RF Exposure Estimation

1. Introduction

Applicant:	Rollease Acmeda Inc
Address:	7th Floor / 750 East Main Street, Stamford, CT 06902, USA
Product:	DC 2.0Nm ARC Motor
FCC ID:	2AGGZ003B9ACA44
IC:	21769-003B9ACA44
Model No.:	MT01-1228-069002-A, MT01-1228-069003-A
Reference RF report #	709502211928-00A

2. B.2 Blanket 1 mW Blanket Exemption

The 1 mW Blanket Exemption of § 1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance. The 1 mW blanket exemption applies at separation distances less than 0.5 cm, including where there is no separation. This exemption shall not be used in conjunction with other exemption criteria other than those for multiple RF sources in paragraph § 1.1307(b)(3)(ii)(A). The 1 mW exemption is independent of service type and covers the full range of 100 kHz to 100 GHz, but it shall not be used in conjunction with other exemption criteria or in devices with higher-power transmitters operating in the same time-averaging period. Exposure from such higher-power transmitters would invalidate the underlying assumption that exposure from the lower-power transmitter is the only contributor to SAR in the relevant volume of tissue.

3. RF Exposure Evaluation

Per the test report included herein, for 433.925MHz

According to ANSI C63.10-2013 (9.5 Equations to calculate EIRP),

Calculate the EIRP from the radiated field strength in the far field using Equation (22):

$$\mathrm{EIRP} = E_{\mathrm{Meas}} + 20\log\left(d_{\mathrm{Meas}}\right) - 104.7 \qquad (22)$$

where

EIRP	is the equivalent isotropically radiated power, in dBm
E_{Meas}	is the field strength of the emission at the measurement distance, in dBµV/m
d_{Meas}	is the measurement distance, in m

NOTE—Because this equation yields the identical result whether the field strength is extrapolated using the default 20 dB/decade of distance extrapolation factor, or the field strength is not extrapolated for distance, this equation can generally be applied directly (with no further correction) to determine EIRP. In some cases, a different distance correction factor may be required; see 9.1.

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Frequency (MHz)	Max. Field Strength (dBuV/m)@3m	Max. Output Power (dBm)	Max. Output Power (mW)	Min. test separation distance (mm)
433.925	83.48(Note 1)	-11.68(Note 2)	0.068 (Note 3)	5mm

Note: 1. Field Strength (dBuV/m@3m) test result please refer to test report 709502211928-00A.
2. Output power (dBm) = Field Strength (dBuV/m)@3m + 20log(Distance=3meter) – 104.7.
3. Output power (mW) = 10^ (Max power (dBm)/10)

We used the maximum ERP/EIRP to perform RF exposure exemption evaluation.

	Evaluation method	Exempt Limit (mW)	Verdict
■	Blanket 1 mW Blanket Exemption	1mW	Yes
☐	MPE-based Exemption (ERP)	7mW (ERP)	N/A
☐	SAR-based Exemption (Pth)	3060mW	N/A

So, the device is qualified for SAR test exemption, the exemption report is in lieu of the SAR report.

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Innovation, Science and Economic Development Canada (ISED) MPE / Health Hazard Requirement for the 433.925MHz

According to Innovation, Science and Economic Development Canada (ISED) RSS-102 Issue 5, Section 2.5.1, SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1.

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance[4,5]

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

RESULTS

Per the test report included herein, for 433.925MHz

According to RSS-GEN (6.12 Transmitter output power),

If the antenna is not detachable, field strength measurements shall be made using a test site that complies with the appropriate normative reference.

The following formula[Notes 1,2] may be used to convert measured electric field strength (FS), in Volts/metre, to transmitter output power delivered to the antenna (TP), in Watts:

$$TP = \frac{(FS \times D)^2}{30 \times G}$$

where D is the distance in metres between the measurement antenna and the transmit antenna (of the EUT) and G is the numerical gain of the transmit antenna, referenced to isotropic gain, in dBi.

Note 1: When performing radiated measurements on an open area test site or alternative test site, the influence of the metal ground plane on the maximum field strength value should be considered before calculating TP.

Note 2: The above formula is only valid if the measurement is performed under far-field conditions.

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Frequency (MHz)	Max. Field Strength (dBuV/m)@3m	Antenna Gain (dBi)	Maximum Antenna Gain (numeric)	Max. Output Power (mW)	Min. test separation distance (mm)
433.925	83.48(Note 1)	0.5	1.12	0.060 (Note 3)	5mm

Note: 1. Field Strength (dBuV/m@3m) test result please refer to test report 709502211928-00A.

2. Output power (dBm) = $\frac{(FS \times D)^2}{30 \times G}$

where D is the distance in metres between the measurement antenna and the transmit antenna (of the EUT) and G is the numerical gain of the transmit antenna, referenced to isotropic gain, in dBi.

3. Output power (mW) = 10^ (Max power (dBm)/10)

EIRP (PK) = 0.060mW < 52 mW (At separation distance of ≤5 mm)

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Date: Dec. 02, 2022	Date: Dec. 02, 2022	Date: Dec. 02, 2022

----------End of Test Report----------

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