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Dormakaba USA Inc.
TEST REPORT

SCOPE OF WORK
EMC TESTING – TRINITY

REPORT NUMBER
105079698LEX-002.2

ISSUE DATE **REVISED DATE**
8/17/2023 10/17/2023

PAGES
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DOCUMENT CONTROL NUMBER
Non-Specific EMC Report Shell Rev. December 2017

EMC TEST REPORT

(FULL COMPLIANCE)

Report Number: 105079698LEX-002.2
Project Number: G105079698

Report Issue Date: 8/17/2023
Report Revised Date: 10/17/2023

Model(s) Tested: Trinity

Standards: Title 47 CFR Part 15.225
RSS-210 Issue 10
RSS-Gen Issue 5

Tested by:
Intertek Testing Services NA, Inc.
731 Enterprise Dr.
Lexington, KY 40510
USA

Client:
Dormakaba USA Inc.
1525 Bull Lea Rd. #100
Lexington, KY 40511
USA

Report prepared by

Seth Parker, Associate Engineer

Report reviewed by

Brian Lackey, Team Leader

Table of Contents

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
6	Radiated Spurious Emissions (Transmitters Active) (ANSI C63.10:2013, RSS-210 Issue 10)	Pass
7	Frequency Stability (ANSI C63.10:2013, RSS-210-Issue 10)	Pass
8	Occupied Bandwidth (ANSI C63.10:2013, RSS-Gen Issue 5)	Pass
9	Antenna Requirement (FCC Part 15.203, RSS-Gen Issue 5 § 8.3)	Pass

3 Client Information

This product was tested at the request of the following:

Client Information	
Client Name:	Dormakaba USA Inc.
Address:	1525 Bull Lea Rd. #100 Lexington, KY 40511 USA
Contact:	James Adams
Email:	james.adams@dormakaba.com
Manufacturer Information	
Manufacturer Name:	Dormakaba USA Inc.
Manufacturer Address:	1525 Bull Lea Rd. #100 Lexington, KY 40511 USA

4 Description of Equipment under Test and Variant Models

Equipment Under Test	
Product Name	Trinity
Model Number	TBDE-Box: DKAPXEB Lock: DKAPXMLK Entry: DKAPX81X
Test Start Date	8/15/2022
Test End Date	9/19/2022
Device Received Condition	Good
Test Sample Type	Production
Input Rating	100-240V ~ 50-60Hz 0.5A, Battery
Description of Equipment Under Test (provided by client)	
Electronic lock and keypad system with Bluetooth and NFC transceivers.	

4.1 Variant Models:

There were no variant models covered by this evaluation.

5 System Setup and Method

5.1 Method:

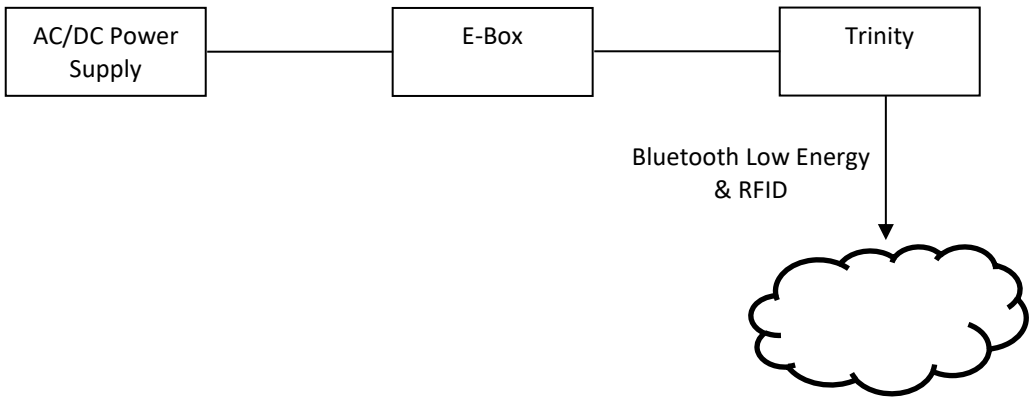
Configuration as required by ANSI C63.4: 2014 and ANSI C63.10:2013

No.	Descriptions of EUT Exercising
1	The EUT was powered by 120V/60Hz and configured to transmit a RFID signal at 13.56MHz continuously.

Cables					
Qty	Description	Length (m)	Shielding	Ferrites	Termination
1	AC Mains	2	No	No	Plug
1	Ethernet	2	Yes	No	RJ45

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
-	-	-	-

5.2 EUT Block Diagram:



6 Radiated Emissions

6.1 Test Method

Tests are performed in accordance with ANSI C63.10:2013 § 11.12.1 Radiated emission measurements.

TEST SITE: 10m ALSE

Site Designation: 10m Chamber

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 10m	30-1000 MHz	3.9dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	4.0dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.7dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	4.7dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	4.7dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	4.7dB	5.5 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required.

6.2 Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG

Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

6.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	8181	Rohde & Schwarz	ESW44	11/16/2021	11/16/2022
Bilog Antenna	7085	ETS	3142C	10/5/2021	10/5/2022
System Controller	3957	Sunol Sciences	SC99V	Verify at Time of Use	Verify at Time of Use
Coaxial Cable	8185			1/13/2022	1/13/2023
Coaxial Cable	8188			1/13/2022	1/13/2023
Coaxial Cable	3339			1/13/2022	1/13/2023
Preamplifier	3919	Rohde & Schwarz	TS-PR3	1/13/2022	1/13/2023
Coaxial Cable	3172			1/13/2022	1/13/2023
Coaxial Cable	2590			1/13/2022	1/13/2023
Coaxial Cable	8186			1/13/2022	1/13/2023
Coaxial Cable	8187			1/13/2022	1/13/2023
Magnetic Loop Antenna	2366	ETS	6502	8/22/2022	8/22/2023

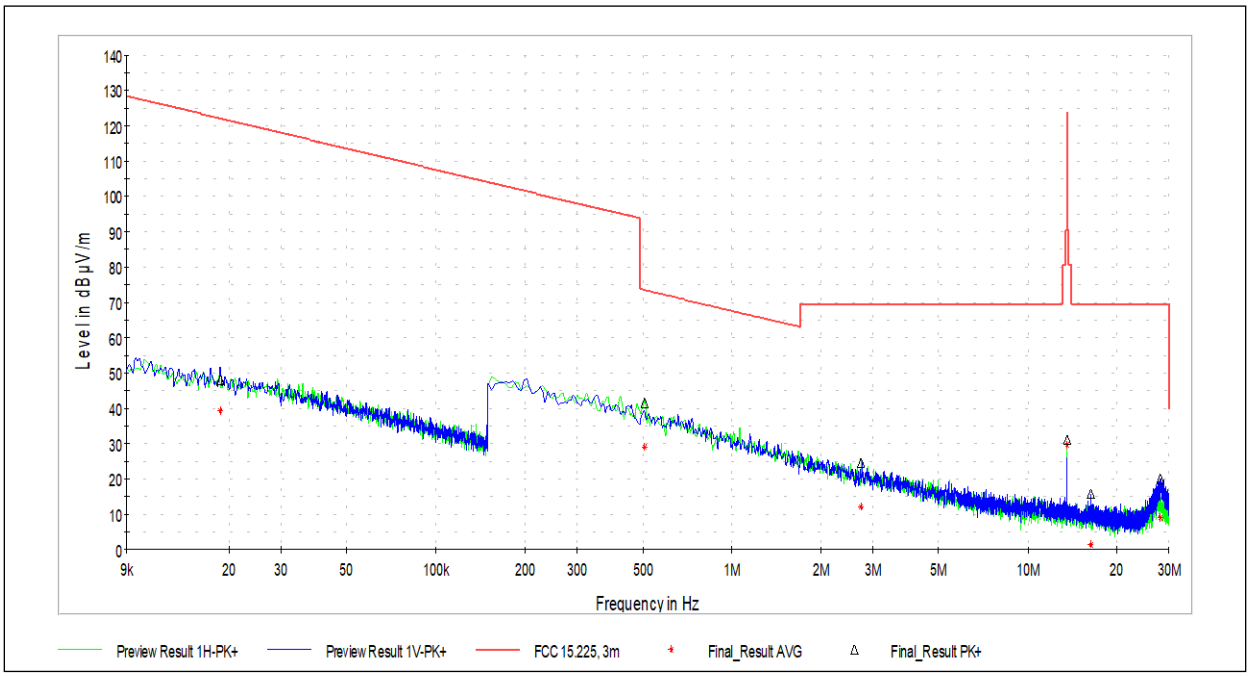
6.4 Software Utilized

Name	Manufacturer	Version
EMC32	Rohde & Schwarz	Version 10.60.20

6.5 Test Results

The sample tested was found to be **compliant**.

6.6 Test Data: 9 kHz – 30 MHz (3m Test Distance)

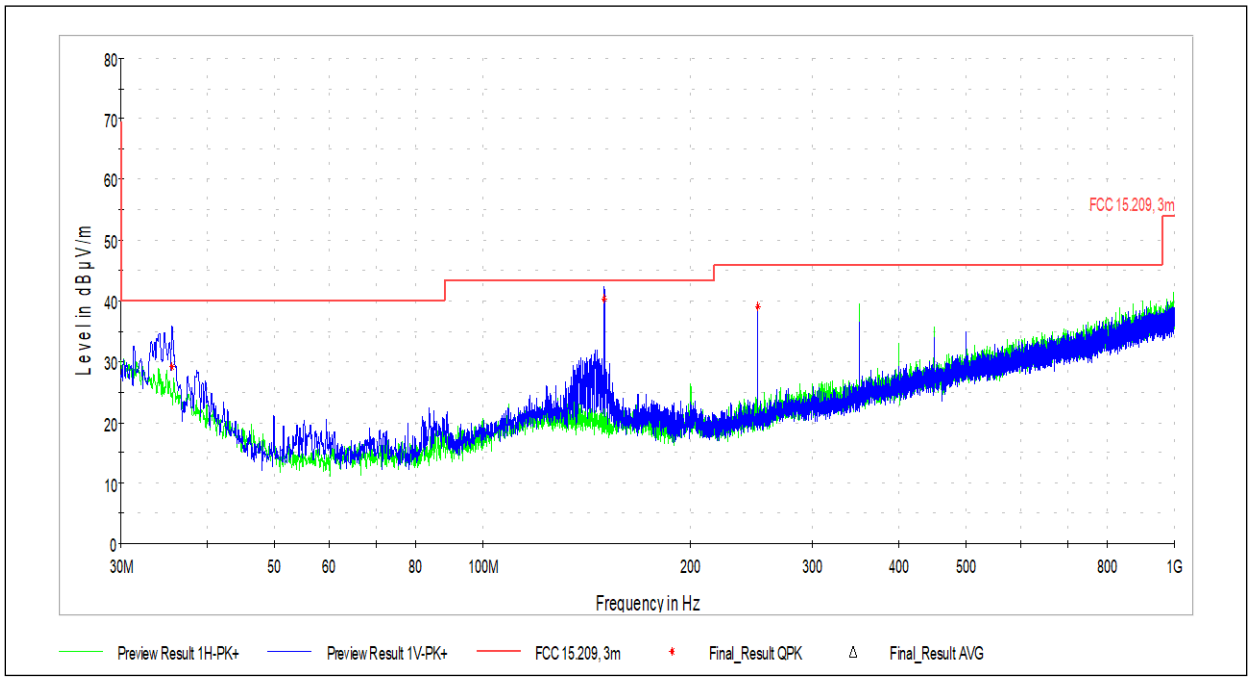


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Azimuth (deg)	Corr. (dB/m)
0.018669	48.11	122.17	74.06	0.20	92.00	15.05
0.505566	41.52	73.53	32.01	9.00	74.00	11.69
2.726757	24.58	69.50	44.92	9.00	304.00	11.35
13.560552	31.21	124.00	92.79	9.00	284.00	10.70
16.321677	15.74	69.50	53.76	9.00	0.00	10.47
27.945618	20.08	69.50	49.42	9.00	8.00	8.61

Test Personnel:	Seth Parker	Test Date:	9/12/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.225 RSS-210 Issue 10	Ambient Temperature:	22.7C
Input Voltage:	120V/60Hz	Relative Humidity:	64.8%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	982.5mbar

Deviations, Additions, or Exclusions: None

6.7 Test Data: 30 MHz – 1 GHz (3m Test Distance)



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
35.550556	29.20	40.000	10.80	120.000	100.0	V	324.0	23.50
149.956667	40.30	43.500	3.20	120.000	100.0	V	294.0	21.77
249.974444	39.11	46.000	6.89	120.000	119.0	H	172.0	21.55

Test Personnel:	Seth Parker	Test Date:	9/12/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.225 RSS-210 Issue 10	Ambient Temperature:	22.7C
Input Voltage:	120V/60Hz	Relative Humidity:	64.8%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	982.5mbar

Deviations, Additions, or Exclusions: None

7 Frequency Stability

7.1 Test Limits

FCC Part 15.225:

(e) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

RSS-210 Issue 10 § B.6:

Carrier frequency stability shall be maintained to ±0.01% (±100 ppm).

7.2 Test Method

Tests are performed in accordance with ANSI C63.10:2013.

7.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
Spectrum Analyzer	3727	Rohde & Schwarz	FSQ	9/17/2021	9/17/2022
Environmental Chamber	7078	GENTHERM	ESZ	8/4/2022	8/4/2023

7.4 Test Results

The sample tested was found to be **compliant**.

7.5 Test Data:

Voltage %	Voltage (VDC)	Temp (°C)	Measured Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	Limit (%)
100%	12	-20	13,560,006	99	0.0007	0.01
100%	12	-10	13,560,002	95	0.0007	0.01
100%	12	0	13,559,993	86	0.0006	0.01
100%	12	10	13,559,993	86	0.0006	0.01
100%	12	20	13,559,907	0	0.0000	0.01
100%	12	30	13,559,907	0	0.0000	0.01
100%	12	40	13,559,847	60	0.0004	0.01
100%	12	50	13,559,817	90	0.0007	0.01
115%	13.8	20	13,559,885	22	0.0002	0.01
85%	10.2	20	13,559,890	17	0.0001	0.01

Test Personnel:	Seth Parker	Test Date:	9/12/2022
Supervising/Reviewing Engineer:	Brian Lackey	Limit Applied:	See Above
Product Standard:	FCC Part 15.225 RSS-210 Issue 10	Ambient Temperature:	22.5C
Input Voltage:	120V/60Hz	Relative Humidity:	41.1%
Pretest Verification w / Ambient Signals or BB Source:	Yes	Atmospheric Pressure:	984.6mbar

Deviations, Additions, or Exclusions: None

8 20dB Bandwidth

8.1 Test Limits

15.215(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

8.2 Test Method

Tests are performed in accordance with ANSI C63.10:2013.

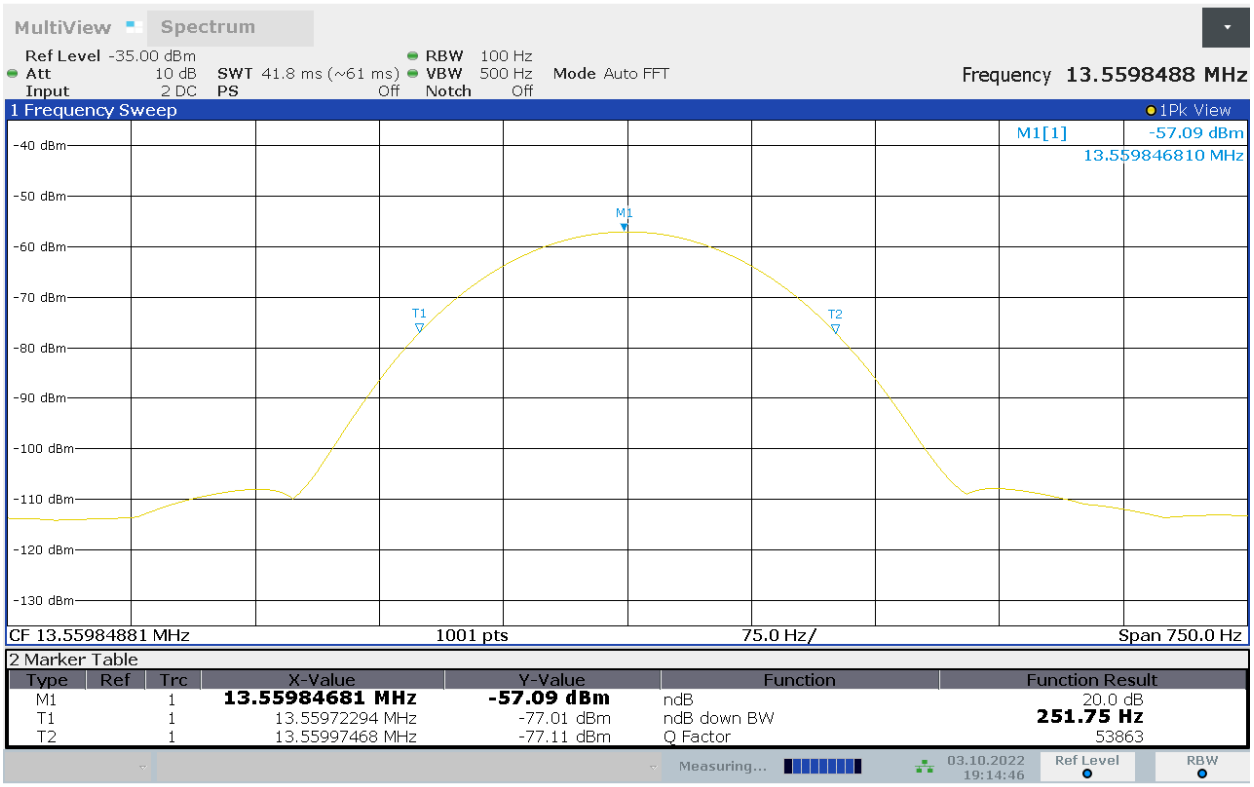
8.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	8181	Rohde & Schwarz	ESW44	11/16/2021	11/16/2022

8.4 Test Results

The sample tested was found to be **compliant**. The 20dB bandwidth was entirely within the transmit band 13.11MHz – 14.01MHz as required by FCC Part 15.215.

8.5 Test Data:



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9 Antenna Requirement

9.1 Test Limits

FCC Part 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

RSS-Gen Issue 4 § 8.3:

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

9.2 Test Results

The device was found to be **compliant**. The device is using a permanently installed internal antenna.

10 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	8/17/2023	105079698LEX-002			Original Issue
1	8/23/2023	105079698LEX-002.1			Updated RSS standards.
2	10/17/2023	105079698LEX-002.2			Added test distance to radiated emissions.