EXHIBITS

- EXHIBIT 1: Letter Requesting Confidentiality under Sec. 0.457(d)
- EXHIBIT 2: Information for which Confidentiality is Requested

Schematics Block Diagrams Theory of Operations

- EXHIBIT 3: Product Photographs
- EXHIBIT 4: Parts List of Active Devices
- EXHIBIT 5: User Manual and FCC ID Label
- EXHIBIT 6: Spectral Efficiency Per Section 90.203
- EXHIBIT 7: Report of Measurements
- EXHIBIT 8: Data Graphs Occupied Bandwidth
- EXHIBIT 9: Data Graphs Out of Band Emissions
- EXHIBIT 10: Data Graphs Modulation Limiting and Transient Response
- EXHIBIT 11: Data Sheets Frequency Stability

EXHIBIT 1: Letter Requesting Confidentiality under Sec. 0.457(d)

- see separate attachment TM3conf.doc

EXHIBIT 2: Information for which Confidentiality is Requested

Schematics

Theory of Operation

Block Diagrams

EXHIBIT 3: Product Photographs

- See separately submitted .jpg photograph files

EXHIBIT 4: Parts List of Active Devices

- refer to schematics, block diagrams, and theory of operation

EXHIBIT 5: User Manual and FCC ID Label

- See separate attachments USERMAN.pdf and TRIM3FCCID.pdf

EXHIBIT 6: Spectral Efficiency per Section 90.203

CERTIFICATE:

Trimble Navigation Ltd. certifies that, per the requirements of 90.203(j)3, that the reference radio, FCC ID: JUP-9414-450, meets the spectrum efficiency channel of one voice channel bandwidth per 12.5 kHz of channel bandwidth. Furthermore, the reference device is capable of transmitting data and is capable of supporting a data rate of 4800 bits per second per 6.25 kHz of bandwidth. Channel bandwidth is calculated as the bandwidth containing 99% of the energy of the emission, or the 20 dB bandwidth.

EXHIBIT 7: Report of Measurements

FCC CERTIFICATION INFORMATION

The following information is in accordance with FCC Rules, 47CFR Part 2, Subpart J, sections 2.1031 - 2.1057.

2.1033(c)1	Applicant:	Trimble Navigation Ltd.
		645 N. Mary Avenue
		Sunnyvale, CA 94086

2.1033(c)2 FCC ID: JUP-9414-450

2.1033(c)3 Installation and operating instructions are in separate documentation.

2.1033(c)4 Types of emission:

1. 4	4800 baud GMSK(.5), 3.5 kHz deviation	20 kHz auth BW:	20K0G1D
2. 9	9600 baud GMSK(.5), 3.5 kHz deviation	20 kHz auth BW:	20K0G1D
3. 4	4800 baud GMSK(.5), 2.4 kHz deviation	20 kHz auth BW:	20K0G1D
4. 4	4800 baud GMSK(.5) 1.2 kHz deviation	11.25 kHz auth BW:	11K25G1D
5. 9	9600 baud GMSK(.3) 1.5 kHz deviation	11.25 kHz auth BW:	11K25G1D
6. 9	9600 baud GMSK(.5) 4.8 kHz deviation	20 kHz auth BW:	20K0G1D
7.	19200baud GMSK(.3) 4.0 kHz deviation	20 kHz auth BW:	20K0G1D
8. 9	9600 baud 4FSK 4 kHz deviation	11.25 kHz auth BW:	11K25G1D
9.	19200 baud 4FSK 4.8 kHz deviation	20 kHz auth BW:	20K0G1D

- **2.1033(c)5** Frequency range: 410-470 MHz
- **2.1033(c)6** Range of operating power: 2 watts or 25 watts programmable
- **2.1033(c)7** Maximum output power: 25 watts design (26.6 watts measured, +0.3 dB)
- **2.1033(c)8** Applied DC voltages and currents to final amplifier:

Refer to schematic

2.1033(c)9 Tune-up procedure

Refer to user manual USERMAN.pdf

2.1033(c)10 Schematic, Block Diagram, and Theory of Operation

Refer to Exhibit 2. Confidentiality is requested for these items.

2.1033(c)11 Drawing or photograph of FCC ID label

Refer to Exhibit 5.

- **2.1033(c)12** Types of equipment: Refer to separate .jpg product photographs
- **2.1033(c)13** Desciption of digital modulation: See 2.1033(c) above and Exhibit 2

Standard Test Conditions

The transmitter was tested under the following conditions:

Room Temperature: 20 - 23 °C Relative Humidity: 35 - 50% DC Supply Voltage: 12.6 VDC

The transmitter was aligned and tuned up according to manufacturer's alignment procedure, prior to testing. All data presented represents the worst case parameter being measured.

Section 2.1046 RF Power Output

Test Set-up



Measurement Equipment Used:

HP 437B Power Meter HP 8482A Power Sensor Weinschel model 401034 attenuator, 50 watt

90.205 Power and Antenna Height Limits

Test Results

Maximum Output Power: 26.6 Watts @ 450 MHz

Section 2.1049 Occupied Bandwidth

Test Set-up



Measurement Equipment Used:

HP 8561 Spectrum Analyzer Weinschel model 401034 attenuator, 50 watt

Data on the bandwidth occupied by this transmitter is presented in graphical form using spectrum analyzer plots.

A separate spectrum plot is supplied for each modulation type.

90.209 Bandwidth limitations

90.210(b) Emission mask B: 25 kHz channel (20 kHz authorized BW)

Any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

1. On any frequency removed from the assigned frequency by more than 50 percent but less than 100 percent: at least 25 dB

2. On any frequency removed from the assigned frequency by more than 100 percent but less than 250 percent: at least 35 dB

3. On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 250 percent: At least $43 + 10 \log(P) dB$

90.210(d) Emission mask D: 12.5 kHz channel bandwidth (11.25 kHz authorized BW)

Any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

1. On any frequency from the center of the authorized bandwidth fo to 5.625 kHz removed from fo: Zero dB

2. On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least 7.27(fd-2.88 kHz) dB

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log(P) dB or 70 dB, whichever is the lesser attenuation.

Test Results:

Refer to spectrum analyzer charts labeled in Exhibit 8.

Section 2.1051 Spurious and Harmonic Emissions at Antenna Terminals

Measurement Equipment Used:

HP 8561 Spectrum Analyzer Weinschel model 401034 attenuator, 50 watt HP Modulation analyzer/audio generator

Test Set-up

-see Occupied Bandwidth test above

90.210

Minimum standard: The magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under conditions specified in the instruction manual and/or alignment procedure, shall not be less than:

Mask B: 43 + 10log(mean output power in watts) dBc, equivalent to -13 dBm Mask D: 50+10 log(mean output power in watts) dBc, equivalent to - 20 dBm.

Test Results

Refer to spectrum analyzer charts in Exhibit 9. Output emissions data is presented from 1 MHz to the 10th harmonic of the carrier frequency, for worst-case emission (Mask D).

Section 2.1053 Field Strength of Spurious and Harmonic Radiation

Measurement Equipment Used:

HP 8563E Spectrum Analyzer EMCO 3146 Log Periodic Antenna, 200 - 1000 MHz ARA DRG-118/A Double Ridged Horn antenna, 1 - 18 GHz

Test Set-Up



Minimum Requirement

The magnitude of each spurious and harmonic emission detected as being radiated from the EUT must be at a level more than $50 + 10 \log(\text{mean output power, watts}) \, dB$ below the mean power output (= -20 dBm).

Resultant radiated field at 3 m from -20 dBm source feeding isotropic antenna: 75.4 dBuV/m

Test Method

The antenna output port of the EUT was terminated with a 50 ohm shielded termination. With the transmitter operating at full power, the EUT was rotated 360° and the search antenna was raised and lowered in both polarities, all in an attempt to maximize the levels of the received emission for each harmonic and spurious emission up to 10 fo.

Test Results

Corrected field strength readings extrapolated to 3m: more 7 dB below limit. Refer to tabular data in Exhibit 9.

Section 2.1055 Frequency Stability

Test Set-up

- see Occupied Bandwidth above

Measurement Equipment Used

HP 8561 Spectrum Analyzer Weinschel model 401034 attenuator, 50 watt

Section 90.213 Minimum Frequency Stability

Minimum Requirement

Fixed and base stations, 421 - 512 MHz: 2.5 ppm = 1150 Hz for 460 MHz Mobile stations, over 2 watts: 5.0 ppm = 2300 Hz for 460 MHz

Test Method

<u>Temperature</u>: Vary the ambient temperature from -30 to $+50^{\circ}$ C, in 10 degree increments, allowing the EUT to stabilize at each temperature.

<u>Primary Supply Voltage</u>: Vary the supply voltage from 85% to 115% of the nominal operating voltage

Requirement is that frequency determining circuitry only needs testing.

Test Results

Freq. v Temperature: Refer to manufacturer's data in Exhibit 10 for TCXO data.

Freq. v Supply Voltage: TX set to 460 MHz

Nominal: 12.6 VDC f = 459.999861 MHz (-149 Hz)

90.214 Transient frequency behavior

The Trimmark 3 radio is designed to operate on 12.5 kHz channels. Transient frequencies must be within the tolerances and within the time frames described below:

Time Invervals Maximum freq. diff, kHz Duration for 450-500 MHz

t1	12.5	10 msec
t2	6.25	25 msec
t3	12.5	10 msec

Transient frequency behavior was tested according to the procedures in section 2.2.19 of TIA/EIA Standard TIA/EIA - 603. The turn on /turn off limits described in the table is shown in section 5.2.19.

Measurement Equipment Used

HP 54602A Oscilloscope HP 8561 Spectrum Analyzer HP 8648C Signal Generator HP 8920A Communications Transceiver Test Set Mini-Circuits RF combiners, 2-2500 Mhz Weinshel 30 dB in-line RF attenuator, 50 watts Directional coupler. 20 dB HP 423A RF detector

Test Set-up



Test Results

Refer to oscilloscope printouts labeled "Key ON" and "Key OFF".

The EUT meets the minimum transient frequency response limits for this type of device.

1. 4800 baud, GMSK(.5), ± 3.5kHz Deviation, BW= 20 kHz



2. 9600 baud, GMSK(0.5), ± 3.5kHz Deviation, BW= 20 kHz



3. 4800 baud, GMSK(.5) \pm 2.4 kHz deviation, BW=20 kHz



4. 4800 baud, $GMSK(.5) \pm 1.2$ kHz deviation, BW=11.25 kHz



5. 9600 baud, $GMSK(.3) \pm 1.5$ kHz deviation, BW=11.25 kHz



6. 9600 baud, $GMSK(.3) \pm 4.8$ kHz deviation, BW=20 kHz



7. 19200 baud, $GMSK(.3) \pm 4.0$ kHz deviation, BW= 20 kHz



8. 9600 baud, $4FSK \pm 4.0$ kHz deviation, BW= 11.25 kHz



9. 19200 baud, $4FSK \pm 4.8$ kHz deviation, BW= 20 kHz



EXHIBIT 9: Data Graphs: Out of Band Emissions

Conducted: Antenna port spurious and harmonics



EXHIBIT 9: Data Graphs: Out of Band Emissions

Conducted: Antenna port spurious and harmonics

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EXHIBIT 9: Data Graphs: Out of Band Emissions

Case Radiated

COMPLIANCE ENGINEERING SERVICES, INC. CASE RADIATED EMISSIONS

Trimble FCC ID: JUP-9414-450

fo= 460 MHz

F(MHz)	READI NG	AF	CL	AMP	HPF	TOTAL	LIMIT	MARGIN
	(dBuV)	(dB)	(dB)	(dB)	(dB)	(dBuV/ m)	(dBuV/ m)	(dB)
	<u>Pk</u>					_ <u>Pk</u>	<u>Pk</u>	<u>Pk</u>
1380	69.1	31	1.1	-35	1	67.2	75.4	-8.2
1840	67	33	1.7	-35	1	67.9	75.4	-7.5
2300	53	33	2.2	-35	1	53.7	75.4	-21.7
2760	52	34	2.7	-35	1	54.7	75.4	-20.7
3220	47.6	36	3.1	-35	1	52.6	75.4	-22.8
3680	49.7	37	3.2	-35	1	55.9	75.4	-19.5
4140	47.8	38	4.8	-35	1	56.1	75.4	-19.3
4600	32.7	39	5.2	-35	1	43.0	75.4	-32.4

NOTE: ALL READINGS ARE HORIZONTAL

AF: Antenna Factor AMP: Pre-amp gain CL: Cable loss HPF: High pass filter insertion loss (4.6GHz)

23-Dec-99 Morgan Hill, Test Site A R. Castillo

EXHIBIT 10: Data Graphs: Modulation Limiting Transient Response

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Display Mode: Normal

EXHIBIT 10: Data Graphs: Modulation Limiting Transient Response

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EXHIBIT 11: Data Sheets - Frequency Stability

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	SPEC	CIFICAT	
CUSTOMER :	NDK-A		
	ITEM MODEL CUSTOMER SPEC. NO. NDK SPEC.NO. CONTENTS ORDER NO. (NDK ON NO	: CRYSTAL OS : ENA3244A : : ENA3244A : SPECIFICATION OUT VIEW OF CRYSTAL OSC PACKING SPECIFICATION D.): TRIMBLE/SR011189	<u>SCILLATOR</u> (T35-4406A-A) (T23-1008Y-B) (T42-0021F-D) (T7120550)
	RECEIPT		RAWN : Yen Headerst
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NIHON DEMPA KOGYO CO., LTD.

[TOKYO	SALES	OFFICE	1
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EXHIBIT 11: Data Sheets - Frequency Stability