

TEST REPORT

Reference No. : WTD24D08191148W002
FCC ID : 2BLE2-DLZERO
Applicant..... : Digital Logic Ltd
Address..... : Nemanjina 57A, 12000 Pozarevac Serbia
Manufacturer : Digital Logic Ltd
Address..... : Nemanjina 57A, 12000 Pozarevac Serbia
Product..... : uFR Zero Series - Contactless Card Reader
Model(s). : µFR Zero Online, µFR Zero Online OEM, µFR Zero Online LITE
Standards..... : 47 CFR Part 2 §2.1091
Date of Receipt sample : 2024-08-14
Date of Test : 2024-08-14 to 2024-09-19
Date of Issue..... : 2024-11-15
Test Result..... : Pass

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

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2. Contents

	Page
1 COVER PAGE.....	1
2. CONTENTS	2
3. REVISION HISTORY	3
4. GENERAL INFORMATION.....	4
4.1. GENERAL DESCRIPTION OF E.U.T.....	4
4.2. DETAILS OF E.U.T.....	4
4.3. TEST FACILITY	5
4.4. SUBCONTRACTED.....	5
4.5. ABNORMALITIES FROM STANDARD CONDITIONS	5
5. TEST SUMMARY	6
6. RF EXPOSURE.....	7
6.1. DEFINITIONS	7
6.2. METHOD OF EVALUATION.....	7
6.3. CALCULATION FORMULA.....	8
6.4. MPE CALCULATION METHOD	8
6.5. EVALUATION RESULTS	9

3. Revision History

Test Report No.	Date of Receipt Sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTD24D08191148W002	2024-08-14	2024-08-14 to 2024-09-19	2024-11-15	Original	-	Valid

4. General Information

4.1. General Description of E.U.T.

Product:	uFR Zero Series - Contactless Card Reader
Model(s):	μFR Zero Online, μFR Zero Online OEM, μFR Zero Online LITE
Model Description:	All same except for model's name, μFR Zero Online OEM without enclosure/housing, μFR Zero Online LITE does not support ISO 15693 cards. μFR Zero Online was tested in this report.
Test Sample No.:	1-1/1
Hardware Version:	3.8
Software Version:	3.0.33

4.2. Details of E.U.T.

Operation Frequency:	13.56MHz±7kHz
Transmitted Power:	61.46dBuV/m @3m distance
Technology:	ASK
Antenna installation:	Inductive loop coil antenna
Antenna gain:	N/A

Note:

#: The antenna gain is provided by the applicant, and the applicant should be responsible for its authenticity, WALTEK lab has not verified the authenticity of its information.

Ratings:	5V _{DC} 300mA
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4.3. Test Facility

The test facility has a test site registered with the following organizations:

ISED CAB identifier: CN0013. Test Firm Registration No.: 7760A.

Waltek Testing Group Co., Ltd. Has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files.

Registration number 7760A, October 15, 2016.

FCC Designation No.: CN1201. Test Firm Registration No.: 523476.

Waltek Testing Group Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration number 523476, September 10, 2019.

4.4. Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

☐ Yes ☒ No

If Yes, list the related test items and lab information:

Test Lab: N/A

Lab address: N/A

Test items: N/A

4.5. Abnormalities from Standard Conditions

None.

5. Test Summary

Test Items	Test Requirement	Result
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	47 CFR Part 2 §2.1091	PASS

6. RF Exposure

Test Requirement: 47CFR Part 2 Subpart J Section 2.1091
 47CFR Part 1 §1.1307
 47CFR Part 1 §1.1310
 Evaluation Method: KDB 447498 D01 General RF Exposure Guidance v06

6.1. Definitions

According to § 2.1093 (b), A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the RF source's radiating structure(s) and the body of the user or nearby persons.

This device belongs to mobile device and with multiple RF sources.

6.2. Method of Evaluation

Determination of Exemption:
For single RF sources

Option A

Option A 1-mW Test Exemption

Applies to all frequencies and all distances

- Could be considered SAR-based and MPE-based exclusions
- $P < 1\text{mW}$
- Limitation—when there are simultaneously operating transmitters this exclusion only applies when all simultaneously operating transmitters meet this exemption
- Refer 1.1307(b)(3)(i)(A) and 1.1307(b)(3)(ii)(A)

Option B SAR-Based Exemption

Frequency range 300 MHz -6 GHz, $5\text{mm} \leq \text{distance} \leq 40\text{cm}$

- The maximum time-averaged power or effective radiated power (ERP), whichever is greater, $\leq P_{th}$.
- P_{th} is calculated based on separation distance d cm from transmitter to person for the device operating at f GHz.

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20\text{ cm}} (d/20\text{ cm})^x & d \leq 20\text{ cm} \\ ERP_{20\text{ cm}} & 20\text{ cm} < d \leq 40\text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20\text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

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

d = the separation distance (cm);

Option C MPE-Based Exemption

1.1307(b)(3)(i)(C): ERP is below a threshold calculated based on the distance R between the person and the antenna / radiating structure, where $R > \lambda / 2\pi$.

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$.
1.34-30	$3,450 R^2/f^2$.
30-300	$3.83 R^2$.
300-1,500	$0.0128 R^2f$.
1,500-100,000	$19.2R^2$.
Note: R in meters, f in MHz	

For multiple RF sources

According to 47CFR 1.1307(b)(3)(ii), the calculation formula is as follow:

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

6.3. Calculation formula

According to ANSI C63.10,

$$EIRP = E_{meas} + 20 \log(d_{meas}) - 104.7$$

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

6.4. MPE Calculation Method

$$S = \frac{P \times G}{4 \times \pi \times R^2}$$

S = power density (in appropriate units, e.g. mW/cm²)

P = output power to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

6.5. Evaluation Results

Single Source Transmissions

NFC

Frequency (MHz)	E (dB μ V/m)	EIRP (dBm)	EIRP (mW)	Power density (mW/cm ²)		Ratio
				Evaluated	Exposure Limit	
13.56	61.46	-33.74	0.0004227	0.000000084	0.9789	0.000000086

Note:

1. The minimum mobile separation distance R=20cm.
2. Limit refer to 47 CFR 1.1310(e)(1) table 1.
3. EIRP=0.000427<1mW, when NFC transmitting, there are simultaneously operating transmitters (WLAN or BLE). Then Option A is not applicable, MPE-based is applicable.

BLE & 2.4G WLAN

Description	Frequency GHz	Conducted Power dBm	Gain dBi	Tune-up dB	ERP mW	ERP _{th} mW	Ratio
2.4G WLAN	2.457	25.27	4.54	±1.0	734.78	3060	0.24012
BLE	2.440	10.31	4.54	±1.0	23.45	3060	0.00766

Note:

1. Option B is applicable
2. Please refer to **FCC ID: 2AC7Z-ESPS3MINI1** for the data in the above table.
3. According to the EUT characteristic, WLAN and BLE cannot transmit simultaneously.

Simultaneous Transmissions

Description	Calculation	Limit
NFC + 2.4G WLAN	0.00766372	≤1.0

Conclusion:

RF Exposure is FCC compliant.

=====End of Report=====