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47 CFR PART 2.1091

RADIOFREQUENCY RADIATION EXPOSURE EVALUATION: MOBILE DEVICES

REPORT NUMBER: M2011022-11 V2

STANDARD: 47 CFR § 2.1091

CLIENT: THERMO FISHER SCIENTIFIC AUSTRALIA PTY LTD

DEVICE: GAS LOGGER

MODEL: G20 RTX

DATE OF ISSUE: 14 DECEMBER 2021

REVISION TABLE

Version	Sec/Para Changed	Change Made	Date
1		Initial issue of document	12/10/2021
2		Model name and EUT picture updated	08/12/2021

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RADIOFREQUENCY RADIATION EXPOSURE EVALUATION REPORT - MPE

Device:	Gas Logger
Model Number:	G20 RTX RTX
Serial Number:	Not designated, EUT is a Prototype
Manufacturer:	Thermo Fisher Scientific Australia Pty Ltd
Assessed for:	Thermo Fisher Scientific Australia Pty Ltd
Address:	5 Caribbean Drive Scoresby, VIC 3179, Australia
Phone Number:	03 9757 4449
Contact:	Alex Liu
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Standards:	**447498 D01 General RF Exposure Guidance v06** RF exposure procedures and equipment authorization policies for mobile and portable devices. **47 CFR § 2.1091** Radiofrequency radiation exposure evaluation: mobile devices (Transmitter is more than 20 cm from human body).
Result:	Based on an assessment of the documentation provided the Gas Logger model G20 RTX RTX complies with the RF exposure requirements of 47 CFR Part 2.1091, however an exclusion zone of 20 cm in front of the radiating elements applies, elsewhere the exposure level was below the applicable limits.. Refer to Report M2011022-11 V2 for full details
Assessment Date:	8 September 2021
Assessment Engineer:	Deborah Olaleye Graduate/Trainee Test Engineer
Authorised Signatory:	Emad Mansour EMR and Sites Manager **EMC Technologies Pty Ltd**

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1 INTRODUCTION

This report is intended to demonstrate compliance of the Gas Logger model G20 RTX RTX with the RF exposure requirements of 47 CFR Part 2.1091. Evaluation was performed in accordance with FCC KDB 447498 D01.

The test sample was provided by the Client. The conclusion herein is based on the information provided by the client.

1.1 Laboratory Overview

EMC Technologies Pty. Ltd. is an independently owned Australian company that is NATA accredited to ISO 17025 for both testing and calibration and ISO 17020 for Inspection. – **Accreditation Number 5292.**

1.2 Test Laboratory/Accreditations

Inspection were performed at EMC Technologies' laboratory in Keilor Park, Victoria Australia.

Table 1-1: Accreditations for Conformity Assessment

Country/Region	Body	
Australia/New Zealand	NATA	Accreditation Number: 5292
Europe	European Union	Notified Body Number: 0819
USA	FCC	Designation Number: AU0001 (Melb)
Canada	ISED Canada	Company Number: 3569B(Melb)
Japan	VCCI	Company Number: 785
Taiwan	BSMI	Lab Code SL2-IN-E-5001R

2 DEVICE DETAILS

(Information supplied by the Client)

The Gas Loggermodel G20 RTX RTX is a compact portable plastic encased electronic gas logger fitted with internal electrochemical hydrogen sulphide sensor.

The device is equipped with a 4GX CATM1/NBIoT and classic Low Energy Bluetooth module for wireless communication.

Manufacturer: Thermo Fisher Scientific Australia Pty Ltd
Inspected Sample: Gas Logger
Model Number: G20 RTX

2.1 Transmitter Details

Transmit parameters were provided by the customer and are shown below:

Table 2-1: Transmitter 1 Parameters

Transmitter #1	
Wireless Radio Module Model:	STMicroelectronics, STM32WB55RGV6
Operating Frequency:	2400 MHz
Nominal Power:	6 dBm
Antenna Type:	PCB
Max Antenna gain:	Unknown

Table 2-2: Transmitter 2 Parameters

Transmitter #2	
Wireless Radio Module Model:	Telit, LE910C1-NF
Operating Bandwidths:	3G: B2/B4/B5 4G: B2/B4/B5/B12
Nominal Power:	23 dBm for 4G and 24 dBm for 3G
Antenna Type:	Unknown
Max Antenna gain:	2.81dBi

3 LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE), §1.1310

TABLE 1 - LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) 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
(B) 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

4 UNCERTAINTY

EMC Technologies has evaluated the tools and methods used to perform Radiated Electromagnetic Field predictions.

The estimated inspection uncertainties for the test shown within this report are as follows:

Electromagnetic Modelling

30 MHz to 100GHz ±2.8 dB

The above expanded uncertainties are based on standard uncertainties multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

5 ASSUMPTIONS IN THIS ASSESSMENT

This assessment does not include accumulated RF fields from nearby sites/antennas or possible radio signal reflections or attenuation due to buildings or the general environment.

Antenna Parameters and power settings were supplied by the customer.

A 100% duty cycle is assumed and 4 dBi antenna gain is assumed for the Bluetooth PCB antenna.

The aperture of the radiating element assumed to be a point source in free space and far field conditions.

6 RF EXPOSURE CALCULATIONS

The reference level was evaluated at 20 cm to show compliance with the power density listed in Table 4 (Section3)

The following formula was used to calculate the power density at 20 cm:

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

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

Where

(S): Power density (mW/cm^2)
(P): Output power at antenna terminal (mW)
(G): Gain (ratio)
(R): Minimum test separation distance (20 cm)

Table 6-1: Calculations

Technology	Frequency Band (MHz)	Power	Gain	Duty Cycle	EIRP	EIRP	Flux Density at 20 cm	Flux Density limit	Percentage of the limit
		dBm	dBi	%	dBm	mW	mW/cm^2	mW/cm^2	%
Bluetooth	2400	6	4	100%	10.0	10.0	0.002	1.0	0.2%
4G	Band 12- 700	23	2.81	100%	25.8	381.1	0.1	0.5	16.3%
	Band 5- 850	23	2.81	100%	25.8	381.1	0.1	0.6	13.4%
	Band 4- 1700	23	2.81	100%	25.8	381.1	0.1	1.0	7.6%
	Band 2- 1900	23	2.81	100%	25.8	381.1	0.1	1.0	7.6%
3G	Band 5- 850	24	2.81	100%	26.8	479.7	0.1	0.6	16.9%
	Band 4- 1700	24	2.81	100%	26.8	479.7	0.1	1.0	9.6%
	Band 2- 1900	24	2.81	100%	26.8	479.7	0.1	1.0	9.6%
Total percentage of the limit at 20 cm for simultaneous transmission (Worst-case)									**17.10%**

7 CO-LOCATION CONSIDERATION:

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.

$$\sum_{1}^{N} \frac{S_{eqN}}{S_{limN}} = \frac{S_{eq1}}{S_{lim1}} + \frac{S_{eq2}}{S_{lim2}} + \cdots + \frac{S_{eqN}}{S_{limN}} \leq 1$$

Where: Seq = Power Spectral density (mw/cm^2) of a specific transmitter
Slim = MPE limit (mw/cm^2)

The following simultaneous transmissions are possible:

Transmitter 1	Transmitter 2	MPE Ratio Sum	Result
BT Transceiver	Cellular Transceiver	0.17	Pass

8 CONCLUSION

Based on an assessment of the documentation provided the Gas Loggermodel G20 RTX RTX complies with the 47 CFR Part 2.1091. An exclusion zone of 20 cm in front of the radiating elements applies, elsewhere the exposure level was below the applicable limits.

9 APPENDIX A

Referenced Documents

Document	Comments
Form 005 Customer Information Sheet	EUT and transmitters details
10-1000, OdaLog Gas L2 Logger Manual, Rev F_ 2019_10	EUT details
STM32WB55RGV6_datasheet	Transmitter details
Telit_LE910Cx_Datasheet	Transmitter details