



Radio Frequency Exposure Evaluation Report

For:

Roadrunner Recycling, Inc.

Model Number:

C01

Product Description:

Compactor Camera

FCC ID: 2BEZ8-C01

Applied Rules and Standards:

CFR Part Part1 (1.1307 &1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General RF Exposure Guidance v06

Report number: EMC_COMPO_028_24001_RF_Exposure

DATE: 2024-10-07



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1 **Assessment**

This RF Exposure evaluation report provides evidence for compliance of the below identified device with the RF Exposure limits for mobile devices as defined in FCC CFR Part 1 (1.1307 &1.1310), Part 2 (2.1091) and ISED standard RSS-102 issue 6 under worst case conditions (measured or rated RF output power, antenna gain, distance towards human body, multiple transmitter information as presented by the applicant).
In addition, maximum antenna gain or minimum distance towards the human body is calculated respectively, where relevant.

The device meets the limits as stipulated by the above given FCC and ISED rule parts based on available specifications for worst-case conditions at 20 cm distance to the body.

Company	Description	Module Model #
Roadrunner Recycling, Inc.	Compactor Camera	C01

Responsible for the Report:

		Art Thammanavarat	
2024-10-07	Compliance	(Senior EMC Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section3.
CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
EMC Lab Manager:	Alvin, Ilarina
Responsible Project Leader:	Akanksha Baskaran

2.2 Identification of the Client

Client Firm/Name:	Roadrunner Recycling, Inc
Street Address:	40 Boardman Place
City/Zip Code	San Francisco California 94103
Country	United States

2.3 Identification of the Manufacturer

Manufacturer's Name:	All Quality & Services, Inc
Manufacturers Address:	47817 Fremont Blvd
City/Zip Code	Fremont, CA 94538
Country	United States

3 Equipment under Assessment

EUT Specifications

Model No:	C01
Marketing Name:	Compactor Camera
HW Version:	revD
SW Version:	anvil-001a
Contain FCC-ID:	2BEZ8-C01
Product Description:	Compactor Camera
Frequency Range / number of channels (All Radios)	FCC BANDS LTE-Band 2: 1850 – 1910 MHz LTE-Band 4: 1710 – 1755 MHz LTE-Band 12: 699 – 716 MHz
Modes of Operation / Type(s) of Modulation (All Radios):	Module: U-blox SARA-R510M8S (LTE-M) FCC ID: XPYUBX19KM01; IC: 8595A-UBX19KM01. 4G: FDD LTE Bands 2, 4,12
Antenna Information ^{as} MFG:2J declared:	Name: 2J Type: 4G Cellular Connector Surface Mount Location: Internal Peak Gain: • LTE-Band 2: 4.1 dBi • LTE-Band 4: 4.1 dBi • LTE-Band 12: 1.2 dBi
Max. Peak Output Power ^{(All} LTE Radios):	LTE power class 3 (23 dBm)
Power Supply/ Rated Operating Voltage Range:	3.6VDC nominal input
Operating Temperature Range	-30C - 75C
Sample Revision:	☐ Production Unit; ☒ Pre-Production
Product dimensions [mm]:	23cm x 9.4cm x 8cm
Weight (g)	574g
EUT Diameter	23cm
Note: The information of the EUT specifications in the table above is provided by the client.	

4 RF Exposure Limits and FCC Basic Rules

FCC

4.1.1 § 2.1093(c)(1)

Evaluation of compliance with the exposure limits in § 1.1310 of this chapter, and preparation of an EA if the limits are exceeded, is necessary for mobile devices with single RF sources having either more than an available maximum time-averaged power of 1 mW or more than the ERP listed in Table 1 to § 1.1307(b)(3)(i)(C), whichever is greater. For mobile devices not exempt by § 1.1307(b)(3)(i)(C) at distances from 20 centimeters to 40 centimeters and frequencies from 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in § 1.1310 of this chapter is necessary if the ERP of the device is greater than ERP_{20cm} in the formula below. If the ERP of a single RF source at distances from 20 centimeters to 40 centimeters and frequencies from 0.3 GHz to 6 GHz is not easily obtained, then the available maximum time-averaged power may be used (i.e., without consideration of ERP) in comparison with the following formula only if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

$$P_{th}(\text{mW}) = ERP_{20\text{ cm}}(\text{mW}) = \begin{cases} 2040f & 0.3\text{ GHz} \leq f < 1.5\text{ GHz} \\ 3060 & 1.5\text{ GHz} \leq f \leq 6\text{ GHz} \end{cases}$$

4.1.2 § 2.1093(c)(2)

For multiple mobile or portable RF sources within a device operating in the same time averaging period, routine environmental evaluation is required if the formula in § 1.1307(b)(3)(ii)(B) of this chapter is applied to determine the exemption ratio and the result is greater than 1.

4.1.3 § 1.1307(b)(3)(ii)(B)

in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

5 Evaluations

5.1 Analysis of RF Exposure

Duty Cycle

The table below illustrates the highest possible duty cycle for each type of radio during operation.

Mode	Duty Cycle	Duty Cycle Correction [dBm]
LTE	1:1	0

5.2 FCC RF Exposure (Standalone)

Radio	Tech-Band	Freq-Low _[GHz]	Pwr _[dBm]	Power _[W]	Ant-G _[dBi]	EIRP _[W]	ERP _[W]	ERP _[mW]	Threshold ERP _[W]	ERP < Threshold ERP _[W]	FCC 2.1093(c)(1) Pth _[mW] = ERP _{20cm}
Cellular	LTE 2	1.8550	22.67	0.185	4.10	0.475	0.290	289.73	0.77	Yes	3060.00
	LTE 4	1.7150	23.17	0.207	4.10	0.533	0.325	325.09	0.77	Yes	3060.00
	LTE 12	0.7040	22.21	0.166	1.20	0.219	0.134	133.66	0.36	Yes	1436.16

Conclusion:

- The maximum RF emissions from this equipment fulfills the RF exclusion threshold limits for separation distance between the antenna and the human body greater than 20 cm. No RF Exposure evaluation is required.

6 Revision History

Date	Report Name	Changes to report	Report prepared by
2024-10-07	EMC_COMPO_028_24001_RF_Exposure	Initial Version	Art Thammanavarat

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