

TR 3765 C

Equipment Under Test: RM1262

Requirement(s): FCC 2.1091
RSS-102

Test Date(s): 12/13/2023 - 12/19/2023

Prepared for: Laird Connectivity
Attn: Jonathan Kaye
W66 N220 Commerce Ct.
Cedarburg, WI 53012

Report Issued by: Adam Alger, Laboratory Manager

Signature: *Adam Alger*

Date: 2/22/2024

Report Reviewed by: Adam Alger, Laboratory Manager

Signature: *Adam Alger*

Date: 1/8/2024

Report Constructed by: Anthony Smith, EMC Engineering Specialist

Signature: *Anthony Smith*

Date: 12/20/2023

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Job: C-3765		Serial: 00082

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Laird Connectivity Test Services in Review

The Laird Connectivity LLC laboratory located at W66 N220 Commerce Court Cedarburg, Wisconsin, 53012 USA is recognized through the following organizations:



A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025:2017 with Electrical (EMC) Scope

A2LA Certificate Number: 1255.01

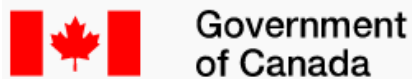
Scope of accreditation includes all test methods listed herein unless otherwise noted



Federal Communications Commission (FCC) – USA

Accredited Test Firm Registration Number: 953492

Recognition of two 3 meter Semi-Anechoic Chambers



Innovation, Science and Economic Development Canada

Accredited U.S. Identification Number: US0218

Recognition of two 3 meter Semi-Anechoic Chambers

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1 TEST REPORT SUMMARY

During **December 13th, 2023 to December 19th, 2023** the Equipment Under Test (EUT), **RM1262**, as provided by **Laird Connectivity** was tested to the following requirements for the purpose of a **Class 2 Permissive Change to add an antenna**:

Mobile Device

Requirements	Description	Method	Compliant
FCC 1.1307, 2.1091	Radiofrequency Radiation Exposure Limits	FCC KDB 447498	Yes
ISED Canada: RSS-102	Radiofrequency Radiation Exposure Limits	RSS-102 § 2.5.2	Yes

Notice:

The results relate only to the item tested as configured and described in this report. Any additional configurations, modes of operation, or modifications made to the equipment under test after the specified test date(s) are at the decision of the client and may not apply to the data seen in this test report.

The decision rule for Pass / Fail assessment to the specification or standard listed in this test report has been agreed upon by the client and laboratory to be as follows:

Measurement Type	Rule
Emissions – Amplitude	1 dB below specified limit
Emissions – Frequency	1% less than the specification
Immunity	Tested at specified level

2 CLIENT INFORMATION

Company Name	Laird Connectivity
Contact Person	Jonathan Kaye
Address	W66N220 Commerce Court Cedarburg, WI, 53012

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	RM1262
Model Number	RM1262
Serial Number	00082
FCC ID	SQG-RM1262
IC ID	3147A-RM1262

2.2 Product Description

LoRaWAN module operating in the 902.3-914.9 MHz range.

2.3 Modifications Incorporated for Compliance

None noted at time of test

2.4 Deviations and Exclusions from Test Specifications

None noted at time of test

2.5 Additional Information

Programmed via USB cable utilizing UwTerminalX ver 1.17 (terminal emulator software).

Radio Test Firmware: RM1262_480-00219-R128.4.1.242.gbl

Powered via USB.

2.6 Additional Information

Tested for a Class 2 Permissive Change to add a Laird FlexDIPOLE antenna with a peak gain of 2.4 dBi to the list of antennas usable by the RM1262. EUT tested via Cabinet Radiation method.

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2.7 RF Information

Channel Frequency (MHz)	Channel List	Data Rate (bits/sec)	Spreading Factor	Channel Bandwidth (kHz)
903.0-914.2	8 Channels	12500	SF 8	500
902.3-914.9	64 Channels	980	10	125

2.8 Test Channels, Duty Cycle, and Power Index

Channel	Frequency (MHz)	Power Index	Modulation Mode	Duty Cycle	Duty Factor (dB)	Channel Bandwidth (kHz)
64	903.0	22	LoRa	79.5	1.0	500
67	907.8	22	LoRa	79.5	1.0	500
71	914.2	22	LoRa	79.5	1.0	500
0	902.3	22	LoRa	98.0	N/A	125
31	908.5	22	LoRa	98.0	N/A	125
63	914.9	22	LoRa	98.0	N/A	125

3 REFERENCES

Publication	Edition	Date	AMD 1
eCFR	-	2023	-
RSS-247	3	2024	-
RSS-GEN	5	2018	2019
ANSI C63.10	-	2013	-
KDB 178919 D01	6	2015	-
RSS-102	5	2015	2021
KDB 447498	-	2015	-

4 UNCERTAINTY SUMMARY

Using the guidance of the following publications the calculated measurement uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k = 2.

References
CISPR 16-4-1
CISPR 16-4-2
CISPR 32
ANSI C63.23
A2LA P103
A2LA P103c
ETSI TR 100-028

Measurement Type	Configuration	Uncertainty ±
Radiated Emissions	Biconical Antenna	5.0 dB
Radiated Emissions	Log Periodic Antenna	5.3 dB
Radiated Emissions	Horn Antenna	4.7 dB
AC Line Conducted Emissions	Artificial Mains Network	3.4 dB
Telecom Conducted Emissions	Asymmetric Artificial Network	4.9 dB
Disturbance Power Emissions	Absorbing Clamp	4.1 dB
Radiated Immunity	3 Volts/meter	2.2 dB
Conducted Immunity	CDN/EM/BCI	2.4/3.5/3.4 dB
EFT Burst/Surge	Peak pulse voltage	164 volts
ESD Immunity	15 kV level	1377 Volts

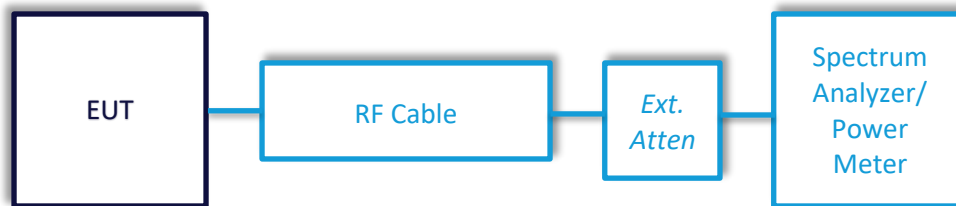
Parameter	ETSI U.C. ±	U.C. ±
Radio Frequency, from F0	1x10 ⁻⁷	0.55x10 ⁻⁷
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

5 TEST DATA

5.1 Antenna Port Conducted Emissions

Description of Measurement	<p>The direct measurement of emissions at the antenna port of the EUT is achieved by use of a RF connection to a spectrum analyzer or power meter.</p> <p>The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.</p>
Example Calculations	<p>Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm)</p> <p>Margin (dB) = Limit (dBm) – Corrected Reading (dBm)</p>

Block Diagram



5.1.1 Antenna Port Conducted Emissions – RF Output Power

Worst Case Output Power (See TR 3765 A and TR 3765 B)

DTS

Frequency (MHz)	Antenna Gain (dBi)	Measurement (dBm)	Duty Cycle Correction (dB)	Corrected Average Output Power (dBm)	Limit (dBm)	Margin (dB)
903.0	2.4	20.8	1.0	21.8	30.0	8.2
907.8	2.4	20.8	1.0	21.8	30.0	8.2
914.2	2.4	20.6	1.0	21.6	30.0	8.4

FHSS

Frequency (MHz)	Antenna Gain (dBi)	Peak Output Power (dBm)	Limit (dBm)	Margin (dB)
902.3	2.4	21.9	30.0	8.1
908.5	2.4	21.8	30.0	8.2
914.9	2.4	21.8	30.0	8.2

6 FCC SAR BASED EXEMPTION

6.1 Limit

- (B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:

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

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);

Limit at 902.3 MHz

2040 * 0.9023 = 1841 mW (Worst Case)

6.2 Exemption Calculation

Frequency Range (MHz)	Maximum Conducted Power (dBm)	Maximum Tune Up Limit (dBm)	Antenna Gain (dBi)	EIRP (dBm)	ERP (dBm)	ERP (mW)	SAR-Based Exemption Thresholds (mW)	Ratio*	Result
902.3-914.9 FHSS	21.9	22.5	2.4	24.9	22.75	188.3	1841	0.10	Pass
903.0-914.2 DTS	21.8	22.5	2.4	24.9	22.75	188.3	1841	0.10	Pass

*Ratio = ERP/SAR-Based Exemption Threshold

Note: Minimum separation distance = 20 cm

7 ISED CANADA MPE EVALUATION OF MOBILE DEVICE

7.1 RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency (MHz)	Power Density (W/m ²)	Averaging Time (Minutes)
300-6000	0.02619f ^{0.6834}	6
6000-15000	10	6

7.2 MPE Evaluation Formula

$$P_d = P_t / (4 * \pi * R^2)$$

Where

P_d = Power density in W/m²

P_t = EIRP in W

π = 3.1416

R = Measurement Distance

7.3 MPE Evaluation Results

Frequency Range (MHz)	Maximum Conducted Power (dBm)	Rated Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (W/m ²)	Limit (W/m ²)	Ratio*	Result
902.3-914.9 (FHSS)	21.9	22.5	2.4	20	0.61	2.74	0.22	Pass
903.0-914.2 (DTS)	21.8	22.5	2.4	20	0.61	2.74	0.22	Pass

*Ratio = Power density / Limit

8 REVISION HISTORY

Version	Date	Notes	Person
0	12/20/2023	Initial Draft	Anthony Smith
1	1/9/2024	Revised Draft – Comments Addressed	Anthony Smith
2	2/22/2024	RSS-247 Issue 3	Adam Alger

END OF REPORT