



Canada

EMC & RF Test Report

Class II Permissive Change Results
based on

RSS-247 Issue 2:2017 & FCC Part 15 Subpart 15.247

Unlicensed Intentional Radiators

on the

BLE-5100 Bluetooth Module

Issued by:

TÜV SÜD Canada Inc.
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Testing produced for

Prepared by:

Amir Emami,
Project Engineer

dormakaba

See Appendix A for full client &
EUT details.

Reviewed by:

Min Xie,
Sr. Project Engineer



Registration #
6844A-3



Testing Laboratory
Certificate #2955.02



R-14023, G-20072
C-14498, T-20060



Registration #
CA6844

Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Table of Contents

Table of Contents	2
Report Scope	3
Summary	4
Test Results Summary	5
Notes, Justifications, or Deviations	6
Sample Calculation(s)	6
Applicable Standards, Specifications and Methods	7
Document Revision Status	8
Definitions and Acronyms	9
Testing Facility	10
Calibrations and Accreditations	10
Testing Environmental Conditions and Dates	11
Detailed Test Results Section	12
Transmitter Spurious Radiated Emissions	13
Appendix A – EUT Summary	40
Appendix B – EUT and Test Setup Photos	42

Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Report Scope

This report addresses the EMC verification testing and test results of the **BLE-5100 Bluetooth Module**, and is herein referred to as EUT (Equipment Under Test). The EUT was tested for compliance against the following standards:

RSS-247 Issue 2:2017

FCC Part 15 Subpart C 15.247

Test procedures, results, justifications, and engineering considerations, if any, follow later in this report. Refer to the original test report, TÜV SÜD Canada Report # **GEMC-FCC-24G-Q50551R1** for full testing and test results.

This report does not imply product endorsement by any government, accreditation agency, or TÜV SÜD Canada Inc.

Opinions or interpretations expressed in this report, if any, are outside the scope of TÜV SÜD Canada Inc. accreditations. Any opinions expressed do not necessarily reflect the opinions of TÜV SÜD Canada Inc., unless otherwise stated.

Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Summary

The results contained in this report relate only to the item(s) tested.

EUT:	BLE-5100 Bluetooth Module
FCC Certification #, FCC ID:	Q8SA38880
Industry Canada Certification #, IC:	4652A-A38880
EUT passed all tests performed	Yes
Tests conducted by	Amir Emami
Report reviewed by	Min Xie

For testing dates, see "Testing Environmental Conditions and Dates".

Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Test Results Summary

Standard/Method	Description	Class/Limit	Result
FCC 15.203	Antenna Requirement	Unique	Pass See Justification
FCC 15.205 RSS-GEN (Table 6)	Restricted Bands for Intentional Operation	QuasiPeak Average	Pass
FCC 15.209 RSS-GEN (Table 4)	Spurious Radiated Emissions	QuasiPeak Average	Pass
Overall Result			Pass

If the product as tested or otherwise complies with the specification, the EUT is deemed to comply with the requirement and is deemed a 'PASS' grade. If not 'FAIL' grade will be issued. Note that 'PASS' / 'FAIL' grade is independent of any measurement uncertainties.

Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Notes, Justifications, or Deviations

The following notes, justifications for tests not performed or deviations from the above listed specifications apply:

This report is a Class II Permissive Changes test report. Refer to the original test report, TÜV SÜD Canada Report # **GEMC-FCC-24G-Q50551R1**, for full testing and test results.

As per the manufacturer, the chip antenna on the 124-515085 board has been replaced with ACAG0301-2450-T from Abracon. No other changes are made to the circuit.

The following tests were re-evaluated on the EUT to verify if this change did not degrade the radiated data previously reported.

- Spurious radiated emission
- Restricted band Band Edge measurements

Since the EUT is a limited module, peak radiated power was verified on the EUT module as is and additionally installed in a host device (Saflok Quantum RFID lock). It was measured in three orthogonal axes. Worst case peak radiated power results were obtained with the EUT installed in the host device and in the Y-axis. Therefore, full data was recorded for the EUT module installed inside the host device. See Appendix B for axis details.

For the Antenna requirement specified in FCC 15.203 (RSS-247 section 5.4(d)), the new ceramic chip antenna used has a peak gain of 5.19dBi which is less than the 6 dBi gain limit.

Sample Calculation(s)

Radiated Emission Test

E-Field Level = Received Signal + Antenna Factor + Cable Loss – Pre-Amp Gain

E-Field Level = 50dB μ V + 10dB/m + 2dB – 20dB

E-Field Level = 42dB μ V/m

Margin = Limit – E-Field Level

Margin = 50dB μ V/m – 42dB μ V/m

Margin = 8.0 dB (pass)

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Applicable Standards, Specifications and Methods

ANSI C63.4:2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10:2013	American National Standard For Testing Unlicensed Wireless Devices
CFR 47 FCC 15 Subpart C	Code of Federal Regulations – Radio Frequency Devices, Intentional Radiators
FCC KDB 558074: 2019	FCC KDB 558074 Digital Transmission Systems, measurements and procedures
FCC KDB 447498: 2015	RF exposure procedures and equipment authorization policies for mobile and portable devices
ICES-003 Issue 6 2019	Digital Apparatus - Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard
RSS-GEN Issue 5 2019	General Requirements and Information for the Certification of Radio Apparatus
RSS-247 Issue 2:2017	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
ISO 17025:2017	General Requirements for the Competence of Testing and Calibration Laboratories

Client	dormakaba Canada Inc.	 Canada
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Document Revision Status

Revision	Date	Description	Initials
000	March 29, 2021	Initial Release	AE
-	-	-	-

Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Definitions and Acronyms

The following definitions and acronyms are applicable in this report.
See also ANSI C63.14.

DTS – Digital Transmission System
LISN – Line Impedance Stabilization Network
NCR – No Calibration Required
NSA – Normalized Site Attenuation
N/A – Not Applicable
RF – Radio Frequency

AE – Auxiliary Equipment. A digital accessory that feeds data into or receives data from another device (host) that in turn, controls its operation.

Antenna Port – Port, other than a broadcast receiver tuner port, for connection of an antenna used for intentional transmission and/or reception of radiated RF energy.

BW – Bandwidth. Unless otherwise stated, this refers to the 6 dB bandwidth.

EMC – Electro-Magnetic Compatibility. The ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

EMI – Electro-Magnetic Immunity. The ability to maintain a specified performance when the equipment is subjected to disturbance (unwanted) signals of specified levels.

EUT – Equipment Under Test. A device or system being evaluated for compliance that is representative of a product to be marketed.

ITE – Information Technology Equipment. Has a primary function of entry, storage, display, retrieval, transmission, processing, switching, or control of data and/or telecommunication messages and which may be equipped with one or more ports typically for information transfer.

Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Testing Facility

Testing for EMC on the EUT was carried out at TÜV SÜD Canada testing lab near Toronto, Ontario. The testing lab has calibrated 3m semi-anechoic chambers which allow measurements on a EUT that has a maximum width or length of up to 2m and a height of up to 3m. The testing lab also has a calibrated 10m Open Area Test Site (OATS). The chambers are equipped with a turntable that is capable of testing devices up to 5000lb in weight and are equipped with a mast that controls the polarization and height of the antenna. Control of the mast occurs in the control room adjoining the shielded chamber. This facility is capable of testing products that are rated for single phase or 3-phase AC input and DC capability is also available. Radiated emission measurements are performed using a BiLog antenna and a Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN and using the vertical ground plane if applicable.

Calibrations and Accreditations

The 3m semi-anechoic chamber is registered with Federal Communications Commission (FCC, CA6844), Innovation, Science and Economic Development Canada (ISED, 6844A-3) and Voluntary Control Council for Interference (VCCI, R-14023, G-20072, C-14498, and T-20060). This chamber was calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. The NSA data is kept on file at TÜV SÜD Canada. For radiated susceptibility testing, a 16 point field calibration has been performed on the chamber. The field uniformity data is kept on file at TÜV SÜD Canada. TÜV SÜD Canada Inc. is accredited to ISO 17025 by A2LA with Testing Certificate #2955.02. The laboratory's current scope of accreditation listing can be found as listed on the A2LA website. All measuring equipment is calibrated on an annual or biennial basis as listed for each respective test.

Client	dormakaba Canada Inc.	 Canada
Product	BLE-5100 Bluetooth Module	
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Testing Environmental Conditions and Dates

Following environmental conditions were recorded in the facility during time of testing

Date	Test	Initials	Temperature (°C)	Humidity (%)	Pressure (kPa)
March 15, 2021	Radiated Emissions	AE	21.5	19.1	101.2

Client	dormakaba Canada Inc.	 Canada
Product	BLE-5100 Bluetooth Module	
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Detailed Test Results Section

Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Transmitter Spurious Radiated Emissions

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT does not exceed the limits listed below as defined in the applicable test standard, as measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

Limits and Method

The method is as defined in FCC KDB 558074 Section 12.2 and ANSI C63.10.

The limits, as defined in 15.247(d) for unintentional radiated emissions, apply for those emissions that fall in the restricted bands, as defined in Section 15.205(a). These emissions must comply with the radiated emission limits specified in Section 15.209(a).

Frequency	Field Strength Limit ($\mu\text{V/m}$)	Field Strength at 3m ($\text{dB}\mu\text{V/m}$)
0.009 MHz – 0.490 MHz	2400/F(kHz) ^a (at 300m)	128.5 to 93.8 ^a
0.490 MHz – 1.705 MHz	24000/F(kHz) ^a (at 30m)	73.8 to 63.0 ^a
1.705 MHz – 30 MHz	30 ^a (at 30m)	69.5 ^a
30 MHz – 88 MHz	100 ^a (at 3m)	40.0 ^a
88 MHz – 216 MHz	150 ^a (at 3m)	43.5 ^a
216 MHz – 960 MHz	200 ^a (at 3m)	46.0 ^a
Above 960 MHz	500 ^a (at 3m)	54.0 ^a
Above 1000 MHz	500 ^b (at 3m)	54.0 ^b
Above 1000 MHz	5 mV/m ^c (at 3m)	74.0 ^c

^aLimit is with Quasi Peak detector with bandwidths as defined in CISPR-16-1-1

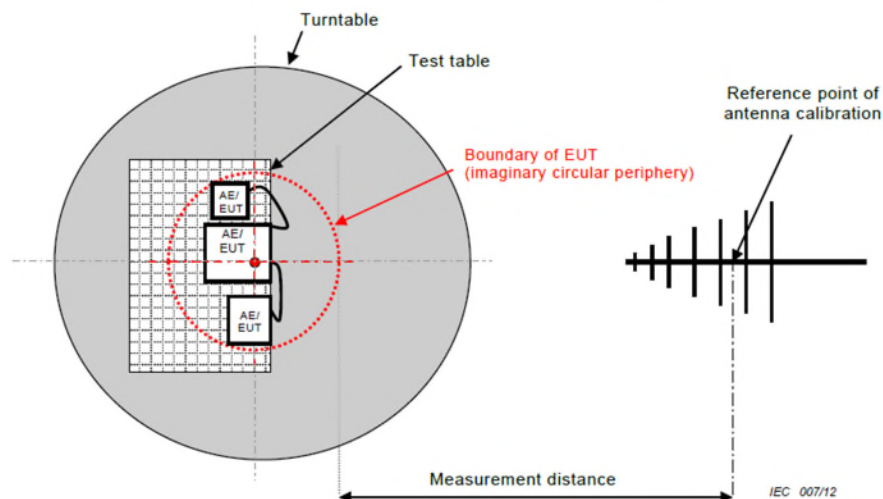
^bLimit is with 1 MHz measurement bandwidth and using an Average detector

^cLimit is with 1 MHz measurement bandwidth and using a Peak detector

Based on ANSI C63.4 Section 4.2, if the Peak detector measurements do not exceed the Quasi-Peak limits, where defined, then the EUT is deemed to have passed the requirements.

Client	dormakaba Canada Inc.	 TÜV SÜD Canada
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Typical Radiated Emissions Setup



Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is $\pm 5.67\text{dB}$ for 30MHz – 1GHz and $\pm 4.58\text{dB}$ for 1GHz – 18GHz with a 'k=2' coverage factor and a 95% confidence level.

Preliminary Graphs

The graphs shown below are maximized peak measurement graphs measured with a resolution bandwidth greater than or equal to the final required detector over a full 0-360°. This peaking process is done as a worst case measurement and enables the detection of frequencies of concern for final measurement. For final measurements with the appropriate detector, where applicable, please refer to the tables under Final Measurements.

In accordance with FCC Part 15, Subpart A, Section 15.33, the device was scanned to the 10th harmonic (a minimum of 24.835 GHz).

Devices scanned may be scanned at alternate test distances and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 20 dB/decade was used above 30 MHz and 40 dB/decade below 30 MHz. For example for 1 meter measurements, an extrapolation factor 9.5 dB from 20 Log (1m / 3m) is applied.

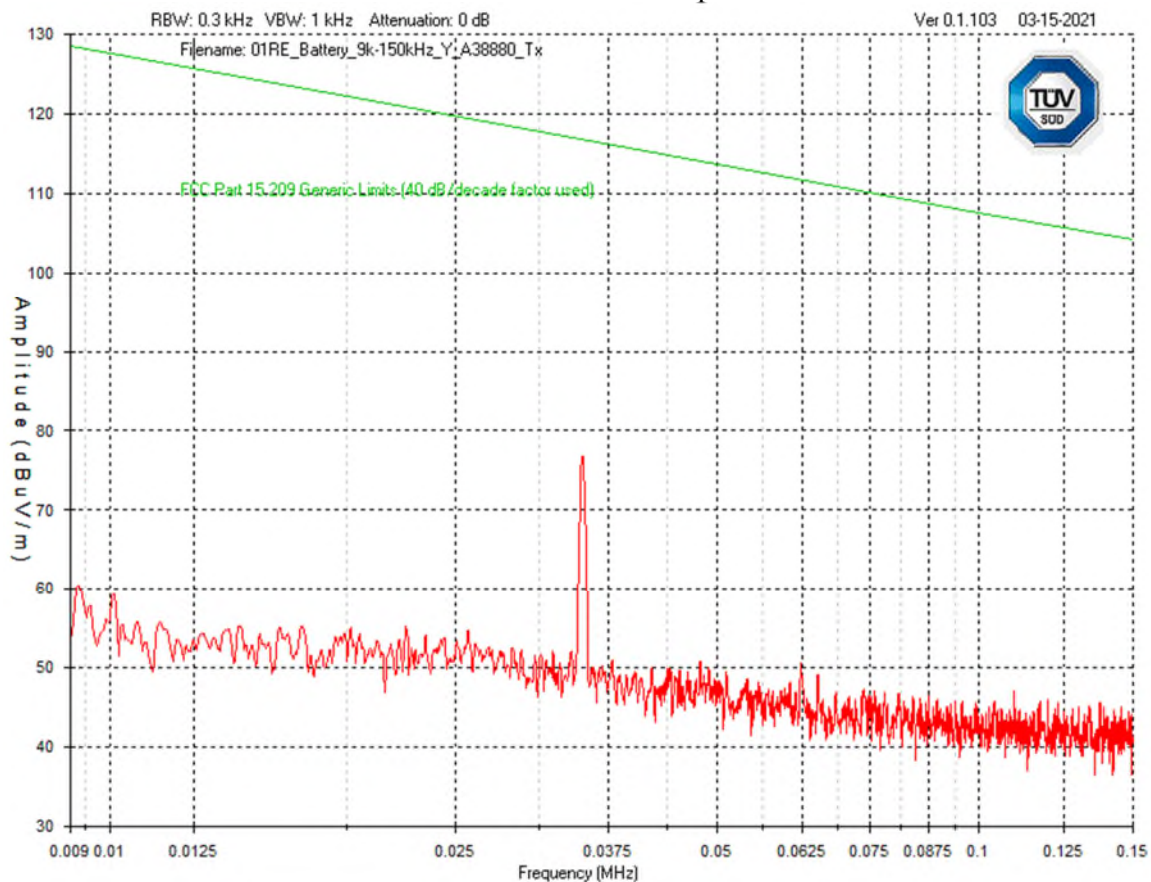
Peak output power for low, middle and high channels and each in three orthogonal axes were checked on the EUT installed in a host device. The worst case was used for the spurious emissions which was on the low channel and in the Y-axis.

Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
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Band-edge measurement graphs are shown for illustration purposes. See final measurement section for all measurements. Graphs for the worst-case, Y-axis, are presented.

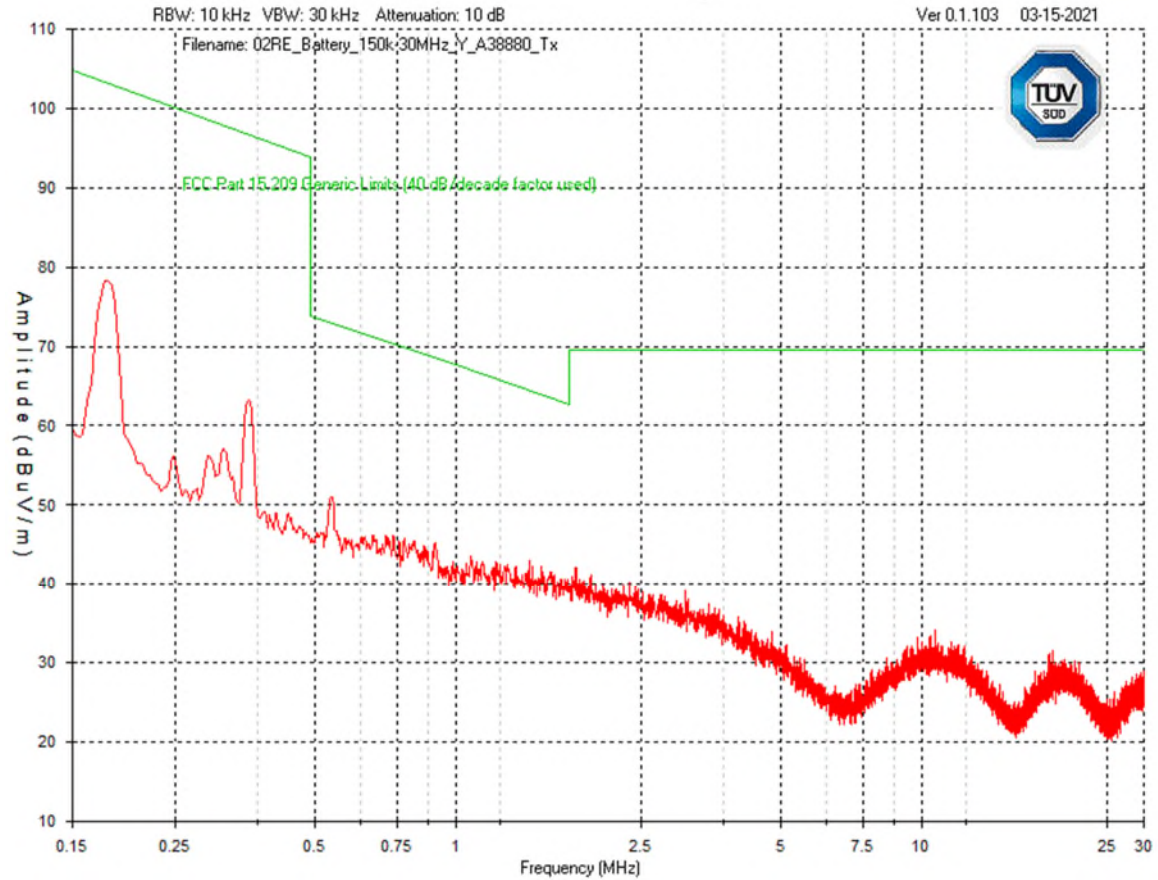
Spurious Emissions

Low Channel 9 kHz – 150 kHz Peak Emission Graph



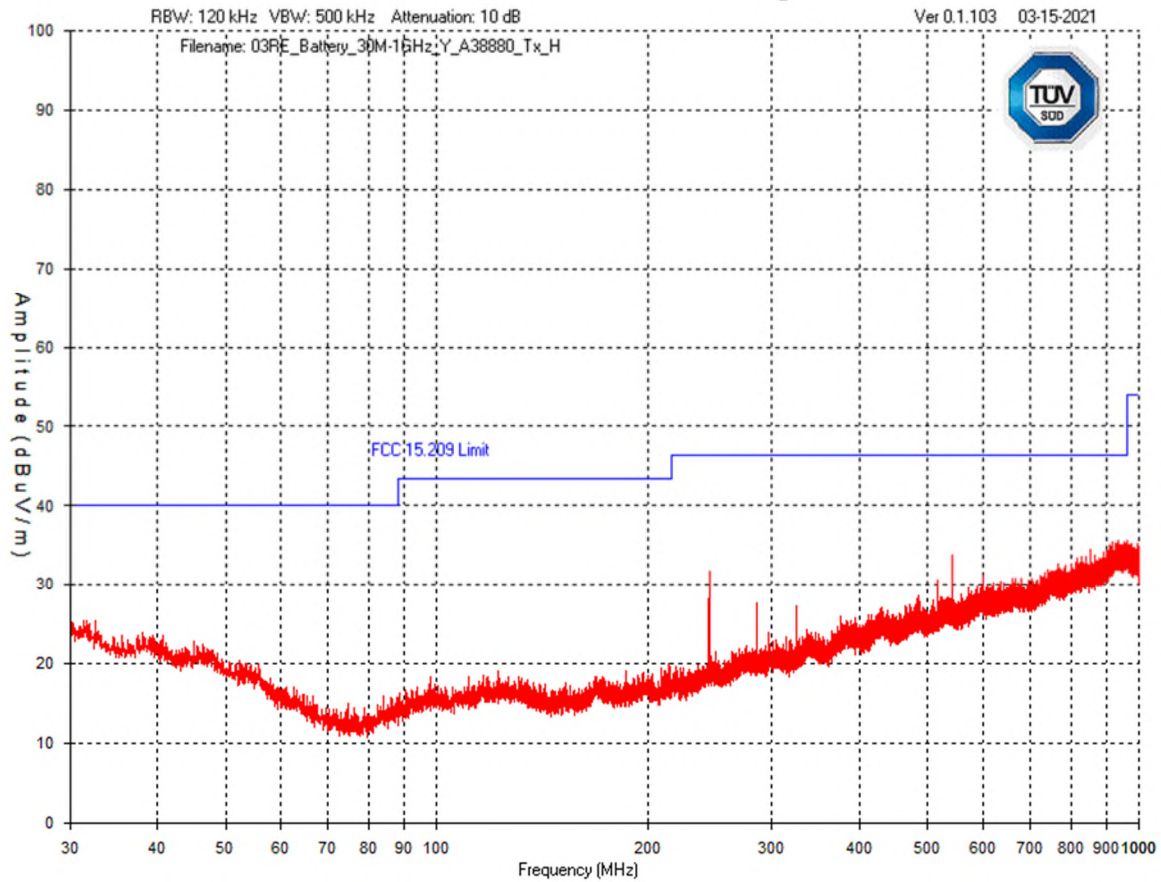
Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Low Channel
150 kHz – 30 MHz
Peak Emission Graph



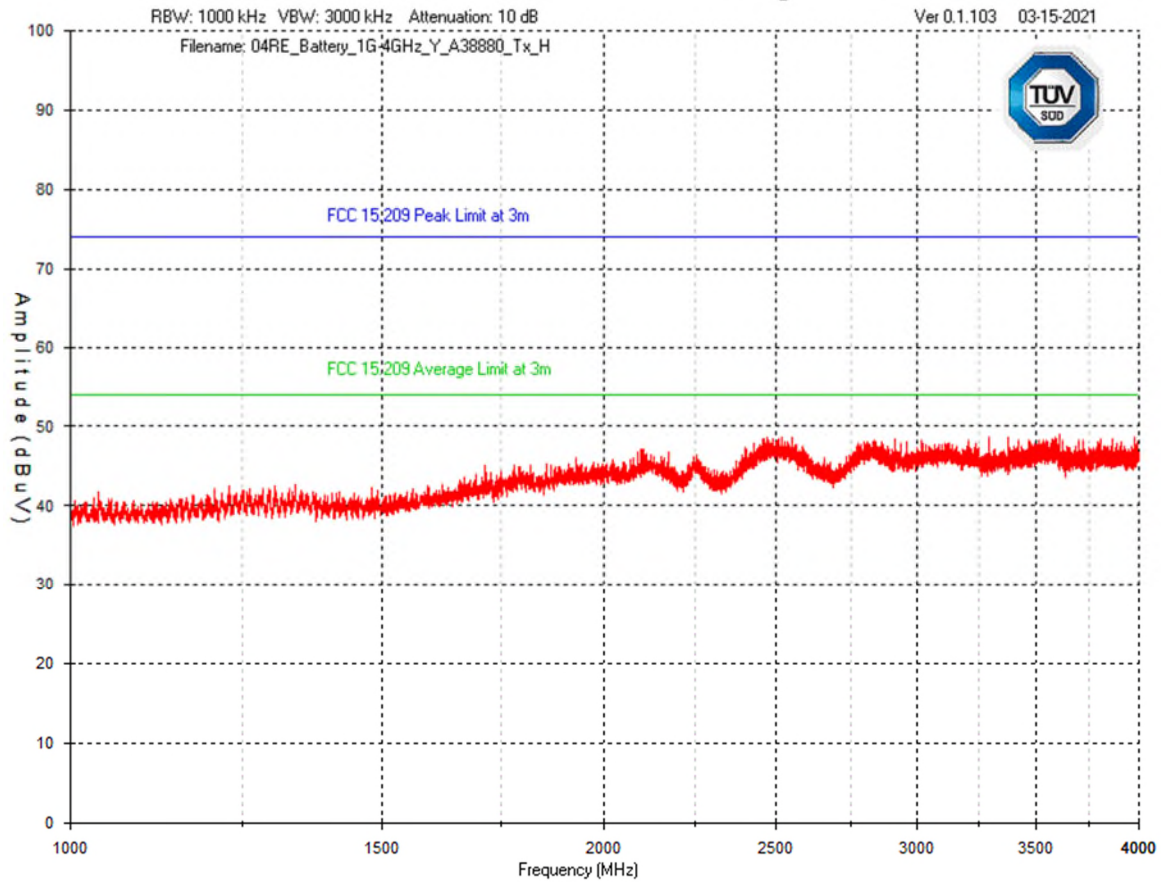
Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Low Channel – 30 MHz – 1 GHz
Horizontal - Peak Emission Graph



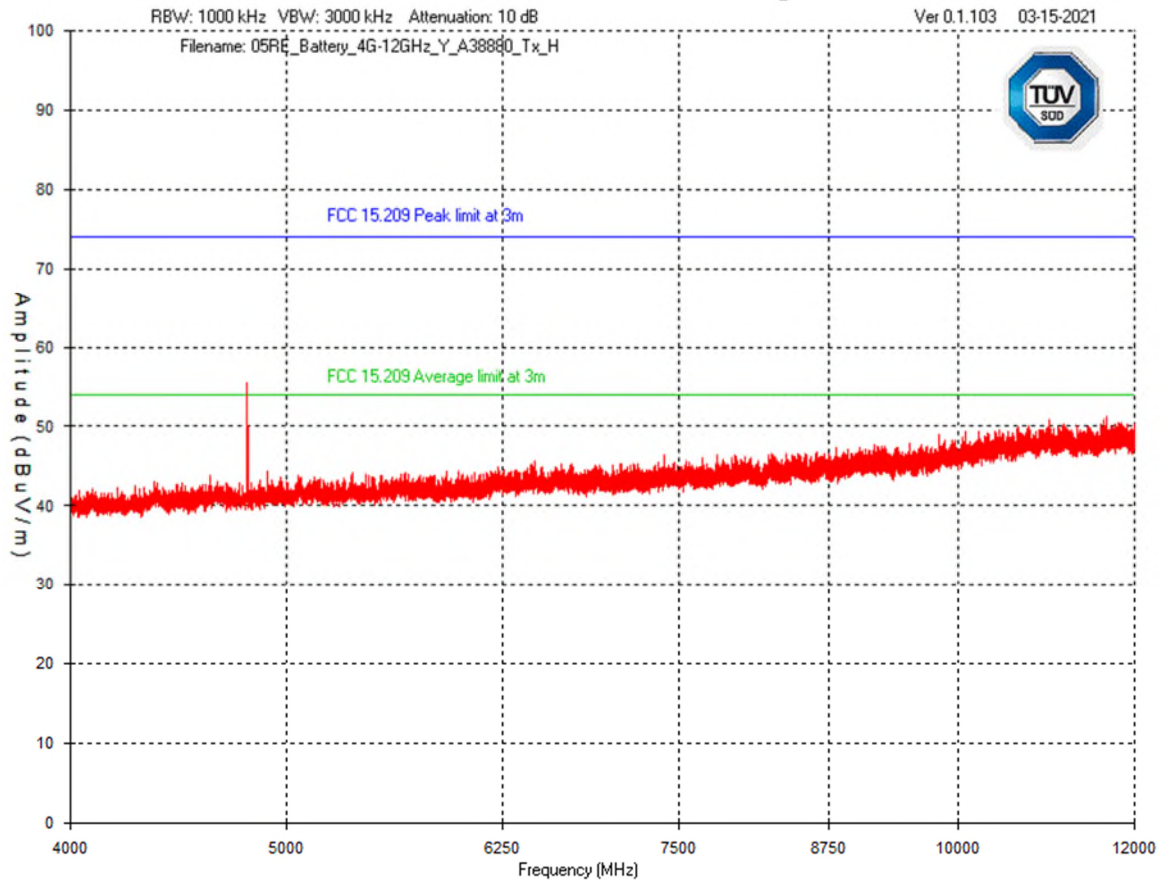
Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Low Channel – 1 GHz – 4 GHz
Horizontal - Peak Emission Graph



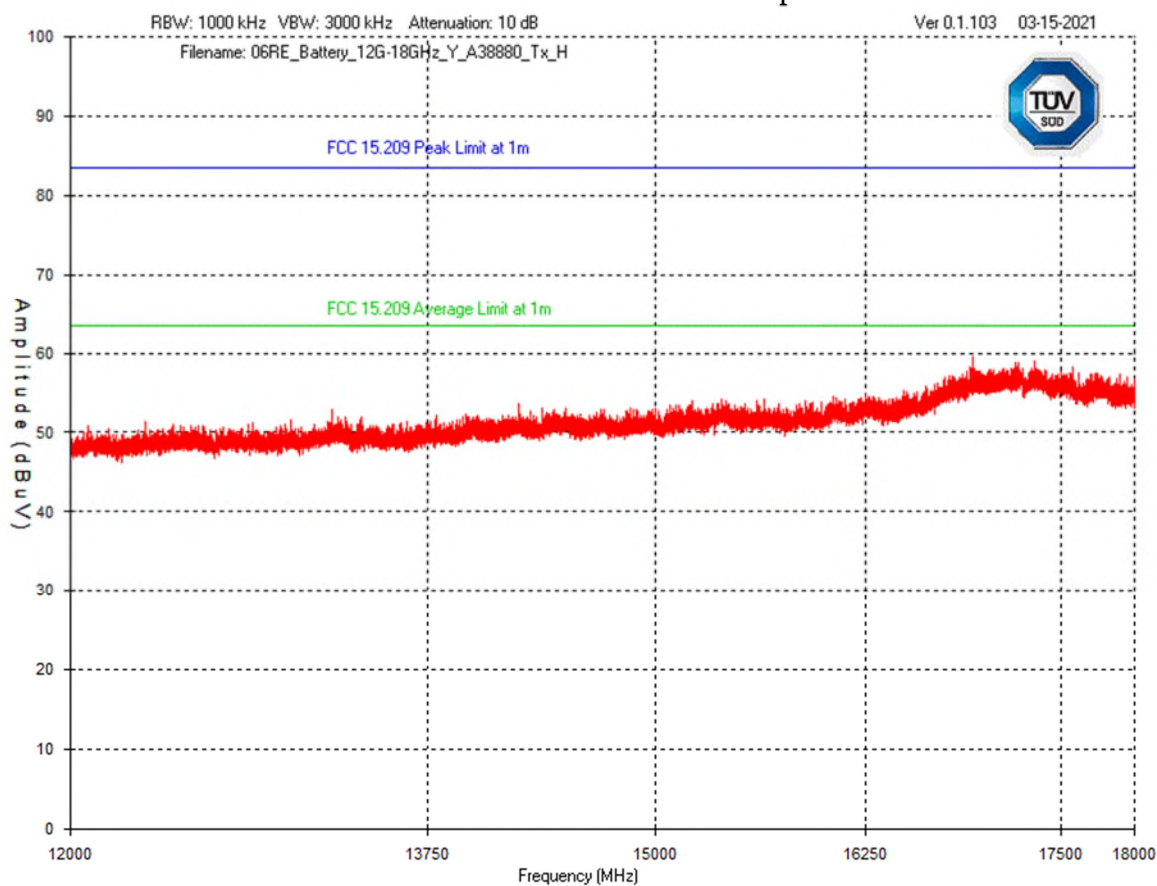
Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Low Channel – 4 GHz – 12 GHz
Horizontal - Peak Emission Graph



Client	dormakaba Canada Inc.	 Canada
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

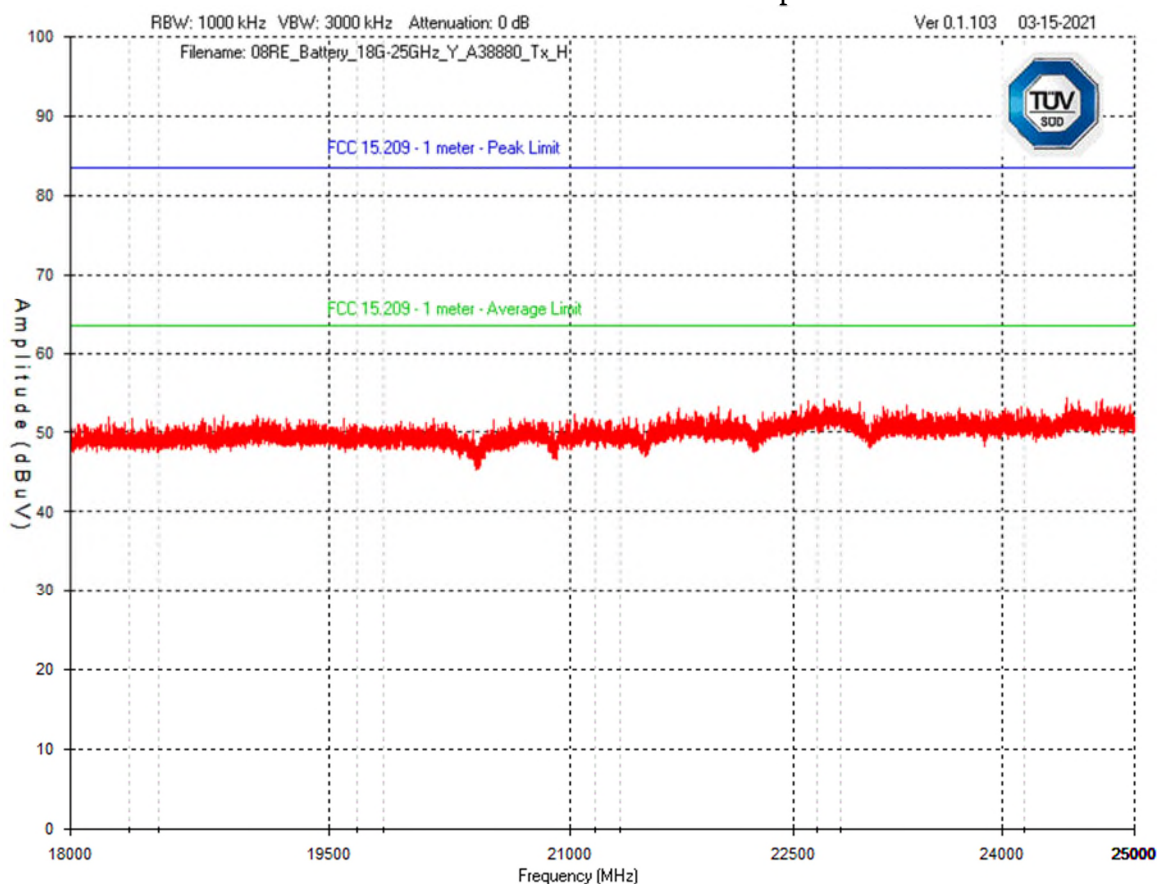
Low Channel – 12 GHz – 18 GHz
Horizontal - Peak Emission Graph



Plot was taken at a 1 meter distance. All emissions were noise floor of measurement instrument. No emissions were found in this frequency range.

Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
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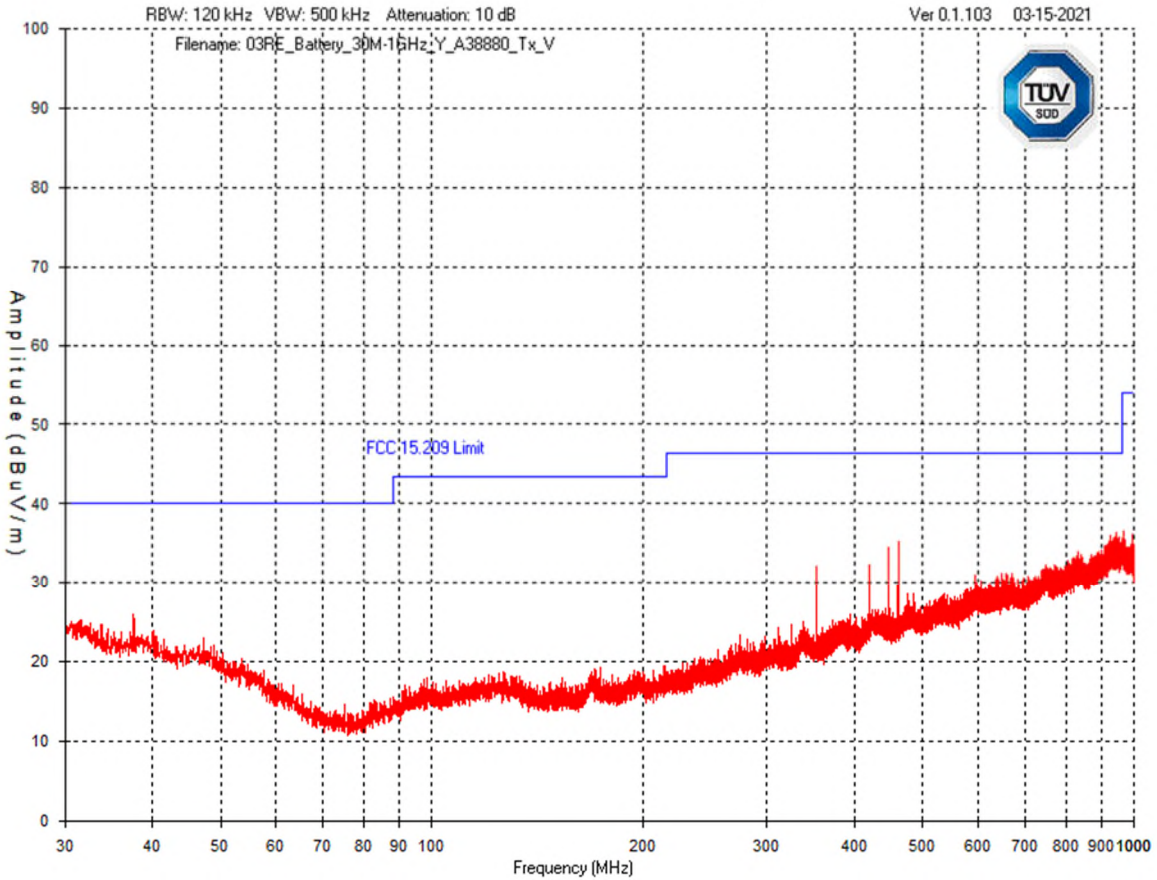
Low Channel – 18 GHz – 25 GHz
Horizontal - Peak Emission Graph



Plot was taken at a 1 meter distance. All emissions were noise floor of measurement instrument. No emissions were found in this frequency range.

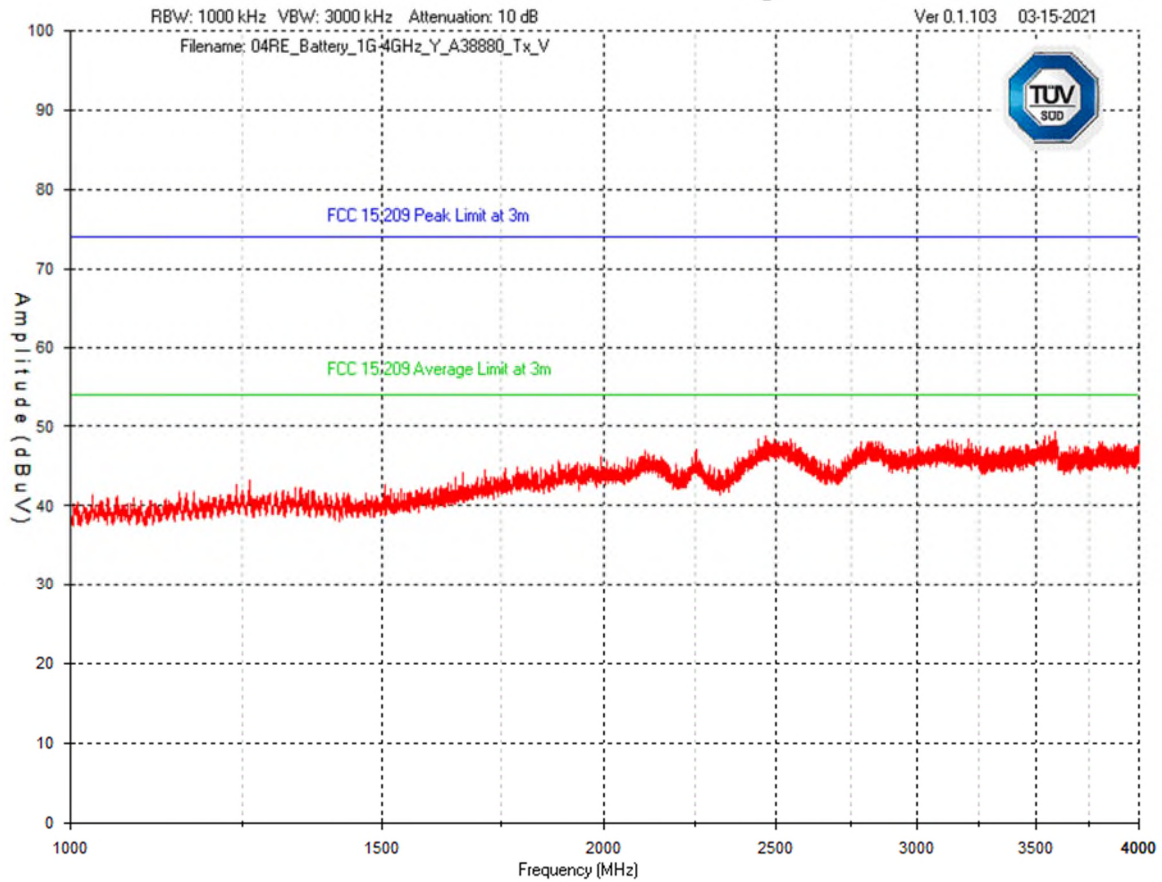
Client	dormakaba Canada Inc.	
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Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Low Channel – 30 MHz – 1 GHz
Vertical - Peak Emission Graph



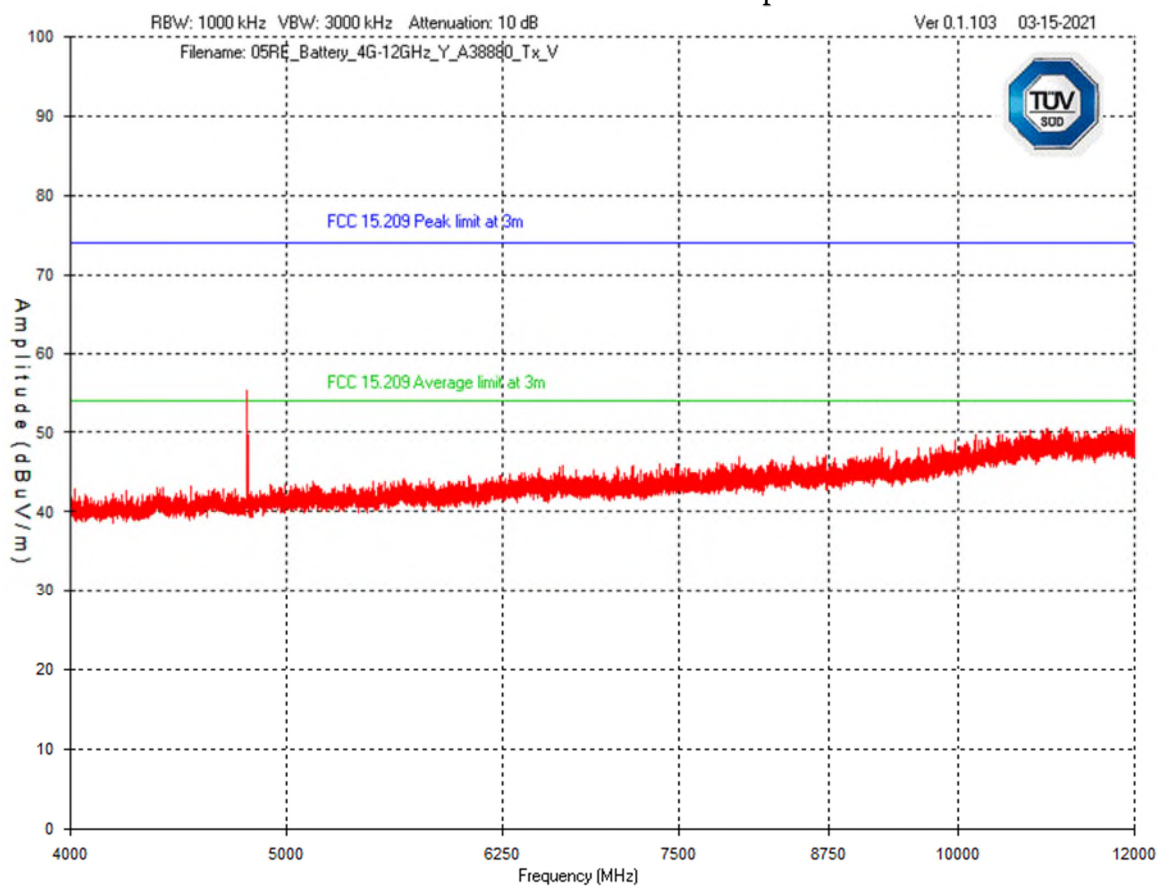
Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Low Channel – 1 GHz – 4 GHz
Vertical - Peak Emission Graph



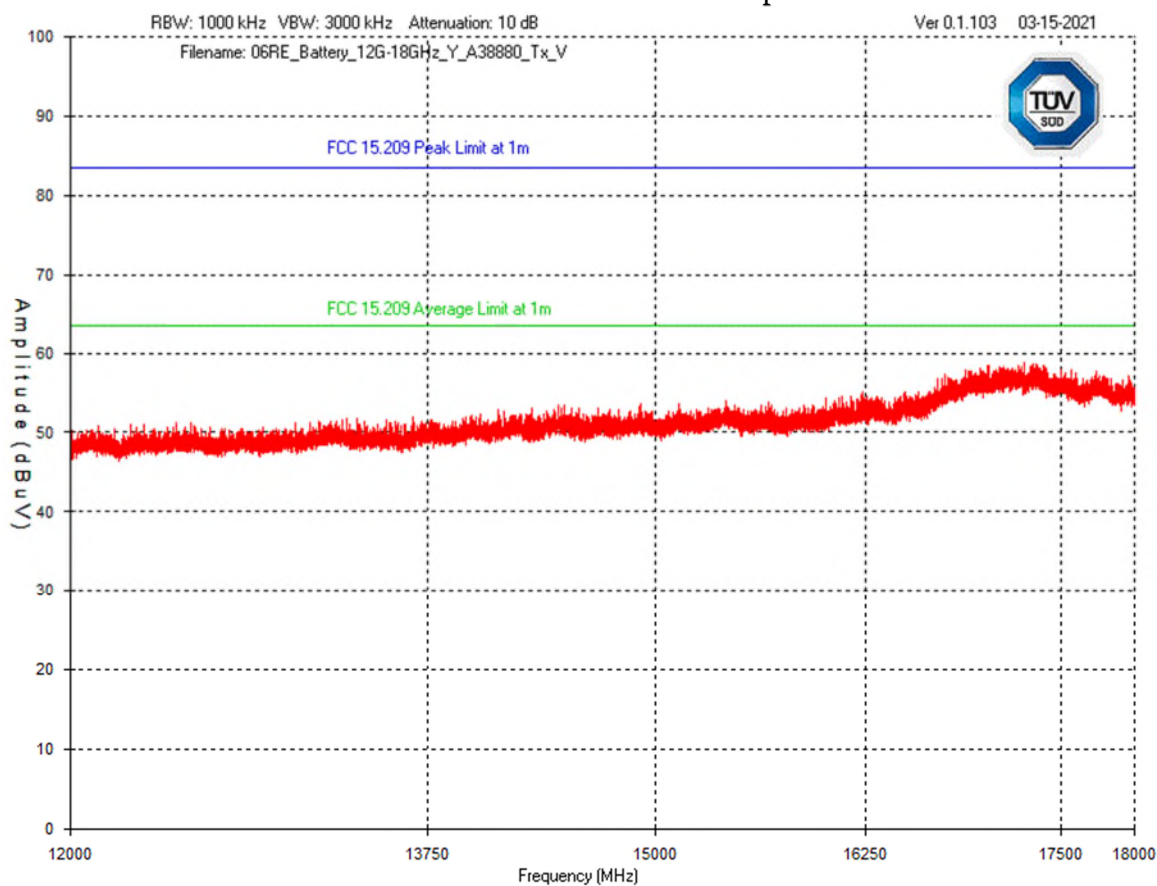
Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
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Low Channel – 4 GHz – 12 GHz
Vertical - Peak Emission Graph



Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

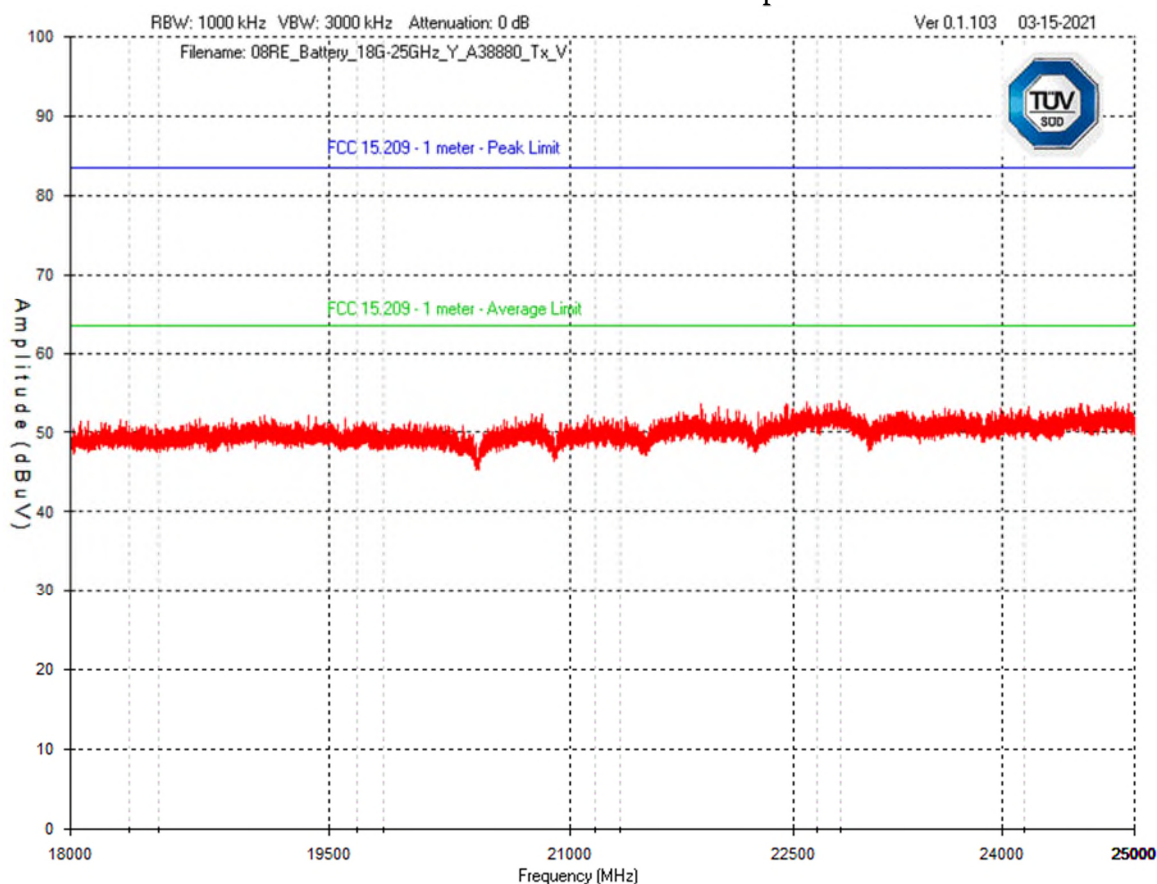
Low Channel – 12 GHz – 18 GHz
Vertical - Peak Emission Graph



Plot was taken at a 1 meter distance. All emissions were noise floor of measurement instrument. No emissions were found in this frequency range.

Client	dormakaba Canada Inc.	 Canada
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

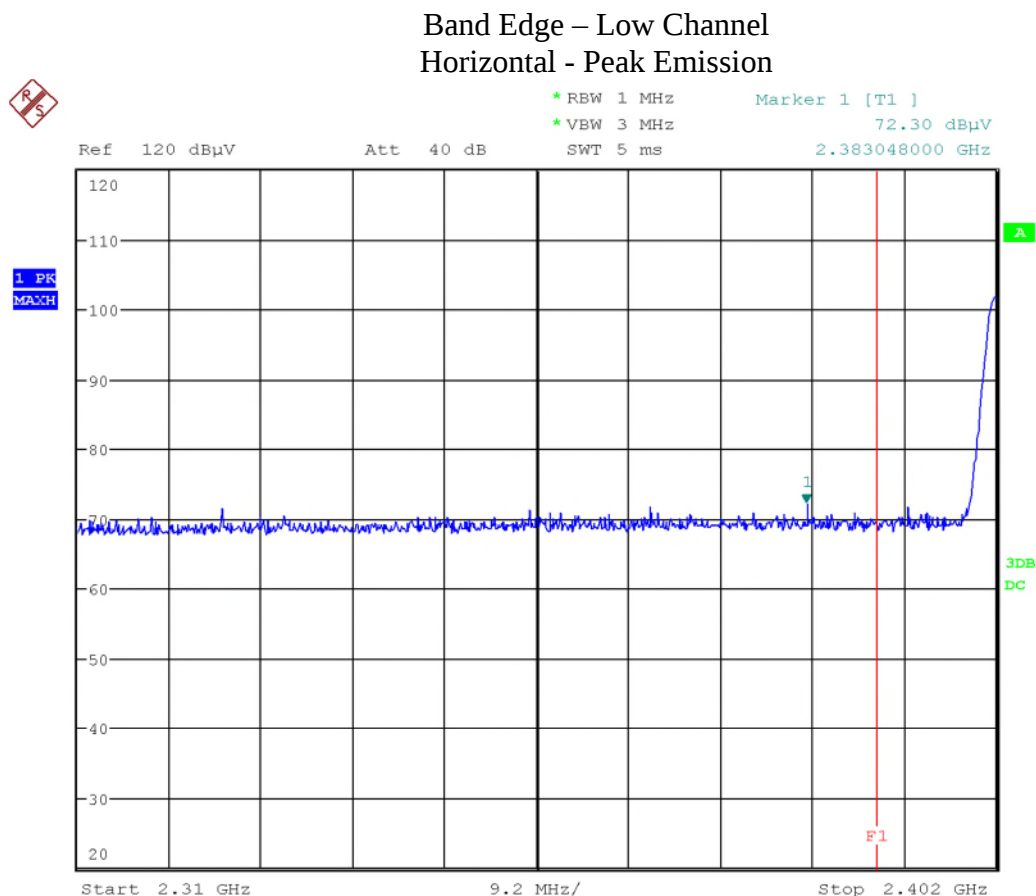
Low Channel – 18 GHz – 25 GHz
Vertical - Peak Emission Graph



Plot was taken at a 1 meter distance. All emissions were noise floor of measurement instrument. No emissions were found in this frequency range.

Client	dormakaba Canada Inc.	 Canada
Product	BLE-5100 Bluetooth Module	
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Band Edges

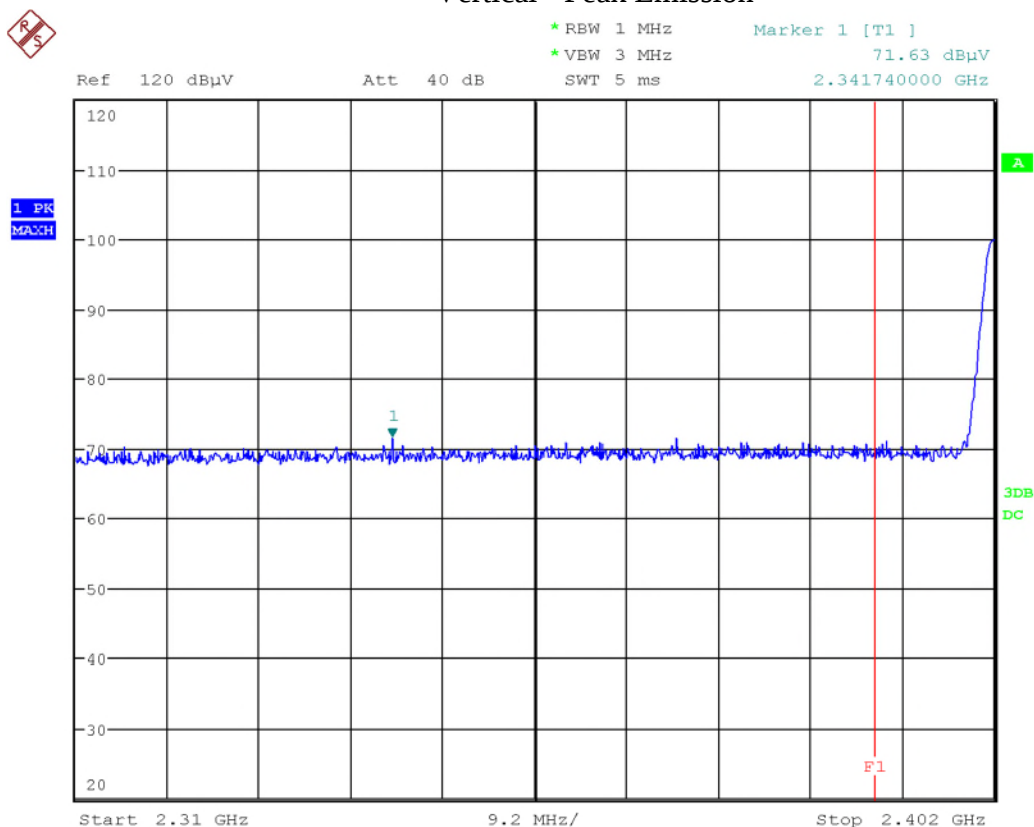


Date: 15.MAR.2021 12:15:14

Note: Restricted band Band Edge plot was taken at a 3m measurement distance. The marker shows the raw value. See the Final Measurements and Results section below for correct values.

Client	dormakaba Canada Inc.	 Canada
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Band Edge – Low Channel Vertical - Peak Emission

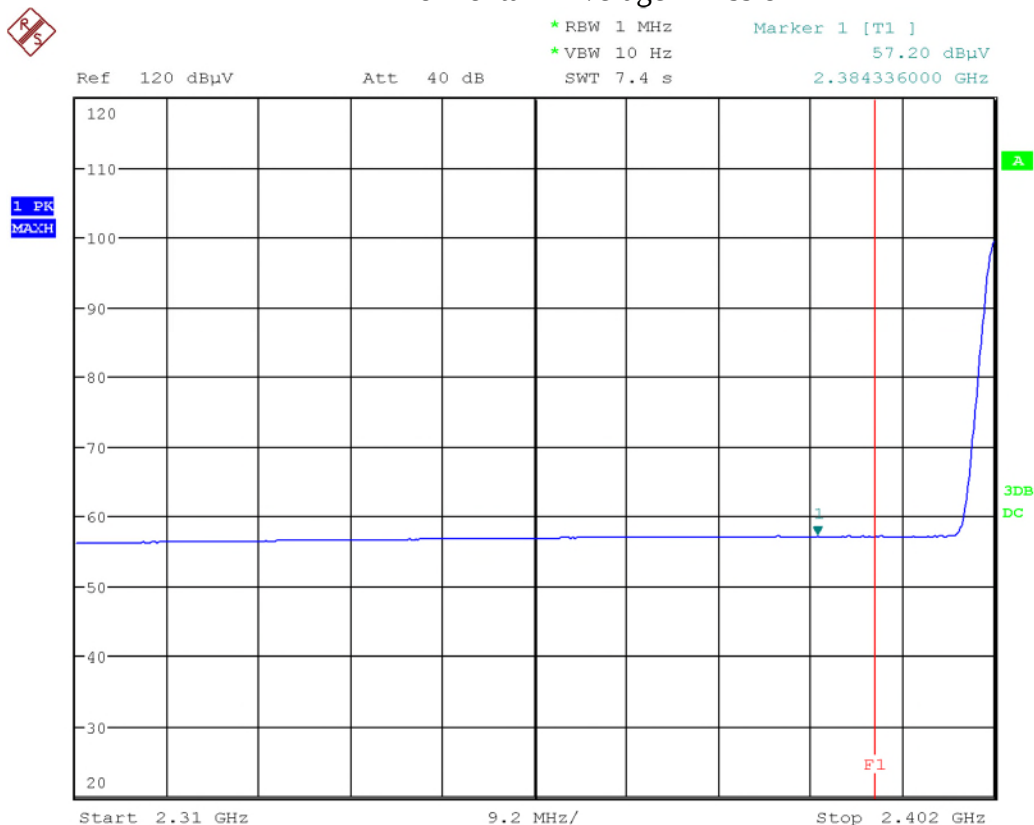


Date: 15.MAR.2021 15:04:12

Note: Restricted band Band Edge plot was taken at a 3m measurement distance. The marker shows the raw value. See the Final Measurements and Results section below for correct values.

Client	dormakaba Canada Inc.	 Canada
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Band Edge – Low Channel Horizontal - Average Emission

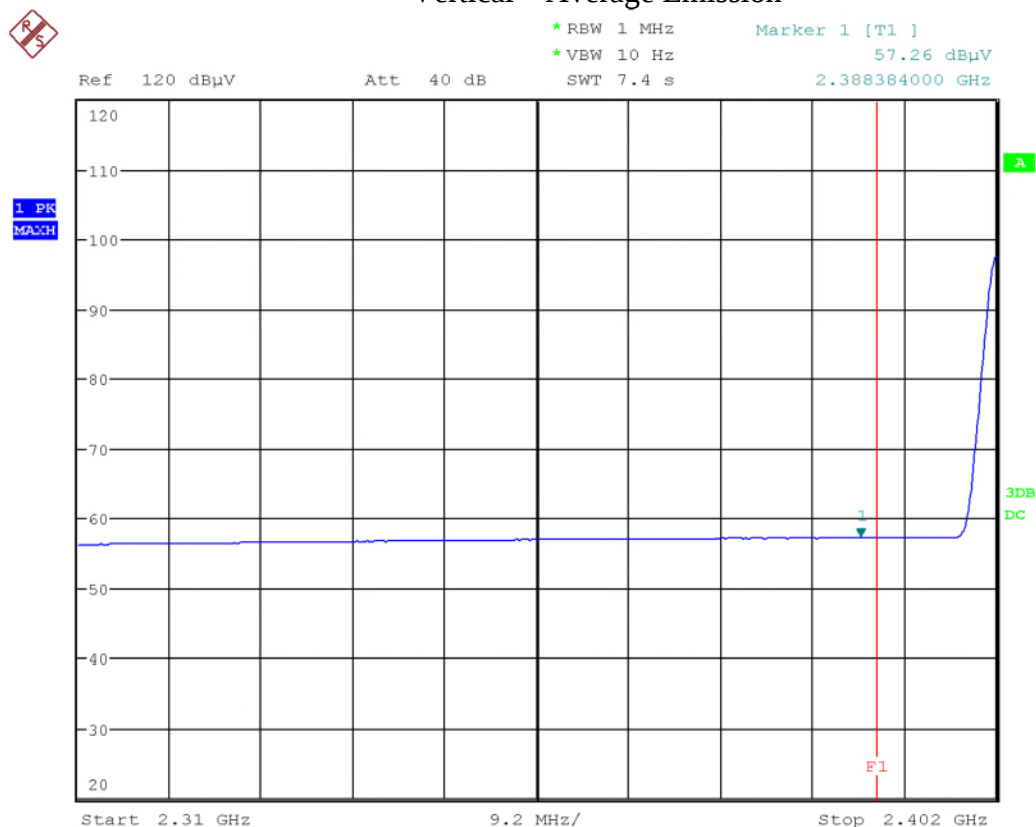


Date: 15.MAR.2021 12:15:44

Note: Restricted band Band Edge plot was taken at a 3m measurement distance. The marker shows the raw value. See the Final Measurements and Results section below for correct values.

Client	dormakaba Canada Inc.	 Canada
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Band Edge – Low Channel Vertical – Average Emission

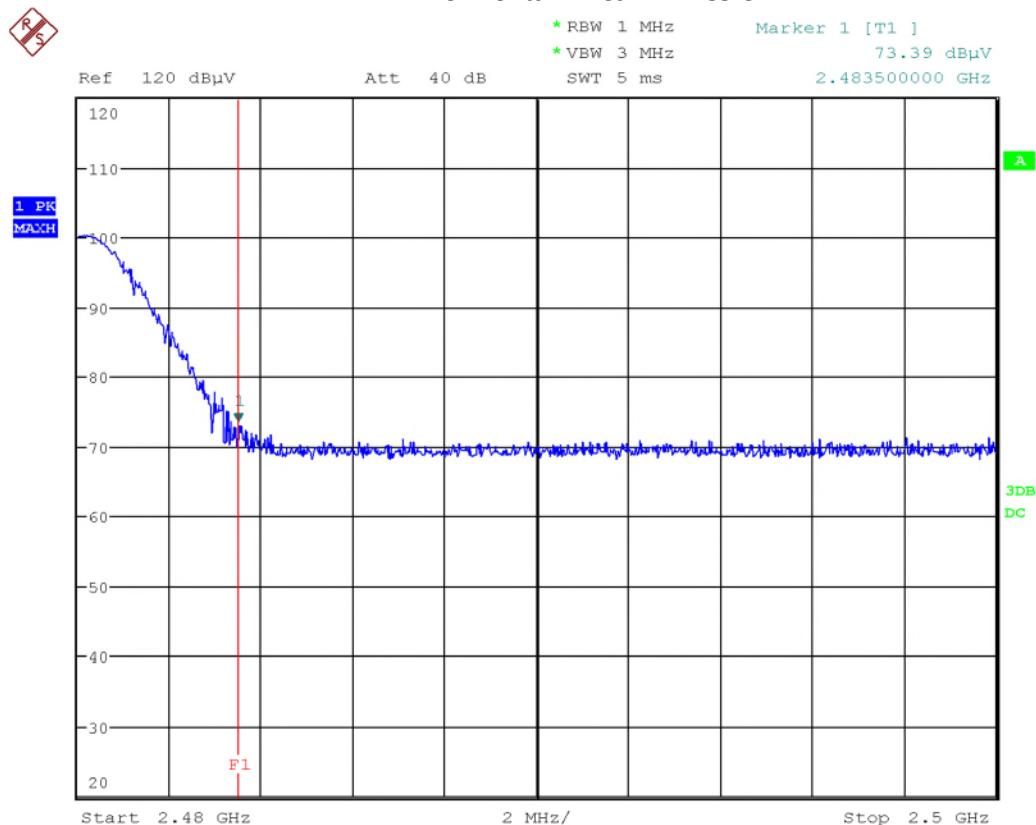


Date: 15.MAR.2021 15:04:42

Note: Restricted band Band Edge plot was taken at a 3m measurement distance. The marker shows the raw value. See the Final Measurements and Results section below for correct values.

Client	dormakaba Canada Inc.	 Canada
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Band Edge – High Channel Horizontal - Peak Emission

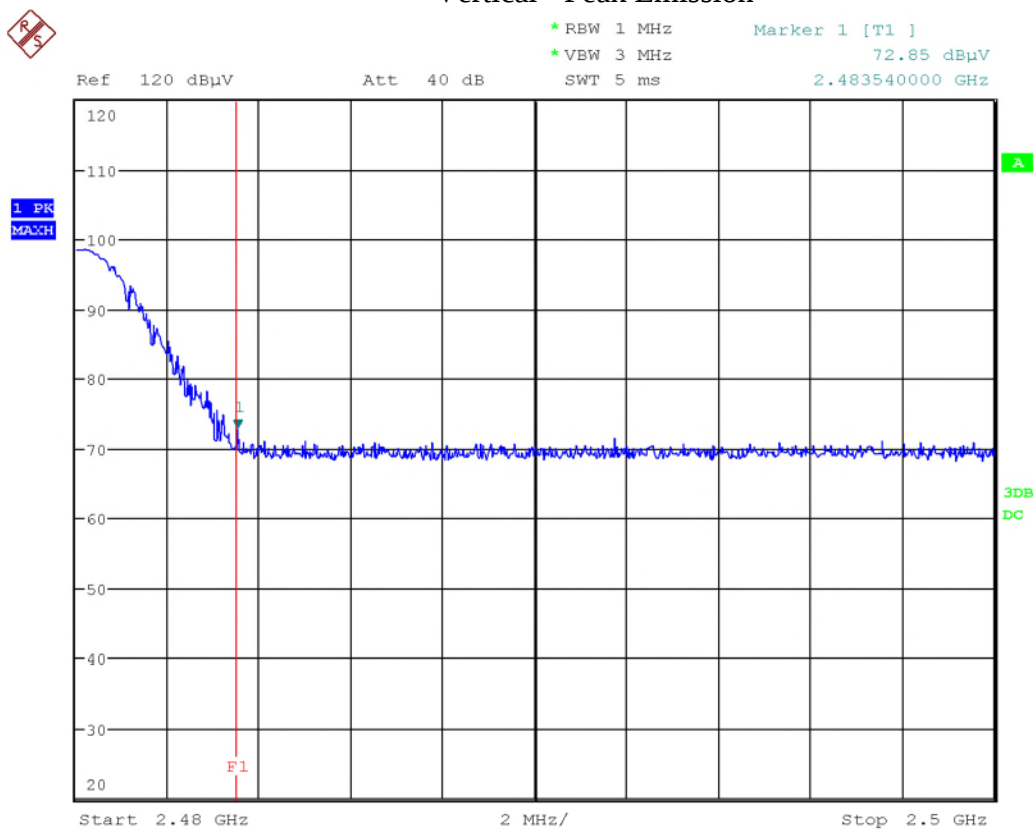


Date: 15.MAR.2021 12:58:05

Note: Restricted band Band Edge plot was taken at a 3m measurement distance. The marker shows the raw value. See the Final Measurements and Results section below for correct values.

Client	dormakaba Canada Inc.	 Canada
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Band Edge – High Channel Vertical - Peak Emission

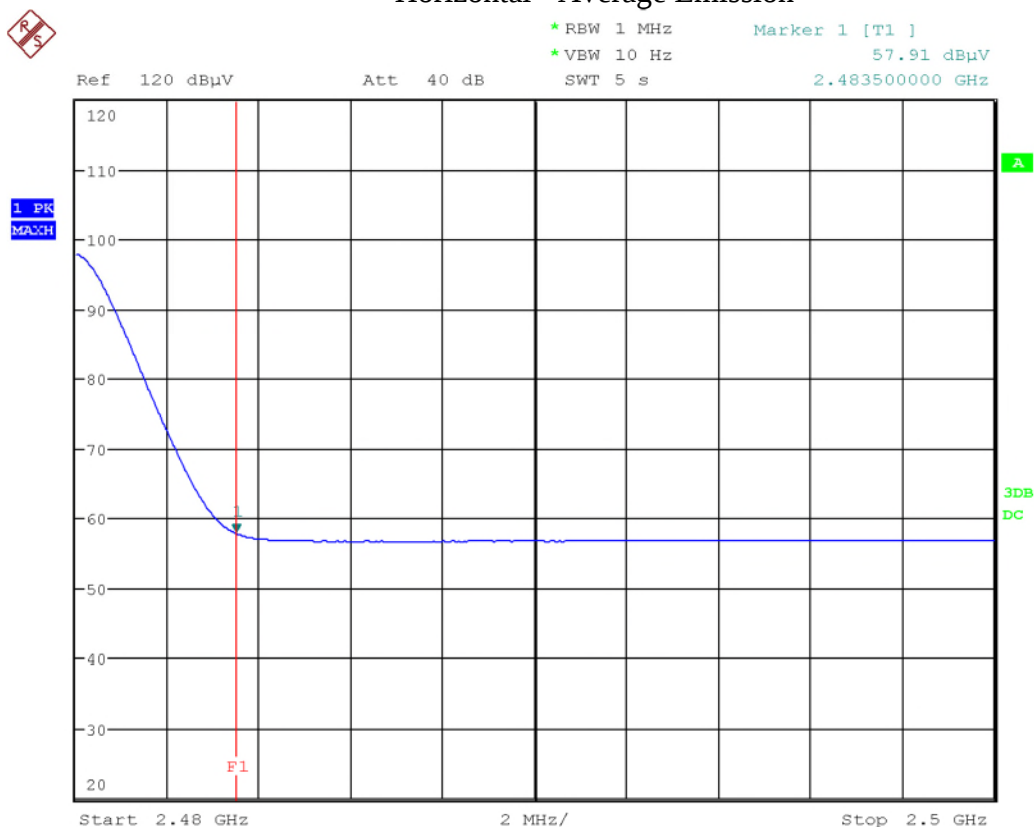


Date: 15.MAR.2021 12:52:08

Note: Restricted band Band Edge plot was taken at a 3m measurement distance. The marker shows the raw value. See the Final Measurements and Results section below for correct values.

Client	dormakaba Canada Inc.	 Canada
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Band Edge – High Channel Horizontal - Average Emission

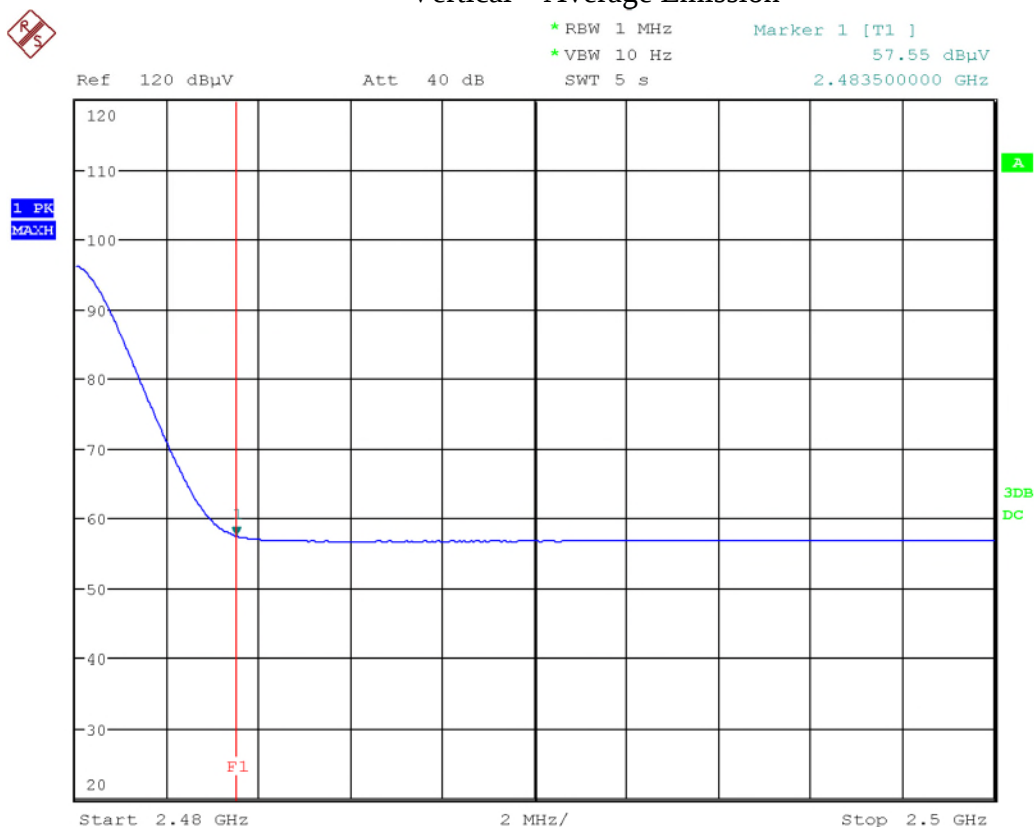


Date: 15.MAR.2021 12:58:27

Note: Restricted band Band Edge plot was taken at a 3m measurement distance. The marker shows the raw value. See the Final Measurements and Results section below for correct values.

Client	dormakaba Canada Inc.	 Canada
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Band Edge – High Channel Vertical – Average Emission



Date: 15.MAR.2021 12:52:30

Note: Restricted band Band Edge plot was taken at a 3m measurement distance. The marker shows the raw value. See the Final Measurements and Results section below for correct values.

Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
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Final Measurements and Results

The EUT passed. Low, middle, and high bands were measured.

Results below are with the EUT installed inside the host device, Saflok Quantum RFID lock.

In accordance with 15.247(d), only frequencies exceeding the 15.209 limit that occur within the bands listed in 15.205 need to be verified with a final detector. Emissions outside the restricted bands were measured for informational purposes.

The measurements were maximized by rotating the turn table over a full 0-360 rotation and the antenna height was varied from 1 m to 4 m.

Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dBµV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-Amp Gain (dB)	Level (dBµV/m)	Emission Limit (dBµV/m)	Margin (dB)	Result
Low Channel										
Z axis										
2402	Peak	Horz	101.5	26.4	4.7	-36.4	96.1			PASS
2402	Avg	Horz	99.2	26.4	4.7	-36.4	93.8			PASS
2402	Peak	Vert	99.6	26.4	4.7	-36.4	94.2			PASS
2402	Avg	Vert	97.3	26.4	4.7	-36.4	91.9			PASS
2366.9	Peak	Horz	71.2	26.5	4.6	-36.4	65.9	74.0	8.1	PASS
2389.1	Avg	Horz	57.3	26.4	4.7	-36.4	51.9	54.0	2.1	PASS
2374.7	Peak	Vert	71.2	26.4	4.6	-36.4	65.9	74.0	8.1	PASS
2387.6	Avg	Vert	57.3	26.4	4.7	-36.4	51.9	54.0	2.1	PASS
2493.7	Peak	Horz	71.6	26.2	4.7	-36.4	66.1	74.0	7.9	PASS
2499	Avg	Horz	56.9	26.1	4.7	-36.4	51.4	54.0	2.6	PASS
2498.5	Peak	Vert	72.1	26.1	4.7	-36.4	66.6	74.0	7.4	PASS
2499.8	Avg	Vert	56.9	26.1	4.7	-36.4	51.4	54.0	2.6	PASS
Low Channel										
X axis										
2402	Peak	Horz	100.8	26.4	4.7	-36.4	95.4			PASS
2402	Avg	Horz	98.5	26.4	4.7	-36.4	93.1			PASS
2402	Peak	Vert	96.8	26.4	4.7	-36.4	91.4			PASS
2402	Avg	Vert	94.5	26.4	4.7	-36.4	89.1			PASS
2351.8	Peak	Horz	71.4	26.5	4.6	-36.4	66.1	74.0	7.9	PASS
2390	Avg	Horz	57.3	26.4	4.7	-36.4	51.9	54.0	2.1	PASS
2366.3	Peak	Vert	71.1	26.5	4.6	-36.4	65.7	74.0	8.3	PASS
2379.5	Avg	Vert	57.3	26.4	4.6	-36.4	51.9	54.0	2.1	PASS
2498.8	Peak	Horz	72.1	26.1	4.7	-36.4	66.6	74.0	7.4	PASS
2499.7	Avg	Horz	56.9	26.1	4.7	-36.4	51.4	54.0	2.6	PASS
2499.5	Peak	Vert	72.3	26.1	4.7	-36.4	66.8	74.0	7.2	PASS
2498.5	Avg	Vert	56.9	26.1	4.7	-36.4	51.4	54.0	2.6	PASS
Low Channel										
Y axis										
2402	Peak	Horz	101.7	26.4	4.7	-36.4	96.3			PASS
2402	Avg	Horz	99.4	26.4	4.7	-36.4	94.0			PASS
2402	Peak	Vert	100.0	26.4	4.7	-36.4	94.6			PASS
2402	Avg	Vert	97.7	26.4	4.7	-36.4	92.3			PASS
2383	Peak	Horz	72.3	26.4	4.6	-36.4	66.9	74.0	7.1	PASS
2384.3	Avg	Horz	57.2	26.4	4.6	-36.4	51.8	54.0	2.2	PASS
2341.7	Peak	Vert	71.6	26.5	4.6	-36.4	66.3	74.0	7.7	PASS
2388.4	Avg	Vert	57.3	26.4	4.7	-36.4	51.9	54.0	2.1	PASS
2498.1	Peak	Horz	71.9	26.1	4.7	-36.4	66.4	74.0	7.6	PASS
2499.4	Avg	Horz	56.9	26.1	4.7	-36.4	51.4	54.0	2.6	PASS
2484.3	Peak	Vert	71.9	26.2	4.7	-36.4	66.4	74.0	7.6	PASS
2499.9	Avg	Vert	57.0	26.1	4.7	-36.4	51.5	54.0	2.5	PASS
4804	Peak	Horz	57.7	27.8	7.0	-35.2	57.3	74.0	16.7	PASS
4804	Avg	Horz	53.3	27.8	7.0	-35.2	52.9	54.0	1.1	PASS
4804	Peak	Vert	57.2	27.8	7.0	-35.2	56.8	74.0	17.2	PASS
4804	Avg	Vert	52.7	27.8	7.0	-35.2	52.3	54.0	1.7	PASS
7206	Peak	Horz	45.5	29.0	8.7	-35.3	47.8	74.0	26.2	PASS
7206	Avg	Horz	32.7	29.0	8.7	-35.3	35.0	54.0	19.0	PASS
7206	Peak	Vert	45.9	29.0	8.7	-35.3	48.2	74.0	25.8	PASS
7206	Avg	Vert	34.3	29.0	8.7	-35.3	36.6	54.0	17.4	PASS
9608	Peak	Horz	42.9	31.2	10.0	-35.7	48.3	74.0	25.7	PASS
9608	Avg	Horz	28.2	31.2	10.0	-35.7	33.6	54.0	20.4	PASS
9608	Peak	Vert	43.1	31.2	10.0	-35.7	48.5	74.0	25.5	PASS
9608	Avg	Vert	28.2	31.2	10.0	-35.7	33.6	54.0	20.4	PASS

Peak Power and Band-Edge Measurements
Low Channel

Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dBμV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-Amp Gain (dB)	Level (dBμV/m)	Emission Limit (dBμV/m)	Margin (dB)	Result
Mid Channel										
Z axis										
2440	Peak	Horz	100.3	26.4	4.7	-36.4	95.0	--	--	PASS
2440	Avg	Horz	98.0	26.4	4.7	-36.4	92.7	--	--	PASS
2440	Peak	Vert	98.9	26.4	4.7	-36.4	93.6	--	--	PASS
2440	Avg	Vert	96.6	26.4	4.7	-36.4	91.2	--	--	PASS
Mid Channel										
X axis										
2440	Peak	Horz	100.4	26.4	4.7	-36.4	95.1	--	--	PASS
2440	Avg	Horz	98.1	26.4	4.7	-36.4	92.8	--	--	PASS
2440	Peak	Vert	99.2	26.4	4.7	-36.4	93.9	--	--	PASS
2440	Avg	Vert	96.9	26.4	4.7	-36.4	91.6	--	--	PASS
Mid Channel										
Y axis										
2440	Peak	Horz	100.6	26.4	4.7	-36.4	95.2	--	--	PASS
2440	Avg	Horz	98.2	26.4	4.7	-36.4	92.9	--	--	PASS
2440	Peak	Vert	97.8	26.4	4.7	-36.4	92.5	--	--	PASS
2440	Avg	Vert	95.5	26.4	4.7	-36.4	90.1	--	--	PASS

Peak Power Measurements
Mid Channel

Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dBμV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-Amp Gain (dB)	Level (dBμV/m)	Emission Limit (dBμV/m)	Margin (dB)	Result
High Channel Z axis										
2480	Peak	Horz	98.0	26.2	4.7	-36.4	92.6			PASS
2480	Avg	Horz	95.7	26.2	4.7	-36.4	90.3			PASS
2480	Peak	Vert	99.4	26.2	4.7	-36.4	94.0			PASS
2480	Avg	Vert	97.0	26.2	4.7	-36.4	91.6			PASS
2363	Peak	Horz	71.4	26.5	4.6	-36.4	66.1	74.0	7.9	PASS
2388	Avg	Horz	57.3	26.4	4.7	-36.4	51.9	54.0	2.1	PASS
2384.7	Peak	Vert	71.8	26.4	4.6	-36.4	66.4	74.0	7.6	PASS
2384.2	Avg	Vert	57.3	26.4	4.6	-36.4	51.9	54.0	2.1	PASS
2483.5	Peak	Horz	72.0	26.2	4.7	-36.4	66.6	74.0	7.4	PASS
2483.5	Avg	Horz	57.5	26.2	4.7	-36.4	52.0	54.0	2.0	PASS
2483.7	Peak	Vert	72.4	26.2	4.7	-36.4	66.9	74.0	7.1	PASS
2483.5	Avg	Vert	57.7	26.2	4.7	-36.4	52.3	54.0	1.7	PASS
High Channel X axis										
2480	Peak	Horz	99.4	26.2	4.7	-36.4	94.0			PASS
2480	Avg	Horz	97.1	26.2	4.7	-36.4	91.7			PASS
2480	Peak	Vert	99.5	26.2	4.7	-36.4	94.1			PASS
2480	Avg	Vert	97.2	26.2	4.7	-36.4	91.8			PASS
2324.2	Peak	Horz	71.7	26.4	4.6	-36.4	66.3	74.0	7.7	PASS
2389.4	Avg	Horz	57.3	26.4	4.7	-36.4	51.9	54.0	2.1	PASS
2380.3	Peak	Vert	71.5	26.4	4.6	-36.4	66.1	74.0	7.9	PASS
2387.8	Avg	Vert	57.3	26.4	4.7	-36.4	51.9	54.0	2.1	PASS
2483.6	Peak	Horz	72.3	26.2	4.7	-36.4	66.9	74.0	7.1	PASS
2483.5	Avg	Horz	57.7	26.2	4.7	-36.4	52.3	54.0	1.7	PASS
2483.6	Peak	Vert	73.4	26.2	4.7	-36.4	68.0	74.0	6.0	PASS
2483.5	Avg	Vert	57.7	26.2	4.7	-36.4	52.3	54.0	1.7	PASS
High Channel Y axis										
2480	Peak	Horz	100.2	26.2	4.7	-36.4	94.8			PASS
2480	Avg	Horz	98.0	26.2	4.7	-36.4	92.5			PASS
2480	Peak	Vert	98.6	26.2	4.7	-36.4	93.2			PASS
2480	Avg	Vert	96.3	26.2	4.7	-36.4	90.9			PASS
2362.2	Peak	Horz	71.5	26.5	4.6	-36.4	66.2	74.0	7.8	PASS
2385.3	Avg	Horz	57.2	26.4	4.6	-36.4	51.9	54.0	2.1	PASS
2343	Peak	Vert	71.7	26.5	4.6	-36.4	66.4	74.0	7.6	PASS
2387	Avg	Vert	57.3	26.4	4.7	-36.4	51.9	54.0	2.1	PASS
2483.5	Peak	Horz	73.4	26.2	4.7	-36.4	68.0	74.0	6.0	PASS
2483.5	Avg	Horz	57.9	26.2	4.7	-36.4	52.5	54.0	1.5	PASS
2483.5	Peak	Vert	72.8	26.2	4.7	-36.4	67.4	74.0	6.6	PASS
2483.5	Avg	Vert	57.5	26.2	4.7	-36.4	52.1	54.0	1.9	PASS

Peak Power and Band-Edge Measurements
High Channel

Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	ESU 40	Rohde & Schwarz	Jan. 15, 2020	Jan. 15, 2022	GEMC 233
Loop Antenna	EM 6871	Electro-Metrics	Feb 26, 2021	Feb 26, 2023	GEMC 70
Loop Antenna	EM 6872	Electro-Metrics	Feb 26, 2021	Feb 26, 2023	GEMC 71
BiLog Antenna	AC-220	Com-Power Corporation	Mar. 03, 2021	Mar. 03, 2023	GEMC 360
Horn Antenna 4 – 18 GHz	WBH218HN	Q-par	Apr. 1, 2020	Apr. 1, 2022	GEMC 6375
Horn Antenna 1 – 4 GHz	3117	ETS-Lindgren	Feb. 17, 2020	Feb. 17, 2022	GEMC 340
Horn Antenna 18 - 26.5 GHz	SAS-572	A.H. Systems	Dec. 1, 2020	Dec. 1, 2022	GEMC 6371
Attenuator 6 dB	6N5W-06	Inmet	NCR	NCR	GEMC 347
Pre-Amp 9 kHz – 1 GHz	LNA 6901	Teseq	Feb. 12, 2021	Feb. 12, 2023	GEMC 168
Pre-Amp 1 – 26.5 GHz	HP 8449B	HP	Aug. 4, 2020	Aug. 4, 2022	GEMC 312
2.4GHz-2.5GHz Notch Filter	BRM50702	Micro-Tronics	NCR	NCR	GEMC 230
RF Cable 10m	LMR-400-10M- 50Ω-MN-MN	LexTec	NCR	NCR	GEMC 274
RF Cable 2m	Sucoflex 104A	Huber+Suhner	NCR	NCR	GEMC 271
Emissions Software	0.1.103	TUV SUD Canada, Inc.	NCR	NCR	GEMC 58

Client	dormakaba Canada Inc.	 Canada
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Appendix A – EUT Summary

Client	dormakaba Canada Inc.	
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

For further details for filing purposes, refer to filing package.

General EUT Description

Client	
Organization / Address	dormakaba Canada Inc. 7301 Decarie Blvd Montreal, Quebec, H4P 2G7 Canada
Contact	Michael Mosca
Phone	514-735-5410 ext. 749
Email	michael.mosca@kaba.com
EUT Details	
EUT Name	BLE-5100 Bluetooth Module
Model	A38880
FCC ID	Q8SA38880
IC	4652A-A38880
Equipment Category	Module
Basic EUT Functionality	Bluetooth module
Input Voltage and Frequency	5Vdc from Host
Rated Input Current	500mA
Connectors available on EUT	None
Peripherals Required for Test	Assembled Lock on a mount Host: Saflok Quantum RFID lock
Intentional Radiator Frequency	2400 – 2483.5 MHz for BLE applications
EUT Configuration	Wireless configured to transmit continuously at 100% duty cycle DKS-6000 (from Legic) test software used which was pre-configured for low, mid and high channel modulated transmission at max power.

Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated. For a close-up picture of the EUT, see ‘Appendix B – EUT and Test Setup Photos’.

Client	dormakaba Canada Inc.	 Canada
Product	BLE-5100 Bluetooth Module	
Standard(s)	RSS 247 Issue 2:2017 FCC Part 15 Subpart 15.247	

Appendix B – EUT and Test Setup Photos

Refer to the files separate from this test report