



TRIMBLE NAVIGATION LTD. TEST REPORT

FOR THE

46707-00 CROSSCHECK CDPD

FCC PART 15 SUBPART B SECTION 15.109 CLASS B

COMPLIANCE

DATE OF ISSUE: JANUARY 3, 2002

PREPARED FOR:

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Date of test: December 18, 2001

Report No.: FC02-004

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CKC Laboratories, Inc. has received Certificates of Accreditation from the following agencies:

A2LA (USA); DATech (Germany); BSMI (Taiwan); Nemko (Norway); and GOST (Russia).

CKC Laboratories, Inc has received test site Registration Acceptance from the following agencies:

FCC (USA); VCCI (Japan); and Industry Canada.

CKC Laboratories, Inc. has received Letters of Acceptance through an MRA for the following agencies:

ACA/NATA (Australia); SABS (South Africa); SWEDAC (Sweden); Radio Communications Agency (RA); HOKLAS (Hong Kong); Bakom (Swiss); BIPT (Belgium); Denmark Telestyrelsen; RvA (Netherlands); SEE (Luxembourg) SITTEL (Bolivia); and UKAS (UK).

ADMINISTRATIVE INFORMATION

DATE OF TEST: December 18, 2001

DATE OF RECEIPT: December 18, 2001

PURPOSE OF TEST: To demonstrate the compliance of the 46707-00 CrossCheck CDPD with the requirements for FCC Part 15 Subpart B Section 15.109 Class B devices.

TEST METHOD: ANSI C63.4 (1992)

FREQUENCY RANGE TESTED: 30 - 1000 MHz

MANUFACTURER: Trimble Navigation Ltd.
485 Potrero Ave., B1
Sunnyvale, CA 94086

REPRESENTATIVE: Jorge Heraud

TEST LOCATION: CKC Laboratories, Inc.
480 Los Viboras Road
Hollister, CA 95023

SUMMARY OF RESULTS

As received, the Trimble Navigation Ltd. 46707-00 CrossCheck CDPD was found to be fully compliant with the following standards and specifications:

United States

- FCC Part 15 Subpart B Section 15.109 Class B
- ANSI C63.4 (1992) method

Canada

- ICES-003 Class B using:
 - ANSI C63.4 (1992) method
- Industry of Canada File No. IC 3171-D

The results in this report apply only to the items tested, as identified herein.

REQUIRED EUT CHANGES TO COMPLY

No modifications to the EUT were necessary to comply.

15.203 ANTENNA COMPLIANCE STATEMENT

The antenna is installed professionally by Trimble Navigation authorized dealers only and therefor, complies with the requirements of FCC Part 15.203.

APPROVALS

QUALITY ASSURANCE:



Dennis Ward, Quality Manager



Christine Nicklas, EMC/Lab Manager

TEST PERSONNEL:



Matthew Pettersen, Test Engineer

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

The EUT tested by CKC Laboratories was a production unit. The EUT is a vehicle mounted location device. This device incorporates a certified transmitter module, FCC ID: NBZNRM-6832.

The following model has been tested by CKC Laboratories: CrossCheck CDPD Vehicle Mounted Location Device.

Since the time of testing, the device name has been changed to 46707-00 CrossCheck CDPD. The device is identical electrically to the one which was tested. Only the name has been revised.

EQUIPMENT UNDER TEST

CrossCheck CDPD

Manuf: Trimble Navigation Ltd.
Model: 46707-00
Serial: 4000186
FCC ID: JUPXXXXX (pending)

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

CDPD Antenna

Manuf: Antenex
Model: 3DB Whip Antenna
Serial: NA
FCC ID: DoC

Mobile Data Terminal

Manuf: Navman
Model: MDT-800
Serial: 17E100001
FCC ID: DoC

DC Power Supply

Manuf: HP
Model: 6002A
Serial: 2428A-08955
FCC ID: DoC

GPS Antenna

Manuf: Trimble Navigation
Model: P/N- 28367-40
Serial: 08110134
FCC ID: DoC

SPECIFICATIONS AND REQUIREMENTS

The following summarizes the specifications and requirements for the emission tests performed on the 46707-00 CrossCheck CDPD. If the actual test levels are higher or different than required, these levels are listed in the appropriate tables.

Test	Specification	Requirement
Radiated Emissions	FCC Part 15 Subpart B Section 15.109	Class B

REPORT OF MEASUREMENTS

The following tables report the worst case emissions levels recorded during the tests performed on the 46707-00 CrossCheck CDPD. All readings taken were peak readings unless otherwise stated. The data sheets from which the emissions tables were compiled are contained in Appendix C.

Table 1: Six Highest Radiated Emission Levels									
FREQUENCY MHz	METER READING dB μ V	CORRECTION FACTORS				CORRECTED READING dB μ V/m	SPEC LIMIT dB μ V/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB	Dist dB				
118.788	47.0	11.1	-27.7	3.3		33.7	43.5	-9.8	V
131.342	51.2	11.3	-27.5	3.5		38.5	43.5	-5.0	VQ
231.332	49.3	11.0	-27.0	4.8		38.1	46.0	-7.9	V
771.275	36.1	21.1	-27.8	9.3		38.7	46.0	-7.3	V
771.282	36.5	21.1	-27.8	9.3		39.1	46.0	-6.9	H
936.586	32.4	23.0	-27.3	10.8		38.9	46.0	-7.1	HQ

Test Method: ANSI C63.4 (1992)
 Spec Limit: FCC Part 15 Sections 15.109 Class B
 Test Distance: 3 Meters

NOTES: H = Horizontal Polarization
 V = Vertical Polarization
 Q = Quasi Peak Reading

COMMENTS: EUT is a vehicle mounted location device. A GPS antenna is connected to the EUT. It is sending the location to the EUT. The EUT processes this information and displays it on the Navman mobile data terminal. The EUT also sends this data out to a base station via the whip antenna. The EUT is powered by 9-32VDC. Currently the EUT is powered at 13.6VDC. This power supply is located underneath the turntable. Radiated emissions 30MHz - 1GHz.

MEASUREMENT UNCERTAINTY

Associated with data in this report is a ± 4 dB measurement uncertainty.

TESTING

The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available I/O ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. I/O cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected. The interval between different pieces of equipment was approximately 10 centimeters. All excessive interconnecting cable was bundled in 30-40 centimeter lengths.

EMISSIONS

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the photographs in Appendix A. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables. The corrected data was then compared to the applicable emission limits to determine compliance.

The radiated emissions data of the 46707-00 CrossCheck CDPD, was taken with the HP Spectrum Analyzer. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in Table A.

Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dB μ V/m, the spectrum analyzer reading in dB μ V was corrected by using the following formula in Table A. This reading was then compared to the applicable specification limit to determine compliance.

TABLE A: SAMPLE CALCULATIONS		
	Meter reading	(dB μ V)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dB μ V/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed in Appendix B were used to collect the radiated emissions data for the 46707-00 CrossCheck CDPD. For radiated measurements from 30 MHz to 1000MHz, the biconilog antenna was used.

The HP spectrum analyzer was used for all measurements. Table B shows the analyzer bandwidth settings that were used in designated frequency bands. During radiated testing, the measurements were made with 0 dB of attenuation, a reference level of 97 dB μ V, and a vertical scale of 10 dB per division.

TABLE B: ANALYZER BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz

SPECTRUM ANALYZER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the highest readings, this is indicated as a "Q" or an "A" in the appropriate table. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data for the 46707-00 CrossCheck CDPD.

Peak

In this mode, the Spectrum Analyzer or test engineer recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the analyzer called "peak hold," the analyzer had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the analyzer made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the HP Quasi-Peak Adapter for the HP Spectrum Analyzer. The detailed procedure for making quasi peak measurements contained in the HP Quasi-Peak Adapter manual was followed.

Average

For certain frequencies, average measurements may be made using the spectrum analyzer. To make these measurements, the test engineer reduces the video bandwidth on the analyzer until the modulation of the signal is filtered out. At this point the analyzer is set into the linear mode and the scan time is reduced.

RADIATED EMISSIONS

The EUT was mounted on a nonconductive, rotating table 80 cm above the conductive grid. The nonconductive table dimensions were 1 meter by 1.5 meters.

During the preliminary radiated scan, the EUT was powered up and operating in its defined test mode. The frequency range of 30 MHz to 1000 MHz was scanned with the biconilog antenna located about 1.5 meter above the ground plane in the vertical polarity. During this scan, the turntable was rotated and all peaks at or near the limit were recorded. A scan of the FM band from 88 to 110 MHz was then made using a reduced resolution bandwidth and frequency span. The biconilog antenna was changed to the horizontal polarity and the above steps were repeated. Care was taken to ensure that no frequencies were missed within the FM and TV bands. An analysis was performed to determine if the signals that were at or near the limit were caused by an ambient transmission. If unable to determine by analysis, the equipment was powered down to make the final determination if the EUT was the source of the emission.

A thorough scan of all frequencies was made manually using a small frequency span, rotating the turntable as needed. The test engineer maximized the readings with respect to the table rotation and configuration of EUT. Maximizing of the EUT was achieved by monitoring the spectrum analyzer on a closed circuit television monitor. Photographs showing the final worst case configuration of the EUT are contained in Appendix A.

APPENDIX A

INFORMATION ABOUT THE EQUIPMENT UNDER TEST

INFORMATION ABOUT THE EQUIPMENT UNDER TEST	
Test Software/Firmware:	CrossCheck CDPD Application
CRT was displaying:	N/A
Power Supply Manufacturer:	N/A
Power Supply Part Number:	N/A
AC Line Filter Manufacturer:	N/A
AC Line Filter Part Number:	N/A

I/O PORTS	
Type	#
Power and I/O port	1
Serial port	1
GPS antenna connector	1
CDPD antenna connector	1

CRYSTAL OSCILLATORS	
Type	Freq In MHz
TCXO	12.504
XO	3.6864
XO	0.032768

PRINTED CIRCUIT BOARDS				
Function	Model & Rev	Clocks, MHz	Layers	Location
Main Board	39661-20-E, Rev E	12.504, 3.6864, 0.032768	6	Bottom
Daughter board	46401-00-B, Rev B	N/A	2	Top

CABLE INFORMATION

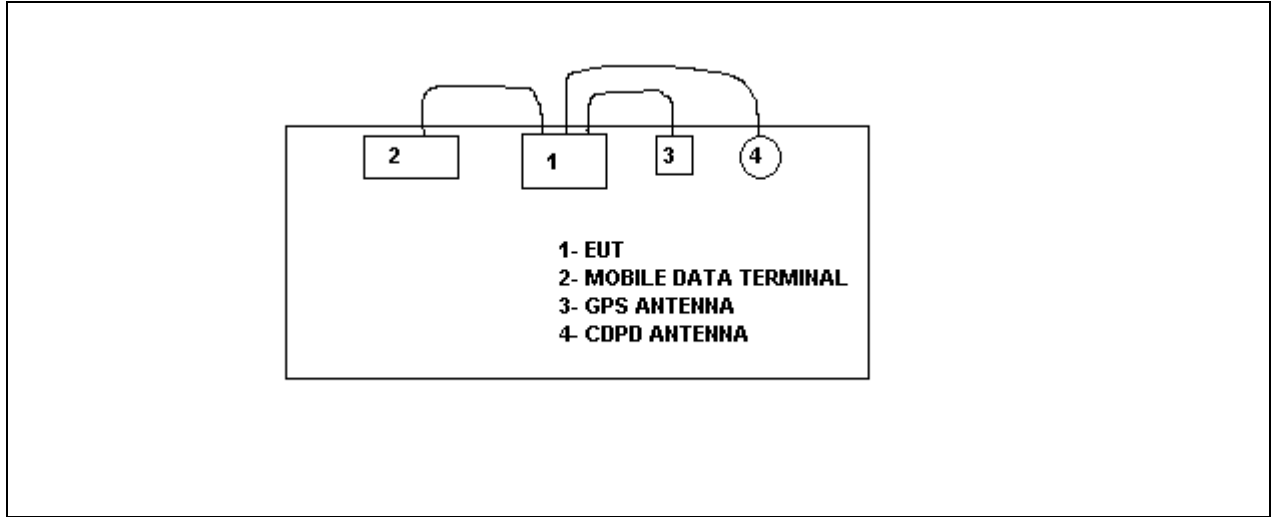
Cable #:	1	Cable(s) of this type:	1
Cable Type:	Power and I/O	Shield Type:	None
Construction:	Crimp pins	Length In Meters:	1
Connected To End (1):	EUT	Connected To End (2):	Vehicle battery simulator – support equipment. – HP DC power supply 6002A
Connector At End (1):	Molex micro fit, 16 pin	Connector At End (2):	Alligator clips
Shield Grounded At (1):	None	Shield Grounded At (2):	None
Part Number:	46598	Number of Conductors:	16
Notes and/or description:			

Cable #:	2	Cable(s) of this type:	1
Cable Type:	Serial cable	Shield Type:	None
Construction:	Molded RJ45, soldered DB9 Male	Length In Meters:	2.90
Connected To End (1):	EUT	Connected To End (2):	Mobile data terminal – support equipment.
Connector At End (1):	DB-9	Connector At End (2):	RJ-45
Shield Grounded At (1):	None	Shield Grounded At (2):	None
Part Number:	46755	Number of Conductors:	8
Notes and/or description:			

Cable #:	3	Cable(s) of this type:	1
Cable Type:	RF	Shield Type:	Coaxial
Construction:	Molded into antenna	Length In Meters:	5
Connected To End (1):	EUT	Connected To End (2):	GPS antenna – support equipment
Connector At End (1):	SMA Male	Connector At End (2):	Molded into antenna
Shield Grounded At (1):	Coaxial connector	Shield Grounded At (2):	Ground plane inside antenna
Part Number:	N/A – part of the antenna	Number of Conductors:	1 + 1 shield
Notes and/or description:			

Cable #:	4	Cable(s) of this type:	1
Cable Type:	RF	Shield Type:	Coaxial
Construction:	Molded into antenna	Length In Meters:	3
Connected To End (1):	EUT	Connected To End (2):	CDPD antenna
Connector At End (1):	TNC Male	Connector At End (2):	Molded into antenna
Shield Grounded At (1):	Coaxial connector	Shield Grounded At (2):	Ground plane inside antenna
Part Number:	N/A – part of the antenna	Number of Conductors:	1 + 1 shield
Notes and/or description:			

TEST CONNECTION DIAGRAM



PHOTOGRAPH SHOWING RADIATED EMISSIONS



Radiated Emissions - Front View

PHOTOGRAPH SHOWING RADIATED EMISSIONS



Radiated Emissions - Back View

APPENDIX B

TEST EQUIPMENT LIST

Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
S.A. 8568A	2235A02391	09/25/2001	09/25/2002	446
S.A. Display	2237A04350	09/25/2001	09/25/2002	446
Q.P. Adapter	2043A00286	09/25/2001	09/25/2002	445
Preamp, HP8447D	2944A06739	11/14/2001	11/14/2002	705
Bilog Antenna CBL6111C	2451	10/10/2001	10/10/2002	1995
rad cable 10M or 3M	rad_cab_10M_01_hd	07/24/2001	07/24/2002	0

APPENDIX C

MEASUREMENT DATA SHEETS

Test Location: CKC Laboratories, Inc. • 480 Los Viboras Road, Site D • Hollister, CA 95023 • 831-637-8176

Customer: **Trimble Navigation**
 Specification: **FCC B RADIATED**
 Work Order #: **78104** Date: 12/18/2001
 Test Type: **Maximized Emissions** Time: 11:57:26
 Equipment: **Vehicle Mounted Location Device** Sequence#: 2
 Manufacturer: Trimble Navigation Tested By: Matthew Pettersen
 Model: CrossCheck CDPD
 S/N: 4000186

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Vehicle Mounted Location Device*	Trimble Navigation	CrossCheck CDPD	4000186

Support Devices:

Function	Manufacturer	Model #	S/N
GPS Antenna	Trimble Navigation	P/N- 28367-40	08110134
CDPD Antenna	Antenex	3DB Whip Antenna	none
Mobile Data Terminal	Navman	MDT-800	17E100001
DC Power Supply	HP	6002A	2428A-08955

Test Conditions / Notes:

EUT is a vehicle mounted location device. A GPS antenna is connected to the EUT. It is sending the location to the EUT. The EUT processes this information and displays it on the Navman mobile data terminal. The EUT also sends this data out to a base station via the whip antenna. The EUT is powered by 9-32VDC. Currently the EUT is powered at 13.6VDC. This power supply is located underneath the turntable. Radiated emissions 30MHz - 1GHz.

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	Chase		HP 84		10m o	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
			dB	dB	dB	dB						
1	131.342M	51.2	+11.3		-27.5	+3.5	+0.0	38.5	43.5	-5.0	Vert	
	QP											
^	131.333M	52.5	+11.3		-27.5	+3.5	+0.0	39.8	43.5	-3.7	Vert	
3	771.282M	36.5	+21.1		-27.8	+9.3	+0.0	39.1	46.0	-6.9	Horiz	
4	936.586M	32.4	+23.0		-27.3	+10.8	+0.0	38.9	46.0	-7.1	Horiz	
	QP											
^	936.584M	34.3	+23.0		-27.3	+10.8	+0.0	40.8	46.0	-5.2	Horiz	
6	771.275M	36.1	+21.1		-27.8	+9.3	+0.0	38.7	46.0	-7.3	Vert	
7	231.332M	49.3	+11.0		-27.0	+4.8	+0.0	38.1	46.0	-7.9	Vert	
8	118.788M	47.0	+11.1		-27.7	+3.3	+0.0	33.7	43.5	-9.8	Vert	
9	225.115M	47.7	+10.6		-27.0	+4.8	+0.0	36.1	46.0	-9.9	Vert	
10	68.813M	48.4	+6.4		-27.8	+2.5	+0.0	29.5	40.0	-10.5	Horiz	
11	81.303M	46.6	+7.6		-27.7	+2.6	+0.0	29.1	40.0	-10.9	Horiz	

12	229.800M	44.6	+10.9	-27.0	+4.8	+0.0	33.3	46.0	-12.7	Vert
13	218.846M	44.9	+10.2	-26.9	+4.7	+0.0	32.9	46.0	-13.1	Horiz
14	225.117M	44.0	+10.6	-27.0	+4.8	+0.0	32.4	46.0	-13.6	Horiz