Trimble Navigation Limited

Ranger/TSC3 Cirronet 2.4 GHz Radio

EMC Test Report

Report No. TRPO0053

Report Prepared By

NORTHWEST EMC

www.nwemc.com
1-888-EMI-CERT

NORTHWEST EMC

22975 NW Evergreen Parkway
Suite 400
Hillsboro, Oregon 97124

Certificate of Test

Last Date of Test: January 27, 2010
Trimble Navigation Limited
Model: Ranger/TSC3 Cirronet 2.4 GHz radio

Emissions			
Test Description	**Specification**	**Test Method**	**Pass/Fail**
Spurious Radiated Emissions	FCC 15.247:2010	ANSI C63.10:2009	**Pass**
AC Powerline Conducted Emissions	FCC 15.209:2010	ANSI C63.10:2009	**Pass**

Modifications made to the product
See the Modifications section of this report

Test Facility

The measurement facility used to collect the data is located at:

Northwest EMC, Inc.
22975 NW Evergreen Parkway, Suite 400
Hillsboro, OR 97124

Phone: (503) 844-4066 Fax: 844-3826

This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada (Site filing #2834D-2).

Approved By:
Don Facteau, IS Manager

NVLAP Lab Code: 200630-0

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.

Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.

Revision Number	Description	Date	Page Number
00	None		

Barometric Pressure

The recorded barometric pressure has been normalized to sea level.

Accreditations and Authorizations

FCC

Accredited by NVLAP for performance of FCC radio, digital, and ISM device testing. Our Open Area Test Sites, certification chambers, and conducted measurement facilities have been fully described in reports filed with the FCC and accepted by the FCC in letters maintained in our files. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by the FCC as a Telecommunications Certification Body (TCB). This allows Northwest EMC to certify transmitters to FCC specifications in accordance with 47 CFR 2.960 and 2.962.

NVLAP

Northwest EMC, Inc. is accredited under the United States Department of Commerce, National Institute of Standards and Technology, and National Voluntary Laboratory Accreditation Program for satisfactory compliance with the requirements of ISO/IEC 17025 for Testing Laboratories. The NVLAP accreditation encompasses Electromagnetic Compatibility Testing in accordance with the European Union EMC Directive 2004/108/EC, and ANSI C63.4. Additionally, Northwest EMC is accredited by NVLAP to perform radio testing in accordance with the European Union R&TTE Directive 1999/5/EEC, the requirements of FCC, and the RSS radio standards for Industry Canada.

NVLAP LAB CODE 200629-0
NVLAP LAB CODE 200630-0
NVLAP LAB CODE 200676-0
NVLAP LAB CODE 200761-0
NVLAP LAB CODE 200881-0

Industry Canada

Accredited by NVLAP for performance of Industry Canada RSS and ICES testing. Our Open Area Test Sites and certification chambers comply with RSS-Gen, Issue 2 and have been filed with Industry Canada and accepted. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by NIST and recognized by Industry Canada as a Certification Body (CB) per the APEC Mutual Recognition Arrangement (MRA). This allows Northwest EMC to certify transmitters to Industry Canada technical requirements. (*Site Filing Numbers - Hillsboro: 2834D-1, 2834D-2, Sultan: 2834C-1, Irvine: 2834B-1, 2834B-2, Brooklyn Park: 2834E-1)*

CAB

Designated by NIST and validated by the European Commission as a Conformity Assessment Body (CAB) to conduct tests and approve products to the EMC directive and transmitters to the R&TTE directive, as described in the U.S. - EU Mutual Recognition Agreement.

NEMKO

Assessed and accredited by NEMKO (Norwegian testing and certification body) for European emissions and immunity testing. As a result of NEMKO's laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification (Authorization No. ELA 119).

Accreditations and Authorizations

Australia/New Zealand

The National Association of Testing Authorities (NATA), Australia has been appointed by the ACA as an accreditation body to accredit test laboratories and competent bodies for EMC standards. Accredited test reports or assessments by competent bodies must carry the NATA logo. Test reports made by an overseas laboratory that has been accredited for the relevant standards by an overseas accreditation body that has a Mutual Recognition Agreement (MRA) with NATA are also accepted as technical grounds for product conformity. The report should be endorsed with the respective logo of the accreditation body (NVLAP).

VCCI

Accepted as an Associate Member to the VCCI, Acceptance No. 564. Conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. *(Registration Numbers. - Hillsboro: C-1071, R-1025, G-84, C-2687, T-1658, and R-2318, Irvine: R-1943, G-85, C-2766, and T-1659, Sultan: R-871, G-83, C-1784, and T-1511, Brooklyn Park: R-3125, G-86, G-141, C-3464, and T-1634).*

BSMI

Northwest EMC has been designated by NIST and validated by C-Taipei (BSMI) as a CAB to conduct tests as described in the APEC Mutual Recognition Agreement (US0017). License No.SL2-IN-E-1017.

GOST

Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification

KCC

Northwest EMC, Inc is a CAB designated by MRA partners and recognized by Korea. (*Assigned Lab Numbers: Hillsboro: US0017, Irvine: US0158, Sultan: US0157)*

VIETNAM

Vietnam MIC has approved Northwest EMC as an accredited test lab. Per Decision No. 194/QD-QLCL (dated December 15, 2009), Northwest EMC test reports can be used for Vietnam approval submissions.

SCOPE

For details on the Scopes of our Accreditations, please visit:
http://www.nwemc.com/accreditations/

Northwest EMC Locations

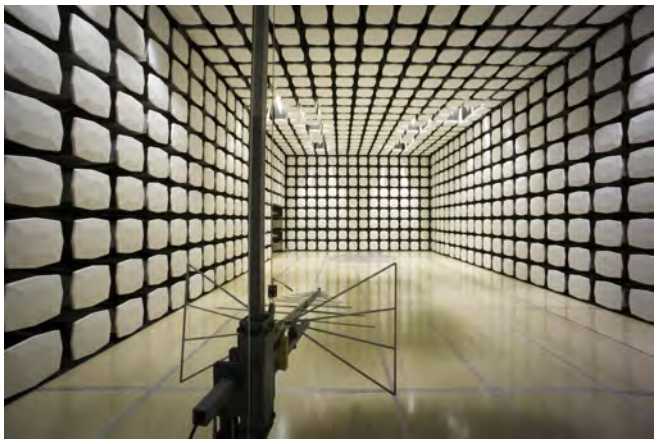
Oregon
Labs EV01-EV12
22975 NW Evergreen Pkwy
Suite 400
Hillsboro, OR 97124
(503) 844-4066

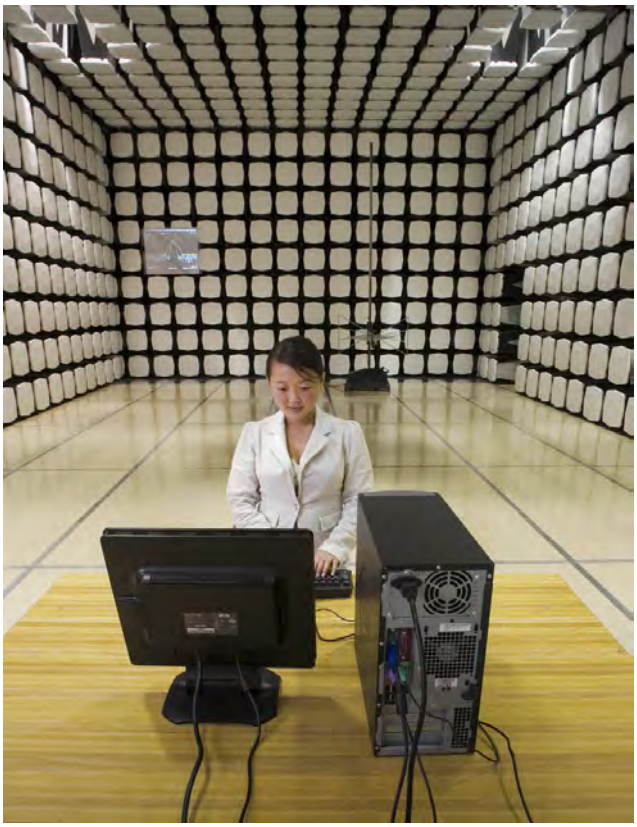
California
Labs OC01-OC13
41 Tesla
Irvine, CA 92618
(949) 861-8918

Minnesota
Labs MN01-MN08
9349 W Broadway Ave.
Brooklyn Park,
MN 55445
(763) 425-2281

Washington
Labs SU01-SU07
14128 339th Ave. SE
Sultan, WA 98294
(360) 793-8675

New York
Labs WA01-WA04
4939 Jordan Rd.
Elbridge, NY 13060
(315) 685-0796





Party Requesting the Test

Company Name:	Trimble Navigation Limited
Address:	345 SW Avery Ave
City, State, Zip:	Corvallis, OR 97333
Test Requested By:	Bob Grant
Model:	Ranger/TSC3 Cirronet 2.4 GHz radio
First Date of Test:	January 15, 2010
Last Date of Test:	January 27, 2010
Receipt Date of Samples:	December 1, 2009
Equipment Design Stage:	Prototype
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):
2.4 GHz FHSS radio module

Testing Objective:
Seeking limited modular approval under FCC 15.247 for operation in the 2.4 GHz band

CONFIGURATION 1 TRPO0053

Software/Firmware Running during test	
Description	**Version**
Windows Mobile Professional	6.5
BT3Cirro3	1.2.0.2

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Hand Held Computer	Trimble Navigation Limited	Ranger/TSC3	RG1000000106
Cirronet radio	Trimble Navigation Limited	WIT2410	Unknown

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AC Adapter	Ault	PW173KB1500F03	0933A

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Power	PA	1.0m	PA	Hand Held Computer	AC Adapter
AC Power	No	1.8m	No	AC Addatper	AC Mains
Serial	Yes	1.0m	No	Hand Held Computer	Unterminated
USB	Yes	1.0m	No	Hand Held Computer	Unterminated
Mini USB	Yes	1.0m	No	Hand Held Computer	Unterminated
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Equipment modifications					
Item	Date	Test	Modification	Note	Disposition of EUT
1	1/15/2010	Spurious Radiated Emissions	Modified from delivered configuration. Initial or No Modification	The Cirronet radio module was modified from delivered with copper tape along the full length of the antenna connector side and the lower side where the external antenna cable routes. Modification authorized by Bob Grant.	EUT remained at Northwest EMC following the test.
2	1/27/2010	AC Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Schedule testing was completed.

SPURIOUS RADIATED EMISSIONS

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

MODES OF OPERATION

Transmitting Cirronet with default modulation and dwell time.

CHANNELS TESTED

Low channel, 2401.642 MHz
Mid channel, 2435.76 MHz
High channel, 2469.84 MHz

POWER SETTINGS INVESTIGATED

120VAC/60Hz

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	25 GHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440A	AFA	11/14/2008	15
High Pass Filter	Micro-Tronics	50111	HGE	1/13/2010	13
EV12 Cables		Bilog Cables	EVS	6/25/2009	13
Pre-Amplifier	Miteq	AM-1616-1000	AVM	6/25/2009	13
Antenna, Biconilog	EMCO	3141	AXG	11/4/2008	16
Pre-Amplifier	Miteq	AMF-3D00100800-32-13P	AVF	6/25/2009	13
Antenna, Horn	ETS	3115	AIB	8/25/2008	24
EV12 Cables		Double Ridge Horn Cables	EVT	10/23/2009	13
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVH	6/26/2009	13
Antenna, Horn	ETS	3160.07	AHZ	10/14/2008	24
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVI	6/26/2009	13
Antenna, Horn	ETS	3160-08	AIA	NCR	0
EV12 Cables		Standard Gain Horn Cables	EVU	6/25/2009	13
Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AVU	5/19/2009	13
Antenna, Horn	ETS Lindgren	3160-09	AIV	NCR	0
Cable	ESM Cable Corp.	KMKM-72	EVY	11/3/2009	13

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

Measurements were made using the bandwidths and detectors specified. No video filter was used.

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. The measurement uncertainty estimation is available upon request.

TEST DESCRIPTION

The spurious RF conducted emissions were measured with the EUT set to low, medium, and high transmit frequencies. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its maximum data rate in a no hop mode. For each transmit frequency, the spectrum was scanned throughout the specified frequency.

NORTHWEST

EMC SPURIOUS RADIATED EMISSIONS

PSA 2008.07.21
EMI 2009.8.29

EUT:	Ranger/TSC3 Cirronet 2.4 GHz radio	**Work Order:**	TRPO0053
Serial Number:	Unknown	**Date:**	01/15/10
Customer:	Trimble Navigation Limited	**Temperature:**	21
Attendees:	None	**Humidity:**	38%
Project:	None	**Barometric Pres.:**	30.15
Tested by:	Rod Peloquin	**Power:** 120VAC/60Hz	**Job Site:** EV12

TEST SPECIFICATIONS	Test Method
FCC 15.247:2010	ANSI C63.10:2009

TEST PARAMETERS

Antenna Height(s) (m)	1 - 4	**Test Distance (m)**	3

COMMENTS

EUT on side with all cables. Cirronet module modified with Copper tape applied continuously around module on antenna connector end and continuously along lower side of module where antenna cable routes.

EUT OPERATING MODES

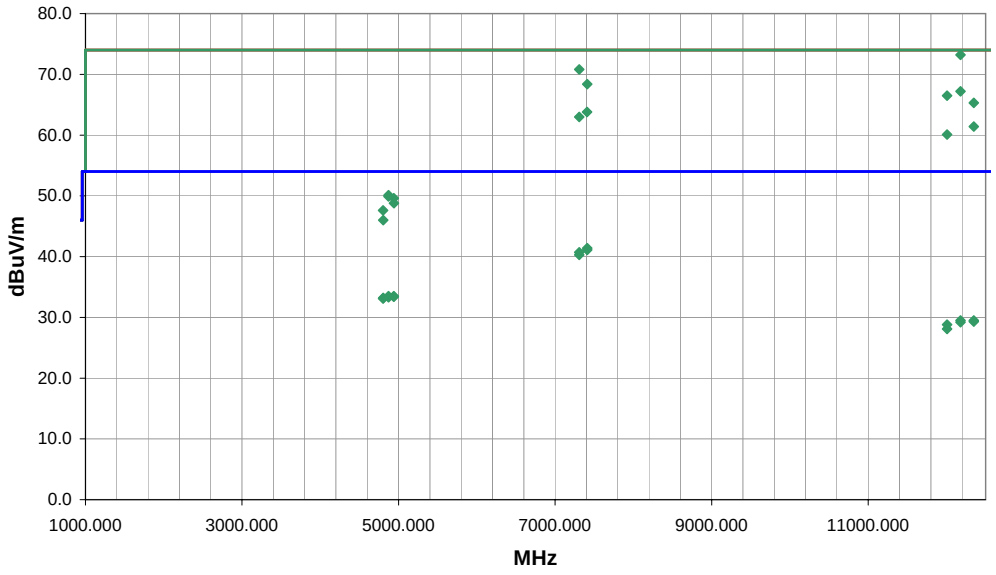
Transmitting Cirronet

DEVIATIONS FROM TEST STANDARD

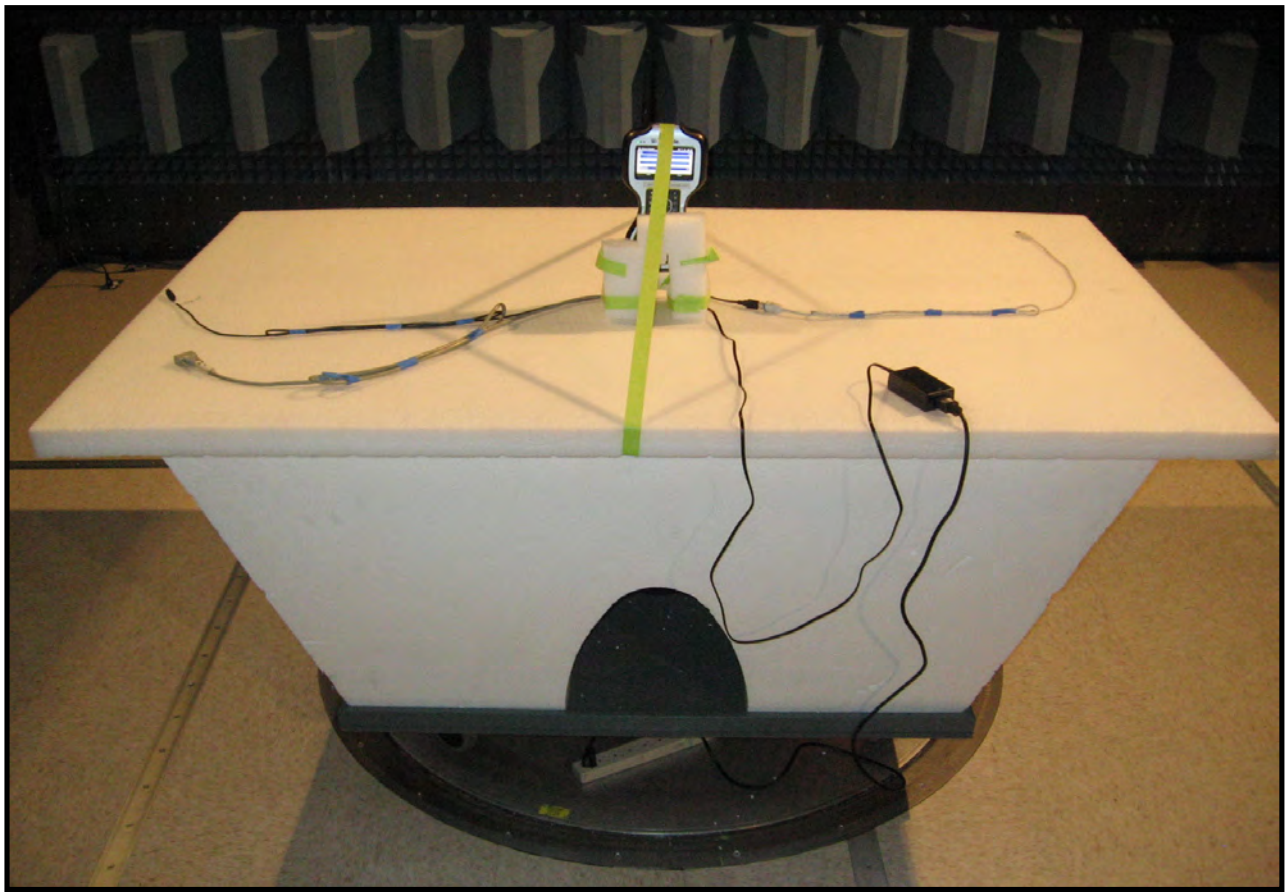
No deviations.

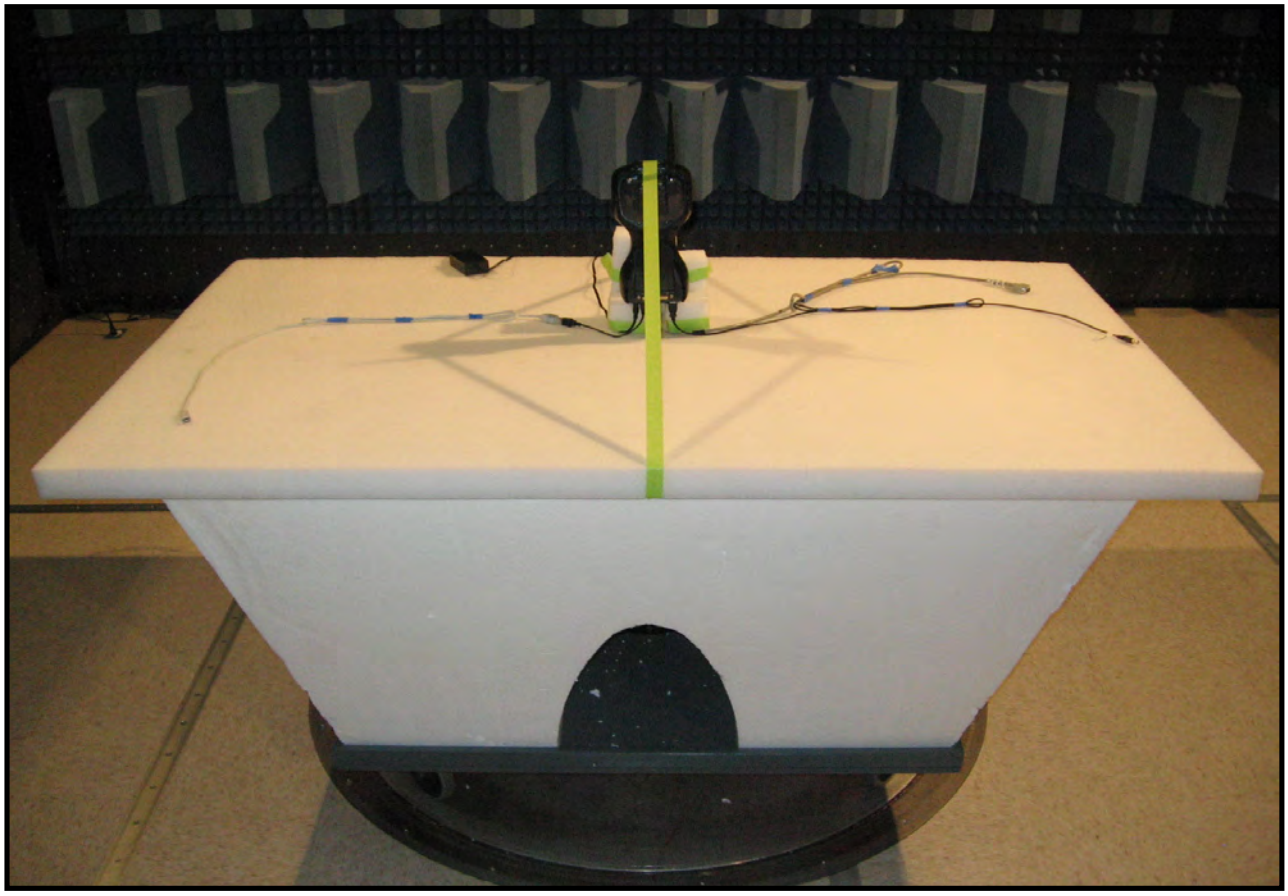
Run #	6
Configuration #	1
Results	Pass

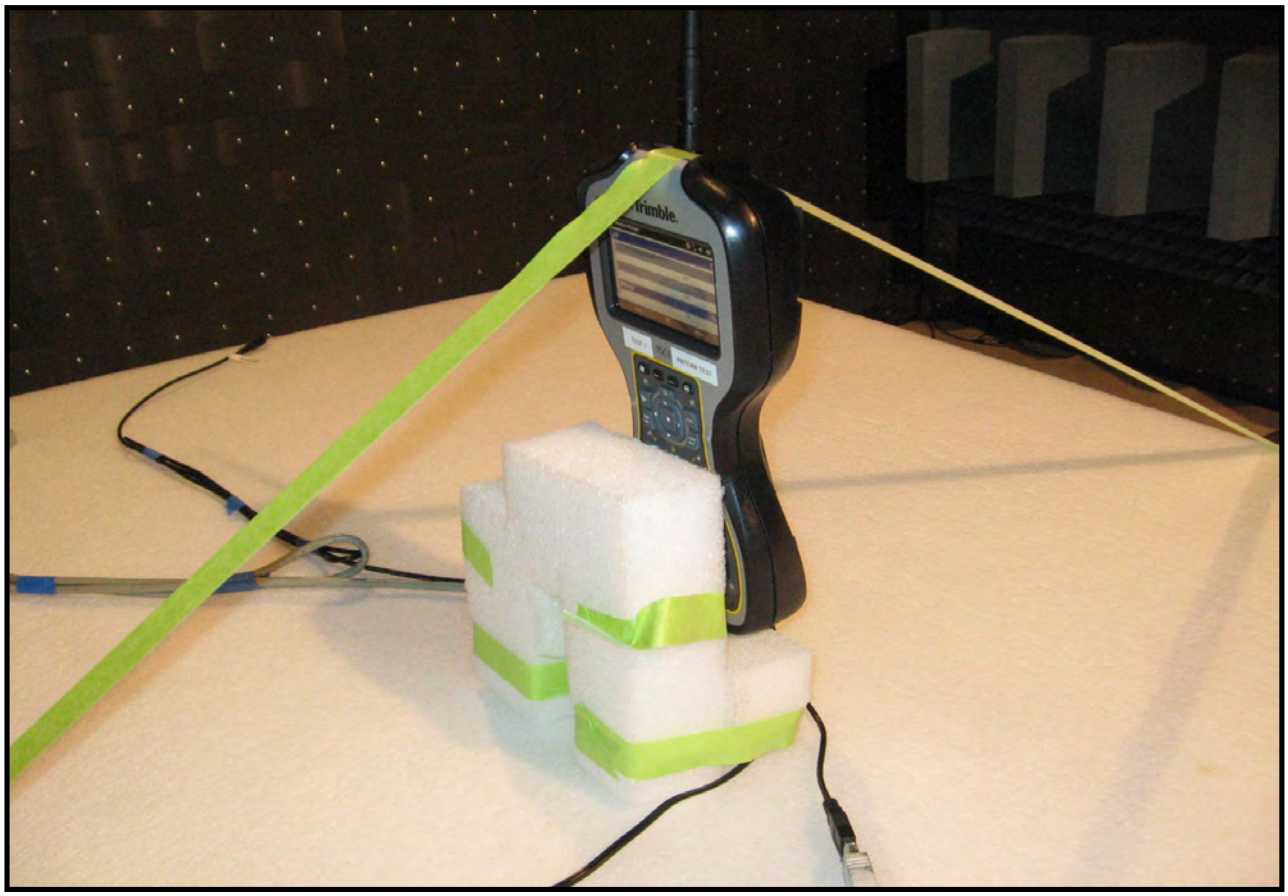
Signature



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
12178.640	81.8	-8.6	133.0	1.0	3.0	0.0	H-Horn	PK	0.0	73.2	74.0	-0.8	Mid channel
7307.284	55.6	15.2	37.0	1.9	3.0	0.0	V-Horn	PK	0.0	70.8	74.0	-3.2	Mid channel
7409.967	52.9	15.5	80.0	1.0	3.0	0.0	V-Horn	PK	0.0	68.4	74.0	-5.6	High channel
12178.870	75.8	-8.6	25.0	1.7	3.0	0.0	V-Horn	PK	0.0	67.2	74.0	-6.8	Mid channel
12008.010	75.5	-9.0	140.0	1.0	3.0	0.0	H-Horn	PK	0.0	66.5	74.0	-7.5	Low channel
12349.320	73.3	-8.0	149.0	1.0	3.0	0.0	H-Horn	PK	0.0	65.3	74.0	-8.7	High channel
7408.973	48.3	15.5	135.0	1.0	3.0	0.0	H-Horn	PK	0.0	63.8	74.0	-10.2	High channel
7307.538	47.8	15.2	153.0	1.0	3.0	0.0	H-Horn	PK	0.0	63.0	74.0	-11.0	Mid channel
7409.497	25.9	15.5	80.0	1.0	3.0	0.0	V-Horn	AV	0.0	41.4	54.0	-12.6	High channel
12349.200	69.4	-8.0	25.0	1.0	3.0	0.0	V-Horn	PK	0.0	61.4	74.0	-12.6	High channel
7409.407	25.6	15.5	135.0	1.0	3.0	0.0	H-Horn	AV	0.0	41.1	54.0	-12.9	High channel
7307.247	25.5	15.2	153.0	1.0	3.0	0.0	H-Horn	AV	0.0	40.7	54.0	-13.3	Mid channel
7307.247	25.1	15.2	37.0	1.9	3.0	0.0	V-Horn	AV	0.0	40.3	54.0	-13.7	Mid channel
12008.130	69.1	-9.0	58.0	1.0	3.0	0.0	V-Horn	PK	0.0	60.1	74.0	-13.9	Low channel
4871.313	25.1	8.4	24.0	1.0	3.0	0.0	V-Horn	AV	0.0	33.5	54.0	-20.5	Mid channel
4939.620	25.0	8.5	106.0	1.0	3.0	0.0	H-Horn	AV	0.0	33.5	54.0	-20.5	High channel
4939.673	24.9	8.5	34.0	1.0	3.0	0.0	V-Horn	AV	0.0	33.4	54.0	-20.6	High channel
4871.570	24.9	8.4	113.0	1.0	3.0	0.0	H-Horn	AV	0.0	33.3	54.0	-20.7	Mid channel
4803.173	24.6	8.6	98.0	1.4	3.0	0.0	V-Horn	AV	0.0	33.2	54.0	-20.8	Low channel
4802.997	24.6	8.5	98.0	1.0	3.0	0.0	H-Horn	AV	0.0	33.1	54.0	-20.9	Low channel
4871.420	41.7	8.4	24.0	1.0	3.0	0.0	V-Horn	PK	0.0	50.1	74.0	-23.9	Mid channel
4871.183	41.5	8.4	113.0	1.0	3.0	0.0	H-Horn	PK	0.0	49.9	74.0	-24.1	Mid channel
4939.363	41.1	8.5	34.0	1.0	3.0	0.0	V-Horn	PK	0.0	49.6	74.0	-24.4	High channel
12349.000	37.5	-8.0	25.0	1.0	3.0	0.0	V-Horn	AV	0.0	29.5	54.0	-24.5	High channel
12178.600	38.1	-8.6	133.0	1.0	3.0	0.0	H-Horn	AV	0.0	29.5	54.0	-24.5	Mid channel
12349.170	37.3	-8.0	149.0	1.0	3.0	0.0	H-Horn	AV	0.0	29.3	54.0	-24.7	High channel
12178.700	37.8	-8.6	25.0	1.7	3.0	0.0	V-Horn	AV	0.0	29.2	54.0	-24.8	Mid channel
12008.320	37.8	-9.0	140.0	1.0	3.0	0.0	H-Horn	AV	0.0	28.8	54.0	-25.2	Low channel
4940.090	40.3	8.5	106.0	1.0	3.0	0.0	H-Horn	PK	0.0	48.8	74.0	-25.2	High channel
12008.040	37.1	-9.0	58.0	1.0	3.0	0.0	V-Horn	AV	0.0	28.1	54.0	-25.9	Low channel
4802.770	39.1	8.5	98.0	1.0	3.0	0.0	H-Horn	PK	0.0	47.6	74.0	-26.4	Low channel
4804.200	37.5	8.5	98.0	1.4	3.0	0.0	V-Horn	PK	0.0	46.0	74.0	-28.0	Low channel



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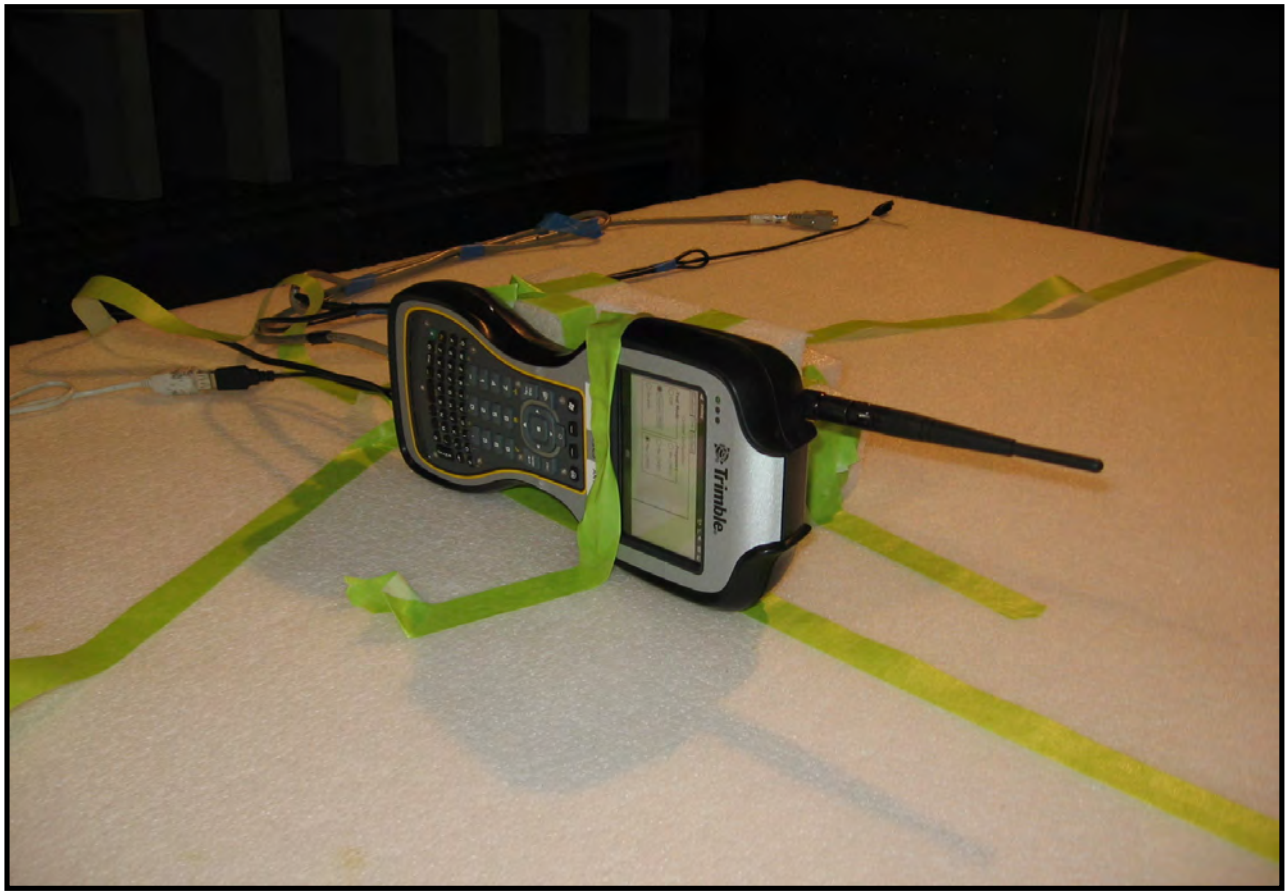
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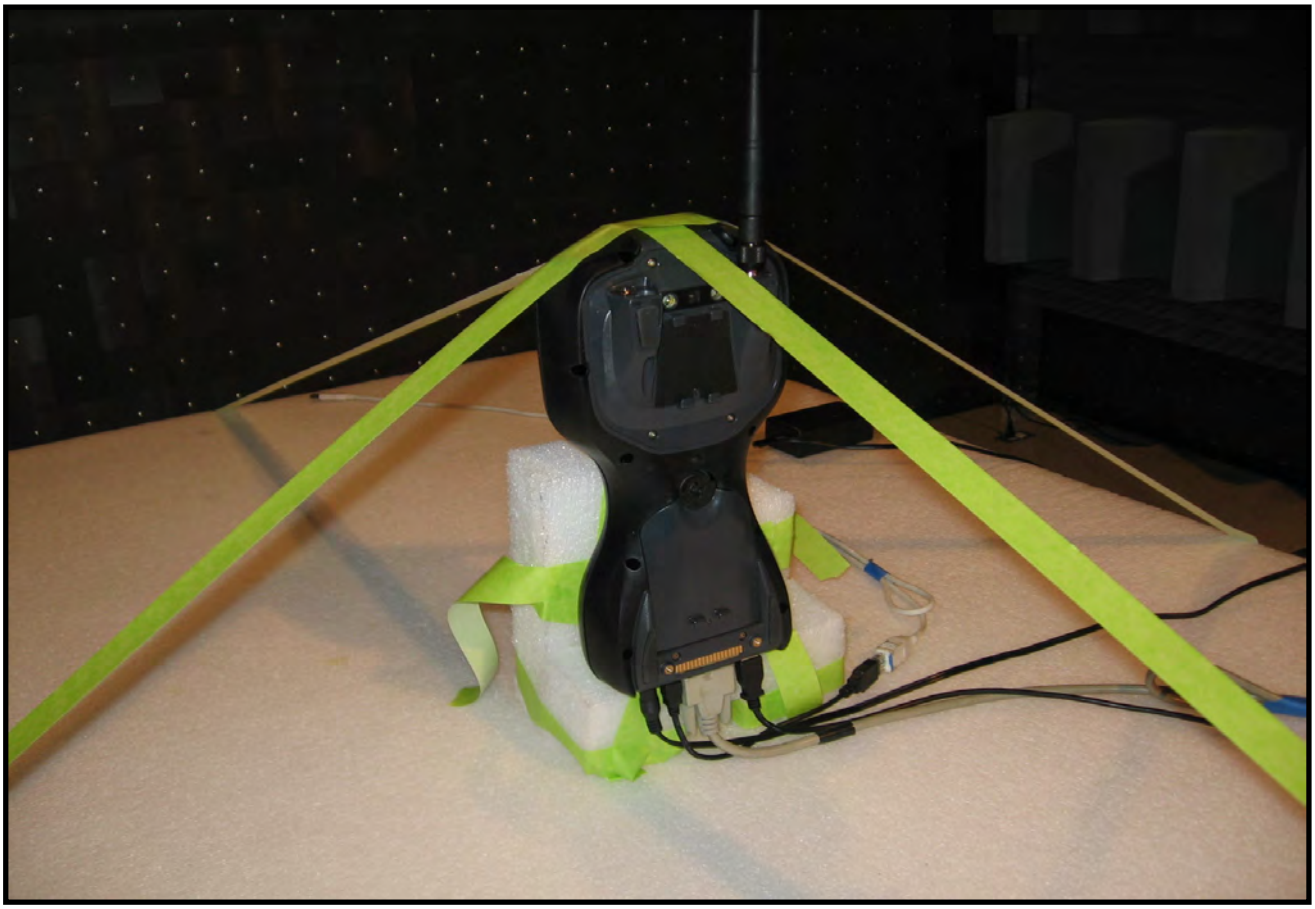


EMC AC POWERLINE CONDUCTED EMISSIONS

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

MODES OF OPERATION

Transmitting Cirronet, low channel
Transmitting Cirronet, mid channel
Transmitting Cirronet, high channel

POWER SETTINGS INVESTIGATED

120VAC/60Hz

CONFIGURATIONS INVESTIGATED

TRPO0053 - 1

SAMPLE CALCULATIONS

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Receiver	Rohde & Schwarz	ESCI	ARH	9/25/2009	13 mo
LISN	Solar	9252-50-R-24-BNC	LIR	2/4/2009	13 mo
Attenuator	Coaxicom	66702 2910-20	ATO	7/21/2009	13 mo
High Pass Filter	TTE	H97-100K-50-720B	HFX	5/27/2009	13 mo
EV07 Cables		Conducted Cables	EVG	6/1/2009	13 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

Measurements were made using the bandwidths and detectors specified. No video filter was used.

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm.

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

PSA-ESCI 2009.06.09
Version 2009.12.28

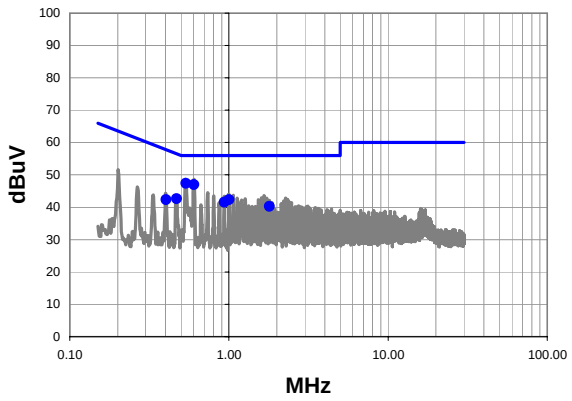
Work Order:	TRPO0053	**Date:**	01/27/10		
Project:	None	**Temperature:**	21		
Job Site:	EV07	**Humidity:**	38		
Serial Number:	Unknown	**Barometric Pres.:**	30.15	**Tested by:**	Rod Peloquin

EUT:	Ranger/TSC3 Cirronet 2.4 GHz radio
Configuration:	1 - Emissions
Customer:	Trimble Navigation Limited
Attendees:	None
EUT Power:	120VAC/60Hz
Operating Mode:	Transmitting Cirronet, low channel
Deviations:	No deviations.
Comments:	AC only, host battery removed

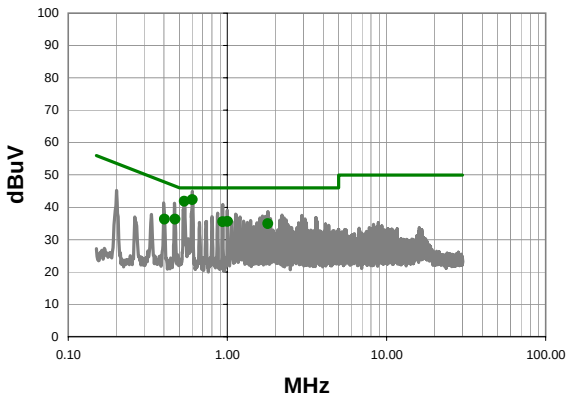
Test Specifications	**Test Method**
FCC 15.209:2010	ANSI C63.10:2009

Run #	1	**Line:**	High Line	**Ext. Attenuation:**	20	**Results**	Pass

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.536	26.9	20.5	47.4	56.0	-8.6
0.602	26.5	20.5	47.0	56.0	-9.0
1.002	21.9	20.4	42.3	56.0	-13.7
0.469	22.2	20.5	42.7	56.5	-13.9
0.934	21.2	20.4	41.6	56.0	-14.4
0.402	21.8	20.6	42.4	57.8	-15.4
1.800	19.9	20.4	40.3	56.0	-15.7

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.602	21.9	20.5	42.4	46.0	-3.6
0.536	21.4	20.5	41.9	46.0	-4.1
0.469	15.8	20.5	36.3	46.5	-10.3
1.002	15.2	20.4	35.6	46.0	-10.4
0.934	15.1	20.4	35.5	46.0	-10.5
1.800	14.5	20.4	34.9	46.0	-11.1
0.402	15.7	20.6	36.3	47.8	-11.5

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

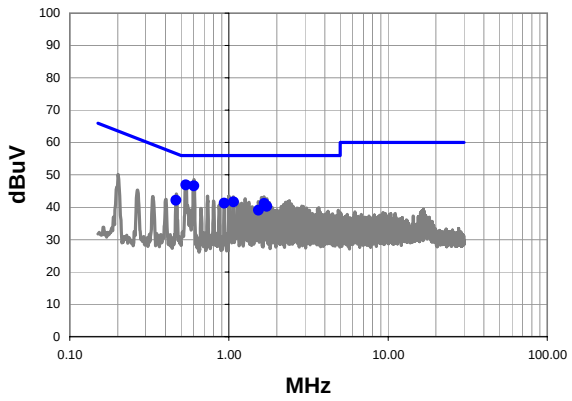
PSA-ESCI 2009.06.09
Version 2009.12.28

Work Order:	TRPO0053	**Date:**	01/27/10		
Project:	None	**Temperature:**	21		
Job Site:	EV07	**Humidity:**	38		
Serial Number:	Unknown	**Barometric Pres.:**	30.15	**Tested by:**	Rod Peloquin
EUT:	Ranger/TSC3 Cirronet 2.4 GHz radio				
Configuration:	1 - Emissions				
Customer:	Trimble Navigation Limited				
Attendees:	None				
EUT Power:	120VAC/60Hz				
Operating Mode:	Transmitting Cirronet, low channel				
Deviations:	No deviations.				
Comments:	AC only, host battery removed				

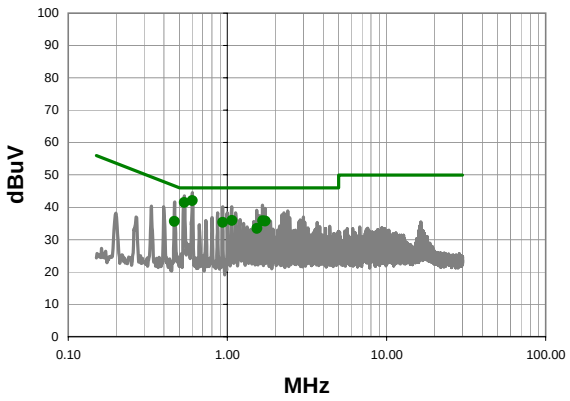
Test Specifications	**Test Method**
FCC 15.209:2010	ANSI C63.10:2009

Run #	2	**Line:**	Neutral	**Ext. Attenuation:**	20	**Results**	Pass

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.536	26.4	20.5	46.9	56.0	-9.1
0.602	26.1	20.5	46.6	56.0	-9.4
1.068	21.3	20.4	41.7	56.0	-14.3
0.466	21.7	20.5	42.2	56.6	-14.4
0.934	20.9	20.4	41.3	56.0	-14.7
1.668	20.8	20.4	41.2	56.0	-14.8
1.736	19.9	20.4	40.3	56.0	-15.7
1.536	18.7	20.4	39.1	56.0	-16.9

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.602	21.6	20.5	42.1	46.0	-3.9
0.536	21.0	20.5	41.5	46.0	-4.5
1.068	15.5	20.4	35.9	46.0	-10.1
1.668	15.4	20.4	35.8	46.0	-10.2
1.736	15.3	20.4	35.7	46.0	-10.3
0.934	14.9	20.4	35.3	46.0	-10.7
0.466	15.1	20.5	35.6	46.6	-11.0
1.536	13.0	20.4	33.4	46.0	-12.6

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

PSA-ESCI 2009.06.09
Version 2009.12.28

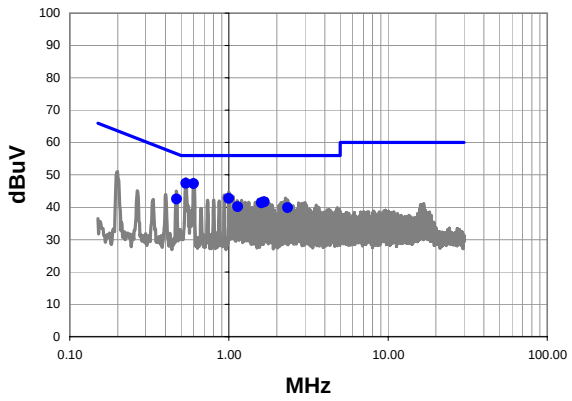
Work Order:	TRPO0053	**Date:**	01/27/10		
Project:	None	**Temperature:**	21		
Job Site:	EV07	**Humidity:**	38		
Serial Number:	Unknown	**Barometric Pres.:**	30.15	**Tested by:**	Rod Peloquin

EUT:	Ranger/TSC3 Cirronet 2.4 GHz radio
Configuration:	1 - Emissions
Customer:	Trimble Navigation Limited
Attendees:	None
EUT Power:	120VAC/60Hz
Operating Mode:	Transmitting Cirronet, mid channel
Deviations:	No deviations.
Comments:	AC only, host battery removed

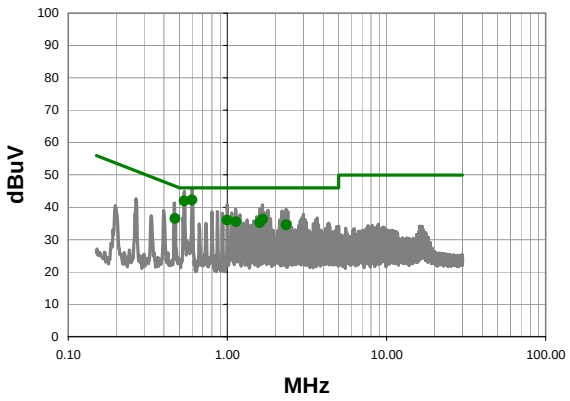
Test Specifications	**Test Method**
FCC 15.209:2010	ANSI C63.10:2009

Run #	3	**Line:**	High Line	**Ext. Attenuation:**	20	**Results**	Pass

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.536	26.9	20.5	47.4	56.0	-8.6
0.601	26.8	20.5	47.3	56.0	-8.7
1.000	22.3	20.4	42.7	56.0	-13.3
0.469	22.1	20.5	42.6	56.5	-14.0
1.668	21.2	20.4	41.6	56.0	-14.4
1.600	21.0	20.4	41.4	56.0	-14.6
1.136	19.8	20.4	40.2	56.0	-15.8
2.336	19.5	20.4	39.9	56.0	-16.1

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.601	21.8	20.5	42.3	46.0	-3.7
0.536	21.5	20.5	42.0	46.0	-4.0
1.668	15.9	20.4	36.3	46.0	-9.7
1.000	15.6	20.4	36.0	46.0	-10.0
0.469	16.0	20.5	36.5	46.5	-10.1
1.136	15.1	20.4	35.5	46.0	-10.5
1.600	14.8	20.4	35.2	46.0	-10.8
2.336	14.1	20.4	34.5	46.0	-11.5

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

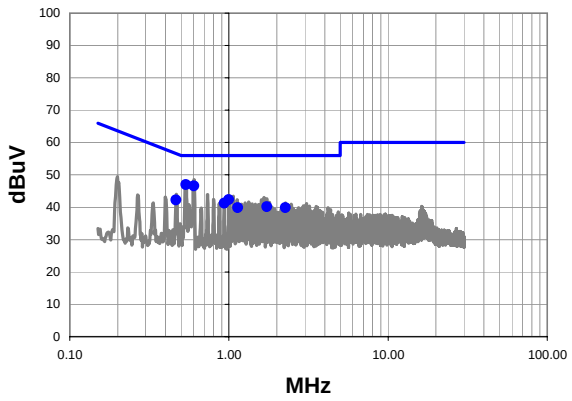
PSA-ESCI 2009.06.09
Version 2009.12.28

Work Order:	TRPO0053	**Date:**	01/27/10		
Project:	None	**Temperature:**	21		
Job Site:	EV07	**Humidity:**	38		
Serial Number:	Unknown	**Barometric Pres.:**	30.15	**Tested by:**	Rod Peloquin
EUT:	Ranger/TSC3 Cirronet 2.4 GHz radio				
Configuration:	1 - Emissions				
Customer:	Trimble Navigation Limited				
Attendees:	None				
EUT Power:	120VAC/60Hz				
Operating Mode:	Transmitting Cirronet, mid channel				
Deviations:	No deviations.				
Comments:	AC only, host battery removed				

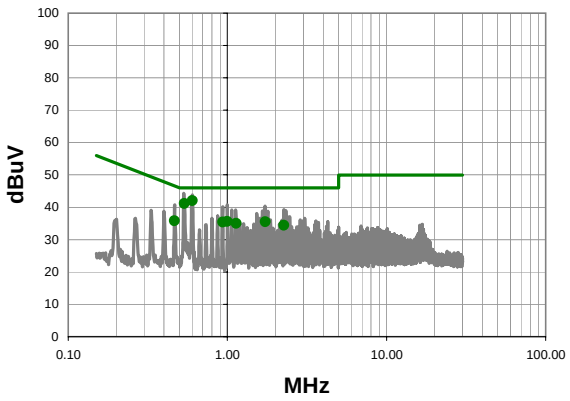
Test Specifications	**Test Method**
FCC 15.209:2010	ANSI C63.10:2009

Run #	4	**Line:**	Neutral	**Ext. Attenuation:**	20	**Results**	Pass

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.537	26.5	20.5	47.0	56.0	-9.0
0.602	26.1	20.5	46.6	56.0	-9.4
1.000	21.9	20.4	42.3	56.0	-13.7
0.466	21.8	20.5	42.3	56.6	-14.3
0.934	20.9	20.4	41.3	56.0	-14.7
1.736	19.8	20.4	40.2	56.0	-15.8
2.268	19.5	20.4	39.9	56.0	-16.1
1.136	19.5	20.4	39.9	56.0	-16.1

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.602	21.6	20.5	42.1	46.0	-3.9
0.537	20.7	20.5	41.2	46.0	-4.8
1.000	15.2	20.4	35.6	46.0	-10.4
1.736	15.1	20.4	35.5	46.0	-10.5
0.934	15.0	20.4	35.4	46.0	-10.6
0.466	15.3	20.5	35.8	46.6	-10.8
1.136	14.6	20.4	35.0	46.0	-11.0
2.268	14.0	20.4	34.4	46.0	-11.6

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EMC

AC POWERLINE CONDUCTED EMISSIONS

PSA-ESCI 2009.06.09
Version 2009.12.28

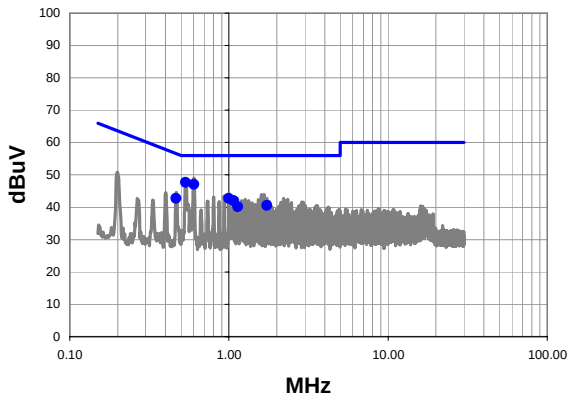
Work Order:	TRPO0053	**Date:**	01/27/10		
Project:	None	**Temperature:**	21		
Job Site:	EV07	**Humidity:**	38		
Serial Number:	Unknown	**Barometric Pres.:**	30.15	**Tested by:**	Rod Peloquin

EUT:	Ranger/TSC3 Cirronet 2.4 GHz radio
Configuration:	1 - Emissions
Customer:	Trimble Navigation Limited
Attendees:	None
EUT Power:	120VAC/60Hz
Operating Mode:	Transmitting Cirronet, high channel
Deviations:	No deviations.
Comments:	AC only, host battery removed

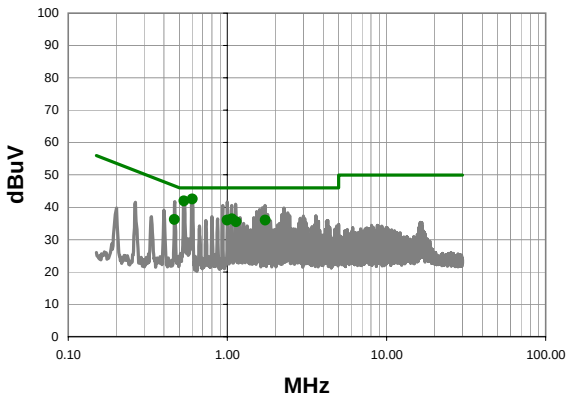
Test Specifications	**Test Method**
FCC 15.209:2010	ANSI C63.10:2009

Run #	5	**Line:**	High Line	**Ext. Attenuation:**	20	**Results**	Pass

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.535	27.2	20.5	47.7	56.0	-8.3
0.602	26.6	20.5	47.1	56.0	-8.9
1.000	22.3	20.4	42.7	56.0	-13.3
0.466	22.3	20.5	42.8	56.6	-13.8
1.068	21.7	20.4	42.1	56.0	-13.9
1.736	20.2	20.4	40.6	56.0	-15.4
1.136	19.8	20.4	40.2	56.0	-15.8

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.602	22.1	20.5	42.6	46.0	-3.4
0.535	21.5	20.5	42.0	46.0	-4.0
1.068	16.0	20.4	36.4	46.0	-9.6
1.736	15.6	20.4	36.0	46.0	-10.0
1.000	15.6	20.4	36.0	46.0	-10.0
0.466	15.7	20.5	36.2	46.6	-10.4
1.136	15.1	20.4	35.5	46.0	-10.5

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

PSA-ESCI 2009.06.09
Version 2009.12.28

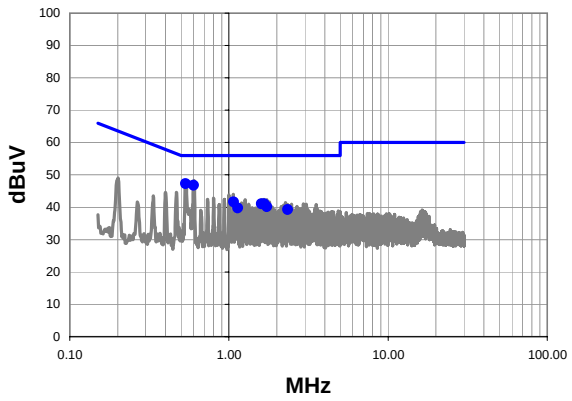
Work Order:	TRPO0053	**Date:**	01/27/10		
Project:	None	**Temperature:**	21		
Job Site:	EV07	**Humidity:**	38		
Serial Number:	Unknown	**Barometric Pres.:**	30.15	**Tested by:**	Rod Peloquin

EUT:	Ranger/TSC3 Cirronet 2.4 GHz radio
Configuration:	1 - Emissions
Customer:	Trimble Navigation Limited
Attendees:	None
EUT Power:	120VAC/60Hz
Operating Mode:	Transmitting Cirronet, high channel
Deviations:	No deviations.
Comments:	AC only, host battery removed

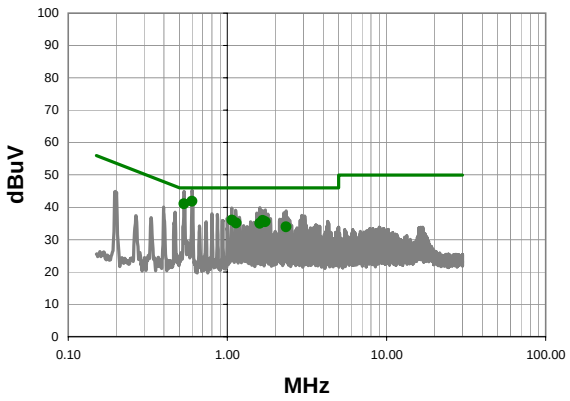
Test Specifications	**Test Method**
FCC 15.209:2010	ANSI C63.10:2009

Run #	6	**Line:**	Neutral	**Ext. Attenuation:**	20	**Results**	Pass

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.534	26.8	20.5	47.3	56.0	-8.7
0.601	26.3	20.5	46.8	56.0	-9.2
1.068	21.3	20.4	41.7	56.0	-14.3
1.668	20.7	20.4	41.1	56.0	-14.9
1.600	20.7	20.4	41.1	56.0	-14.9
1.736	19.8	20.4	40.2	56.0	-15.8
1.136	19.4	20.4	39.8	56.0	-16.2
2.336	18.9	20.4	39.3	56.0	-16.7

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
0.601	21.4	20.5	41.9	46.0	-4.1
0.534	20.6	20.5	41.1	46.0	-4.9
1.068	15.6	20.4	36.0	46.0	-10.0
1.668	15.5	20.4	35.9	46.0	-10.1
1.736	15.1	20.4	35.5	46.0	-10.5
1.136	14.7	20.4	35.1	46.0	-10.9
1.600	14.6	20.4	35.0	46.0	-11.0
2.336	13.5	20.4	33.9	46.0	-12.1