May 25, 2023

TUV SUD America CB
10 Centennial Drive FL2
Peabody, MA 01960

Attention: Director of Certification

RE: Analysis of RF Exposure per D01 44749 General RF Exposure Guidance v07 and RSS-102 Issue 5 March 2015.

FCC ID: 2BAOV40256201
ISED Certification Number IC: 30354-40256201

1. General Information:

Applicant:	Progress Rail, a caterpillar Company
Environment:	General Population/Uncontrolled Exposure
Exposure Conditions:	Mobile

2. Technical Information:

Minimum Test Separation Distance:	20 cm
Operating Frequency:	24.160 GHz ± 0.015 GHz
Antenna Type:	Integral
Antenna Gain:	N/A
Maximum Transmitter Conducted Power:	N/A
Maximum Transmitter EIRP:	23.31 dBm

3. 47 CFR 1.1307(b)(3)(i)(C) MPE-Based Exemption ERP (W):

Technical Parameters	EUT
λ / 2π (m)	0.002
R≥ λ / 2π	YES
Maximum (Source-Based) Time-Averaged ERP (W)	0.1307
ERP Threshold (W)	0.7680
Exemption	**YES**
Contribution Ratio (ERP / ERP_{th})	0.170

Distance to Limit (cm)*	8.25

* *Shows R= λ / 2π for R< λ / 2π. Further adjustment of distance may be needed based on power threshold when distance is set to R.*

4. *ISED Limits:*

Limits for Devices Used by the General Public (Uncontrolled Environment (RSS-102 Issue 5 March 2015)

Frequency Range (MHz)	Electric Field Strength (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003 - 10^{21}	83	90	-	Instantaneous
0.1 - 10	-	0.73/f	-	6**
1.1 - 10	$87/f^{0.5}$	-	-	6**
10 - 20	27.46	0.0728	2	6
20 - 48	$-58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48 - 300	22.06	0.05852	1.291	6
300 - 6000	$3.142\ f^{0.3417}$	$0.008335\ f^{0.3417}$	$0.02619\ f^{0.6834}$	6
6000 - 15000	61.4	0.163	10	6
15000 - 150000	61.4	0.163	10	$616000/f^{1.2}$
150000 - 300000	$0.158f^{0.5}$	$4.21 \times 10^{-4}\ f^{0.5}$	$6.67 \times 10^{-5}\ f$	$616000/f^{1.2}$

f is frequency in MHz
**Based on nerve stimulation (NS)*
*** Based on specific absorption rate (SAR)*

5. *ISED Mobile MPE Calculation using a 20cm separation distance:*

Using Power Density formula:

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

where: S = power density
P = power input to the antenna
G = power gain of the antenna in the direction of interest relative to isotropic
R = distance to the center of radiation of the antenna

Measured Field Strength (3 meters) - Radiated:	118.54	(dBµV/m)
Maximum peak output power - Radiated:	214.345	(mW)
Antenna gain(typical):	0.00	(dBi)
Maximum antenna gain:	1.00	(numeric)
Prediction distance:	20	(cm)

Prediction frequency:	24160.0	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1.000	(mW/cm^2)
Power density at prediction frequency:	0.00128	(mW/cm^2)
Power density at prediction frequency:	0.04264	(mW/m^2)
Margin of Compliance:	-13.70	(dB)

Sincerely,

Ferdie S. Custodio
Name
Authorized Signatory
Title: Senior EMC Test Engineer /Wireless Team Lead