



**RADIATED SPURIOUS EMISSIONS PORTIONS OF
FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 7**

**CERTIFICATION TEST REPORT
FOR**

**TELEMATICS PLATFORMS
(GPS+WWAN (CDMA2000 EV-DO/1xRTT) +WLAN (802.11a/b/g) + BLUETOOTH (Ver.2.0))**

MODEL NUMBER: TVG-850 EVDO

**FCC ID: JUP-TVG850EVDO
IC ID: 1756A-TVG850EVDO**

REPORT NUMBER: 10U13184-3

ISSUE DATE: JUNE 18, 2010

Prepared for
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NVLAP[®]

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
---	06/18/10	Initial Issue	T. Chan

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: TRIMBLE MRM
888 TASMAN ROAD,
MILPITAS, CA 95035, U.S.A.

EUT DESCRIPTION: TELEMATICS PLATFORM
Contains: GPS+WWAN (CDMA2000 EV-DO/1xRTT) +WLAN
(802.11a/b/g) + BLUETOOTH (Ver.2.0)

MODEL: TVG-850 EVDO

SERIAL NUMBER: 38

DATE TESTED: APRIL 27 – JUNE 16, 2010

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 7 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 2	Pass

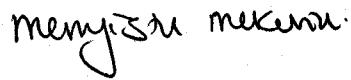
Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. 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. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For CCS By:



Tested By:



THU CHAN
EMC MANAGER
COMPLIANCE CERTIFICATION SERVICES

MENGISTU MEKURIA
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, 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. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

TVG-850 EVDO is a telematics platform primarily intended for use in: transportation and distribution vehicles, telecommunications, and other vertical markets that may require high data rates, WiFi access point connections, and permit the use of an environmentally unsealed enclosure. TVG-850 performs data collection from the vehicle and other sensors, processes the data, and then sends the data wirelessly to a central data server using various wireless technologies. It also acts as a WiFi hotspot when in cellular coverage.

5.2. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA antenna, with a maximum gain of 1.7 dBi.

5.3. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was ITSE-0056-02, rev. 01

The EUT driver software installed during testing was Ver. 6.0.

The test utility software used during testing was CSR Blue Suite / Blue Test Tool, provided by Bluetooth Module supplier (CSR), Ver. 1.22.

5.4. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Dell	PP18L	N/A	DoC
AC/DC Adapter	Dell	LA65NS0-00	CN-0DF263-71615-72M-2925	DoC
12V DC Battery	N/A	N/A	N/A	N/A

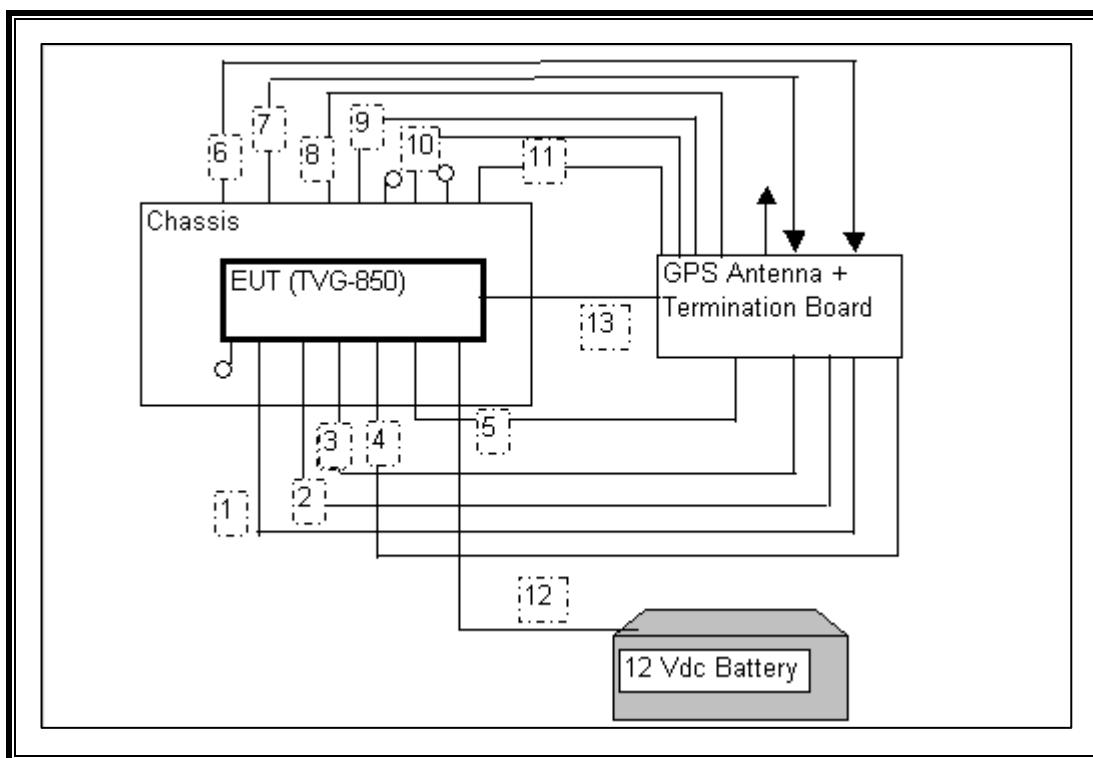
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	Ethernet	1	RJ45	Un-Shielded	0.5m	
2	Serial	1		Un-Shielded	0.4m	
3	Serial	1	RS232	Un-Shielded	0.4m	
4	Serial	1		Un-Shielded	0.4m	
5	Digital I/O	1		Un-Shielded	0.4m	
6	WLAN_Main	1	Fakra Black	RG-58	4.5m	Bundled Together
7	WLAN_Diversity	1	Fakra Black	RG-58	3.0m	
8	WWAN_Main	1	Fakra Purple	RG-58	4.5m	Bundled Together
9	WWAN_Diversit	1	Fakra Purple	RG-174	3.0m	
10	GPS	1	Fakra Blue	RG-174	4.5m	Bundled Together
11	Bluetooth	1	Fakra White	RG-174	3.0m	
12	Battery	1	Wires	Un-Shielded	0.4m	
13	Ground	1	Wire	Un-Shielded	0.4m	

TEST SETUP

The EUT is stand-alone unit with all ports are terminated by termination board during the tests. The support laptop was used only to program the EUT for the appropriate channel and modulation changes.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Asset	Cal Due
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01178	08/31/10
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	07/06/10
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	08/04/10
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	07/14/10
Antenna, Horn, 18 GHz	EMCO	3115	C00945	07/29/10
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02685	CNR

7. RADIATED TEST RESULTS

7.1. 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, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

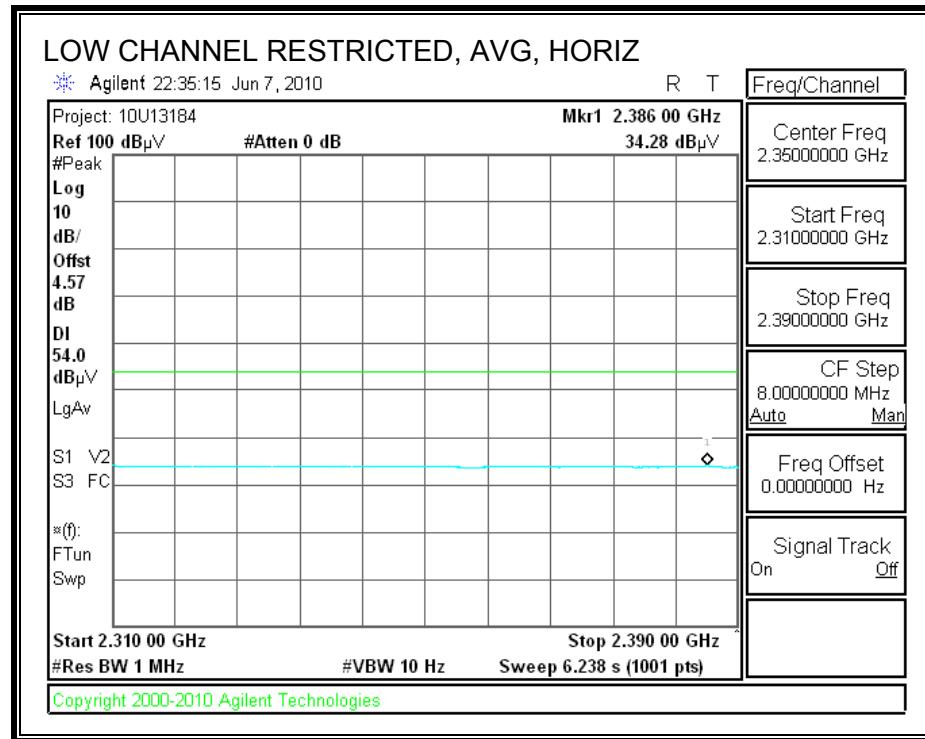
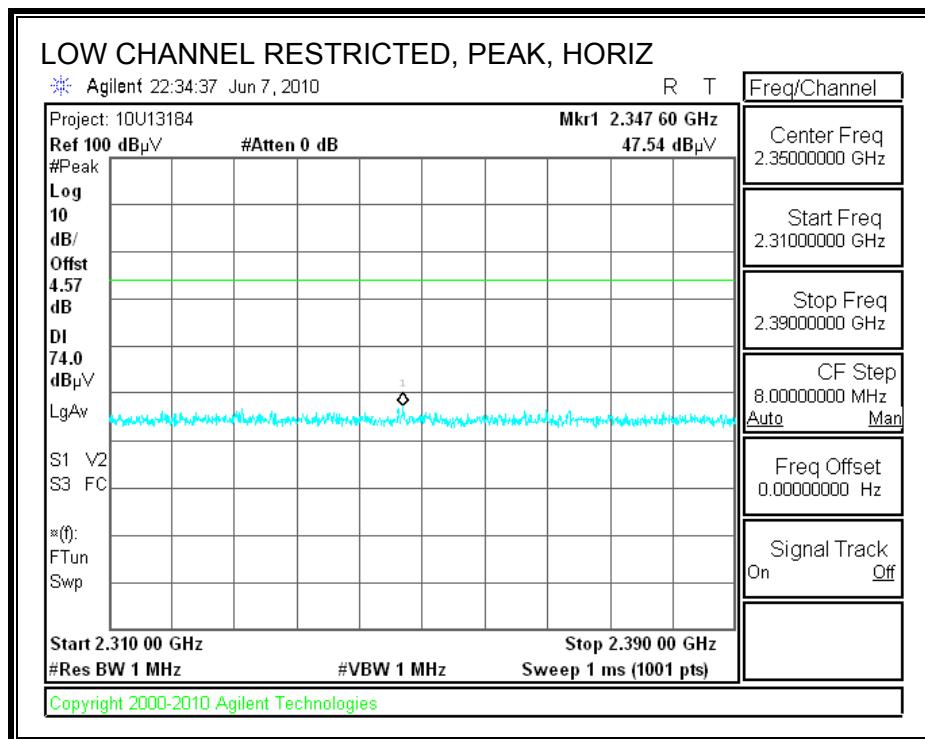
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The 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.

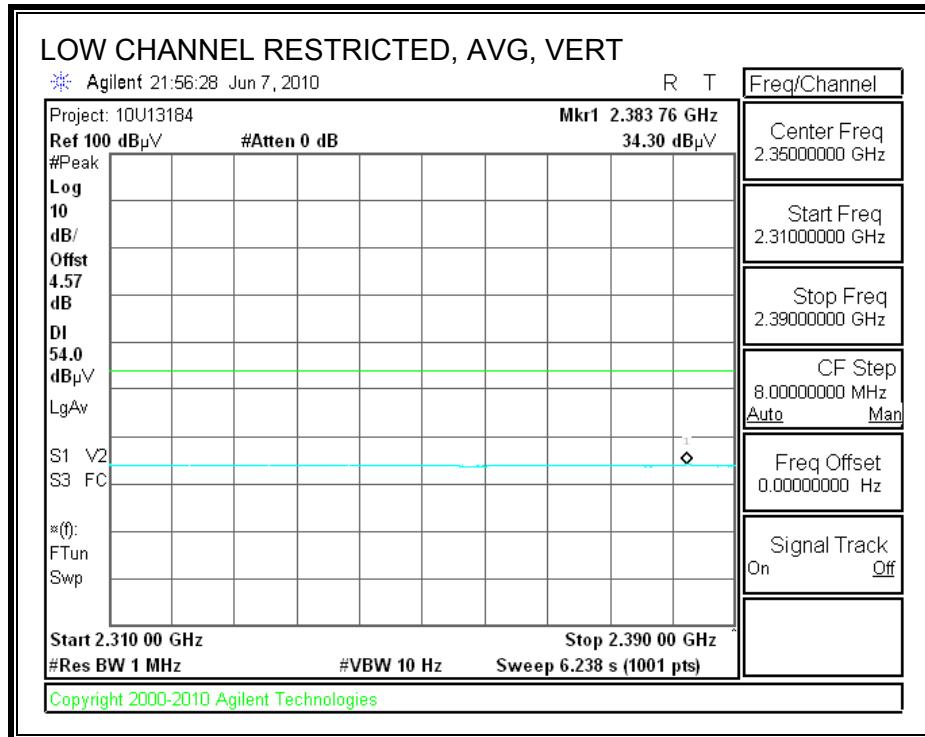
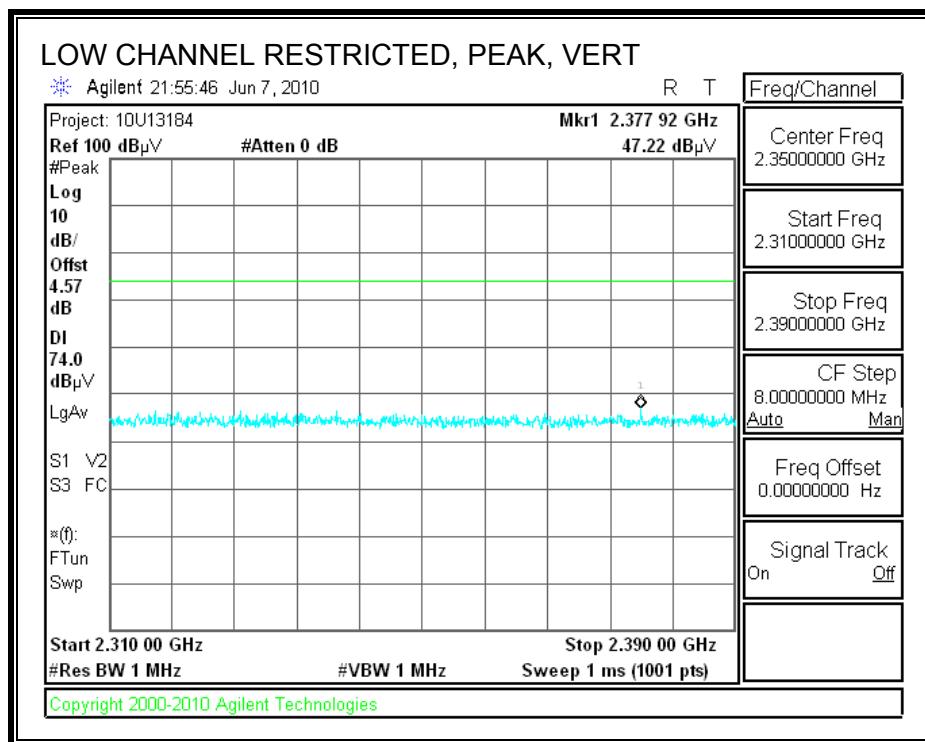
7.2. TRANSMITTER ABOVE 1 GHz

7.2.1. BASIC DATA RATE GFSK MODULATION

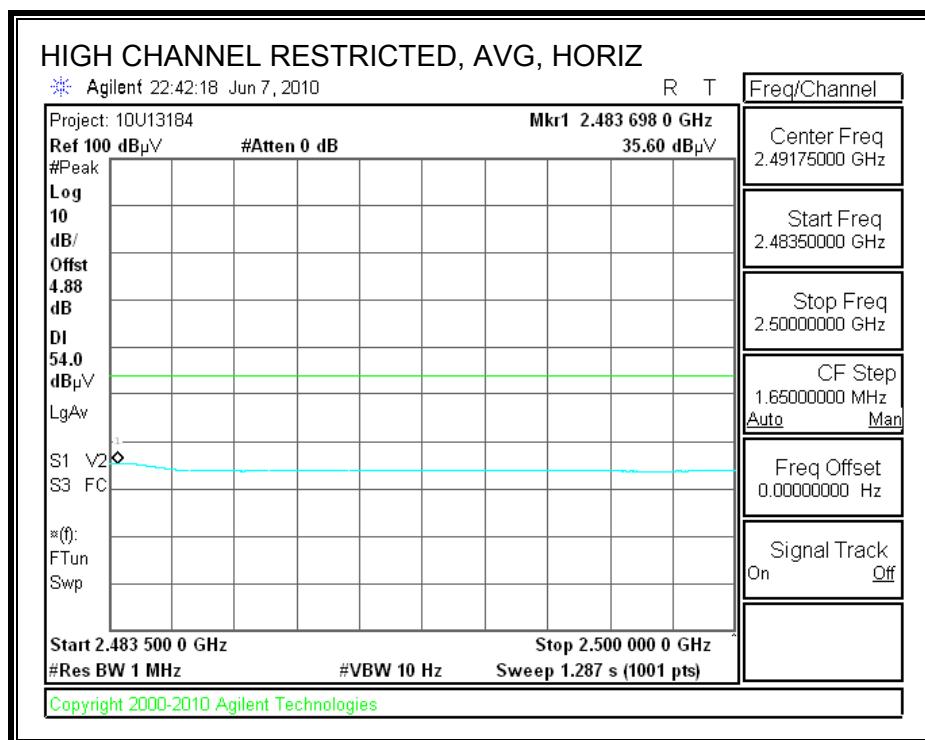
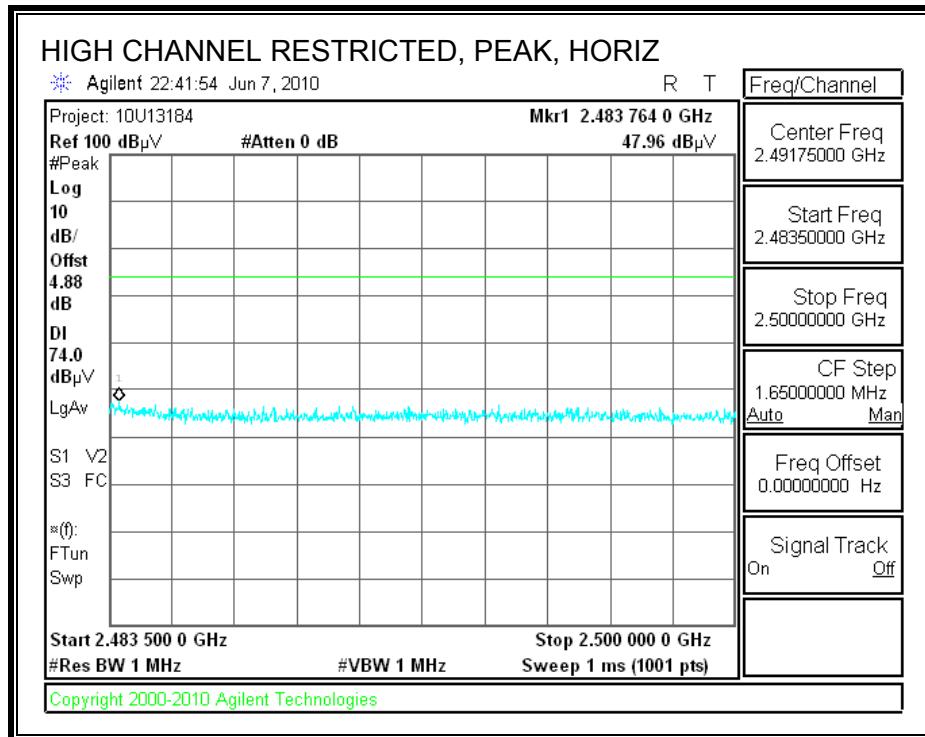
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



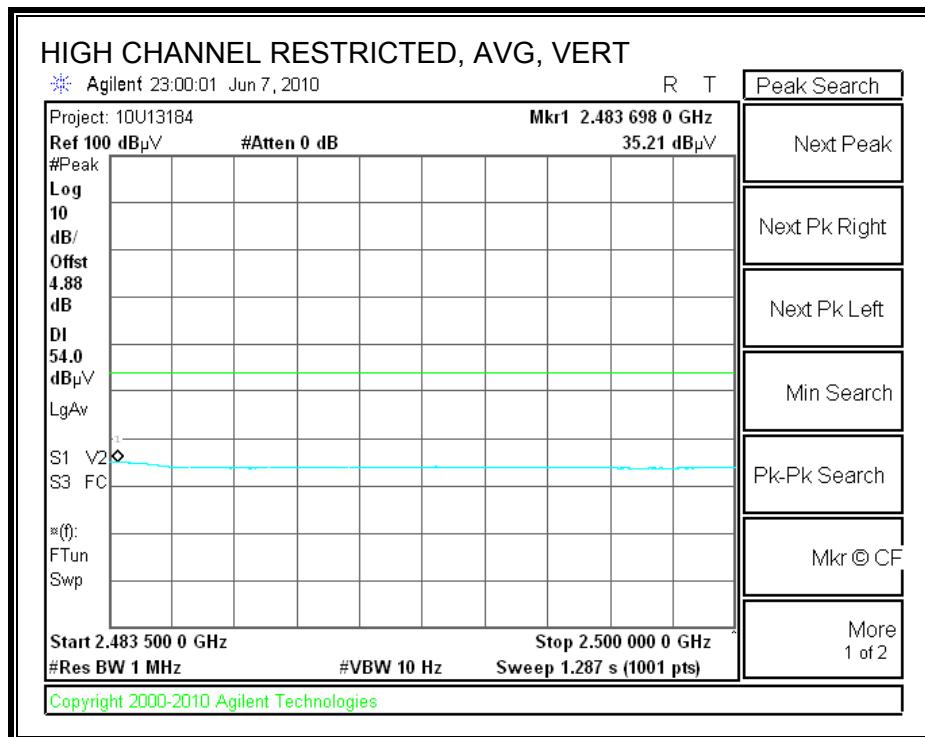
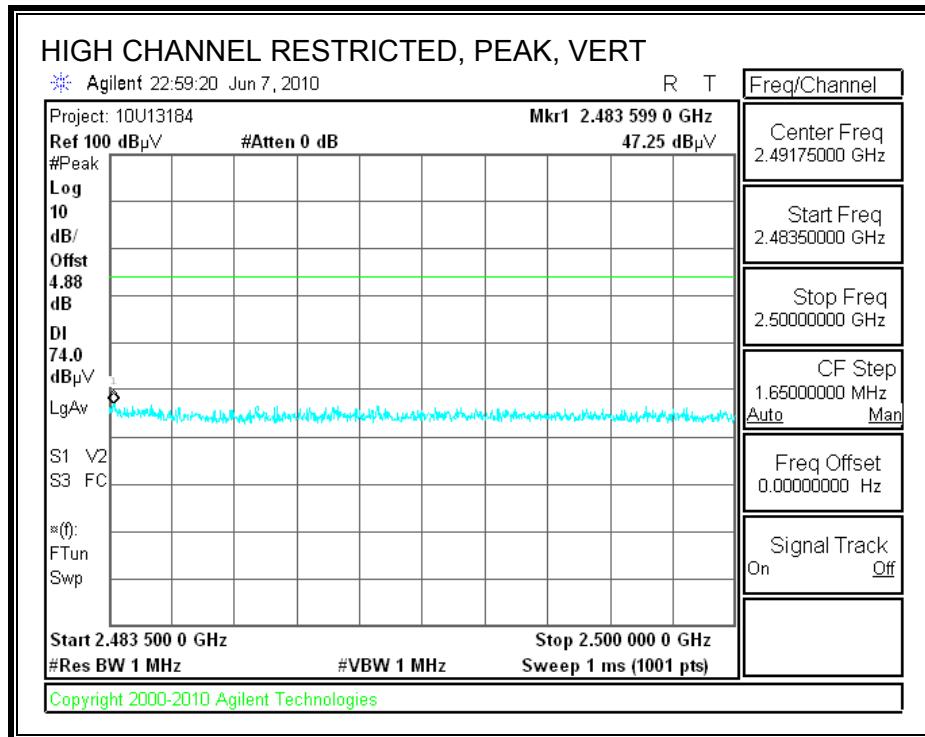
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

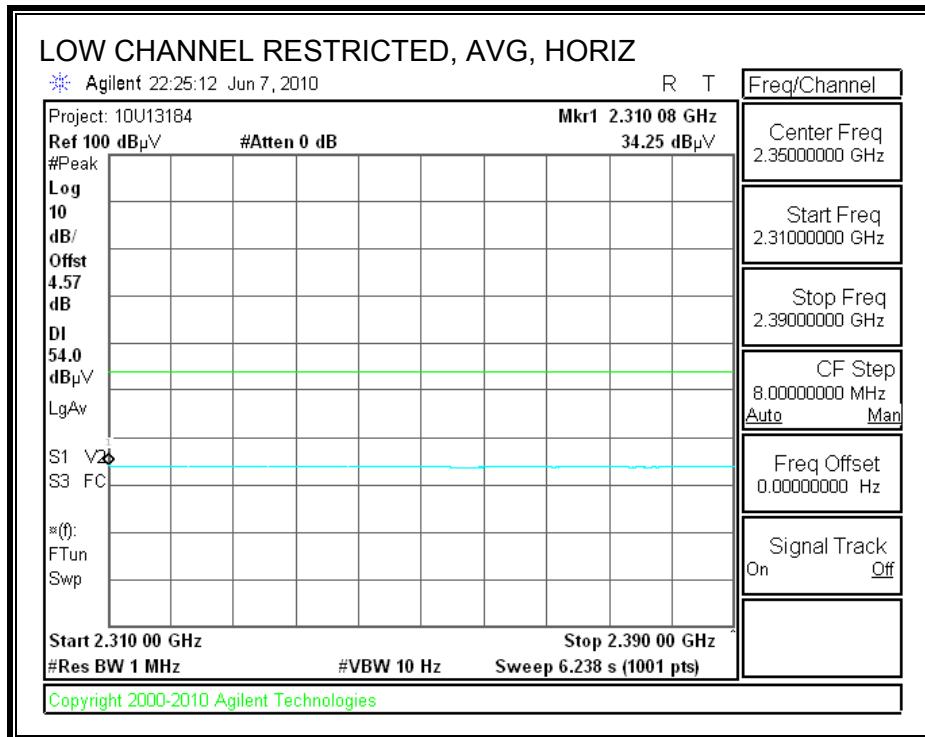
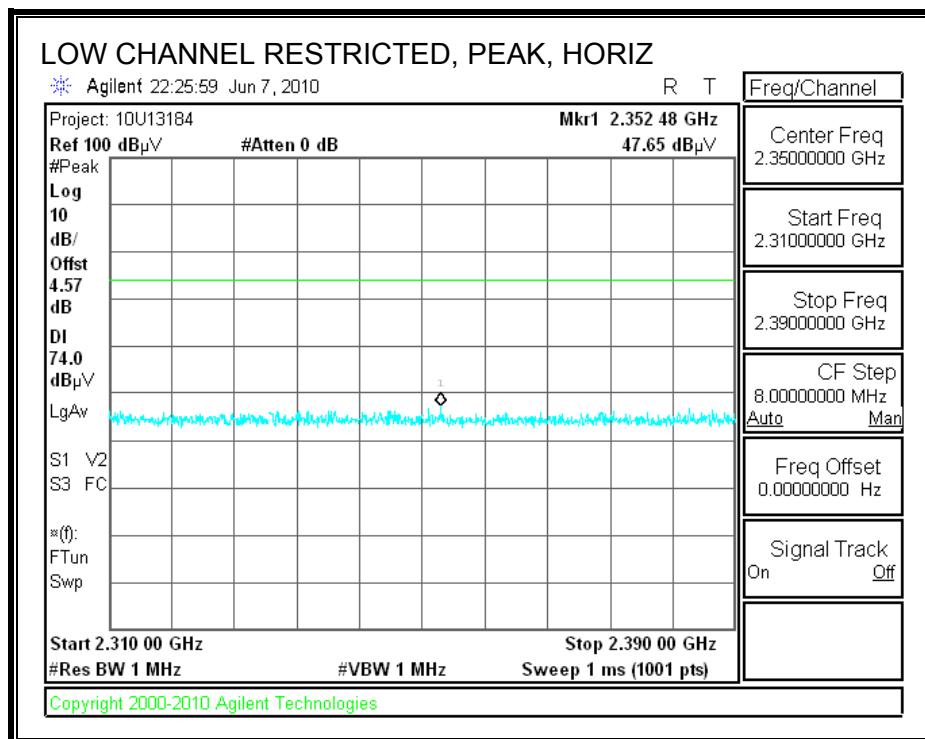


HARMONICS AND SPURIOUS EMISSIONS

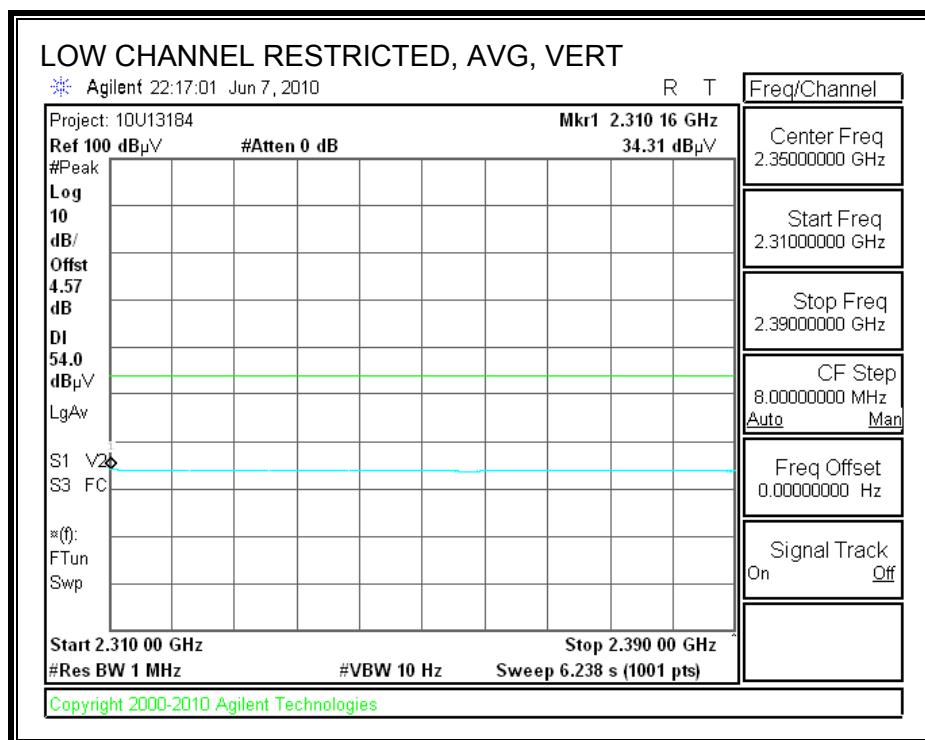
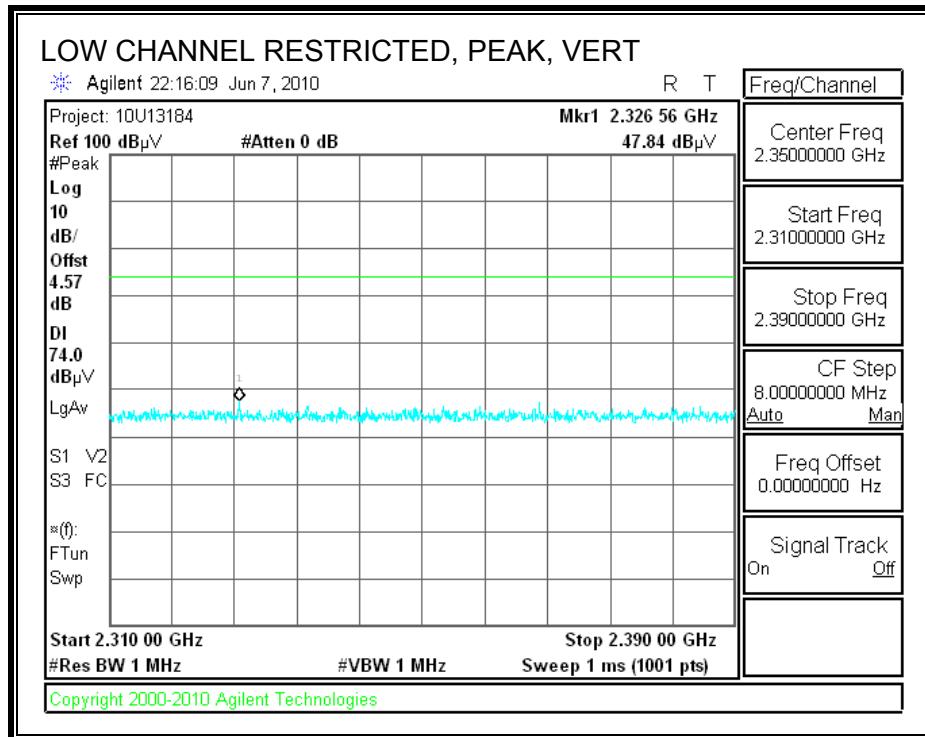
High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber																
Company:	Trimble MRM															
Project #:	10U13184															
Date:	6/7/2010															
Test Engineer:	MENGISTU MEKURIA															
Configuration:	EUT and Support Equipments															
Mode:	Tx, GFSK Mode															
Test Equipment:																
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit				
T73; S/N: 6717 @3m			T144 Miteq 3008A00931									FCC 15.205				
Hi Frequency Cables																
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			Peak Measurements RBW=VBW=1MHz	
3' cable 22807700			12' cable 22807600			20' cable 22807500						R_001			Average Measurements RBW=1MHz; VBW=10Hz	
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)	
Low Channel (2402 MHz)																
4.804	3.0	41.8	30.0	33.0	5.8	-36.5	0.0	0.0	44.1	32.4	74	54	-29.9	-21.6	V	
4.804	3.0	41.3	29.6	33.0	5.8	-36.5	0.0	0.0	43.6	31.9	74	54	-30.4	-22.1	H	
Mid Channel (2441 MHz)																
4.882	3.0	43.4	33.8	33.1	5.8	-36.5	0.0	0.0	45.9	36.3	74	54	-28.1	-17.7	V	
4.882	3.0	43.4	33.3	33.1	5.8	-36.5	0.0	0.0	45.8	35.7	74	54	-28.2	-18.3	H	
Hi Channel (2480 MHz)																
4.960	3.0	45.4	37.1	33.2	5.9	-36.5	0.0	0.0	48.0	39.7	74	54	-26.0	-14.3	V	
4.960	3.0	44.8	36.1	33.2	5.9	-36.5	0.0	0.0	47.5	38.7	74	54	-26.5	-15.3	H	
Rev. 07.22.09																
f	Measurement Frequency			Amp	Preamp Gain			D Corr	Distance Correct to 3 meters			Avg Lim	Average Field Strength Limit			
Dist	Distance to Antenna			D Avg	Average Field Strength @ 3 m			Pk Lim	Peak Field Strength Limit							
Read	Analyzer Reading			Peak	Calculated Peak Field Strength			Avg Mar	Margin vs. Average Limit							
AF	Antenna Factor			HPF	High Pass Filter			Pk Mar	Margin vs. Peak Limit							
CL	Cable Loss															

7.2.2. ENHANCED DATA RATE 8PSK MODULATION

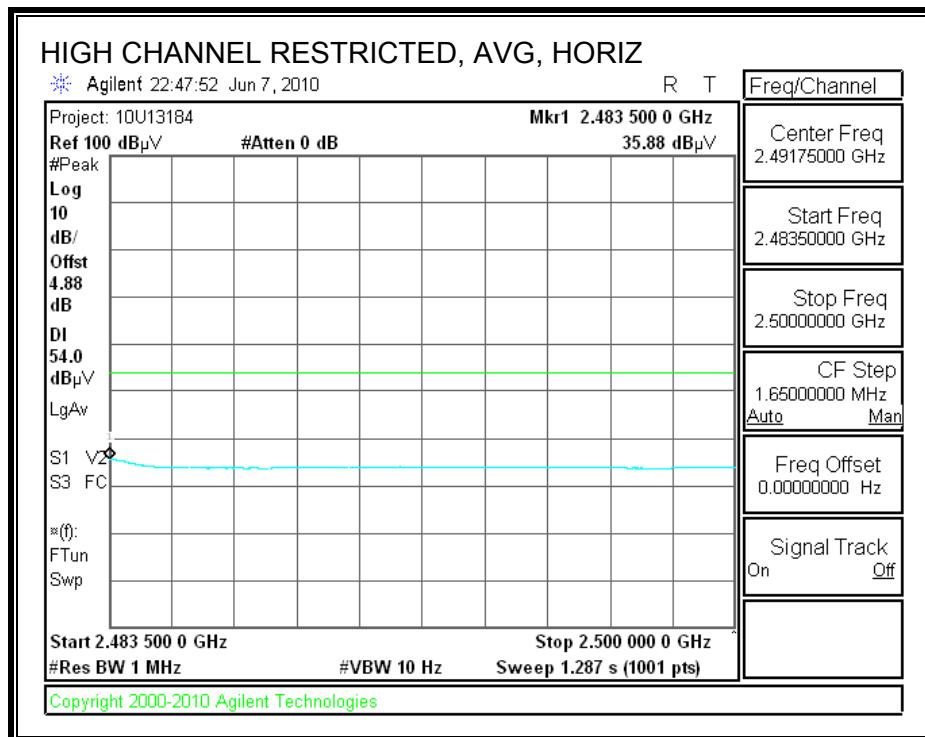
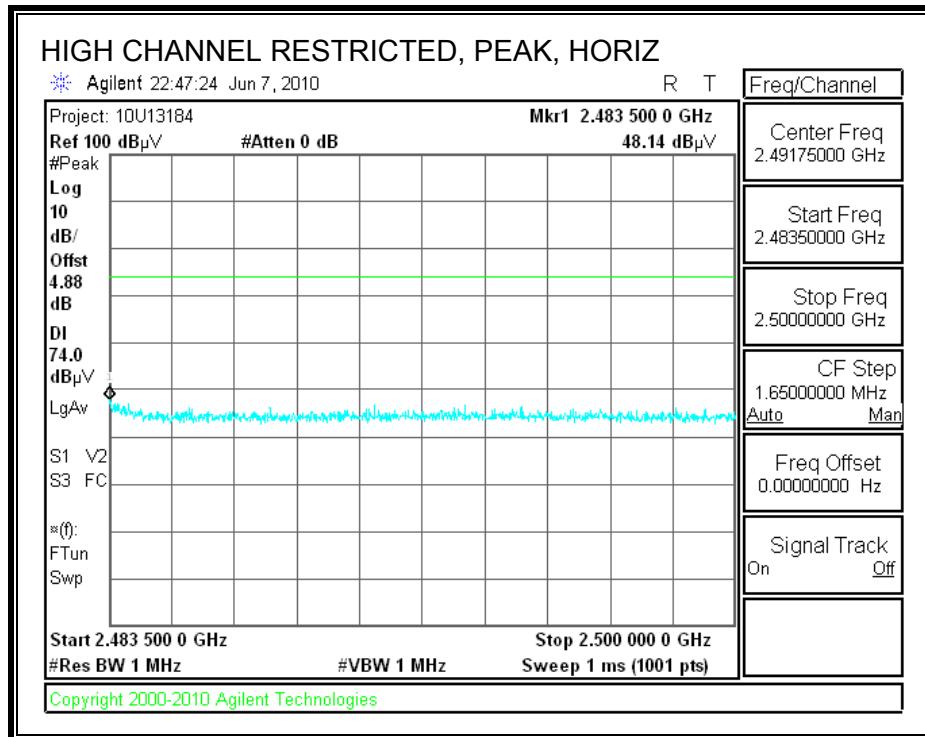
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



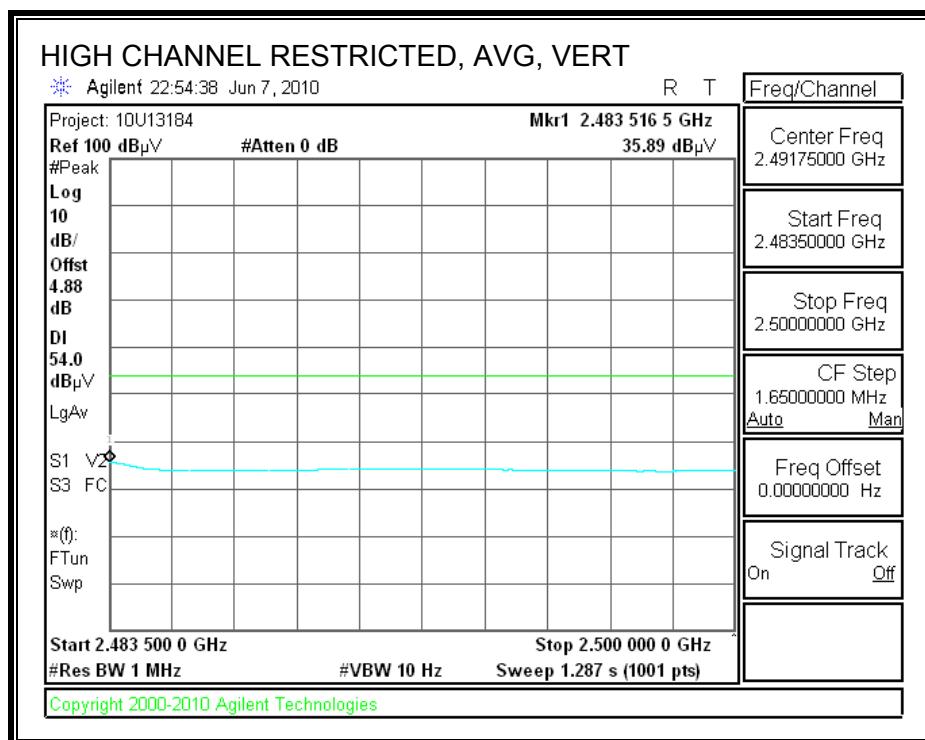
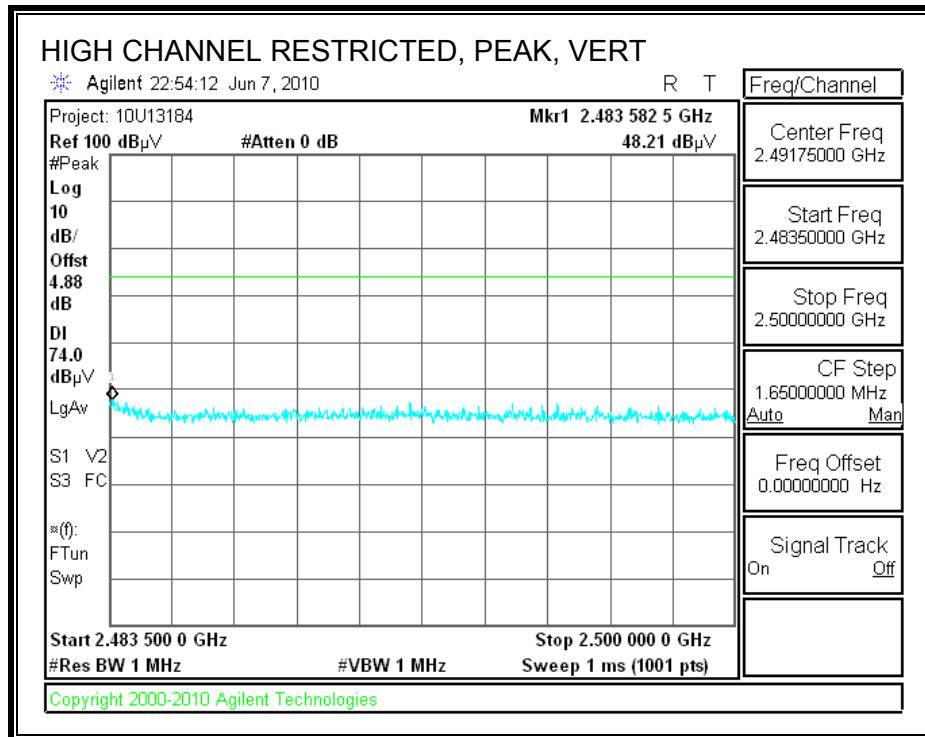
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HARMONICS AND SPURIOUS EMISSIONS

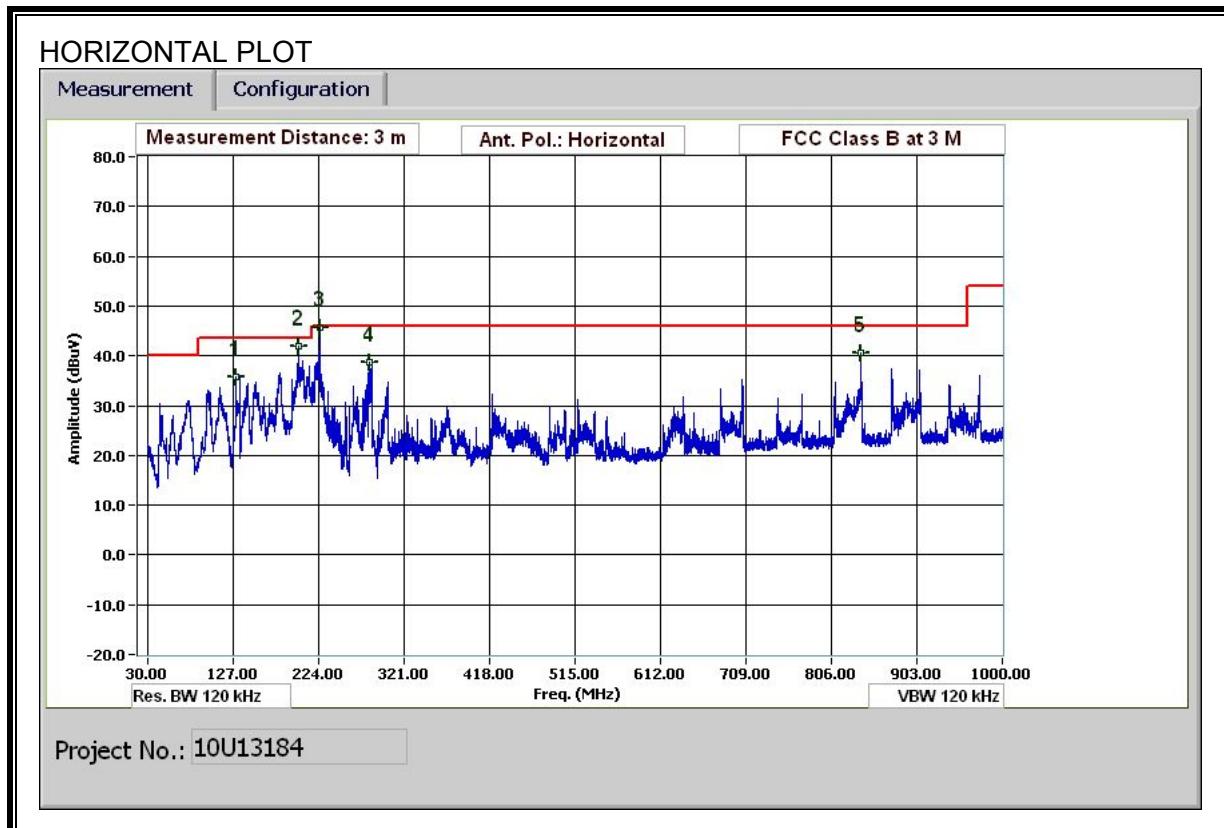
High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber																
Company:	Trimble MRM															
Project #:	10U13184															
Date:	6/7/2010															
Test Engineer:	MENGISTU MEKURIA															
Configuration:	EUT and Support Equipments															
Mode:	Tx, 8PSK Mode															
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Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit				
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4.804	3.0	39.9	27.2	33.0	5.8	-36.5	0.0	0.0	42.2	29.5	74	54	-31.8	-24.5	H	
Mid Channel (2441 MHz)																
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4.882	3.0	39.5	27.2	33.1	5.8	-36.5	0.0	0.0	42.0	29.7	74	54	-32.0	-24.3	H	
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4.960	3.0	39.4	27.1	33.2	5.9	-36.5	0.0	0.0	42.0	29.8	74	54	-32.0	-24.2	H	
Rev. 07.22.09																
f	Measurement Frequency			Amp	Preamp Gain						Avg Lim	Average Field Strength Limit				
Dist	Distance to Antenna			D Corr	Distance Correct to 3 meters						Pk Lim	Peak Field Strength Limit				
Read	Analyzer Reading			Avg	Average Field Strength @ 3 m						Avg Mar	Margin vs. Average Limit				
AF	Antenna Factor			Peak	Calculated Peak Field Strength						Pk Mar	Margin vs. Peak Limit				
CL	Cable Loss			HPF	High Pass Filter											

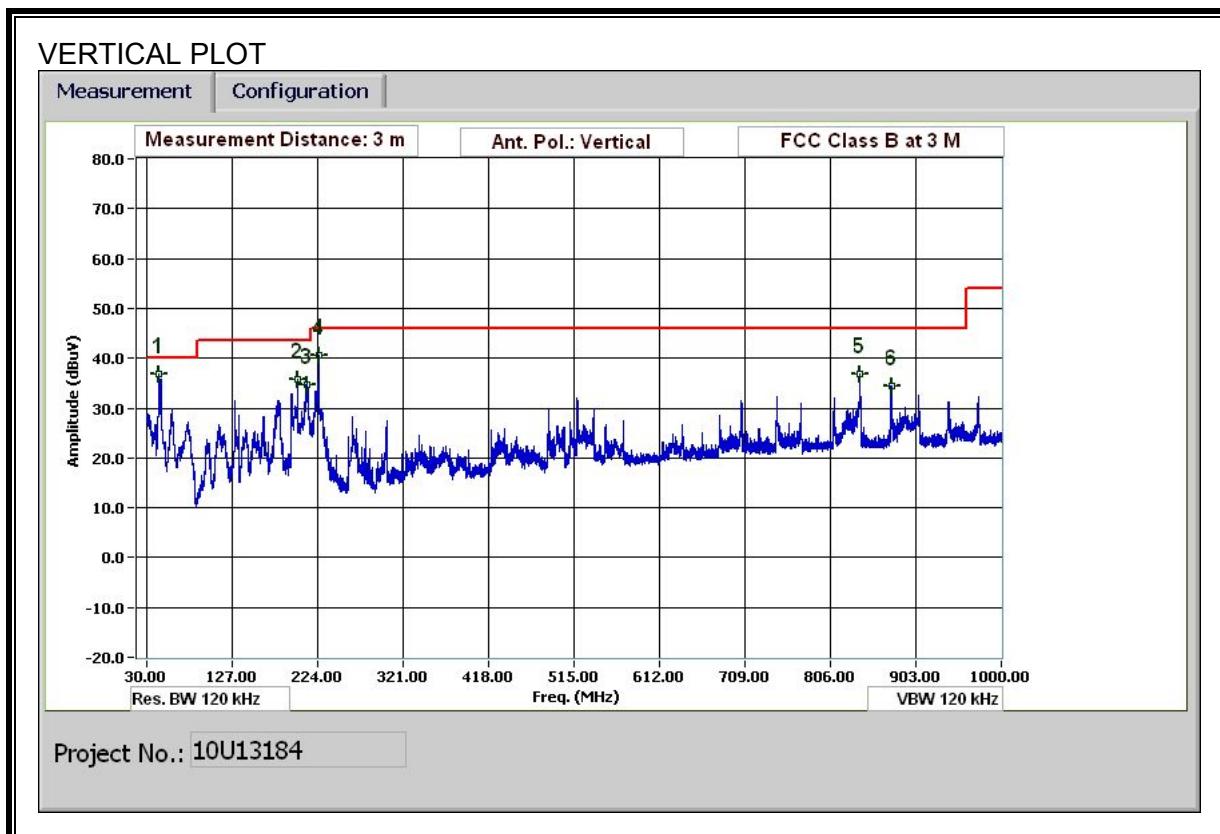
7.3. RECEIVER ABOVE 1 GHz

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber																																												
Company:	Trimble MRM																																											
Project #:	10U13184																																											
Date:	06/16/10																																											
Test Engineer:	Mengistu Mekuria																																											
Configuration:	EUT with 12VDC (Battery)																																											
Mode:	Normal																																											
Test Equipment:																																												
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit																																
T59; S/N: 3245 @3m			T145 Agilent 3008A005c									FCC Class B																																
Hi Frequency Cables																																												
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			Peak Measurements RBW=VBW=1MHz																													
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Horizontal																																												
1.012	3.0	59.4	42.2	24.0	2.4	-36.1	0.0	0.0	49.6	32.4	74	54	-24.4	-21.6	H																													
1.085	3.0	59.0	40.2	24.2	2.5	-36.1	0.0	0.0	49.6	30.9	74	54	-24.4	-23.1	H																													
1.221	3.0	54.3	35.6	24.8	2.6	-36.0	0.0	0.0	45.7	27.0	74	54	-28.3	-27.0	H																													
1.419	3.0	56.0	35.3	25.5	2.9	-35.8	0.0	0.0	48.5	27.8	74	54	-25.5	-26.2	H																													
Vertical																																												
1.012	3.0	55.4	36.3	24.0	2.4	-36.1	0.0	0.0	45.6	26.5	74	54	-28.4	-27.5	V																													
1.085	3.0	54.7	33.5	24.2	2.5	-36.1	0.0	0.0	45.3	24.1	74	54	-28.7	-29.9	V																													
1.221	3.0	53.6	33.7	24.8	2.6	-36.0	0.0	0.0	45.0	25.1	74	54	-29.0	-28.9	V																													
1.419	3.0	54.6	32.8	25.5	2.9	-35.8	0.0	0.0	47.1	25.3	74	54	-26.9	-28.7	V																													
<table> <tr> <td>f</td> <td>Measurement Frequency</td> <td>Amp</td> <td>Preamp Gain</td> <td>Avg Lim</td> <td>Average Field Strength Limit</td> </tr> <tr> <td>Dist</td> <td>Distance to Antenna</td> <td>D Corr</td> <td>Distance Correct to 3 meters</td> <td>Pk Lim</td> <td>Peak Field Strength Limit</td> </tr> <tr> <td>Read</td> <td>Analyzer Reading</td> <td>Avg</td> <td>Average Field Strength @ 3 m</td> <td>Avg Mar</td> <td>Margin vs. Average Limit</td> </tr> <tr> <td>AF</td> <td>Antenna Factor</td> <td>Peak</td> <td>Calculated Peak Field Strength</td> <td>Pk Mar</td> <td>Margin vs. Peak Limit</td> </tr> <tr> <td>CL</td> <td>Cable Loss</td> <td>HPF</td> <td>High Pass Filter</td> <td></td> <td></td> </tr> </table>															f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit	Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit	Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit	AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit	CL	Cable Loss	HPF	High Pass Filter		
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AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit																																							
CL	Cable Loss	HPF	High Pass Filter																																									

7.4. WORST-CASE BELOW 1 GHz

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





VERTICAL AND HORIZONTAL DATA

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: MENGISTU MEKURIA

Date: 06/08/10

Project #: 10U13184

Company: TRIMBLE MRM

EUT Description: TELEMATICS PLATFORM

EUT M/N: TVG-850

Test Target: FCC CLASS B

Mode Oper: TX MODE

f	Measurement Frequency	Amp	Preamp Gain	Margin	Margin vs. Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		
Read	Analyzer Reading	Filter	Filter Insert Loss		
AF	Antenna Factor	Corr.	Calculated Field Strength		
CL	Cable Loss	Limit	Field Strength Limit		

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filter dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant Pol V/H	Det P/A/QP	Notes
43.855	3.0	53.2	11.5	0.6	28.4	0.0	0.0	36.9	40.0	-3.1	V	P	
43.855	3.0	52.3	11.5	0.6	28.4	0.0	0.0	36.1	40.0	-3.9	V	QP	
201.487	3.0	50.8	12.0	1.3	28.2	0.0	0.0	35.8	43.5	-7.7	V	P	
212.408	3.0	49.7	11.9	1.3	28.2	0.0	0.0	34.7	43.5	-8.8	V	P	
224.997	3.0	55.7	11.9	1.3	28.2	0.0	0.0	40.7	46.0	-5.3	V	P	
224.997	3.0	54.3	11.9	1.3	28.2	0.0	0.0	39.3	46.0	-6.7	V	QP	
839.553	3.0	40.4	21.3	2.7	27.6	0.0	0.0	36.8	46.0	-9.2	V	P	
875.075	3.0	37.7	21.6	2.8	27.7	0.0	0.0	34.4	46.0	-11.6	V	P	
129.604	3.0	49.4	13.5	1.1	28.3	0.0	0.0	35.7	43.5	-7.8	H	P	
201.487	3.0	57.0	12.0	1.3	28.2	0.0	0.0	42.0	43.5	-1.5	H	P	
201.496	3.0	52.4	12.0	1.3	28.2	0.0	0.0	37.4	43.5	-6.1	H	QP	
224.997	3.0	60.6	11.9	1.3	28.2	0.0	0.0	45.6	46.0	-0.4	H	P	
224.997	3.0	59.1	11.9	1.3	28.2	0.0	0.0	44.0	46.0	-2.0	H	QP	
281.650	3.0	52.7	12.8	1.5	28.1	0.0	0.0	38.8	46.0	-7.2	H	P	
839.433	3.0	44.2	21.3	2.7	27.6	0.0	0.0	40.7	46.0	-5.3	H	P	

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Note: No other emissions were detected above the system noise floor.

8. REQUIREMENTS - LIMITATION OF EXPOSURE

8.1. LIMITS

FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
30-300	27.5	0.073	0.2	30
300-1500	f/1500	30
1500-100,000	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

Table 5

Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m ²)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	280/f	2.19/f		6
10–30	28	2.19/f		6
30–300	28	0.073	2*	6
300–1 500	1.585f ^{0.5}	0.0042f ^{0.5}	f/150	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	616 000 /f ^{1.2}
150 000–300 000	0.158f ^{0.5}	4.21 × 10 ⁻⁴ f ^{0.5}	6.67 × 10 ⁻⁵ f	616 000 /f ^{1.2}

* Power density limit is applicable at frequencies greater than 100 MHz.

Notes:

1. Frequency, f , is in MHz.
2. A power density of 10 W/m² is equivalent to 1 mW/cm².
3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μ T) or 12.57 milligauss (mG).

LIMITS APPLICABLE TO THE EUT

For mobile radio equipment operating in the cellular phone band, the lowest power density limit is calculated using the lowest frequency, as 824 MHz / 1500 = 0.55 mW/cm² (FCC) and 824 MHz / 150 = 5.5 W/m² (IC).

For operation in the PCS band and the 2.4 GHz band, from FCC §1.1310 Table 1 (B), the maximum value of $S = 1.0$ mW/cm² and from IC Safety Code 6, Section 2.2 Table 5 Column 4, $S = 10$ W/m².

8.2. EQUATIONS

Power density is given by:

$$S = \text{EIRP} / (4 * \pi * D^2)$$

where

S = Power density in W/m²

EIRP = Equivalent Isotropic Radiated Power in W

D = Separation distance in m

Where applicable (for example, multi-slot cell phone applications) a duty cycle factor may be applied.

$$\text{Source-based time-averaged EIRP} = (\text{DC} / 100) * \text{EIRP}$$

where

DC = Duty Cycle in %, as applicable

EIRP = Equivalent Isotropic Radiated Power in W

For multiple colocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the Power * Gain product (in linear units) of each transmitter.

$$\text{Total EIRP} = (P1 * G1) + (P2 * G2) + \dots + (Pn * Gn)$$

where

Px = Power of transmitter x

Gx = Numeric gain of antenna x

For multiple colocated transmitters operating simultaneously in frequency bands where different limits apply, either the lowest limit applicable to the co-located transmitters can be applied or a fraction of the exposure limit is established for each band, such that the sum of the fractions is less than or equal to one.

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

8.3. RESULTS

8.3.1. CO-LOCATED RESULTS FOR SIMULTANEOUS OPERATION IN THE CELLULAR BAND AND 2.4 GHz BAND

Band	Mode	Separation Distance (m)	Output Power (dBm)	Antenna Gain With Cable Loss (dBi)	Duty Cycle (%)	IC Power Density (W/m^2)
850 MHz	Cell		29.82	-0.25	50	
2.4 GHz	BT		3.20	1.70	100	
Combined		0.20				0.91

The co-located Power Density is less than 5.5 W/m^2, which is the most stringent of the limits for each separate transmitter (5.5 W/m^2 and 10 W/m^2 for the WAN and WLAN respectively).

8.3.2. CO-LOCATED RESULTS FOR SIMULTANEOUS OPERATION IN THE PCS BAND AND 2.4 GHz BAND

Band	Mode	Separation Distance (m)	Output Power (dBm)	Antenna Gain With Cable Loss (dBi)	Duty Cycle (%)	IC Power Density (W/m^2)
1900 MHz	PCS		29.10	1.70	100	
2.4 GHz	BT		3.20	1.70	100	
Combined		0.20				2.40

The co-located Power Density is less than 10 W/m^2, which is the limit for each separate transmitter.