Castra without Zigbee Conducted Test Report

80-VR789-2 Rev. A

June 25, 2009

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U.S.A.

June 25, 2009

Castra without Zigbee Conducted Test Report
80-VR789-2 Rev. A

Revision history

Revision	Date	Description
A	June 2009	Initial release

Castra without Zigbee Conducted Test Report

FCC Part 22 & 24 Certification	
FCC ID:	**J9CCASTRAWOZB**
Model:	**Castra without Zigbee**

STATEMENT OF CERTIFICATION

The data, data evaluation and equipment configuration represented herein are a true and accurate representation of the measurements of the sample's radio frequency interference emissions characteristics as of the dates and at the times of the test under the conditions herein specified.

Test performed by:	QUALCOMM Incorporated 5775 Morehouse Drive San Diego, CA 92121-1714
Report Prepared by:	QUALCOMM Incorporated 5775 Morehouse Drive San Diego, CA 92121-1714
Tests that required an OATS site were performed by Nemko Product Services.	

Table of Contents

1 Introduction and Purpose

This document provides the FCC test data for the Castra without Zigbee Qualcomm® second generation dedicated tracking module. The tests included in this report are limited to all conducted tests required for FCC Part 22 and 24. The radiated tests were performed at Nemko USA, Inc. in San Diego, CA, and are reported in a separate document.

2 Description of Device Under Test

The Castra without Zigbee module, is the Qualcomm® second generation dedicated tracking module. Castrawithout Zigbee is a CDMA2000®-1X module powered by the Qualcomm QSC6055™ chipset. The module supports CDMA BC0 and BC1, with a single diversity in addition to GPS. The module also hosts, as options, a Bosch three axes accelerometer. The module tested included the Bosch three axes accelerometer.
The Castra without Zigbee modules are meant to be integrated into various dedicated tracking devices and can include a customized UI, antenna, and additional proprietary circuitry. The module is a 7.3 gram, 21 mm x 46 mm x 5 mm sized devices. While CDMA2000 1X compliant, the HTT design is optimized for minimal cost, minimal size, maximum battery life and superb position location performance. The device uses A-GPS to obtain position location and sends this information back to the network by SMS or packed data. For the most active mode of operation, a position fix occurs about every 15 seconds followed by a 3 second SMS message or packet data stream. Other modes of simplified operation request position fixes less often. The hibernation mode extends the battery life beyond normal cellular phone standby time. Hibernation technology comprises of several innovative modes of battery saving. Smart mechanism selects the best fit mode based on future activities of the device.

Only 850 MHz (Cellular) and 1900 MHz (PCS) bands are used for operation. The DUT is a pre-production sample.

3 Test Summary

FCC/IC Rule	Description of Test	Result	Page
§2.1046	RF Power Output	**Complies**	3
§2.1049	Occupied Bandwidth	**Complies**	6
§22.359, 24.238	Block Edge Requirement	**Complies**	11
§2.1051, 22.917, 24.238(a)	Out of Band Emission at Antenna Terminals	**Complies**	14
§2.1055, 22.355, 24.235	Frequency Stability vs. Temperature vs. Voltage	**Complies**	19
§1.1310, 2.1091	RF Exposure	**Complies**	See Exhibit 4
§2.1053, 22.917. 24.238(a)	Field Strength of Spurious Radiation	**Complies**	See Exhibit 3

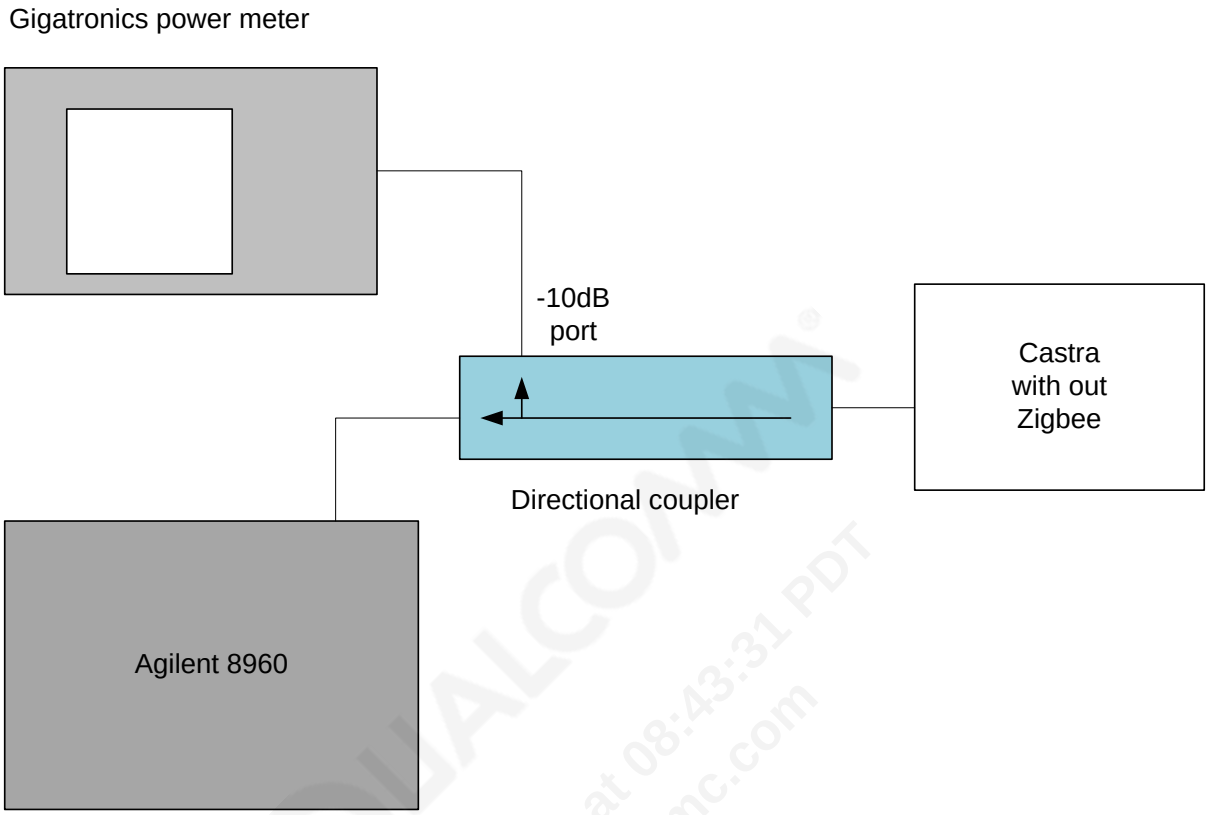
4 RF Power Output Verification

FCC:	§ 2.1046 , 24.232(d)
Limit:	n/a
DUT SN	B0A4F5

4.1 Base Station Emulator Settings and Measurement Procedures

As shown in the figure below, connect the transmitter output of the module to the communication test set 8960 and configure it to operate at maximum power in a call. Measure the power at three equally spaced operating frequencies for each band.

Use the Gigatronics power meter to measure CDMA 1x conducted power outputs. The relevant cable loss is measured for the specific frequencies under test and added as a correction factor for all the tests.



4.1.1 For CDMA2000 1x

Measure the power at Ch1013, 384 and 777 for US cell; Ch25, 600 and 1175 for US PCS band.
1xRTT
Use CDMA2000 Rev 6 protocol in the call box 8960.
Test for Reverse/Forward TCH RC1 and RC3 Reverse FCH and demodulation of RC 3.
Set up a call using Fundamental Channel Test Mode 1 (RC1, SO 2) with 9600 bps data rate only.
As per C.S0011 or TIA/EIA-98-F Table 4.4.5.2-1, set the test parameters as shown in Table 4-1.
Send continuously '0' power control bits to the UNDP-1.
Measure the output power at inGeo1AW antenna connector as recorded on the power meter with values corrected for cables losses.
Repeat step b through d for Fundamental Channel Test Mode:
RC3, SO55

Table 4-1 Parameters for Max. Power with a single traffic code channel, SR1

Parameter	Units	Value
$\hat{I}_{or}$	dBm/1.23 MHz	-104
$\frac{\text{Pilot } E_c}{I_{or}}$	dB	-7
$\frac{\text{Traffic } E_c}{I_{or}}$	dB	-7.4

4.2 Test Results

CDMA2000 1x

Mode	Test Case			Cell Channel			PCS Channel		
	#	FWD RC/TAP	REV RC/TAP	1013	384	777	25	600	1175
Conducted Power	1	RC3	RC3 (SO55)	23.63	23.66	23.92	24.75	24.63	24.56

Mode	Test Case			Cell Channel			PCS Channel		
	#	FWD RC/TAP	REV RC/TAP	1013	384	777	25	600	1175
Conducted Power PAR	1	RC3	RC3 (SO55)	N/A	N/A	N/A	3.70	3.86	3.50

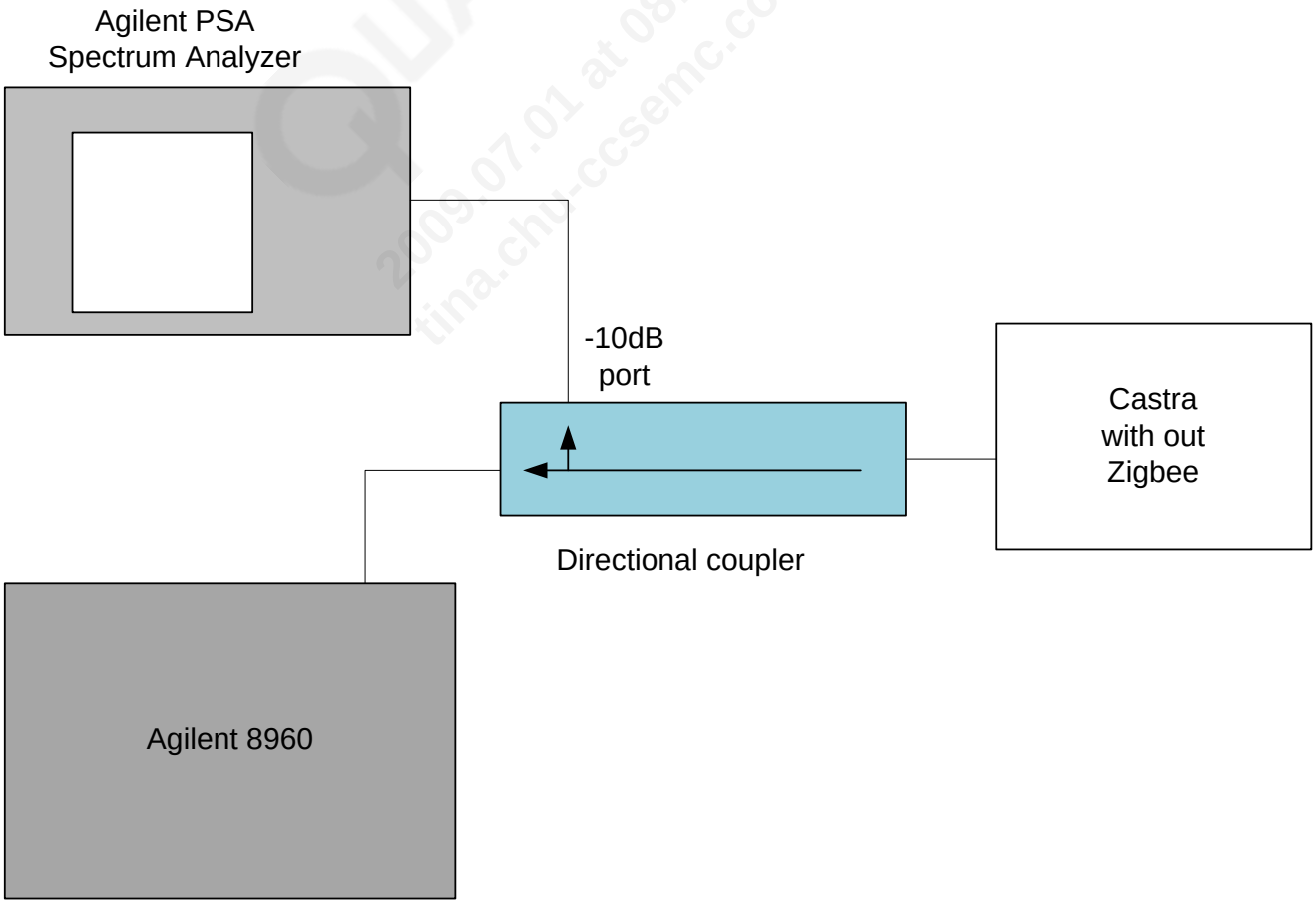
5 Occupied Bandwidth

FCC:	§2.1049
Limit:	n/a
DUT SN	B0A4F5
Modes Tested	CDMA 1x
	RC3 SO55

5.1 Test Procedures

As Figure below indicates, the module was connected to the call simulator test box through a calibrated coaxial cable and directional coupler. The coupled port of the coupler was connected to the spectrum analyzer. Occupied bandwidth (defined as the 99% power bandwidth) was measured using the PSA internal measurement personality feature.

Testing was completed using the Agilent 8960 for the CDMA 1x measurement.



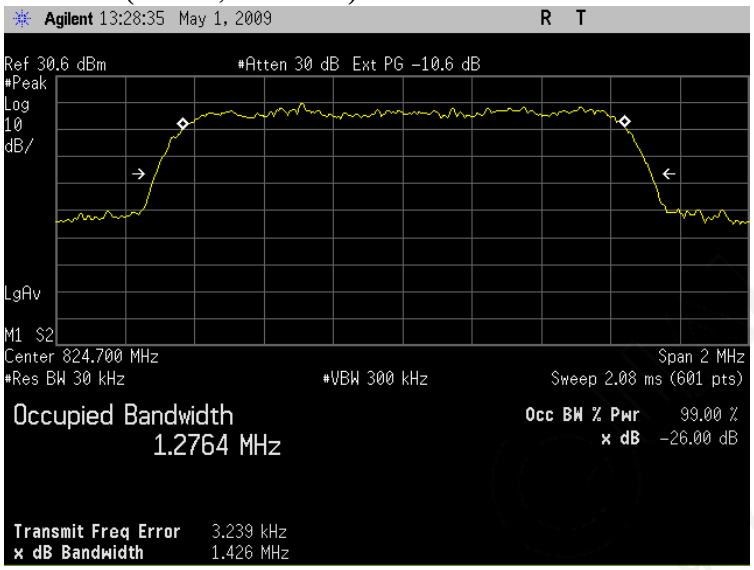
5.2 Test Results

The occupied bandwidth was measured at low, mid and high channel in each band.

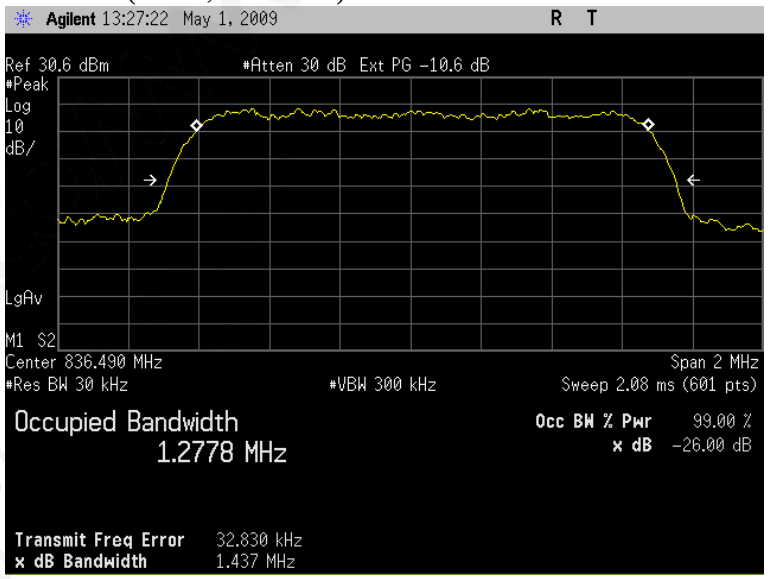
Mode		Frequency (MHz)	Channel	99% Occupied Bandwidth (MHz)	Plot number
CDMA1x/ 1x-EVDO	RC3 SO55	**824.7**	**1013**	1.2764	Plot 5.2 - 1
		836.52	**384**	1.2778	Plot 5.2 - 2
		848.31	**777**	1.2759	Plot 5.2 - 3
		1851.25	**25**	1.2800	Plot 5.2 - 4
		1880	**600**	1.2807	Plot 5.2 - 5
		1908.75	**1175**	1.2759	Plot 5.2 - 6

5.3 Plots

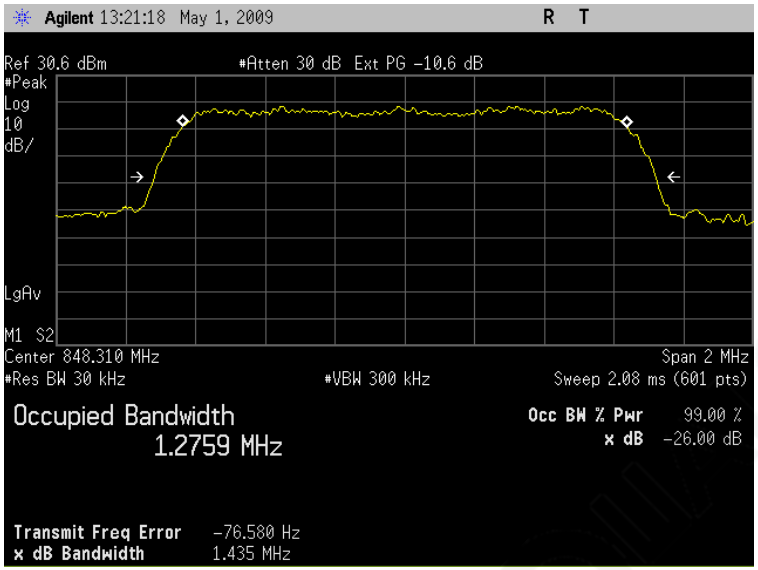
Plot 5.2 - 1 (Ch1013, RC3 SO55)



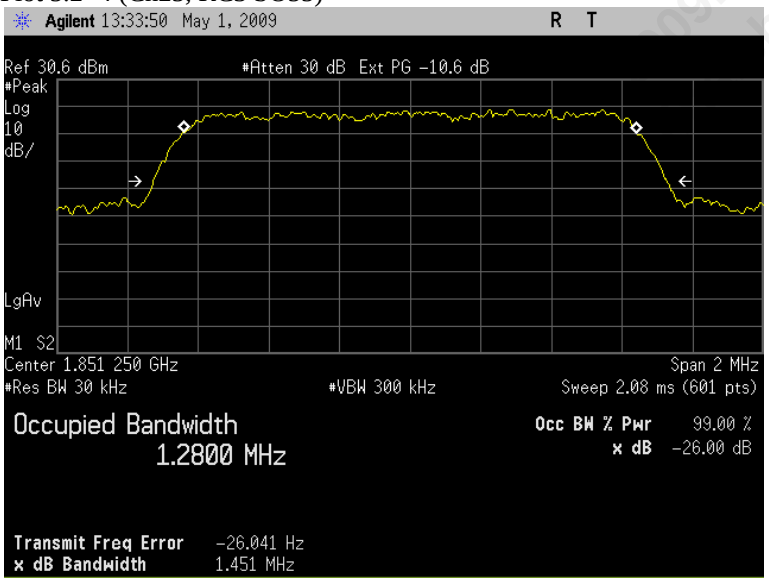
Plot 5.2 - 2 (Ch384, RC3 SO55)



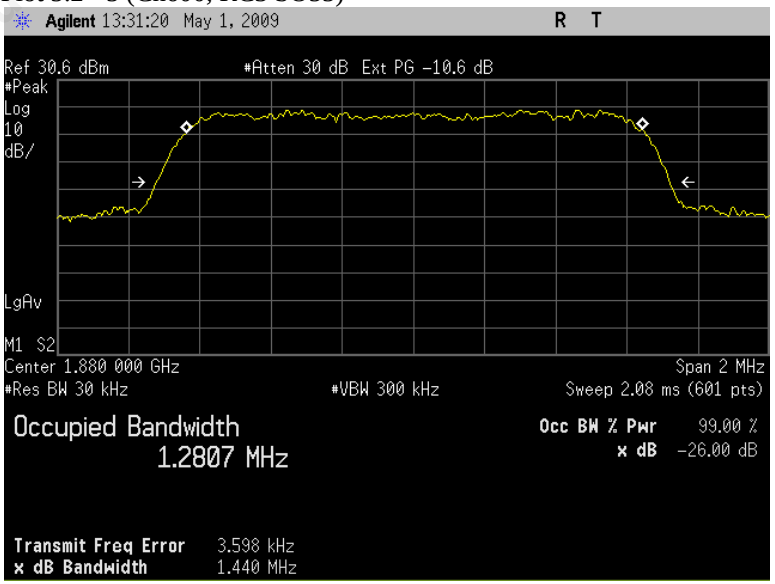
Plot 5.2 - 3 (Ch777, RC3 SO55)



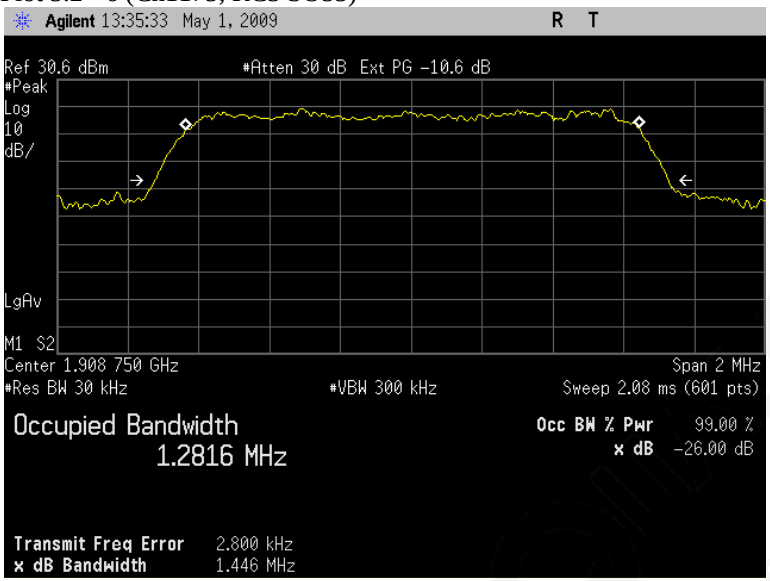
Plot 5.2 -4 (Ch25, RC3 SO55)



Plot 5.2 - 5 (Ch600, RC3 SO55)



Plot 5.2 - 6 (Ch1175, RC3 SO55)



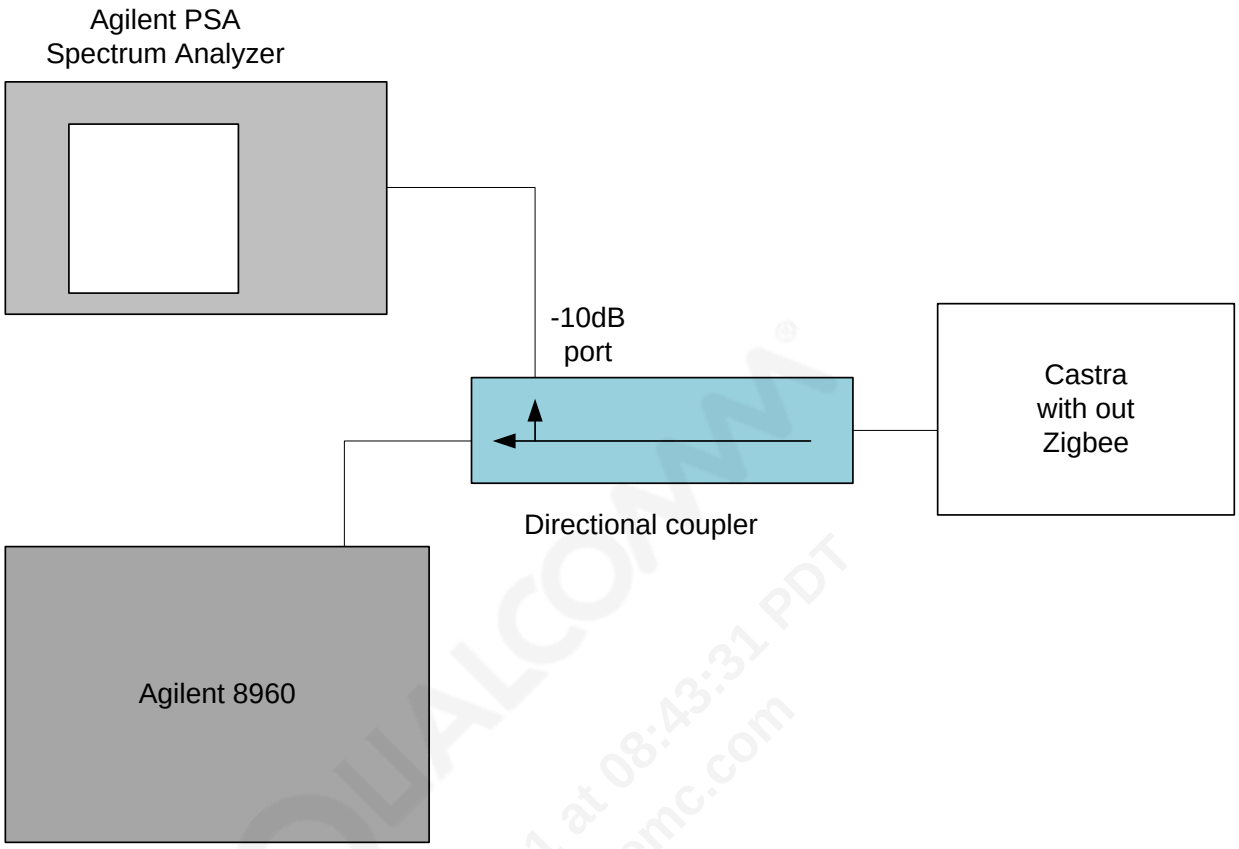
6 Block Edge Compliance

FCC:	§22.359, 24.238
Limit:	-13dBm
DUT SN	B0A4F5
Modes Tested	CDMA 1x
	RC3 SO55

6.1 Test Procedures

As Figure below indicates, the module was connected to the call simulator test box through a calibrated coaxial cable and directional coupler. The coupled port of the coupler was connected to the spectrum analyzer. Block edge emissions were measured at the required operating frequencies in each band on the spectrum analyzer.
For Each block edge measurement:
Set the spectrum analyzer span to include the block edge frequency (824, 848, 1850, 1910MHz)
Set a marker to point the corresponding block edge frequency in each test case
Set display line at -13dBm
Set resolution bandwidth to at least 1% of emission BW
Set video averaging to 10 samples

Testing was completed using the Agilent 8960 for CDMA 1x.



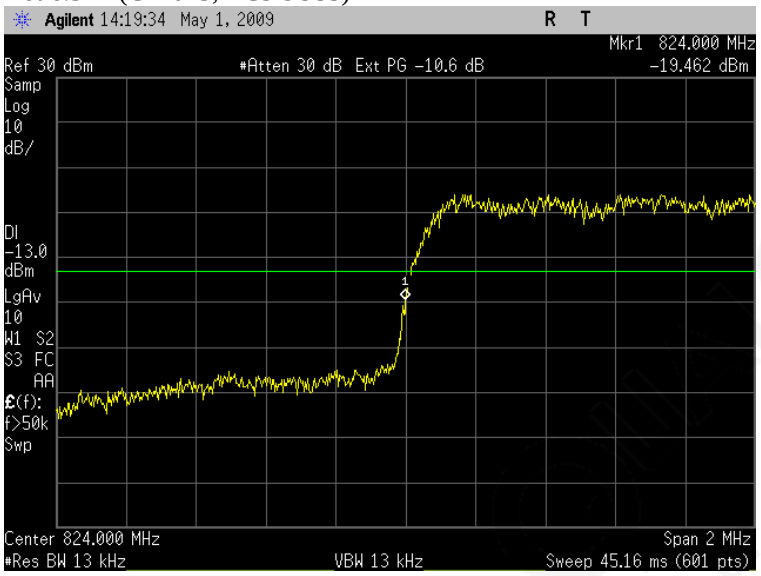
6.2 Test Results

The test was conducted at block edges in each band

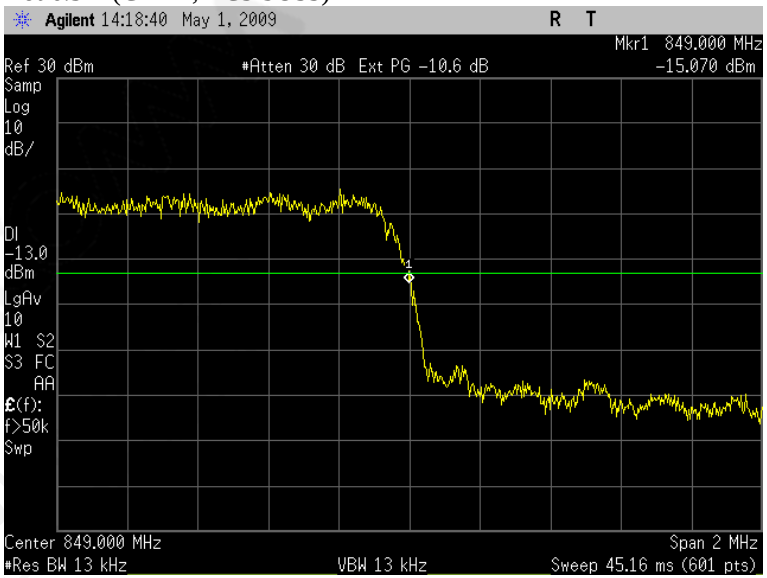
Mode		Frequency (MHz)	Channel Tested	Corresponding Plot number	Test Result
CDMA 1x	RC3 SO55	824	1013	Plot 6.2 - 1	Complies
		849	777	Plot 6.2 - 2	Complies
		1850	25	Plot 6.2 - 3	Complies
		1910	1175	Plot 6.2 - 4	Complies

6.3 Plots

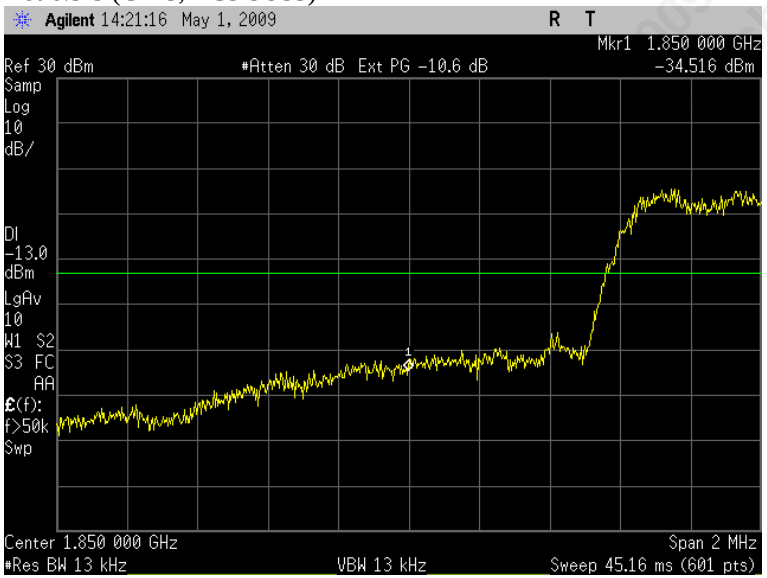
Plot 6.3 -1 (Ch1013, RC3 SO55)



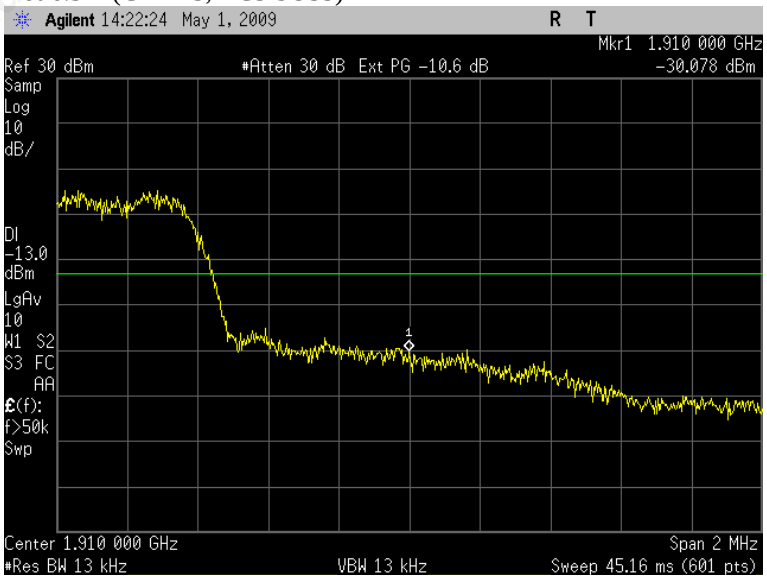
Plot 6.3-2 (Ch777, RC3 SO55)



Plot 6.3-3 (Ch25, RC3 SO55)



Plot 6.3-4 (Ch1175, RC3 SO55)



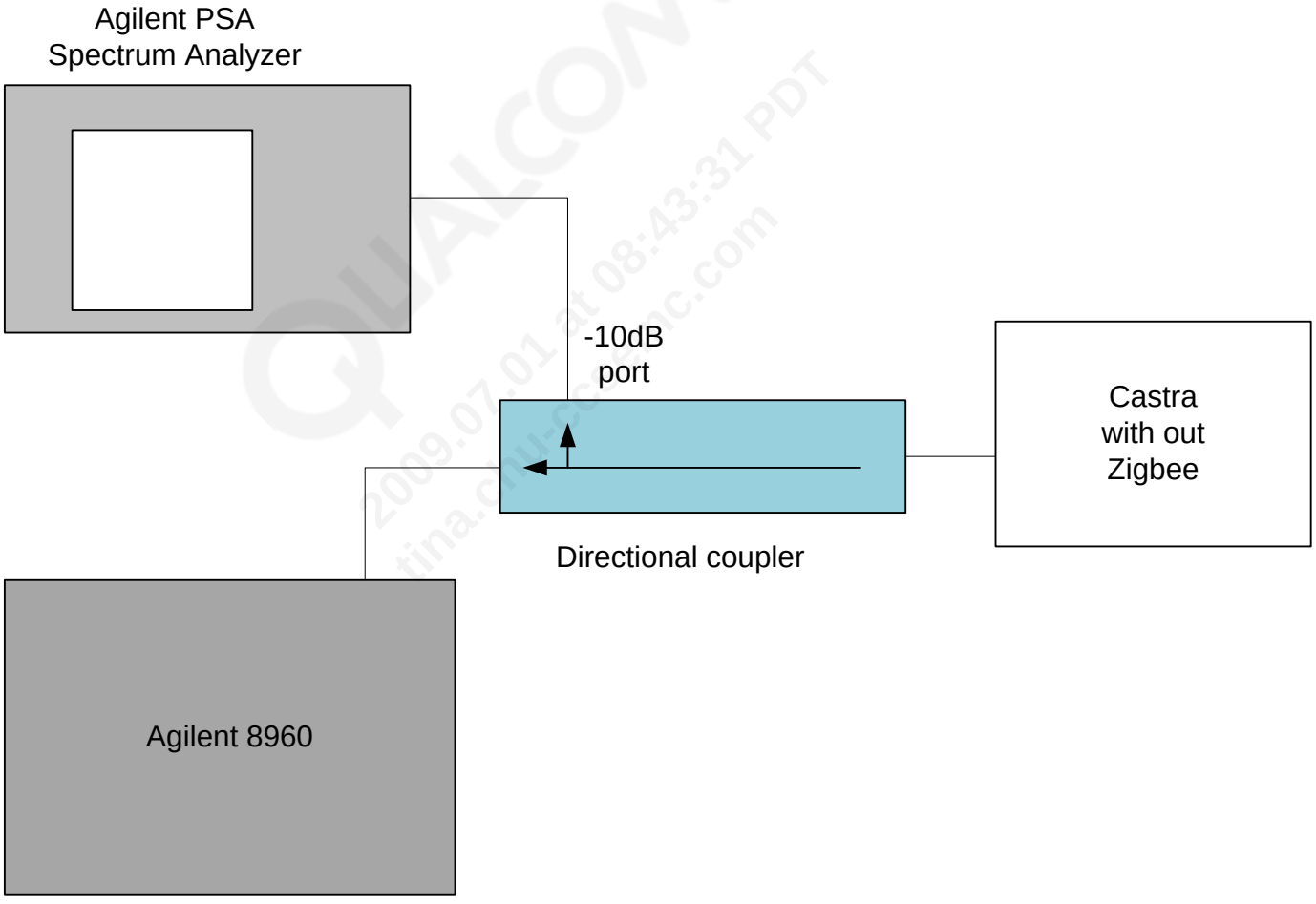
Out of Band Emission at Antenna Terminals

FCC:	§22.901(d), 22.917, 24.238 (a)
Limit:	-13dBm
DUT SN	B0A4F5
Modes Tested	CDMA 1x
	RC3 SO55

Test Procedure

As Figure below indicates, the module was connected to the call simulator test box through a calibrated coaxial cable and directional coupler. The coupled port of the coupler was connected to the spectrum analyzer. The PSA was used to scan the out-of-band emission up to 10th harmonics. RBW and VBW were set to 100kHz for measurements below 1GHz and 1MHz for testing above 1GHz. Recorded multiple sweeps in maximum hold mode using a peak detector to ensure that the worst case emission were caught.

Testing was completed using the Agilent 8960 for CDMA 1x measurement testing.



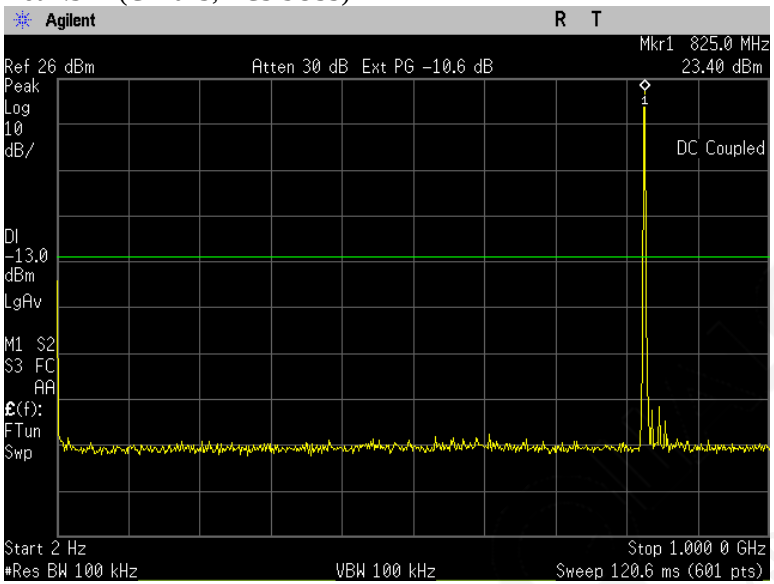
Test Result

The test was conducted at low, mid and high channel in each band.

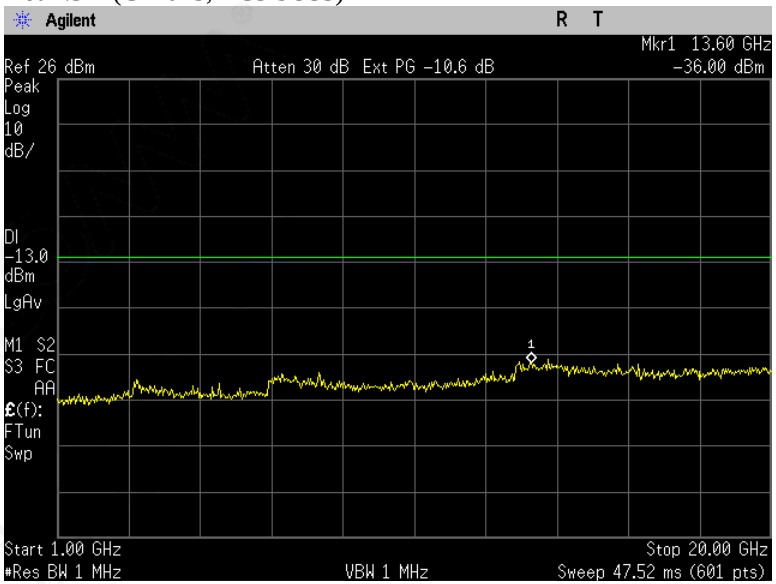
Mode		Frequency (MHz)	Channel Tested	Corresponding Plot number	Test Result
CDMA1x	**RC3 SO55**	**0 ~ 20 GHz**	**1013**	Plot 7.3 – 1,2	Complies
		0 ~ 20 GHz	**384**	Plot 7.3 – 3,4	Complies
		0 ~ 20 GHz	**777**	Plot 7.3 – 5,6	Complies
		0 ~ 20 GHz	**25**	Plot 7.3 – 7,8	Complies
		0 ~ 20 GHz	**600**	Plot 7.3 – 9,10	Complies
		0 ~ 20 GHz	**1175**	Plot 7.3 – 11,12	Complies

Plots

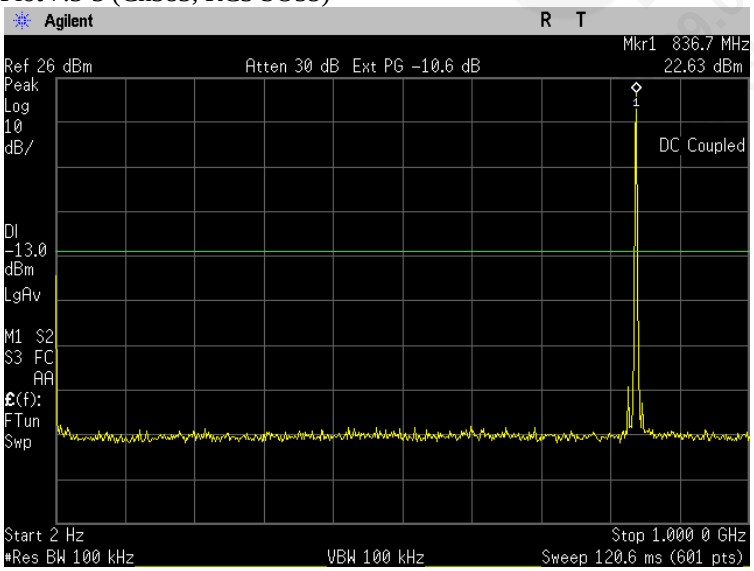
Plot 7.3 -1 (Ch1013, RC3 SO55)



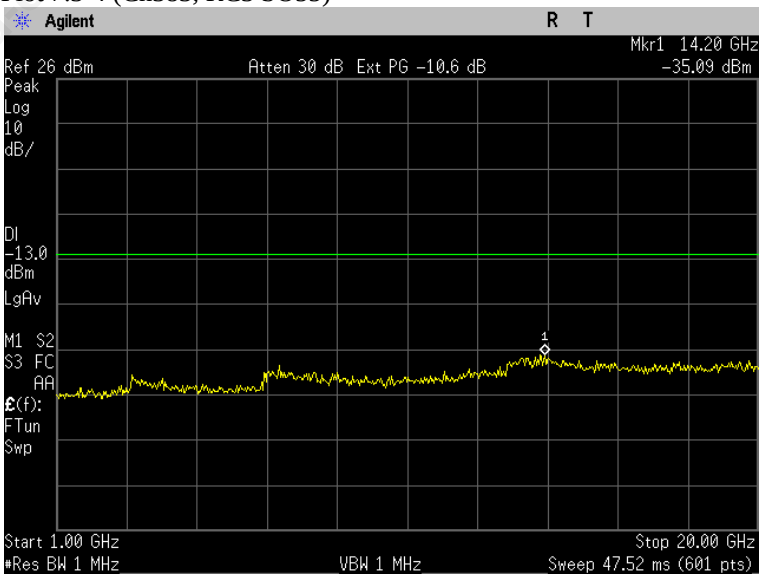
Plot 7.3-2 (Ch1013, RC3 SO55)



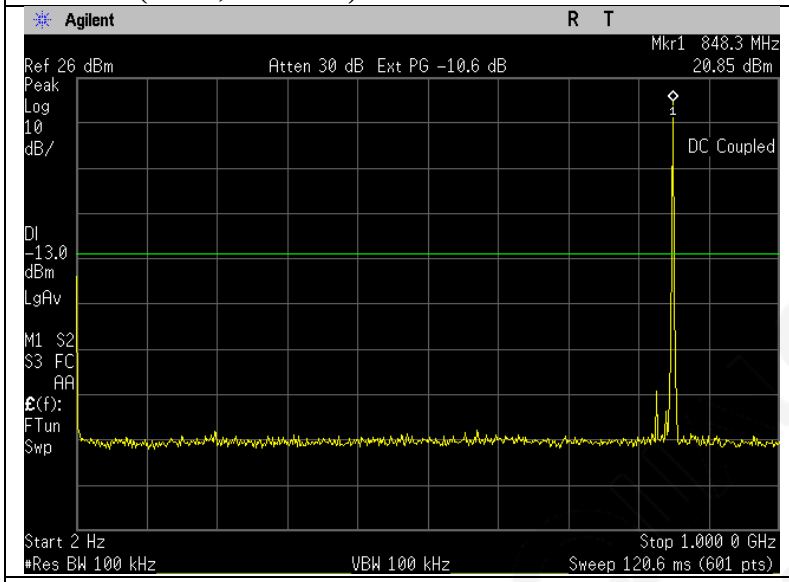
Plot 7.3-3 (Ch383, RC3 SO55)



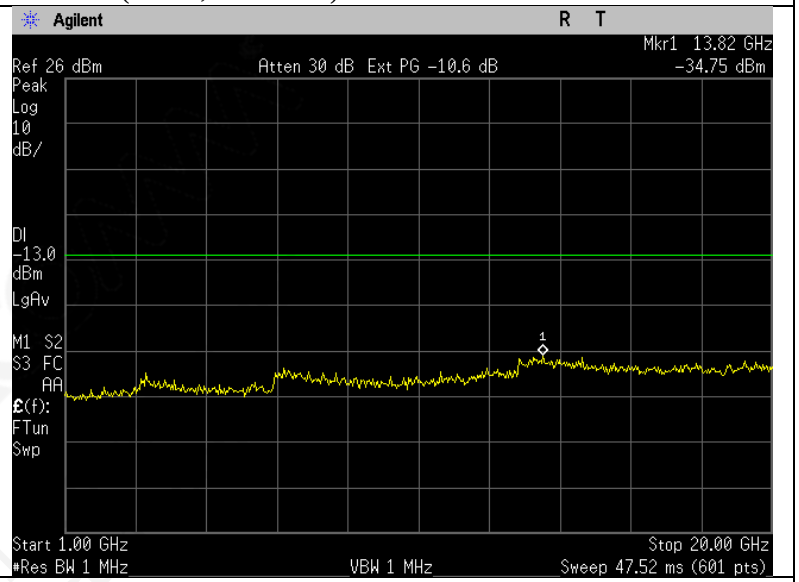
Plot 7.3-4 (Ch383, RC3 SO55)



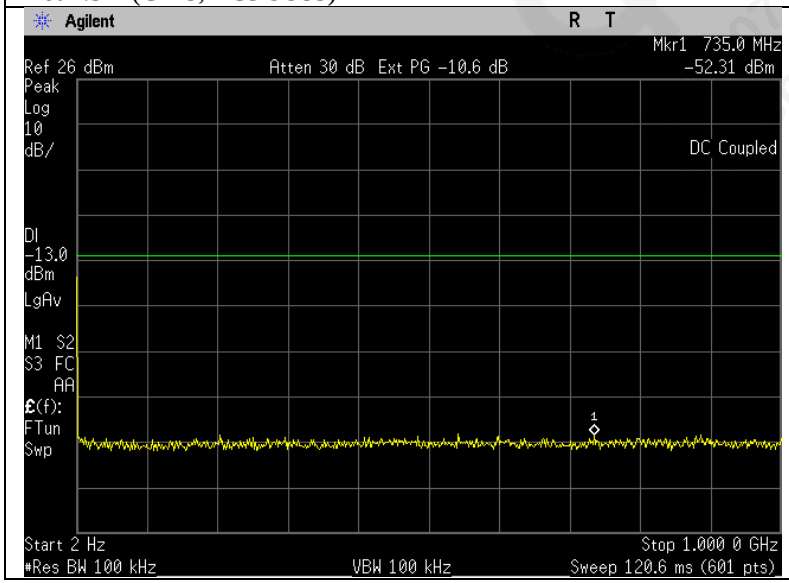
Plot 7.3 -5 (Ch777, RC3 SO55)



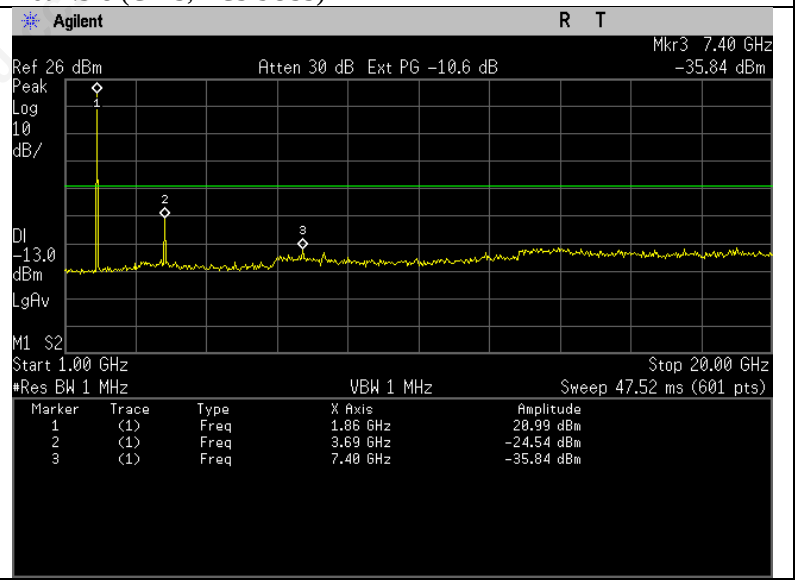
Plot 7.3-6 (Ch777, RC3 SO55)



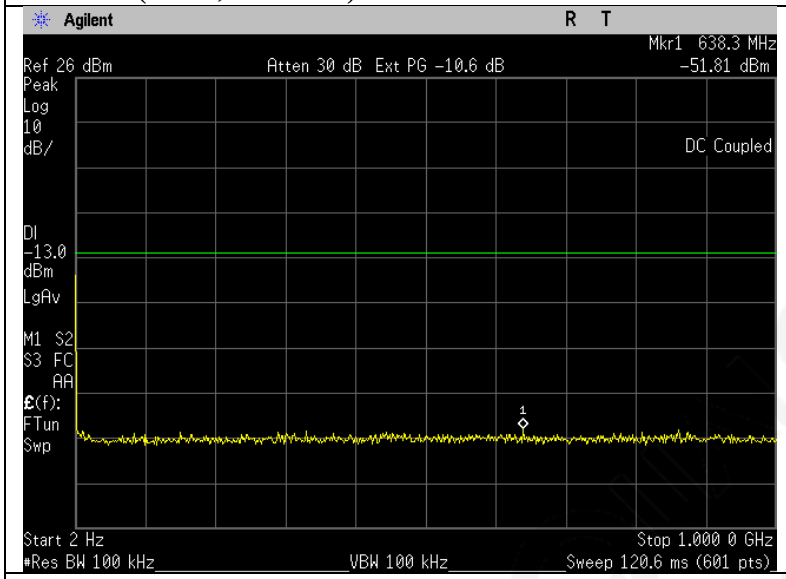
Plot 7.3-7 (Ch25, RC3 SO55)



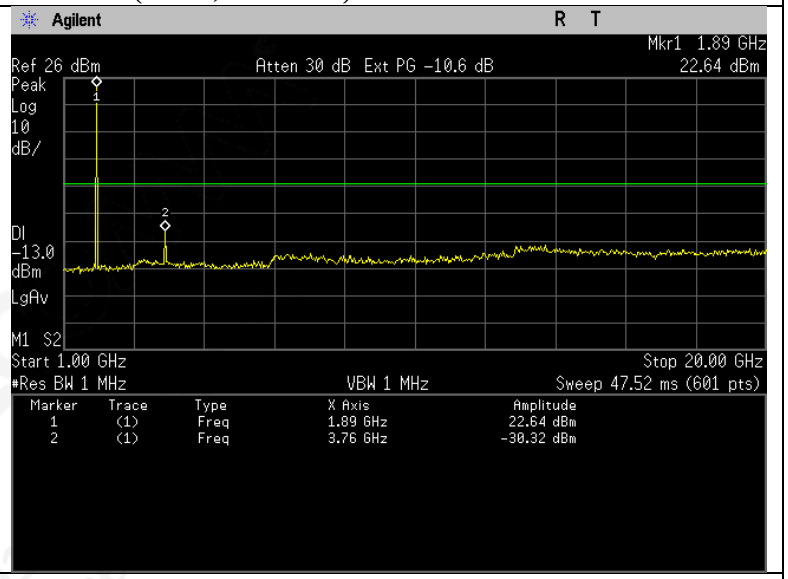
Plot 7.3-8 (Ch25, RC3 SO55)



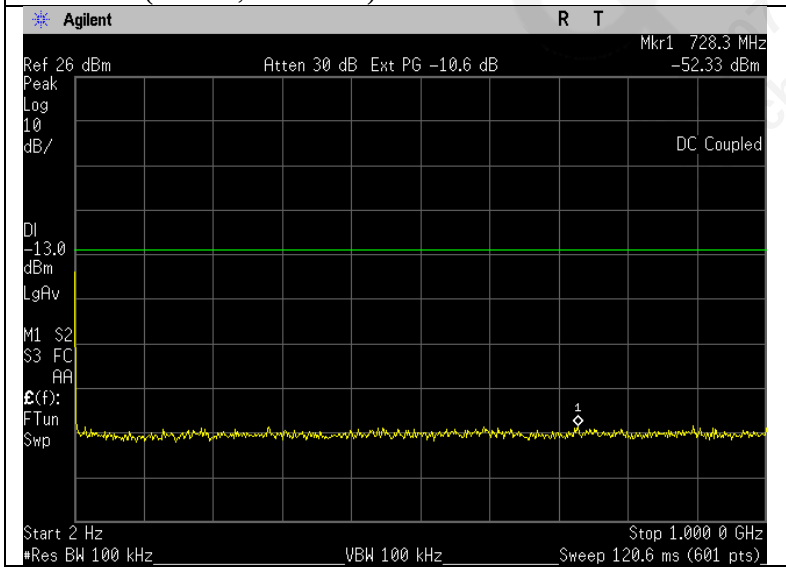
Plot 7.3 -9 (Ch600, RC3 SO55)



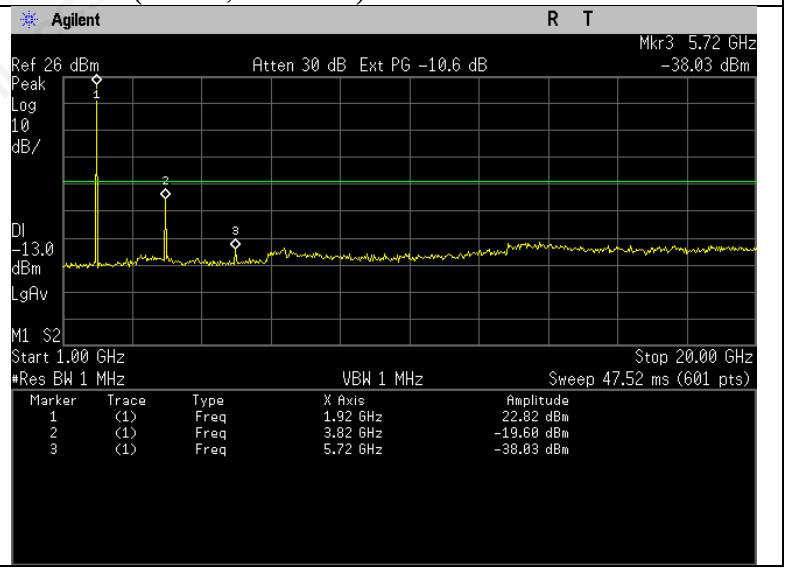
Plot 7.3-10 (Ch600, RC3 SO55)



Plot 7.3-11 (Ch1175, RC3 SO55)



Plot 7.3-12 (Ch1175, RC3 SO55)



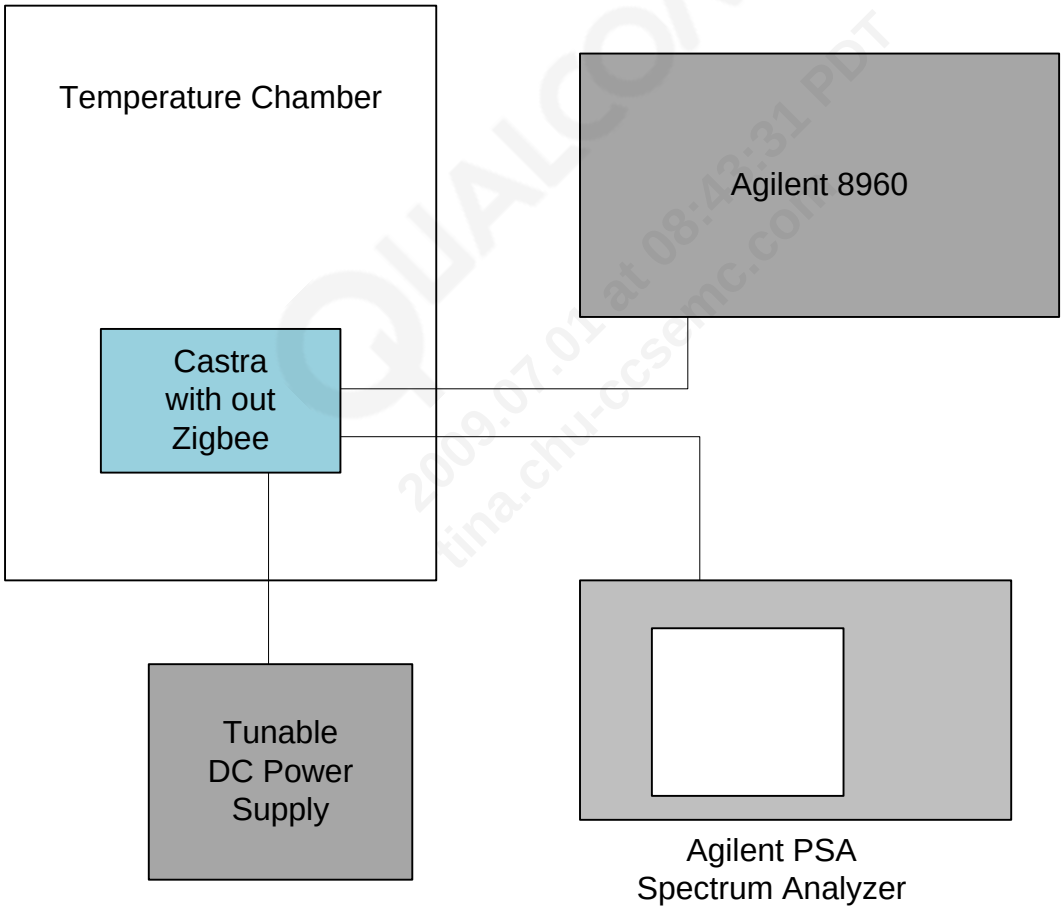
Frequency Stability

FCC:	§2.1055, 22.355, 24.235
Limit:	±2.5ppm
DUT SN	B0A4F5
Modes Tested	CDMA 1x
	RC3 SO55

Test Procedure

As the test setup indicates, the module was placed inside the temperature chamber. Transmitting frequency error was measured at 20 degrees C with DC voltage varying from 3.3 volts to 4.2 volts, and then set the temperature to -30 degrees C and allow it to stabilize. After 1 hour soak time, the transmitting frequency error measurement was recorded at -30 degrees. The process was repeated at an incremental of 10 degrees C until +60 degrees C is completed.

Testing was completed using the Agilent 8960 for CDMA 1x.



Test Results

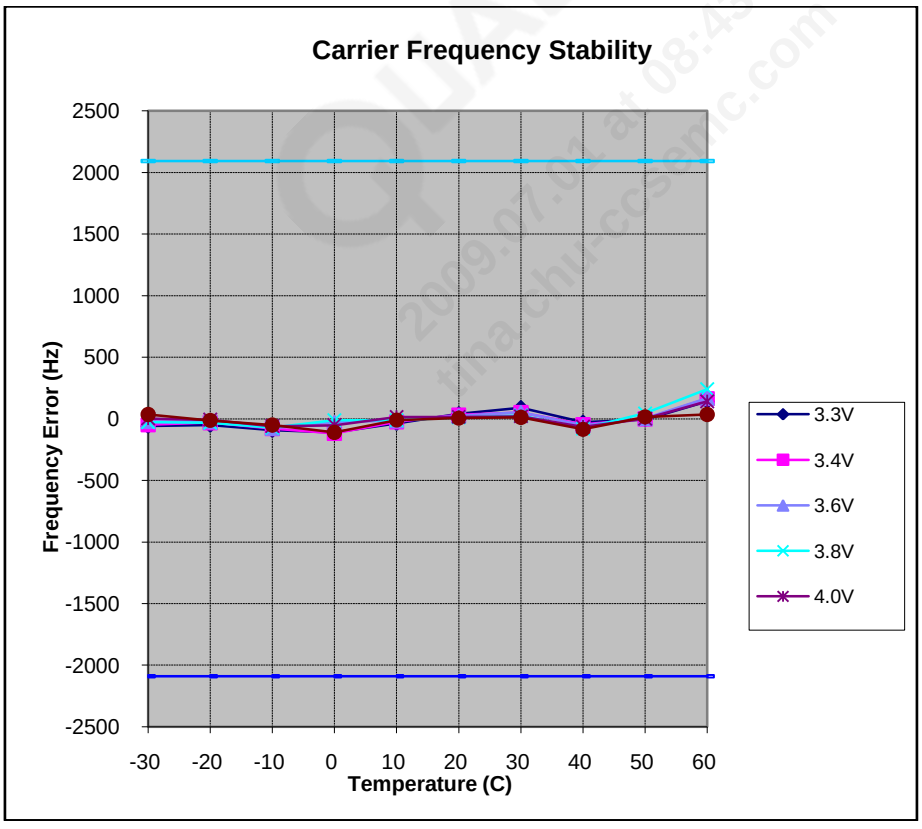
The test was conducted at mid channel in each band.

Operation Mode:	CDMA 1x	**Channel:**	384
Tx Frequency:	836.49MHz	**Voltage:**	3.8v (3.3v ~ 4.2v)

Limit:	±2.5ppm (±2091Hz)

Carrier Frequency Reference at 25 Degrees C: 836489931 Hz

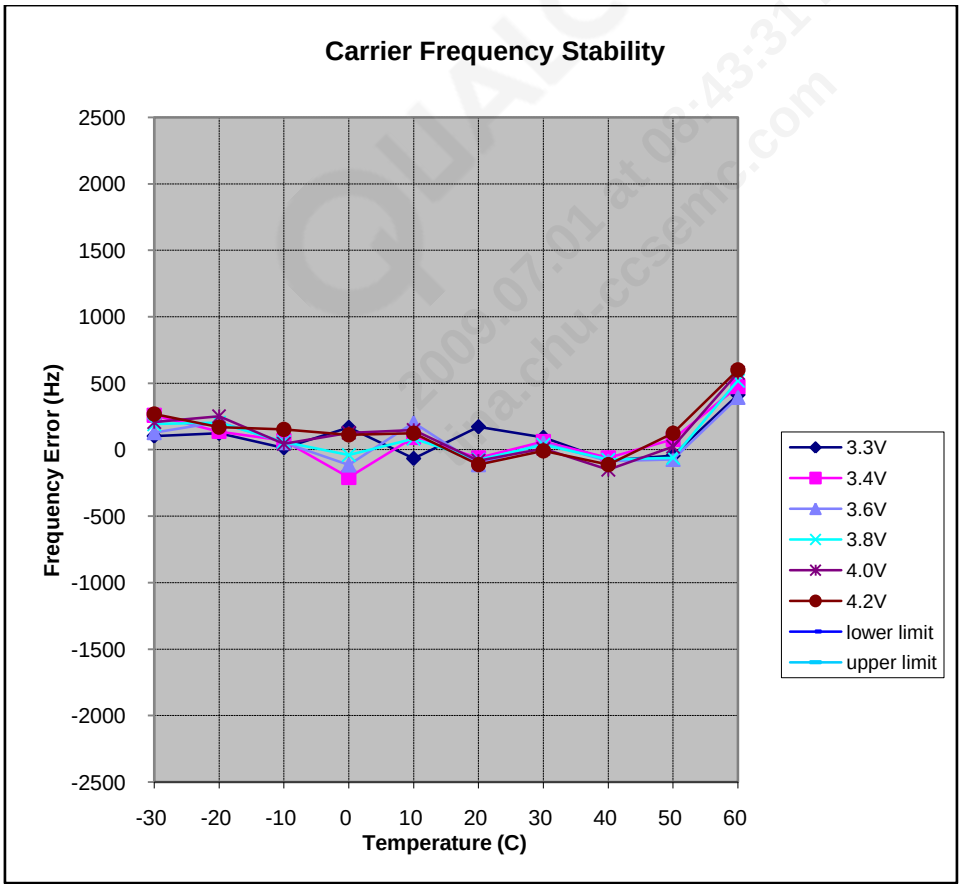
	variation from carrier frequency reference (Hz)						specification	
temp (C)	3.3V	3.4V	3.6V	3.8V	4.0V	4.2V	lower limit	upper limit
-30	-61	-50	-22	-30	1	35	-2091	2091
-20	-53	-33	-24	-34	-9	-14	-2091	2091
-10	-95	-80	-77	-74	-61	-51	-2091	2091
0	-112	-120	-29	-12	-52	-112	-2091	2091
10	-39	-26	-16	-12	14	-11	-2091	2091
20	39	30	24	9	14	5	-2091	2091
30	89	50	52	26	19	11	-2091	2091
40	-29	-48	-55	-81	-66	-87	-2091	2091
50	-7	-2	2	43	0	15	-2091	2091
60	140	163	166	240	140	35	-2091	2091



Operation Mode:	CDMA 1x PCS	**Channel:**	600
Tx Frequency:	1880MHz	**Voltage:**	3.8v (3.3v ~ 4.2v)
Limit:	±2.5ppm (±4700Hz)		

Carrier Frequency Reference at 25 Degrees C: 1879999871 Hz

	variation from carrier frequency reference (Hz)						specification	
temp (C)	3.3V	3.4V	3.6V	3.8V	4.0V	4.2V	lower limit	upper limit
-30	102	258	128	192	208	268	-4700	4700
-20	122	137	208	203	253	170	-4700	4700
-10	13	68	53	57	45	153	-4700	4700
0	167	-209	-115	-40	128	112	-4700	4700
10	-67	92	203	83	148	123	-4700	4700
20	172	-62	-113	-77	-82	-112	-4700	4700
30	92	62	50	37	8	-8	-4700	4700
40	-82	-62	-85	-75	-150	-112	-4700	4700
50	-45	77	-73	-62	23	124	-4700	4700
60	412	476	393	520	580	600	-4700	4700



Test Equipment and Firmware

The following test equipments were used.

Model	Manufacturer	Description	S/N	Cal Data	Cal Due Date
8960 Series 10 E5515C	Agilent	Wireless Communication Set	K119302	09/15/2008	09/15/2009
E4440A PSA Series	Agilent	Spectrum Analyzer	K159342	09/15/2008	09/15/2009
Model 105	TestEquity	Temperature Chamber	K162535	08/04/2008	08/04/2009
8541C	Gigatronics	Power Meter	X07077	06/23/2008	06/23/2009
80601A	Gigatronics	Power Meter Sensor	K60750	02/12/2009	02/12/2010

The firmware built in the 8960 was used to test the module.

Call Box	Technology	Firmware Rev
8960	1x	B.12.21