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5/24/2023

Starling Medical
7505 Fannin St., Ste.610
Houston, TX 77054
USA

Dear Alex Arevalos,

Enclosed is the MPE test report for testing of the Starling Medical, Urine Analyzer tested to the requirements of FCC Part 2.1091 and RSS-102 Issue 5

Thank you for using the services of Eurofins E&E North America. If you have any questions regarding these results or if MET can be of further service to you, please do feel free to contact me.

Sincerely,

Nancy LaBrecque
Documentation Department
Eurofins Electrical and Electronic Testing NA, Inc.

Reference: WIRA124547-MPE_R1

ACCREDITED
TESTING CERT #0591.06

Eurofins MET Laboratories Inc. (Eurofins E&E North America) is part of the Eurofins Electrical & Electronics (E&E) global compliance network.

RF Exposure Criteria

Test Report
Using Maximum Permissible Exposure (MPE) Calculations

for the

Starling Medical
Urine Analyzer

Tested under

FCC Part 2.1091 and RSS-102 Issue 5

Report: WIRA124547-MPE_R1

5/24/2023

Bryan Taylor, Wireless Team Lead
Electromagnetic Compatibility Lab

Nancy LaBrecque
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules Part 15.247 under normal use and maintenance.

Matthew Hinojosa
EMC Manager, Austin Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
0	3/27/2023	Initial Issue.
1	5/24/2023	Corrected typographical error in the table of contents

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
CISPR	**C**omite **I**nternational **S**pecial des **P**erturbations **R**adioelectriques (International Special Committee on Radio Interference)
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**er**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**H**er**z**
kPa	**k**ilo**Pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**H**ertz
µ**H**	**microH**enry
µ**F**	**microF**arad
µ**s**	**micros**econds
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

1.0 Requirements Summary

Page Number	Test Name	Result
11	IEC62311: 2019 MPE Limits (For General Public Exposure)	**Compliant**
12	RSS-102 Issue 5 MPE Limits (For General Public Exposure)	**Compliant**
12	FCC Part 2.1091 MPE Limits (For General Public Exposure)	**Compliant**

Table 1. Summary of Test Results

2.0 Equipment Configuration

2.1 Overview

Eurofins MET Labs was contracted by Starling Medical to perform testing on the Urine Analyzer, under Starling Medical's purchase order number 20221222.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Starling Medical Urine Analyzer.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	Urine Analyzer	
Model(s) Covered:	Urine Analyzer	
EUT Specifications:	Primary Power: 3.3 V - 3.6 V	
	Antenna Info and Gain[1]:	**BLE** Johanson Technology 2450AT18D0100001 1.5dBi **LTE** Ethertronics P822601 2.6dBi (698-960MHz) 4.4dBi (1710 – 2200MHz)
	EUT Frequency Ranges and Maximum Output Power[2]:	BLE, 2400 – 2483.5MHz, -12.03dBm
		LTE Band 2, 1850 – 1910MHz, 24.00dBm
		LTE Band 4, 1710 – 1785MHz, 24.00dBm
		LTE Band 5, 824 – 849MHz, 24.00dBm
		LTE Band 12, 699 – 716MHz, 24.00dBm
		LTE Band 13, 777 – 787MHz, 24.00dBm
		LTE Band 14, 788 – 798MHz, 24.00dBm
		LTE Band 17, 704 – 716MHz, 24.00dBm
		LTE Band 25, 1850 – 1915MHz, 24.00dBm
		LTE Band 26, 814 – 849MHz, 24.00dBm
		LTE Band 66, 1710 – 1780MHz,
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Type of Filing:	Original	
Evaluated by:	Bryan Taylor	
Report Date(s):	2/28/2023 through 3/6/2023	

Table 2. EUT Summary Table

[1] The antenna gain information was provided by Starling Medical at the time of testing.
[2] The BLE output power was taken directly from the worst case measurements from the FCC part 15C tetsing. The LTE output power was taken from the RF exposure exhibit for the integrated preapproved module (FCCID: 2ANPO00NRF9160)

2.2 Test Site

All testing was performed at Eurofins E&E North America, Austin, TX. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

2.3 References

IEC62311 Edition 2.0 (2019-04)	Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz to 300 GHz)
RSS-102: Issue 5	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
FCC Part 2.1091	Radiofrequency radiation exposure evaluation: mobile devices.

Table 3. References

2.4 Description of Test Sample

This Urine Analyzer is used to seamlessly blend into the daily bathroom routine of any user. The device attaches onto the bowl of any standard toilet where a user can deliver a urine sample into the device and the internal sensors can analyze the urine. Data representative of biophysical changes is uploaded to the patient's electronic health record for clinician access.

2.5 Modifications

2.5.1 Modifications to EUT

No modifications were made to the EUT.

2.5.2 Modifications to Test Standard

No modifications were made to the test standard.

3.0 Maximum Permissible Exposure Results

3.1 IEC62311 (ICNIRP) RF Exposure Limits

Table 7. Reference levels for general public exposure to time-varying electric and magnetic fields (unperturbed rms values).[a]

Frequency range	E-field strength ($V\ m^{-1}$)	H-field strength ($A\ m^{-1}$)	B-field (μT)	Equivalent plane wave power density S_{eq} ($W\ m^{-2}$)
up to 1 Hz	—	3.2×10^4	4×10^4	—
1–8 Hz	10,000	$3.2 \times 10^4/f^2$	$4 \times 10^4/f^2$	—
8–25 Hz	10,000	$4{,}000/f$	$5{,}000/f$	—
0.025–0.8 kHz	$250/f$	$4/f$	$5/f$	—
0.8–3 kHz	$250/f$	5	6.25	—
3–150 kHz	87	5	6.25	—
0.15–1 MHz	87	$0.73/f$	$0.92/f$	—
1–10 MHz	$87/f^{1/2}$	$0.73/f$	$0.92/f$	—
10–400 MHz	28	0.073	0.092	2
400–2,000 MHz	$1.375f^{1/2}$	$0.0037f^{1/2}$	$0.0046f^{1/2}$	$f/200$
2–300 GHz	61	0.16	0.20	10

[a] Note:
1. f as indicated in the frequency range column.
2. Provided that basic restrictions are met and adverse indirect effects can be excluded, field strength values can be exceeded.
3. For frequencies between 100 kHz and 10 GHz, S_{eq}, E^2, H^2, and B^2 are to averaged over any 6-min period.
4. For peak values at frequencies up to 100 kHz see Table 4, note 3.
5. For peak values at frequencies exceeding 100 kHz see Figs. 1 and 2. Between 100 kHz and 10 MHz, peak values for the field strengths are obtained by interpolation from the 1.5-fold peak at 100 kHz to the 32-fold peak at 10 MHz. For frequencies exceeding 10 MHz it is suggested that the peak equivalent plane wave power density, as averaged over the pulse width does not exceed 1,000 times the S_{eq} restrictions, or that the field strength does not exceed 32 times the field strength exposure levels given in the table.
6. For frequencies exceeding 10 GHz, S_{eq}, E^2, H^2, and B^2 are to be averaged over any $68/f^{1.05}$-min period (f in GHz).
7. No E-field value is provided for frequencies <1 Hz, which are effectively static electric fields. perception of surface electric charges will not occur at field strengths less than 25 kVm^{-1}. Spark discharges causing stress or annoyance should be avoided.

3.2 RSS-102 RF Exposure Limits

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003-10[21]	83	90	-	Instantaneous*
0.1-10	-	0.73/ ƒ	-	6**
1.1-10	87/ $ƒ^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ $ƒ^{0.25}$	0.1540/ $ƒ^{0.25}$	8.944/ $ƒ^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 $ƒ^{0.3417}$	0.008335 $ƒ^{0.3417}$	0.02619 $ƒ^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ $ƒ^{1.2}$
150000-300000	0.158 $ƒ^{0.5}$	4.21 x 10^{-4} $ƒ^{0.5}$	6.67 x 10^{-5} ƒ	616000/$ƒ^{1.2}$

Note: ƒ is frequency in MHz.
* Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

3.3 FCC Exposure Limits

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*(900/f^2)	<6
30-300	61.4	0.163	1.0	<6
300-1,500			f/300	<6
1,500-100,000			5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f^2)	<30
30-300	27.5	0.073	0.2	<30
300-1,500			f/1500	<30
1,500-100,000			1.0	<30

f = frequency in MHz. * = Plane-wave equivalent power density.

Test Procedure:

An MPE evaluation for was performed in order to show that the device was compliant with the general population exposure limits. The maximum power density was calculated for each transmitter band at a separation distance of 20cm using the maximum declared output power including tune up tolerance.

For each transmitter the maximum RF exposure at a 20 cm distance using the formula:

$$ConductedPower_{mW} = 10^{ConductedBwer(dBm)/10}$$

$$PowerDensity = \frac{ConductedPower_{mW} \times Ant.Gain}{4\pi \times (20_{cm})^2}$$

For transmitters that could operate simultaneously, the MPE to limit ratio for each was calculated and then summed. If the sum of the MPE to limit ratios was less than 1, that specific combination of transmitters was deemed to comply.

Test Results:

The Urine Analyzer was **compliant** with FCC Part 2.1091 and RSS-102 Issue 5. The calculated maximum power density at 20cm distance was equal to or less than the required limits for general population exposure for FCC Part 2.1091 and RSS-102 Issue 5. Additionally, the sum of the worst case for each MPE to Limit ratio is less than 1 indicating that all radios may transmit simultaneously. The Urine Analyzer can transmit with BLE and any one band of LTE simultaneously. The worst case LTE band was used for the simultaneous transmission calculations.

Test Data:

Duty Cycle	100 (%)							
Separation Dist.	20 (cm)							
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (mW/cm^2)	MPE Limit (mW/cm^2)	Margin to Limit (mW/cm^2)	MPE / Limit Ratio (for Co-Location)
BLE	2400	-12.03	-12.03	1.5	1.7609E-05	1.0000	1.0000	**1.7609E-05**
LTE Band 2	1850	24	24.00	4.4	0.1376	1.0000	0.8624	0.137635
LTE Band 4	1710	24	24.00	4.4	0.1376	1.0000	0.8624	0.137635
LTE and 5	824	24	24.00	2.6	0.0909	0.5493	0.4584	0.165537
LTE Band 12	699	24	24.00	2.6	0.0909	0.4660	0.3751	**0.195139**
LTE Band 13	777	24	24.00	2.6	0.0909	0.5180	0.4271	0.175550
LTE Band 14	788	24	24.00	2.6	0.0909	0.5253	0.4344	0.173099
LTE Band 17	704	24	24.00	2.6	0.0909	0.4693	0.3784	0.193753
LTE Band 25	1850	24	24.00	4.4	0.1376	1.0000	0.8624	0.137635
LTE Band 26	814	24	24.00	2.6	0.0909	0.5427	0.4517	0.167570
LTE Band 66	1710	24	24.00	4.4	0.1376	1.0000	0.8624	0.137635
							Sum (BLE and LTE12):	0.195157

FCC MPE Data

Duty Cycle	100 (%)							
Separation Dist.	20 (cm)							
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (W/m^2)	MPE Limit (W/m^2)	Margin to Limit (W/m^2)	MPE / Limit Ratio (for Co-Location)
BLE	2400	-12.03	-12.03	1.5	1.7609E-04	5.3478	5.3476	**3.2927E-05**
LTE Band 2	1850	24	24.00	4.4	1.3764	4.4763	3.1000	0.307475
LTE Band 4	1710	24	24.00	4.4	1.3764	4.2419	2.8656	0.324463
LTE and 5	824	24	24.00	2.6	0.9093	2.5756	1.6663	0.353061
LTE Band 12	699	24	24.00	2.6	0.9093	2.3017	1.3924	**0.395074**
LTE Band 13	777	24	24.00	2.6	0.9093	2.4743	1.5649	0.367520
LTE Band 14	788	24	24.00	2.6	0.9093	2.4982	1.5888	0.364006
LTE Band 17	704	24	24.00	2.6	0.9093	2.3130	1.4036	0.393155
LTE Band 25	1850	24	24.00	4.4	1.3764	4.4763	3.1000	0.307475
LTE Band 26	814	24	24.00	2.6	0.9093	2.5542	1.6449	0.356020
LTE Band 66	1710	24	24.00	4.4	1.3764	4.2419	2.8656	0.324463
							Sum (BLE and LTE12):	0.395107

ISED MPE Data

Test Engineer(s): Bryan Taylor

Test Date(s): 2/28/2023 through 3/6/2023