

## FCC IC Test Report

**Report No.:** FCC\_IC\_RF\_SL20051301-TRB-015\_Co-location Rev\_3.0

**FCC ID:** JUP-R8S (BT)  
KEAXDLM (403-473MHz)

**IC:** 1756A-R8S (BT)  
2368B-XDLM (403-473MHz )

**Test Model:** R8s with BT & UHF (450MHz)

**Series Model:** R8s

**Received Date:** 07/14/2020

**Test Date:** 07/16/2020

**Issued Date:** 08/27/2020

**Applicant:** Trimble Inc.

**Address:** 935 Stewart Drive, Sunnyvale, CA 94085, USA

**Manufacturer:** Trimble Inc.

**Address:** 935 Stewart Drive, Sunnyvale, CA 94085, USA

**Issued By:** Bureau Veritas Consumer Products Services, Inc.

**Lab Address:** 775 Montague Expressway, Milpitas, CA 95035

**Test Location (1):** 775 Montague Expressway, Milpitas, CA 95035



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any government agencies.

Table of Contents

Release Control Record .....	3
1 Certificate of Conformity .....	4
2 Summary of Test Results .....	5
2.1 Test Instruments .....	6
2.2 Measurement Uncertainty .....	7
2.3 Modification Record .....	7
3 General Information .....	8
3.1 General Description of EUT .....	8
3.2 Description of Support Units .....	9
3.2.1 Configuration of System under Test .....	10
3.3 General Description of Applied Standards .....	10
4 Test Procedure and Results .....	11
4.1 Spurious Emission .....	11
4.1.1 Limits of Spurious Emissions .....	11
4.1.2 Test Procedure .....	12
4.1.3 Deviation from Test Standard .....	13
4.1.4 Test Setup .....	13
4.1.5 EUT OPERATING CONDITIONS .....	15
4.1.6 Test Results .....	16
Appendix - Information on the Testing Laboratories .....	18

### Release Control Record

Issue No.	Description	Date Issued
FCC_IC_RF_SL20051301-TRB-015_Co-location	Original Release	07/31/2020
FCC_IC_RF_SL20051301-TRB-015_Co-location Rev_1.0	Update per customer review	08/11/2020
FCC_IC_RF_SL20051301-TRB-015_Co-location Rev_2.0	Update BT Module FCC/IC ID	08/19/2020
FCC_IC_RF_SL20051301-TRB-015_Co-location Rev_3.0	Minor Update, UHF Frequency range update	08/27/2020

## 1 Certificate of Conformity

**Product:** Smart GNSS Receiver

**Brand:** Trimble

**Test Model:** R8s with BT & UHF (450MHz)

**Series Model:** R8s

**Sample Status:** Engineering Sample

**Trimble SW app used:** UHF: CSGTestSuite

BT: Commset

**Applicant:** Trimble Inc.


**Test Date:** 07/16/2020


**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.247)

RSS 247 Issue2, RSS Gen Issue5

ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services, Inc., Milpitas Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**Prepared by :**  \_\_\_\_\_ , **Date:** 08/27/2020  
Deon Dai / Test Engineer

**Approved by :**  \_\_\_\_\_ , **Date:** 08/27/2020  
Gary Chou / Engineer Reviewer

## 2 Summary of Test Results

The EUT has been tested according to the following specifications:

47 CFR FCC Part 15, Subpart C (Section 15.247) RSS 247 Issue2, RSS Gen Issue5		
Item	Test Parameter	Results
1	Spurious Emission/ Unwanted Emissions Strength	Pass

Note: Only radiated spurious emission test in this report, for other test result please refer FCC ID: Z64-2564N & KEAXDLM test report.

## 2.1 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
EMI Receiver Rohde & Schwarz	ESW 44	100179	8/30/2019	08/30/2020
Preamplifier RF-Lambda	RAMP00M50GA	17032300047	09/19/2019	09/19/2020
Pre-Amplifier RF Bay, Inc.	LPA-6-30	11170601	04/27/2020	04/27/2021
Hybrid Antenna SUNAR	JB6	A111717	03/09/2020	03/09/2021
Horn Antenna ETS-Lindgren	3117	218554	12/20/2019	12/20/2020
Tuned Dipole Antenna 30 - 1000 MHz (4pcs set)	AD-100	40133	01/23/2020	01/23/2021

## 2.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .

Measurement	Frequency	Expanded Uncertainty ( $k=2$ ) ( $\pm$ )
Conducted Emissions at mains ports	150kHz ~ 30MHz	3.51dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	3.73dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	4.64dB
	6GHz ~ 18GHz	4.82dB
	18GHz ~ 40GHz	4.91dB

## 2.3 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

Product	Smart GNSS Receiver
Brand	Trimble
Test Model	R8s with BT & UHF (450MHz)
Identification No. of EUT	N/A
Series Model	R8s
Status of EUT	Engineering sample
Nominal Voltage	10.5V DC - 28V DC
External Adapter input	100-240VAC, 1.2A, 50-60Hz
Temperature Operating Range	-40°C~+65°C
Modulation Type	UHF:GMSK, 4FSK Bluetooth:GFSK, $\pi$ /4DQPSK, 8DPSK
Operating Frequency	UHF:403 MHz~473 MHz Bluetooth: 2402~2480 MHz
Antenna Type	UHF: Monopole Antenna Bluetooth: Monopole Antenna
Antenna Gain (dBi)	UHF: -2 dBi Bluetooth: -4.6 dBi

Note:

1. The EUT uses following adapter.

Brand	TECH
Model	ATS065T-A190
Input Power	100-240V, 50-60Hz, 1.4A Max
Output Power	19Vdc; 3.43A
Power Line	1.2m

2. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.



### 3.2 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	Lenovo	E430	MP-3B3NA	N/A	Provided by Customer
B.						
C.						
D.						
E.						
F.						

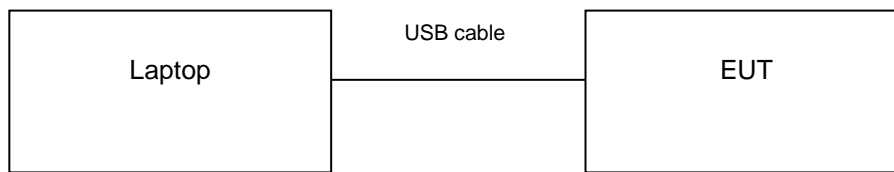
Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items E-F acted as communication partners to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RS232 to USB	2	1	N	0	Connected from EUT to laptop
2.						
3.						
4.						
5.						
6.						

Note: The core(s) is(are) originally attached to the cable(s).

### 3.2.1 Configuration of System under Test



### 3.3 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standard:

**47 CFR FCC Part 15, Subpart C (Section 15.247)**  
**ANSI C63.10: 2013**  
**FCC Part 90**

All test items have been performed and recorded as per the above standard.

## 4 Test Procedure and Results

### 4.1 Spurious Emission

#### 4.1.1 Limits of Spurious Emissions

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB (power peak measurement) or 30dB (power Ave.measurement) below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

#### 4.1.2 Test Procedure

Measurement Method	
<input type="checkbox"/> Conducted measurement	<input checked="" type="checkbox"/> Radiated measurement

##### For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

##### NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

##### For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

##### Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or 10Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.

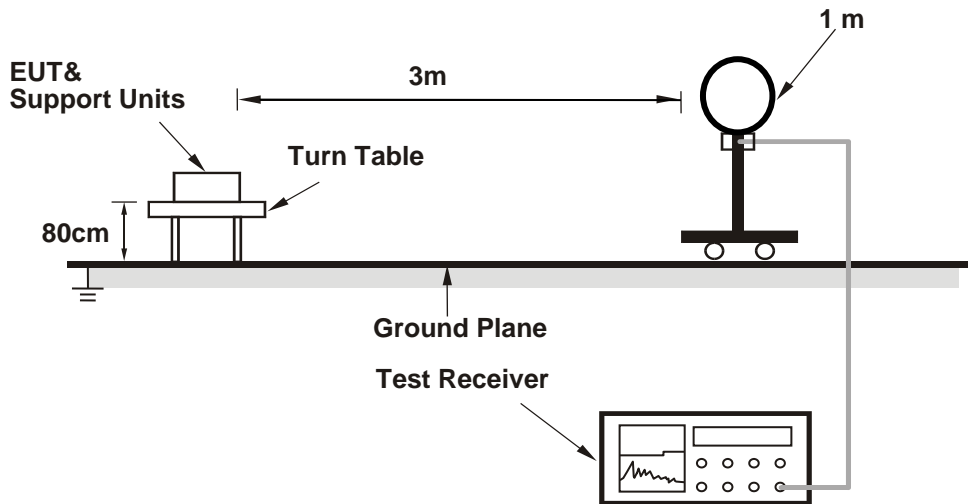
4. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.3 Deviation from Test Standard

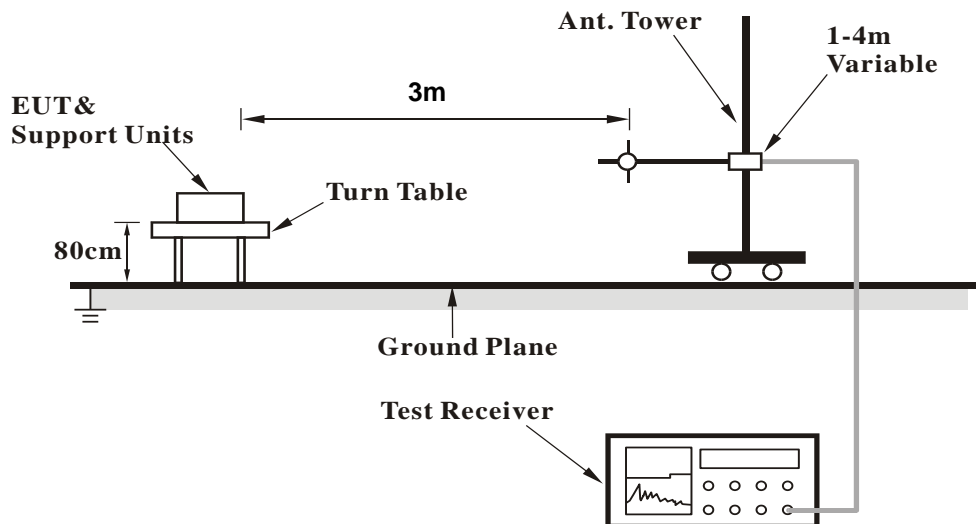
No deviation.

#### 4.1.4 Test Setup

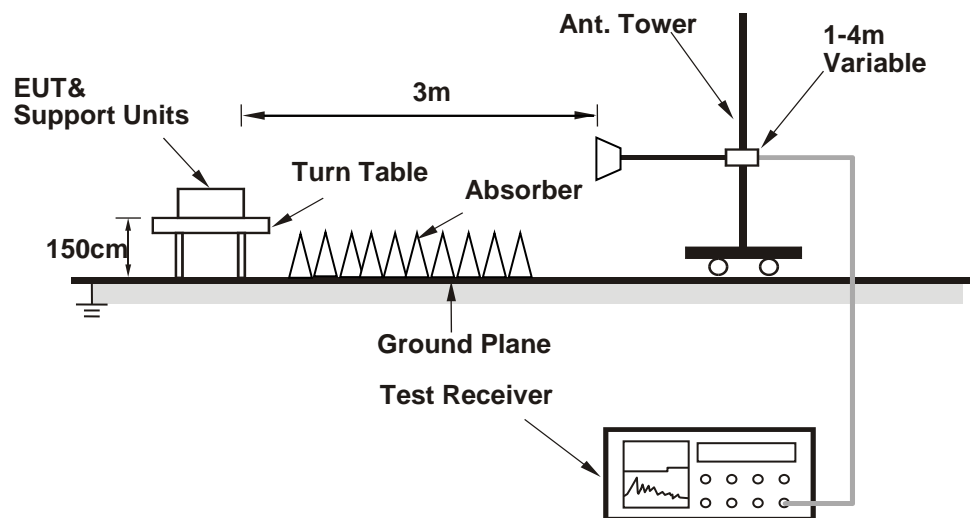
##### For Radiated emission below 30MHz



##### For Radiated emission 30MHz to 1GHz



### For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.1.5 EUT OPERATING CONDITIONS

- a. Placed the EUT on the testing table.
- b. Prepared notebooks to act as communication partner and placed it outside of testing area.
- c. The communication partner connected with EUT via a USB cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- d. The necessary accessories enable the system in full functions.

### 4.1.6 Test Results

#### Radiated Test

#### BELOW 1GHz WORST-CASE DATA:

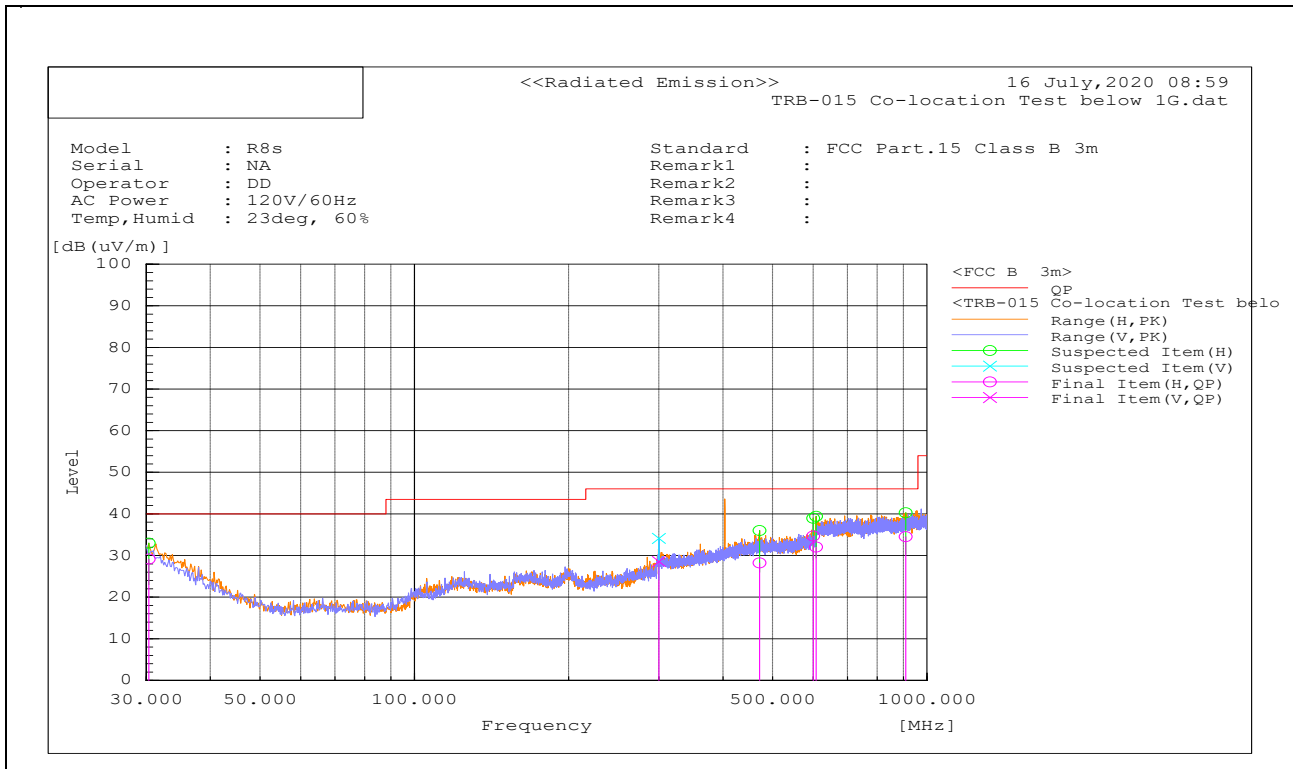
<b>CHANNEL</b>	900MHz/BLE transmit simultaneous mode	<b>DETECTOR FUNCTION</b>	Quasi Peak
<b>FREQUENCY RANGE</b>	30MHz – 1GHz		

#### Antenna Polarity & Test Distance: Vertical and Horizontal at 3m

No.	Frequency (MHz)	Polarization (H/V)	Reading QP [dB(uV)]	Factor [dB(1/m)]	Level QP [dB(uV/m)]	Limit\QP dB(uV/m)	Margin QP [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	30.323	H	2.5	26.7	29.2	40	-10.8	100	211	Pass
2	299.983	V	8	20.6	28.6	46	-17.4	244	78	Pass
3	471.35	H	2.8	25.4	28.2	46	-17.8	306	83.7	Pass
4	600.037	H	7.3	27.4	34.7	46	-11.3	256	252	Pass
5	607.635	H	4.6	27.4	32	46	-14	362	128	Pass
6	908.658	H	3.3	31.2	34.5	46	-11.5	281	297	Pass

#### REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value (dBuV/m)





**Above 1GHz Test Data:**

**Above 1GHz-26.5GHz – Co-location**

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK dB(uV/m)	Limit AV dB(uV/m)	Limit PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	1135.39	V	44.1	57.3	-15	29.1	42.3	54	74	-24.9	-31.7	198	335	Pass
2	2529.653	H	42.7	55.9	-9.3	33.4	46.6	54	74	-20.6	-27.4	144	181	Pass
3	4803.086	H	40.8	54.5	-5.9	34.9	48.6	54	74	-19.1	-25.4	137	123	Pass
4	5744.117	V	38.9	52.7	-4.3	34.6	48.4	54	74	-19.4	-25.6	315	285	Pass
5	16811.12	H	33.5	46.8	11.5	45	58.3	54	74	-9	-15.7	201	212	Pass
6	17490.72	V	33.1	46.6	12.3	45.4	58.9	54	74	-8.6	-15.1	219	324	Pass

**REMARKS:**

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value (dBuV/m)

## Appendix - Information on the Testing Laboratories

Bureau Veritas is a global leader in testing, inspection and certification (TIC) services. We help businesses improve safety, sustainability and productivity; and our clients include the majority of leading brands in retail, manufacturing and other industries. With a presence in every major country around the world, our quality assurance and compliance solutions are vital in helping our customers enhance product quality and concept-to-consumer journeys. We also assist with increasing speed to market, profitability and brand equity throughout the supply chain. Bureau Veritas is a leading wireless/IoT testing, inspection, audit and certification provider, with a global network of test laboratories to support the IoT industry in areas of connectivity, security, interoperability as well as quality, health & safety, and environmental/chemical requirements.

If you have any comments, please feel free to contact us at the following:

**Milpitas EMC/RF/Safety/Telecom Lab**

775 Montague Expressway, Milpitas, CA 95035  
Tel: +1 408 526 1188

**Sunnyvale OTA/Bluetooth Lab**

1293 Anvilwood Avenue, Sunnyvale, CA 94089  
Tel: +1 669 600 5293

**Littleton EMC/RF/Safety/Environmental Lab**

1 Distribution Center Cir #1, Littleton, MA 01460  
Tel: +1 978 486 8880

**Email:** [sales.eaw@us.bureauveritas.com](mailto:sales.eaw@us.bureauveritas.com)

**Web Site:** [www.cpsusa-bureauveritas.com](http://www.cpsusa-bureauveritas.com)

The address and road map of all our labs can be found in our web site also.

--- END ---