TEST REPORT

FCC Part 15 Subpart C Section 15.247
Industry Canada RSS-210 Issue 8

MANUFACTURER	Global Traffic Technologies LLC 7800 Third Street North St Paul MN 55128
DESCRIPTION OF EQUIPMENT	Multi-Mode Vehicle Unit
NAME OF EQUIPMENT	Multi Mode Emitter / GPS Radio Unit
MODEL NUMBER(S) TESTED	794HM / 1012B
SERIAL NUMBER(S) TESTED	7941DE0111 / 10120086
TEST REPORT NUMBER	WC1105069
TEST DATE(S)	07 June 2011

TÜV SÜD America Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the applicable requirements of FCC Part 15, Subpart C, Sections 15.247 *"Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz",* and Industry Canada RSS-210 Issue 8 *"Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment.*

The manufacturer wishes to add a different type of antenna from the one used in the existing certification for the product, which requires re-testing of the radiated spurious emissions in the restricted bands requirement. The new antenna is a Centurion D-Puck Antenna WID2452.

It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.

Date:	21 June 2011	Tested by:	Approved by:
Location:	Taylors Falls MN USA	Joel T Schneider Senior EMC Engineer	Greg Jakubowski Senior EMC Technician

Not Transferable

EMC TEST REPORT

Test Report No.	**WC1105069**	Date of issue:	21 June 2011
Product Description	Multi-Mode Vehicle Unit		
Product Name	Multi Mode Emitter / GPS Radio Unit		
Model No(s) Tested	794HM / 1012B		
Serial No(s) Tested	7941DE0111 / 10120086		
Manufacturer	Global Traffic Technologies LLC		
Address	7800 Third Street North		
	St Paul MN 55128		

Test Result ■ **Positive** ☐ **Negative**

TÜV SÜD America Inc reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. TÜV SÜD America Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD America Inc issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval. This report shall not be used by the client to claim product endorsement by NVLAP, NIST, or any agency of the US government.

TÜV SÜD America Inc and its professional staff hold government and professional organization certifications and are members of AAMI, ACIL, AEA, ANSI, IEEE, NARTE, and VCCI.

REVISION RECORD

REVISION	TOTAL NUMBER OF PAGES	DATE	DESCRIPTION
	25	21 June 2011	Initial Release

TEST REPORT CONTENTS **Page(s)**

EMC TEST REGULATIONS:
The tests were performed according to the following regulations:
- FCC Part 15 Subpart C Section 15.247 Paragraph (d)
- Industry Canada RSS-210 Issue 8, Section A8.5

ENVIRONMENTAL CONDITIONS IN THE LAB

	Actual
Temperature:	: 24°C
Atmospheric pressure	: 97 kPa
Relative Humidity	: 52%

POWER SUPPLY UTILIZED

Power supply system	: 8 (radio) / 13.5 (emitter) VDC

TEST EQUIPMENT
All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated according to internal procedure.

SIGN EXPLANATIONS
☐ - not applicable
■ - applicable.

Radiated spurious emissions in the restricted bands
FCC 15.247(d), IC RSS-210 A8.5

Test summary
The requirements are: ■ - MET ☐ - NOT MET
Testing was performed in accordance with ANSI C63.4 2003, clause 8.3 and FCC KDB Publication 558074.

Calculation and plot of "Duty cycle correction factor" is taken from the previously submitted test report, supplied by manufacturer: The dwell time per channel of the hopping signal is 3 ms, therefore "Duty cycle correction factor"= 20 log (3 ms/100 ms) =-30.45dB.

Maximum radiated peak spurious emission is 53.1 dBµV/m (452 µV/m) with peak detection at 7.323 GHz
Maximum radiated average spurious emission is 49.9 dBµV/m (313 µV/m) with average detection at 7.445 GHz
Maximum radiated quasi-peak spurious emission is 35.8 dBµV/m (61.7 µV/m) with quasi-peak detection at 163.175 MHz
Maximum radiated quasi-peak spurious emission of incorporated digital device to Class A limit is 50.4 dBµV/m (331 µV/m) with quasi-peak detection at 245.72 MHz

Test location
■ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)
☐ - Wild River Lab Tech Area, conducted measurement

Test distance – radiated emissions
■ - 3 meters
☐ - 10 meters

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
NBLE03196	8566B	Hewlett-Packard	Spectrum Analyzer	2240A01856	19-Oct-11
NBLE03195	85662A	Hewlett-Packard	Analyzer Display	2648A13518	19-Oct-11
WRLE10527	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0001	Code B 05-Oct-11
WRLE03229	3115	EMCO	Ridge Guide Antenna	2483	30-Jul-11
WRLE03997	EWT-14-0066	EWT	2.4 GHz Notch filter	E2	Code B 12-May-12
WRLE03371	E4440A	Agilent	Spectrum Analyzer	MY43362222	09-Aug-11
WRLE03978	SL26-3010	Phase One Microwave	Amplifier 18-26.5 GHz	0005	Code B 23-Jul-11
WRLE06717	3116	EMCO	Ridge Guide Ant 18-40 GHz	2005	08-Jun-11
WRLE02003	F550B1	Acronetics	4 – 8 GHz Bandpass Filter	010	Code B 05-Oct-11
WRLE03933	F551B-1	Acronetics	8 – 12 GHz Bandpass Filter	010	Code B 05-Oct-11
WRLE03934	F549B-1	Acronetics	2 – 4 GHz Bandpass Filter	010	Code B 05-Oct-11
WRLE03935	F548B-1	Acronetics	1 – 2 GHz Bandpass Filter	010	Code B 05-Oct-11
OWLE03202	EM-6917B	Electro-Metrics	Biconicalog Periodic	101	28-May-11
WRLE10616	ZHL-1042J	Mini-Circuits	Preamplifier 10 - 3000 MHz	QA0746005	Code B 25-Oct-11
OWLE02682	85650A	Hewlett-Packard	Quasi-Peak Adapter	2811A01127	17-Feb-12
OWLE02074	3115	Electro-Mechanics	Ridge Guide Antenna	2504	24-Feb-12
WRLE10617	ZHL-1042J	Mini-Circuits	Preamplifier 30 MHz-5 GHz	QA0746004	Code B 20-Oct-11
WRLE10536	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0002	Code B 25-Oct-11
WRLE03294	8566B	Hewlett-Packard	Spectrum Analyzer	2349A03098	08-Apr-12

Cal Code B = Calibration verification performed internally.

Test limit - conducted
-20 dBc

Test limit within restricted bands per 15.205 - radiated

Frequncy (MHz)	Field strength (μV/meter)	Field strength (dBμV/meter)
30 - 88	100, QP	40.0
88 - 216	150, QP	43.5
216 - 960	200, QP	46.0
Above 960	500, QP	54.0
> 1000	500, AV 5000, PK	54.0 74.0

Test limit for incorporated digital device – radiated – 15.109 Class A – 10 meters

Frequncy (MHz)	Field strength (μV/meter)	Field strength (dBμV/meter)	Field strength (dBμV/meter) – 3 meter extrapolation
30 - 88	90, QP	39.1	49.5
88 - 216	150, QP	43.5	54
216 - 960	210, QP	46.4	56.9
Above 960	300, QP	49.5	60.0
> 1000	300, AV 3000, PK	49.5 69.5	60.0 80.0

Radiated Emissions
The spectrum analyzer uses a quasi-peak detector for frequencies up to and including 1 GHz. For measurements above 1 GHz, peak and average detectors are used. The bandwidths used are equal to or greater than 100 Hz from 9 kHz to 150 kHz, 9 kHz from 150 kHz to 30 MHz, 100 kHz from 30 MHz to 1000 MHz, and 1 MHz from 1 GHz to 40 GHz. Video bandwidths are at least three times greater than the IF bandwidth. Average measurements above 1 GHz are also achieved using a peak detector with 1 MHz RBW and 10 Hz VBW.

Test data
Radiated emissions within the restricted bands per 15.205

Measurement summary for limit1: 15.209 >1G 3 M peak (Pk)						
FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	FINAL (dBuV / m) – 30 dB duty cycle factor	FCC 15.209 Limit dBµV/m peak
2.4835 GHz*	47.7 Pk	4.9 / 28.3 / 0.0 / 0.0	80.91	H / 1.20 / 270	50.91	74
7.323 GHz	79.5 Pk	8.77 / 36.25 / 42.59 / 1.21	83.14	V / 1.30 / 300	53.14	74
4.802 GHz	85.0 Pk	7.14 / 32.77 / 43.35 / 0.43	81.99	H / 1.70 / 160	51.99	74
7.445 GHz	77.1 Pk	8.83 / 36.37 / 42.51 / 1.27	81.06	V / 1.30 / 300	51.06	74
4.964 GHz	80.9 Pk	7.29 / 33.08 / 43.22 / 0.47	78.52	H / 1.50 / 130	48.52	74
4.882 GHz	79.5 Pk	7.21 / 32.92 / 43.25 / 0.45	76.83	H / 1.60 / 240	46.83	74
12.409 GHz	60.3 Pk	12.28 / 39.06 / 40.56 / 2.48	73.55	V / 1.00 / 275	43.55	74
12.006 GHz	60.9 Pk	11.98 / 39.4 / 40.52 / 1.09	72.85	V / 1.10 / 70	42.85	74
12.205 GHz	57.7 Pk	12.13 / 39.23 / 40.45 / 1.5	70.11	V / 1.10 / 275	40.11	74
2.39 GHz	34.6 Pk	4.8 / 27.91 / 0.0 / 0.0	67.31	H / 1.20 / 255	37.31	74
2.4835 GHz**	36.2 Pk	4.9 / 28.3 / 0.0 / 0.0	69.41	H / 1.20 / 270	39.41	74

Measurement made with transmitter full on – 3 meters

Calculation and plot of "Duty cycle correction factor" is taken from the previously submitted test report, supplied by manufacturer: The dwell time per channel of the hopping signal is 3 ms, therefore "Duty cycle correction factor"= 20 log (3 ms/100 ms) =-30.45dB.

*2.4835 GHz measurement above is upper band edge level with channel 80.
**2.4835 GHz measurement above is upper band edge level with channel 79.
2.39 GHz measurement above is lower band edge level with channel 1.

Measurement summary for limit2: FCC 15.209 >1GHz 3m ave (Av)						
FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	FINAL (dBuV / m) – 30 dB duty cycle factor	FCC 15.209 Limit dBµV/m ave
7.445 GHz	76.0 Av	8.83 / 36.37 / 42.51 / 1.27	79.96	V / 1.30 / 300	49.96	54
7.323 GHz	76.3 Av	8.77 / 36.25 / 42.59 / 1.21	79.94	V / 1.30 / 300	49.94	54
4.964 GHz	80.89 Av	7.29 / 33.08 / 43.22 / 0.47	78.51	H / 1.50 / 130	48.51	54
4.802 GHz	80.86 Av	7.14 / 32.77 / 43.35 / 0.43	77.85	H / 1.70 / 160	47.85	54
4.882 GHz	78.94 Av	7.21 / 32.92 / 43.25 / 0.45	76.27	H / 1.60 / 240	46.27	54
12.409 GHz	57.24 Av	12.28 / 39.06 / 40.56 / 2.48	70.49	V / 1.00 / 275	40.49	54
2.4835 GHz	36.33 Av	4.9 / 28.3 / 0.0 / 0.0	69.54	H / 1.20 / 270	39.54	54
12.006 GHz	57.17 Av	11.98 / 39.4 / 40.52 / 1.09	69.12	V / 1.10 / 70	39.12	54
12.205 GHz	53.91 Av	12.13 / 39.23 / 40.45 / 1.5	66.32	V / 1.10 / 275	36.32	54
2.39 GHz	17.86 Av	4.8 / 27.91 / 0.0 / 0.0	50.57	V / 1.02 / 350	20.57	54

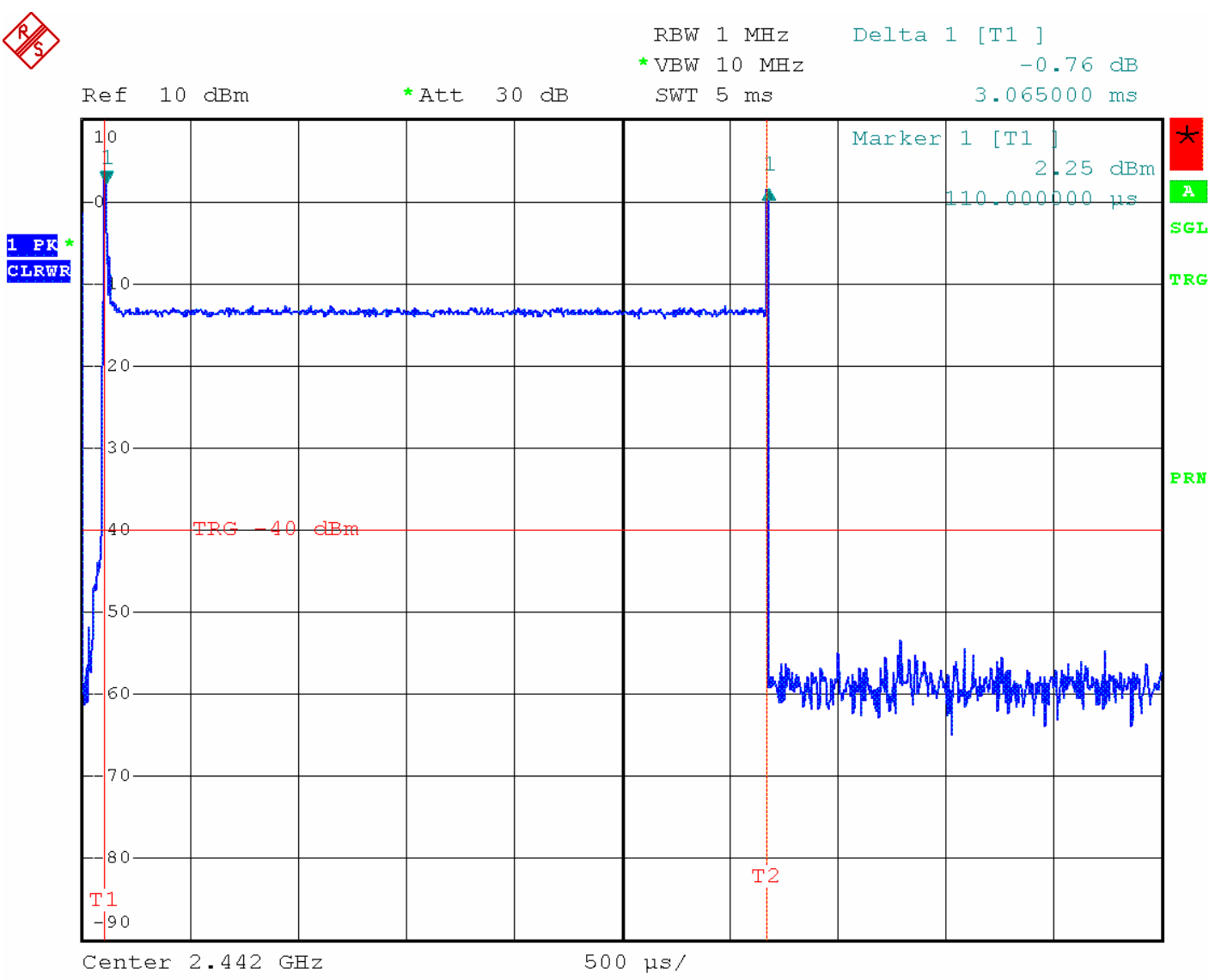
Calculation and plot of "Duty cycle correction factor" is taken from the previously submitted test report, supplied by manufacturer: The dwell time per channel of the hopping signal is 3 ms, therefore "Duty cycle correction factor"= 20 log (3 ms/100 ms) =-30.45dB.

2.4835 GHz measurement above is upper band edge level with channel 80.
2.39 GHz measurement above is lower band edge level with channel 1.

Measurement summary for limit1: FCC-15.209 <1GHz 3m (Qp)					
FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC-B <1GHz 3m
163.175 MHz	54.1 Qp	1.22 / 8.26 / 27.78 / 0.0	35.8	V / 1.00 / 90	-7.7
111.95 MHz	53.45 Qp	1.21 / 8.37 / 27.73 / 0.0	35.31	V / 1.00 / 180	-8.19
327.15 MHz	48.26 Qp	1.68 / 13.1 / 27.17 / 0.0	35.87	V / 1.00 / 270	-10.13
73.7 MHz	48.24 Qp	0.77 / 8.13 / 27.82 / 0.0	29.32	V / 1.00 / 270	-10.68
124.1 MHz	50.1 Qp	1.07 / 7.58 / 27.79 / 0.0	30.96	V / 1.00 / 0	-12.54
156.85 MHz	47.89 Qp	1.19 / 8.29 / 27.82 / 0.0	29.55	V / 1.00 / 0	-13.95

The following signal was due to incorporated digital device, present with transmitter off

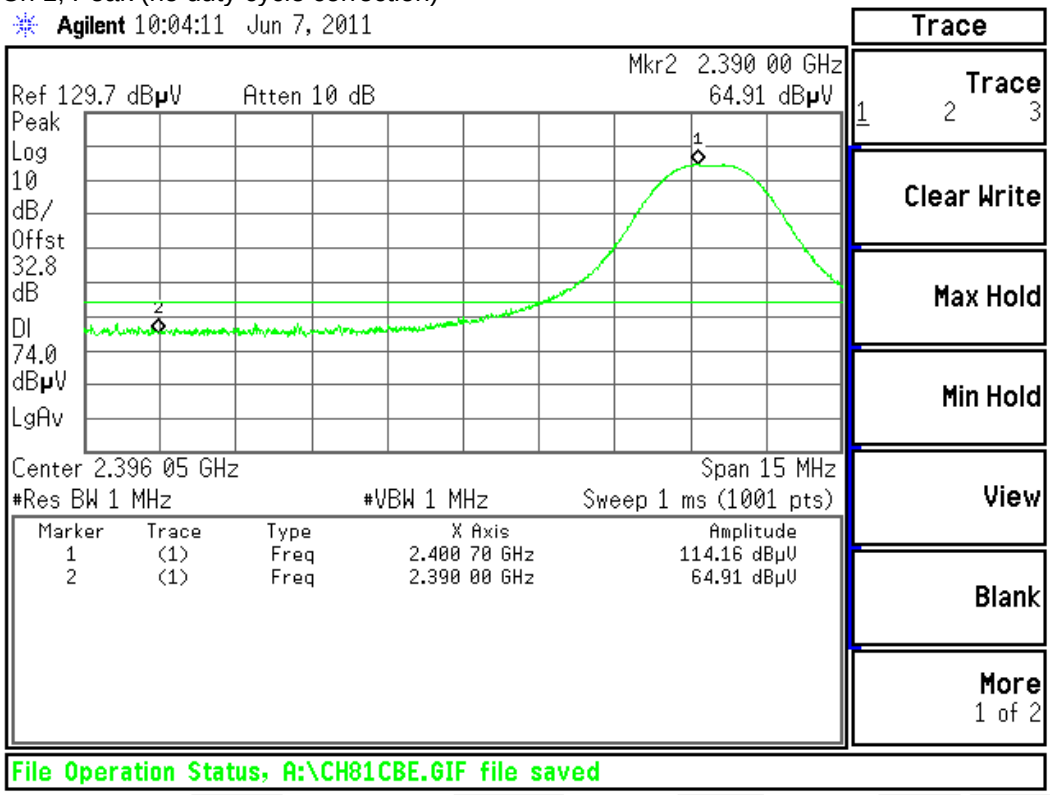
Measurement summary for limit2: FCC-A <1GHz 3m (Qp)					
FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA2 FCC-A <1GHz 3m
245.72 MHz	65.64 Qp	1.42 / 11.13 / 27.79 / 0.0	50.41	V / 1.00 / 145	-5.99



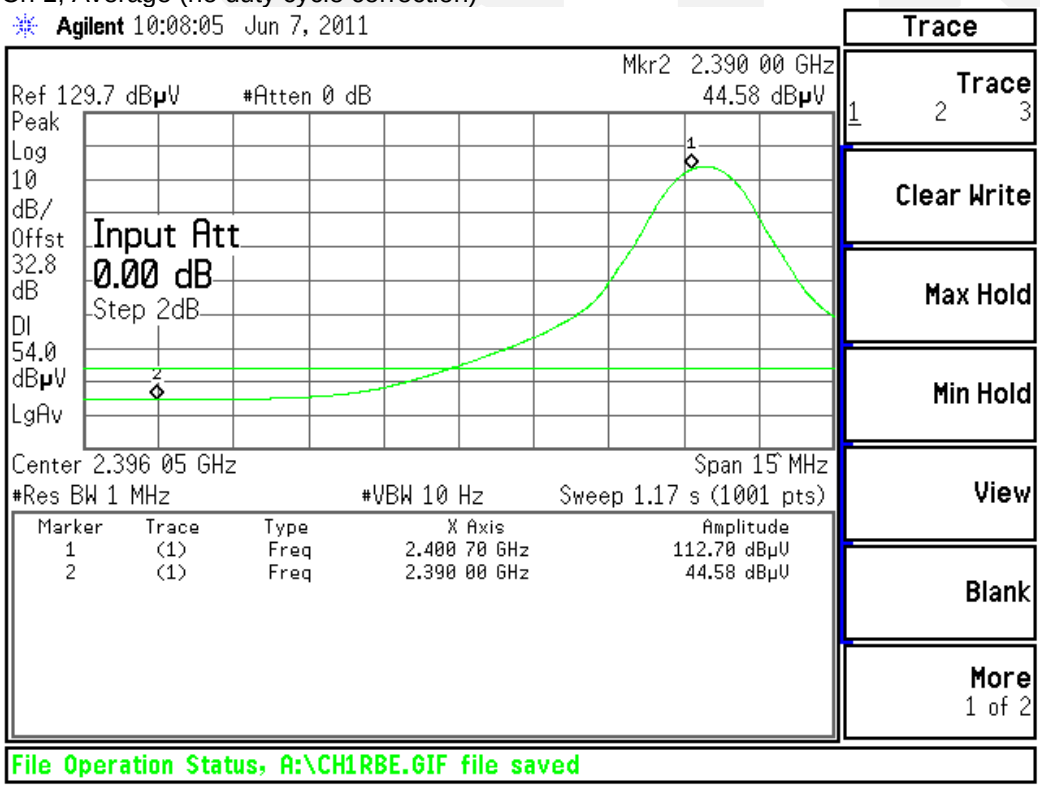
Date: 29.OCT.2004 13:29:39

Radiated bandedge

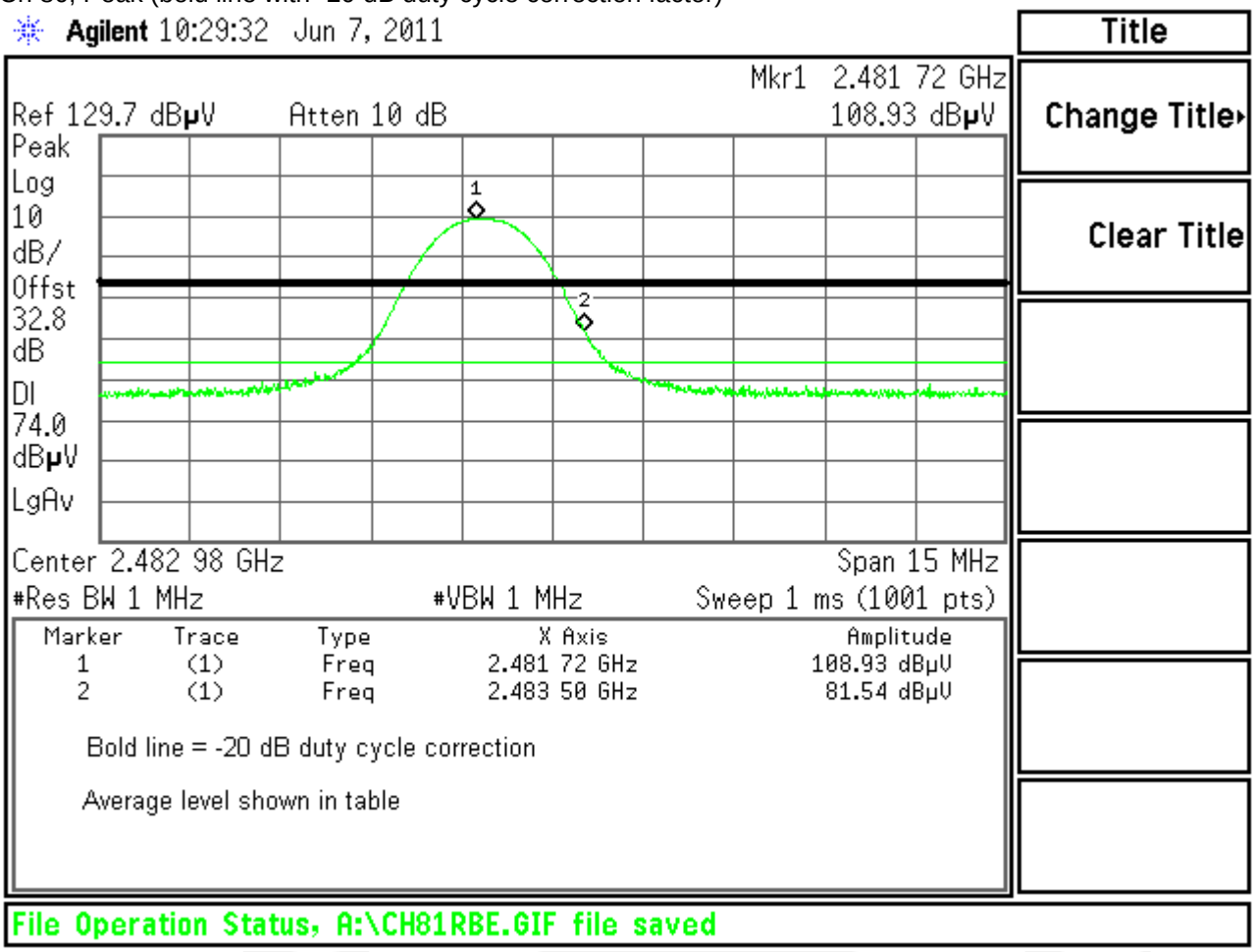
Ch 1, Peak (no duty cycle correction)



Ch 1, Average (no duty cycle correction)



Ch 80, Peak (bold line with -20 dB duty cycle correction factor)



Test-setup photo(s):
Radiated measurements

Test-setup photo(s):
Radiated measurements

Equipment Under Test (EUT) Test Operation Mode:

The device under test was operated under the following conditions during emissions testing:

☐ - Standby

☐ - Test program (H - Pattern)

☐ - Test program (color bar)

☐ - Test program (customer specific)

☐ - Practice operation

☐ - Normal Operating Mode

■ - Transmitter full on, transmitter off.

Configuration of the device under test:

■ - See Constructional Data Form and Block Diagram in Appendix A

☐ - See Product Information Form in Appendix B

GENERAL REMARKS:

None

Modifications required to pass:

- ■ None
- ☐ As indicated on the data sheet(s)

Test Specification Deviations: Additions to or Exclusions from:

- ■ None
- ☐ As indicated in the Test Plan
- ☐

SUMMARY:

The requirements according to the technical regulations are

- ■ - met and the equipment under test does fulfill the general approval requirements.
- ☐ - **not** met and the equipment under test does **not** fulfill the general approval requirements.

EUT Received Date:	07 June 2011
Condition of EUT:	Normal
Testing Start Date:	07 June 2011
Testing End Date:	07 June 2011

TÜV SÜD AMERICA INC

Tested by:

Joel T Schneider
Senior EMC Engineer

Approved by:

Appendix A

Constructional Data Form

Form

EMC Test Plan and Constructional Data Form

PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE. IF TESTING RESULTS IN MODIFICATIONS TO THE EQUIPMENT, PLEASE SUBMIT A REVISED TP/CDF INDICATING THOSE MODIFICATIONS.
NOTE: This information will be input into your test report as shown below. Press the F1 key at any time to get HELP for the current field selected.

Company:	Global Traffic Technologies, LLC		
Address:	7800 Third Street North		
	St. Paul, MN 55128		
Contact:	Peter Leung	Position:	QA Engineer
Phone:	651-789-7314	Fax:	651-789-7334
E-mail Address:	peter.leung@gtt.com		

General Equipment Description -- ***NOTE: This information will be input into your test report as shown below.***

EUT Description	Multi Mode Vehicle Unit		
EUT Name	794XM Multi-Mode Emitter, 1012 GPS Radio Unit		
Model No.:	794XM, 1012B	Serial No.:	7941DE0111, 10120086
Product Options:			
Configurations to be tested:	2.4 GHz FHSS radio with multimode emitter 794XM		

Equipment Modification (*If applicable, indicate modifications since EUT was last tested. If modifications are made during this testing, submit revised TP/CDF after testing is complete.)*

Modifications since last test:	New Antenna
Modifications made during test:	

Test Objective(s): ***Please indicate the tests to be performed, entering the applicable standard(s) where noted.***

- ☐ EMC Directive 2004/108/EC (EMC) Std: ____
- ☐ Machinery Directive 89/392/EEC (EMC) Std: ____
- ☐ Medical Device Directive 93/42/EEC (EMC) Std: ____
- ☐ Vehicle Directive: ☐ 2001/3/EC (EMC) ☐ 2004/104/EC (EMC) ☐ Other Vehicle Std: ____
- ☐ FDA Reviewers Guidance for Premarket Notification Submissions (EMC)

- ☐ FCC: Class ☒ A ☐ B Part C
- ☐ VCCI: Class ☐ A ☐ B
- ☐ BSMI: Class ☐ A ☐ B (Separate Report)
- ☐ Canada: Class ☒ A ☐ B
- ☐ Australia: Class ☐ A ☐ B
- ☐ Other: ____

Third Party Certification, if applicable (*Signature on Page 6 Required)

- ☐ Attestation of Conformity (AoC)*
- ☐ Certificate of Conformity (CoC)*
- Protection Class (N/A for vehicles) ☐ Class I ☐ Class II ☐ Class III
  (Press **F1** when field is selected to show additional information on Protection Class.)
- ☒ FCC / TCB Certification
- ☐ E-Mark Certification
- ☐ EMC Certification (used with Octagon Mark)*
- ☐ Compliance Document*
- ☐ Industry Canada / FCB Certification
- ☐ Taiwan Certification

EMC Test Plan and Constructional Data Form

Attendance

Test will be: ☒ Attended by the customer ☐ Unattended by the customer

Failure - *Complete this section if testing will not be attended by the customer.*

If a failure occurs, TÜV SÜD America should:

☒ Call contact listed above, if not available then stop testing. (After hrs phone): Charles Meyer 651-789-7311 or 715-220-0177 (cel)
☒ Continue testing to complete test series.
☐ Continue testing to define corrective action.
☐ Stop testing.

EUT Specifications and Requirements

Length: 4" Width: 4" Height: 3" Weight: 2.4 lb

Power Requirements

Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)

Voltage: 8VDC to radio 800 mA; 12-24VDC to emitter 300mA (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: _____

Current (Amps/phase(max)): _____ Current (Amps/phase(nominal)): see Voltage

Other _____

Other Special Requirements

FCC TEst Firmware in radio. Cycle power to switch from Tx to Rx on Channel 1, Channel 40 and Channel 80.

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)
Emergency Vehicles, Transit Vehicles

EUT Power Cable

☒ Permanent OR ☐ Removable Length (in meters): 3
☐ Shielded OR ☒ Unshielded
☐ Not Applicable

EMC Test Plan and Constructional Data Form

EUT Interface Ports and Cables

Type			During Test		Qty	Shielding			Termination	Connector Type	Port Termination	Length tested (in meters)	Removable	Permanent
	Analog	Digital	Active	Passive		Yes	No	Type						
EXAMPLE: *RS232*	☐	☒	☒	☐	*2*	☒	☐	*Foil over braid*	*Coaxial*	*Metallized 9-pin D-Sub*	*Characteristic Impedance*	*6*	☒	☐
GPS	☐	☒	☐	☒		☒	☐		x			8	☐	☒
Radio	☐	☒	☐	☒		☒	☐		x			8	☐	☒
Emitter Power	☐	☐	☒	☐		☐	☐					3	☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
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EMC Test Plan and Constructional Data Form

EUT Software.

Revision Level: 4.07

Description: Normal High Priority Mode

Equipment Under Test (EUT) Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

1. High Priority Mode

2.

3.

Equipment Under Test (EUT) System Components -- List and describe all components which are part of the EUT. For FCC & Taiwan testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc)

Description	Model #	Serial #	FCC ID #
Multi-Mode Emitter	794XM	7941DE0111	
GPS Radio Unit	1012	10120086	VJB-OPTICOMGPS1 IC: 7275A-OPTICOM1

EMC Test Plan and Constructional Data Form

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc) This information is required for FCC & Taiwan testing.

Description	*Model #*	*Serial #*	*FCC ID #*

Oscillator Frequencies

Manufacturer	*Frequency*	*Derived Frequency*	*Component # / Location*	*Description of Use*
	9.8304 MHz			uP Oscillator
	692 KHz			40V Switching Power Supply
	398 KHz			5V Switching Power Supply
	24.476 MHz			Radio Oscillator
	12.00 MHz			Radio Controller Oscillator

Power Supply

Manufacturer	*Model #*	*Serial #*	*Type*
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____

Power Line Filters

Manufacturer	*Model #*	*Location in EUT*

EMC Test Plan and Constructional Data Form

Critical EMI Components (Capacitors, ferrites, etc.)

Description	*Manufacturer*	*Part # or Value*	*Qty*	*Component # / Location*

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.

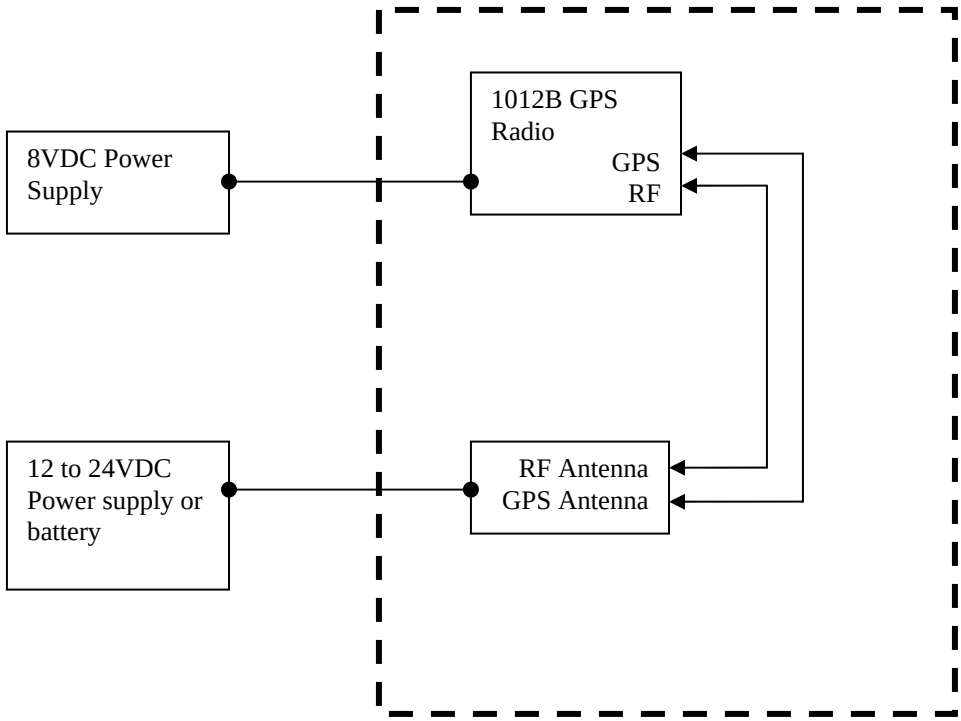
PLEASE ENTER NAMES BELOW (INSERT ELECTRONIC SIGNATURE IF POSSIBLE)

Authorization (Signature Required if a Third Party Certification is checked on pg 1)

Peter Leung	6/1/2011
Customer authorization to perform tests according to this test plan.	Date
Peter Leung	6/1/2011
Test Plan/CDF Prepared By (please print)	Date

EMC Block Diagram Form

System Configuration Block Diagram -- Provide a line drawing identifying the EUT, simulators, support equipment, I/O cables, power cables, and any other pertinent components to be used during testing. Use a dashed line to separate the equipment in the testing field versus equipment outside testing field.



794HM Block Diagram
2.4 GHz FHSS Radio
FCC ID: VJB-OPTICOMGPS1
IC ID: 7275A-OPTICOM1

Authorization Signatures

Peter Leung	6/1/11
Customer authorization to perform tests according to this test plan.	Date
Peter Leung	6/1/11
Test Plan/CDF Prepared By (please print)	Date

Appendix B

Measurement Protocol

MEASUREMENT PROTOCOL

GENERAL INFORMATION

Test Methodology

Emissions testing is performed according to the procedures in ANSI C63.4-2003, FCC KDB Publication 558074, the article “The Measurement of Occupied Bandwidth” by Industry Canada’s certification bureau, & FCC Public Notice DA 02-2138.

Measurement Uncertainty

The test system for conducted emissions – AC lines is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system has a measurement uncertainty of ±1.8 dB. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. The test system has a measurement uncertainty of ±4.8 dB. The equipment comprising the test systems is calibrated on an annual basis.

Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into its characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

Conducted Emissions

Final measurement levels are determined by connecting the antenna port of the DUT to a spectrum analyzer input via coaxial adapters, high frequency coax, and attenuators as necessary. The loss created by the interconnect apparatus is offset by settings within the analyzer. Specific analyzer settings are determined by the procedures throughout this report.

Radiated Emissions

The spectrum analyzer uses a quasi-peak detector for frequencies up to and including 1 GHz. For measurements above 1 GHz, peak and average detectors are used. The bandwidths used are equal to or greater than 100 Hz from 9 kHz to 150 kHz, 9 kHz from 150 kHz to 30 MHz, 100 kHz from 30 MHz to 1000 MHz, and 1 MHz from 1 GHz to 40 GHz. Video bandwidths are at least three times greater than the IF bandwidth. Average measurements above 1 GHz are also achieved using a peak detector with 1 MHz RBW and 10 Hz VBW.

The final level, in dBμV/m, equals the reading from the spectrum analyzer (Level dBμV), adding the antenna correction factor and cable loss factor (Factor dB) to it, and subtracting the preamp gain (and duty cycle correction factor, if applicable). This result then has the limit subtracted from it to provide the Delta, which gives the tabular data as shown in the data. Intentional radiators are rotated through 3 orthogonal axes to determine the test position yielding the maximum emission levels.

Example:

FREQ (MHz)	LEVEL (dBuV)		CABLE/ANT/PREAMP (dB)	(dB/m)	(dB)	FINAL (dBuV/m)	POL/HGT/AZ	(m)	(deg)	DELTA1
60.80	42.5Qp	+	1.2	+ 10.9	- 25.5 =	29.1	V	1.0	0.0	-10.9

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Test Equipment

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated according to internal procedure.