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Mr. Laurence Borst
Ingersoll Rand
1467 Rt. 31 South
Annandale NJ, 08801

Ph: (908) 238-7236
Fx: N/A
email: lborst@irco.com

Subject: Low Duty Cycle RF Exposure Analysis of the Viper Tool with CEL Radio PCB

Ingersoll Rand (IR) is integrating a pre-approved 2.4 GHz Zigbee radio module, FCC ID: W7Z-FSTARPRO, manufactured by California Eastern Laboratories (CEL), into a handheld portable tool, shown here.

The grant of authorization for FCC ID: W7Z-FSTARPRO is modular, restricted to Mobile applications, and lists a conducted output power of 116 mW (20.66 dBm) into a -1.03 dB gain PCB inverted F antenna, yielding an EIRP of 19.63 dBm or 91.8 mW peak. The conducted output power is used for RF exposure purposes.

Zigbee radios operated under 47CFR FCC Part 15 Subpart C 15.247 are subject to routine RF exposure evaluation per 15.247 paragraph (i) when the average power exceeds the 60/f exemption threshold of 25 mW. The usage type for this device would be “General Population/Uncontrolled” therefore the averaging time allowed for RF exposure is 6 minutes maximum.

Ingersoll Rand has provided a detailed analysis of the worst case duty cycle as an attestation. The worst case involves 1200 end of run (EOR) events at 500ms intervals, with each end of run event consisting of one initial transmission followed by 3 retries before moving on to the next end of run event. The duty cycle is calculated to be 2.896%, based on this worst case pulse train consisting of the four 3.62 ms pulses within the repetitive period of 500ms for each EOR. The 500 ms average is taken to be the same as the 6 minute average due to the repetitive nature of the signal over a period longer than 6 minutes.

Given a duty cycle of 2.896%, the average EIRP for RF exposure purposes would be 3.36 mW or 5.26 dBm EIRP. This is well below the 25 mW exemption threshold, therefore it is expected that the FCC ID: W7Z-FSTARPRO module complies with the RF exposure requirements in this specific portable configuration.

Completed by:	Nicholas Abbondante	Reviewed by:	Vathana F. Ven
Title:	Transmitter Staff Engineer	Title:	Senior Project Engineer
Signature:		Signature	
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Intertek Testing Services NA, Inc.
70 Codman Hill Road, Boxborough, MA 01719
Telephone: 978-263-2662 Fax: 978-263-7086 Web: www.intertek-etlsemko.com