Radio Frequency Exposure Evaluation Report

FOR:
Compology

Model:
R13S

Product Description:
Wireless container monitor.

FCC ID: 2AO44-R13
IC: 23661-R13

Per:
CFR Part Part1 (1.1307 &1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General RF Exposure Guidance v06
ISEDC RSS-102 Issue 5

Report number: EMC_COMPO_023_22001_FCC_ISED_MPE_Rev1

DATE: 2023-01-03

***CETECOM* Inc.**
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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 IC standard RSS-102 issue 5 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 IC rule parts based on available specifications for worst case conditions at 20cm distance to the body.

Company	Description	Model #
Compology	Wireless container monitor.	R13S

Report reviewed by: TCB Evaluator

Date	Section	Name	Signature
2023-01-03	Compliance	Arndt Stoecker (Director of Regulatory Services)	Arndt Stoecker Digitally signed by: Arndt Stoecker DN: CN = Arndt Stoecker email = arndt.stoecker@cetecom.com C = US O = CETECOM Inc Date: 2023.01.03 15:11:29 -08'00'

Responsible for the Report:

Date	Section	Name	Signature
2023-01-03	Compliance	Cheng Song (EMC Engineer)	cheng.song@cetecom.com Digitally signed by: cheng.song@cetecom.com DN: CN = cheng.song@cetecom.com Date: 2023.01.03 09:31:19 -08'00'

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the 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
Lab Manager:	Arndt Stoecker
Responsible Project Leader:	Akanksha Baskaran

2.2 Identification of the Client / Manufacturer

Client's Name:	Compology
Street Address:	40 Boardman Place
City/Zip Code	San Francisco CA 94103
Country	USA

Identification of the Manufacturer

Manufacturer's Name:	Same as Client
Manufacturers Address:	
City/Zip Code	
Country	

3 Equipment under Assessment

Model No:	R13S
HW Version :	RevE
SW Version :	oscar-C365
FCC-ID :	2AO44-R13
IC:	23661-R13
PMN:	R13S
Product Description:	Wireless container monitor.
Radio Information:	**Bluetooth LE:** • Module: STmicro BLUENRG-232 • BLE Radio Version 4.0
Antenna Information:	Max gain 1.3 dBi
Power Supply/ Rated Operating Voltage Range:	Vmin: 2.5 VDC/ Vnom: 3.67 VDC / Vmax: 3.9 VDC
Operating Temperature Range	-40 ºC to 85 ºC
Sample Revision	☐Prototype Unit; ☐Production Unit; ■Pre-Production

4 RF Exposure Limits and FCC and IC Basic Rules

For the specific described radio apparatus the following basic limits and rules apply for both, FCC and IC where not indicated differently.

4.1 Power Density Limits acc. to FCC 1.1310(e) / RSS-102 i5, cl. 4:

FCC

Frequency Range (MHz)	Power density (mW/cm²)	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30
1500 – 100000	1.0	30

IC

Frequency Range (MHz)	Power density (W/m²)	Averaging time (minutes)
300 – 6000	0.02619 x f (MHz) $^{0.6834}$	6

4.2 Routine Environmental Evaluation Categorical Exclusion Limits acc. to FCC 2.1091(c) / RSS-102, cl. 2.5 (rounded to 1 decimal point):

FCC
operating frequency < 1.5GHz: excluded if ERP < 1.5W / 31.8dBm (EIRP: 33.9 dBm);
operating frequency > 1.5GHz: excluded if ERP < 3.0W / 34.8dBm (EIRP: 36.9 dBm);

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

IC
300MHz < = operating frequency < 6 GHz: excluded if EIRP < 0.0131 x f (MHz) $^{0.6834}$ W

4.3 RF Exposure Estimation (MPE Estimation)

Having available the source based average output power and peak antenna gain or the ERP/EIRP of the specified device and for a known minimum distance of its radiating structures from the body of persons according to its use cases (at least 20cm) the power density at that distance can be estimated by the following formula for plane-wave equivalent conditions (far-field conditions), when ground reflection is neglected.

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

where: S = power density (mW/cm² or W/m²)
P = power input to the antenna (mW or W)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna (cm or m)

5 Evaluations

5.1 Analysis of RF Exposure

- Evaluations are based on worst case power density limits for US and Canada.
- Calculations are made for 20cm.
- Evaluations are based on ERP/EIRP measured or calculated from known gain and conducted output power.

FCC:
BTLE
Operating frequency > 1.5GHz, ERP20cm Limit = 3060mW = 3.06W
Actual ERP = 0.008W < 3.06W; Excluded.

IC:
BTLE
EIRP Limit = 0.0131 x f (MHz) $^{0.6834}$ = 2.68W
Actual EIRP = 0.014W < 2.68W; Excluded.

5.2 Conclusion:

The equipment is passing RF exposure requirements for 20cm distance.

6 Revision History

Date	Report Name	Changes to report	Prepared by
2022-11-29	EMC_COMPO-023-22001_FCC_ISED_MPE	Initial Release	Cheng Song
2023-01-03	EMC_COMPO_023_22001_FCC_ISED_MPE_Rev1	Updated section 5.1 Analysis of RF Exposure.	Cheng Song

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