RF Test Report

As per

Transmitter Unwanted Emission per FCC 15.407 (b) & RSS-247 Clause 6.2.1.2

on the

IVID0608

FCC ID: 2ATDAAMNPTRX01
IC: 25063-AMNPTRX01

Issued by:

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Testing produced for

See Appendix A for full client & EUT details.

Innovation, Science and Economic Development Canada
Registration # 6844A-3

Testing Laboratory
Certificate #2955.02

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

Registration # CA6844

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Report Scope

This report addresses the EMC verification testing and test results of the **Innovere Medical Inc. Model: IVID0608**, herein referred to as EUT (Equipment Under Test). The EUT was tested for compliance against the following standards:

FCC 15.407 (b) & RSS-247 Clause 6.2.1.2

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

For a more detailed list of the standards and the revision used, see the "Applicable Standards, Specifications and Methods" section of this report.

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

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Summary

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

Equipment Under Test (EUT)	IVID0608
FCC ID:	2ATDAAMNPTRX01
IC:	25063-AMNPTRX01
EUT passed all tests performed	Yes
Testing conducted by	Min Xie

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

Test Results Summary

Standard/ Method	Description	Criteria	Class / Level	Result
FCC 15.407 (b) & RSS-247 Clause 6.2.1.2	Transmitter Unwanted Emissions in the Spurious Domain	N/A	See Transmitter Limits For Spurious Emissions	Pass
Overall Result				**Pass**

If the product as tested complies with the specification or requirement, the EUT is deemed to comply and is issued a 'PASS' grade. If not, 'FAIL' grade is issued.

Notes, Justifications, or Deviations

The EUT is tested as a stand-alone equipment.

IVID0608 is a transmitter based on Amimon Ltd's AMNPTRX01 5 GHz transmitter. The client removed ferrous inductors associated with onboard power management. The power requirement of the transmitter will be provided by the host.

It was deemed, and agreed by the client, that only radiated transmitter unwanted emissions outside the 5 GHz bands was required to verify the modification did not violate the applicable rules.

As no other changes were made to the radio portion of the transmitter, the other characteristics associated with radio should not be influenced by this modification. See Permissive Change cover letter for further information.

A later revision of the standard may have been substituted in place of the previous dated referenced revision. The year of the specification used is listed under applicable standards. Using the later revision accomplishes the goal of ensuring compliance to the intent of the previous specification, while allowing the laboratory to incorporate the extensions and clarifications made available by a later revision.

Sample Calculation(s)

Radiated Emission Test

E-Field Level = Received Signal + Antenna Factor + Cable Loss – Pre-Amp Gain
E-Field Level = 50dBµV + 10dB/m + 2dB – 20dB
E-Field Level = 42dBµV/m

Margin = Limit – E-Field Level
Margin = 50dBµV/m – 42dBµV/m
Margin = 8.0 dB (pass)

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
RSS-247 Issue 2:2017	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
CFR 47 FCC 15 Subpart E:2017	Code of Federal Regulations – Radio Frequency Devices, Intentional Radiators
KDB 789033 D02	General UNII Test Procedures New Rules v02r01
ISO 17025:2017	General Requirements for the Competence of Testing and Calibration Laboratories

Document Revision Status

Revision	Date	Description	Initials
000	Nov 18, 2020	Initial Release	MX
001	Dec 5, 2020	Added FCC ID/IC to title page and summary page.	MX

Definitions and Acronyms

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

AM – Amplitude Modulation
CDN – Coupling Decoupling Network
EFT – Electrical Fast Transients
ESD – Electro-Static Discharge
HCP – Horizontal Coupling Plane
VCP – Vertical Coupling Plane
LISN – Line Impedance Stabilization Network
NCR – No Calibration Required
NSA – Normalized Site Attenuation
N/A – Not Applicable
RF – Radio Frequency

AE – Ancillary Equipment. Equipment (apparatus), used in connection with a receiver or transmitter.

It is considered as an ancillary equipment (apparatus) if:

- The equipment is intended for use in conjunction with a receiver or transmitter to provide additional operational and/or control features to the radio equipment, (e.g. to extend control to another position or location); and
- The equipment cannot be used on a standalone basis to provide user functions independently of a receiver or transmitter; and
- The receiver or transmitter, to which it is connected, is capable of providing some intended operation such as transmitting and/or receiving without the ancillary equipment (i.e. it is not a sub-unit of the main equipment essential to the main equipment basic functions).

Portable Equipment – Radio and/or ancillary equipment intended for portable (e.g. handheld) operation, powered by its own integral battery.

Base Station (Fixed Use) Equipment – Radio and/or ancillary equipment intended for operation at a fixed location and powered directly or indirectly (e.g. via an AC/DC converter or power supply) by the AC mains network, or an extended local DC mains network.

Adaptive Equipment – Equipment operating in an adaptive mode. A mechanism by which equipment can adapt to its radio environment by identifying other transmissions present in the band.

Class A device – A device that is marketed for use in a commercial, industrial or business environment. A 'Class A' device should not be marketed for use by the general public. A 'Class A' device should contain a warning notice in the user manual stating that it could cause radio interference. For example: "**Warning**: Operation of this equipment in a residential environment could cause radio interference."

Class B device – A device that is marketed for use in a residential environment and may also be used in a commercial, business or industrial environments. NOTE: A residential environment is an environment where the use of broadcast radio and television receivers may be expected within a distance of 10m of the device concerned.

Geo-Location Capability – Feature of the equipment to determine its geographical location with the purpose to configure itself according to the regulatory requirements applicable at the geographical location where it operates.

Listen Before Talk (LBT) – Mechanism by which an equipment first applies Clear Cannel Assessment (CCA) before using the channel.

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.

Telecommunications Port - For transfers intended to interconnect multi-user telecommunications networks (e.g. PSTN, ISDN, xDSL, etc.), local area networks (e.g. Ethernet, Token Ring, etc.) and similar networks. This excludes one-to-one port types such as RS-232 and USB.

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

EMC Test Plan – An EMC test plan established prior to testing. See 'Appendix A – EUT & Client Provided Details'.

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.

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)
2020 Feb 23 & Mar 24	Radiated Emissions	MX	20 - 25	15 - 45	100- 102

Detailed Test Result Section

Transmitter Unwanted Emission in the Spurious Domain

Purpose

The purpose of this test is to ensure that the maximum power conducted to the radiating element at frequencies outside of the authorized spectrum does not exceed the limits specified. This ensures that the only the intended signal is delivered to the radiating element.

Definition

Transmitter unwanted emissions in the spurious domain are emissions outside the allocated band and outside the Out-of-band Domain as indicated in Figure 1 above when the equipment is in Transmit mode.

Limits and Method

The limits listed below as per FCC 15.407 (b) and RSS-247 Clause 6.2.1.2:

- According to FCC 15.407 (b) (8) unwanted radiated emission below 1 GHz must comply with 12.209(a) and RSS-GEN limits as per table below:

Frequency	Limit
0.009 MHz – 0.490 MHz	2400/F(kHz) uV/m at 300m[1]
0.490 MHz – 1.705 MHz	24000/F(kHz) uV/m at 30m[1]
1.705 MHz – 30 MHz	30 uV/m at 30m[1]
30 MHz – 88 MHz	100 uV/m (40.0 dBuV/m[1]) at 3m
88 MHz – 216 MHz	150 uV/m (43.5 dBuV/m[1]) at 3m
216 MHz – 960 MHz	200 uV/m (46.0 dBuV/m[1]) at 3m
960 MHz – 1000 MHz	500 uV/m (54.0 dBuV/m[1]) at 3m

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

- According to FCC 15.407 (b) and KDB 789033 General UNII Test Procedure v02r01, unwanted radiated emissions above 1 GHz which fall in the restricted bands, as defined in Section 15.205(a), must comply with the radiated emission limits specified in Section 15.209(a).

Frequency	Limit	
Above 1000 MHz	54.0 dBuV/m[2]	74.0 dBuV/m[3]

[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

- Undesirable radiated emissions which fall outside restricted bands, as defined in Section 15.205(a) must comply with the radiated emission limits specified 15.407 (b).

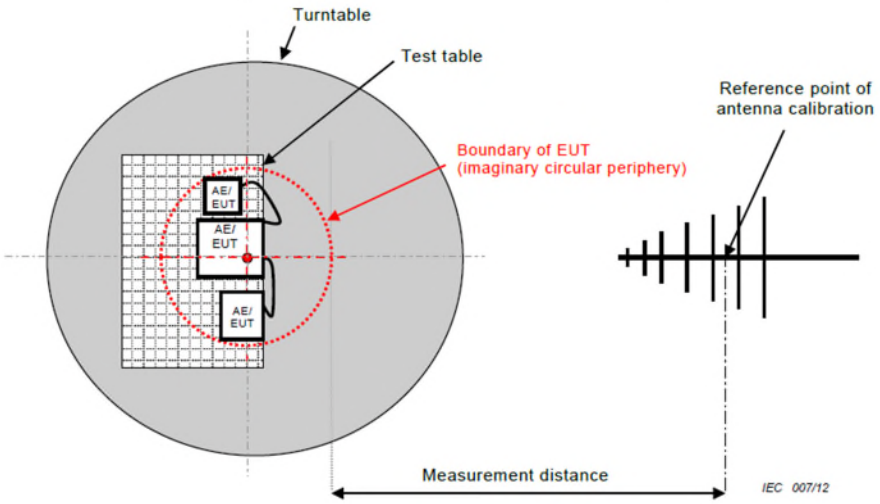
Rules Part	Frequency	EIRP Limit	Equivalent Field Strength at 3 m
15.407 (b)(1)	5150 – 5250 MHz	-27 dBm/MHz	68.2 dBuV/m
15.407 (b)(2)	5250 – 5350 MHz		
15.407 (b)(3)	5470 – 5725 MHz		
15.407 (b)(4)(i)	5725 – 5850 MHz	-27 dBm/MHz[4] 10 dBm/MHz[5] 15.6 dBm/MHz[6] 27 dBm/MHz[7]	68.2 dBuV/m[4] 105.2 dBuV/m[5] 110.8 dBuV/m[6] 122.2 dBuV/m[7]
Note: Limit is with 1 MHz measurement bandwidth and using a Peak detector. The field strength limit for the EUT is give in the below: E(dBµV/m) = ERIP(dBm) + 95.2			

[4] 75 MHz or more above or below the band edge.
[5] 75 MHz – 25 MHz above or below the band edge, increasing linearly to a level of 10 dBm/MHz.
[6] 25 MHz – 5 MHz above or below the band edge, increasing linearly to a level of 15.6 dBm/MHz.
[7] 5 MHz – 0 MHz above or below the band edge, increasing linearly to a level of 27 dBm/MHz.

Based on KDB 789033 and ANSI C63.10, if the Peak detector measurements do not exceed the Average limits, where defined, then the EUT is deemed to have passed the requirements.

Radiated Measurement

Typical Radiated Emissions Setup



Spurious radiated emission limits are converted from a power limit to a field strength limit at 3 meter. The conversion formula used is dBuV/m = dBm + 104.77 – 20log(R).

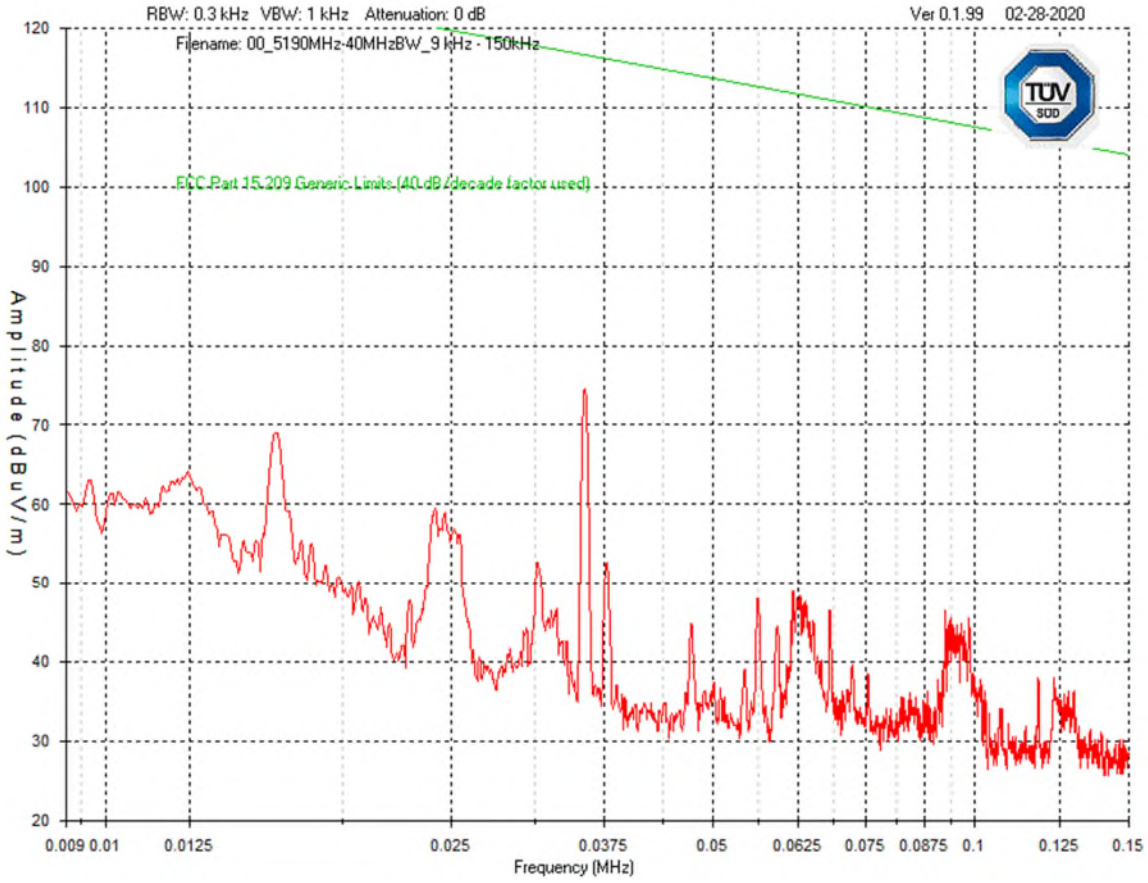
Measurement Uncertainty

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

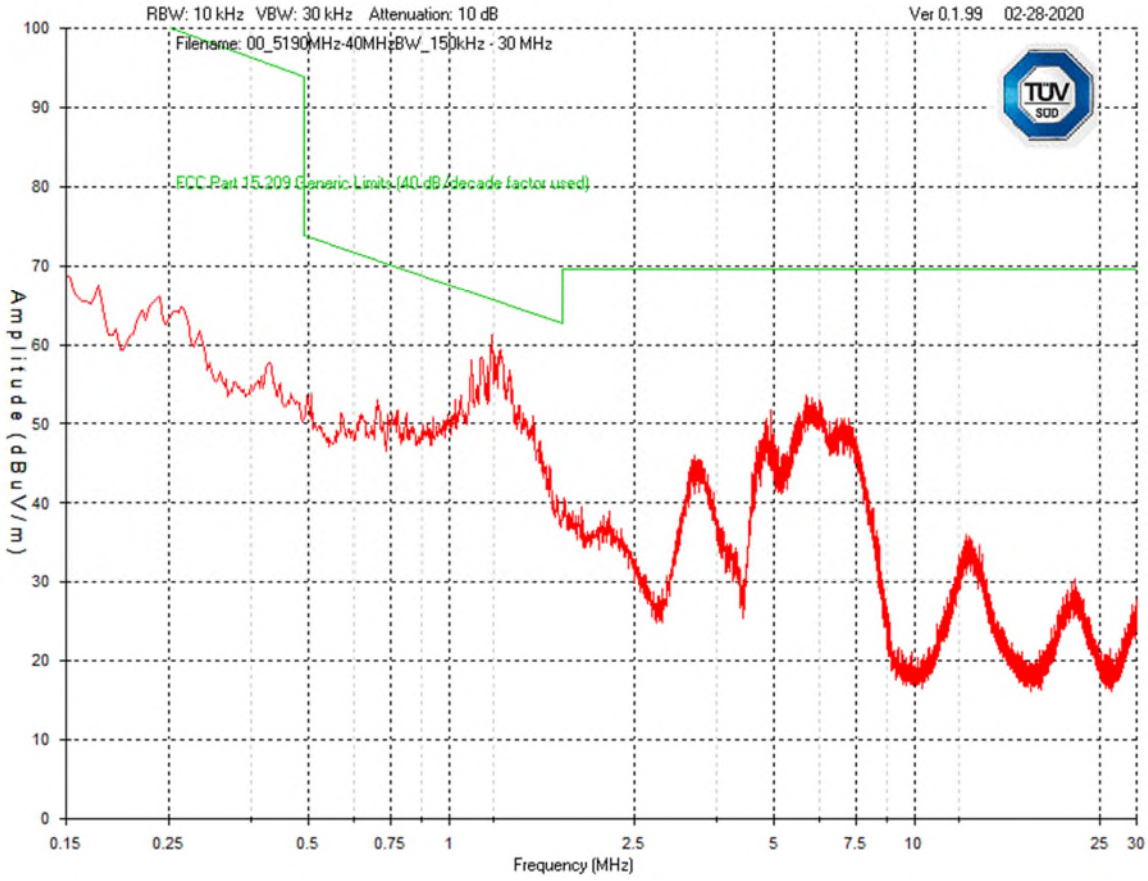
Preliminary Graphs

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.

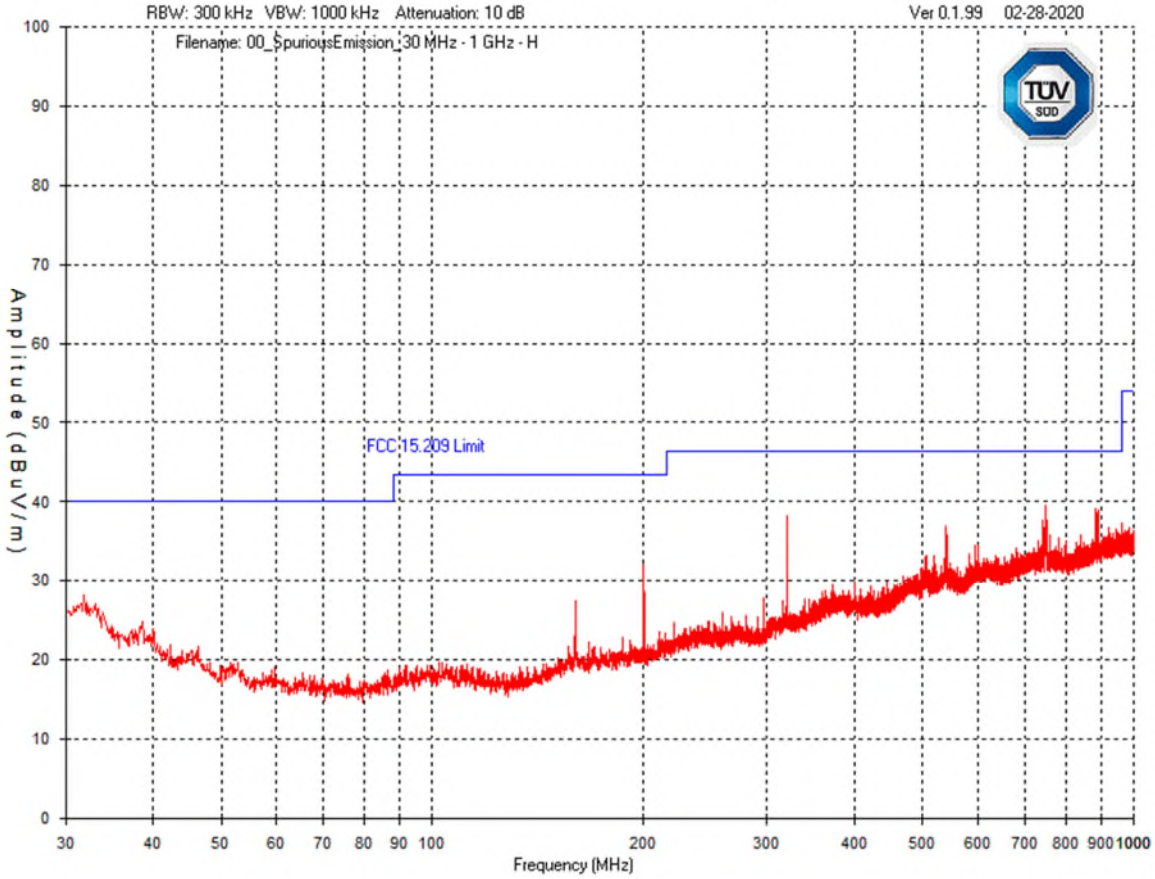
9 kHz – 150 kHz



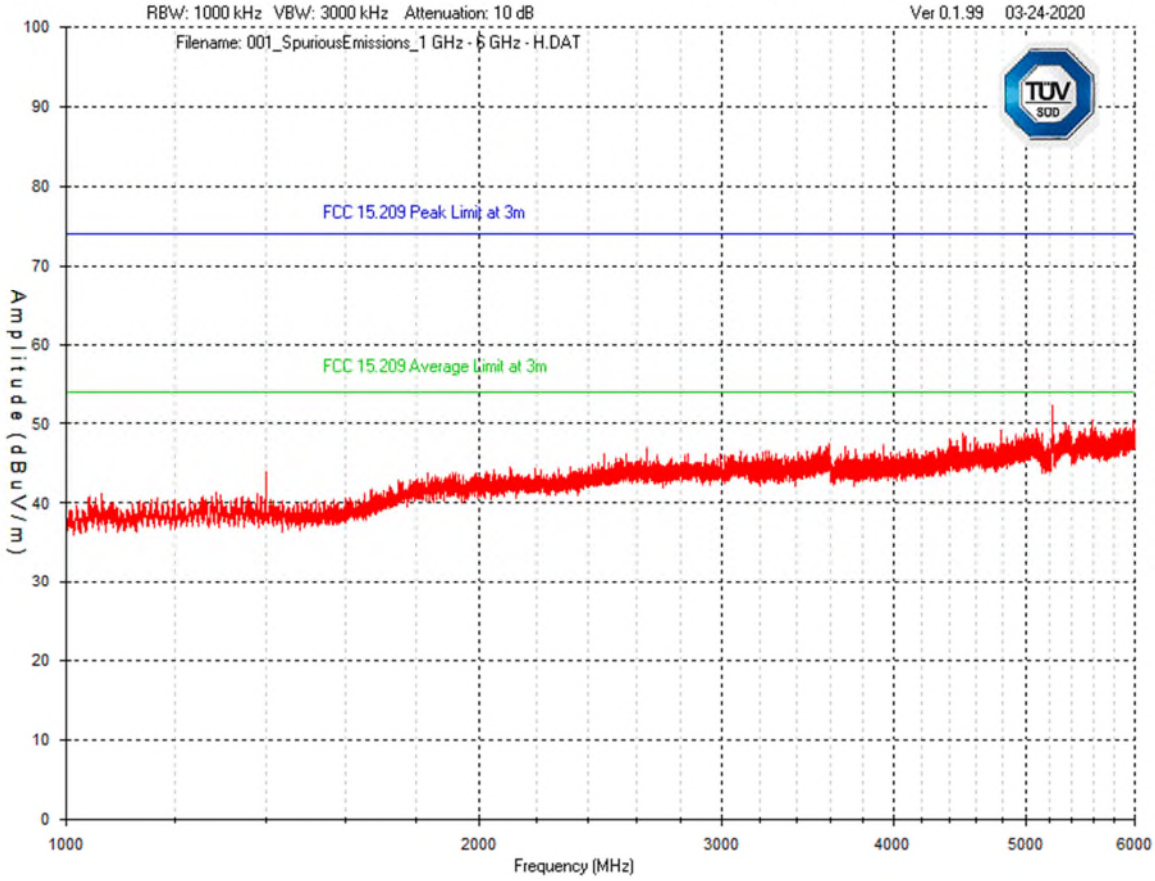
150 kHz – 30 MHz



30 MHz – 1 GHz
Horizontal - Peak Emission Graph

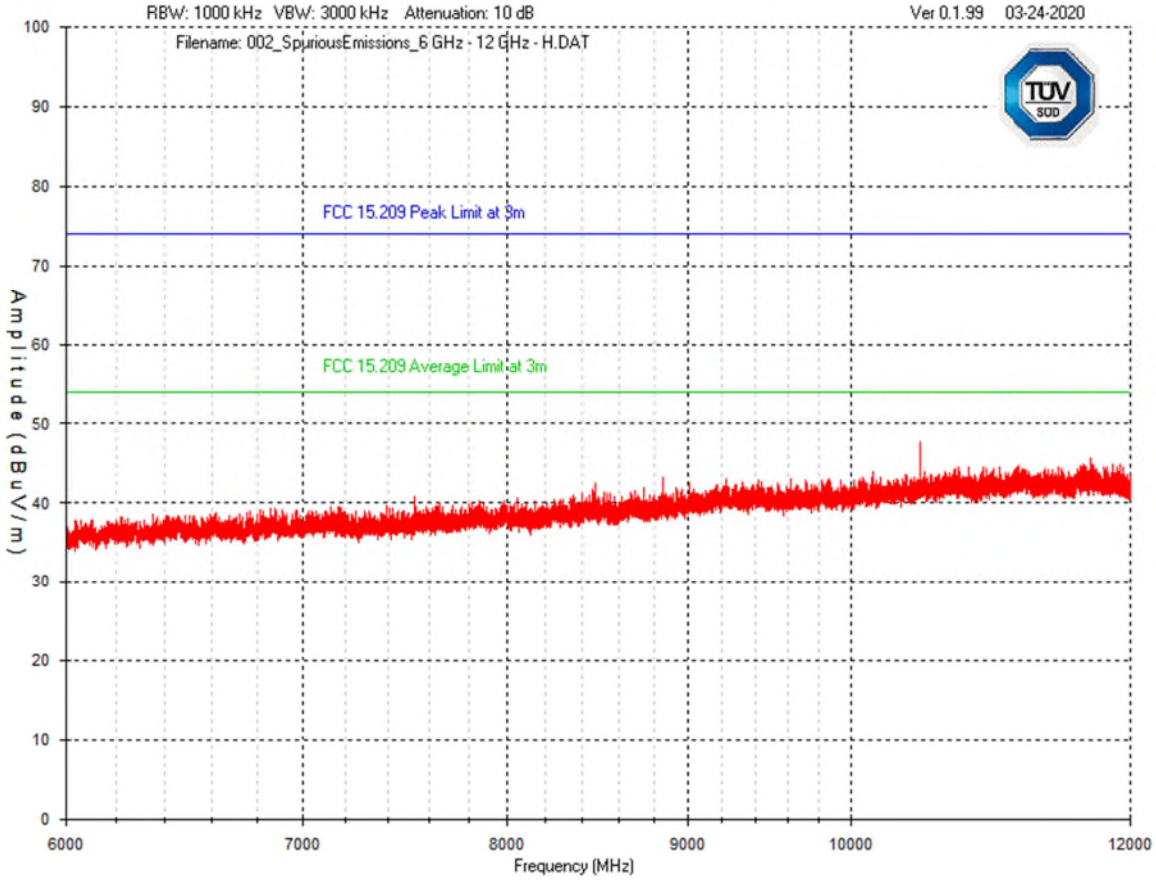


1 GHz – 6 GHz
Horizontal - Peak Emission Graph

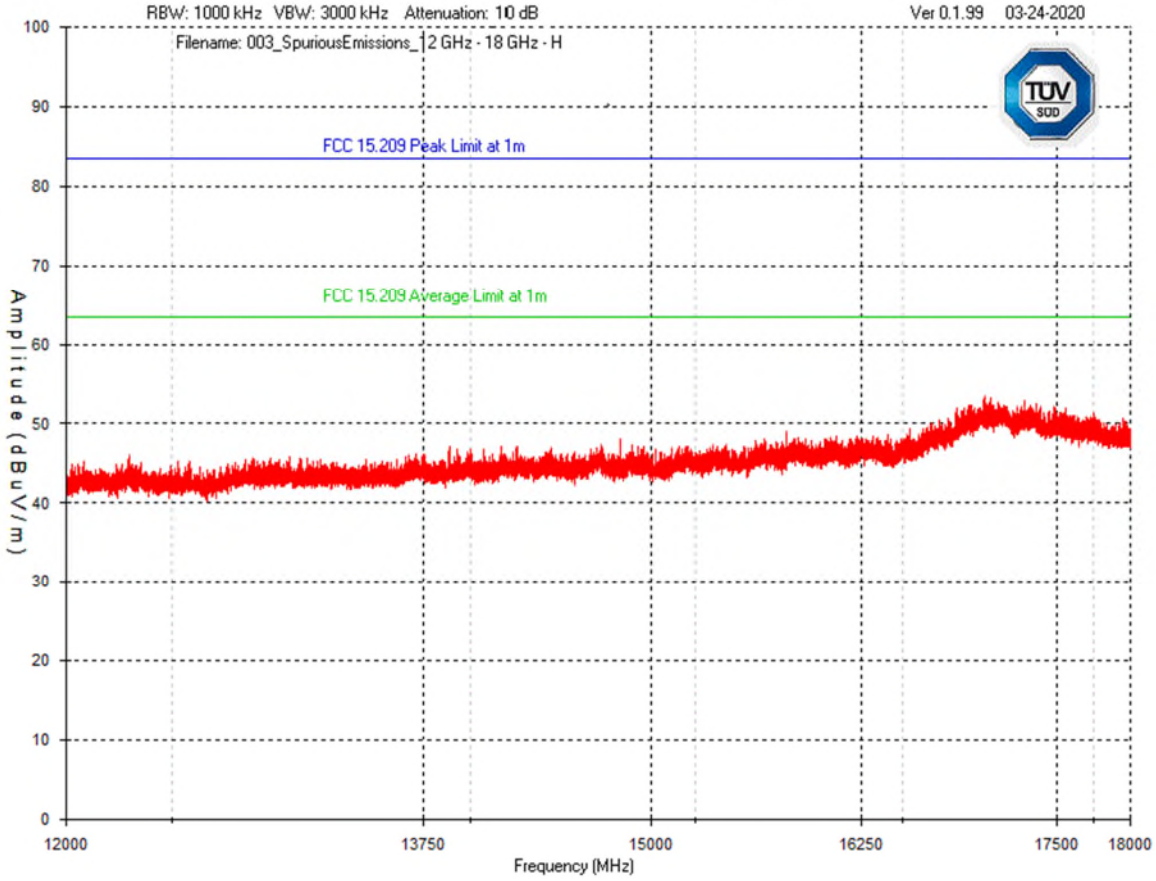


Note: Emission at 5230 MHz is the fundamental.

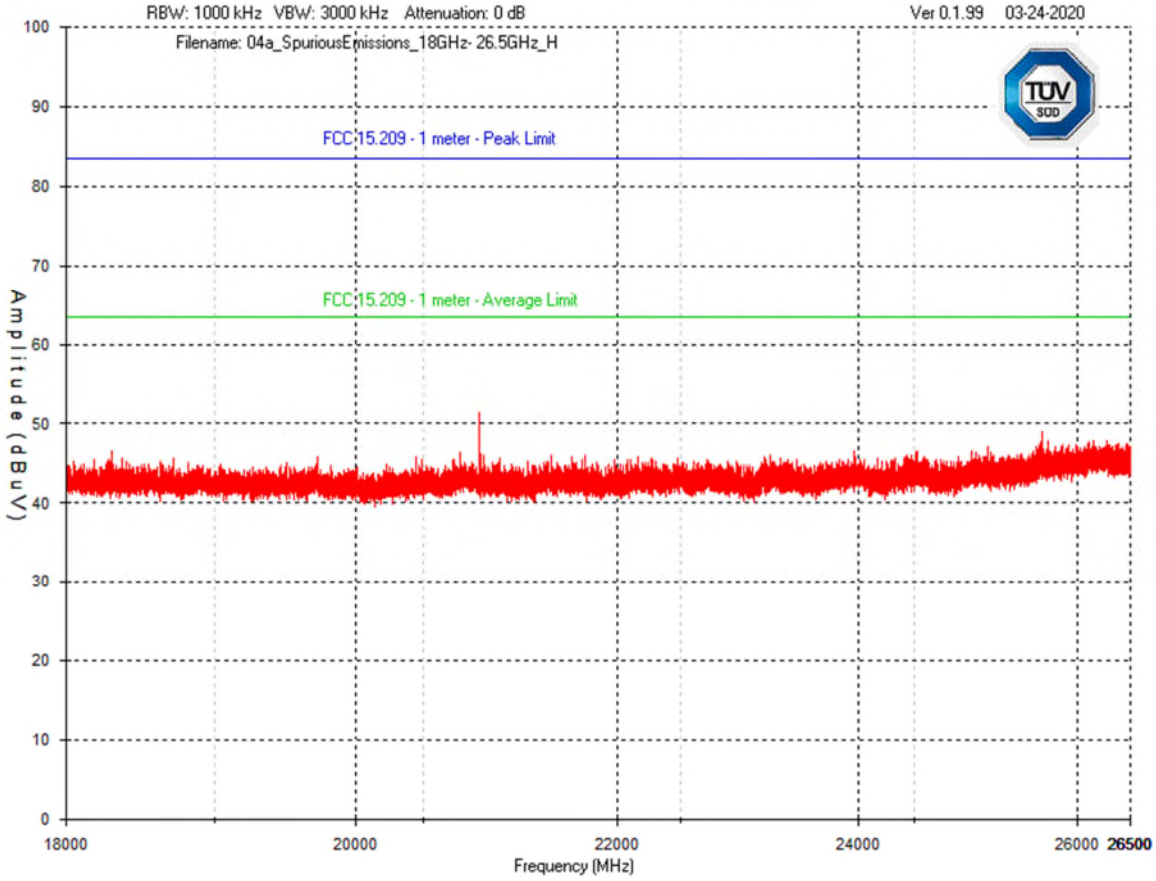
6 GHz – 12 GHz
Horizontal - Peak Emission Graph



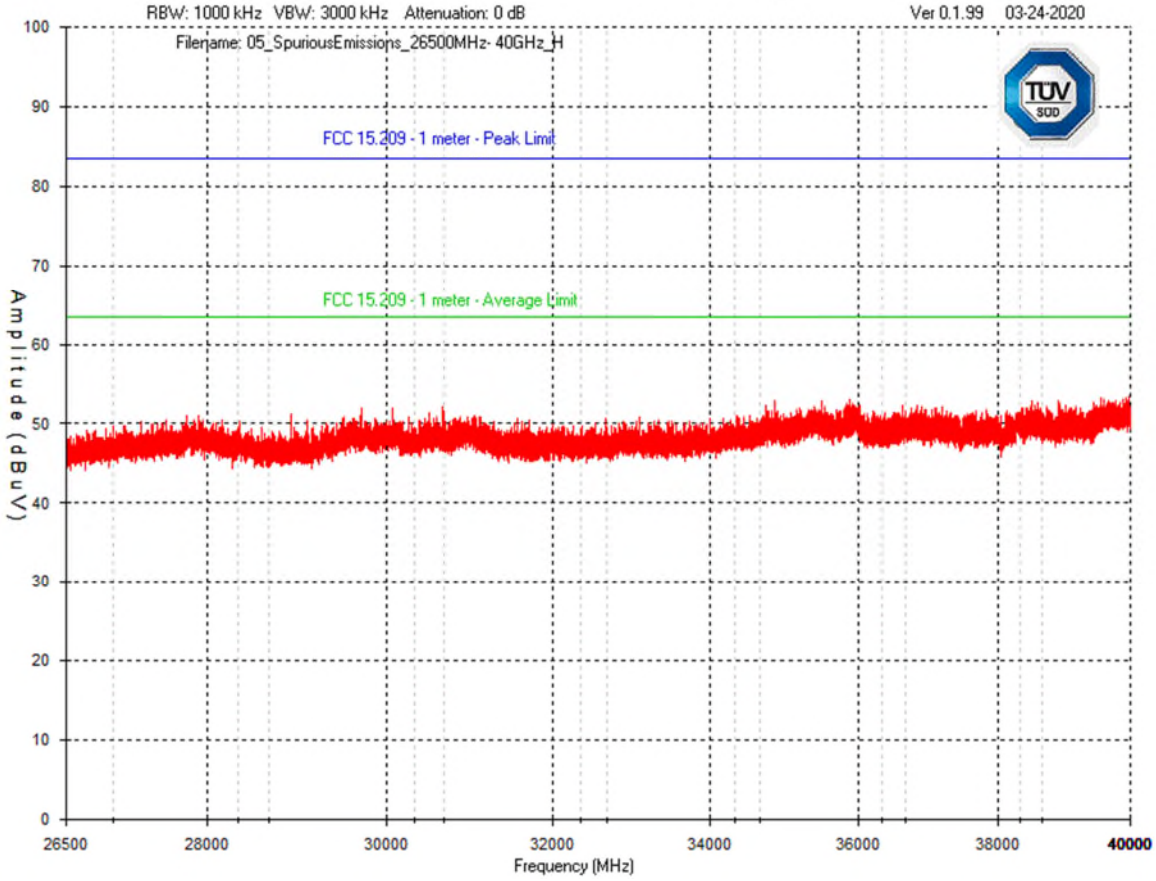
12 GHz – 18 GHz
Horizontal - Peak Emission Graph



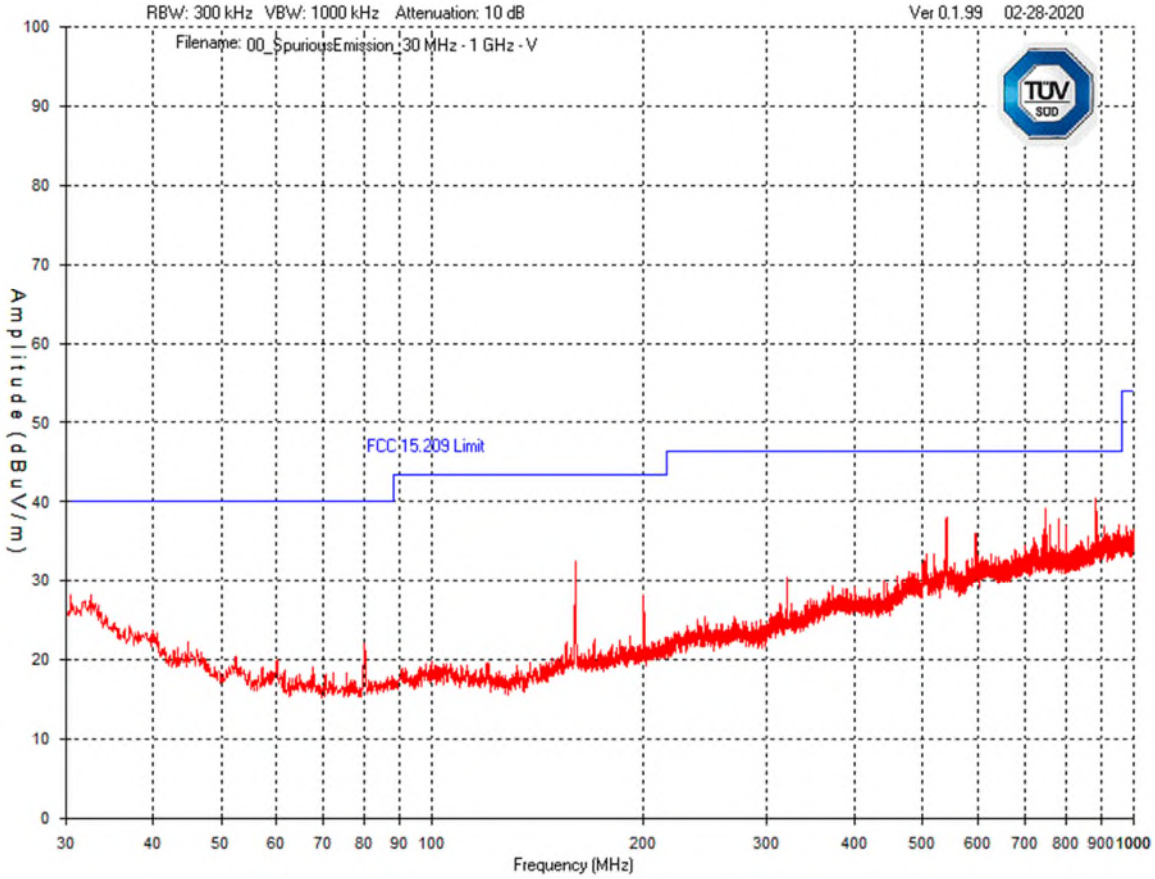
18 GHz – 26.5 GHz
Horizontal - Peak Emission Graph



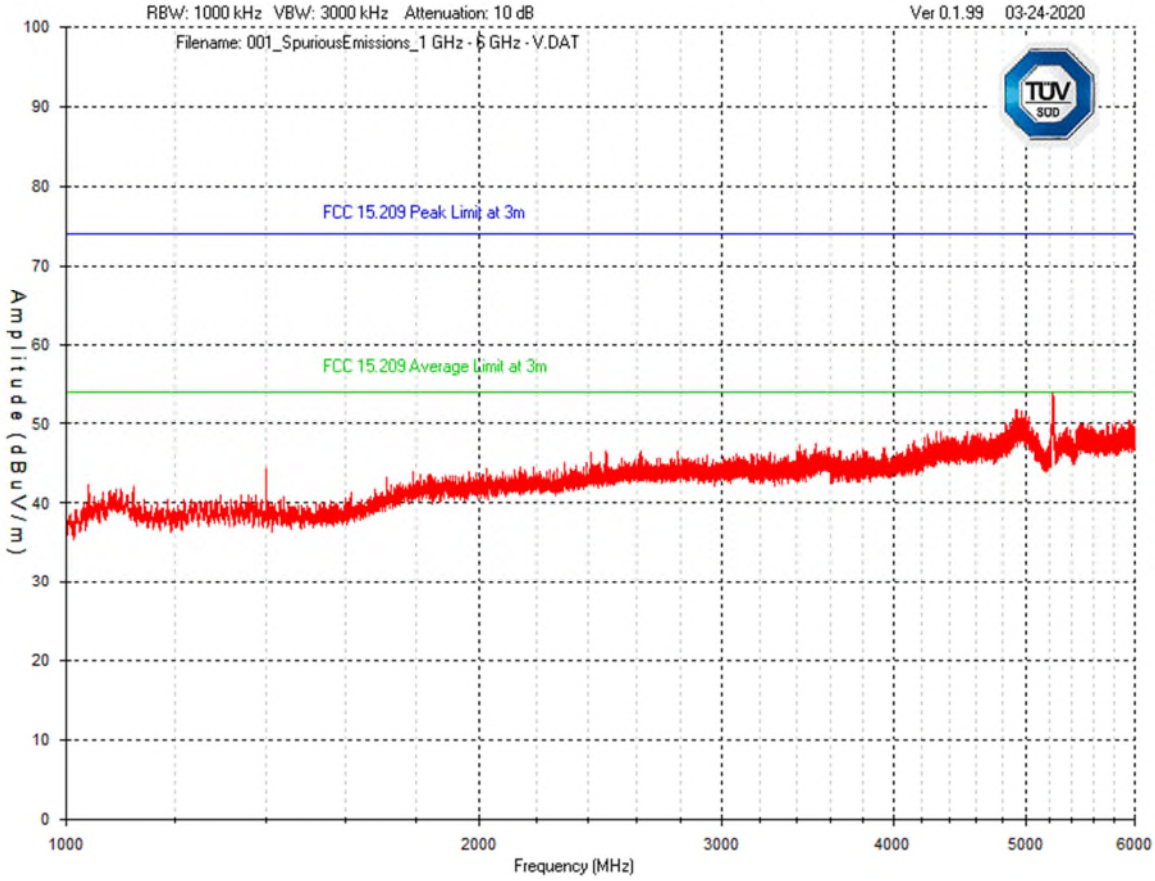
26.5 GHz – 40 GHz
Horizontal - Peak Emission Graph



30 MHz – 1 GHz
Vertical - Peak Emission Graph

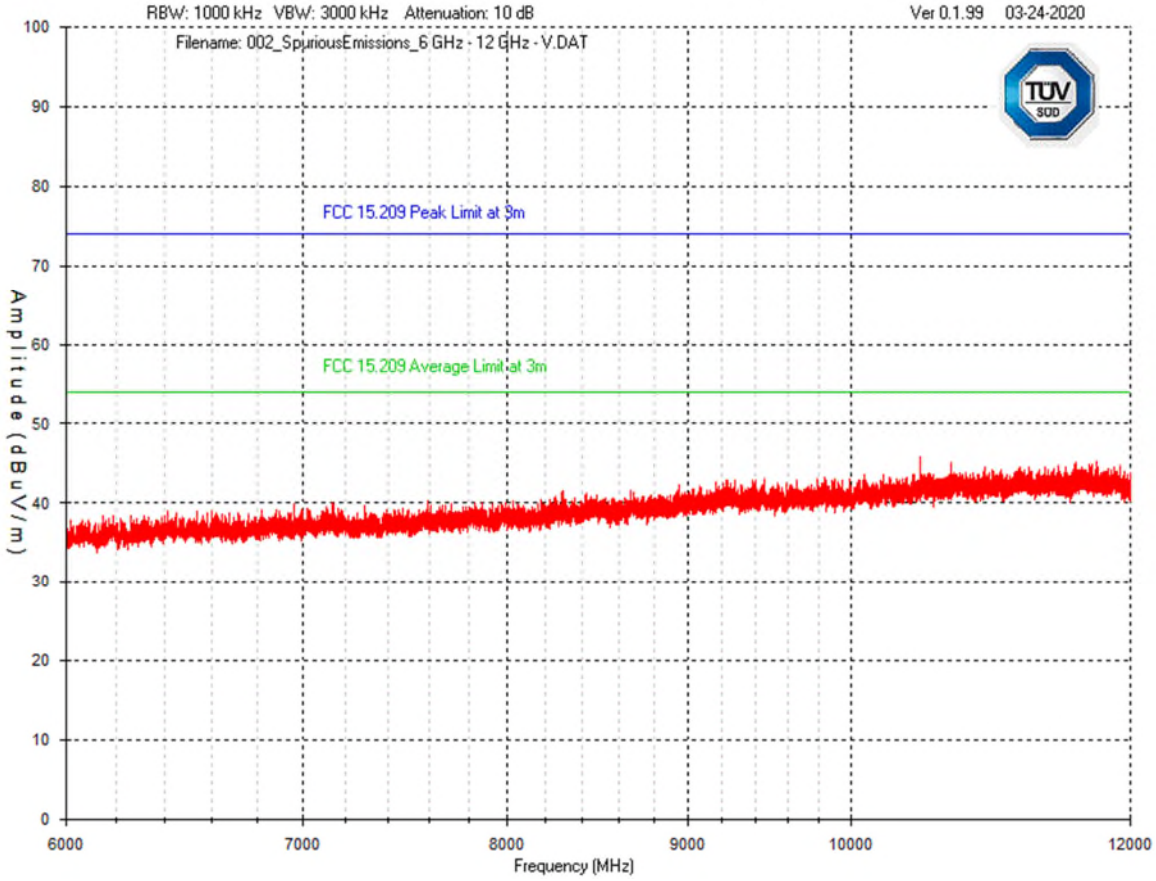


1 GHz – 6 GHz
Vertical - Peak Emission Graph

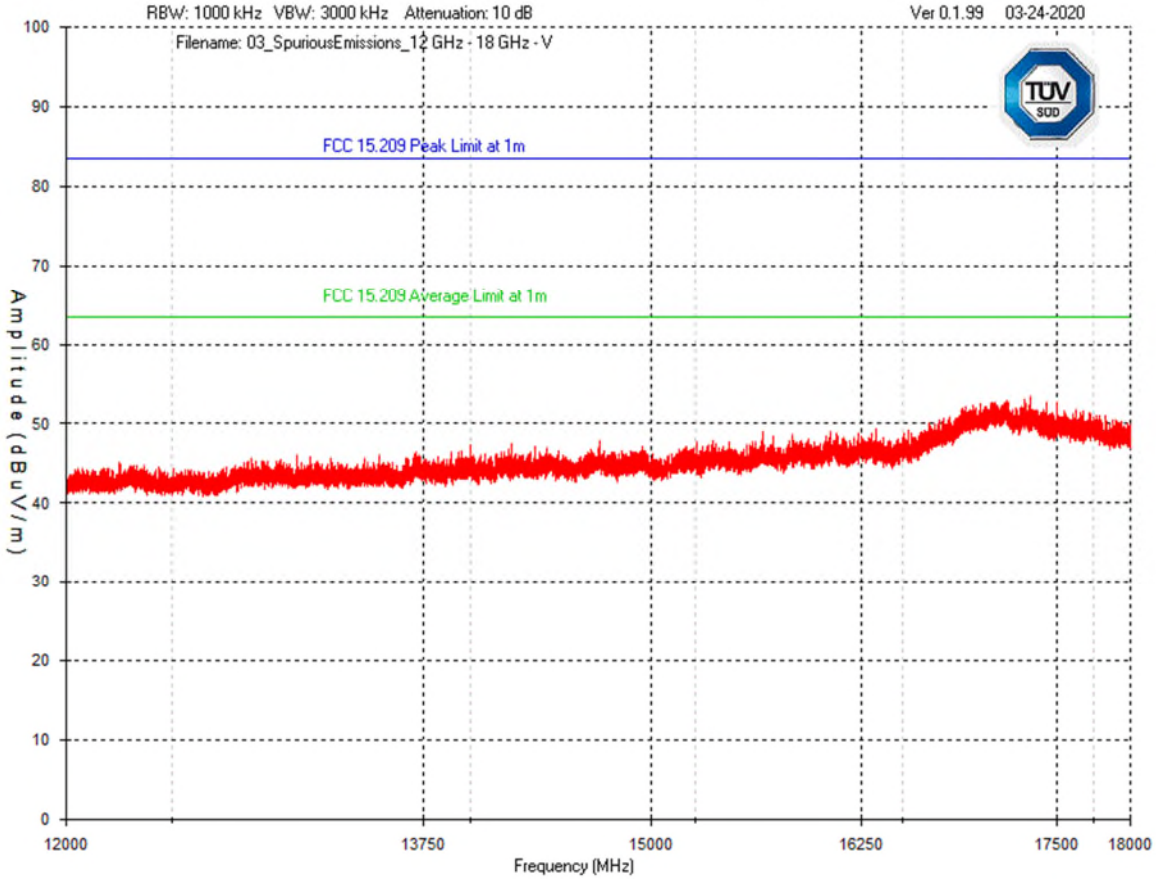


Note: Emission at 5230 MHz is the fundamental.

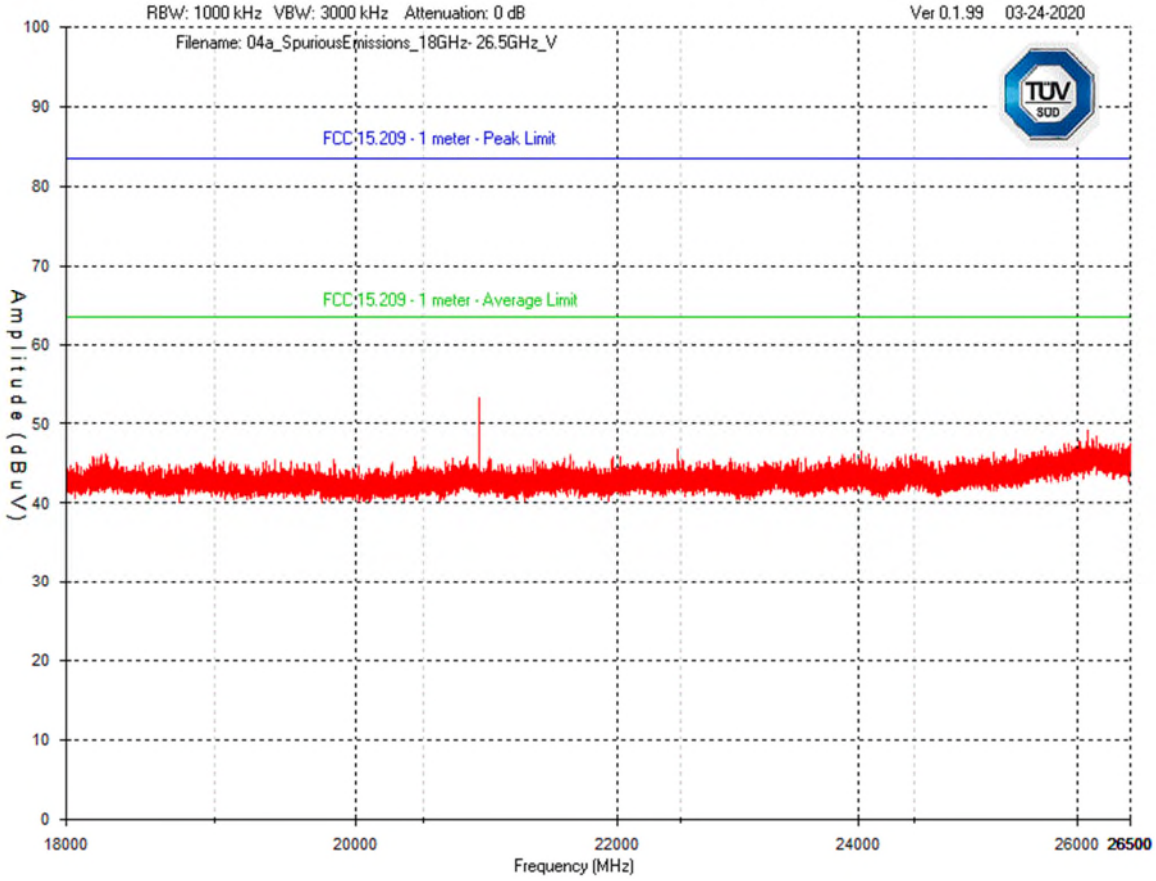
6 GHz – 12 GHz
Vertical - Peak Emission Graph



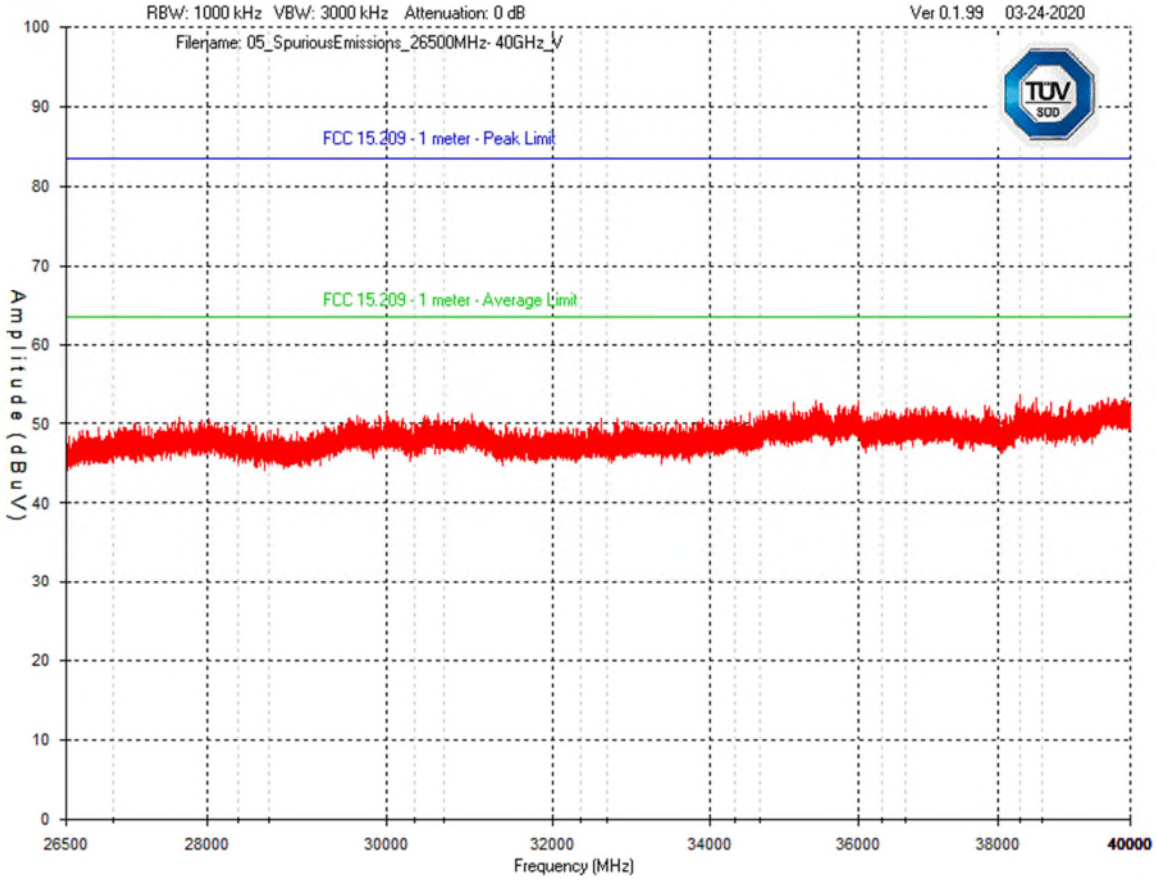
12 GHz – 18 GHz
Vertical - Peak Emission Graph



18 GHz – 26.5 GHz
Vertical - Peak Emission Graph



26.5 GHz – 40 GHz
Vertical - Peak Emission Graph



Final Measurements

No peak emissions are above average or quasi-peak limits.

Note:

See 'Appendix B – EUT, Peripherals, and Test Setup Photos' for photos showing the test set-up for the highest radiated emission.

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 15, 2019	Feb 15, 2021	GEMC 70
Loop Antenna	EM 6872	Electro-Metrics	Feb 15, 2019	Feb 15, 2021	GEMC 71
BiLog Antenna	3142-C	ETS-Lindgren	Oct. 19, 2018	Oct. 19, 2020	GEMC 8
Horn Antenna 1 – 18 GHz	3117	ETS-Lindgren	Feb. 17, 2020	Feb. 17, 2022	GEMC 340
Attenuator 6 dB	612-6-1	Meca Electronics, Inc	NCR	NCR	GEMC 286
Horn Antenna 2 – 18 GHz	WBH218HN	Q-par	Feb. 27, 2018	Feb. 27, 2020	GEMC 6375
Horn Antenna 18 GHz - 26.5 GHz	SAS-572	A.H. Systems	Oct 23, 2018	Oct 23, 2020	GEMC 6371
Horn Antenna 26.5 to 40GHz	QSH22F20S	Q-par	Jan. 10, 2020	Jan. 10, 2022	GEMC 6376
Pre-Amp 9 kHz – 1 GHz	LNA 6901	Teseq	Feb. 25, 2019	Feb. 25, 2021	GEMC 168
Pre-Amp 1 – 26.5 GHz	HP 8449B	HP	Dec. 20, 2019	Dec. 20, 2021	GEMC 189
Pre-Amp 18-40GHz	PAM-840A	Com-Power Corporation	Mar. 20, 2019	Mar. 20, 2021	GEMC 252
5.15 - 5.37GHz Notch Filter	BRM50703	Micro-Tronics	NCR	NCR	GEMC 268
>6 GHz High Pass Filter	HPM50112	Micro-Tronics	NCR	NCR	GEMC 329
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	0.1.99	TUV SUD Canada, Inc.	NCR	NCR	GEMC 58

Appendix A – EUT & Client Provided Details

General EUT Description

Client	
Organization / Address	Innovere Medical Inc. 250 Shields Court Unit 6 Markham ON L3R 9W7 Canada
Contact	Kevan Anderson
Phone	1-888-262-0408
Email	kevan.anderson@innoveremedical.com
EUT Details	
EUT Name	IVID0608
Equipment Category	Low power wireless transceiver
Basic EUT Functionality	EUT is a 5 GHz wireless transceiver
Peripherals Required for Test	Power supplies
Release type	Final
Intentional Radiator Frequency	5 GHz RLAN
EUT Configuration	Wireless configured to transmit continuously at 100% duty cycle

EUT Functional Description

Low power wireless transmitter

EUT Configuration

Please see Appendix B for a picture of the unit running in normal conditions.

- Cables and earthing were connected as per manufacturer's specification.
- RF Testing EUT configuration parameters:
  - Wireless were configured to transmit at maximum possible duty cycle
  - EUT was tested in the 5225 MHz – 5235 MHz band

Operational Setup

Peripheral devices were attached to or used with the EUT for its test operation. However, this report does not represent compliance of these peripheral device(s) in any way.

- Power supplies.

Modifications for Compliance

No modifications were made during testing for the sample to achieve compliance with the testing requirements.

Appendix B – EUT, Peripherals, and Test Setup Photos

See Test setup exhibit.