



## **RF Exposure Evaluation Report**

**FOR:**

**Model Number: 98850**

**Trimble Pro Series Receivers with high-performance GNSS integrated antenna and receiver, user-removable battery, and Bluetooth® wireless technology for connectivity with field computers.**

**FCC ID: JUP98850**

**IC ID: 1756A-98850**

**References:**

1. FCC OET Bulletin 65 Supplement C
2. FCC CFR Part 2
3. RSS-102- Radio Frequency Exposure Compliance of Radiocommunication Apparatus  
Issue 4 March 2010

**1 Administrative Data****1.1 Identification of the Testing Laboratory Issuing the Test Report**

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<b>Test Lab Director:</b>	Heiko Strehlow
<b>Responsible Project Leader:</b>	Sajay Jose

**1.2 Identification of the Client**

<b>Applicant's Name:</b>	Trimble Navigation New Zealand
<b>Street Address:</b>	11 Birmingham Drive P.O. Box 8729
<b>City/Zip Code</b>	Christchurch
<b>Country</b>	New Zealand
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**1.3 Identification of the Manufacturer**

Same as above.

**2 Equipment under Test (EUT)****2.1 Specification of the Equipment under Test**

<b>Model No:</b>	98850
<b>HW Revision/ SW Revision:</b>	98850-XX / 98850-0X 00, [Build 1.0.X]
<b>FCC-ID/ IC-ID:</b>	JUP98850 / 1756A-98850
<b>Product Description:</b>	Trimble Pro Series Receivers with high-performance GNSS integrated antenna and receiver, user-removable battery, and Bluetooth® wireless technology for connectivity with field computers.
<b>Frequency Range:</b>	Bluetooth: 2402 - 2480 MHz
<b>Antenna Type and Gain: (As stated by manufacturer)</b>	Reported Antenna gain at: 2402 MHz: 0.7dBi 2441 MHz: 1.7dBi 2481 MHz: 0.7dBi
<b>Co-located Transmitters/ Antennas?</b>	No
<b>Power supply:</b>	Rechargeable Lithium Ion Battery: 11.1VDC, 2.5Ah
<b>Operating temperature range:</b>	-20°C to +60°C
<b>Prototype / Production unit:</b>	Production
<b>Device Category:</b>	<input checked="" type="checkbox"/> Fixed Installation <input type="checkbox"/> Mobile <input checked="" type="checkbox"/> Portable
<b>Exposure Category:</b>	<input type="checkbox"/> Occupational/ Controlled <input checked="" type="checkbox"/> General Population/ Uncontrolled

### 3 Assessment

**This report serves as the Technical Information regarding RF Exposure evaluation against the requirements in 47 CFR 2.1091 and as the RF Exposure Technical Brief according to RSS-102 Ch. 2.2.**

**The following device has been evaluated and meets/is exempt from the RF Exposure Limits defined in 47 CFR 1.310 and RSS-102 Issue 4 Ch. 4.**

Company	Description	Model #
Trimble Navigation	Trimble Pro Series Receivers with high-performance GNSS integrated antenna and receiver, user-removable battery, and Bluetooth® wireless technology for connectivity with field computers.	98850

2012-03-14	Compliance	Tunji Yusuf (EMC Engineer)	
Date	Section	Name	Signature

## 4 RF Exposure Evaluation Requirements

### 4.1 FCC:

Calculations can be made to predict RF field strength and power density levels around typical RF sources using the general equations (3) and (4) on page 19 of the following FCC document: "OET Bulletin 65, Edition 97-01 - Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields".

The table below is excerpted from Table 1B of 47 CFR 1.1310 titled Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure:

Frequency Range (MHz)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30
1500 – 100.000	1.0	30

Using the equation from page 19 of OET Bulletin 65, Edition 97-01:

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)  
P = power input to the antenna (in appropriate units, e.g., mW)  
G = power gain of the antenna in the direction of interest relative to an isotropic radiator  
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Note:

1. This device is to be used only for fixed and mobile applications.
2. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all the persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

### **Additionally, according to § 2.1091:**

The limit for <1.5 GHz mobile operations where no routine evaluation is required is: 1.5W ERP  
The limit for >1.5 GHz mobile operations where no routine evaluation is required is: 3W ERP

### 4.2 IC:

#### **RSS-102 Section 2.5.2**

RF exposure evaluation is required if the separation distance between the user and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 1.5 GHz and the maximum EIRP of the device is equal to or less than 2.5 W;
- at or above 1.5 GHz and the maximum EIRP of the device is equal to or less than 5 W.

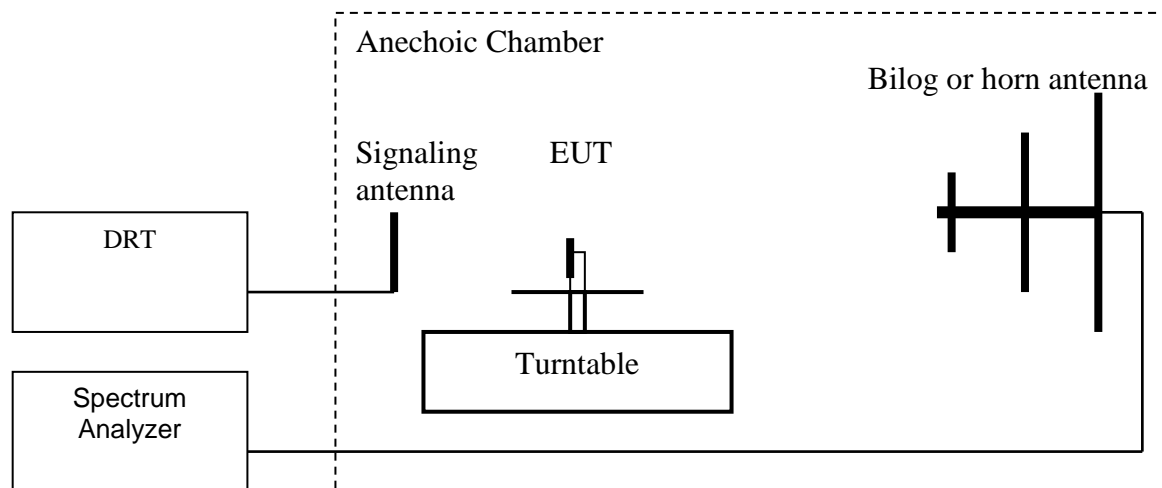
#### **RSS-102 4.2: RF Field strength limits for devices used by the General Public (Uncontrolled Environment):**

Power density

$$\begin{aligned} 300\text{MHz}- 1500 \text{ MHz} &= f/150 \text{ W/m}^2 \\ 1500 \text{ MHz}- 1500000 \text{ MHz} &= 10 \text{ W/m}^2 \end{aligned}$$

## 5 Measurement procedure:

### 5.1 Radiated power measurement- ERP/EIRP-



1. Connect the equipment as shown in the above diagram with the EUT's antenna in center of the turn table.
2. Adjust the settings of the Digital Radio Communication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to the channel frequency. Set the analyzer to measure peak hold with the required settings.
4. Rotate the EUT 360°. Record the peak level in dBm (**LVL**).
5. Replace the EUT with a vertically polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS**). **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
7. Determine the ERP using the following equation:  

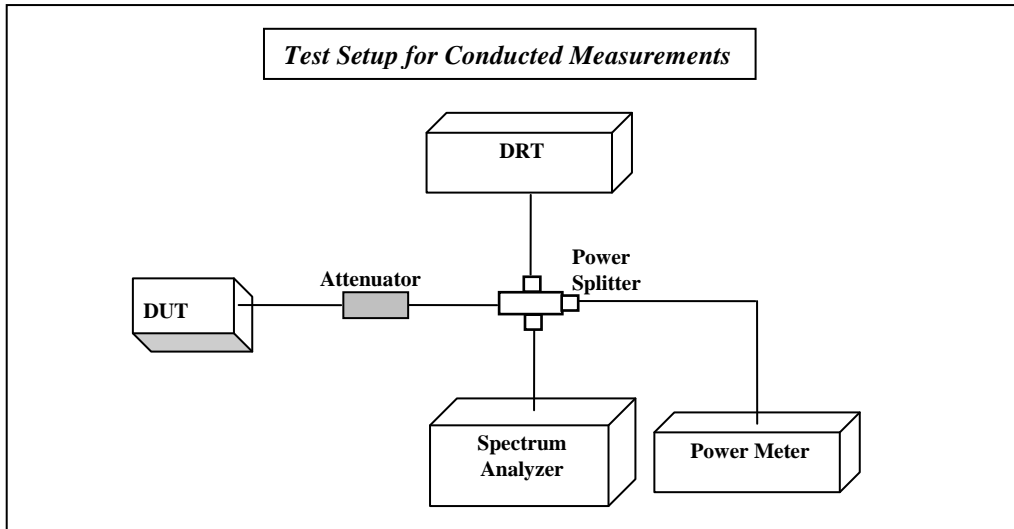
$$\mathbf{ERP} \text{ (dBm)} = \mathbf{LVL} \text{ (dBm)} + \mathbf{LOSS} \text{ (dB)}$$
8. Determine the EIRP using the following equation:  

$$\mathbf{EIRP} \text{ (dBm)} = \mathbf{ERP} \text{ (dBm)} + 2.14 \text{ (dB)}$$
9. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

Measurement uncertainty: +/-3.0 dB

(**Note:** Steps 5 and 6 above are performed prior to testing and **LOSS** is recorded by test software. Steps 3, 4, 7 and 8 above are performed with test software.)

**5.2 Radiated power Calculation- ERP/EIRP-**



1. Connect the equipment as shown in the above diagram.
2. Adjust the settings of the Digital Radio Communication Tester (DRT) to connect the EUT at the required channel (OR) alternatively use the EUT to set to transmit at a specific mode.
3. Measure conducted power using the power meter or the Spectrum Analyzer.
4. ERP/EIRP is calculated by adding the antenna gain to the measured conducted power.  
**EIRP= Measured conducted power+ Antenna Gain (dBi)**  
 (Antenna gain based on measurement or data from the antenna manufacturer.)

**ERP= EIRP- 2.14**

Measurement uncertainty: +/-0.5 dB

**5.3 Measurement Equipment information:**

Instrument/Ancillary	Model	Manufacturer	Serial No.	Cal Date	Cal Interval
Bluetooth Tester	CBT	Rohde & Schwarz	100212	May 2011	2 Years
Spectrum Analyzer	FSU	Rohde & Schwarz	200302	May 2011	2 Years
DC Power Supply	E3610A	Hewlett Packard	KR83021224	n/a	n/a
Multimeter	MM200	Klein	N/A	Apr 2011	2 Years
Temp Hum Logger	TM320	Dickson	03280063	Feb 2012	1 Year
Temp Hum Logger	TM325	Dickson	5285354	Feb 2012	1 Year

#### 5.4 Measurement Summary:

Band of operation	Peak Radiated Power- EIRP		Peak Radiated Power ERP		Procedure used for power estimation.
	dBm	W	dBm	W	
2402- 2480 MHz	-3.1	0.0005	-5.24	0.0003	Calculated acc. to 5.2

Based on the limits defined in Sec 4 of this report, this device is exempt from routine evaluation.