

BFCC CFR47 PART 15 SUBPART C INDUSTRY CANADA RSS-210 ISSUE 7

CERTIFICATION TEST REPORT*

FOR

RUGGEDIZED HANDHELD PDA-TYPE COMPUTER W/ DUAL-BAND CDMA, 802.11B/G & BT

MODEL NUMBER: CN4-C, CN4e-C**

FCC ID: EHA-04CN4 IC: 1223A-02CN4

REPORT NUMBER: 09U12671-3, Revision B

ISSUE DATE: OCTOBER 09, 2009

Prepared for

INTERMEC TECHNOLOGIES CORP 550 SECOND STREET SE CEDAR RAPIDS IOWA, 52401, U.S.A

Prepared by

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** Model differences are described within the body of this report



^{*} This report covers the radiated portion of 11b and 11g modes, and antenna port testing for 11b mode, for antenna port for 11g mode refer to report number ITRM0128.

Revision History

Rev.	Issue Date	Revisions	Revised By
	07/28/09	Initial Issue	F. Ibrahim
Α	07/28/09	Revised model numbers per client's request.	A. Zaffar
В	10/09/09	Added average power for 11g mode in section 7.1.4 Added a justification of testing radiated emissions for 11b mode as worst-case mode in section 5.6	F. Ibrahim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: INTERMEC TECHNOLOGIES CORP

550 SECOND STREET SE

CEDAR RAPIDS, IOWA, 52401, U.S.A

EUT DESCRIPTION: RUGGEDIZED HANDHELD PDA-TYPE DEVICE w/ DUAL BAND

GSM/GPRS/WCDMA/HSDPA, 802.11 b/g & BT

MODEL: CN4-C, CN4e-C

SERIAL NUMBER: 03590990181, 03590990054

DATE TESTED: APRIL 27 – MAY 11, 2009

APPLICABLE STANDARDS

STANDARD

CFR 47 Part 15 Subpart C*

INDUSTRY CANADA RSS-210 Issue 7 Annex 8

INDUSTRY CANADA RSS-GEN Issue 2

Pass

Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by CCS based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By: Tested By:

FRANK IBRAHIM
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

TOM CHEN EMC ENGINEER

COMPLIANCE CERTIFICATION SERVICES

^{*} This report covers the radiated portion of 11b and 11g modes, and antenna port testing for 11b mode, for antenna port for 11g mode refer to report number ITRM0128

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 2, and RSS-210 Issue 7.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Power Line Conducted Emission	+/- 2.3 dB
Radiated Emission	+/- 3.4 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a ruggedized handheld PDA-type device, with dual band CDMA, 802.11b/g & BT.

5.2. DESCRIPTION OF MODEL(S) DIFFERENCES

CN4 is standard and CN4e is extended, both are available with numeric or QWERTY keypads.

CN4e with QWERTY keypad was selected as a representative model for radiated emissions and radiated immunity testing.

5.3. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power in the 11b mode as follows:

Frequency Range Mode		Output Power	Output Power
(MHz)		(dBm)	(mW)
2412 - 2462	802.11b	18.43	69.66

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PFIA antenna, with a maximum gain of -0.045 dBi.

5.5. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was v.20961.

The test utility software used during testing was FCC Test Utility ver1.01 rev.

5.6. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power.

Radiated emissions were performed for 11b because the output power is higher than that of 11g mode.

5.7. DESCRIPTION OF TEST SETUP

TEST SETUP

SETUP DIAGRAM FOR TESTS

EUT	
EUI	

6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEGT FOUNDATION						
TEST EQUIPMENT LIST						
Description Manufacturer Model Asset Cal Date Cal					Cal Due	
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01159	39759	02/07/10	
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	39827	01/14/10	
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	39798	12/16/09	
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	39848	02/04/10	
Antenna, Horn, 18 GHz	EMCO	3115	C00945	39560	04/22/10	
EMI Test Receiver, 30 MHz	R&S	ESHS 20	N02396	39484	08/06/09	
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	39750	10/29/09	

7. ANTENNA PORT TEST RESULTS

7.1. 802.11b MODE IN THE 2.4 GHz BAND

7.1.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

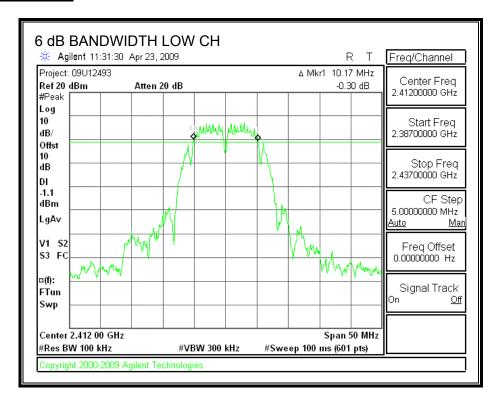
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

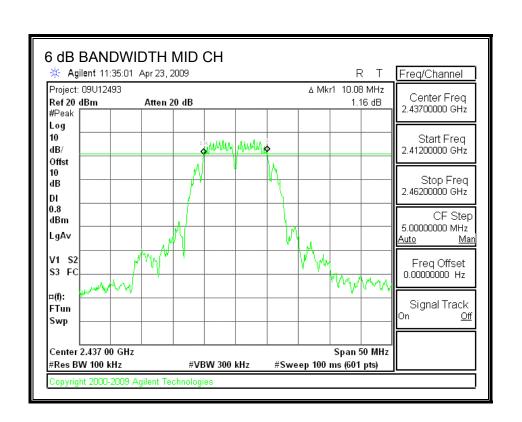
RESULTS

Channel	Frequency	6 dB Bandwidth	Minimum Limit
	(MHz)	(MHz)	(MHz)
Low	2412	10.17	0.5
Middle	2437	10.08	0.5
High	2462	10.17	0.5

6 dB BANDWIDTH

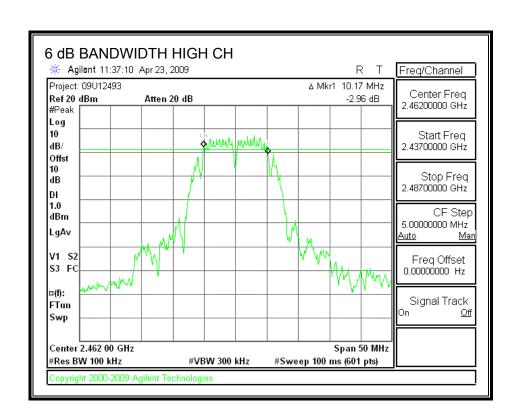


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7.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

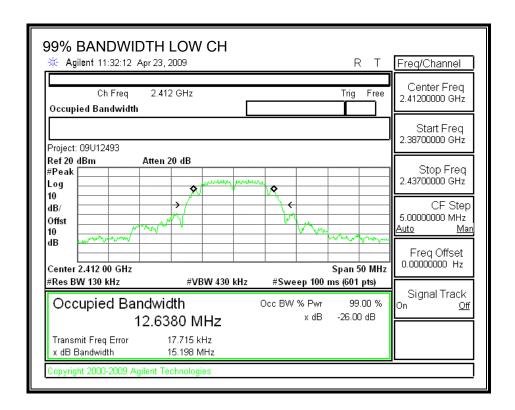
TEST PROCEDURE

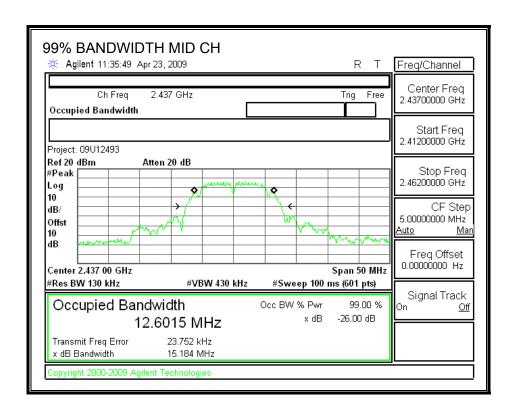
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

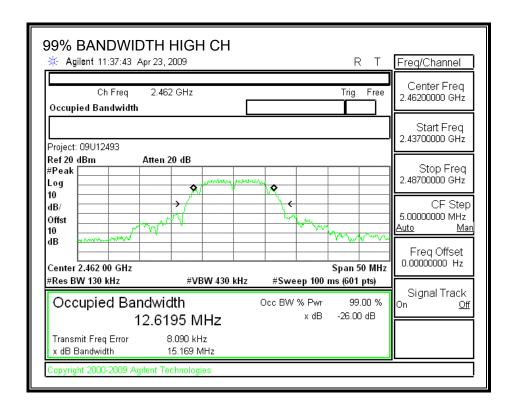
RESULTS

Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	2412	12.6380
Middle	2437	12.6015
High	2462	12.6195

99% BANDWIDTH







7.1.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

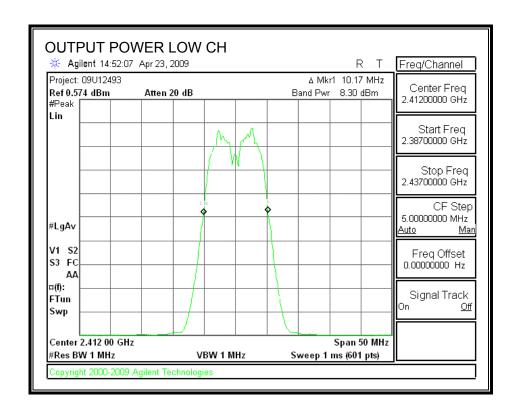
TEST PROCEDURE

Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

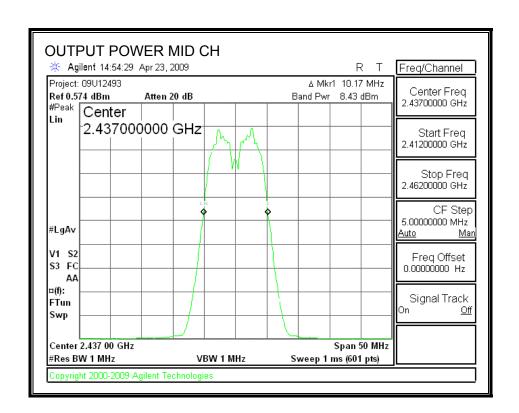
RESULTS

Channel	Frequency	Spectrum	Attenuator and	Output	Limit	Margin
		Analyzer Reading	Cable Offset	Power		
	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Low	2412	8.3	10	18.30	30	-11.70
Middle	2437	8.43	10	18.43	30	-11.57
High	2462	8.15	10	18.15	30	-11.85

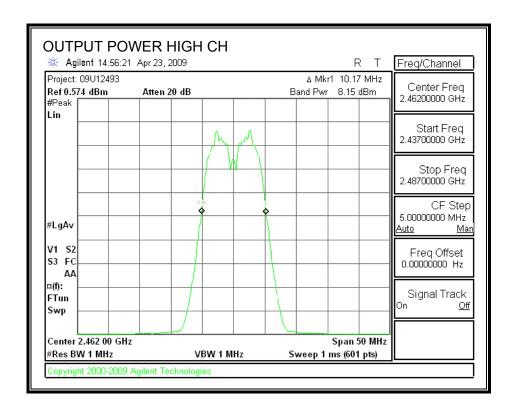
OUTPUT POWER



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7.1.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10 dB (including 10 dB pad) was entered as an offset in the power meter to allow for direct reading of power.

11b mode

Channel	Frequency	Power
	(MHz)	(dBm)
Low	2412	15.67
Middle	2437	15.45
High	2462	15.54

11g mode

Channel	Frequency	Power
	(MHz)	(dBm)
Low	2412	14.10
Middle	2437	14.20
High	2462	14.40

7.1.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

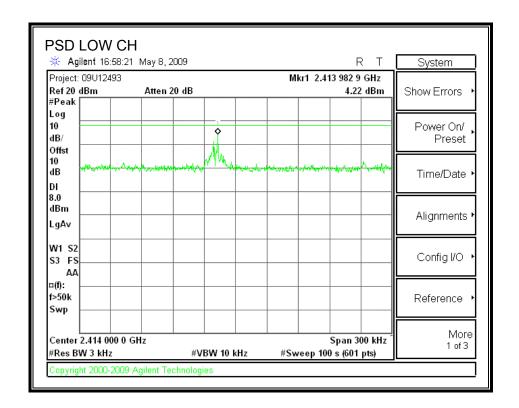
TEST PROCEDURE

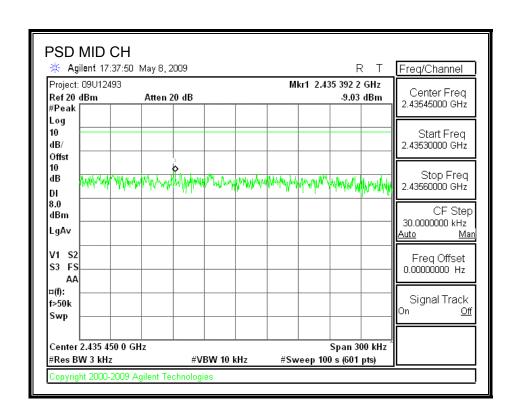
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

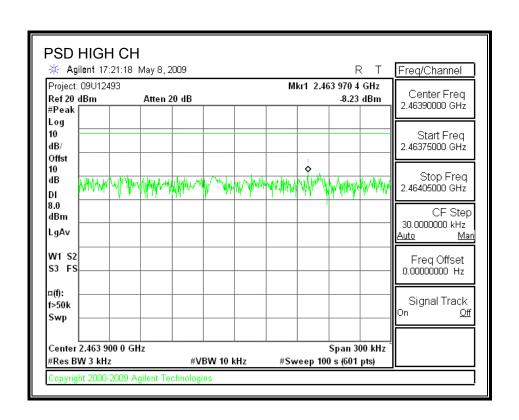
RESULTS

Channel	Frequency	PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2412	4.22	8	-3.78
Middle	2437	-9.03	8	-17.03
High	2462	-8.23	8	-16.23

POWER SPECTRAL DENSITY







7.1.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

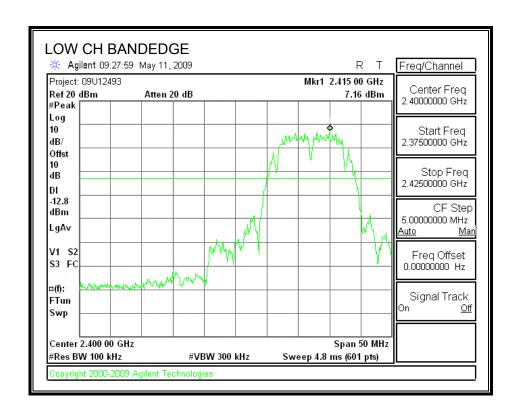
TEST PROCEDURE

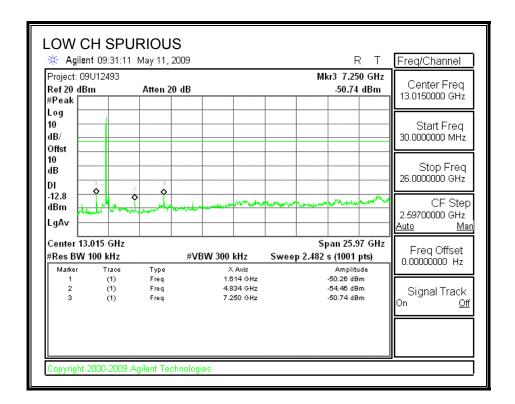
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

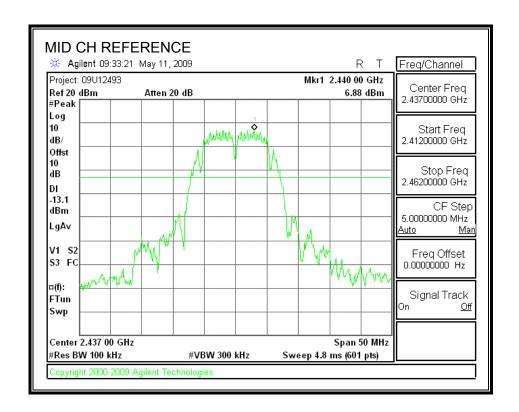
RESULTS

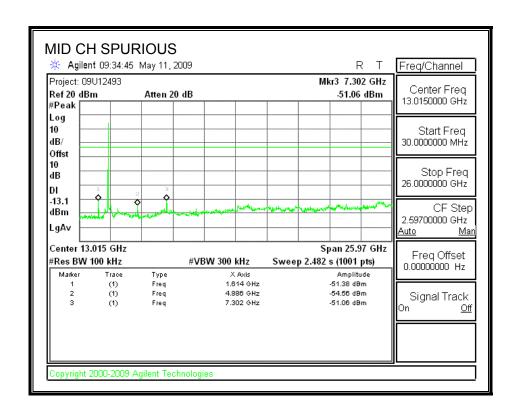
SPURIOUS EMISSIONS, LOW CHANNEL



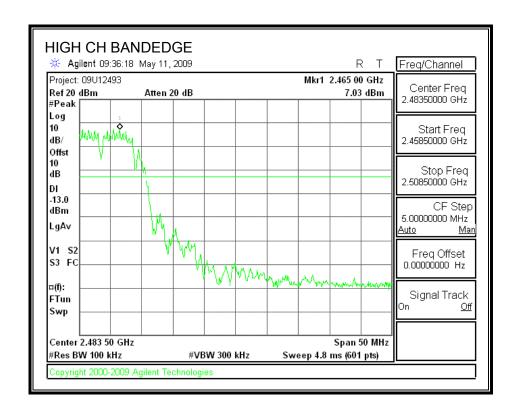


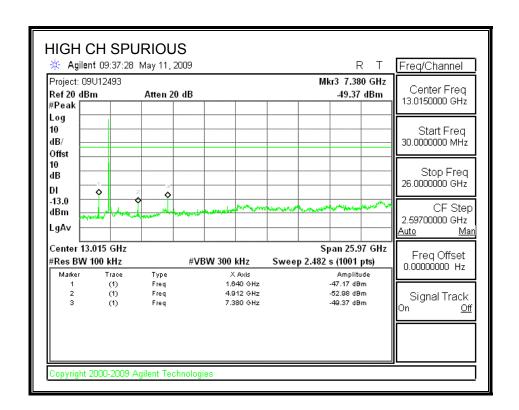
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

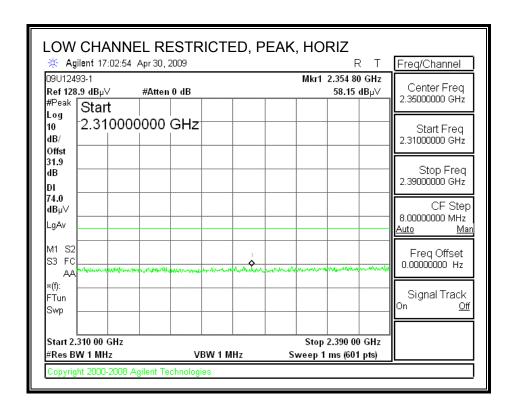
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

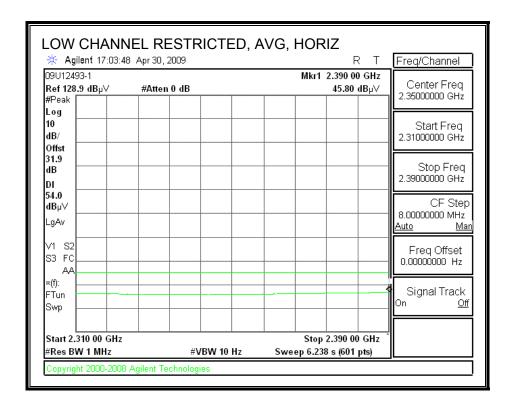
8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. TX ABOVE 1 GHz FOR 802.11b MODE IN THE 2.4 GHz BAND

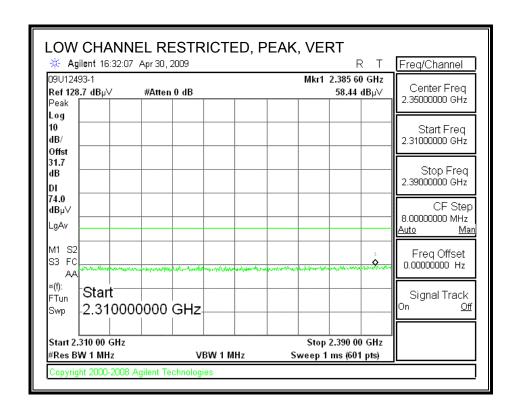
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



REPORT NO: 09U12671-3B



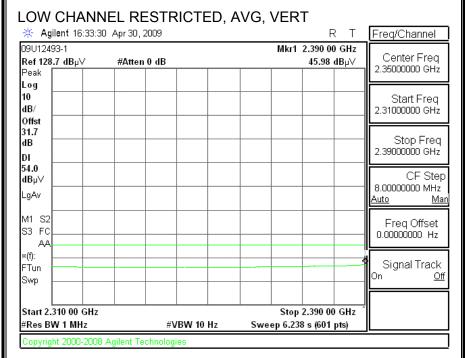
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



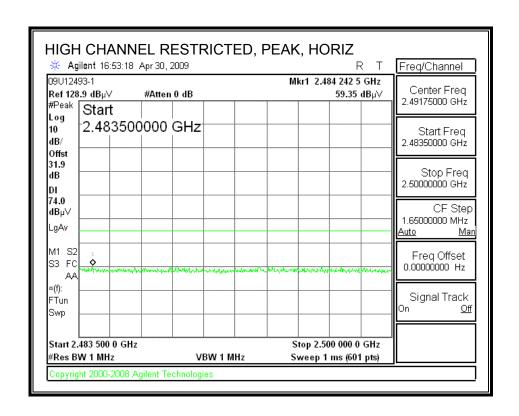
REPORT NO: 09U12671-3B FCC ID: EHA-04CN4

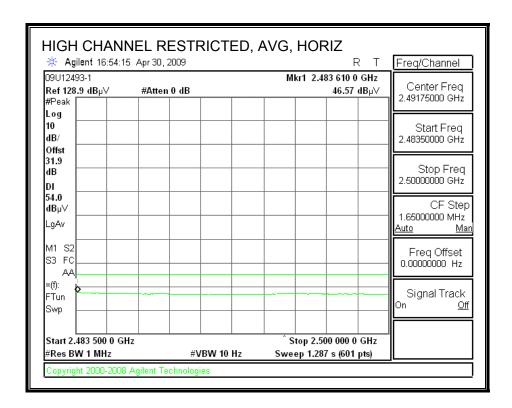
DATE: OCTOBER 09, 2009

IC: 1223A-02CN4

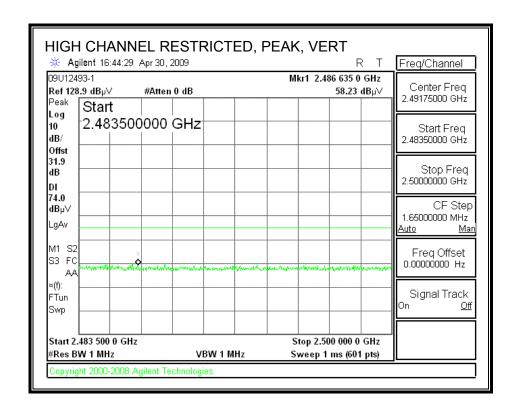


RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

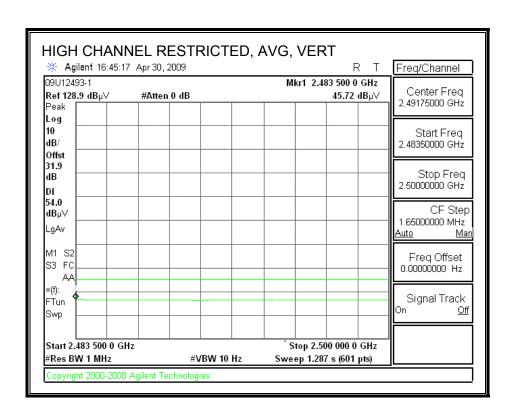




RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



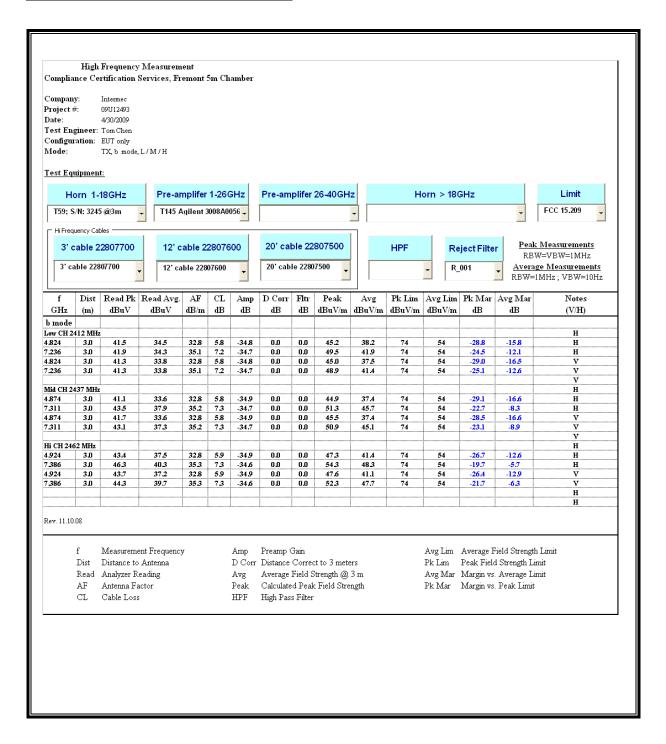
REPORT NO: 09U12671-3B FCC ID: EHA-04CN4



DATE: OCTOBER 09, 2009

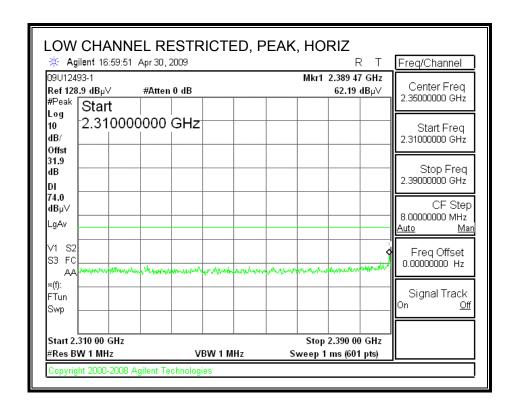
IC: 1223A-02CN4

HARMONICS AND SPURIOUS EMISSIONS

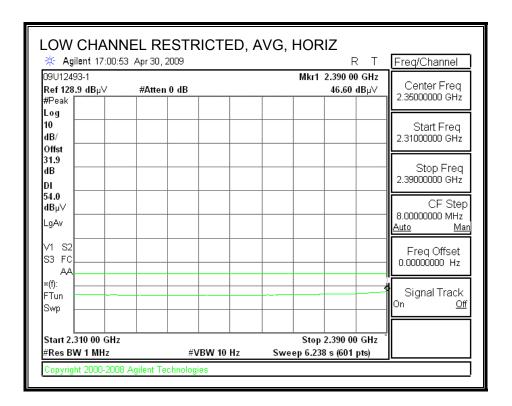


8.2.2. TX ABOVE 1 GHz FOR 802.11g MODE IN THE 2.4 GHz BAND

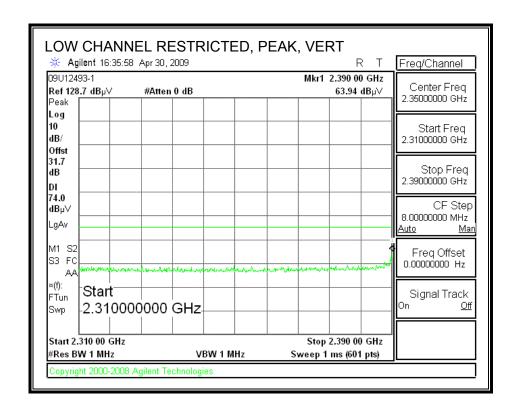
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



REPORT NO: 09U12671-3B



RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



REPORT NO: 09U12671-3B FCC ID: EHA-04CN4

Start 2.310 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

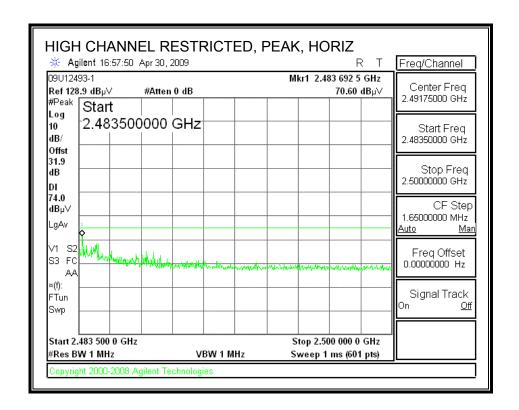
Stop 2.390 00 GHz

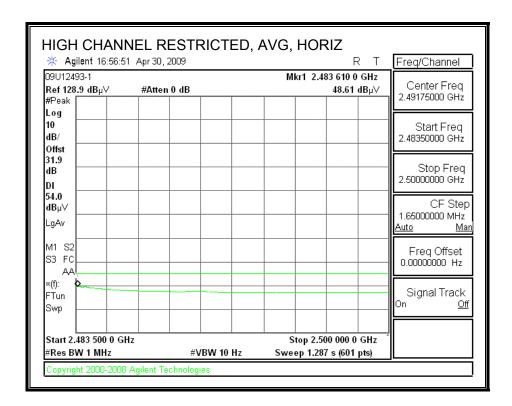
Sweep 6.238 s (601 pts)

DATE: OCTOBER 09, 2009

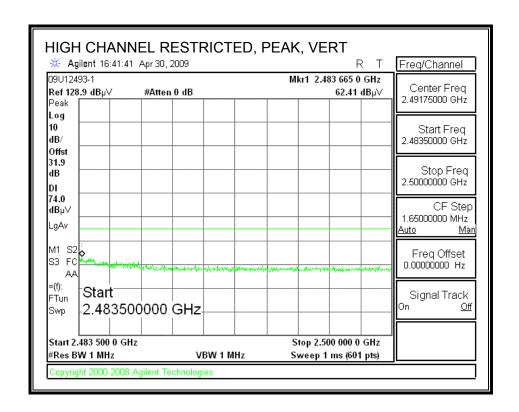
IC: 1223A-02CN4

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

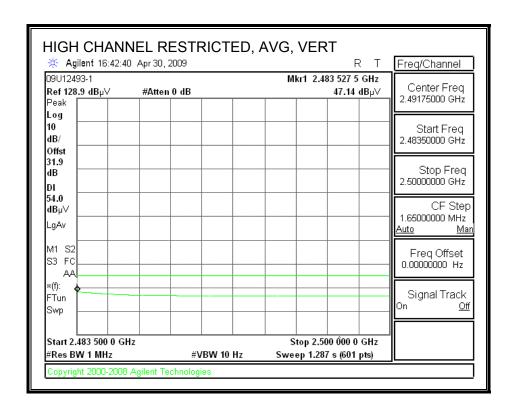




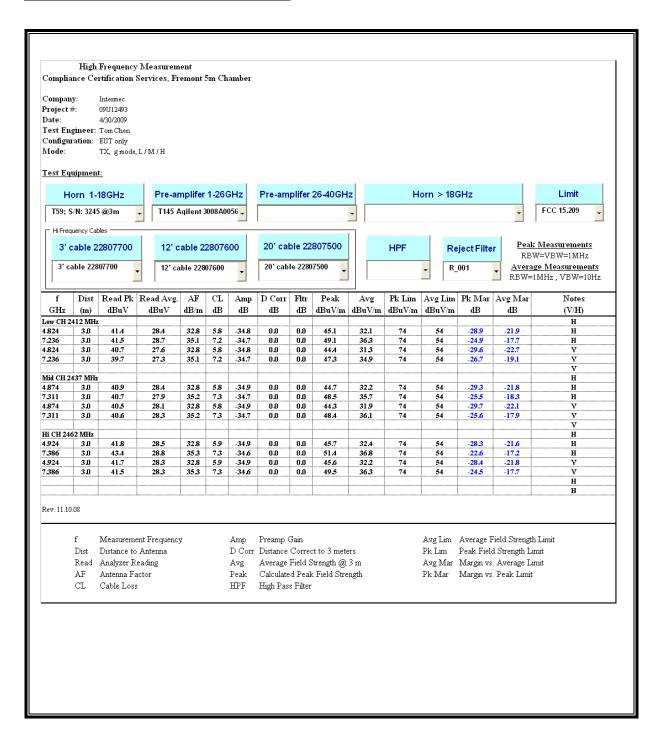
RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



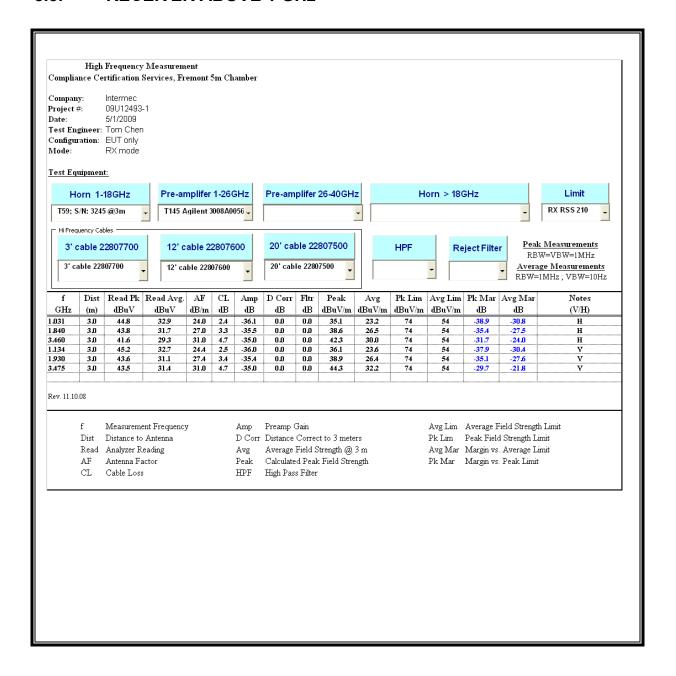
REPORT NO: 09U12671-3B FCC ID: EHA-04CN4



HARMONICS AND SPURIOUS EMISSIONS

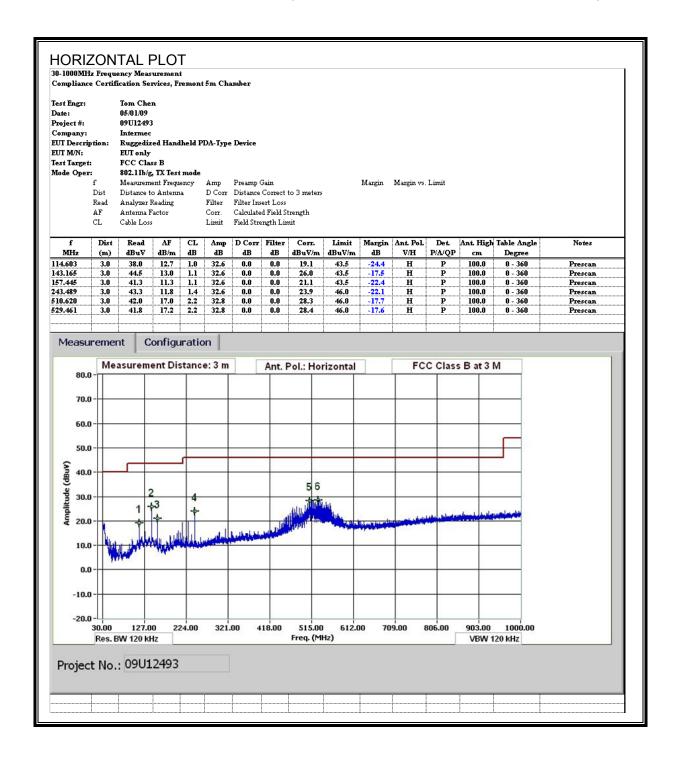


8.3. RECEIVER ABOVE 1 GHz



8.4. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

