47 CFR PART 22H

TEST REPORT

of

EVDO Rev.A Data card

Brand Name: Haier
Model Name: HC-CE310
Report No.: SZ09090091E02
FCC ID.: SG70909HC-CE310

prepared for

Qingdao Haier Telecom Co.Ltd.
No.1, HaierRoad, Hi-tech Zone, Qingdao, 266101, P.R.China

prepared by

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TABLE OF CONTENTS

Change History		
Issue	Date	Reason for change
1.0	October 19, 2009	First edition
2.0	October 29, 2009	Retest the Occupied bandwidth and add the test for frequency stability at “other” voltage

1. Test Result Certification

Equipment under Test:	EVDO Rev.A Data card
Brand Name:	Haier
Model Name:	HC-CE310
FCC ID:	SG70909HC-CE310
Applicant:	Qingdao Haier Telecom Co.Ltd. No.1, HaierRoad, Hi-tech Zone, Qingdao, 266101, P.R.China
Manufacturer:	Haier No.1, HaierRoad, Hi-tech Zone, Qingdao, 266101, P.R.China
Test Standards:	47 CFR Part 2 47 CFR Part 22 Subpart H
Test Result:	PASS

*** We Hereby Certify That:**

The equipment under test was tested by Shenzhen Morlab Communications Technology Co., Ltd. The test data, data evaluation, test procedures and equipment configurations shown in this report were made in accordance with the requirement of related FCC rules.

The test results of this report only apply for the tested sample equipment identified above. The test report shall be invalid without all the signatures of the test engineer, the reviewer and the approver.

Tested by: Ni Yong Dated: 2009.10.29
Ni Yong

Reviewed by: Liao Jianming Dated: 2009.10.29
Liao Jianming

Approved by: Shu Luan Dated: 2009.10.29
Shu Luan

2. General Information

2.1 Equipment under Test (EUT) Description

Description	EVDO Rev.A Data card
Model Name	HC-CE310
Serial No.	N/A
Hardware Version	SP
Software Version.....	R00.00.07
Emission Designator.....	1M45F9W
Modulation	CDMA 1X, EVDO Rev. A
Frequency	Tx: 824.7 – 848.31 MHz; Rx: 869.7-893.31MHz
Battery	Brand Name: Haier Model No: BT1000A100 Capacitance: 250mAh Rated Voltage: 3.7V Manufacturer: BYD COMPANY LIMITED Manufacturer Address: BAK Park, Kui Chong, Long gang, Shenzhen

NOTE:

1. The EUT is an EVDO Rev.A Data card support CDMA1X and EVDO. It can be used as a wireless module.
2. The transmitter (Tx) frequency arrangement of the Band Class 0 used by the EUT can be represented with the formula F(n)= 0.030*(n-1023) + 825.000, 991<= n<=1023 and F(n)= 0.030*n + 825.000, 1<=n<=799; the lowest, middle, highest channel numbers (ARFCHs) used and tested in this report are separately 1013 (824.7MHz), 384 (836.52MHz) and 777 (848.31MHz).
3. The EUT must be installed into a PC like notebook, the EUT is powered by the PC and driveled by the PC. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

Test Standards and Results

The objective of the report is to perform tests according to 47 CFR Part 2, Part 15 Part 22 for FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 2 (10-1-05 Edition)	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
2	47 CFR Part 22 (10-1-05 Edition)	Public Mobile Services

Test detailed items and the results are as below:

No.	Rules	Test Type	Result
FCC Part 22 Requirement			
1	§2.106, §22.905	Frequencies	PASS
2	§2.1046	Conducted RF Output Power at Antenna Terminal	PASS
3	§2.1049	Occupied Bandwidth	PASS
4	§2.1051, §2.1057 §22.917	Conducted Spurious Emission at Antenna Terminal	PASS
5	§22.913	Transmitter Radiated Power (EIPR/ERP)	PASS
6	§2.1053, §2.1057 §22.917	Radiated Spurious Emission	PASS
7	§2.1055, §22.355	Frequency Stability	PASS

2.2 Facilities and Accreditations

2.2.1 Facilities

Shenzhen Electronic Product Quality Testing Center Morlab Laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is CNAS L1659.

All measurement facilities used to collect the measurement data are located at Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen, P. R. China. The site was constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22, the FCC registration number is 741109.

2.2.2 Test Equipments

No.	Description	Specification	
1	System Simulator	Manufacturer: Model No.: Serial No.:	Rohde&Schwarz CMU200 100448
2	System Simulator	Manufacturer: Model No.: Serial No.:	Agilent E5515C GB43130131
3	Spectrum Analyzer	Manufacturer: Model No.: Serial No.:	Agilent E7405A US44210471
4	Telecommunication Antenna	Manufacturer: Model No.: Serial No.:	European Antennas PSA-45010R/356 403688-001
5	Trilogy Antenna	Manufacturer: Model No.: Serial No.:	Schwarzbeck VULB 9163 9163-274
6	Horn Antenna	Manufacturer: Model No.: Serial No.:	Schwarzbeck BBHA 9120C 9120C-384
7	Power Splitter	Manufacturer: Model No.: Serial No.:	WEINSCHEL 1506A NW521
8	Anechoic Chamber	Manufacturer:	Albatross Projects GmbH
9	DC Power Supply	Manufacturer:	Good Will Instrument Co., Ltd.
10	Temperature Chamber	Manufacturer:	Chongqing YinHe Experimental Equip. Co., Ltd.

NOTE:

1. Equipments listed above have been calibrated and are in the period of validation.

2.2.3 Test Environment Conditions

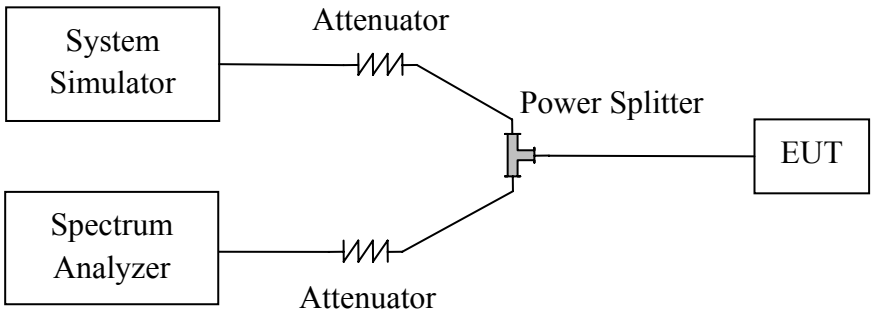
During the measurement, the environmental conditions were within the listed ranges:

Temperature:	20 - 25°C
Relative Humidity:	40 - 60%
Atmospheric Pressure:	86-106kPa

3. 47 CFR Part 2, Part 22H Requirements

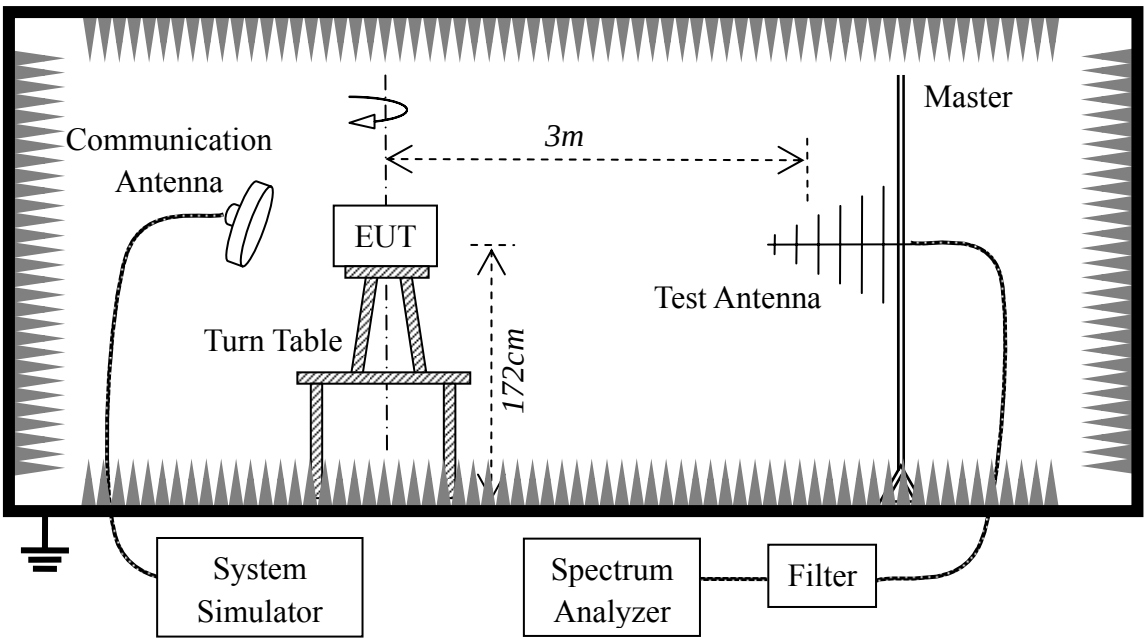
3.1 General Information

3.1.1 Conducted Related Tests



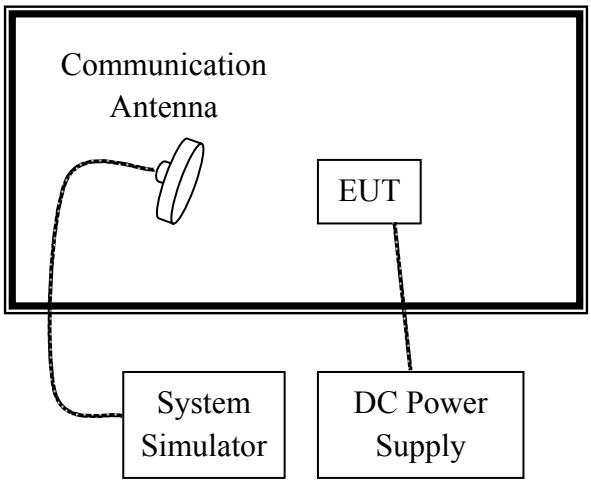
1. The EUT is coupled to the Spectrum Analyzer and the System Simulator with the suitable Attenuators through the Power Splitter; the path loss is calibrated to correct the reading.
2. The EUT is configured here as EUT + PC.
3. The EUT is commanded via the System Simulator (SS) to operate at the maximum output power .A communication link is established between the EUT and the SS.
4. The Spectrum Analyzer is set to max-peak detector function and maximum hold mode.

3.1.2 Radiated Power and Spurious Emission Tests



1. The test is performed in a full-Anechoic Chamber; the air loss of the site and the factors of the test system are pre-calibrated using the substitution method.
2. The EUT is configured as EUT + PC.
3. The EUT is placed on the vertical axis of a Turn Table 1.72 meters above the ground.
4. The Test Antenna is a bi-log one or a horn one, and the Test Antenna is at the same height as the EUT.
5. The EUT is commanded via the System Simulator (SS) to operate at the maximum output power. A communication link is established between the EUT and the SS.
6. The Spectrum Analyzer is set to max-peak detector function and maximum hold mode.

3.1.3 Frequency Stability Test



1. The test is performed in a Temperature Chamber.
2. The EUT is configured as EUT + PC.

3.2 Frequencies

3.2.1 Requirement

According to FCC §22.905, the frequencies blocks assignment for the Cellular Radiotelephone Service are listed as below.

(a) Channel Block A:
Mobile 824 - 835MHz, Base 869 - 880MHz;
Mobile 845 - 846.5MHz, Base 890 - 891.5MHz

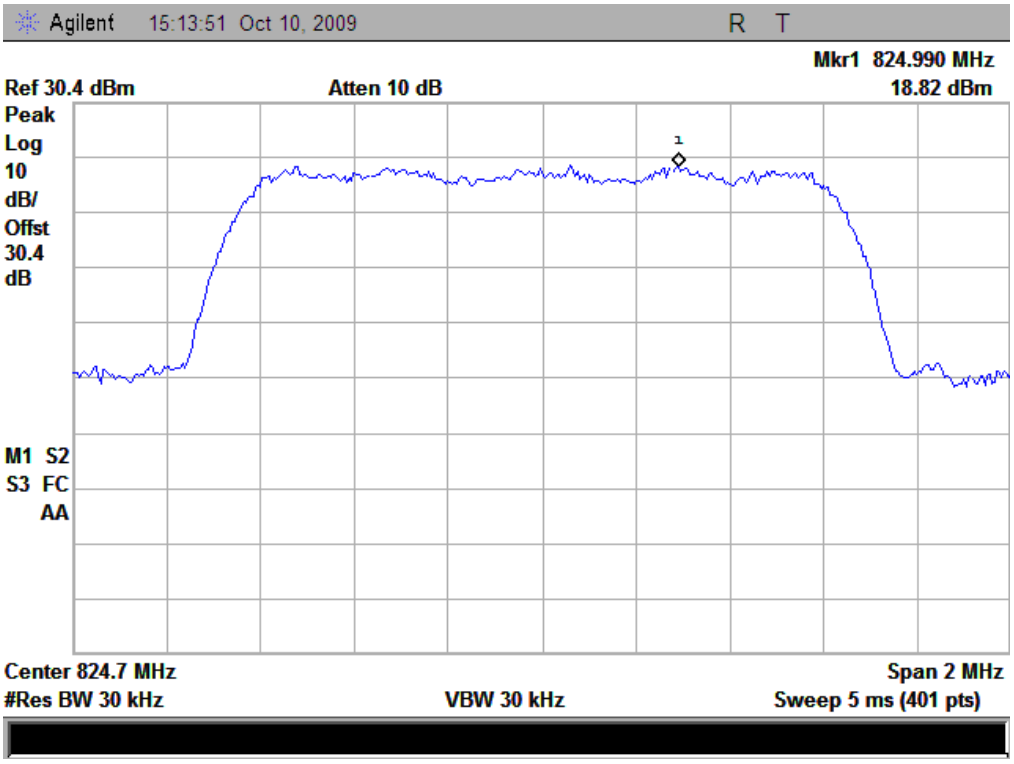
(b) Channel Block B:
Mobile 835 - 845 MHz, Base 880 - 890MHz;
Mobile 846.5 - 849 MHz, Base 891.5 - 894MHz

3.2.2 Test Procedure

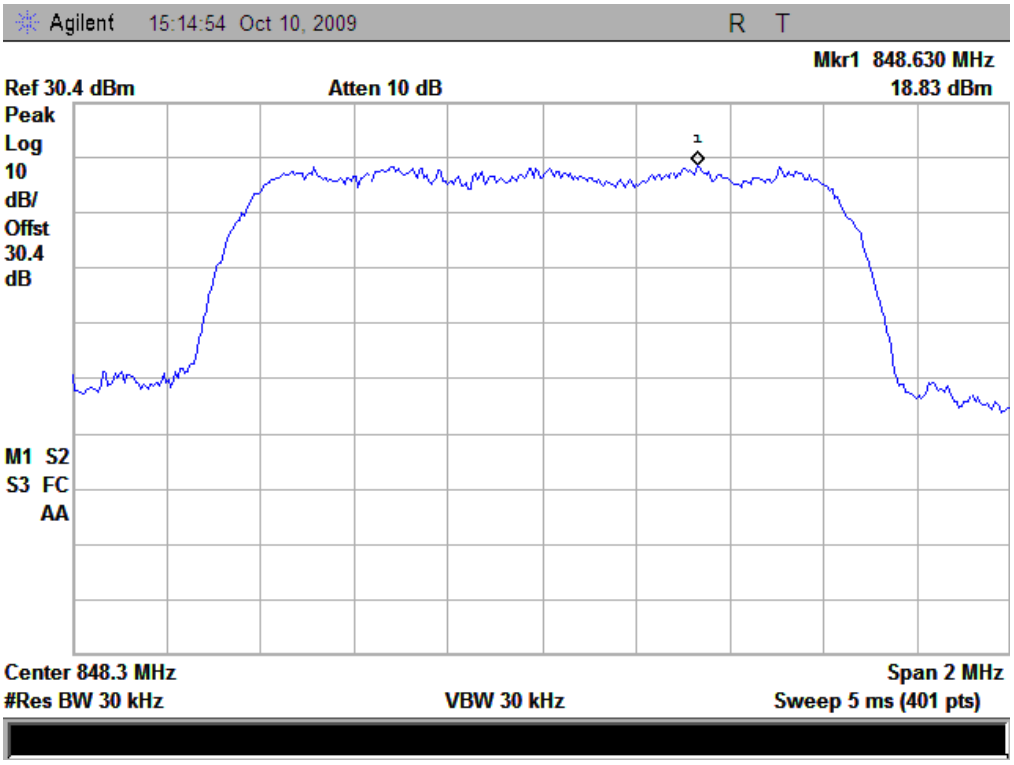
1. Perform test system setup as section 3.1.1.
2. The resolution bandwidth (RBW) of the Spectrum Analyzer was set to at lease 1% of the emission bandwidth of the fundamental emission of the transmitter, e.g. for GSM modulated signal (here used): RBW=VBW=3kHz, for CDMA modulated signal: RBW=VBW=30kHz.
3. The lowest and the highest channel were selected to perform tests respectively. Channel No.1013 (lowest) and 777(highest) for CDMA800 MHz band.
4. The MS operated at the maximum output power. Set the Spectrum Analyzer suitably to capture the waveform, search peak and mark, and then record the plot.

3.2.3 Test Result

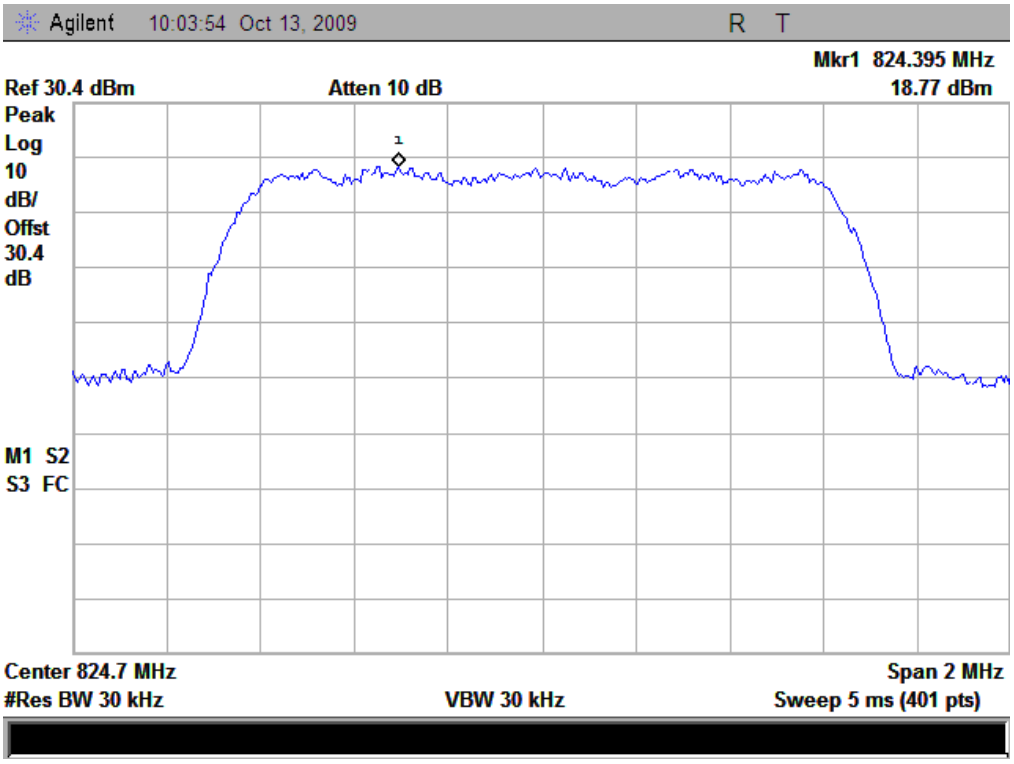
The frequencies of the lowest channel and the highest channel are as the following figures.



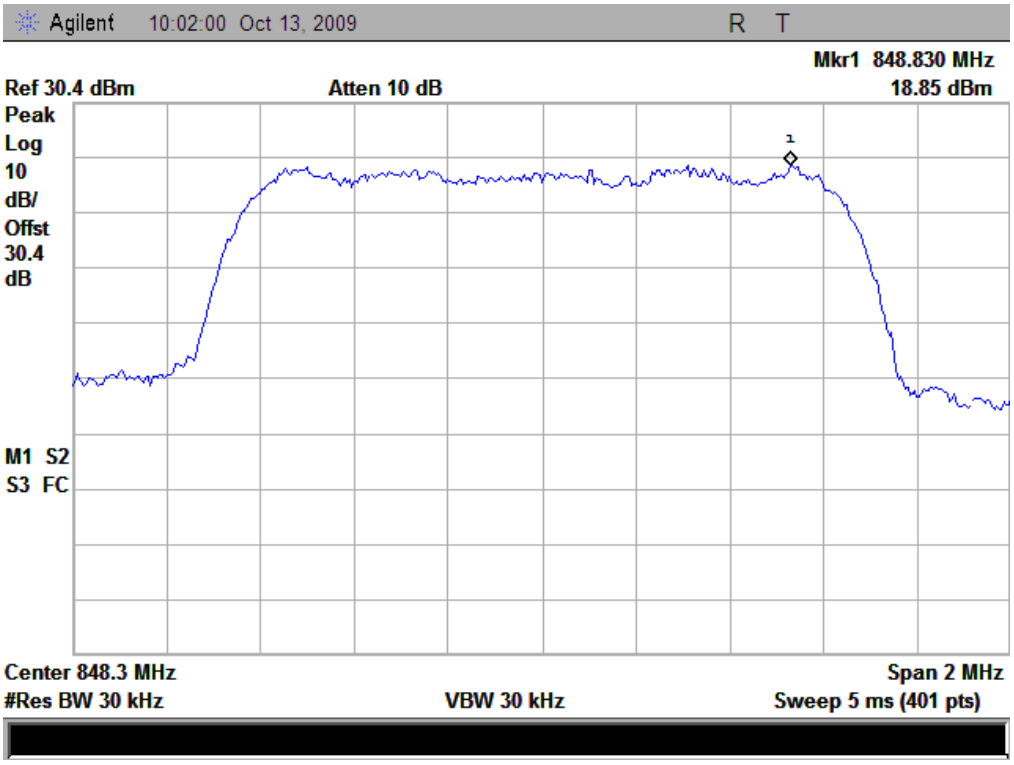
(Plot A: CDMA 800MHz Channel = 1013)



(Plot B: CDMA 800MHz Channel = 777)



(Plot C: EVDO Channel = 1013)



(Plot B: EVDO Channel = 777)

3.3 Conducted RF Output Power

3.3.1 Requirement

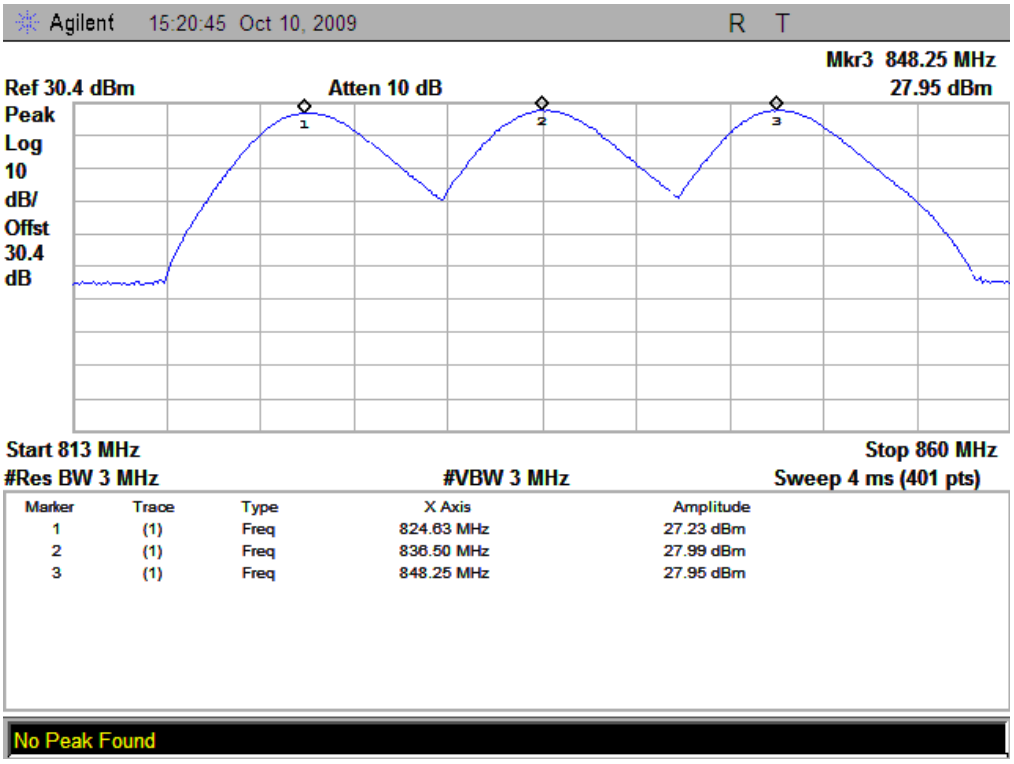
According to FCC §2.1046 (a), for transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in §2.1033 (c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

3.3.2 Test Procedure

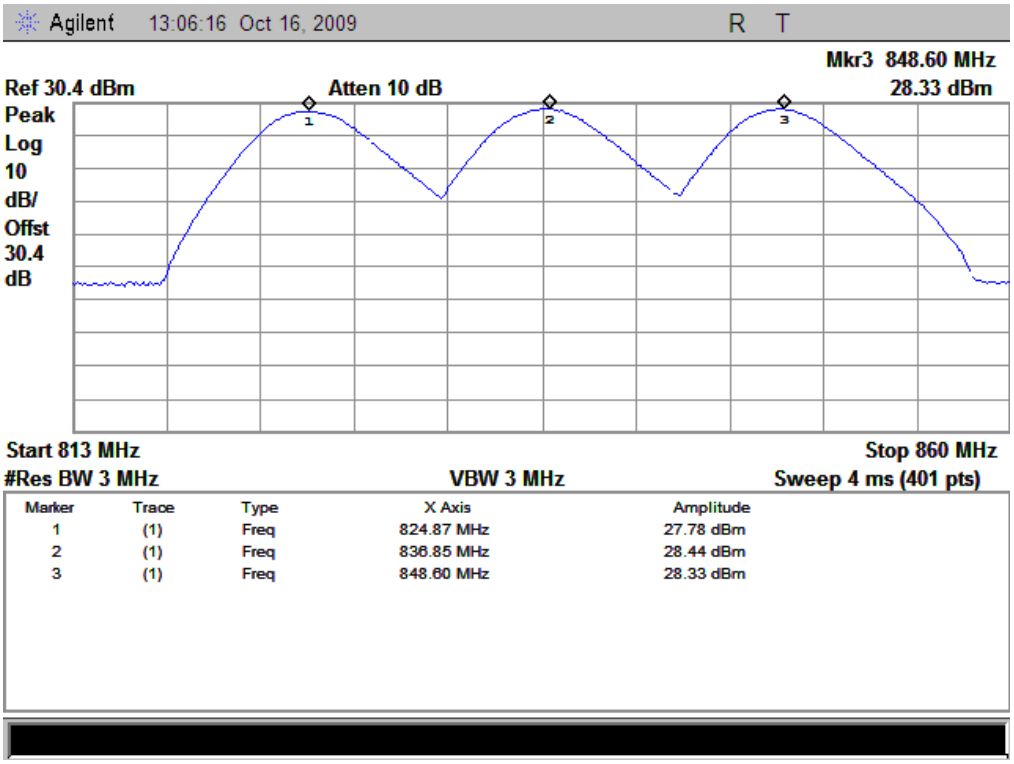
1. Perform test system setup as section 3.1.1 (the radio frequency load attached to the EUT antenna terminal is 50Ω).
2. The resolution bandwidth of the Spectrum Analyzer is set to be comparable to the emission bandwidth of the transmitter, e.g. for GSM modulated signal (here used): RBW=VBW=1MHz, for CDMA modulated signal: RBW=VBW=3MHz.
3. The low, middle and the high channels are selected to perform tests respectively.
4. Set the frequency range of the Spectrum Analyzer suitably to capture the waveform; search peak and mark it; finally record the peak and the plot.

3.3.3 Test Result

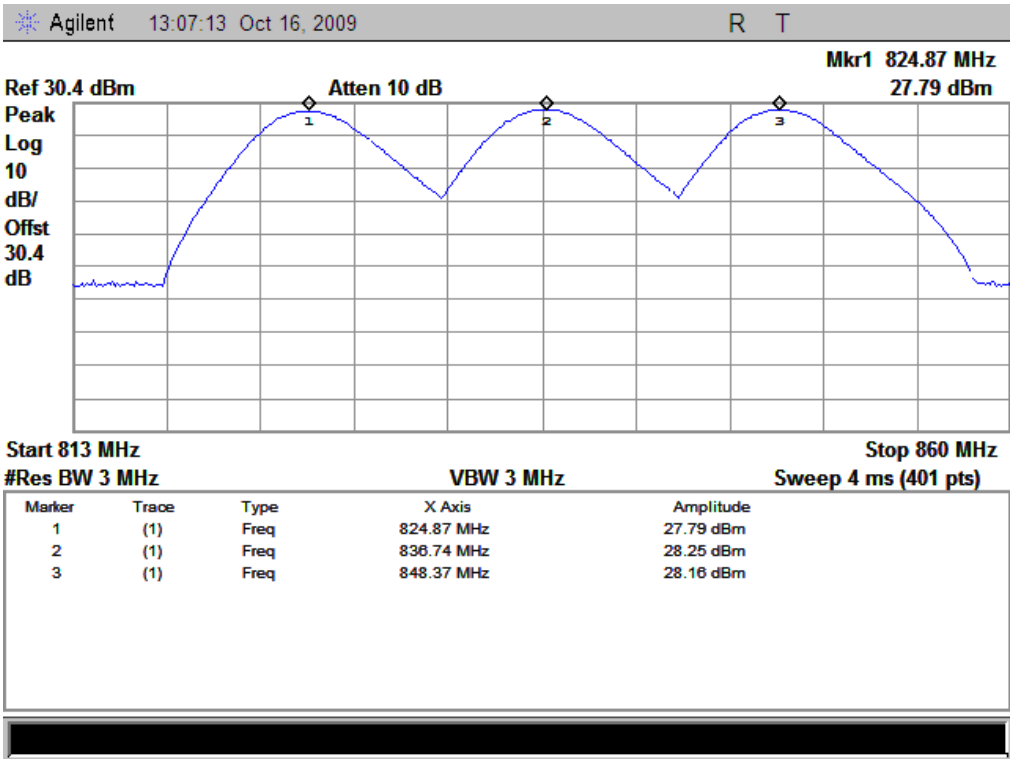
No.	Channel Number	Frequency (MHz)	Measured Power		Rated Power	
			dBm	W	dBm	W
CDMA 800MHz	1013	824.7	27.23	0.53	33	2
	384	836.52	27.99	0.63		
	777	848.31	27.95	0.62		
EVDO FETAP	1013	824.7	27.78	0.60	33	2
	384	836.52	28.44	0.70		
	777	848.31	28.33	0.68		
EVDO RETAP	1013	824.7	27.79	0.60	33	2
	384	836.52	28.25	0.67		
	777	848.31	28.16	0.65		



(Plot A: CDMA 800MHz Channel = 1013, 384, 777)



(Plot B: EVDO-FETAP Channel = 1013, 384, 777)



(Plot C: EVDO-RETAP Channel = 1013, 384, 777)

3.4 Occupied Bandwidth

3.4.1 Occupied Bandwidth Definition

According to FCC §2.1049, the occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

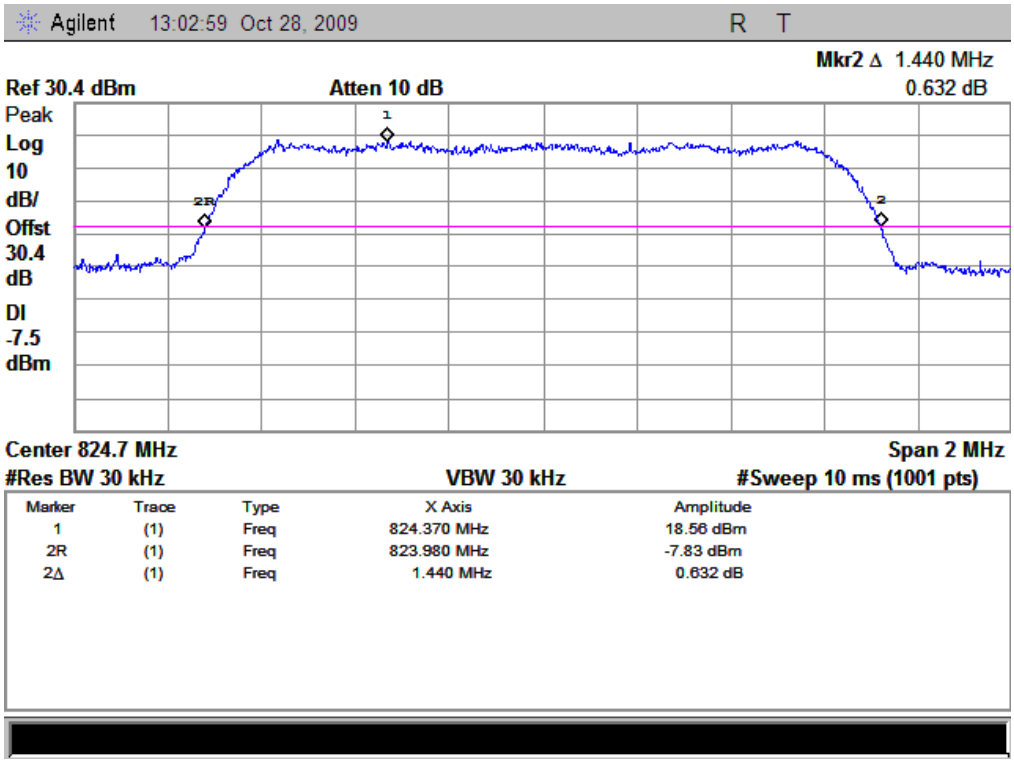
Occupied bandwidth is also known as the 99% emission bandwidth. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

3.4.2 Test Procedure

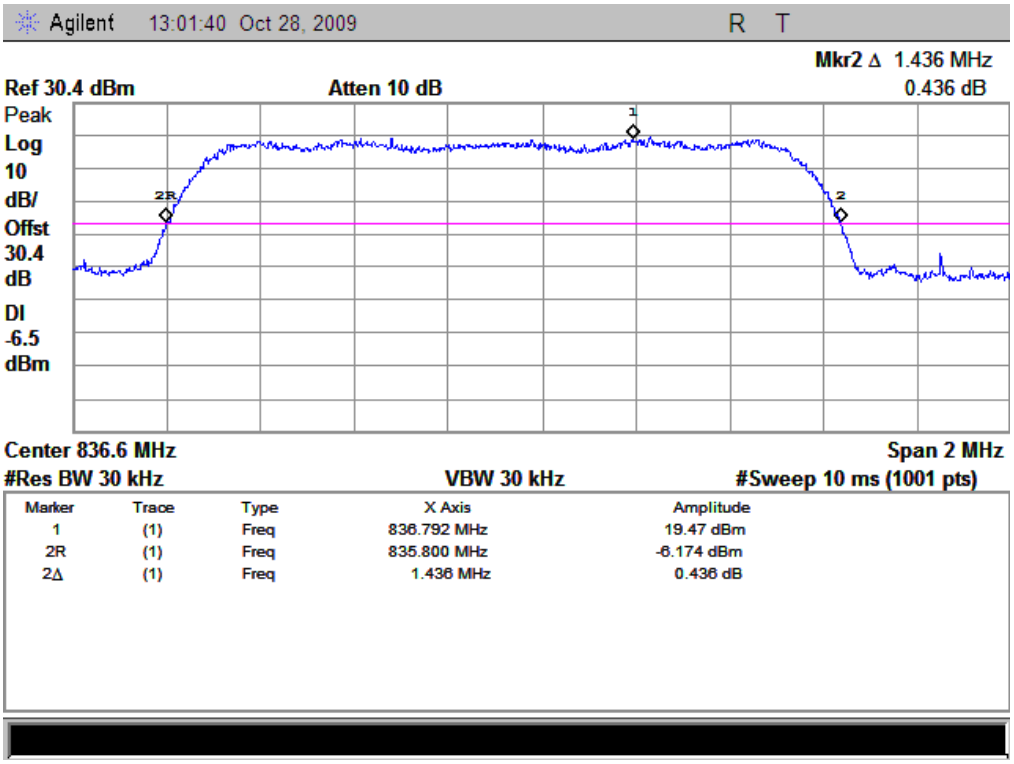
1. Perform test system setup as section 3.1.1.
2. The resolution bandwidth of the Spectrum Analyzer is set to at least one percent of the emission bandwidth, e.g. for GSM modulated signal (here used): RBW=VBW=3kHz, for CDMA modulated signal: RBW=VBW=30kHz.
3. The low, middle and the high channels are selected to perform tests respectively.
4. Set the frequency range of the Spectrum Analyzer suitably to capture the waveform; search peak; make a line whose value is 26dB lower than the peak; mark two points which the line intersected the waveform at; finally record the delta of the two points as the occupied bandwidth and the plot.

3.4.3 Test Result

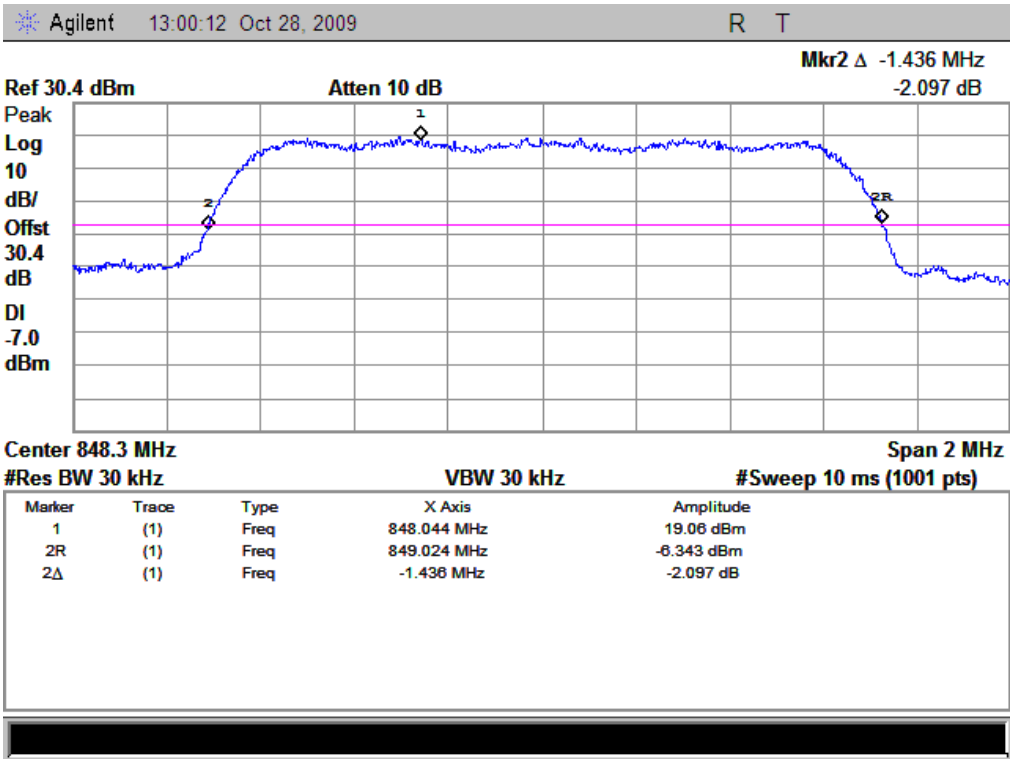
Band	Channel	Frequency (MHz)	Measured 20dB Occupied Bandwidth (MHz)	Refer to Plot
CDMA 800MHz	1013	824.7	1.440	Plot A
	384	836.52	1.436	Plot B
	777	848.31	1.436	Plot C
EVDO	1013	824.7	1.445	Plot D
	384	836.52	1.435	Plot E
	777	848.31	1.445	Plot F



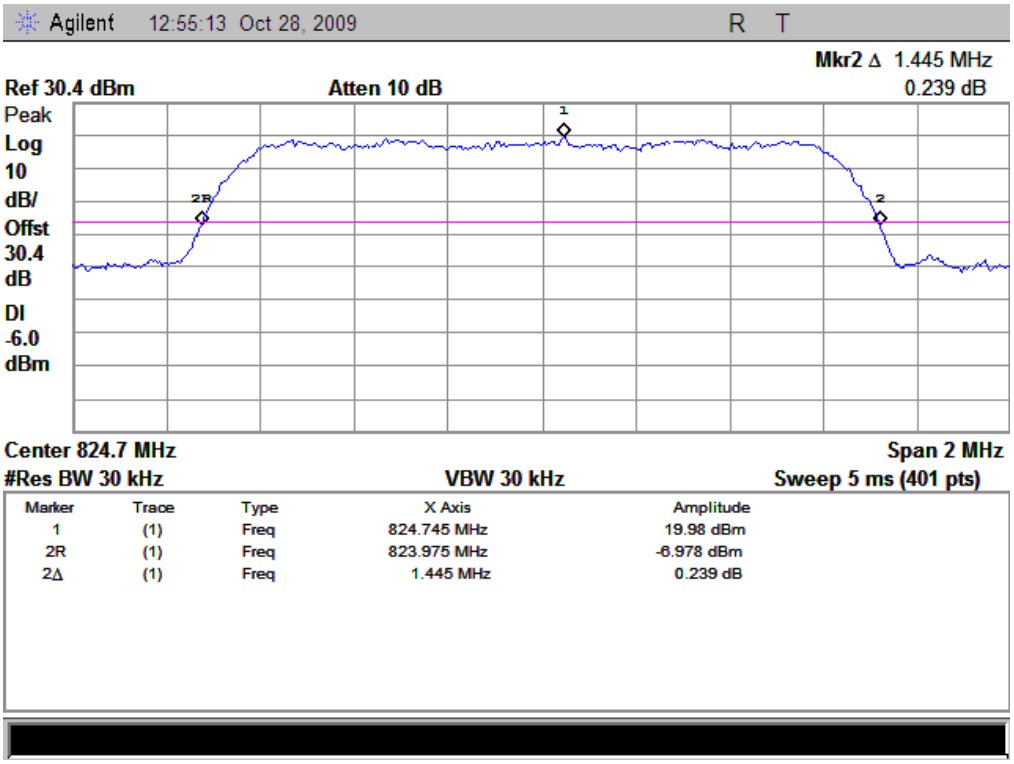
(Plot A: CDMA 800MHz Channel = 1013)



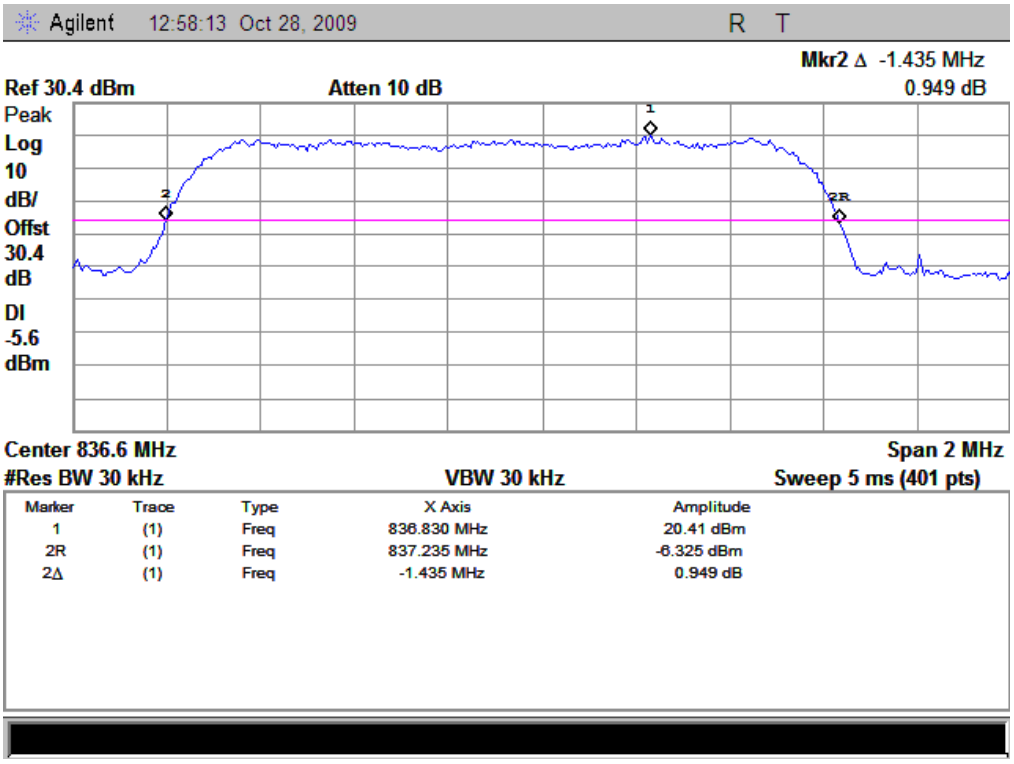
(Plot B: CDMA 800MHz Channel = 384)



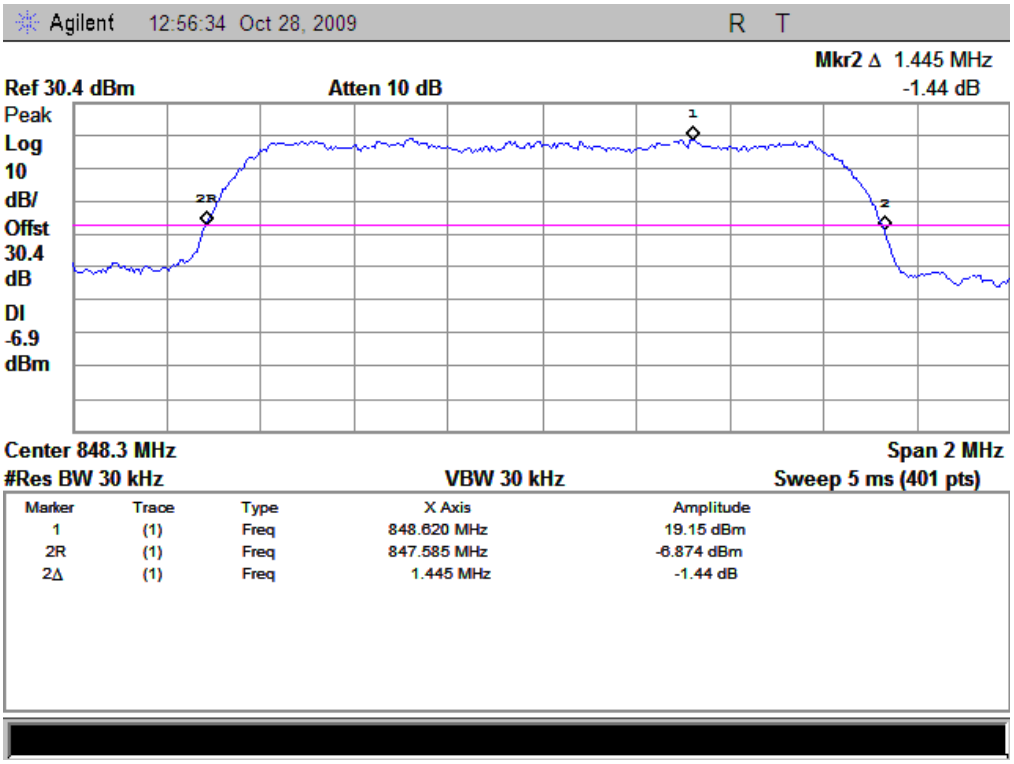
(Plot C: CDMA 800MHz Channel = 777)



(Plot D: EVDO Channel = 1013)



(Plot E: EVDO Channel = 384)



(Plot F: EVDO Channel = 777)

3.5 Conducted Spurious Emission

3.5.1 Requirement

According to FCC §22.917(a), 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. This calculated to be -13dBm.

3.5.2 Test Procedure

1. Perform test system setup as section 3.1.1.
2. Make a limit line whose value is -13dBm on the Spectrum Analyzer.
3. The lowest, middle and the highest channels are selected to perform tests respectively.
4. Set the RBW of the Spectrum Analyzer to 1MHz, and the measuring frequency range from 9kHz to 10^{th} harmonic of the fundamental frequency (here used 10GHz); mark the fundamental frequency and the harmonics thereof; finally record the harmonics and the plot. Note: the measuring frequency range can be divided into several parts to perform tests.
5. In the 1MHz bands immediately outside and adjacent to the frequency black, the RBW of the Spectrum Analyzer was set to at least one percent of the emission bandwidth of the fundamental emission of the transmitter, e.g. for GSM modulated signal (here used): RBW=3kHz, for CDMA modulated signal: RBW=30kHz.

3.5.3 Test Result

3.5.3.1 Table for the Harmonics and Plots for the Spurious Emission

1. Plot for Spurious Emission:

(Plot A: CDMA 800MHz Channel = 1013, 30MHz to 10GHz)

(Plot B: CDMA 800MHz Channel = 384, 30MHz to 10GHz)

(Plot C: CDMA 800MHz Channel = 777, 30MHz to 10GHz)

(Plot D: EVDO Channel = 1013, 30MHz to 10GHz)

(Plot E: EVDO Channel =384, 30MHz to 10GHz)

(Plot F: EVDO Channel =777, 30MHz to 10GHz)

3.6 Band Edge

3.6.1 Requirement

According to FCC section 22.917(b), in the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth (26dB emission bandwidth) of the fundamental emission of the transmitter may be employed.

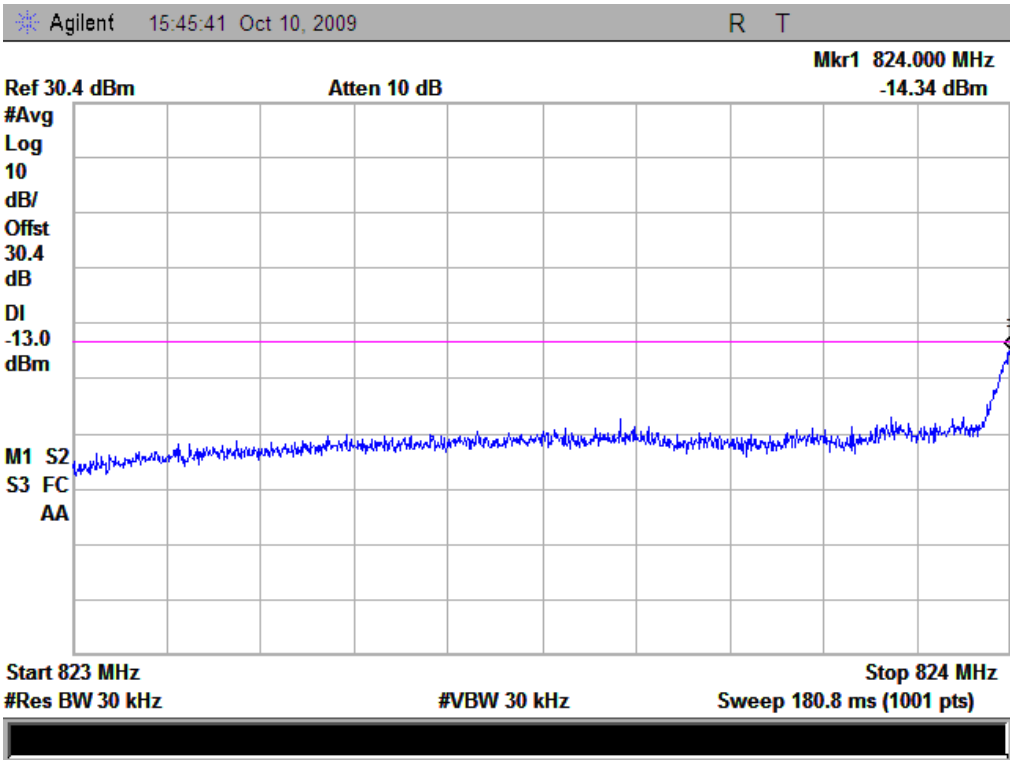
3.6.2 Test Result

The lowest and highest channels are tested to verify the band edge emissions.

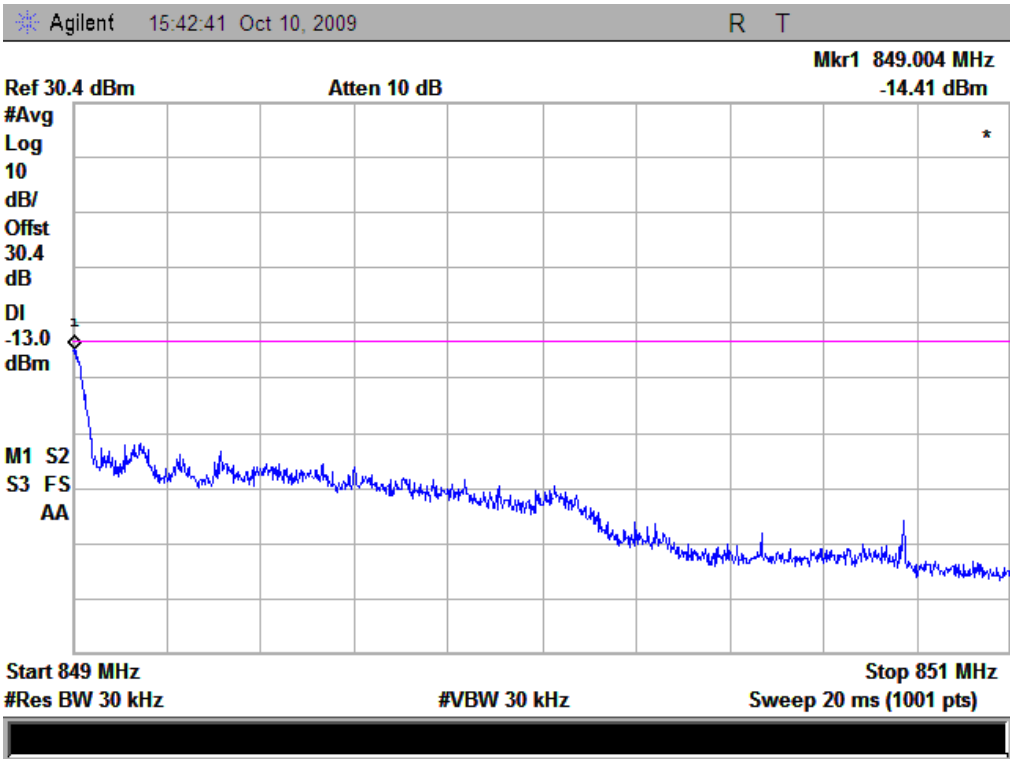
1. Test Verdict:

Band	Channe l	Frequency (MHz)	Measured Max. Band Edge Emission (dBm)	Refer to Plot	Limit (dBm)	Verdict
CDMA 800MHz	1013	824.7	-14.34	Plat A	-13	PASS
	777	848.31	-14.41	Plot B		PASS
EVDO	1013	824.7	-14.26	Plat C	-13	PASS
	777	848.31	-16.65	Plot D		PASS

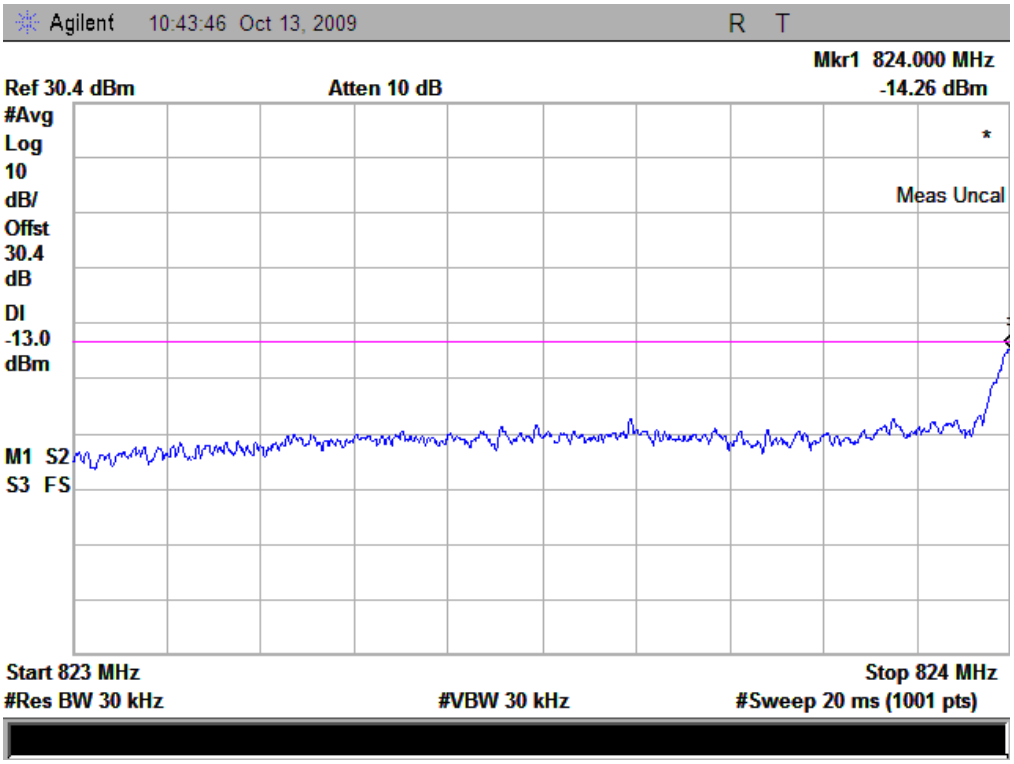
2. Plot



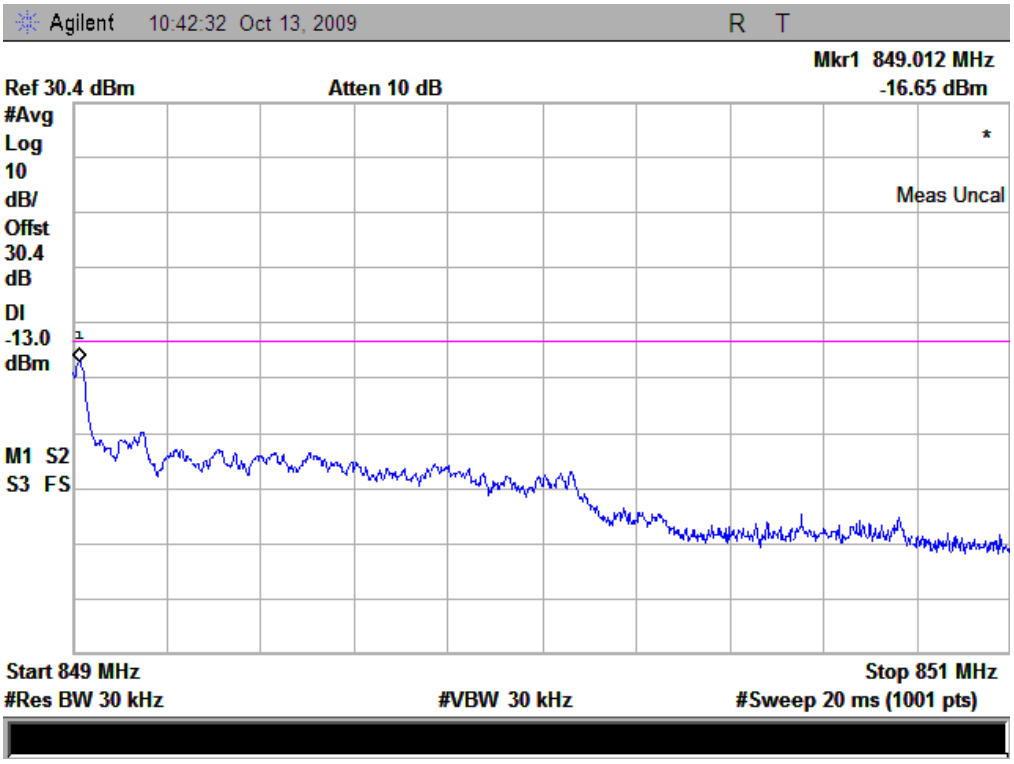
(Plot A: CDMA 800MHz Channel = 1013)



(Plot B: CDMA 800MHz Channel = 777)



(Plot C: EVDO Channel = 1013)



(Plot D: EVDO Channel = 777)

3.7 Transmitter Radiated Power (EIRP/ERP)

3.7.1 Requirement

According to FCC §22.913, the ERP of Cellular mobile transmitters must not exceed 7 Watts

3.7.2 Test Procedure

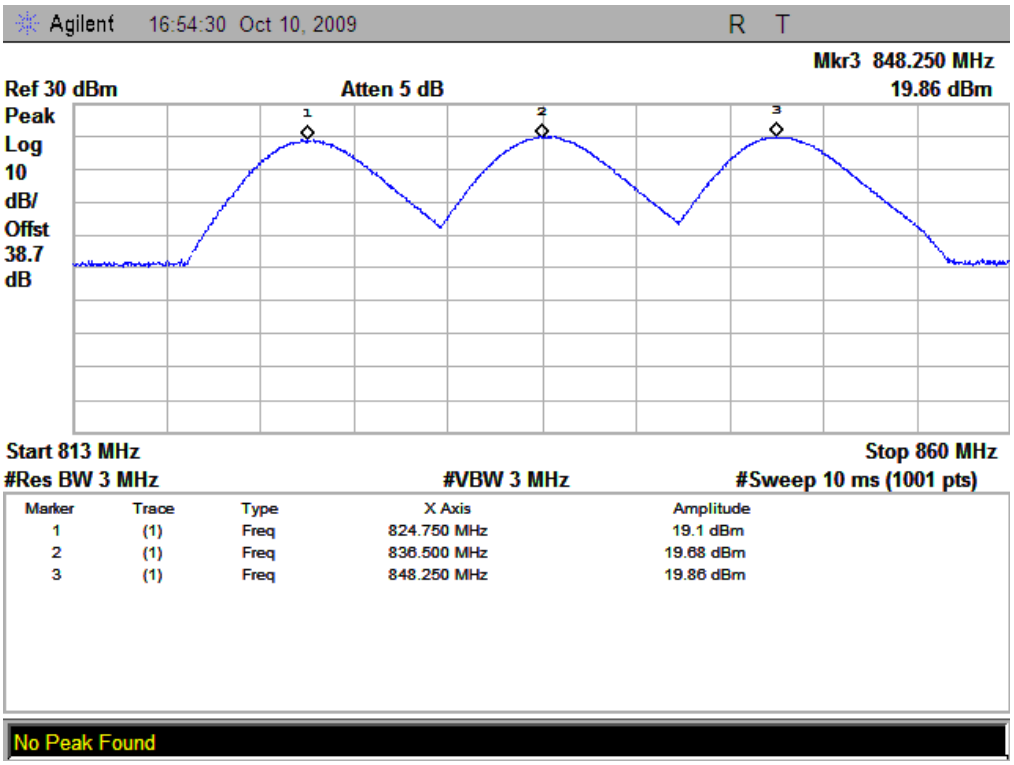
1. Perform test system setup as section 3.1.2.
2. The resolution bandwidth of the Spectrum Analyzer is set to be comparable to the emission bandwidth of the transmitter, e.g. for GSM modulated signal (here used): RBW=VBW=1MHz, for CDMA modulated signal: RBW=VBW=3MHz.
3. The low, middle and the high channels are selected to perform tests respectively.
4. Employ the bi-log Test Antenna as the test system receiving antenna; set the polarization of the Test Antenna to be the same as that of the EUT transmitting antenna.
5. Set the frequency range of the Spectrum Analyzer suitably to capture the waveform; actuate the Turn Table to turn from 0 degrees to 360 degrees to find the maximum reading via the Spectrum Analyzer, mark the peak; finally record the peak and the plot.

3.7.3 Test Result

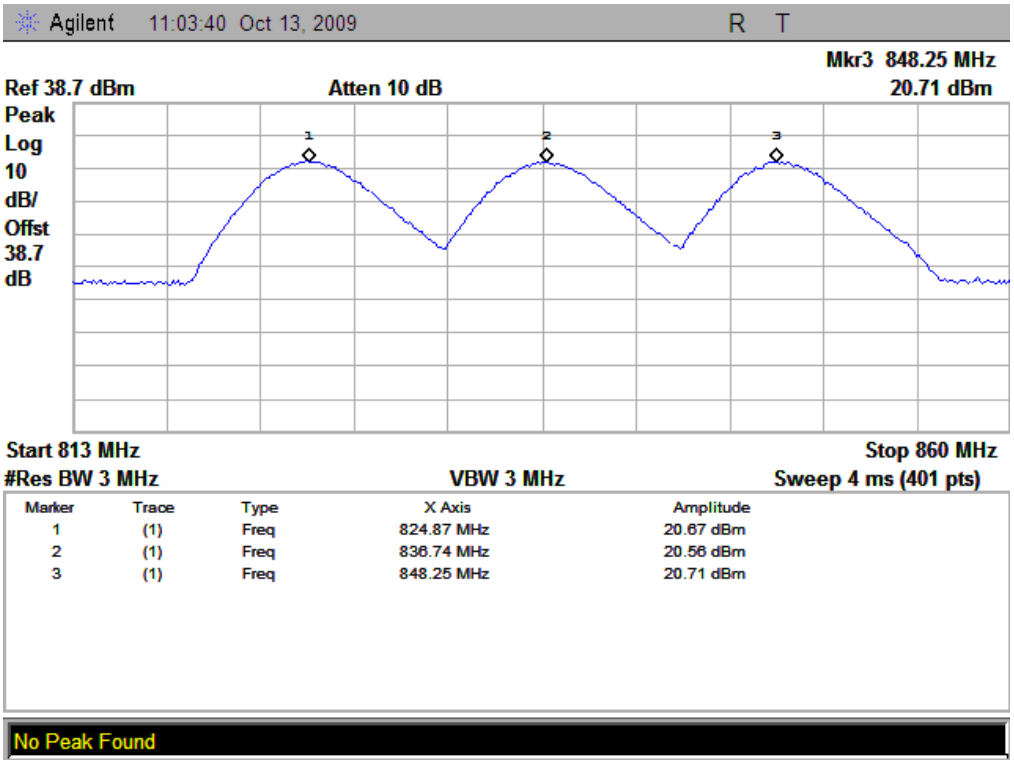
1. Test Verdict:

No.	Channel	Frequency (MHz)	Measured ERP		Limit ERP	
			dBm	W	dBm	W
CDMA 800MHz	1013	824.7	19.1	0.08	38.5	7
	384	836.52	19.68	0.09		
	777	848.31	19.86	0.10		
EVDO	1013	824.7	20.67	0.12	38.5	7
	384	836.52	20.56	0.11		
	777	848.31	20.71	0.12		

2. The plots:



(Plot A: CDMA 800MHz Channel = 1013, 384, 777)



(Plot B: EVDO Channel = 1013, 384, 777)

3.8 Radiated Spurious Emission

3.8.1 Requirement

According to FCC §22.917(a), 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. This calculated to be -13dBm.

3.8.2 Test Procedure

1. Perform test system setup as section 3.1.2.
2. Make a limit line whose value is -13dBm on the Spectrum Analyzer, and set the RBW of the Spectrum Analyzer to 1MHz.
3. The low, middle and the high channels are selected to perform tests respectively.
4. Employ the bi-log Test Antenna as the test system receiving antenna and set the frequency range of the Spectrum Analyzer from 30MHz to 3GHz.
5. The measurement is performed with the Test Antenna at both horizontal and vertical polarization respectively. Set the polarization of the Test Antenna to be horizontal.
6. Actuate the Turn Table to turn from 0 degrees to 360 degrees to find the maximum reading via the Spectrum Analyzer, mark the fundamental frequency and the harmonics thereof, after then record the harmonics and the plot.
7. Set the polarization of the Test Antenna to be vertical, then repeat step 6.
8. Employ the horn Test Antenna as the test system receiving antenna and set the frequency range of the Spectrum Analyzer from 3GHz to 10^{th} harmonic of the fundamental frequency (here used 10GHz for CDMA800MHz and 20GHz for CDMA1900MHz).

3.8.3 Test Result

The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. The lowest, middle and highest channels are tested to verify the out of band emissions.

3.8.3.1 1.Test Plot for the Whole Measurement Frequency Range:

Note: the power of the EUT transmitting frequency should be ignored.

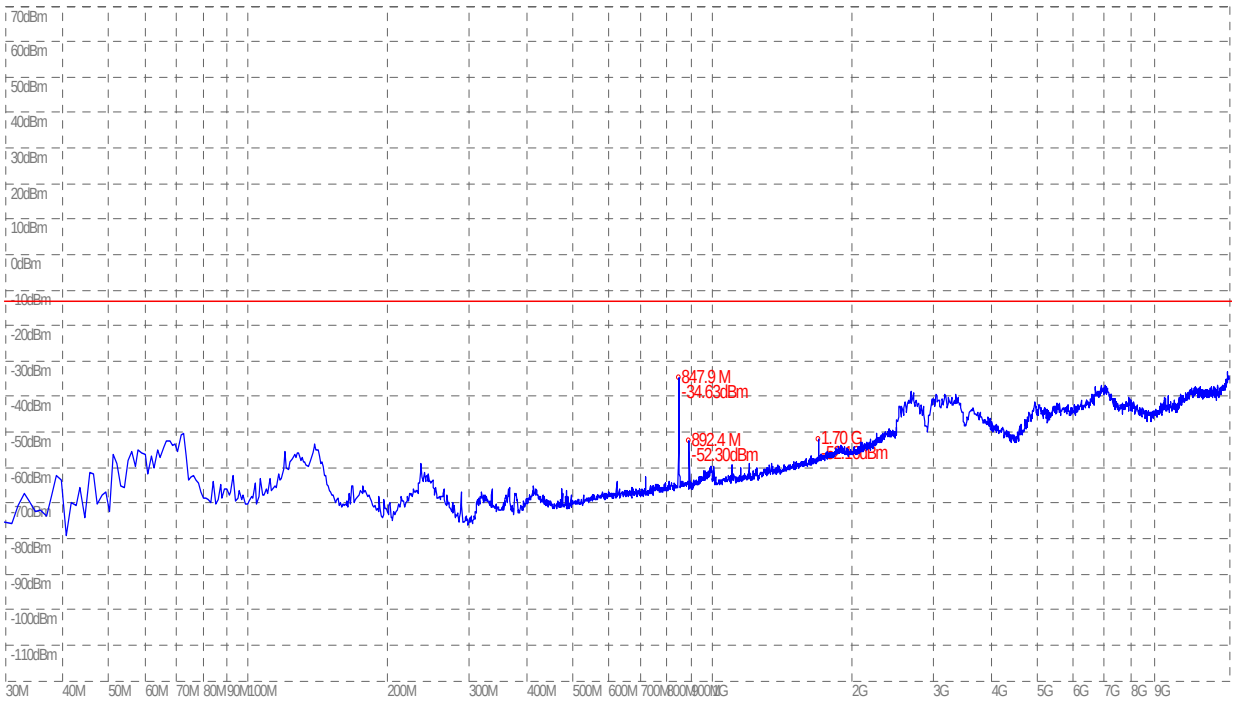
(Plot A.1: CDMA 800MHz Channel = 1013, Test Antenna Horizontal)

(Plot A.2: CDMA 800MHz Channel = 1013, Test Antenna Vertical)

(Plot B.1: CDMA 800MHz Channel = 384, Test Antenna Horizontal)

(Plot B.2: CDMA 800MHz Channel = 384, Test Antenna Vertical)

(Plot C.1: CDMA 800MHz Channel = 777, Test Antenna Horizontal)



(Plot C.2: CDMA 800MHz Channel = 777, Test Antenna Vertical)

(Plot D.1: EVDO Channel = 1013, Test Antenna Horizontal)

(Plot D.2: EVDO Channel = 1013, Test Antenna Vertical)

(Plot E.1: EVDO Channel = 384, Test Antenna Horizontal)

(Plot E.2: EVDO Channel = 384, Test Antenna Vertical)

(Plot F.1: EVDO Channel = 777, Test Antenna Horizontal)

(Plot F.2: EVDO Channel = 777, Test Antenna Vertical)

3.9 Frequency Stability

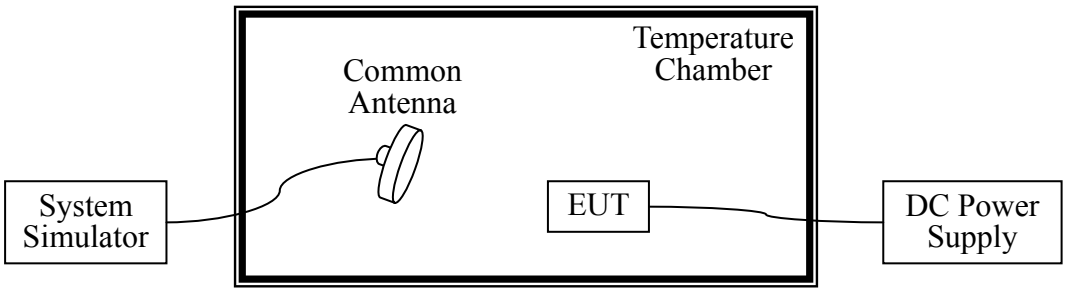
3.9.1 Requirement

According to FCC section 22.355, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. According to FCC section 2.1055, the test conditions are:

(a) The temperature is varied from -30°C to +50°C at intervals of not more than 10°C.
(b) For hand carried battery powered equipment, the primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacture. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

3.9.2 Test Description

Test Setup:



The EUT, which is powered by the DC Power Supply directly, is located in the Temperature Chamber. The EUT is commanded by the System Simulator (SS) to operate at the maximum output power. A call is established between the EUT and the SS via a Common Antenna.

Equipments List:

Description	Manufacturer	Model	Serial No.
System Simulator	Agilent	E5515C	GB43130131
DC Power Supply	Good Will	GPS-3030DD	EF920938
Temperature Chamber	YinHe Experimental Equip.	HL4003T	(n.a.)

3.9.3 Test Procedure

1. Perform test system setup as section 3.1.3.
2. Set the voltage of the DC Power Supply to normal supply voltage (here used 5.0V) and the temperature of the Temperature Chamber to vary from -30°C to +50°C at intervals of 10°C.

3. At each temperature level, the EUT is powered off and kept in the Temperature Chamber for two hours. After sufficient stabilization, turn on the EUT, command it via the System Simulator (SS) to operate at the maximum output power i.e. A communication link is established between the EUT and the SS.
4. The low, middle and the high channels are selected to perform tests respectively. Set the TCH number to1013 as the low channel.
5. The frequency deviation is measured (directly read from the SS, which can report the parameter) within three minutes.
6. Set the TCH number to 384 as the middle channel, then repeat step 5.
7. Set the TCH number to 777 as the high channel, then repeat step 5.
8. Adjust the temperature of the Temperature Chamber as specified in step 2, then repeat step 3 to 7.
9. Set the voltage of the DC Power Supply to high extreme supply voltage (here used 5.5V) and the temperature of the Temperature Chamber to normal (here used +25°C), then repeat step 3 to 8.
10. Set the voltage of the DC Power Supply to low extreme supply voltage (here used 4.5V) and the temperature of the Temperature Chamber to normal (here used +25°C), then repeat step 3 to 8..

3.9.4 Test Result

Band	Test Conditions		Frequency Deviation						Verdict
	Power	Temperature (°C)	Channel = 1013 (824.7MHz)		Channel = 384 (836.52MHz)		Channel = 777 (848.31MHz)		
			Hz	Limits	Hz	Limits	Hz	Limits	
CDMA 800MHz	5.0V	-30	12.23	±2.5ppm	11.65	±2.5ppm	7.37	±2.5ppm	PASS
		-20	28.05		27.17		23.56		
		-10	-26.32		-26.61		-27.49		
		0	-20.19		-22.51		-20.26		
		+10	27.45		23.70		21.54		
		+20	27.64		26.34		25.03		
		+30	19.13		18.50		17.70		
		+40	-2.51		-7.72		-7.83		
		+50	4.84		-0.52		0.70		
	5.5V	+25	10.93		11.34		11.04		
	4.5V	+25	-2.45		-1.58		-2.51		
EVDO	5.0V	-30	-29.98	±2.5ppm	-30.11	±2.5ppm	-32.84	±2.5ppm	PASS
		-20	25.29		19.54		19.31		
		-10	-27.24		-29.40		-27.48		
		0	-3.53		-9.52		-9.52		

Band	Test Conditions		Frequency Deviation						Verdict
	Power	Temperature (°C)	Channel = 1013 (824.7MHz)		Channel = 384 (836.52MHz)		Channel = 777 (848.31MHz)		
			Hz	Limits	Hz	Limits	Hz	Limits	
		+10	5.88		4.77		3.21		
		+20	-13.37		-15.94		-16.02		
		+30	-2.86		-7.69		-7.31		
		+40	-4.69		-5.64		-7.39		
		+50	-1.09		-3.75		-5.61		
	5.5V	+25	9.69		10.26		9.44		
	4.5V	+25	-3.19		-2.84		-2.40		

** END OF REPORT **