The procedure of Radiates Spurious Emission is as follows:

1. Pre-calibration

In an fully anechoic chamber, A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted at a 3 meter test distance from the receive antenna. An RF signal source is connected to the dipole with a Tx cable that has been constructed to not interfere with radiation pattern of the antenna. A known (measured) power (P_{in}) is applied to input of dipole, and the power received (P_r) is recorded from the spectrum analyzer.

“Reference Path loss” is established as $P_{in} - P_r - \text{Tx cable loss} + \text{Substitution antenna gain}$.



2. EUT Test

EUT was placed on a 1.5 meter high non – conductive table at a 3 meter test distance from the receive antenna. The height of receiving antenna is 1.5 m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the table and adjusting the receiving antenna polarization. The measurement is carried out using a spectrum analyzer .The radiated emission measurements of all non-harmonic and harmonic of the transmit frequency from

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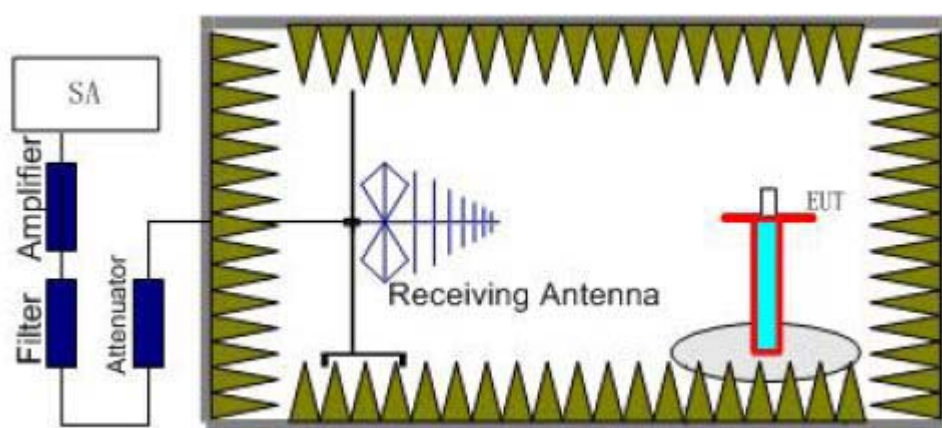
30MHz to the 10th harmonic were measured with peak detector and 1MHz bandwidth. A notch filter is necessary in the band near to the carrier frequency. A high pass filter is needed to avoid the distortion of the testing equipment in the band above the carrier frequency. If the harmonic could not be detected above the noise floor, the ambient level was recorded.

The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

Calculation procedure:

$RSE = Rx \text{ (dBm)} + \text{Reference Path loss}$

Rx: reading of the receiver



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 $k = 1.96$. $U=3.16$ dB.

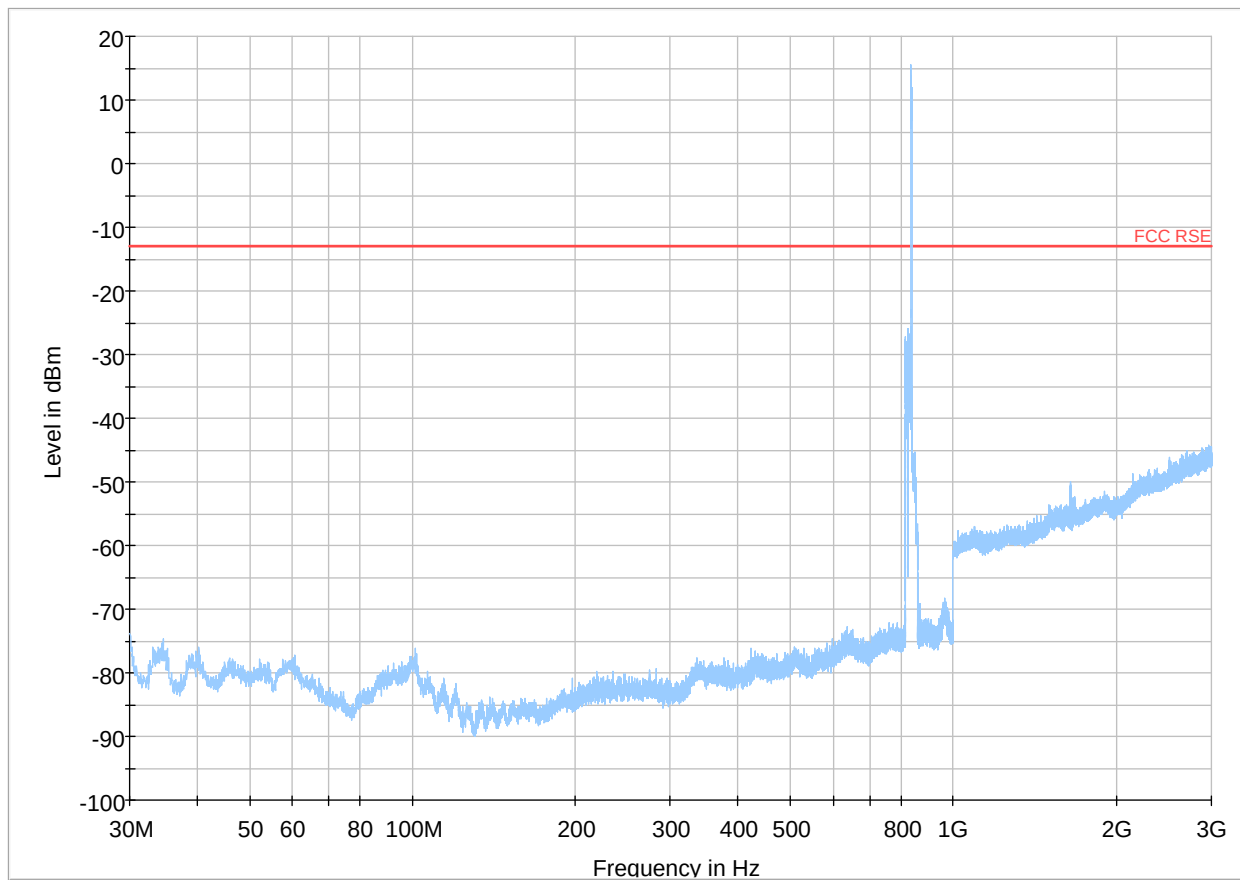
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Note: The signal beyond the limit is carrier.

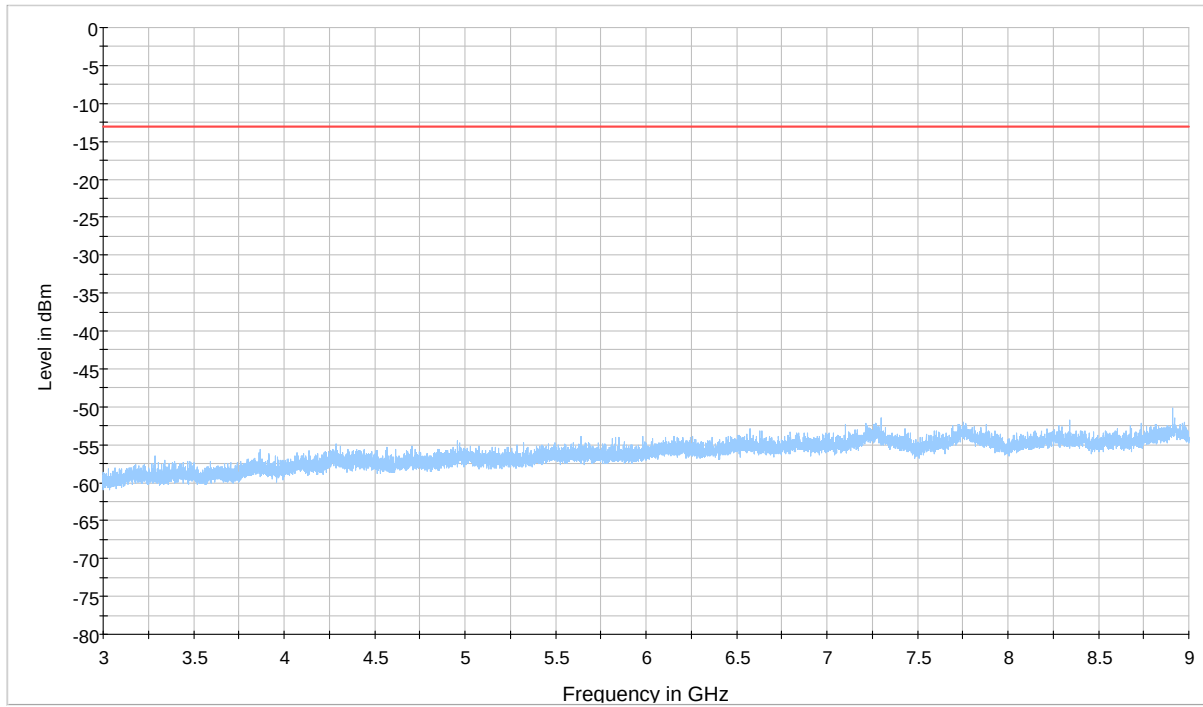
CDMA Cellular 1013 Channel 30MHz~3GHz

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CDMA Cellular 1013 Channel 3GHz ~9GHz

Harmonic	TX ch.1013 Frequency (MHz)	Polarization	Level (dBm)	Limit (dBm)
2	1649.4	Horizontal	-50.063	-13

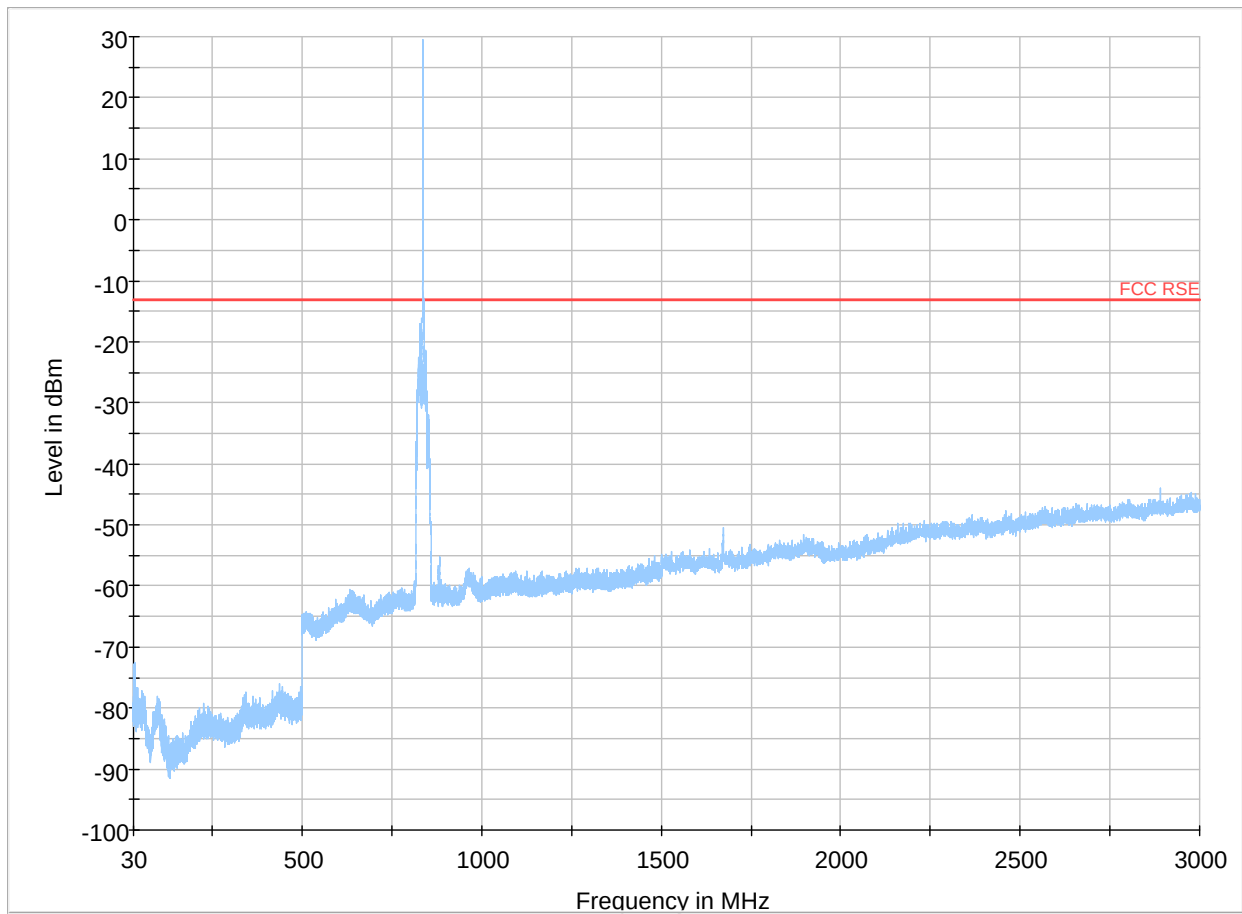
Note: The other Radiates Spurious Emission level is no more than the noise floor level.

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Note: The signal beyond the limit is carrier.

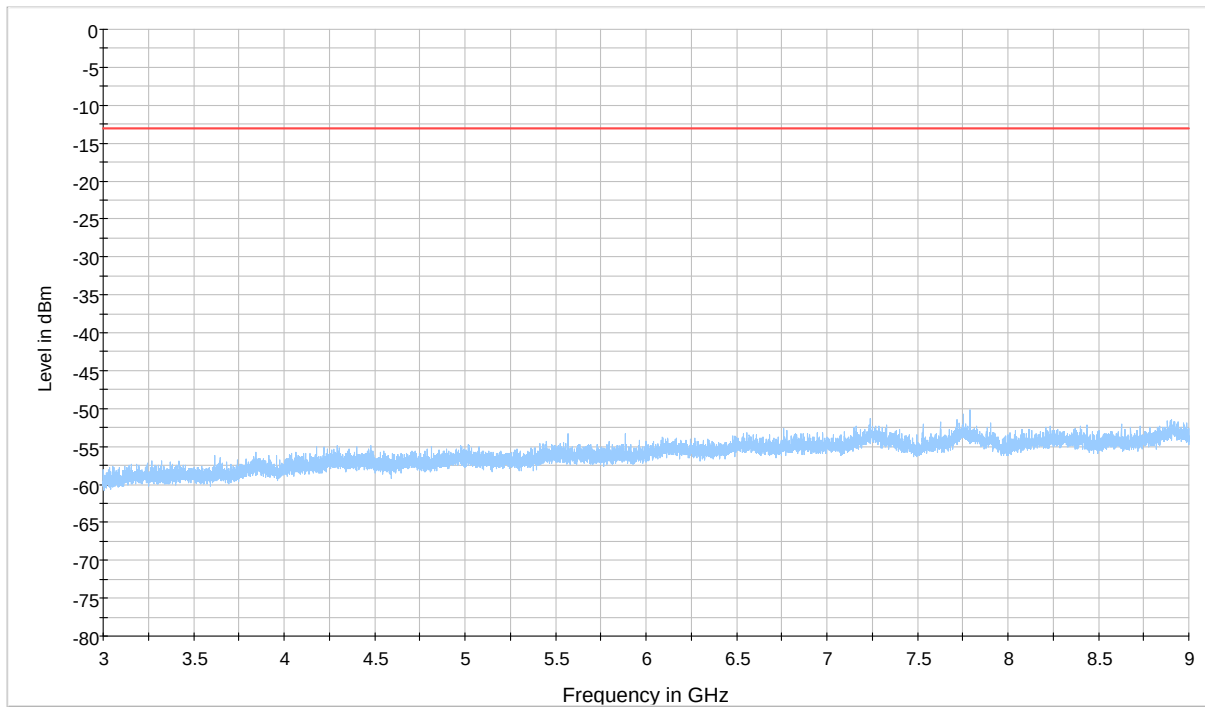
CDMA Cellular 384 Channel 30MHz~3GHz

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CDMA Cellular 384 Channel 3GHz ~9GHz

Harmonic	TX ch.384 Frequency (MHz)	Polarization	Level (dBm)	Limit (dBm)
2	1673.04	Vertical	-50.44	-13

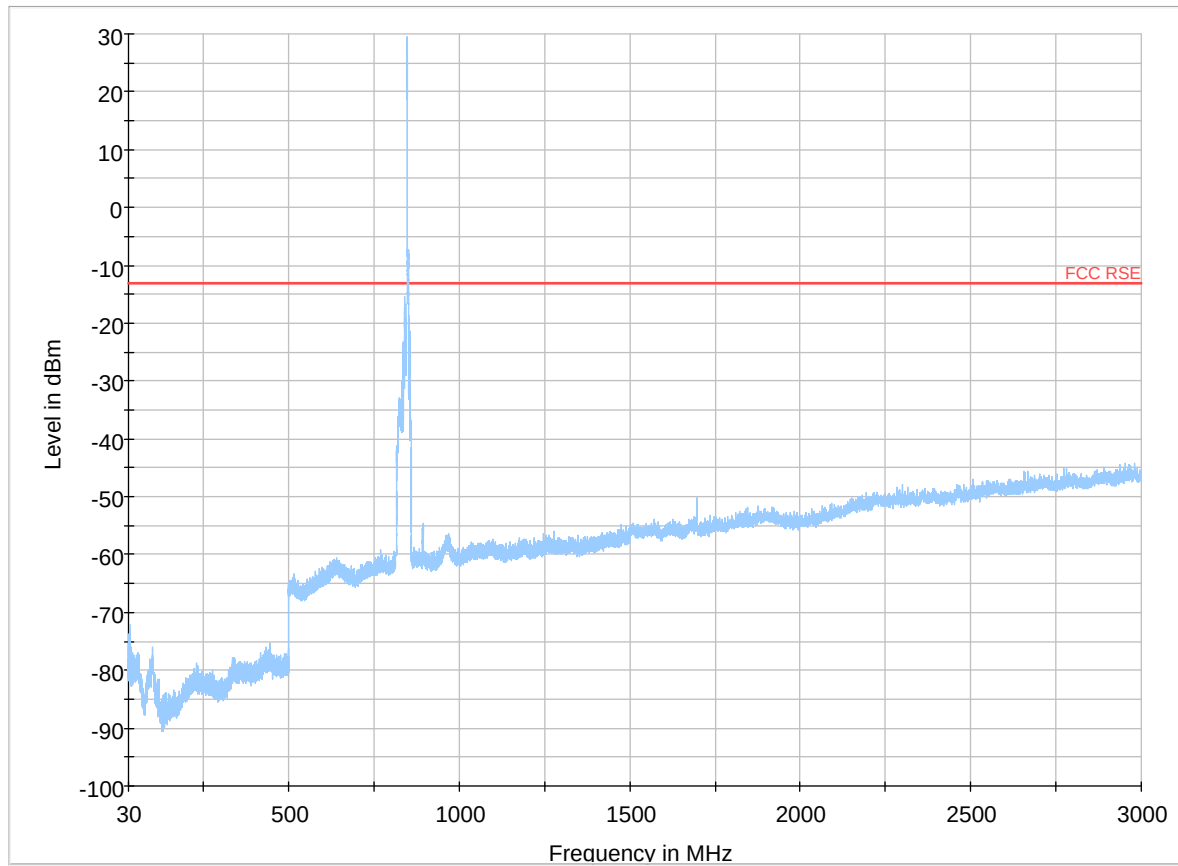
Note: The Other Radiates Spurious Emission level is no more than the noise floor level.

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Note: The signal beyond the limit is carrier.

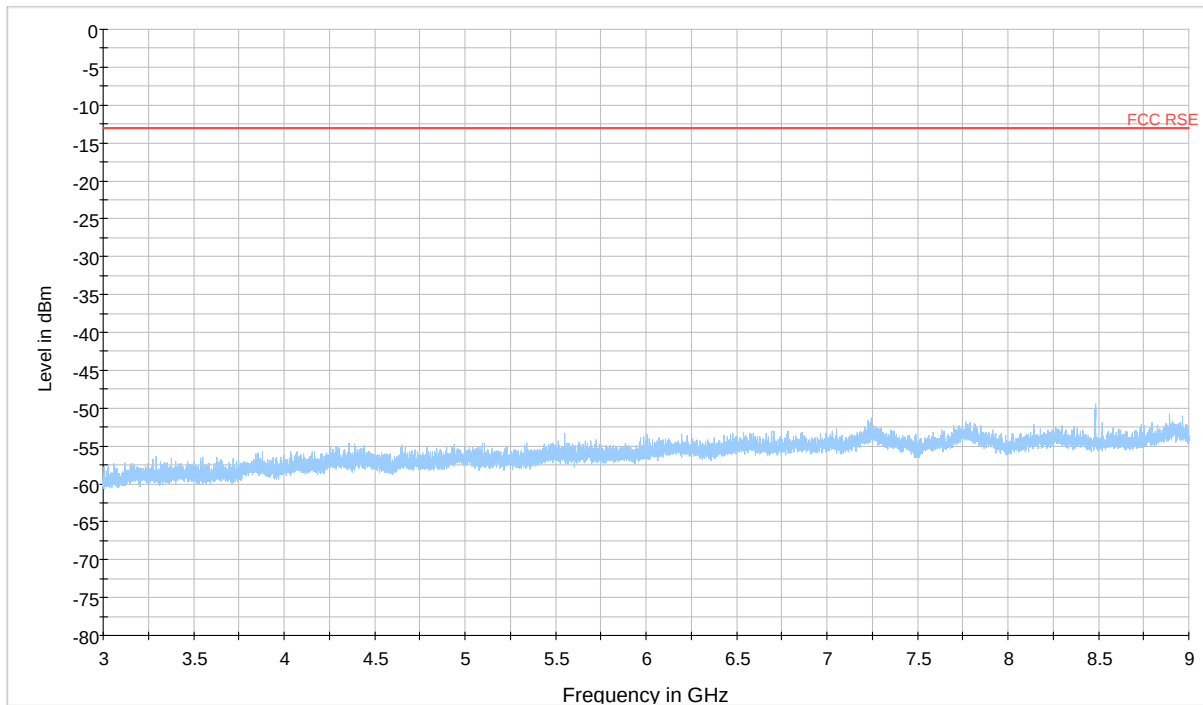
CDMA Cellular 777 Channel 30MHz~3GHz

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CDMA Cellular 777 Channel 3GHz ~9GHz

Harmonic	TX ch.777 Frequency (MHz)	Polarization	Level (dBm)	Limit (dBm)
2	1696.62	Vertical	-50.228	-13
10	8483.1	Horizontal	-49.52	-13

Note: The Other Radiates Spurious Emission level is no more than the noise floor level.

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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	2009-06-02	One year
02	Base Station Simulator	E5515C	Agilent	GB46490218	2008-09-14	One year
03	Signal Analyzer	FSV	R&S	100815	2009-06-29	One year
04	Signal generator	SMR27	R&S	1606.6000.02	2009-06-29	One year
05	Spectrum Analyzer	E4445A	Agilent	MY46181146	2009-06-08	One year
06	EMI Test Receiver	ESCI	R&S	100948	2009-07-02	One year
07	Trilog Antenna	VULB 9163	SCHWARZB ECK	9163-391	2009-05-14	One year
08	Horn Antenna	HF907	R&S	100126	2009-05-20	One year
09	Quad-Ridge Horn Antenna	3164-03	ETS-Lindgren	1064	2009-05-20	One year
10	Power Splitter	11667A	Agilent	52960	NA	NA
11	DC Power Supply	GPS-3030D	GM	E877677	NA	NA
12	Climatic Chamber	ESS-SDH401	YIN HE	2006001	2009-02-23	One year
13	Semi-Anechoic Chamber	9.6*6.7*6.6m	ETS-Lindgren	NA	NA	NA
14	OTA Fully-Anechoic Chamber	7.4*3.6*3.6m	ETS-Lindgren	3658	NA	NA
15	EMI test software	ES-K1	R&S	NA	NA	NA
16	OTA test software	EMQuest	ETS-Lindgren	NA	NA	NA

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

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ANNEX A: EUT Test Setup