



Castra FCC Part 22 & 24 Radiated Test Report

80-VR584-1 Rev. A

June 2, 2009

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June 2, 2009

Castra FCC Part 22 & 24 Radiated Test Report
80-VR584-1 Rev. A

Revision history

Revision	Date	Description
A	June 2009	Initial release

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VERIFICATION TEST REPORT

Report Number: 2009 05128052 FCC

Project Number: 28489-1

Nex Number: 128052

Applicant: QUALCOMM INC.
5775 MOREHOUSE DR
SAN DIEGO, CA 92121


Equipment Under Test (EUT): TRACKING MODULE

Model: CASTRA

FCC ID: J9CCASTRA

In Accordance With: FCC Part 22, Subpart H
FCC Part 24, Subpart E
FCC Part 15 Subpart C, 15.247

Tested By: Nemko USA Inc.
11696 Sorrento Valley Road, Suite F
San Diego, CA 92121

Authorized By: 
Alan Laudani, EMC/RF Test Engineer

Date: May 16, 2009

Total Number of Pages: 30



Section1: Summary of Test Results

General

All measurements are traceable to national standards

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15; Subpart C and IC RSS-210. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC and IC.

The assessment summary is as follows:

Apparatus Assessed:	Tracking Module
Model:	Castra
Specification:	FCC Part 15 Subpart C, 15.247 FCC Part 22, Subpart H FCC Part 24, Subpart E
Date Received in Laboratory:	May 12, 2009
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None

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Report Release History

REVISION	DATE	COMMENTS
-	May 16, 2009	Prepared By: Ferdinand Custodio
-	May 16, 2009	Initial Release: Alan Laudani

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

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TESTED BY: 
Ferdinand S. Custodio, EMC Test Engineer

Date: May 16, 2009



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Section 2: Equipment Under Test

Product Identification

The Equipment Under Test was identified as follows:

**QUALCOMM INC. CASTRA TRACKING MODULE (SN B0A4F5 / PN 20-A6248-1) with
MU901/1801/UMTS-MMS Magnetic Mount, Triple Frequency Mobile Antenna**





Theory of Operation

The Castra is a Tracking Module. The inGeo II module, Castra, is the Qualcomm® second generation dedicated tracking module. inGeo II is a CDMA2000®-1X module powered by the Qualcomm QSC6055™ chipset. Gen II 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, and a ZigBee transceiver. inGeo II modules are meant to be integrated into various dedicated tracking devices and can include a customized UI, antenna, and additional proprietary circuitry. The following figure Figure 1 provides the general module mechanical dimensions.

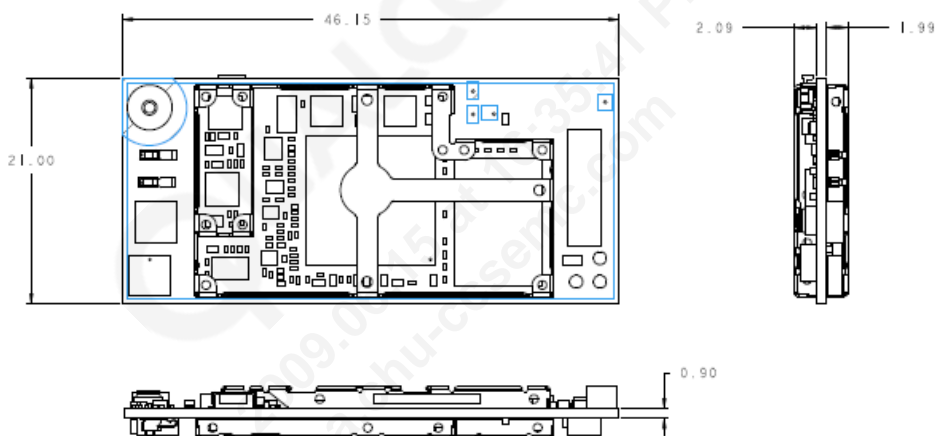


Figure 1 inGeo module dimensions

It 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.

The main on-board Qualcomm chipsets include:

- Single chip solution (Baseband + RF + Power Management): QSC6055™



Key connectivity support includes:

Generic 40-pin connector providing USB 2.0 high-speed, power, GPIOs and serial interfaces

Antenna pads and test connector

- Audio interface (microphone and loudspeaker)
- Battery connection
- Internal 2.4GHz antenna for ZigBee functionality

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Technical Specifications of the EUT

Manufacturer: Qualcomm Inc.

Operating Frequency:

Operating Band	Tx Frequency Range (MHz)	Rx Frequency Range (MHz)
CDMA Cell (BC0)	824 to 849	869 to 894
CDMA PCS (BC1)	1850 to 1910	1930 to 1990
GPS Position Locator		1574.42 to 1576.42

Peak Output Power: 0.31 watts ERP in cell; 0.76 watts EIRP in PCS

Emission Designator:

Mode	Tx Frequency Range (MHz)	Emission Designator
CDMA	824.7 – 848.31	1M28F9W
	1851.25 – 1908.75	1M28F9W

Modulation: CDMA 1X-BPSK

Antenna Data: Mobile: Cellular and PCS band. Antenna gain is 0dBi

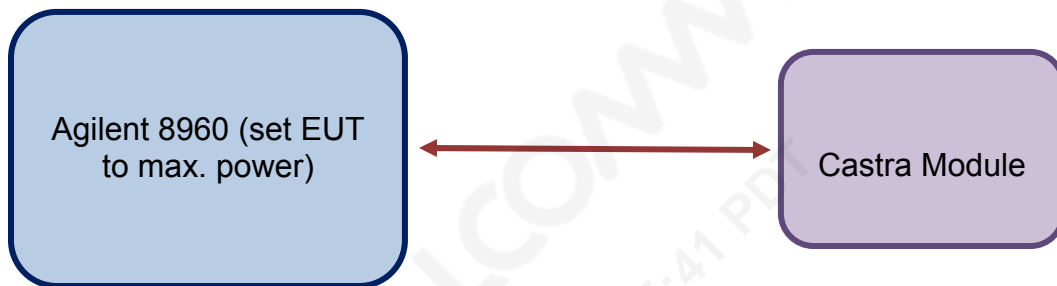
Antenna Connector: U.FL-R-SMT (Hirose)

Power Source: 3.8VDC





Block Diagram of the EUT Setup



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Summary of Test Results

Maximum Radiated Output Power

Mode	Max Power in Cell band (ERP)	Max Power in PCS band (EIRP)
CDMA 1X	24.95dBm/0.31 watts	28.79 dBm/0.76 watts

Field Strength of Spurious

Mode	Frequency (MHz)	Total Power (dBm)	Spec (dBm)	Margin (dBm)
CDMA 1X (PCS)	3702.50	-33.08	-13	-20.1
CDMA 1X (PCS)	5553.75	-32.15	-13	-19.2
CDMA 1X (PCS)	3760.00	-33.23	-13	-20.2
CDMA 1X (PCS)	5640.00	-34.15	-13	-21.2
CDMA 1X (PCS)	3817.50	-33.27	-13	-20.3
CDMA 1X (PCS)	5726.25	-33.44	-13	-20.4
CDMA 1X (PCS)	3702.50	-33.08	-13	-20.1

Note the table only lists the spurious which are within 20dB of the limits.





Section 3: Test Methodology

3.1 Test Standards

The tests documented in this report were performed in accordance with:

- FCC CFR 47 Part 2
- FCC CFR 47 Part 15
- FCC CFR 47 Part 22, Subpart H Cellular Radiotelephone Service
- FCC CFR 47 Part 24, Subpart E Broadband PCS
- Industry Canada, RSS-GEN (Issue 2)
- Industry Canada, RSS-132, Issue 2 (Cellular Telephones Employing New Technologies Operating in the Bands 824-849 MHz and 869-894 MHz)
- Industry Canada, RSS-133, Issue 3 (2 GHz Personal Communications Services)
- TIA/EIA 603C (2004)
- ANSI C63.4 (2003)

3.2 Antenna Substitution Method

1) Methodology Used: TIA/EIA-603 Clause 2.2.17

2) The Substitution Method is used for fundamental power levels and spurious emissions when RF emission signals are measured within 20 dB of the limit.

3) Formula Used to calculate the values:

- a) Measured value + antenna factor + cable loss - preamplifier = Max Level
- b) Margin = Max level - Limit
- c) Signal Generator power level - cable loss + antenna gain = ERP Part 22 or EIRP Part 24
- d) Substituted Margin = ERP (or EIRP) - Limit

Note: gain for dipole = 0; antenna factor is not the same as antenna gain

Note: The signal generator power level is the power required when transmitting into the substituting antenna to duplicate the Measured Value. Substituted margin is reported in 731 forms pertaining to certification grants and Class II Permissive Changes when a direct conducted power reading cannot be performed.





Section 4: Test Conditions

4.1 Specifications

The apparatus was assessed against the following specifications:

- FCC Part 22, Subpart H Cellular Radiotelephone Service
- FCC Part 24, Subpart E Broadband PCS
- FCC Part 15.247, Subpart C Intentional Radiators (Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.)

4.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

4.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	13-18 °C
Humidity range	:	63-83 %
Pressure range	:	102 - 105 kPa



Test Equipment

Nemko ID	Device	Manufacturer	Model	Serial Number	Cal Date	Cal Due Date
746	Signal Generator	HP	8648B	3642U1905	22-Jan-09	22-Jan-10
765	Antenna Set, Dipole	EMCO	3121C	1214	25-Jul-08	25-Jul-10
752	Antenna, DRWG	EMCO	3115	4943	12-Nov-08	12-Nov-10
317	Preamplifier	HP	8449A	2749A00167	16-Apr-09	16-Apr-10
901	pre amp	Sonoma	310 N	130607	27-Mar-09	27-Mar-10
115	Antenna, Bicon	EMCO	3104	3020	15-Sep-08	15-Sep-10
877	Antenna, DRG Horn, .7-18GHz	AH Systems	SAS-571	688	28-Jul-08	28-Jul-10
111	Antenna, LPA	EMCO	3146	1382	20-Oct-08	20-Oct-10
911	Spectrum Analyzer	Agilent	E4440A	US41421266	06-Nov-08	06-Nov-09

2040B-1 OATS/RN# 329550-01

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Section 5: Observations

5.1 Modifications Performed During Assessment

No modifications were performed during assessment.

5.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

5.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

5.4 Test Deleted

See Section 6.

5.5 Additional Observations

There were no additional observations made during this assessment.

Section 6: Results Summary

The results contained in this section are representative of the operation of the apparatus as originally submitted.

Name of Test	Para. No.	Result
RF Power Output	2.1046	COMPLIES
Audio Low Pass Filter Response	2.1047	NA ¹
Audio Frequency Response	2.1047	NA ¹
Modulation Limiting	2.1047	NA ¹
Occupied Bandwidth (WB Data)	2.1049	NA ²
Spurious Emissions at antenna Terminals	2.1051	NA ²
Field Strength of Spurious Emissions	2.1053	COMPLIES
Frequency Stability	2.1055	NA ²

Footnotes for N/A's:

¹Digital Modulation

²Test methodology and results will be provided by the client



Appendix A: Test Results

Para. No. : 2.1046 RF Power Output

§ 22.913 Effective radiated power limits.

The effective radiated power (ERP) of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.

(a) *Maximum ERP.* In general, the effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts. However, for those systems operating in areas more than 72 km (45 miles) from international borders that:

(1) Are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census; or,

(2) Extend coverage on a secondary basis into cellular unserved areas, as those areas are defined in §22.949, the ERP of base transmitters and cellular repeaters of such systems must not exceed 1000 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

§ 24.232 Power and antenna height limits.

(c) Mobile/portable stations are limited to 2 watts EIRP peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

(d) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

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Test Conditions:

Sample Number:	Castra	Temperature:	16.7-18°C
Date:	May 12, 2009 and May 13, 2009	Humidity:	67-81%
Test Procedure:	ANSI C63.4 (2003) Clause 8	Tester:	FSCustodio
		Laboratory:	SOATS

Test Results:

Complies, see tables in the following pages.



Additional Observations:

- Emissions within 20 dB of the limit were substituted by a signal generator and matching antenna and were shown to comply. Please see Field Strength of Spurious Emissions test for substitution data.



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Radiated Power Data

Job # : 28489-1 Test # : 2
Page 1 of 1

Client Name : Qualcomm
EUT Name : Tracking Device
EUT Model # : Castra
EUT Part # : 20-A6248-1
EUT Serial # : B0A4F5
EUT Config. : CDMA 2000 1X RC3 SO55

Specification :	<u>FCC Part 22</u>	Reference :	<u></u>
Rod. Ant. #:	<u>NA</u>	Temp. (°C) :	<u>17.3</u>
Bicon Ant. #:	<u>NA</u>	Humidity (%) :	<u>81</u>
Log Ant. #:	<u>111_3m</u>	EUT Voltage :	<u>3.8 VDC</u>
DRG Ant. #:	<u>877</u>	EUT Frequency :	<u>NA</u>
Dipole Ant. #:	<u>NA</u>	Phase:	<u>NA</u>
Cable#:	<u>SOATS</u>	Location:	<u>RN#: 329550-01</u>
Preamp#:	<u>NA</u>	Distance:	<u>3m</u>
Spec An. #:	<u>911</u>	ERP conversion factor	<u>7</u>
QP #:	<u>NA</u>		
PreSelect#:	<u>NA</u>		
		Date :	<u>5/12/2009</u>
		Time :	<u>8:00AM</u>
		Staff :	<u>FSCustodio</u>
		Photo ID:	<u></u>
		Peak Bandwidth:	<u>1.3 MHz</u>
		Video Bandwidth	<u>5 MHz</u>

Meas. Freq. (MHz)	Meas. (dBuV) pk	Ant Orientation	CF (db)	Max Level (dBm) pk	Spec. Limit (ERP) (dBm) pk	Margin dB pk	EUT Rotation	Ant. Height	Pass Fail Unc.	COMMENT
824.70	97.9	V	25.38	26.0	38.5	-12.4	B	1.2	Pass	
836.52	97.7	V	25.62	26.0	38.5	-12.4	B	1.2	Pass	
848.31	97.9	V	25.81	26.4	38.5	-12.1	B	1.2	Pass	



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Radiated Power Data

Job # : 28489-1 Test # : 3
Page 1 of 1

Client Name :	<u>Qualcomm</u>		
EUT Name :	<u>Tracking Device</u>		
EUT Model # :	<u>Castra</u>		
EUT Part # :	<u>20-A6248-1</u>		
EUT Serial # :	<u>B0A4F5</u>		
EUT Config. :	<u>CDMA 2000 1X PCS RC3 SO55</u>		
Specification :	<u>FCC Part 24</u>	Reference :	
Rod. Ant. #:	<u>NA</u>	Temp. (°C) :	<u>18</u>
Bicon Ant.#:	<u>NA</u>	Humidity (%) :	<u>67</u>
Log Ant.#:	<u>111_3m</u>	EUT Voltage :	<u>3.8VDC</u>
DRG Ant. #	<u>877</u>	EUT Frequency :	<u>NA</u>
Dipole Ant.#:	<u>NA</u>	Phase:	<u>NA</u>
Cable#:	<u>40ft</u>	Location:	<u>RN#: 329550-01</u>
Preamp#:	<u>NA</u>	Distance:	<u>3m</u>
Spec An.#:	<u>911</u>	EIRP conversion fact	<u>5.5</u>
QP #:	<u>NA</u>		
PreSelect#:	<u>NA</u>		

Meas. Freq. (MHz)	Meas. (dBuV) pk	Ant Orientation	CF (db)	Max Level (dBm) pk	Spec. Limit (EIRP) (dBm) pk	Margin dB pk	EUT Rotation	Ant. Height	Pass Fail Unc.	COMMENT
1851.25	94.0	V	30.0	28.8	33.0	-4.2	B	1.0	Pass	
1880.00	93.4	V	30.0	28.2	33.0	-4.8	B	1.0	Pass	
1908.75	92.3	V	30.1	27.2	33.0	-5.8	B	1.0	Pass	



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Radiated Emissions Data

Job # : 28489-1 Test # : 1
Page 1 of 1

Client Name : Qualcomm
EUT Name : Tracking Device
EUT Model # : Castra
EUT Serial # : B0A4F5
EUT Config. : CDMA 1X , BC0, TX

Specification : FCC Part 22 Reference : _____
Rod. Ant. # : _____ Temp. (°C) : 16.7 Date : 05/13/09
Bicon Ant.# : _____ Humidity (%) : 70 Staff : Ferdinand Custodio
Log Ant.# : 110 EUT Voltage : NA Peak Bandwidth: 1 MHz
DRG Ant. # : 877 EUT Frequency : NA Video Bandwidth 1 MHz
Dipole Ant.# : _____ Phase: NA
Cable# : 40ft Location: RN # 329550-01
Preamp# : 317 Distance: 3m
Spec An.# : 911 ERP conversion factor 7

Meas. Freq. (MHz)	Vertical (dBuV) pk	Horizontal (dBuV) pk	CF (db)	Max Level (dBm) pk	Spec. Limit (ERP) (dBm) pk	Margin dB pk	EUT Rotation	Ant. Height	Pass Fail Unc.	Comment
1649.40	60.1	57.0	-5.3	-42.5	-13.0	-29.5		1.2	Pass	*
2474.10	47.0	47.0	-1.8	-52.1	-13.0	-39.1			Pass	NF
3298.80			1.2		-13.0					NF
4123.50	51.0	49.9	3.3	-43.0	-13.0	-30.0		1.2	Pass	*
4948.20	47.4	47.4	5.2	-44.7	-13.0	-31.7			Pass	NF
5772.90			9.2		-13.0					NF
6597.60			12.8		-13.0					NF
7422.30			15.2		-13.0					NF
8247.00			17.5		-13.0					NF
9071.70			18.1		-13.0					NF
1673.04	62.5	59.0	-5.3	-40.1	-13.0	-27.1		1.2	Pass	*
2509.56	48.9	48.9	0.0	-48.4	-13.0	-35.4			Pass	NF
3346.08			1.4		-13.0					NF
4182.60	49.8	49.7	3.3	-44.2	-13.0	-31.2		1.2	Pass	*
5019.12	47.0	47.0	7.0	-43.2	-13.0	-30.2			Pass	NF
5855.64			9.2		-13.0					NF
6692.16			13.0		-13.0					NF
7528.68			15.6		-13.0					NF
8365.20			17.4		-13.0					NF
9201.72			18.9		-13.0					NF
1696.62	62.3	60.0	-5.3	-40.3	-13.0	-27.3		1.2	Pass	*
2544.93	50.2	48.5	0.0	-47.0	-13.0	-34.0		1.2	Pass	*
3393.24	50.6	49.3	1.4	-45.3	-13.0	-32.3		1.2	Pass	*
4241.55	51.2	51.0	3.3	-42.8	-13.0	-29.8		1.2	Pass	*
5089.86	47.2	47.2	7.0	-43.0	-13.0	-30.0			Pass	NF
5938.17			9.2		-13.0					NF
6786.48			13.0		-13.0					NF
7634.79			15.5		-13.0					NF
8483.10			17.6		-13.0					NF
9331.41			18.4		-13.0					NF

* = Signal Measured NF = Noise Floor, no signal observed, even at lower RBW.



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Radiated Emissions Data

Job #: 28489-1 Test #: 6
Page 1 of 1

Client Name : Qualcomm
EUT Name : Tracking Device
EUT Model # : Castra
EUT Serial # : B0A4F5
EUT Config. : CDMA 1X , BC1, TX

Specification : FCC Part 24 Reference : _____
Rod. Ant. #: _____ Temp. (°C) : 16.7 Date : 05/13/09
Bicon Ant. #: _____ Humidity (%) : 70 Staff : Ferdinand Custodio
Log Ant. #: 110 EUT Voltage : NA Peak Bandwidth: 1 MHz
DRG Ant. # 877 EUT Frequency NA Video Bandwidth 1 MHz
Dipole Ant. #: _____ Phase: NA
Cable#: 40ft Location: RN # 329550-01
Preamp#: 317 Distance: 3m
Spec An. #: 911 EIRP conversior 5.5

Meas. Freq. (MHz)	Vertical (dBuV) pk	Horizontal (dBuV) pk	CF (db)	Max Level (dBm) pk	Spec. Limit (ERIP) (dBm) pk	Margin dB pk	EUT Rotation	Ant. Height	Pass Fail Unc.	Comment
3702.50	62.86	59.72	1.2	-31.2	-13.0	-18.2		1.2	Pass	*
5553.75	55.66	52.13	8.3	-31.3	-13.0	-18.3		1.2	Pass	*
7405.00	44.67	44.67	15.2	-35.4	-13.0	-22.4			Pass	NF
9256.25			18.9		-13.0					NF
11107.50			22.8		-13.0					NF
12958.75			24.4		-13.0					NF
14810.00			32.9		-13.0					NF
16661.25			40.9		-13.0					NF
18512.50			56.6		-13.0					NF
20363.75			68.1		-13.0					NF
3760.00	61.09	56.93	1.2	-32.9	-13.0	-19.9		1.2	Pass	*
5640.00	53.60	49.62	9.0	-32.6	-13.0	-19.6		1.2	Pass	*
7520.00	44.43	44.43	15.6	-35.3	-13.0	-22.3			Pass	NF
9400.00			18.4		-13.0					NF
11280.00			22.5		-13.0					NF
13160.00			25.2		-13.0					NF
15040.00			34.3		-13.0					NF
16920.00			40.8		-13.0					NF
18800.00			57.1		-13.0					NF
20680			70.1		-13.0					NF
3817.50	61.99	57.87	1.2	-32.1	-13.0	-19.1		1.2	Pass	*
5726.25	53.23	49.57	9.2	-32.9	-13.0	-19.9		1.2	Pass	*
7635.00	44.69	44.69	15.5	-35.1	-13.0	-22.1			Pass	NF
9543.75			19.0		-13.0					NF
11452.50			22.5		-13.0					NF
13361.25			25.4		-13.0					NF
15270.00			34.7		-13.0					NF
17178.75			46.0		-13.0					NF
19087.50			60.3		-13.0					NF
20996.25			70.1		-13.0					NF

* = Signal Measured NF = Noise Floor, no signal observed, even at lower RBW.

Test Procedure: TIA/EIA 603 Clause 2.2.17

Para. No.:2.1053 Field Strength of Spurious (Substitution Method including Fundamental)



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Substitution Method For Radiated Emissions

Complete <u> X </u>	Job # : <u> 28489-1 </u>	Test # : <u> 1 </u>
Preliminary <u> </u>	Page <u> 1 </u>	of <u> 1 </u>
Client Name : <u> Qualcomm </u>		
EUT Name : <u> Tracking Module </u>		
EUT Model # : <u> Castra </u>		
EUT Part # : <u> 20-A6248-1 </u>		
EUT Serial # : <u> B0A4F5 </u>		
EUT Config. : <u> CDMA 2000 1X RC3 S055 </u>		
Specification : <u> FCC Part 22 </u>		
Rod. Ant. # : <u> NA </u>	Temp. (deg. C) : <u> 13 </u>	Reference : <u> </u>
Bicon Ant.# : <u> NA </u>	Humidity (%) : <u> 83 </u>	Date : <u> 5/13/2009 </u>
Log Ant.# : <u> 111 </u>	EUT Voltage : <u> NA </u>	Time : <u> 1PM </u>
DRG Ant. # : <u> NA </u>	EUT Frequency : <u> NA </u>	Staff : <u> FSCustodio </u>
Dipole Ant.# : <u> 765 </u>	Phase : <u> NA </u>	Photo ID : <u> </u>
Cable# : <u> 60ft </u>	Location : <u> RN# 329550-01 </u>	Peak Bandwidth : <u> 1.3MHz RBW </u>
Preamp# : <u> NA </u>	Distance : <u> 3m </u>	
Spec An.# : <u> 911 </u>		
QP # : <u> 911 </u>		
Sig Gen# : <u> 746 </u>		

Part 22 Substitution (Fundamental)

Target		dipole	Cable loss dB	Signal Generator dBm	Total (ERP) dBm	Spec dBm	Margin dBm
Frequency MHz	Level dBuV/m						
824.70	97.9		3.48	28.19	24.71	38.45	-13.7
836.52	97.7		3.54	28.12	24.58	38.45	-13.9
848.31	97.9		3.55	28.5	24.95	38.45	-13.5



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Substitution Method For Radiated Emissions

Complete X Job # : 28489-1 Test # : 1
Preliminary _____ Page 1 of 1

Client Name : Qualcomm
EUT Name : Tracking Device
EUT Model # : Castra
EUT Part # : 20-A6248-1
EUT Serial # : B0A4F5
EUT Config. : Transmit at max power

Specification : <u>FCC Part 24</u>	Reference :
Rod. Ant. # : <u>NA</u> Temp. (deg. C) : <u>13</u>	Date : <u>5/13/2009</u>
Bicon Ant.# : <u>NA</u> Humidity (%) : <u>83</u>	Time : <u>2:30PM</u>
Log Ant.# : <u>NA</u> EUT Voltage : <u>NA</u>	Staff : <u>FSCustodio</u>
DRG Ant. # <u>529/877</u> EUT Frequency : <u>NA</u>	Photo ID: _____
Dipole Ant.# : <u>NA</u> Phase: <u>NA</u>	Peak Bandwidth: <u>1.3MHz RBW-Fundamental</u>
Cable# : <u>60ft</u> Location: <u>RN# 329550-01</u>	<u>1.0MHz RBW-Harmonics</u>
Preamp# : <u>NA</u> Distance: <u>3m</u>	
Spec An.# : <u>911</u>	
QP # : <u>911</u>	
Sig Gen# : <u>746</u>	

Part 24 Substitution Fundamental

Target		Horn Gain dBi	Cable loss dB	Signal Generator dBm	Total (EIRP) dBm	Spec dBm	Margin dBm
Frequency MHz	Level dBuV/m						
1851.25	94.0	8.8	5.35	25.34	28.79	33	-4.2
1880.00	93.4	8.8	5.52	25.08	28.36	33	-4.6
1908.75	92.3	8.9	5.46	24.89	28.33	33	-4.7

Part 24 Substitution Harmonics

Target		Horn Gain dBi	Cable loss dB	Signal Generator dBm	Total (EIRP) dBm	Spec dBm	Margin dBm
Frequency MHz	Level dBuV/m						
3702.50	62.9	9.9	7.53	-35.45	-33.08	-13	-20.1
5553.75	55.7	10.86	9.78	-33.23	-32.15	-13	-19.2
3760.00	61.1	9.9	7.57	-35.56	-33.23	-13	-20.2
5640.00	53.6	10.97	9.78	-35.34	-34.15	-13	-21.2
3817.50	62.0	9.9	7.94	-35.23	-33.27	-13	-20.3
5726.25	53.2	11.07	9.84	-34.67	-33.44	-13	-20.4



Section 15.247(d) – Field Strength of Spurious Emissions (Radiated)

15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

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Test Conditions:

Sample Number:	Castra	Temperature:	17.3°C
Date:	May 12, 2009	Humidity:	63%
Modification State:	Zigbee mode	Tester:	FSCustodio
		Laboratory:	SOATS

Test Results:

See attached plots.

Additional Observations:

- The Spectrum was searched from 30MHz to the 10th Harmonic, 26500 MHz. There are no emissions found that do not comply to the restricted bands defined in FCC Part 15 Subpart C, 15.205 or Part 15.247(d).
- The EUT emissions was maximized and measured on three orthogonal axis.
- Radiated Measurements below 1GHz were performed at 3m with a Quasi-Peak detector (RBW 120kHz/VBW 300kHz) while Radiated Peak (RBW 1MHz/VBW 3MHz) measurements conducted above 1GHz.
- The device has an integral antenna for Zigbee.

- Sample Computation:

Correction factor @ 40.7MHz	= -18.89
	= Antenna factor + Cable loss – Preamp gain
	= 11.51 + 0.8 – 31.2
Corrected reading	= Max. reading + Correction factor
	= 51.97 + (-18.89)
	= 33 dBµV/m





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Radiated Emissions Data

Job # : 28489-1 Date : 5/12/2009 Page 1 of 1
 NEX # : 128052 Time : 11AM
 Staff : FSC

Client Name : Qualcomm EUT Voltage : 3.8VDC
 EUT Name : Tracking Device EUT Frequency : _____
 EUT Model # : Castra Phase: _____
 EUT Serial # : 20-A6248-1 NOATS _____
 EUT Config. : B0A4F5 SOATS X
Transmit at max power (Zigbee) Distance < 1000 MHz: 3 m
 Distance > 1000 MHz: 3 m

Specification : CFR47 Part 15, Subpart B, Class B

Loop Ant. # : NA
 Bicon Ant.# : 115 Temp. (°C) : 17.3
 Log Ant.# : 111 3m Humidity (%) : 63
 DRG Ant. # : 752 Spec An.# : 911
 Cable LF# : SOATS Spec An. Display # : 911
 Cable HF# : 40ft QP # : 911
 Preamp LF# : 901 PreSelect# : NA
 Preamp HF# : 317

Quasi-Peak	RBW: 120 kHz
	Video Bandwidth 300 kHz
Peak	RBW: 1 MHz
	Video Bandwidth 3 MHz
Average	RBW: 1 MHz
	Video Bandwidth 10 Hz

Measurements below 1 GHz are Quasi-Peak values, unless otherwise stated.
 Measurements above 1 GHz are Average values, unless otherwise stated.

Meas. Freq. (MHz)	Meter Reading Vertical	Meter Reading Horizontal	Det.	EUT Side F/L/R/B	Ant. Height m	Max. Reading (dBµV)	Corrected Reading (dBµV/m)	Spec. limit (dBµV/m)	CR/SL Diff. (dB)	Pass Fail	Comment
35.5	46.4	40.0	Q		1.0	46.41	26.8	40.0	-13.2	Pass	Ambient Noise
40.7	50.7	52.0	Q		1.0	51.97	33.0	40.0	-7.0	Pass	Ambient Noise
101.8	45.4	48.8	Q		1.0	48.79	30.4	43.5	-13.1	Pass	Ambient Noise
116.9	37.6	41.2	Q		1.0	41.22	26.1	43.5	-17.5	Pass	Ambient Noise
306.9	25.3	25.3	Q		1.0	25.32	11.8	46.0	-34.2	Pass	Noise Floor
620.0	26.1	26.0	Q		1.0	26.1	17.4	46.0	-28.7	Pass	Noise Floor



Appendix B: Setup Photographs



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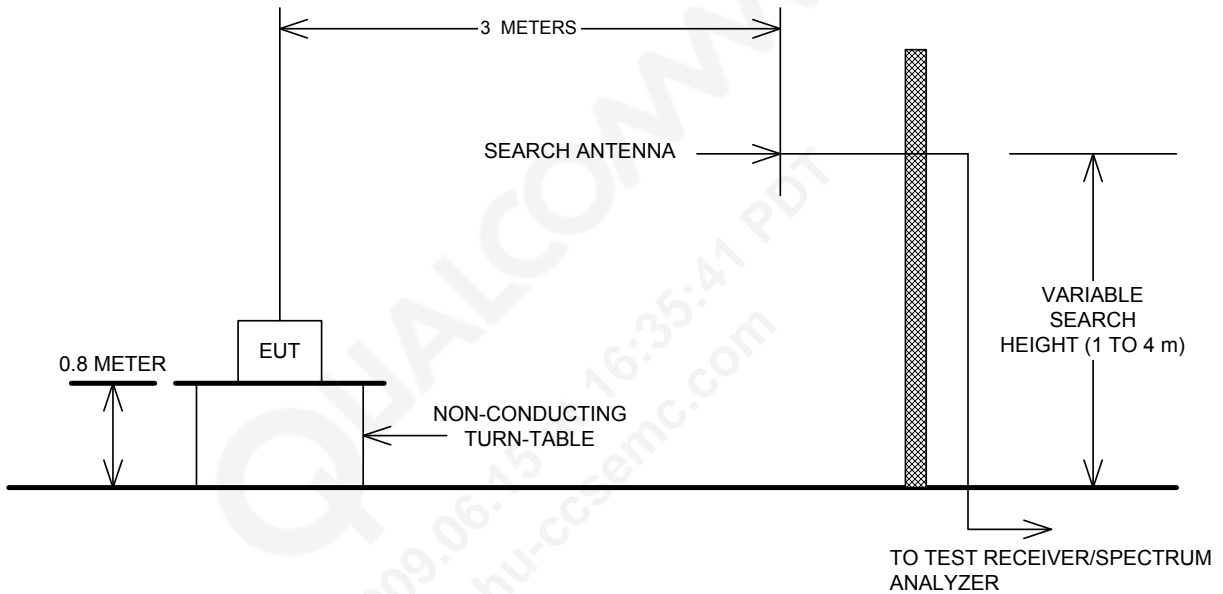
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Appendix C: Block Diagram of Test Setups

Test Site For Radiated Emissions



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