RF Test Report

As per

RSS-210 Issue 11:2024
&
FCC Part 15 Subpart 15.209 & 15.249

Low Power License Exempt Radio Communication Devices Intentional Radiators

on the

Saffire EVO LZ
(C2PC)

Issued by: **TÜV SÜD Canada Inc.**
1280 Teron Rd
Ottawa, Canada

Testing produced for
dormakaba
See Appendix A for full client & EUT details.

Scott Drysdale,
Test Personnel
& Report Author

Steve McFarlane
Report Reviewer

ACCREDITED
Testing Laboratory
Certificate #2955.19

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Report Scope

This report addresses the EMC verification testing and test results of the **Saffire EVO LZ**, herein referred to as EUT (Equipment Under Test). The EUT was tested for compliance against the following standards:

RSS-210 Issue 11:2024

FCC Part 15 Subpart C 15.209 & 15.249:2022

Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

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.

Summary

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

EUT	**Saffire EVO LZ**
FCC Certification #, FCC ID:	Q8SSAFFIREEVOM
Industry Canada Certification #, IC:	4652A-SAFFIREEVOM
EUT passed all tests performed	Yes
Tests conducted by	Scott Drysdale

Note:

Contains FCC ID: 2AU49-DA16200MC
Contains IC: 25650-DA16200MC

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

Test Results Summary

Standard/Method	Description	Class/Limit	Result
FCC 15.203	Antenna Requirement	Unique	Pass See Justification
FCC 15.209 RSS-GEN (Table 4)	Transmitter Spurious Radiated Emissions	Quasi-Peak	Pass
FCC 15.207 RSS-GEN (Table 3)	Power Line Conducted Emissions	Quasi-Peak, Average	N/A, See Justification
FCC 15.215 (c) C63.10 Section 6.9	Occupied Bandwidth	20dB OBW	Pass
RSS-GEN Section 6.6	Occupied Bandwidth	99% OBW	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. A ‘PASS’ / ‘FAIL’ grade within measurement uncertainty is marked with a ‘*’.

Notes, Justifications, or Deviations

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

The purpose of this testing was to qualify the impact of the changes from the RFID antenna being updated and the relevant circuits retuned.

For the antenna requirement specified in FCC 15.203, for RFID the EUT uses a custom loop antenna which is also not meant to be replaceable by the user. For Bluetooth™ the EUT uses a PCB chip antenna, which is not meant to be replaceable by the user.

The device also incorporates a certified Wi Fi module IC: 25650-DA16200MC / FCC ID: 2AU49-DA16200MC. Integration testing was performed separately. All testing in this test report had the module in the on state and performing as per normal operation.

For the Restricted Bands of operation, the EUT is designed to operate only at 13.56 MHz and 2.4 GHz to 2.4835 GHz.

The EUT was mounted in three orthogonal axis. Worst case results were obtained with the EUT in the Z-axis. Worst case results are presented.

Power line conducted emissions was not applicable since the EUT is a battery operated device with no provision for charging or connection to AC mains.

All the tests were performed with new batteries installed.

The EUT does not have an antenna port and all measurements were performed using the radiated method. Antenna gain is not specified as the device has been tested to comply with the applicable radiated emissions limits via radiated emissions measurements and antenna port conducted emissions do not apply.

Sample Calculation(s)

Radiated Emission Test

Margin = Limit – (Received Signal + Antenna Factor + Cable Loss – Pre-Amp Gain)
Margin = 50.5dBµV/m – (50dBµV + 10dB/m + 2.5dB – 20dB)
Margin = 8.0 dB (pass)

Applicable Standards, Specifications and Methods

ANSI C63.4:2017	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10:2020	American National Standard For Testing Unlicensed Wireless Devices
CFR 47 FCC 15 Subpart C:2022	Code of Federal Regulations – Radio Frequency Devices, Intentional Radiators
RSS-GEN Issue 5 2018	General Requirements and Information for the Certification of Radio Apparatus
RSS-210 Issue 11:2024	Licence-Exempt Radio Apparatus: Category I Equipment
ISO/IEC 17025:2017	General Requirements for the Competence of Testing and Calibration Laboratories

Document Revision Status

Revision 000 - Feb 17th, 2025 – first release.

Revision 001 – Feb 19th, 2025 – Minor revision to update customer address.

Revision 002 – Feb 19th, 2025 – Correction to RSS-210 version due to error.

Revision 003 – Feb 19th, 2025 – Correction to RSS-210 version due to error.

Revision 004 – Mar 3rd 2025 – Corrected name of EUT as per customer request.

Definitions and Acronyms

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

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

BW – Bandwidth. Unless otherwise stated, this is refers to the 20 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 with a primary function(s) of entry, storage, display, retrieval, transmission, processing, switching, or control, of data.

LISN – Line Impedance Stabilization Network

NCR – No Calibration Required

RF – Radio Frequency

Testing Facility

Testing for EMC on the EUT was carried out at TÜV SÜD Canada testing lab near Ottawa, Ontario. The testing lab has calibrated 10m semi-anechoic chambers which allow measurements on a EUT that has a maximum width or length of up to 3m and a height of up to 3m. 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 Loop antenna, Biconical 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 10m semi-anechoic chamber is registered with Federal Communications Commission, Innovation, Science and Economic Development Canada and Voluntary Control Council for Interference (Japan). 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, where applicable, a 16-point field calibration has been performed on the chamber. The field uniformity data is kept on file at TÜV SÜD Canada. All measuring equipment is calibrated on an annual or biennial basis as listed for each respective test.

Testing Environmental Conditions and Dates

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

Date	Test	Initials	Temperature (ºC)	Humidity (%)	Pressure (kPa)
Jan 16-17, 2025	Radiated Emissions	SD	20-22	45.0	98-106.5

Detailed Test Results Section

Radiated Emission Field Strength (RFID -15.209)

Purpose

The purpose of this test is to ensure that the RF energy 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 other devices which may be using the same spectrum allocations for similar or other purposes and also ensures the transmit range of the device is within the pre-determined suitable range. This also ensures public safety by not exceeding a level which has been deemed safe for human exposure.

Limits and Method

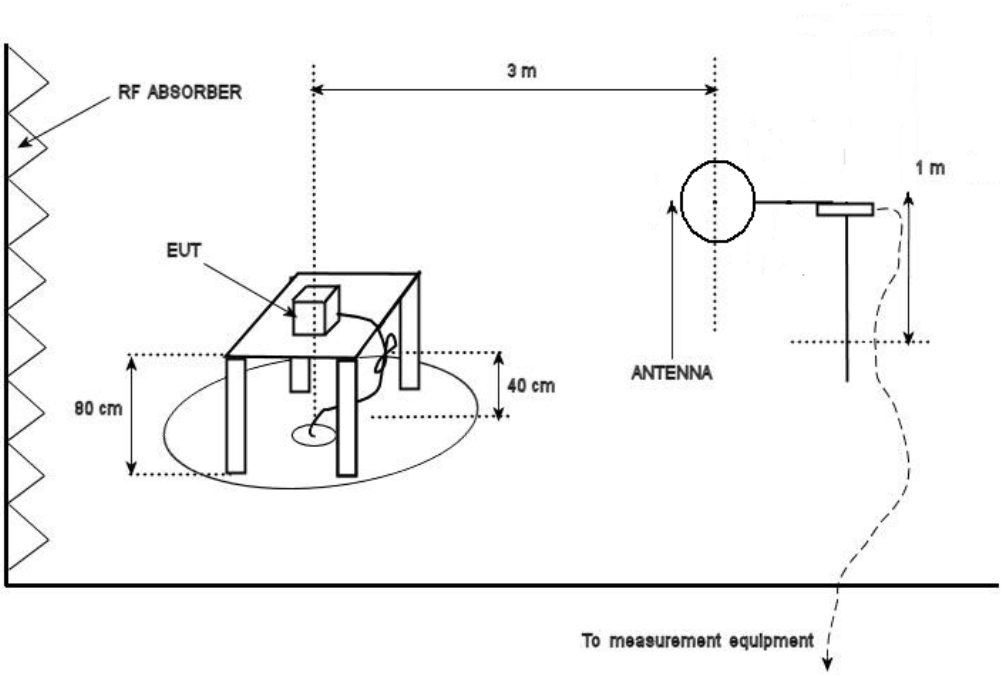
The limits are defined in FCC Part 15.209(a).
Method is using a loop antenna and converting to voltage based on the impedance of free space.

Fundamental Frequency (kHz)	Field Strength Limit (uV/m) at 300m	Limit (dBuV/m)[1] at 3m
13.6 MHz	2400/F (kHz)	69.5

[1]Limit is with a Quasi-Peak detector with bandwidths as defined in CISPR-16-1-1
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.

In accordance with FCC Part 15, section 15.31(f)(2), testing was performed at a 3 meter test distance and an extrapolation factor of 40 dB/decade was applied. For example, an extrapolation of 300m to 3m is 20Log(uV/m) + 40Log(300m/3m).

Typical Radiated Emissions Setup



Measurement Uncertainty

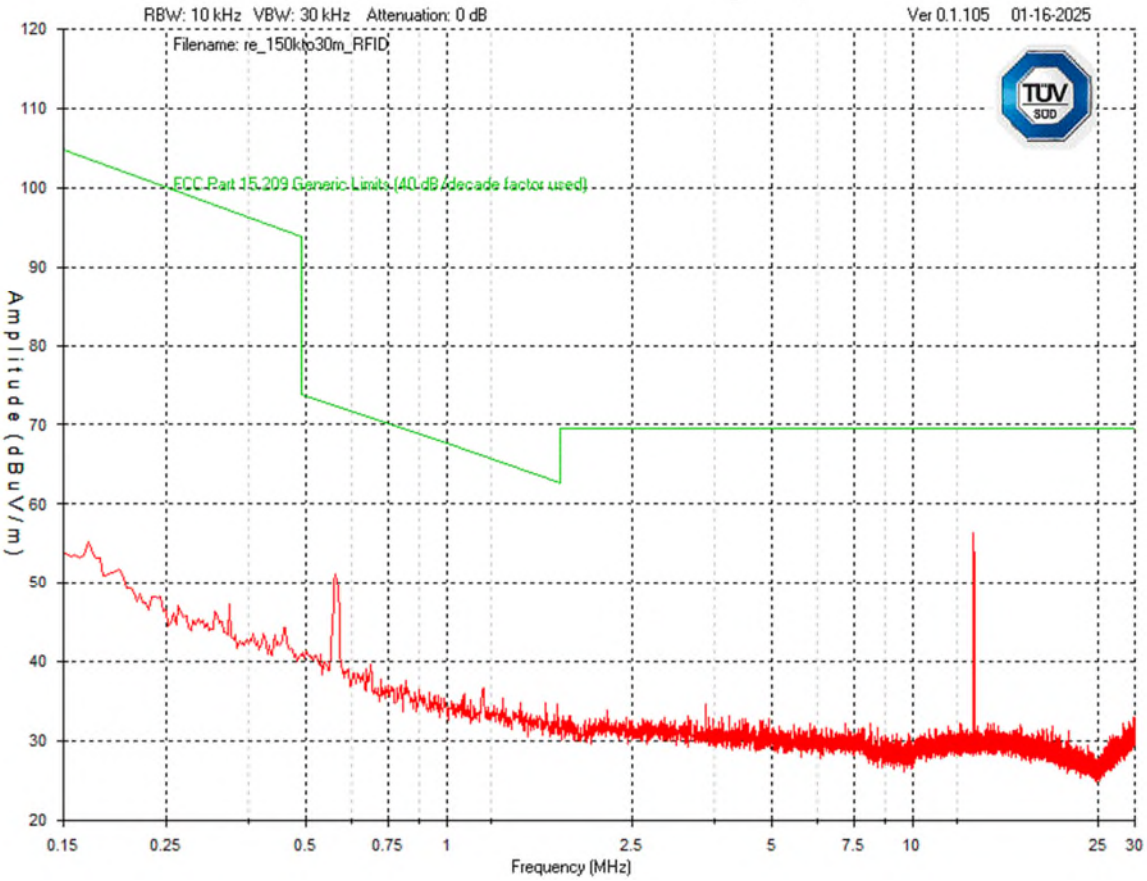
The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is ±4.25dB for 30MHz – 1GHz and ±4.93dB for 1GHz – 18GHz with a 'k=2' coverage factor and a 95% confidence level.

Preliminary Graphs

The graphs shown below are maximized peak measurement graphs over a full 0-360°. The loop was orientated at 0 degrees and 90 degrees and a maximized reading is shown. The marker shows the raw value. See the Final Measurements section below for corrected values.

To obtain the maximum emission, the loop antenna is positioned with its plane vertical and rotated about its vertical axis at the maximum azimuth position. This is then repeated with its plane horizontal, and rotated about the horizontal axis. The maximum obtained emission is presented.

Peak Emission at Carrier Frequency



Final Measurements

Freq.	Detector Peak/QP	EUT Axis	Received Signal (dBµV)	Pre Amp	dBuA/ dBuV Conv. factor	Antenna Factor, Cable (dB/m)	Level (dBµV/m)	Emission Limit dB(µV/m)	Margin dB	Result
13.56	Peak	Z	45.3	-26.5	51.5	-13.9	56.4	69.5	13.1	Pass

Emissions Table

Note:

Peak = Peak measurement
QP = Quasi-Peak measurement

See 'Appendix B – EUT and Test Setup Photos' for photos showing the test set-up and EUT axis.

Test Equipment List

device-no.	name	manufacturer	serial-no.	last calibration	valid until
'LAVE04040	Loop Antenna	Electro-metrics	266	29.05.2024	29.05.2026
'LAVE04346	Pre-Amplifier	HP	1726A01179	10.10.2024	10.10.2025
'SSG012130	Coaxial Cable	Huber & Suhner	10244/4	08.05.2024	08.05.2025
'SSG013672	EMI Receiver	Rohde & Schwarz	100103	28.09.2024	28.09.2025

Radiated Emissions Field Strength (Bluetooth™ - 15.249)

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 Section 12.2 of FCC KDB 558074 and ANSI C63.10.

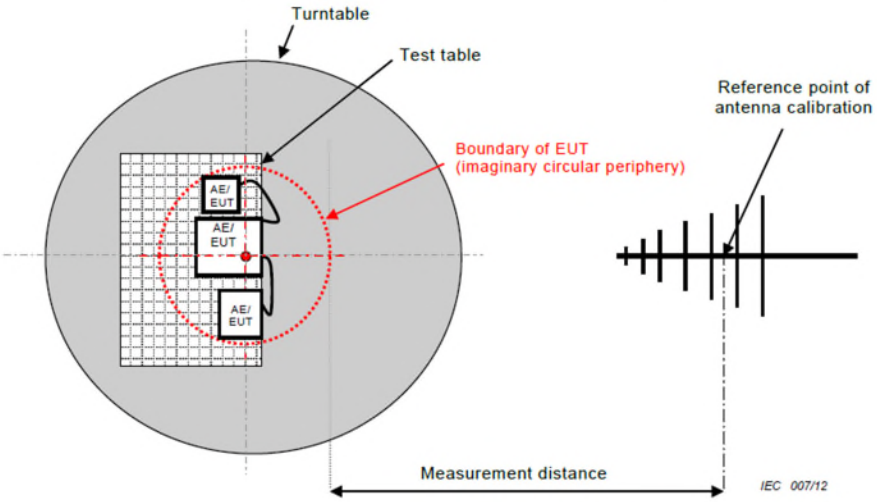
The limits, as defined in 15.249(a) for intentional radiated emissions are:

Fundamental frequency	Field strength of fundamental (millivolts/meter)[1]	Field strength of harmonics (microvolts/meter)
2400-2483.5 MHz	50.0 (94.0 dBuV/m) at 3m	500 (54 dBuV/m) at 3m

[1]Limit is specified with 1 MHz measurement bandwidth and using an Average detector, however a peak limit of 20 dB higher than the average limit applies.

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

Typical Radiated Emissions Setup



Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is ±4.25dB for 30MHz – 1GHz and ±4.93dB for 1GHz – 18GHz with a 'k=2' coverage factor and a 95% confidence level.

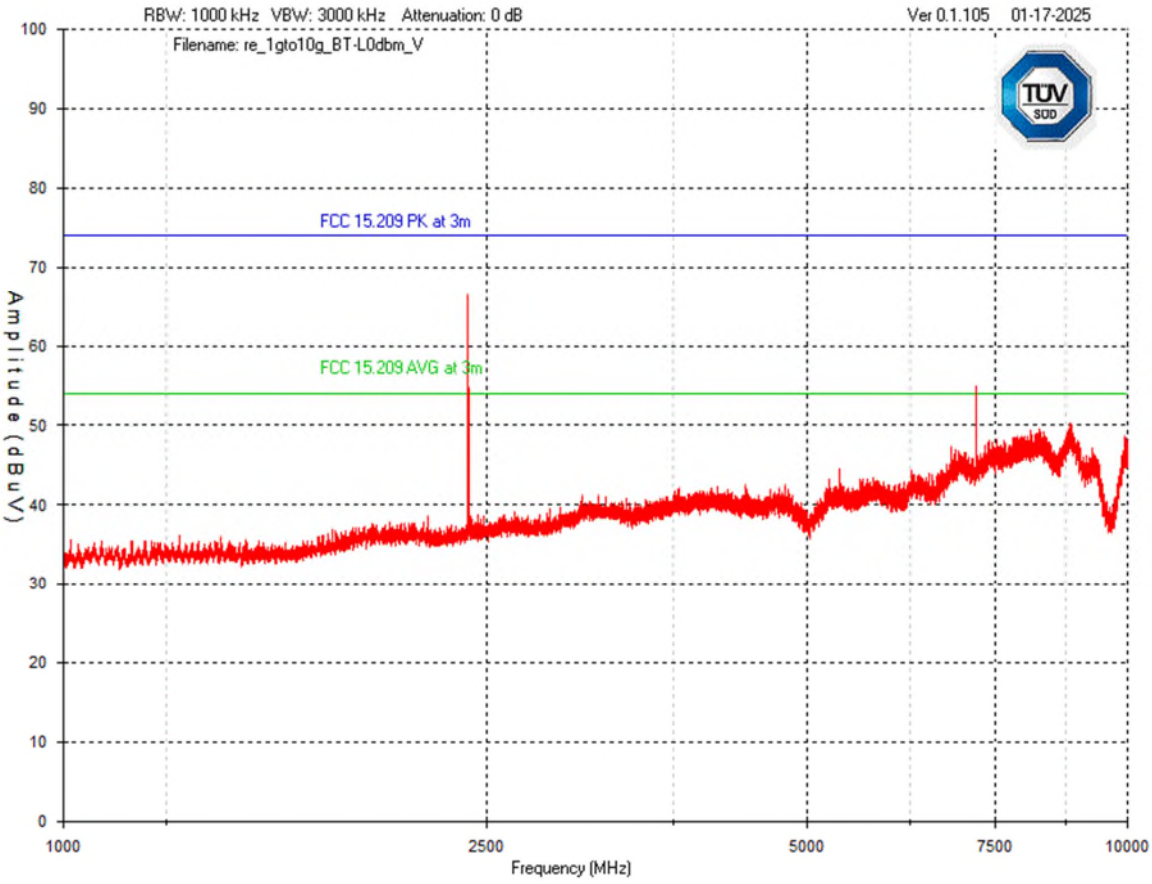
Preliminary Graphs

The graphs shown below are obtained at a 3m test distance and are maximized measurement graphs measured with a resolution bandwidth greater than or equal to the final required detector over a full 0-360°. This maximization 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.

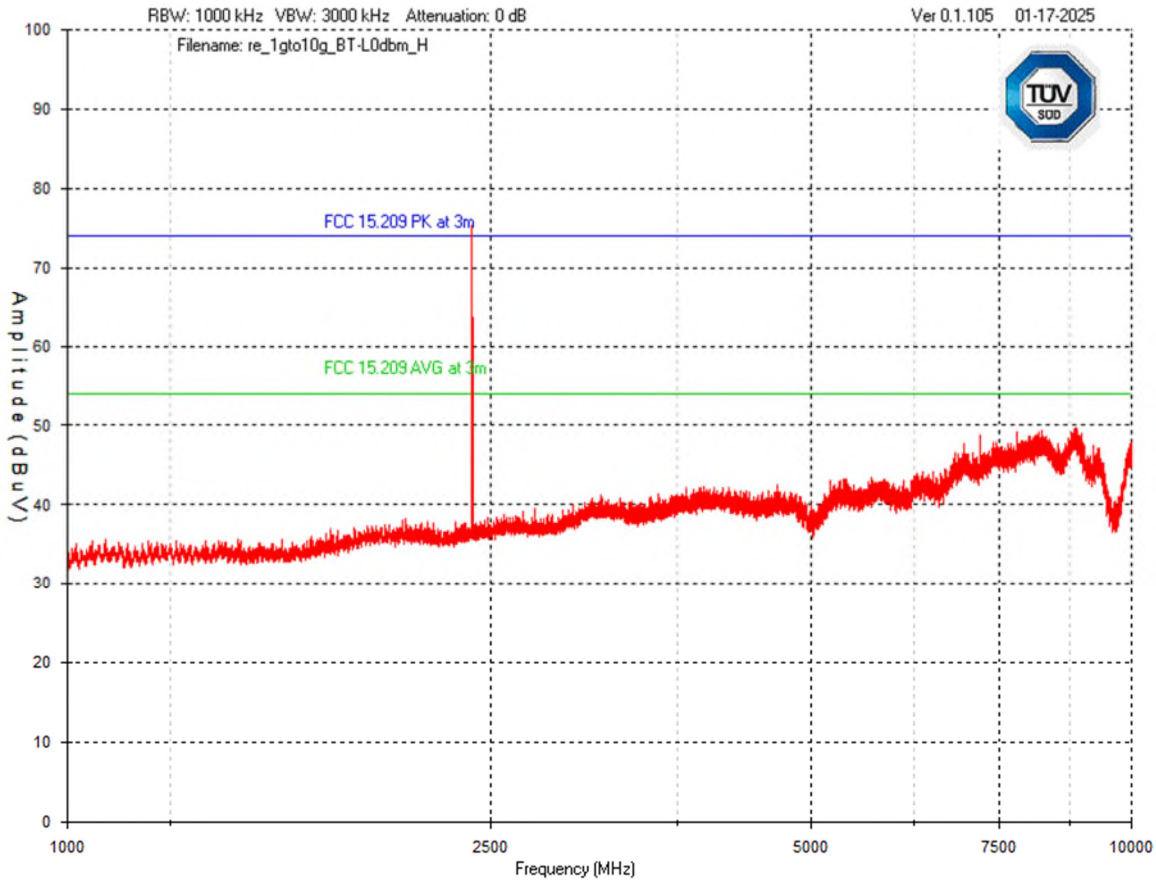
The EUT was checked in three orthogonal axes. However, the worst case graphs are presented from the Z-axis.

Final Measurements

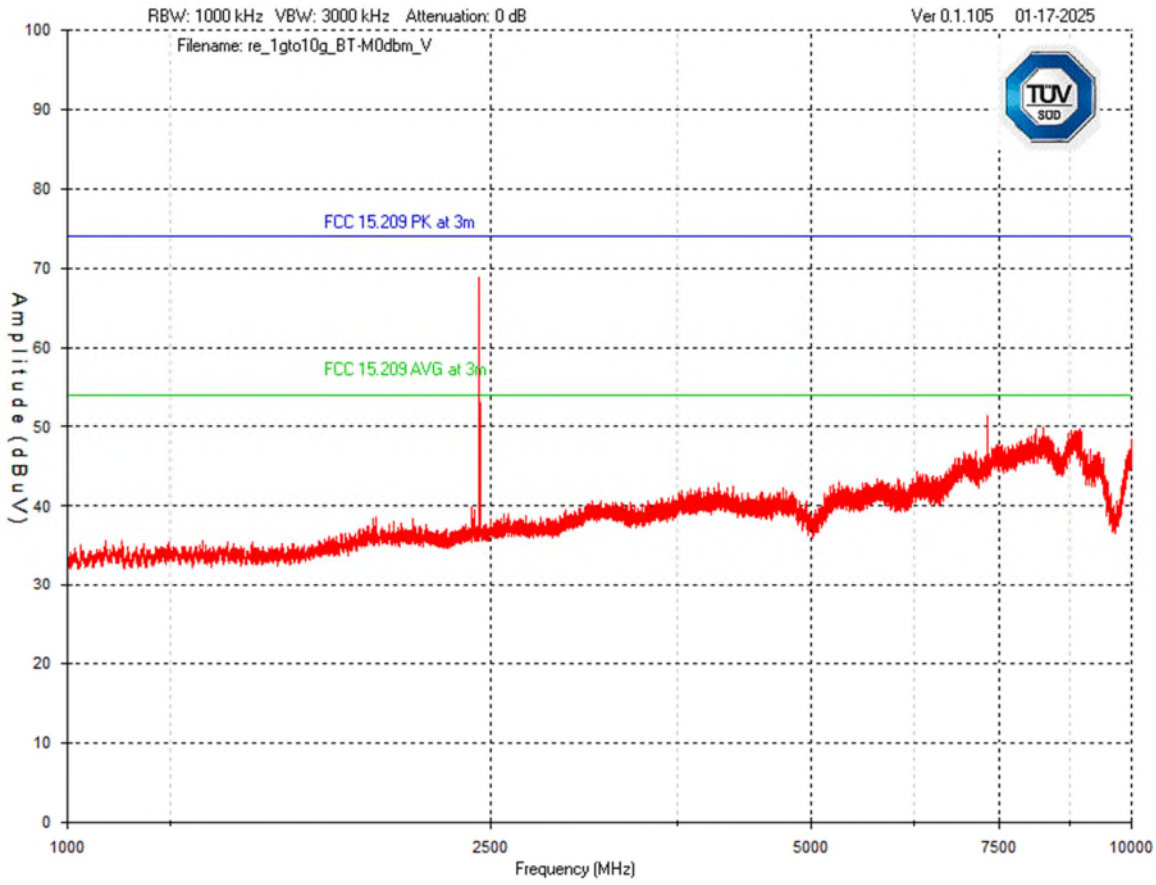
Low channel - Vertical



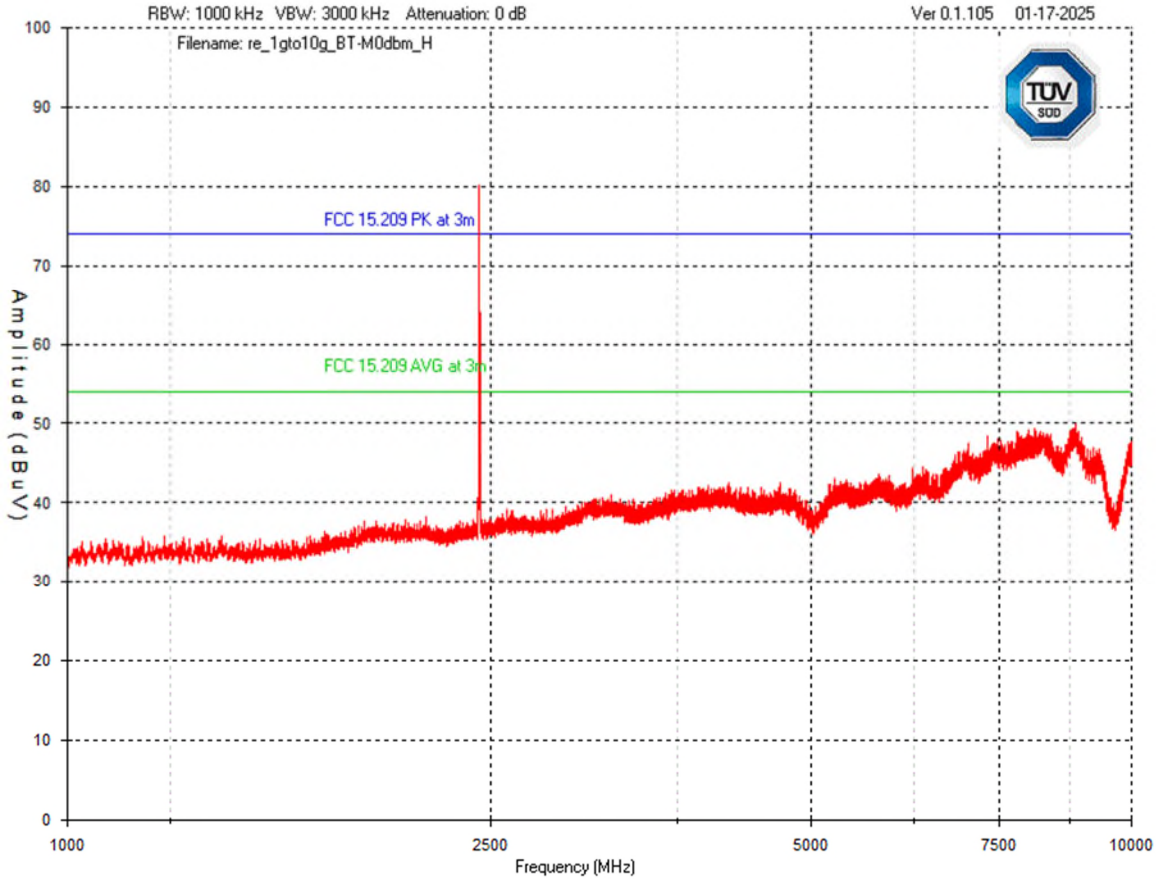
Low Channel – Horizontal



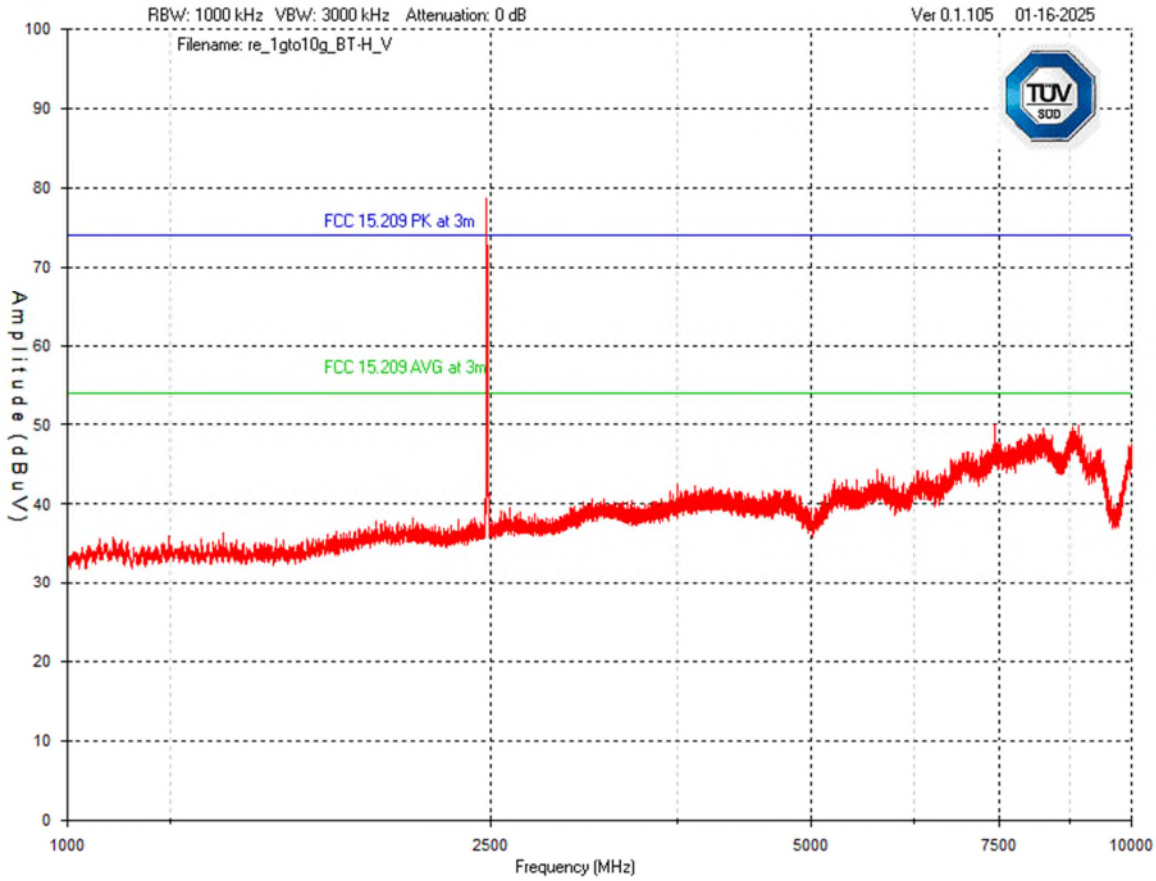
Middle Channel – Vertical



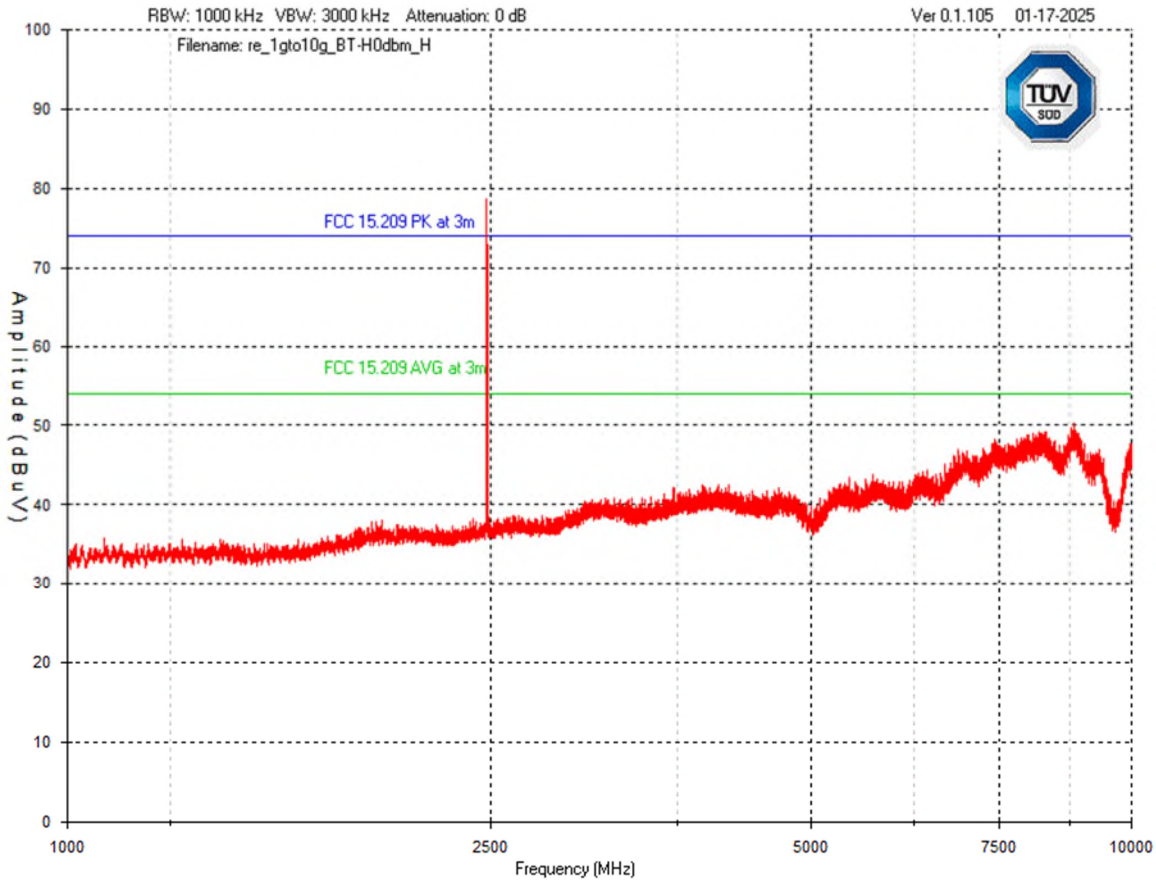
Middle Channel – Horizontal



High Channel – Vertical



High Channel – Horizontal



Frequency (MHz)	Pol/ Detector	Raw (dBuV)	Ant – Factor (dB/m)	Cable 1 Factor (dB)	Cable 2 Factor (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2402	V - AV	71.4	28.4	2.7	3.4	-40.6	65.3	94	28.7
2402	V - PK	72.4	28.4	2.7	3.4	-40.6	66.3	114	48.7
2402	H-AV	71.2	28.4	2.7	3.4	-40.6	74.1	94	19.9
2402	H-PK	81.3	28.4	2.7	3.4	-40.6	75.2	114	38.8
2440	V-AV	73.5	28.5	2.7	3.5	-40.5	67.7	94	26.3
2440	V-PK	74.6	28.5	2.7	3.5	-40.5	68.8	114	45.2
2440	H-AV	85.1	28.5	2.7	3.5	-40.5	79.3	94	14.7
2440	H-PK	86	28.5	2.7	3.5	-40.5	80.2	114	33.8
2480	V-AV	77	28.6	2.8	3.5	-40.6	71.3	94	22.7
2480	V-PK	78.1	28.6	2.8	3.5	-40.6	72.4	114	41.6
2480	H-AV	83.2	28.6	2.8	3.5	-40.6	77.5	94	16.5
2480	H-PK	84.5	28.6	2.8	3.5	-40.6	78.8	114	35.2

Test Equipment List

device-no.	name	manufacturer	serial-no.	last calibration	valid until
'LAVE04211	Horn Antenna 3MCH 00003	ETS-Lindgren	47563	20.05.2024	20.05.2025
'LAVE04346	Pre-Amplifier	HP	1726A01179	10.10.2024	10.10.2025
'SSG012130	Coaxial Cable	Huber & Suhner	10244/4	08.05.2024	08.05.2025
'SSG012594	Pre-Amplifier	BNR	A7	01.05.2024	01.05.2025
'SSG013672	EMI Receiver	Rohde & Schwarz	100103	28.09.2024	28.09.2025

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 limits are as defined in FCC Part 15 Section 15.209(a). The method is as defined in ANSI C63.10.

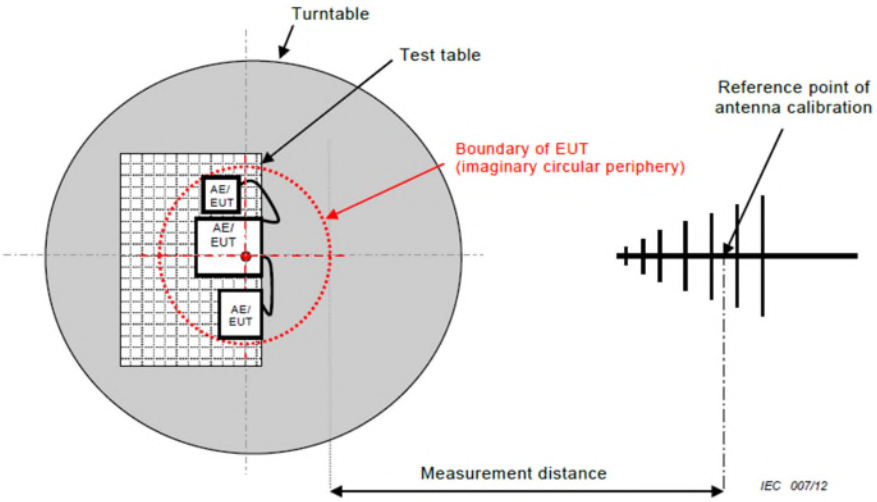
The limits apply for those emissions that fall in the restricted bands, as defined in Section 15.205(a). These emissions must comply with the radiated emission limits specified in Section 15.209(a).

Frequency	Limit at 3m (dBuV/m)
0.009 MHz – 0.490 MHz	128.5 to 93.8[1]
0.490 MHz – 1.705 MHz	73.8 to 63[1]
1.705 MHz – 30 MHz	69.5[1]
30 MHz – 88 MHz	40.0[1]
88 MHz – 216 MHz	43.5[1]
216 MHz – 960 MHz	46.0[1]
Above 960 MHz	54.0[1]
Above 1000 MHz	54.0[2]
Above 1000 MHz	74.0[3]

[1]Limit is with Quasi-Peak detector with bandwidths as defined in CISPR-16-1-1 except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz where an Average detector is used.
[2]Limit is with 1 MHz measurement bandwidth and using an Average detector
[3]Limit 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

Typical Radiated Emissions Setup



Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is ±4.25dB for 30MHz – 1GHz and ±4.93dB for 1GHz – 18GHz with a 'k=2' coverage factor and a 95% confidence level.

Preliminary Graphs

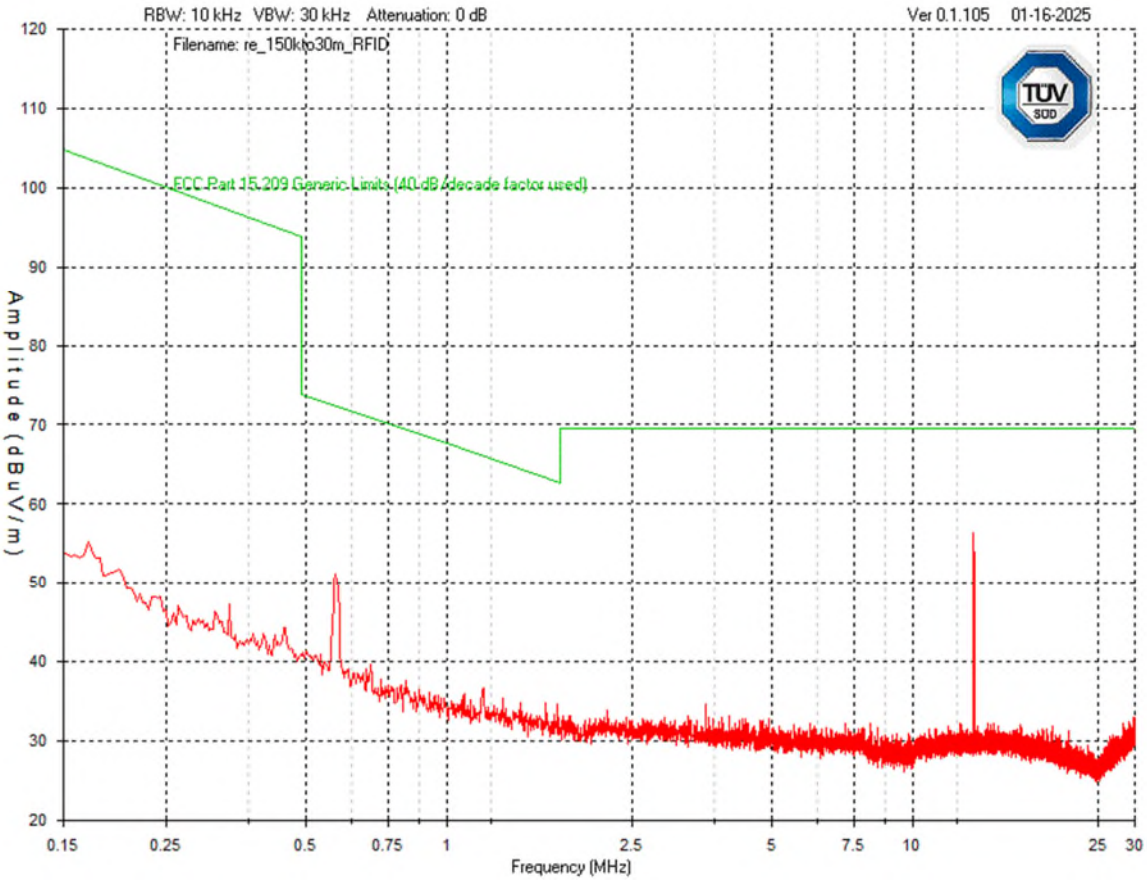
The graphs shown below are obtained at a 3m, or 1m if above 10 GHz, test distance and are maximized peak measurement graphs measured with a resolution bandwidth greater than or equal to the final required detector over a full 0-360°. This peaking process is done as a worst case measurement and enables 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(a), the device is scanned to at least the 10^{th} harmonic (A minimum of 1.25MHz).

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

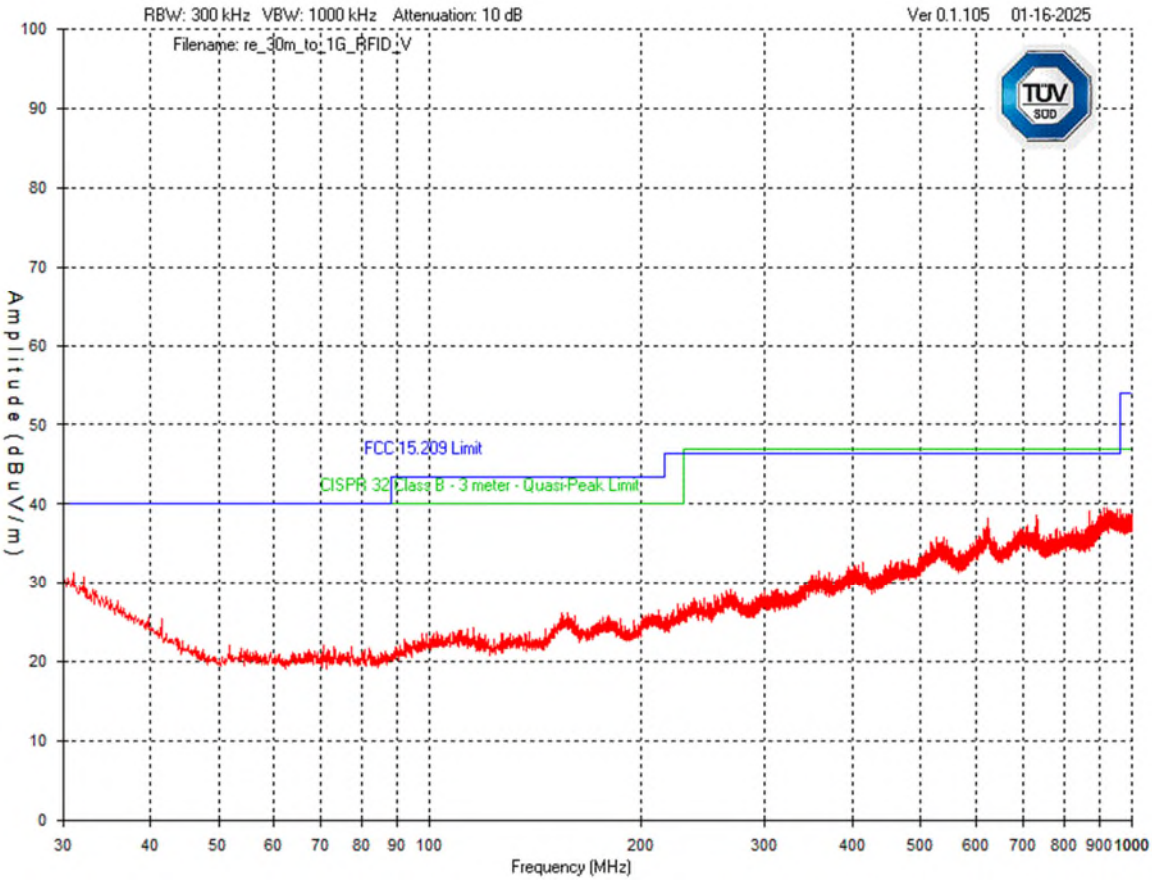
The EUT was checked in three orthogonal axes. However, the worst case graphs are presented from the Z-axis.

150 kHz – 30 MHz

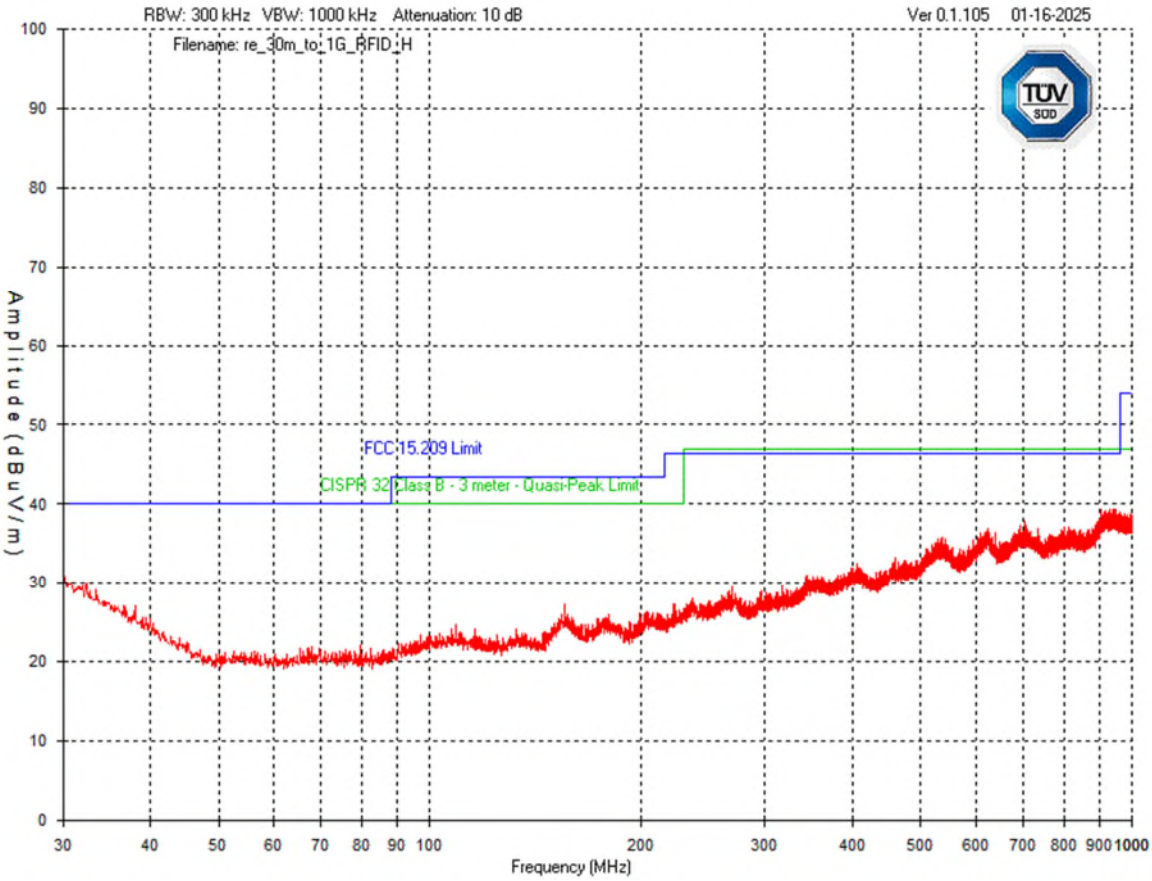


Note: Spike shown at 13.56 MHz is intentional RFID signal. Device was scanned down to 9 kHz, no emissions were detected below 150 kHz.

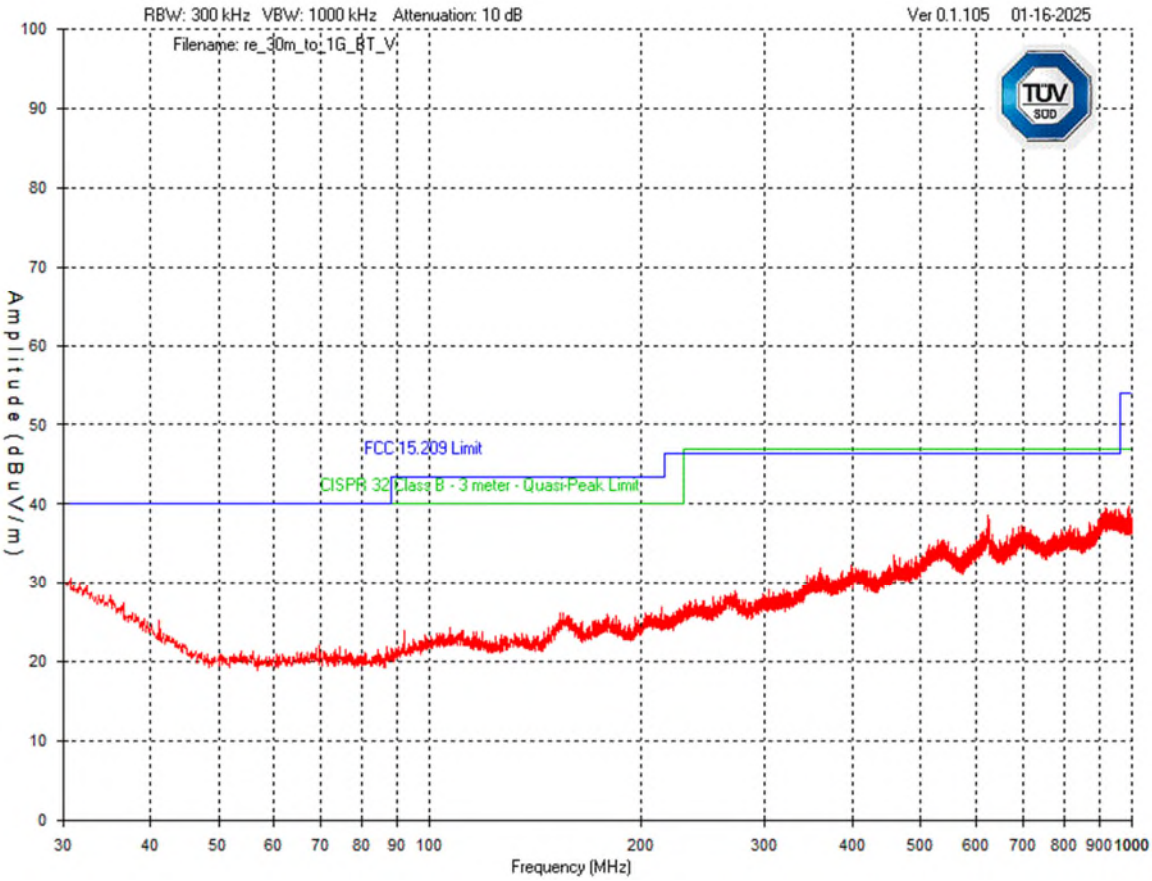
30 MHz to 1 GHz RFID On - Vertical



30 MHz to 1 GHz RFID On – Horizontal

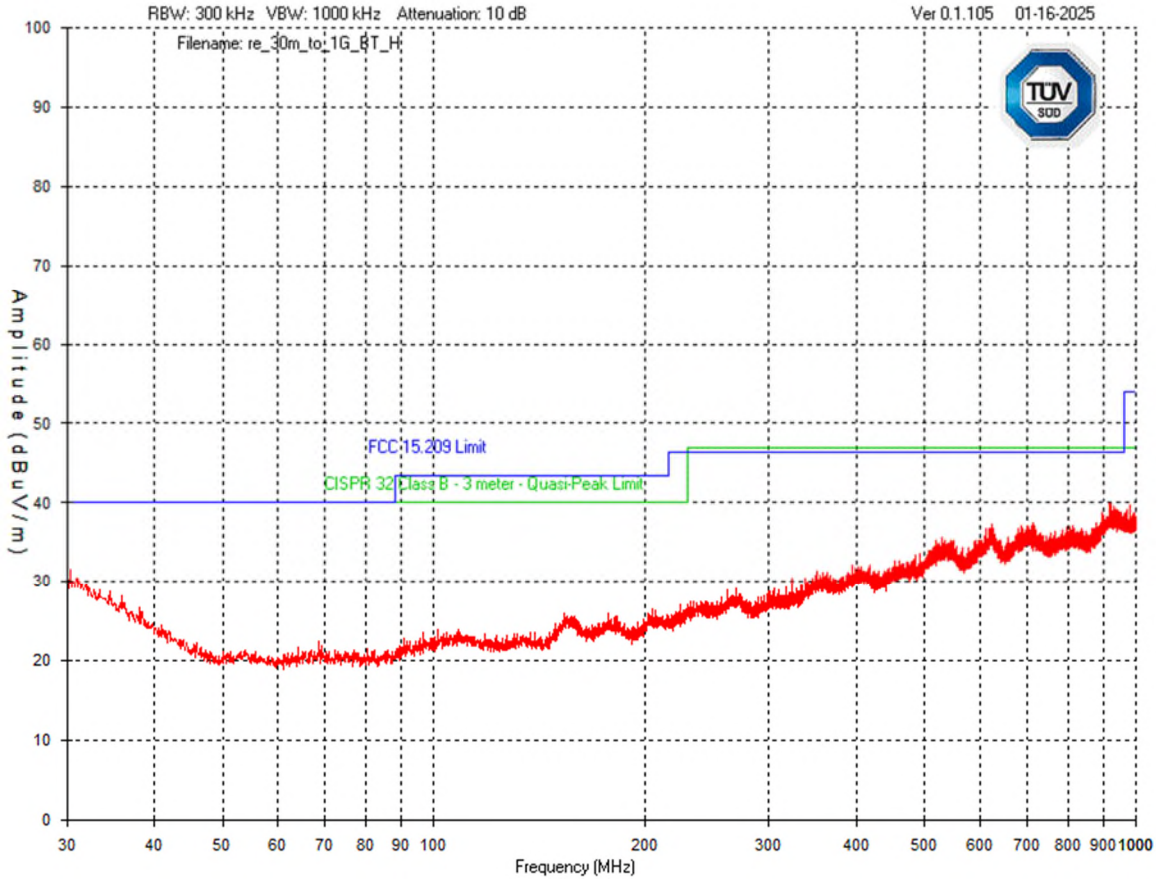


30 MHz to 1 GHz – Bluetooth on – Vertical

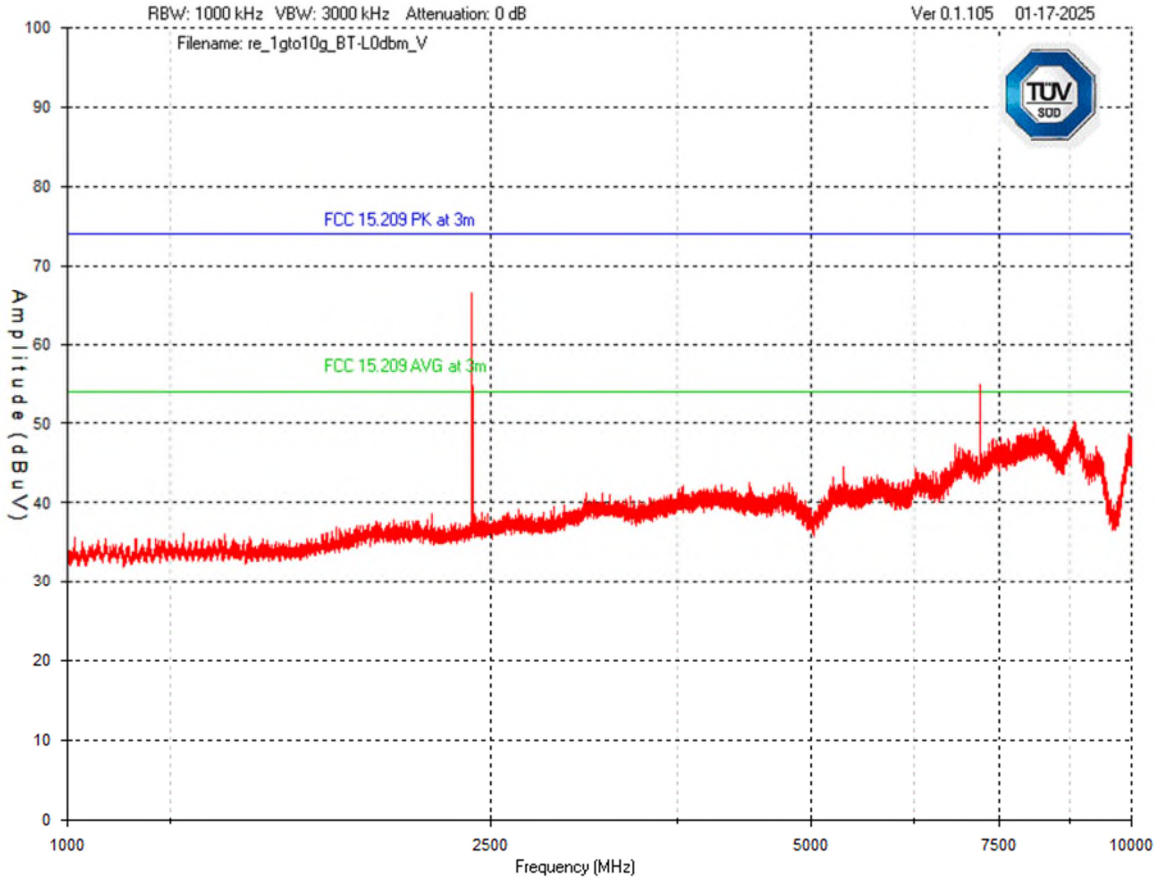


Note: Low channel ‘on’ presented as worst-case / representative.

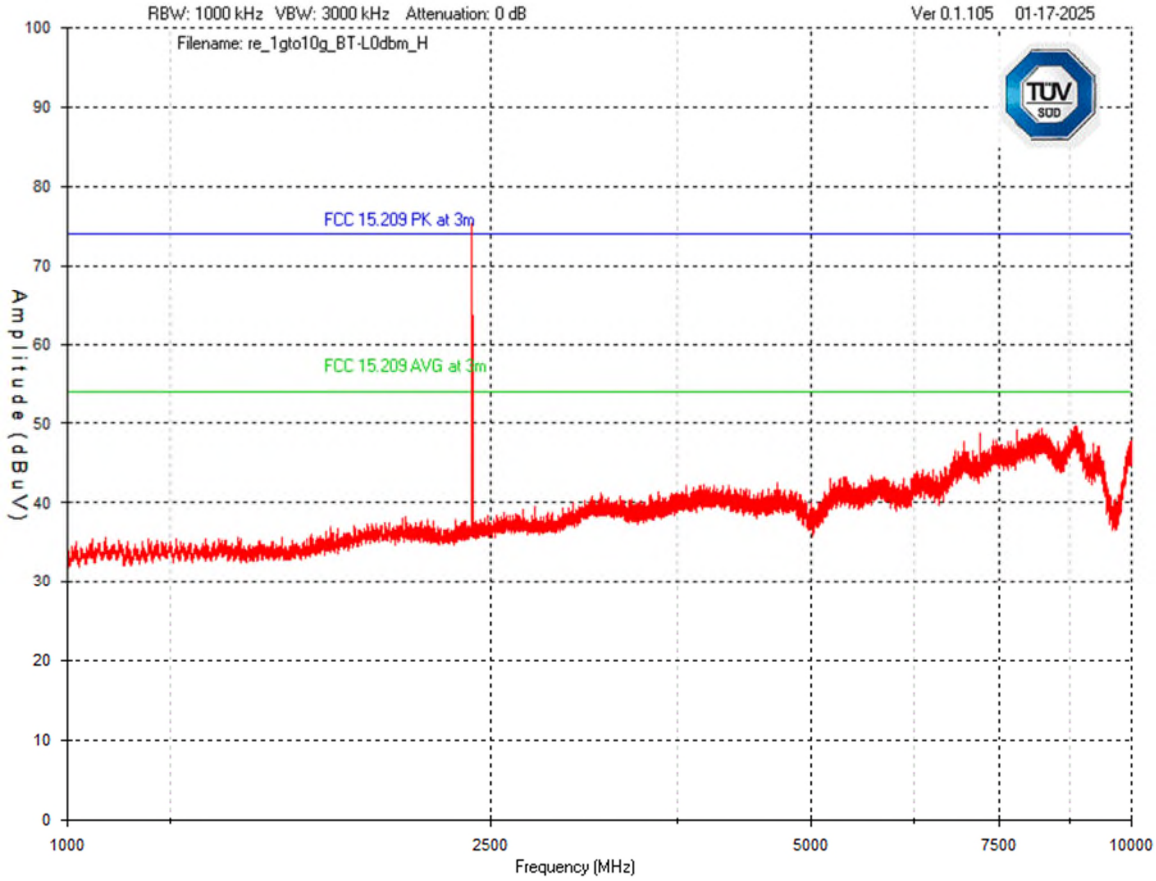
30 MHz to 1 GHz – Bluetooth on – Horizontal



1GHz to 10 GHz - Low Channel (Worst case / representative) - Vertical

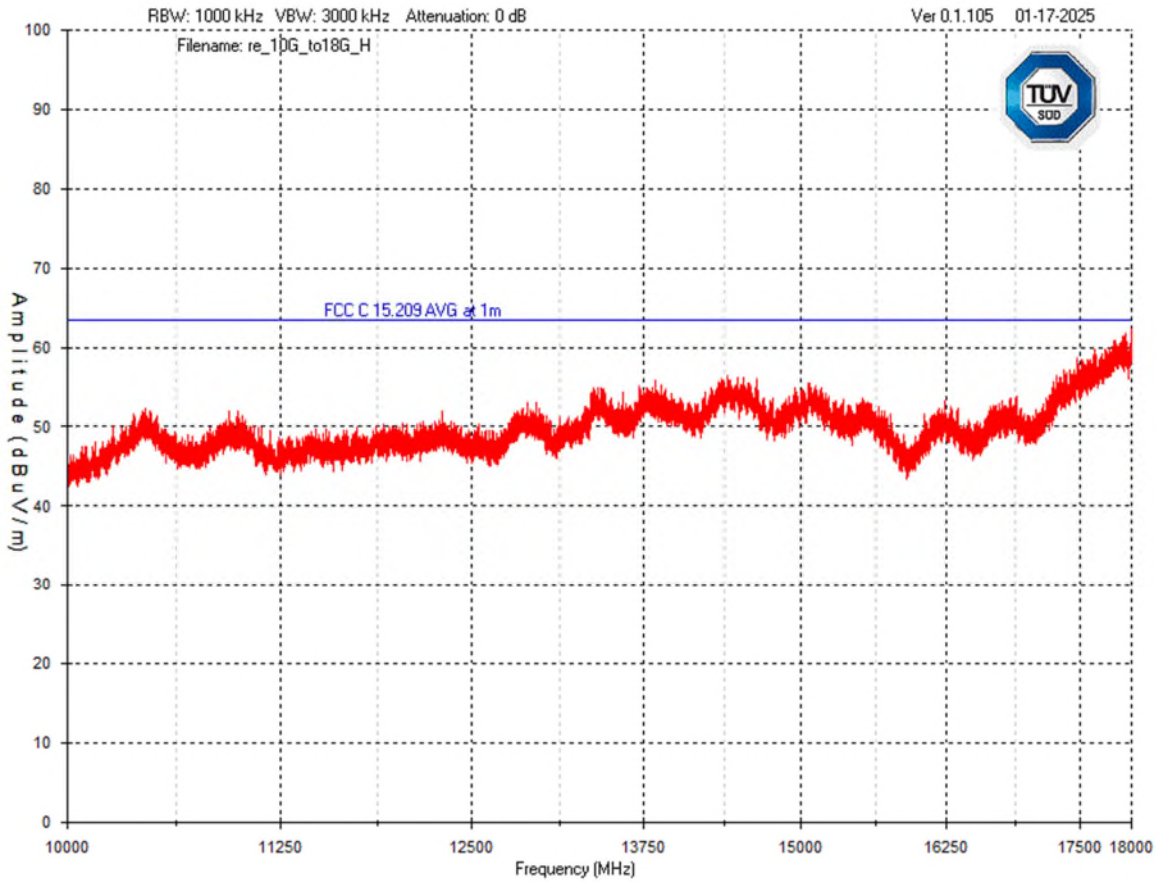


1GHz to 10 GHz - Low Channel (Worst case / representative) – Horizontal

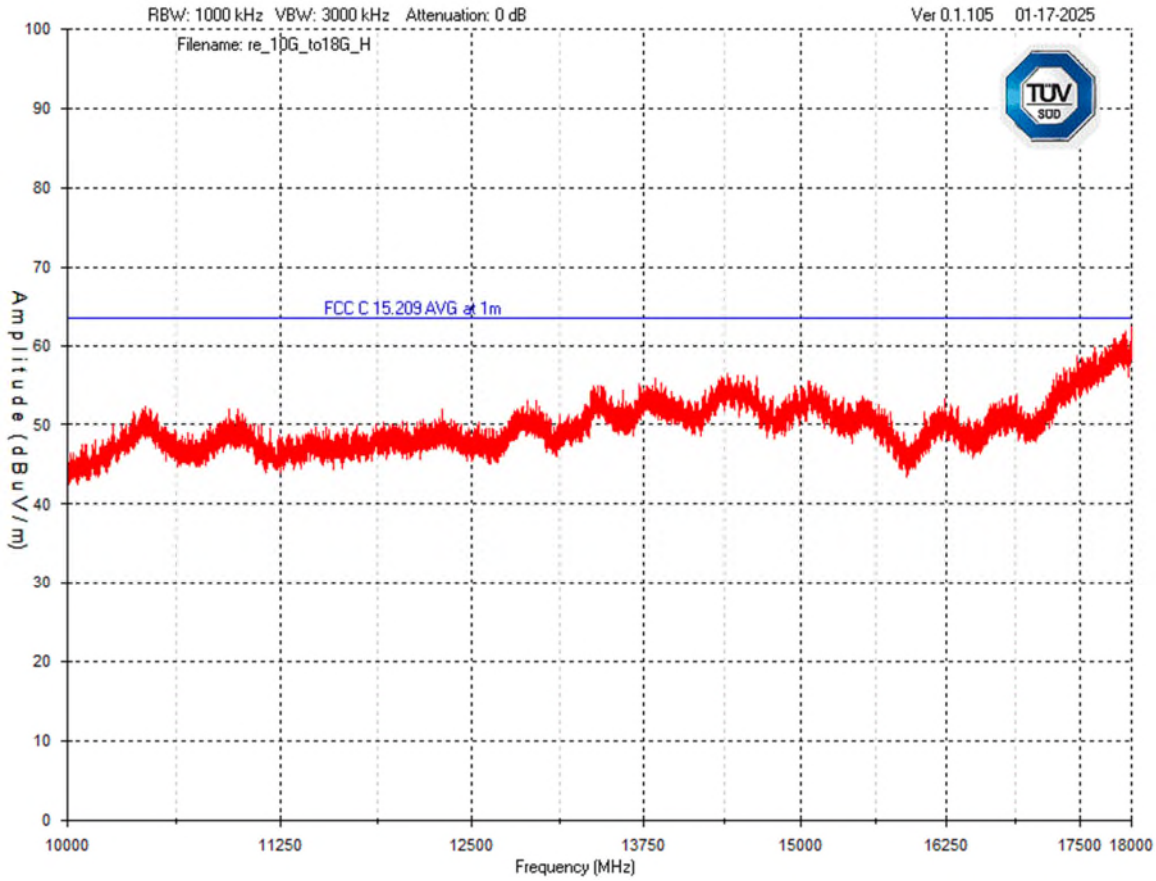


Note: Emission at 2.4 GHz is intentional BT signal.

10 GHz to 18 GHz – Bluetooth™ on. – Vertical



10 GHz to 18 GHz – Bluetooth™ on. – Horizontal



Note: testing was performed to 26.5 GHz, no emissions above 18 GHz were detected and the reading were below the applicable limit(s).

Final Measurements

The EUT passed.

Frequency (MHz)	Pol/ Detector	Raw dBuV	Ant – Factor dB/m	Cable 1 Factor dB	Cable 2 Factor dB	Preamp Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB
7206	V-AV	44.6	36.2	4.4	5.1	-37.7	52.6	54	1.4
7206	V-PK	46.9	36.2	4.4	5.1	-37.7	54.9	74	19.1

No other quasi-peak or average measurement is required as all peak emissions are more than 10dB below the limit, other then as noted in the tables above.

Test Equipment List

device-no.	name	manufacturer	type	serial-no.	last calibration	valid until
'LAVE04002	Bilog Antenna	ETS-Lindgren	3142-E	140041	16.06.2023	16.06.2025
'LAVE04040	Loop Antenna	Electro-metrics	EM 6879	266	29.05.2024	29.05.2026
'LAVE04211	Horn Antenna 3MCH 00003	ETS-Lindgren	3117	47563	20.05.2024	20.05.2025
'LAVE04346	Pre-Amplifier	HP	8447D	1726A01179	10.10.2024	10.10.2025
'SSG012130	Coaxial Cable	Huber & Suhner	104PEA	10244/4	08.05.2024	08.05.2025
'SSG012594	Pre-Amplifier	BNR	LNA	A7	01.05.2024	01.05.2025
'SSG013672	EMI Receiver	Rohde & Schwarz	ESU40	100103	28.09.2024	28.09.2025

Appendix A – EUT Summary

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

General EUT Description

Client	
Organization / Address	Dormakaba Canada Inc 105 blvd Marcel-Laurin, Montréal (QC) Canada H4N 2M3
EUT Details	
EUT Name	**Saffire EVO LZ**
EUT Model	SAFFIRE EVO LZ
Equipment Category	RFID and Bluetooth™
Basic EUT Functionality	The Saffire EVO LZ reads information on the user's RFID keycard data or communicates with the user's Bluetooth phone to determine if access can be granted or not
Input Voltage	4.5V (Battery powered internal – no provisions for external DC source)
Connectors available on EUT	None
Peripherals Required for Test	13.6MHz RFID tag
Release type	Final
Intentional Radiator Frequency	13.6MHz for RFID applications and Bluetooth™
EUT Configuration	Wireless configured to continuously transmit either RFID or Bluetooth™

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'.

Appendix B – EUT and Test Setup Photos

See the Test Setup exhibit which is separate from this test report for the EUT and Test Setup photos.