CFR Title 47 FCC Part 2.1091

Report Exhibit

Prepared for Hanchett Entry Systems, Inc.

This report presents the environmental impact of human exposure to radiofrequency radiation for

DR100-V3

RFID Reader Module

Prepared by

Haiyan Xu

Wireless Engineer

Approved by

Yunus Faziloglu

Wireless Manager

Issue date: Apr 13, 2023

Report No: EW0235-5 Issue 4

ACCREDITED
Cert No. 1627-01

Contents

1 Device Under Test Information

1.1 Product Information

Project Number:	W0235
Applicant Information:	Hanchett Entry Systems, Inc.
	10027 S. 51st Street, Suite 102 Phoenix AZ 85044
Test Item Description:	RFID Reader Module
Model Number:	DR100-V3
Hardware Version of DUT:	N/A
Software Version of DUT:	N/A
Separation Distance:	20cm
Exposure Category of DUT:	Mobile
Multiple Simultaneous RF Sources:	Yes
Type of Test:	FCC RF Exposure Exemption Evaluation
Test Method:	CFR Title 47 FCC Part 1.1307(b)(3)
Deviations from Standard:	None
Sample Receipt Date:	Jul 1, 2022
Evaluation Date:	Jan 10, 2023

1.2 Technical Information

Radio A, Zigbee	
FCC ID:	VC3-DR100V3
Exposure Category of Transmitter:	Mobile
Maximum Conducted Output Power (dBm):	3.4
Maximum Tune-up Tolerance (dB):	N/A
Maximum Antenna Gain (dBi):	2.9

Radio B, BLE – from Intertek Report No. 1516281STO-002, Ed. 1	
FCC ID:	Y88-MBM1CC2640
Exposure Category of Transmitter:	Mobile
Maximum Conducted Output Power (dBm):	-2.0
Maximum Tune-up Tolerance (dB):	N/A
Maximum Antenna Gain (dBi):	1.1

Radio C, 13.56MHz	
FCC ID:	VC3-DR100V3
Exposure Category of Transmitter:	Mobile

Maximum radiated power (dBuV/m @ 3m):	67.9
Maximum EIRP (mW):	0.00185
Maximum Tune-up Tolerance (dB):	N/A
Maximum Antenna Gain (dBi):	N/A

Radio D, 125kHz	
FCC ID:	VC3-DR100V3
Exposure Category of Transmitter:	Mobile
Maximum radiated power (dBuV/m @ 3m):	72.4
Maximum EIRP (mW):	0.00521
Maximum Tune-up Tolerance (dB):	N/A
Maximum Antenna Gain (dBi):	N/A

2 Test Laboratory Information

Location of Test Lab:	One Distribution Center Circle #1 Littleton, MA 01460 (978) 486-8880
Key Contact:	Yunus Faziloglu Yunus.faziloglu@bureauveritas.com
Laboratory Accreditations:	BUREAU VERITAS CONSUMER PRODUCTS SERVICES, INC is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories.
ISO/IEC 17025:2017:	1627-01
FCC Test Site Number:	US1028

3 RF Exposure – Determination of Exemption – FCC Section 1.1307(b)(3)(i)

3.1 MPE-based Exemption – 1.1307(b)(3)(i)(C)

3.1.1 Zigbee:

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

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

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

Maximum peak output power at the antenna terminal:	3.40	(dBm)
Maximum peak output power at the antenna terminal:	2.187761624	(mW)
Antenna gain(typical):	2.9	(dBi)
Maximum antenna gain:	1.9498446	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2440	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm^2)
Power density at prediction frequency:	0.000849	(mW/cm^2)
Maximum allowable antenna gain:	33.61269855	(dBi)

3.1.2 BLE:

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

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

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

Maximum peak output power at the antenna terminal:	-2.00	(dBm)
Maximum peak output power at the antenna terminal:	0.630957344	(mW)
Antenna gain(typical):	1.1	(dBi)
Maximum antenna gain:	1.288249552	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2402	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm^2)
Power density at prediction frequency:	0.000162	(mW/cm^2)
Maximum allowable antenna gain:	39.01269855	(dBi)

3.1.3 13.56MHz RFID

Per 447498 D01 General RF Exposure Guidance v06 Section 4.3.1. Steps (a), (b), and (c):

For frequencies below 100 MHz and test separation distances > 50 mm and < 200 mm, the power threshold at the corresponding test separation distance at 100 MHz in step b) is multiplied by [1 + log(100/f(MHz))].
The power threshold at the corresponding test separation distance at 100 MHz in step b) is obtained from Appendix B at 190mm as 567mW.
Power threshold at 13.56MHz can be calculated as:
567(1+log(100/13.56)) = 1059mW
EIRP for 13.56MHz RFID is 0.00185mW and therefore exempt from routine evaluation.

3.1.4 125kHz RFID

Per 447498 D01 General RF Exposure Guidance v06 Section 4.3.1. Steps (a), (b), and (c):
For frequencies below 100 MHz and test separation distances > 50 mm and < 200 mm, the power threshold at the corresponding test separation distance at 100 MHz in step b) is multiplied by [1 + log(100/f(MHz))].
The power threshold at the corresponding test separation distance at 100 MHz in step b) is obtained from Appendix B at 190mm as 567mW.
Power threshold at 0.125MHz can be calculated as:
567(1+log(100/0.125)) = 2213mW
EIRP for 125kHz RFID is 0.00521mW and therefore exempt from routine evaluation.

4 Multiple Simultaneous RF Exposure – FCC Section 1.1307(b)(3)(ii)

4.1 Multiple RF Source Total Exposure Ratio Exemption – 1.1307(b)(3)(ii)(B)

There are 2 simultaneous transmission configurations in the product.
Configuration 1: Zigbee + BLE + 13.56MHz RFID
Configuration 2: Zigbee + BLE + 125kHz RFID

Per, 447498 D01 General RF Exposure Guidance v06, Section 7.2:
"*Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0, according to calculated/estimated, numerically modeled, or measured field strengths or power density.*"

Calculation / Limit Ratio for each radio:

Radio	Calculation	Limit	Calculation / Limit Ratio
Zigbee	0.000849 mW/cm^2	1 mW/cm^2	0.000849
BLE	0.000162 mW/cm^2	1 mW/cm^2	0.000162
13.56MHz RFID	0.00185 mW	1059 mW	0.00000175
125kHz RFID	0.00521 mW	2213 mW	0.00000235

Sum of Calculation / Limit Ratios for each simultaneous transmission configuration:

	Configuration 1	Configuration 2
	Calculation / Limit Ratio	Calculation / Limit Ratio
Zigbee	0.000849	0.000849
BLE	0.000162	0.000162
13.56MHz RFID	0.00000175	Not active
125kHz RFID	Not active	0.00000235
Sum	0.00101275	0.00101335
Limit	1	1
Verdict	PASS	PASS

4.1.1 Conclusion

The DR100-V3 manufactured by Hanchett Entry Systems, Inc. meets the exemption criteria for the environmental impact of human exposure to radiofrequency radiation using the calculations performed herein.

Document Revisions

Issue No.	Summary of Changes	Date Issued	Prepared by	Approved by
1	Original Release	Jan 12, 2023	HX	YF
2	To address TCB comments: Addition of RFID radios to exemption calculations	Mar 16, 2023	RMB	YF
3	To address TCB comments: RFID radio exemption calculations modified to follow KDB 447498 D01 v06 Sections 4.3.1. Steps (a), (b), and (c).	Apr 3, 2023	RMB	YF
4	To address TCB comments: Zigbee antenna gain and calculations updated	Apr 13, 2023	RMB	YF

End of Report