EMC TEST REPORT

FCC 47 CFR Part 15B, ISED ICES-003 Issue 6

Report Reference No	G0M-1908-8377-EF0115B-V03
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	DAkkS - Registration number : D-PL-12092-01-03 (ISED) ISED Testing Laboratory site: 3470A-3 DAkkS - Registration number : D-PL-12092-01-04 (FCC) FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant	BIOTRONIK SE & Co. KG
Address	Woermannkehre 1 12359 Berlin GERMANY
Test Specification	
Standard	47 CFR Part 15 Subpart B ISED ICES-003 Issue 6 ANSI C63.4:2014 +A1: 2017
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	CardioMessenger Smart / Telemonitoring System
Model(s)	CardioMessenger Smart 4G
Additional Model(s)	None
Brand Name(s)	BIOTRONIK
Hardware Version(s)	CardioMessenger Smart 4G mit LP best. LP1/Telex Smart 4G Rev Cx
Software Version(s)	ULP_HIGH_1_32_0, ULP_LOW_1_13_0, M0B.800004
FCC-ID	QRI-CMSMART4GWW
IC	4708A-CMSMART4GWW
Test Result	**PASSED**

Possible test case verdicts:	
required by standard but not tested	N/T
not required by standard	N/R
required by standard but not appl. to test object	N/A
test object does meet the requirement	P(PASS)
test object does not meet the requirement	F(FAIL)
Testing:	
Date of receipt of test item	2019-09-17
Report:	

Compiled by	Manuel Engel	
Tested by (+ signature) (Responsible for Test)	Manuel Engel Marco Belz	
Approved by (+ signature) (Deputy Head of Lab)	Jens Marquardt	
Date of Issue	2021-11-11	
Total number of pages	60	

General Remarks:

The test results presented in this report relate only to the object tested.
The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

Additional Comments:

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
EUT	Equipment Under Test
FCC	Federal Communications Commission
ISED	Innovation, Science and Economic Development Canada
T_{NOM}	Nominal operating temperature
V_{NOM}	Nominal supply voltage

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2019-11-08	Initial Release	
02	2020-06-05	Editorial corrections.	M. Engel
03	2021-11-11	Replaced document: G0M-1908-8377-EF0115B-V02 Replaced by: G0M-1908-8377-EF0115B-V03 Reason: FCC ID corrected.	M. Engel

REPORT INDEX

1 Equipment (Test Item) Under Test

Description	CardioMessenger Smart / Telemonitoring System	
Model	CardioMessenger Smart 4G	
Additional Model(s)	None	
Brand Name(s)	BIOTRONIK	
Serial Number(s)	80216060	
Hardware Version(s)	CardioMessenger Smart 4G mit LP best. LP1/Telex Smart 4G Rev Cx	
Software Version(s)	ULP_HIGH_1_32_0, ULP_LOW_1_13_0, M0B.800004	
FCC-ID	QRI-CMSMART4GWW	
IC	4708A-CMSMART4GWW	
Class	Class B	
Equipment type	Table top	
Highest internal frequency [MHz]	2169.9, carrier signal mobile communication	
Radio Module 1	Type	Mobile Communication
	Model	ME910C1-WW
	Manufacturer	TELIT COMMUNICATIONS
	FCC-ID	RI7ME910C1WW
	IC	5131A-ME910C1WW
Radio Module 2	Type	Medical Implant Communication Service
	Model	Hermes 3
	Manufacturer	Biotronik/MSEI
Supply Voltage	V_{NOM}	3.7 V DC internal battery
AC/DC-Adaptor	Model	GTM96180-1107-2.0
	Vendor	GlobTek, Inc.
	Input	100 – 240 V 50/60 Hz
	Output	5 V DC
Manufacturer	BIOTRONIK SE & Co. KG Woermannkehre 1 12359 Berlin GERMANY	

1.1 Equipment Ports

Name	Type	Attributes		Comment
USB	DC,IO	Count: Direction: Service only:	1 In Yes	USB Micro

Description:	
AC	AC mains power input/output port
DC	DC power input/output port
BAT	DC power input port connected to external battery
IO	Input/Output port
TP	Telecommunication port
NE	Non-electrical port

1.2 Equipment Photos – Internal

EUT front without housing

EUT back without housing

EUT back without housing and battery

Label mobile communication module

MICS module

1.3 Equipment Photos - External

EUT front

EUT back

EUT right

EUT left

AC/DC power supply

Label AC/DC power supply

1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	Mains adapter	GlobTek, Inc.	GTM96180-1107-2.0	
SIM	Signalling Station	CMW290	RHODE&SCHWARZ	
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
MON	Monitoring Equipment			
CBL	Connecting Cable			
Comment:				

1.5 Operational Modes

Mode #	Description
1	Active mobile communication to CMW. LTE Cat-M1 FDD B2 (1900 MHz) and MICS TX. TPC: Max Power
2	Active mobile communication to CMW. Evaluation of "worst case band" for LTE, FDD 4 / 5 / 12 / 26 TPC: Max Power
Comment:	

1.6 EUT Configuration

Configuration #	Description
1	EUT is placed inside the measurement chamber. EUT powered with the supply voltage 120 V 60 Hz via AC/DC adaptor. CMW placed outside the measurement chamber.
2	EUT is placed inside the measurement chamber. EUT power via internal battery CMW placed outside the measurement chamber.
Comment:	

1.7 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyser in dBµV. Any external preamplifiers used are taken into account through internal analyser settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyser. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

Reading on Analyser (dBµV) + A.F. (dB/m) = Net field strength (dBµV/m)

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of dBµV/m). The FCC limits are given in units of µV/m. The following formula is used to convert the units of µV/m to dBµV/m:

Limit (dBµV/m) = 20*log (µV/m)

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

Reading + AF	= Net Reading	:	Net reading - FCC limit	= Margin
+21.5 dBµV + 26 dB/m	= 47.5 dBµV/m	:	47.5 dBµV/m - 57.0 dBµV/m	= -9.5 dB

2 Result Summary

FCC 47 CFR Part 15B, ISED ICES-003 Issue 6				
Reference	**Requirement**	**Reference Method**	**Result**	**Remarks**
Emission				
FCC 15.109 ICES-003, 8, 6.1	Radiated emissions	ANSI C63.4:2014	PASS	
FCC 15.107 ICES-003, 8, 6.2	AC power line conducted emissions	ANSI C63.4:2014	PASS	
Comment:				

Possible Test Case Verdicts	
PASS	Test object does meet the requirements
FAIL	Test object does not meet the requirements
N/T	Required by standard but not tested
N/R	Not required by standard for the test object

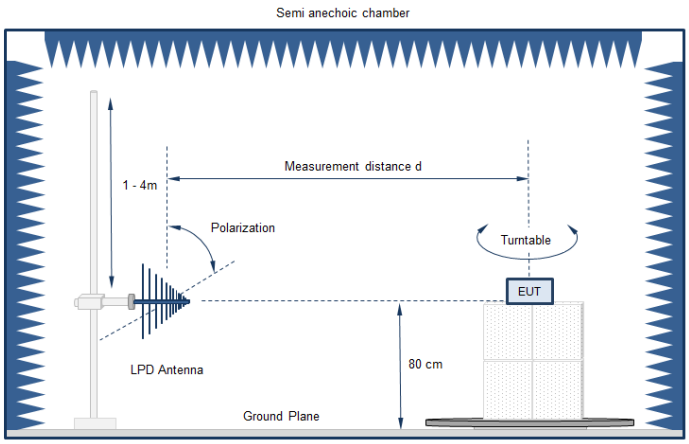
2.1 Test Conditions and Results - Radiated emissions acc. to ANSI C63.4

2.1.1 Information

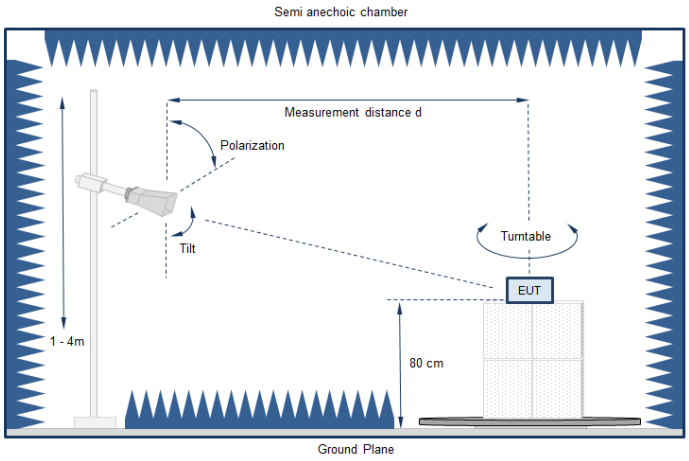
Test Information	
Reference	FCC 15.109, ICES-003, 8, 6.1
Reference method	ANSI C63.4:2014 Section 8
Equipment class	Class B
Equipment type	Table top
Highest internal frequency [MHz]	2169.9
Measurement range	30 MHz to 12 000 MHz
Temperature [°C]	22
Humidity [%]	40 – 52
Operator	Marco Belz
Date	2019-10-01 to 2019-10-02

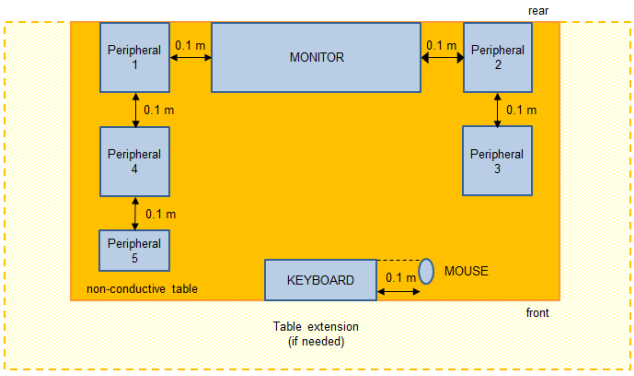
2.1.2 Setup

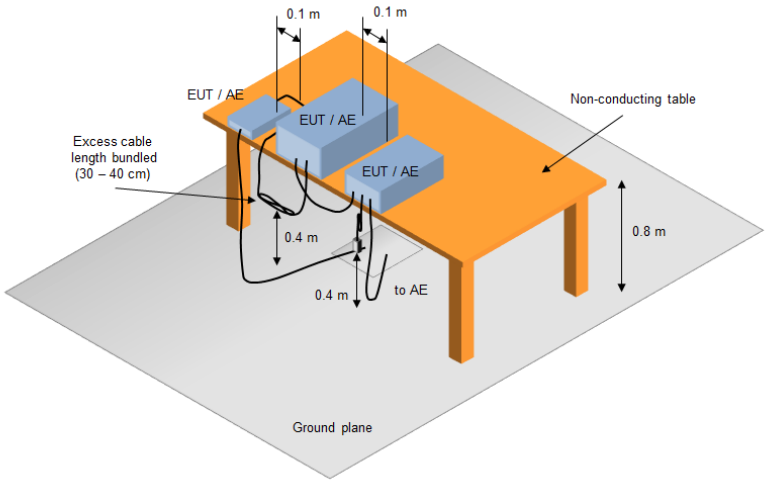
Measurement up to 1 GHz



Measurement above 1 GHz



Equipment placement - Table top


Test Setup


2.1.3 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	Radimation	2016.1.10

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic chamber	Frankonia	AC6	EF00910	2019-05	2022-05
Horn Antenna	ETS-Lindgren	3117	EF00976	2019-03	2022-03
LPD antenna	Rohde & Schwarz Vertriebs GmbH	HL223	EF00202	2018-03	2020-03
Biconical antenna	Rohde & Schwarz Vertriebs GmbH	HK116	EF00186	2018-03	2020-03
EMI Test Receiver	Rohde & Schwarz Vertriebs GmbH	ESU26	EF00887	2019-07	2020-07

2.1.4 Procedure

Exploratory measurement
1. The EUT was placed on a non-conductive table at a height of 0.8m. 2. The EUT and support equipment, if needed, were set up to simulate typical usage. 3. Cables, of type and length specified by the manufacturer, were connected to at least one port of each type and were terminated by a device or simulating load of actual usage. 4. The antenna was placed at a distance of 3 or 10 m. 5. The received signal was monitored at the measurement receiver. 6. This procedure has to be performed in both antenna polarizations, horizontal and vertical. 7. The arrangement of the equipment with the maximum emission level is shown on the setup picture at item 1.3

Final measurement
1. The EUT was placed on a 0.8 m non-conductive table at a 3 m distance from the receive antenna. The antenna output was connected to the measurement receiver. 2. A biconical antenna was used for the frequency range 30 – 200 MHz, a logarithmic periodical antenna was used for the frequency range from 200 – 1000 MHz. Above one 1 GHz a Double Ridged Broadband Horn antenna was used. The antenna was placed on an adjustable height antenna mast. 3. The EUT and cable arrangement were based on the exploratory measurement results. 4. Emissions were maximized at each frequency by rotating the EUT and adjusting the receive antenna height and polarization. The maximum values were recorded. 5. The test data of the worst-case conditions were recorded and shown on the next pages.

2.1.5 Limits

Class B @ 3 m		
Frequency [MHz]	Detector	Limit [dBµV/m]
30 - 88	Quasi-peak	40
88 - 216	Quasi-peak	43.5
216 - 960	Quasi-peak	46
960 - 1000	Quasi-peak	54
> 1000	Peak Average	74 54

2.1.6 Results

Test Results			
Operational mode	EUT Configuration	Verdict	Remark
1 / 2	1 / 2	PASS	

2.1.7 Setup Photos

Mode 1 Configuration 1 / Setup 1

Mode 1 Configuration 1 / Setup 2

Mode 1 Configuration 1 / Setup 3

Mode 1 Configuration 2 / Setup 1

Mode 1 Configuration 2 / Setup 2

Mode 1 Configuration 2 / Setup 3

Mode 2 Configuration 1 / Setup 1

Mode 2 Configuration 1 / Setup 2

Mode 2 Configuration 1 / Setup 3

Mode 2 Configuration 2 / Setup1

Mode 2 Configuration 2 / Setup 2

Mode 2 Configuration 2 / Setup 2

1 - 12 GHz Setup1

1 - 12 GHz Setup 2

1 - 12 GHz Setup 3

1 - 12 GHz Setup 4

2.1.8 Records

Radiated emissions according to FCC 15B

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	HK 116, Vertical
Measurement distance:	10 m converted to 3 m
Mode:	Mode1 Configuration 1
Test Date:	2019-10-02
Note:	

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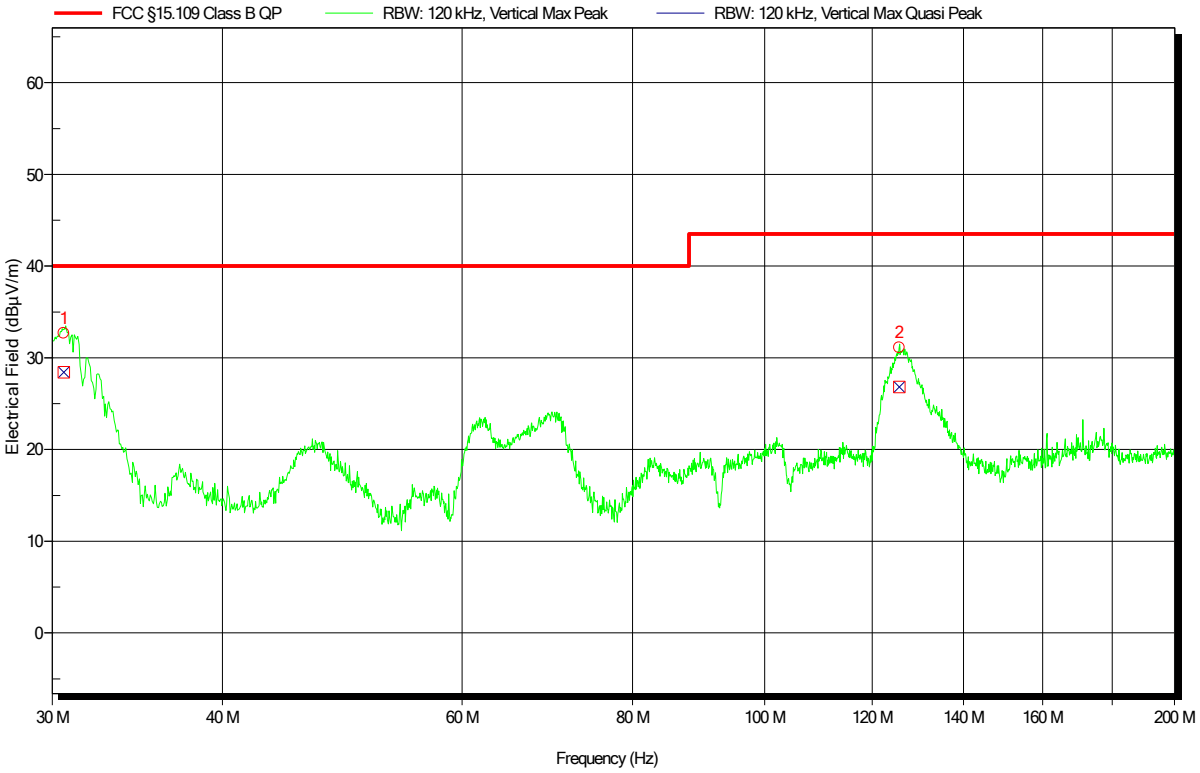

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	30.6 MHz	28.4 dBµV/m	40 dBµV/m	-11.6 dB	Pass	-120 Degree	1 m
2	125.58 MHz	26.8 dBµV/m	43.5 dBµV/m	-16.7 dB	Pass	-120 Degree	1 m

Radiated emissions according to FCC 15B

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	HK 116, Horizontal
Measurement distance:	10 m converted to 3 m
Mode:	Mode1 Configuration 1
Test Date:	2019-10-02
Note:	

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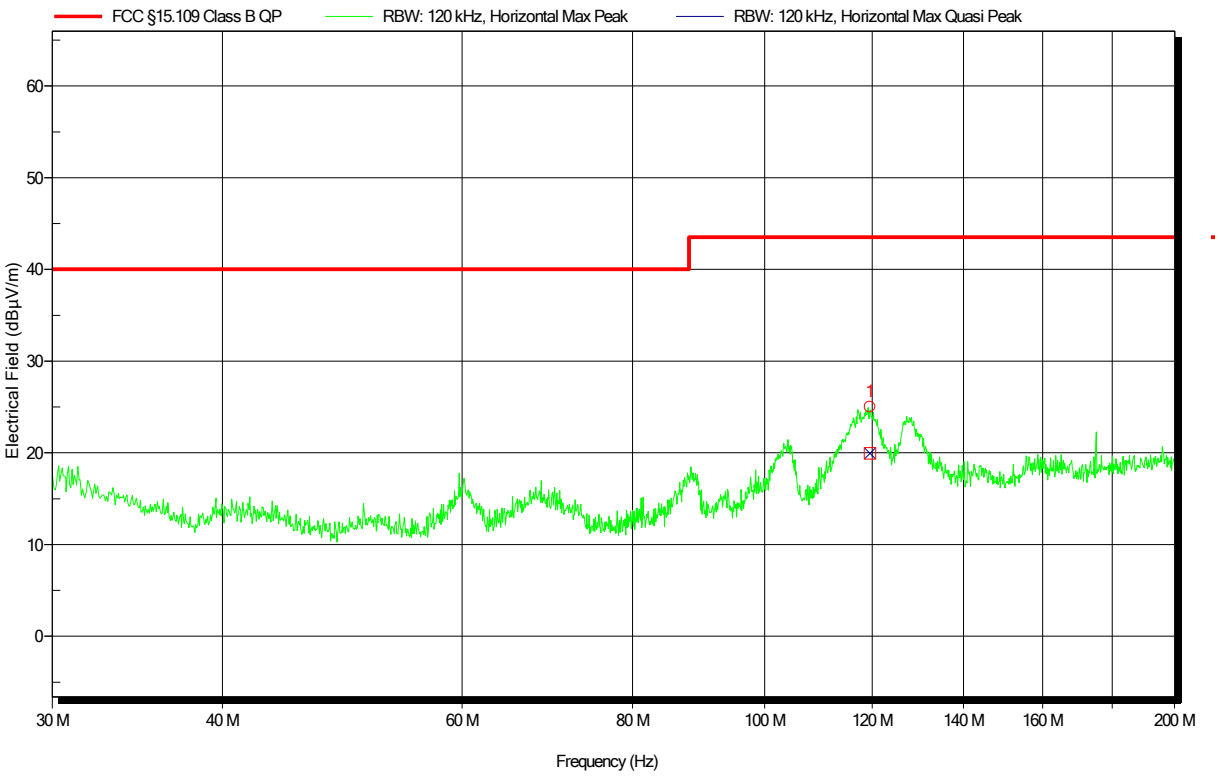

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	119.52 MHz	20 dBµV/m	43.5 dBµV/m	-23.6 dB	Pass	0 Degree	4 m

Radiated emissions according to FCC 15B

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EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	HL 223, Vertical
Measurement distance:	10 m converted to 3 m
Mode:	Mode1 Configuration 1
Test Date:	2019-10-02
Note:	

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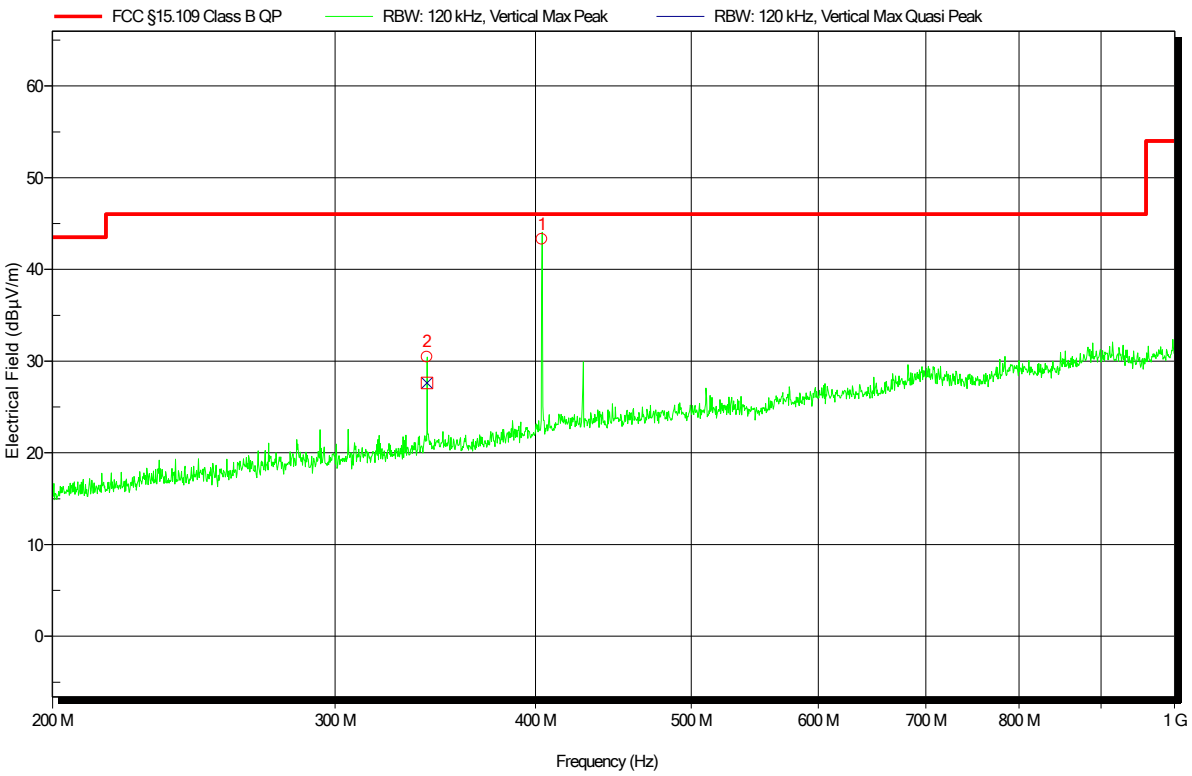

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	403.64 MHz	Carrier					
2	342.398 MHz	27.6 dBµV/m	46 dBµV/m	-18.4 dB	Pass	0 Degree	1 m

Radiated emissions according to FCC 15B

Project number: G0M-1908-8377

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EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	HL 223, Horizontal
Measurement distance:	10 m converted to 3 m
Mode:	Mode1 Configuration 1
Test Date:	2019-10-02
Note:	

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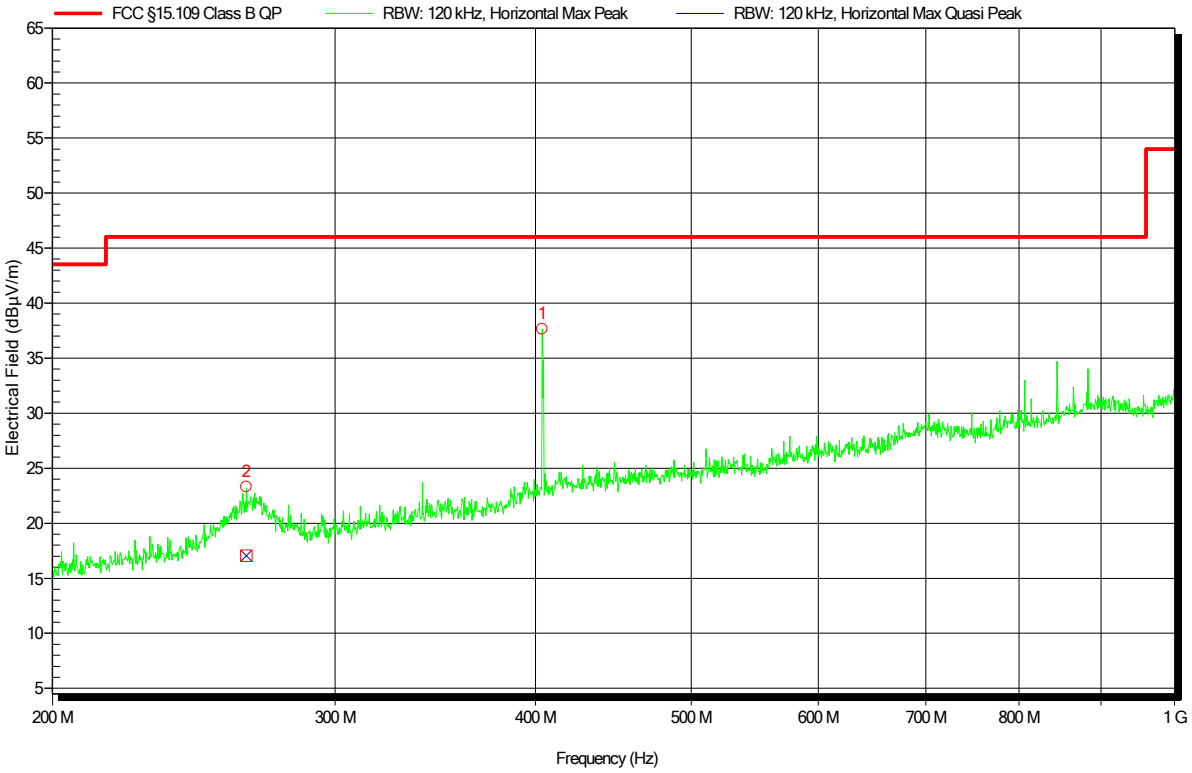

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	403.88 MHz	Carrier					
2	264.26 MHz	17 dBµV/m	46 dBµV/m	-29.0 dB	Pass	110 Degree	1.35 m

Radiated emissions according to FCC 15B

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Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	HK 116, Vertical
Measurement distance:	10 m converted to 3 m
Mode:	Mode1 Configuration 2
Test Date:	2019-10-02
Note:	

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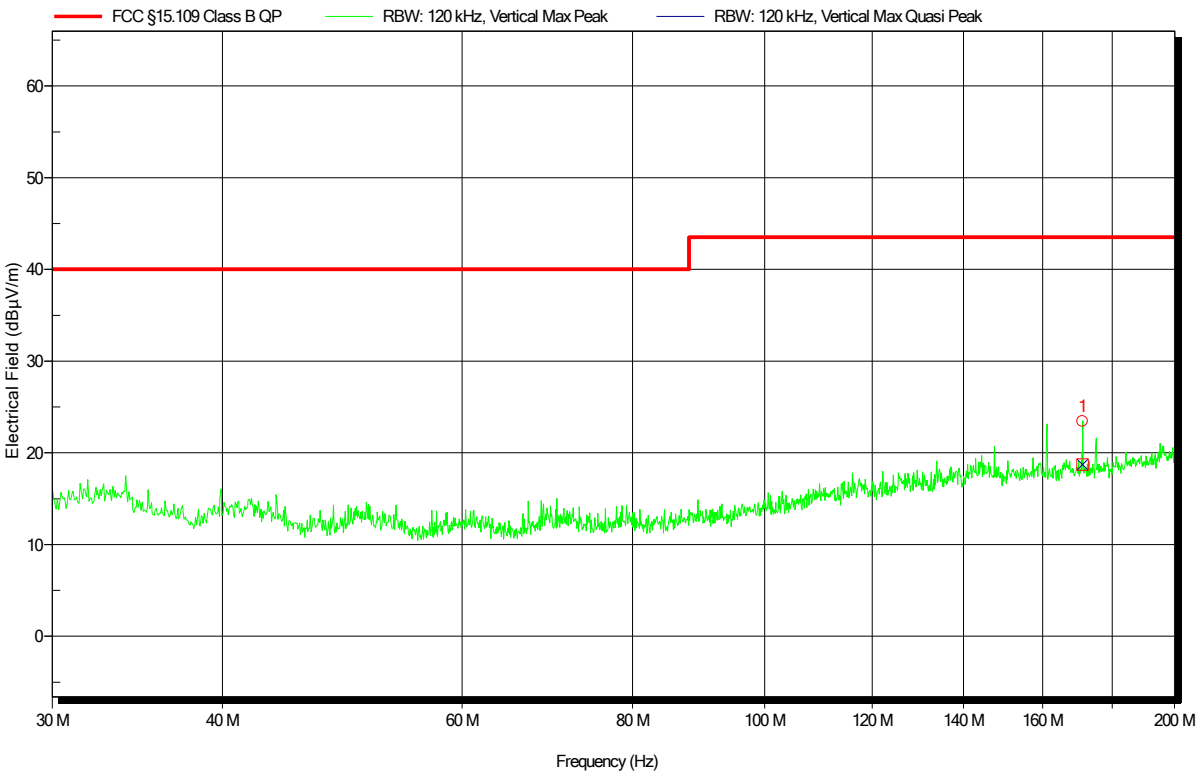

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	171.204 MHz	18.7 dBµV/m	43.5 dBµV/m	-24.8 dB	Pass	-120 Degree	1 m

Radiated emissions according to FCC 15B

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Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	HK 116, Horizontal
Measurement distance:	10 m converted to 3 m
Mode:	Mode1 Configuration 2
Test Date:	2019-10-02
Note:	

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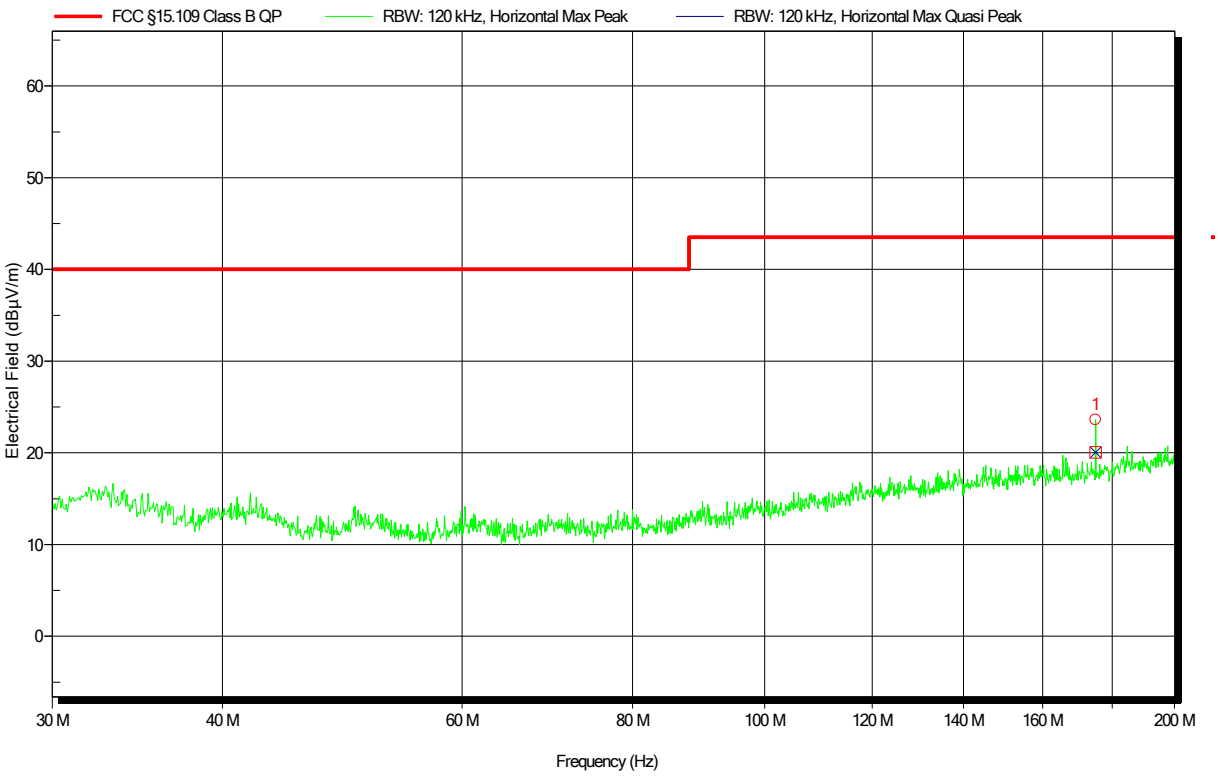

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	175.002 MHz	20 dBµV/m	43.5 dBµV/m	-23.5 dB	Pass	0 Degree	4 m

Radiated emissions according to FCC 15B

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Antenna:	HL 223, Vertical
Measurement distance:	10 m converted to 3 m
Mode:	Mode1 Configuration 2
Test Date:	2019-10-02
Note:	

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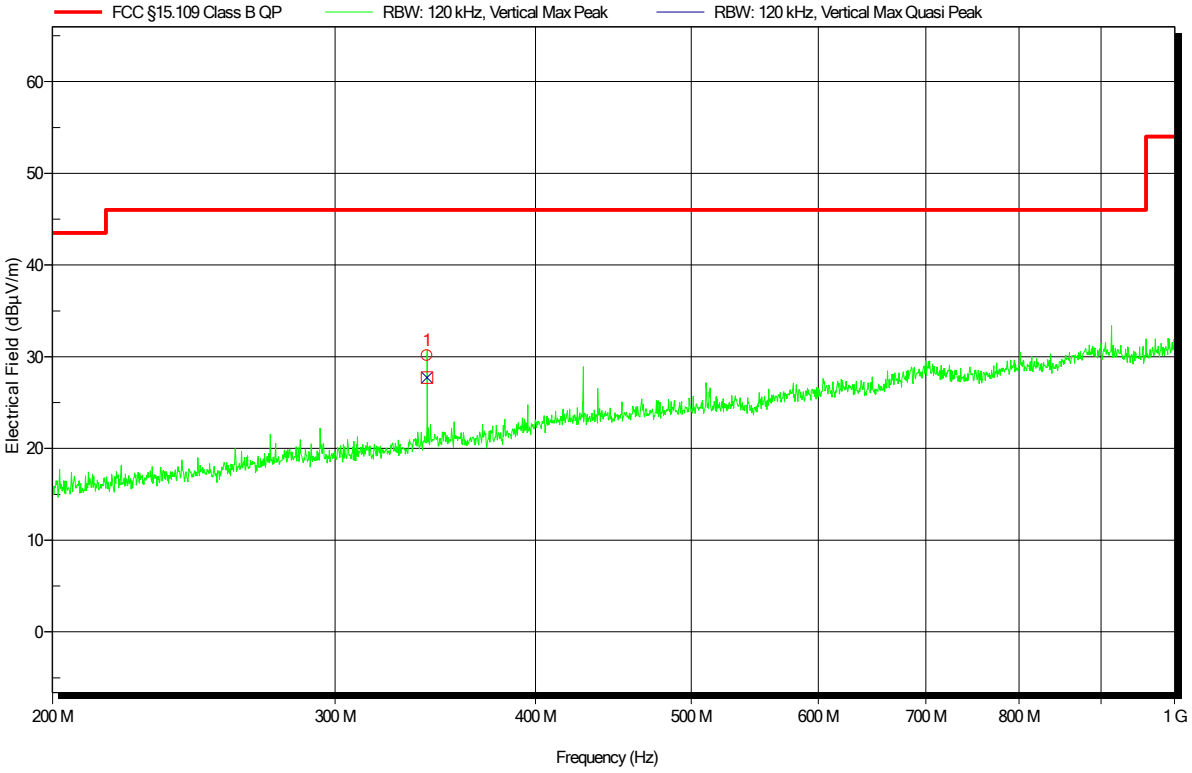

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	342.398 MHz	27.7 dBµV/m	46 dBµV/m	-18.3 dB	Pass	0 Degree	1 m

Radiated emissions according to FCC 15B

Project number: G0M-1908-8377

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Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	HL 223, Horizontal
Measurement distance:	10 m converted to 3 m
Mode:	Mode1 Configuration 2
Test Date:	2019-10-02
Note:	

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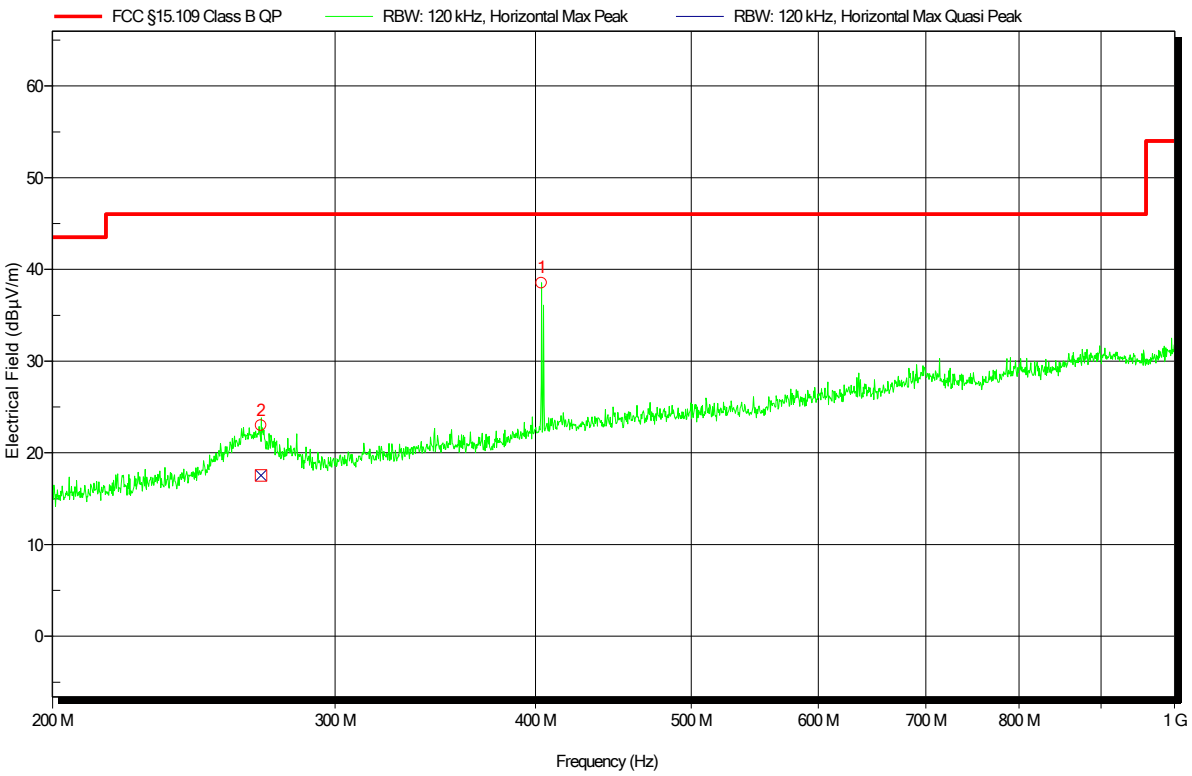

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	403.46 MHz	Carrier					
2	269.9 MHz	17.5 dBµV/m	46 dBµV/m	-28.5 dB	Pass	110 Degree	1.35 m

Radiated emissions according to FCC 15B

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Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	HK 116, Vertical
Measurement distance:	10 m converted to 3 m
Mode:	Mode2 Configuration 1
Test Date:	2019-10-02
Note:	Band 4

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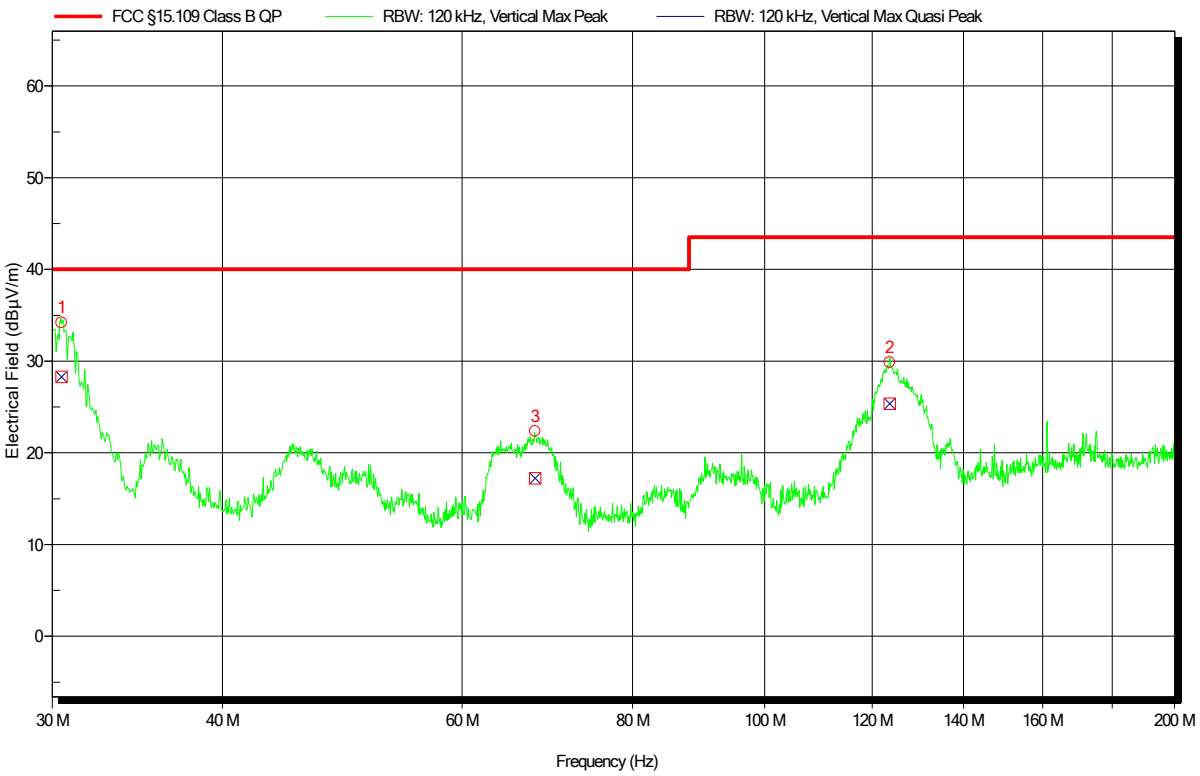

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	30.48 MHz	28.3 dBµV/m	40 dBµV/m	-11.7 dB	Pass	-120 Degree	1 m
2	123.6 MHz	25.4 dBµV/m	43.5 dBµV/m	-18.2 dB	Pass	-120 Degree	1 m
3	67.86 MHz	17.2 dBµV/m	40 dBµV/m	-22.8 dB	Pass	-120 Degree	1 m

Radiated emissions according to FCC 15B

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Mode:	Mode2 Configuration 1
Test Date:	2019-10-02
Note:	Band 4

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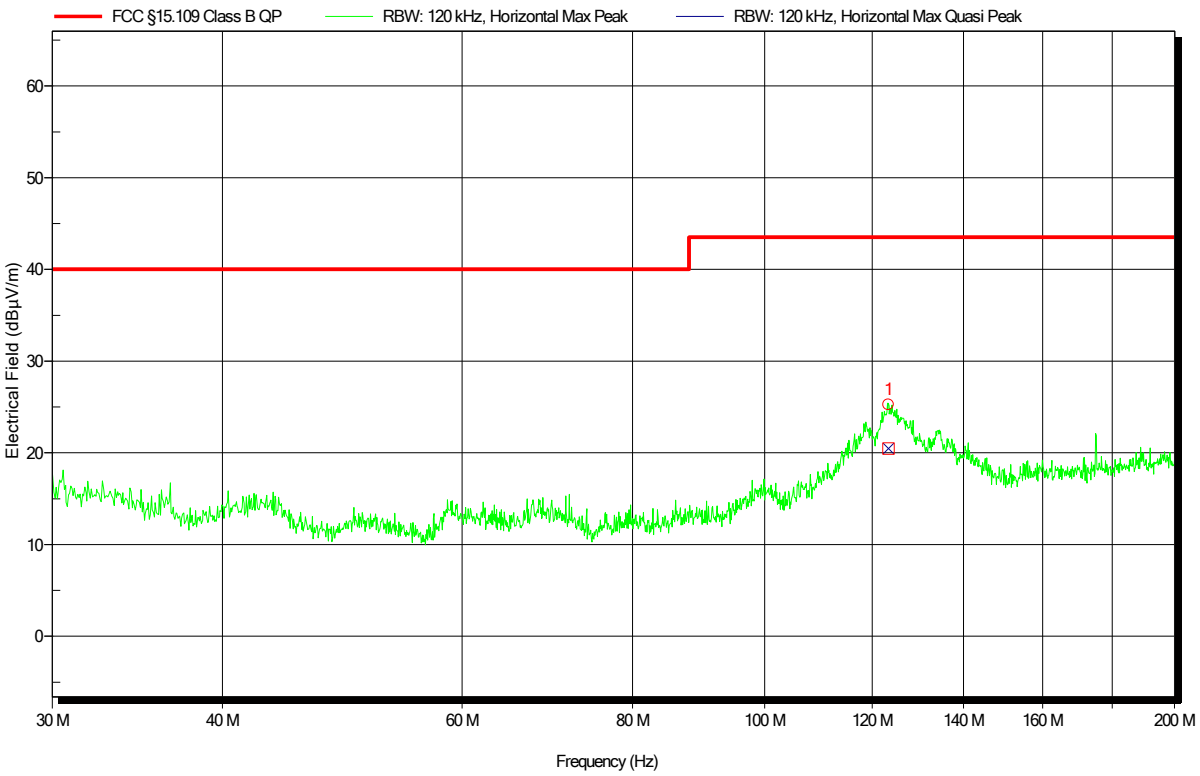

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	123.3 MHz	20.5 dBµV/m	43.5 dBµV/m	-23.1 dB	Pass	0 Degree	4 m

Radiated emissions according to FCC 15B

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Test Date:	2019-10-02
Note:	Band 4

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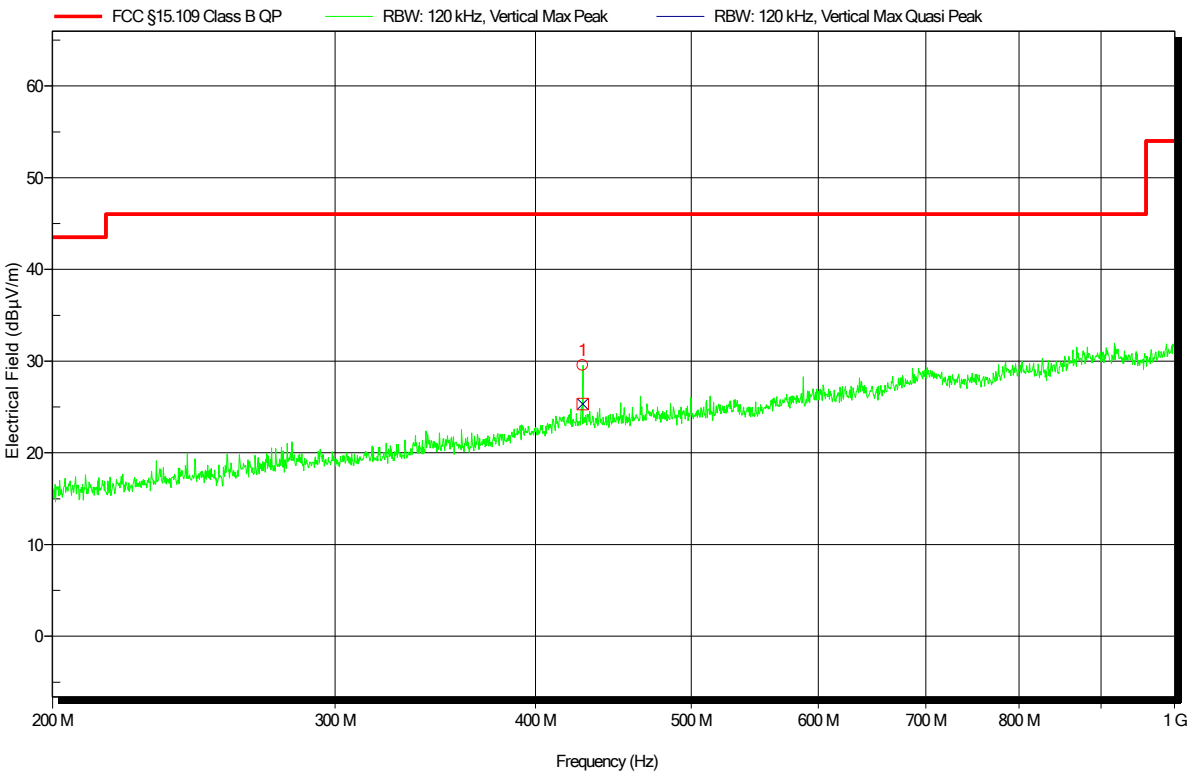

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	428.012 MHz	25.3 dBµV/m	46 dBµV/m	-20.7 dB	Pass	0 Degree	1 m

Radiated emissions according to FCC 15B

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	HL 223, Horizontal
Measurement distance:	10 m converted to 3 m
Mode:	Mode2 Configuration 1
Test Date:	2019-10-02
Note:	Band 4; Table 110°; Antenna 135 cm

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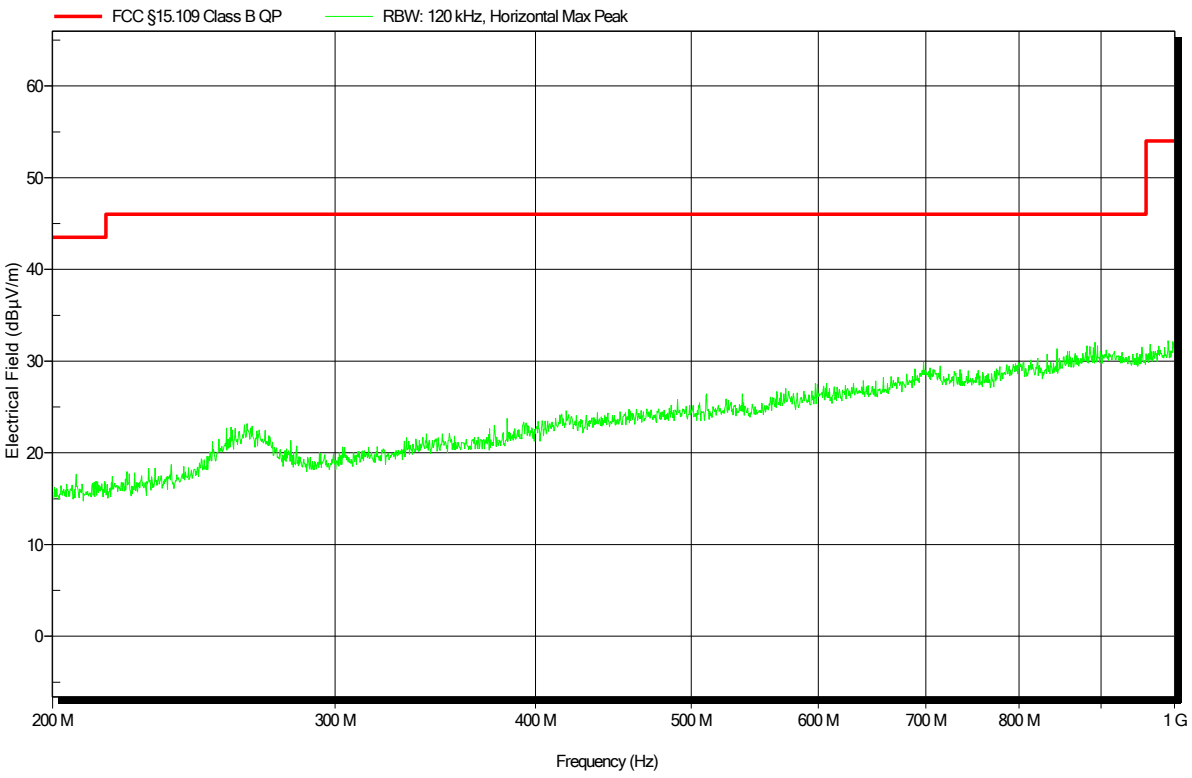

Radiated emissions according to FCC 15B

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	HK 116, Vertical
Measurement distance:	10 m converted to 3 m
Mode:	Mode2 Configuration 2
Test Date:	2019-10-02
Note:	Band 4; Table -120°; Antenna 100 cm

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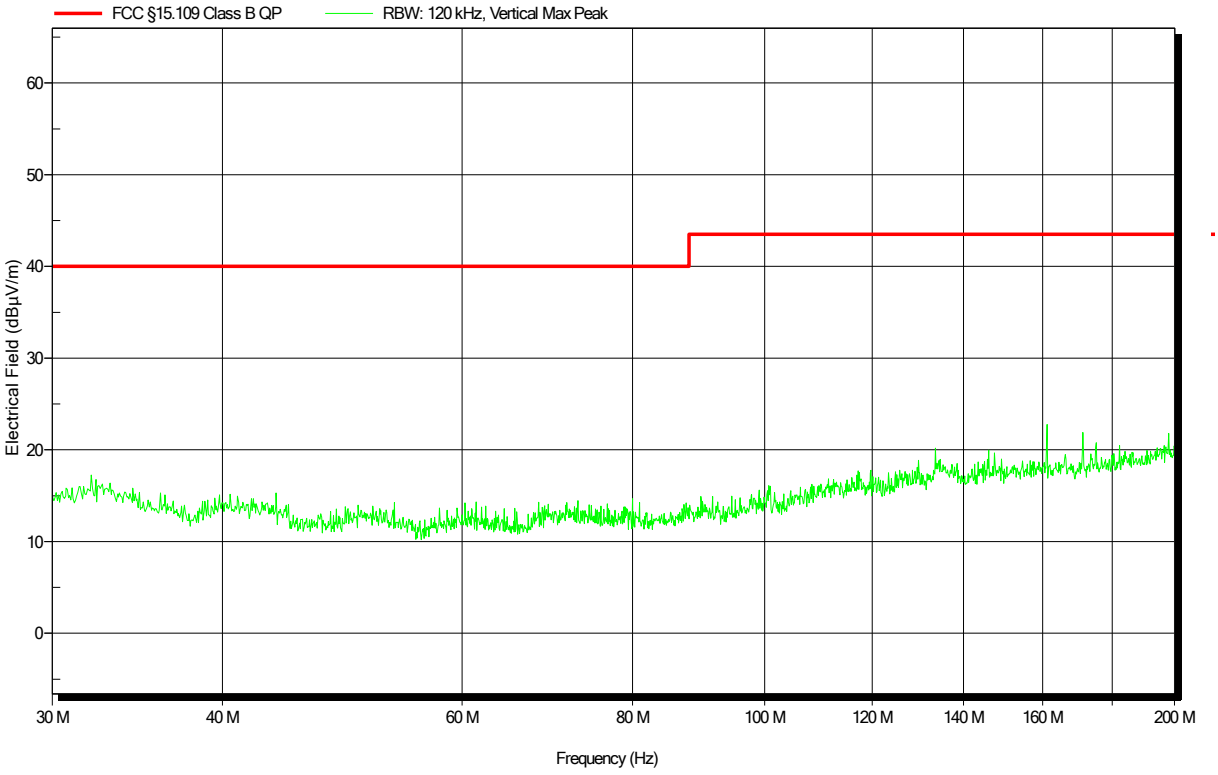

Radiated emissions according to FCC 15B

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	HK 116, Horizontal
Measurement distance:	10 m converted to 3 m
Mode:	Mode2 Configuration 2
Test Date:	2019-10-02
Note:	Band 4; Table 0°; Antenna 400 cm

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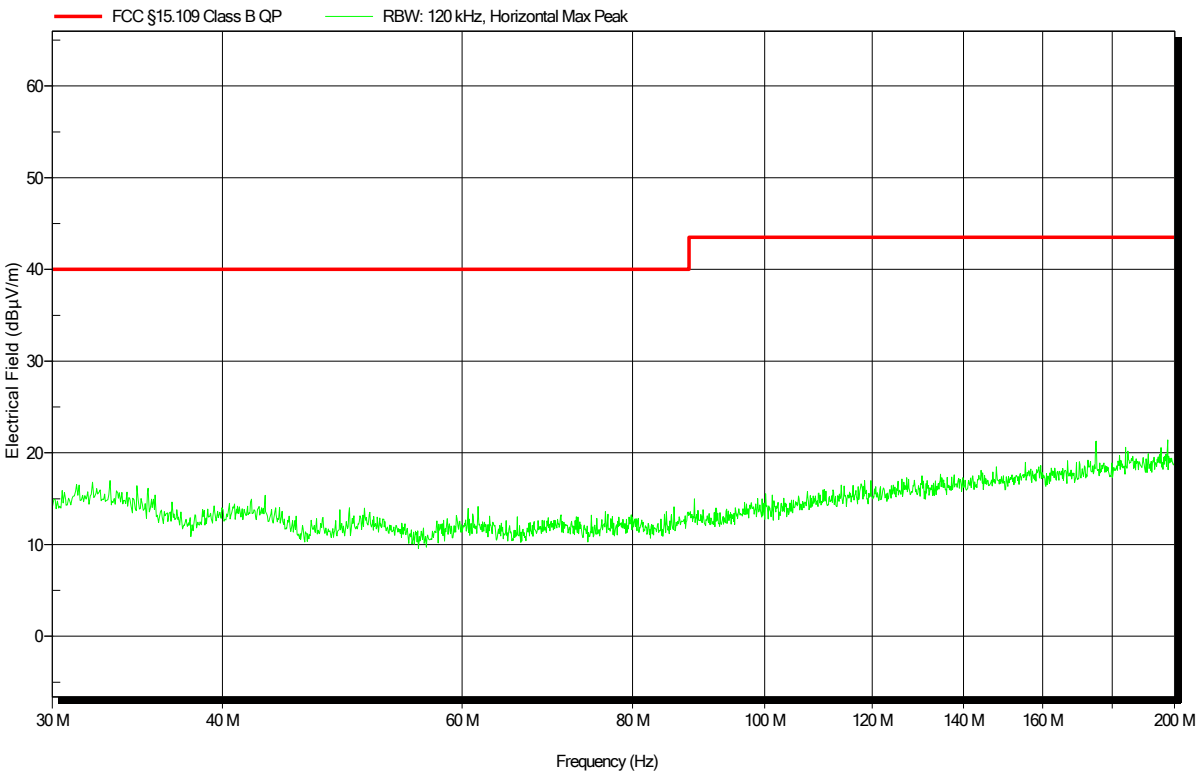

Radiated emissions according to FCC 15B

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	HL 223, Vertical
Measurement distance:	10 m converted to 3 m
Mode:	Mode2 Configuration 2
Test Date:	2019-10-02
Note:	Band 4

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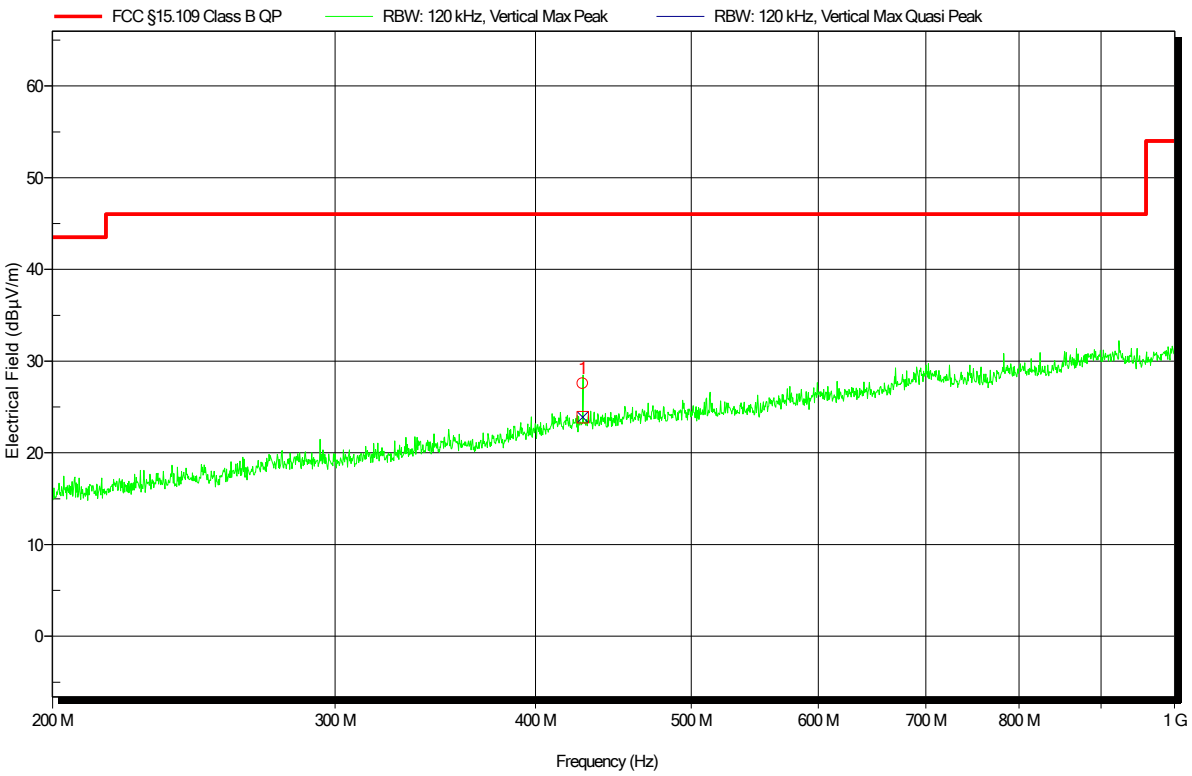

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	427.994 MHz	23.9 dBµV/m	46 dBµV/m	-22.1 dB	Pass	0 Degree	1 m

Radiated emissions according to FCC 15B

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	HL 223, Horizontal
Measurement distance:	10 m converted to 3 m
Mode:	Mode2 Configuration 2
Test Date:	2019-10-02
Note:	Band 4

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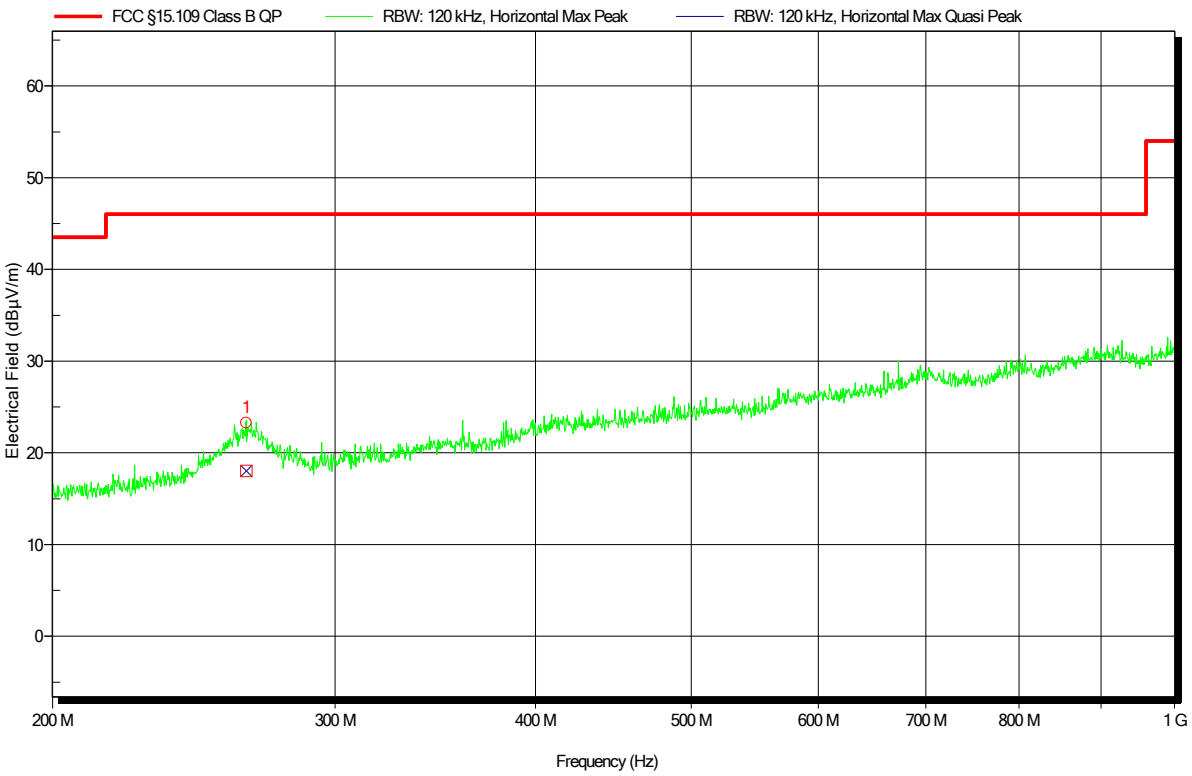

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	264.2 MHz	18 dBµV/m	46 dBµV/m	-28.0 dB	Pass	110 Degree	1.35 m

Radiated emissions according to FCC 15B

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	ETS-Lindgren 3117, Vertical
Measurement distance:	3 m
Mode:	Mode 1 Configuration 2
Test Date:	2019-10-01
Note:	Table -105°; Antenna 115 cm

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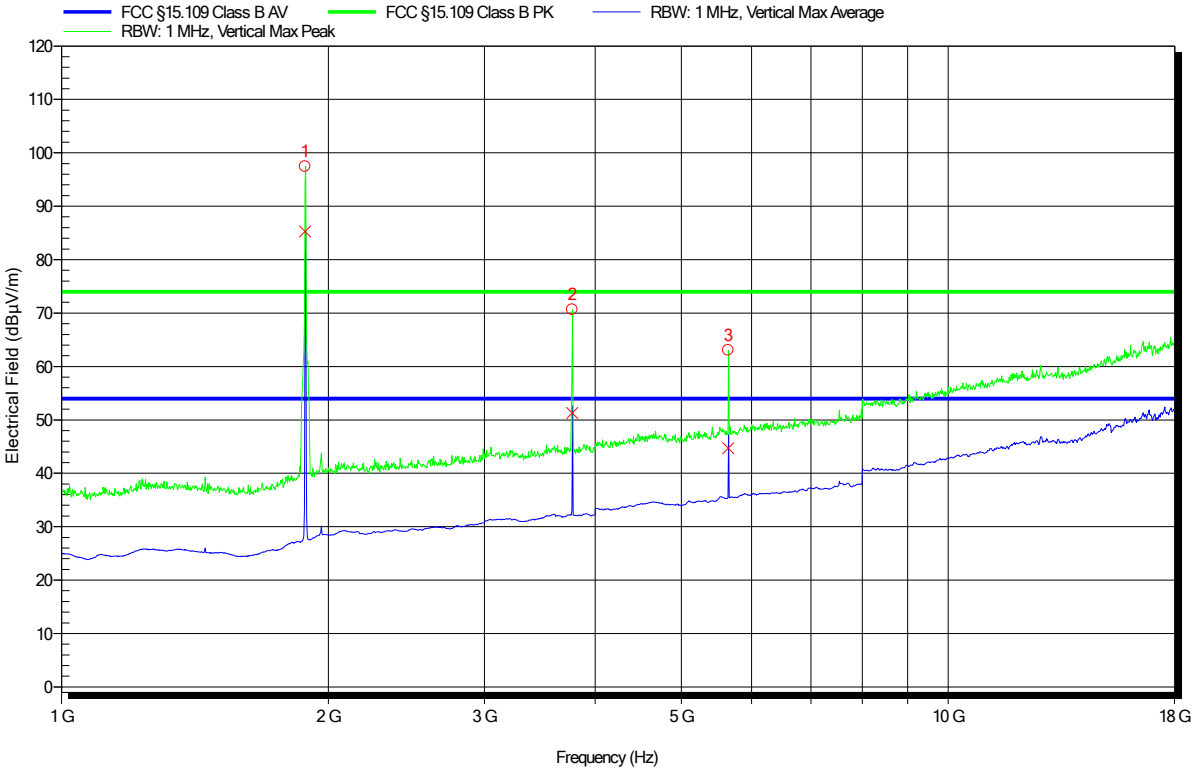

Peak Number	Frequency	
1	1.883 GHz	Carrier
2	3.766 GHz	2. Harmonic
3	5.648 GHz	3. Harmonic

Radiated emissions according to FCC 15B

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	ETS-Lindgren 3117, Horizontal
Measurement distance:	3 m
Mode:	Mode 1 Configuration 2
Test Date:	2019-10-01
Note:	Table -80°; Antenna 100 cm

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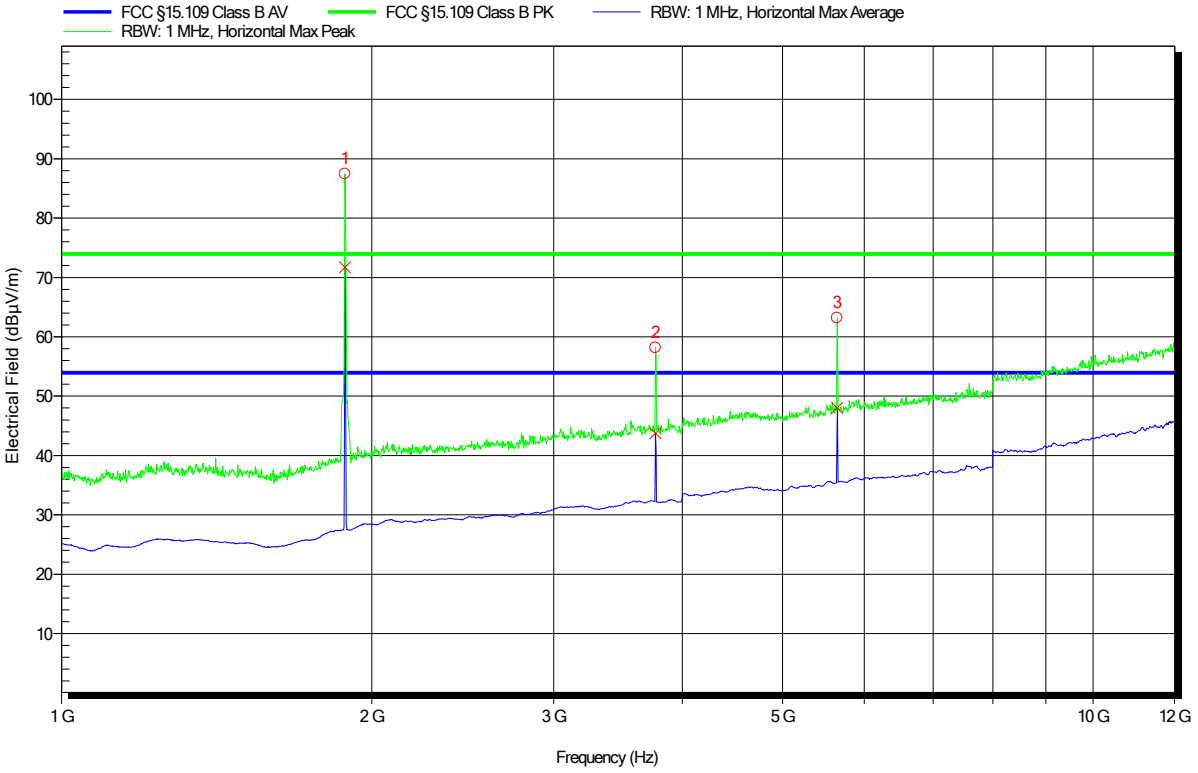

Peak Number	Frequency	
1	1.883 GHz	Carrier
2	3.766 GHz	2. Harmonic
3	5.648 GHz	3. Harmonic

Radiated emissions according to FCC 15B

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	ETS-Lindgren 3117, Vertical
Measurement distance:	3 m
Mode:	Mode 1 Configuration 1
Test Date:	2019-10-01
Note:	Table -105°; Antenna 115

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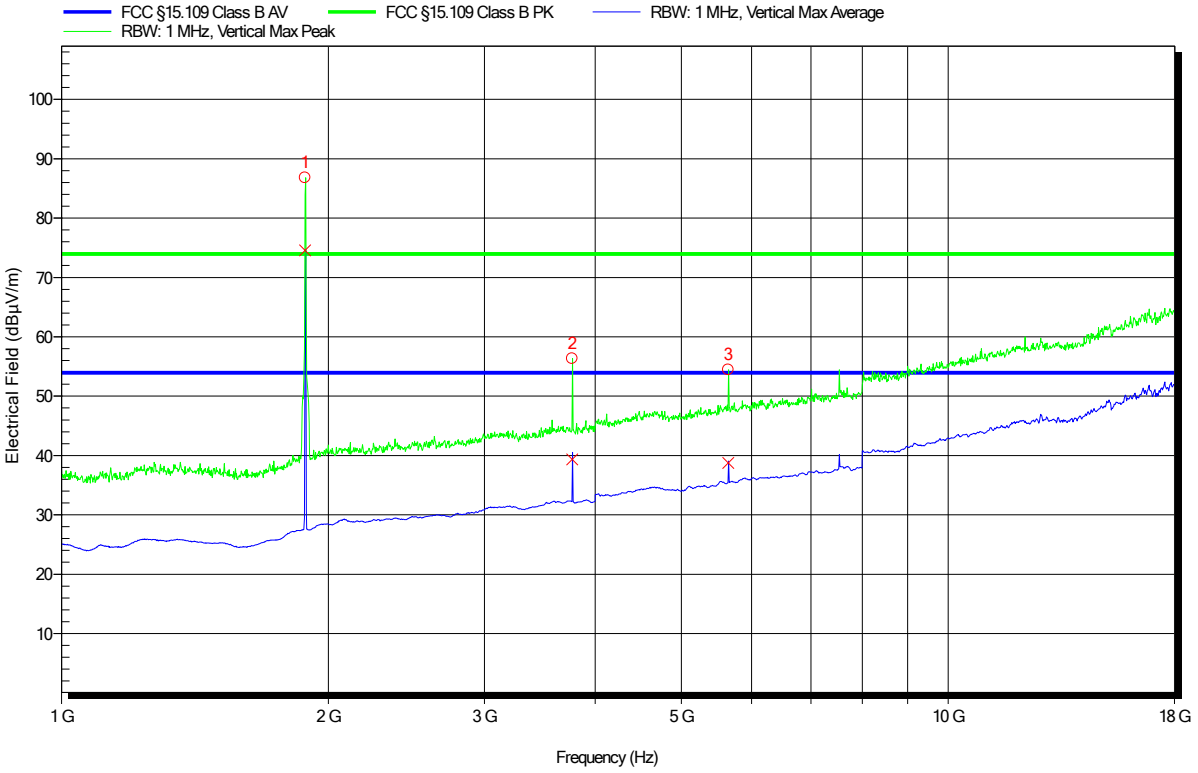

Peak Number	Frequency	
1	1.883 GHz	Carrier
2	3.766 GHz	2. Harmonic
3	5.648 GHz	3. Harmonic

Radiated emissions according to FCC 15B

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	ETS-Lindgren 3117, Horizontal
Measurement distance:	3 m
Mode:	Mode 1 Configuration 1
Test Date:	2019-10-01
Note:	Table -80°; Antenna 100 cm

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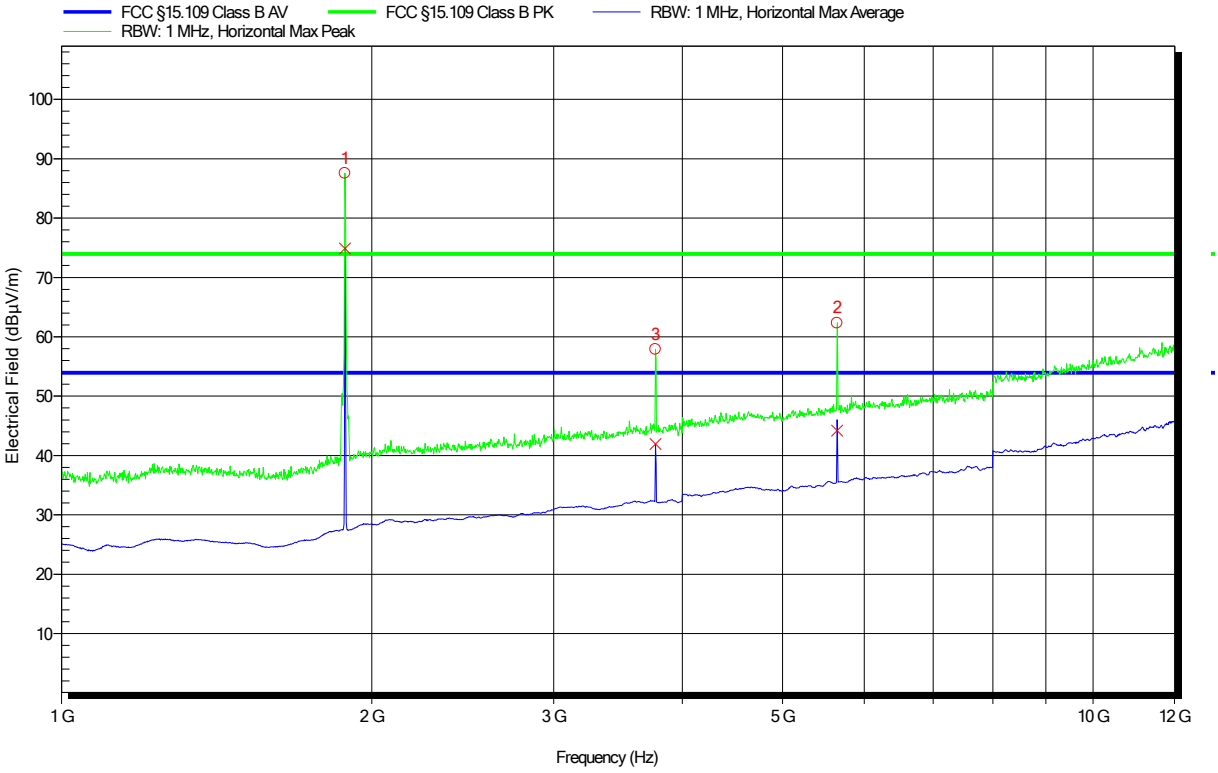

Peak Number	Frequency	
1	1.883 GHz	Carrier
2	5.648 GHz	2. Harmonic
3	3.766 GHz	3. Harmonic

Radiated emissions according to FCC 15B

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	ETS-Lindgren 3117, Vertical
Measurement distance:	3 m
Mode:	Mode 2 Configuration 2
Test Date:	2019-10-01
Note:	Band4; Table -105°; Antenna 115 cm

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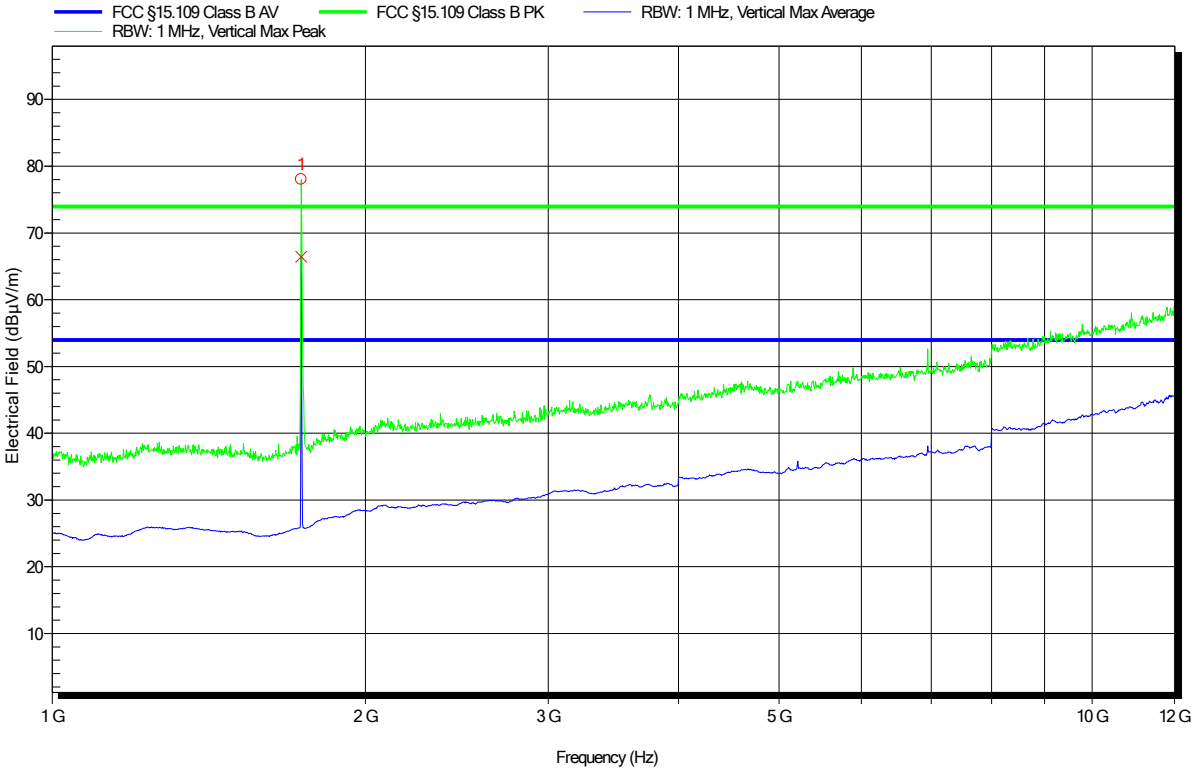

Peak Number	Frequency	
1	1.736 GHz	Carrier

Radiated emissions according to FCC 15B

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	ETS-Lindgren 3117, Horizontal
Measurement distance:	3 m
Mode:	Mode 2 Configuration 2
Test Date:	2019-10-01
Note:	Band4; Table -80°; Antenna 100 cm

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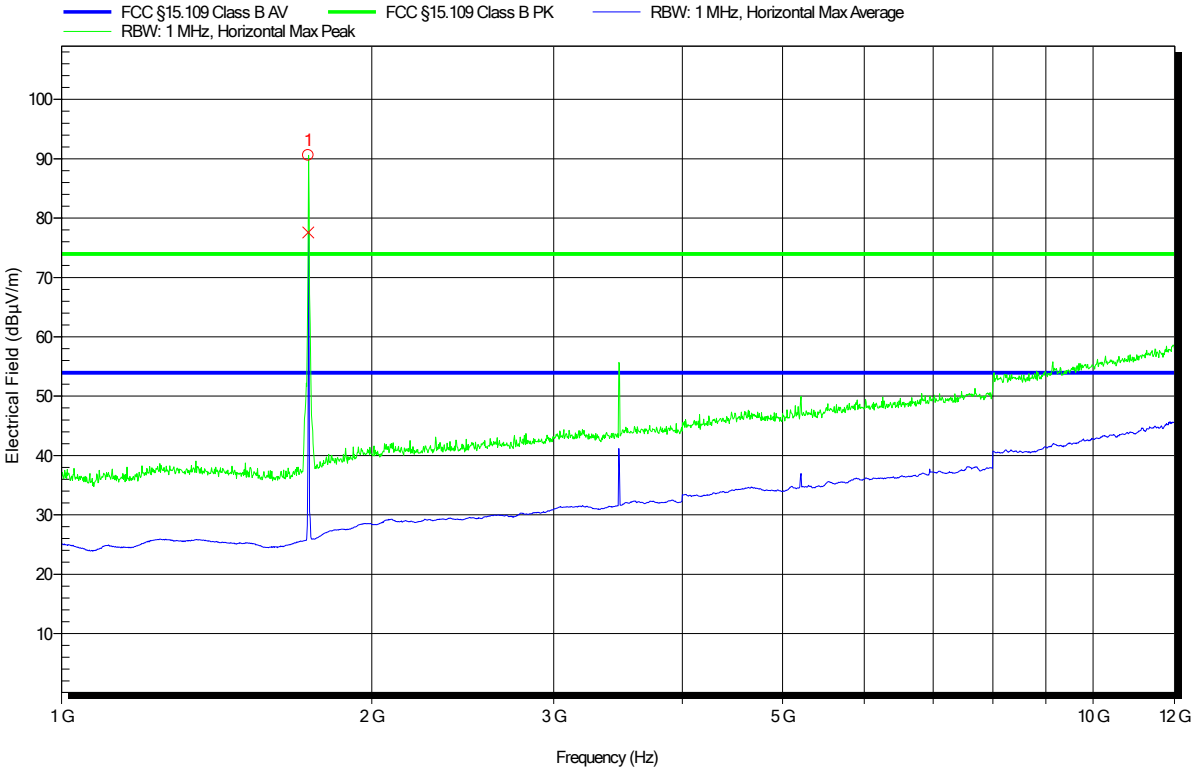

Peak Number	Frequency	
1	1.736 GHz	Carrier

Radiated emissions according to FCC 15B

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	ETS-Lindgren 3117, Vertical
Measurement distance:	3 m
Mode:	Mode 2 Configuration 1
Test Date:	2019-10-01
Note:	Band 4; Table -105°; Antenna 115 cm

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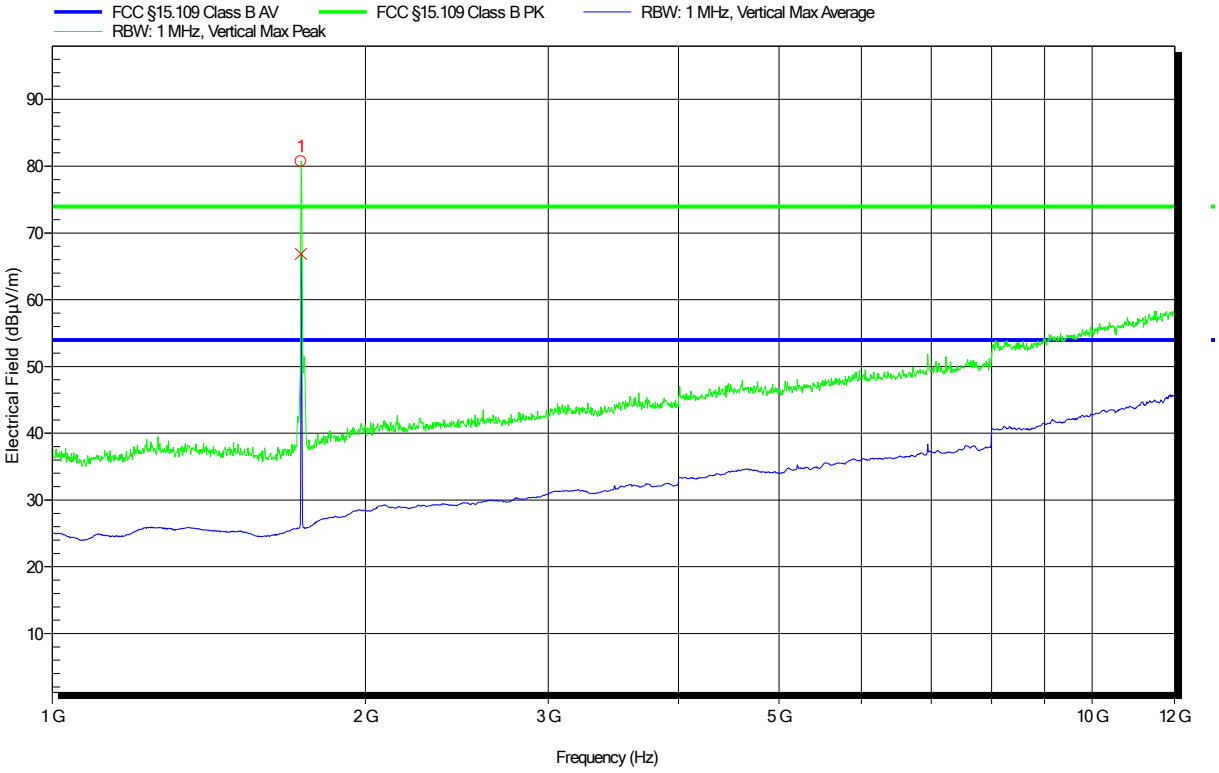

Peak Number	Frequency	
1	1.735 GHz	Carrier

Radiated emissions according to FCC 15B

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Belz
Test Conditions:	Tnom: 22°C, Unom: 120 V 60 Hz
Antenna:	ETS-Lindgren 3117, Horizontal
Measurement distance:	3 m
Mode:	Mode2 Configuration 1
Test Date:	2019-10-01
Note:	Band4; Table -80°; Antenna 100 cm

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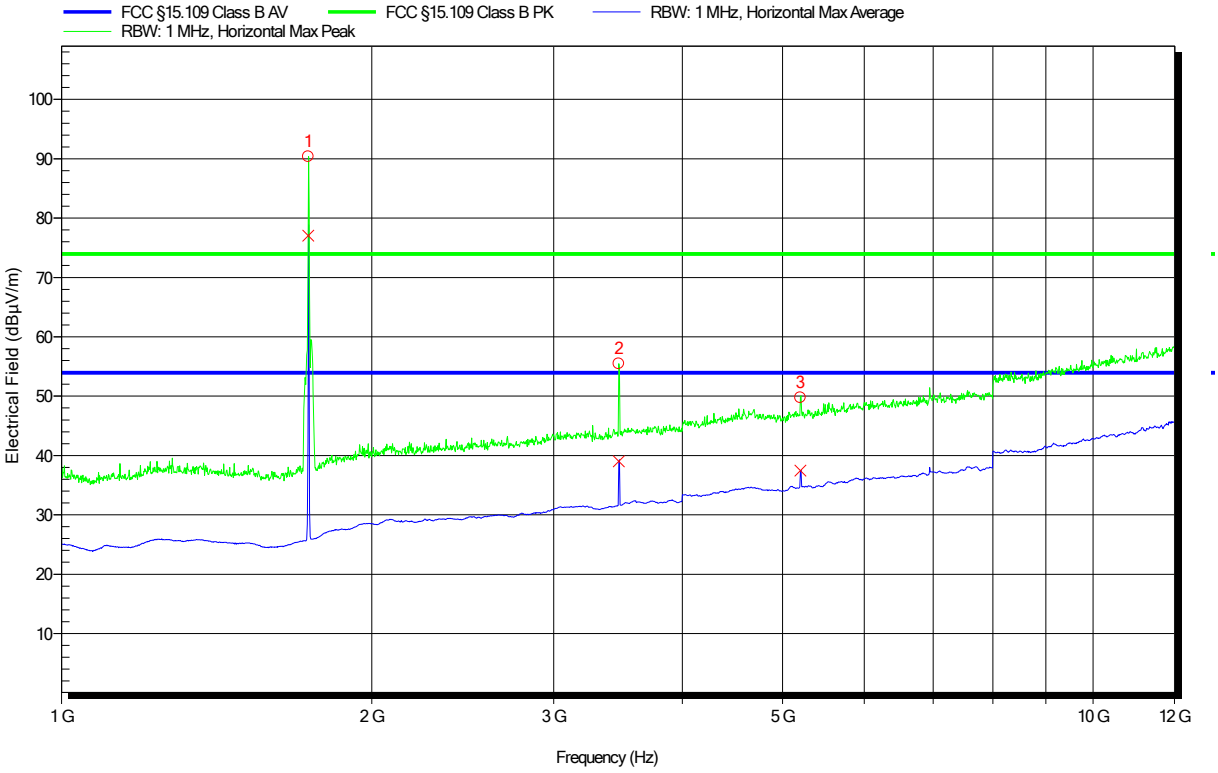


Peak Number	Frequency	
1	1.736 GHz	Carrier
2	3.471 GHz	2. Harmonic
3	5.206 GHz	3. Harmonic

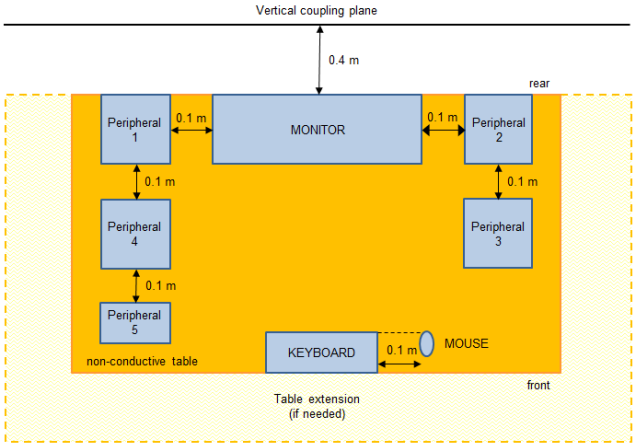
2.2 Test Conditions and Results - Conducted emissions acc. to ANSI C63.4

2.2.1 Information

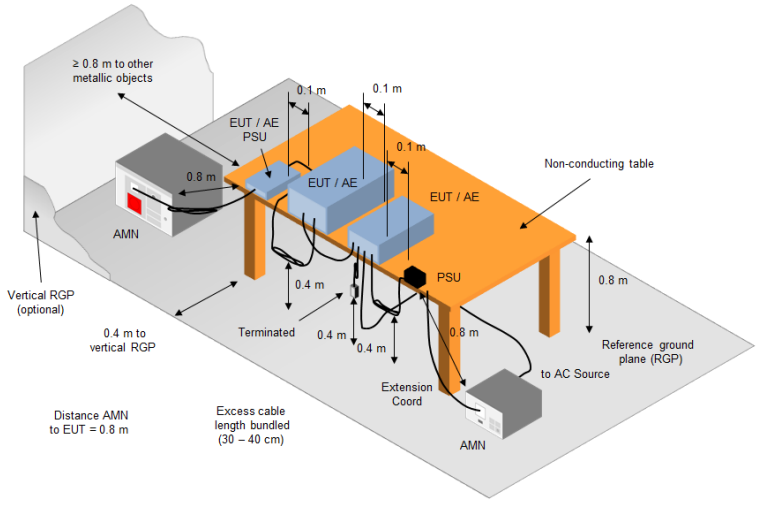
Test Information	
Reference	FCC 15.107, ICES-003, 8, 6.2
Reference method	ANSI C63.4:2014 Section 12
Measurement range	150 kHz to 30 MHz
Equipment class	Class B
Equipment type	Table top
Temperature [°C]	20
Humidity [%]	35
Operator	Manuel Engel
Date	2019-09-20

2.2.2 Setup

Equipment placement



Test Setup



2.2.3 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	Radimation	2016.1.10

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
AMN	Schwarzbeck	NSLK 8128	EF00975	2019-07	2021-07
Pulse Limiter	R&S	ESH3-Z2	EF01063	2019-07	2020-07
EMI Test Receiver	R&S	ESU26	EF00887	2019-07	2020-07
3-phase Electronic Voltage Source	EM Test GmbH (Switzerland)	NetWave 30-400	EF01514	2019-01	2020-01

2.2.4 Procedure

Exploratory measurement
1. The EUT was placed on a non conductive table 0.8 m above the reference ground plane and 0.4 m away from the vertical conducting plane (ANSI C63.4: 2014 item 7.3.1)
2. The power cord that is normally supplied or recommended by the manufacturer was connected to the LISN.
3. The distance between the outer edge of the EUT and the LISN shall be set to 0.8 m. A longer power cord shall be bundled to this length (bundling shall not exceed 40 cm in length).
4. The LISN measurement port was connected to a measurement receiver
5. I/O cables were bundled not longer than 0.4 m
6. Measurement was performed in the frequency range 0.15 – 30MHz on each current-carrying conductor
7. To maximize the emissions the cable positions were manipulated
8. The worst configuration of EUT and cables is shown on a test setup picture at item 1.3

Final measurement
1. The EUT was placed on a non conductive table 0.8 m above the reference ground plane and 0.4 m away from the vertical conducting plane (ANSI C63.4: 2014 item 7.3.1)
2. The power cord that is normally supplied or recommended by the manufacturer was connected to the LISN.
3. The distance between the outer edge of the EUT and the LISN shall be set to 0.8 m. A longer power cord shall be bundled to this length (bundling shall not exceed 40 cm in length).
4. The LISN measurement port was connected to a measurement receiver
5. The EUT and cable arrangement were based on the exploratory measurement results
6. The test data of the worst-case conditions were recorded and shown on the next pages

2.2.5 Limits

Class B		
Frequency [MHz]	Quasi-peak Limit [dBµV]	Average Limit [dBµV]
0.15 - 0.5	66 - 56 *	56 - 46 *
0.5 - 5	56	46
5 - 30	60	50
* Decreases with the logarithm of the frequency		

2.2.6 Results

AC power line conducted emissions					
Port	Coupling	Operational mode	EUT Configuration	Verdict	Remark
Power	AMN	1, 2	1	PASS	
Note: After short check on spectrum analyzer, selection of worst case for operational mode 2 is band 4					

2.2.7 Setup Photos

Setup conducted emission

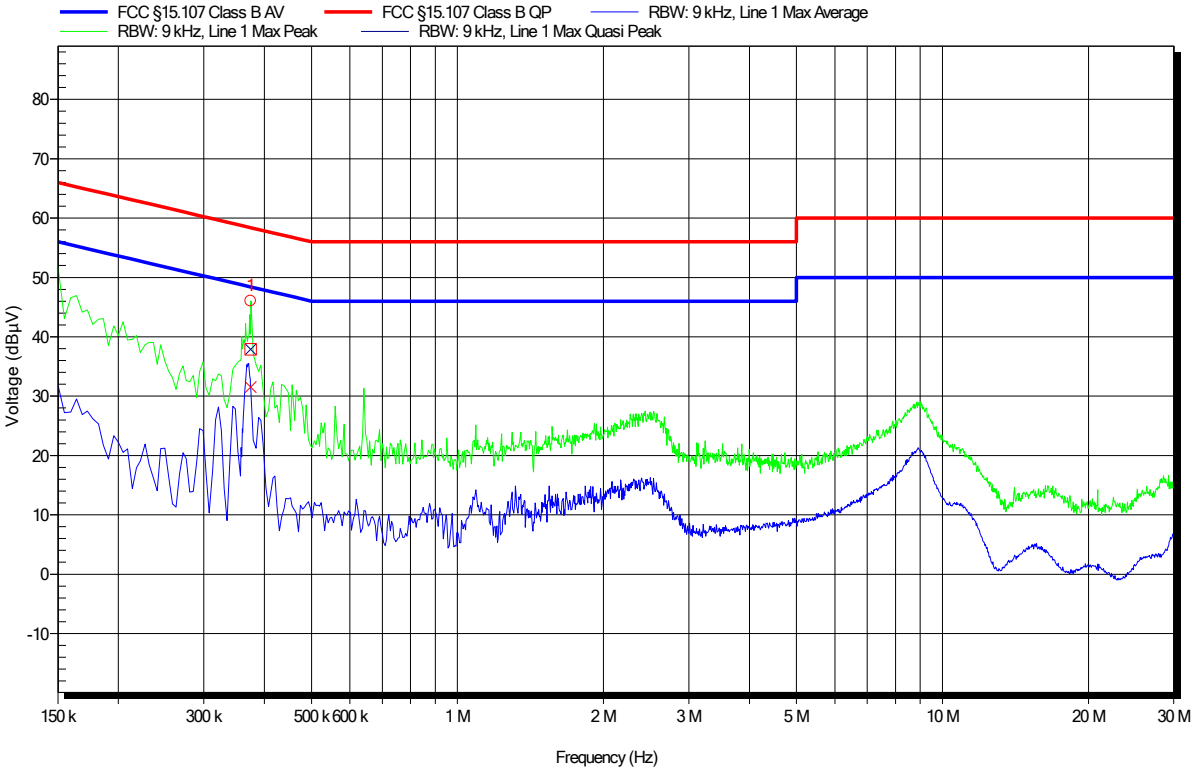
2.2.8 Records

Conducted emissions according to FCC 15B, ICES-003

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Engel
Test Conditions:	Tnom: 20°C, Unom: 120 V 60 Hz
LISN:	Schwarzbeck NSLK 8128 (L)
Mode:	Mode 1 configuration 1
Test Date:	2019-09-20
Note:	

Index 4



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	374.55 kHz	37.9 dBµV	58.4 dBµV	-20.5 dB	Pass

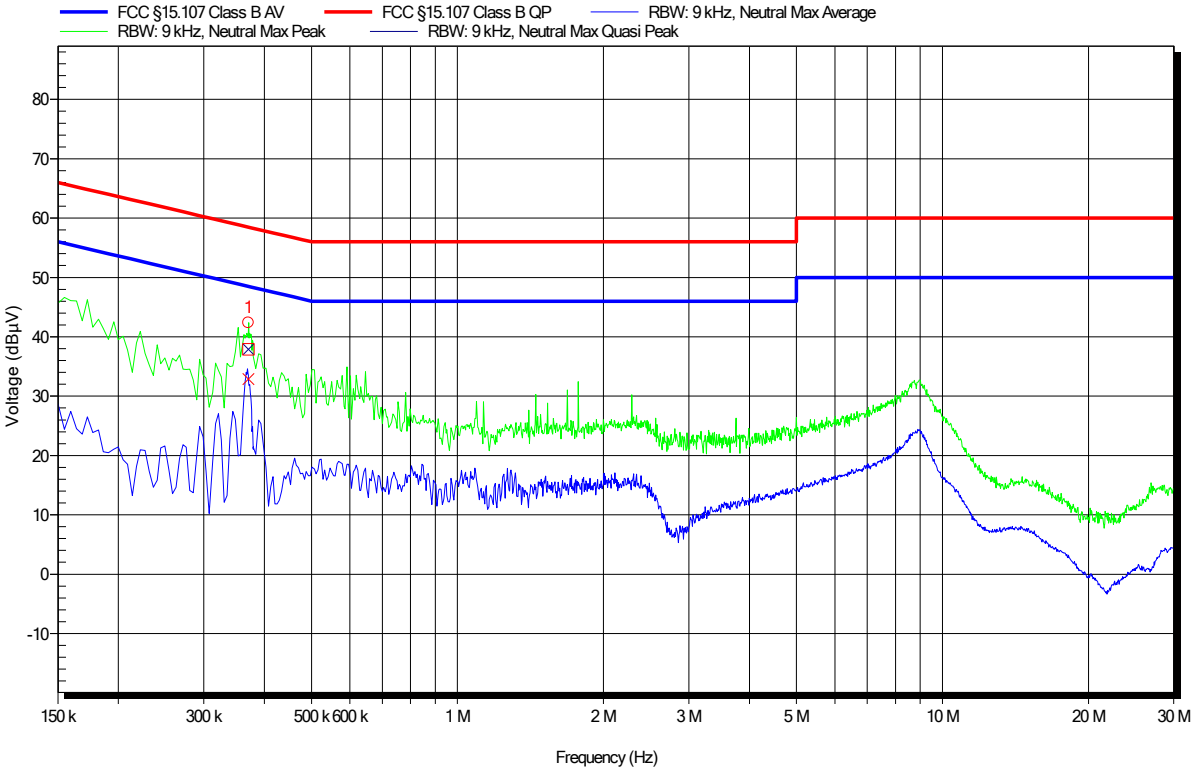
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	374.55 kHz	31.5 dBµV	48.4 dBµV	-16.9 dB	Pass

Conducted emissions according to FCC 15B, ICES-003

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Engel
Test Conditions:	Tnom: 20°C, Unom: 120 V 60 Hz
LISN:	Schwarzbeck NSLK 8128 (N)
Mode:	Mode 1 configuration 1
Test Date:	2019-09-20
Note:	

Index 3



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	370.95 kHz	37.9 dBµV	58.5 dBµV	-20.6 dB	Pass

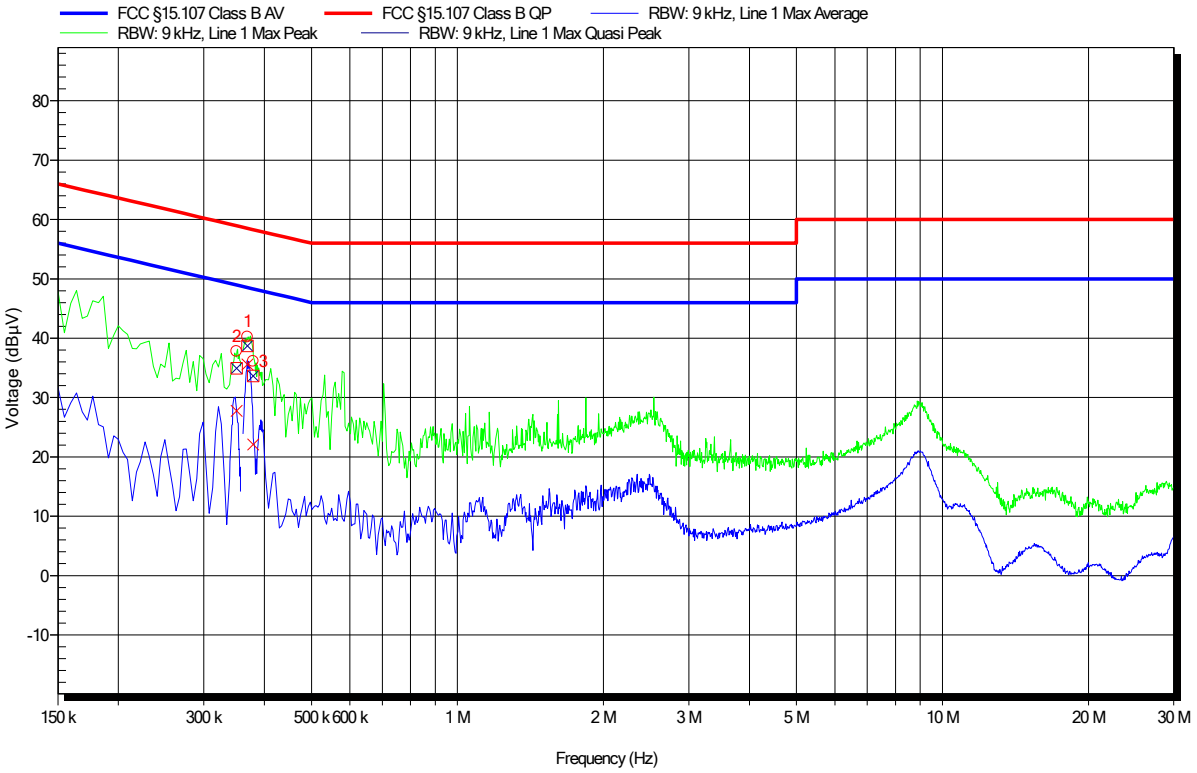
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	370.95 kHz	32.9 dBµV	48.5 dBµV	-15.6 dB	Pass

Conducted emissions according to FCC 15B, ICES-003

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Engel
Test Conditions:	Tnom: 20°C, Unom: 120 V 60 Hz
LISN:	Schwarzbeck NSLK 8128 (L)
Mode:	Mode 2 configuration 1
Test Date:	2019-09-20
Note:	Worst Band 4

Index 1



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	369.15 kHz	38.7 dBµV	58.5 dBµV	-19.8 dB	Pass
2	350.25 kHz	34.9 dBµV	59 dBµV	-24.0 dB	Pass
3	379.5 kHz	33.6 dBµV	58.3 dBµV	-24.7 dB	Pass

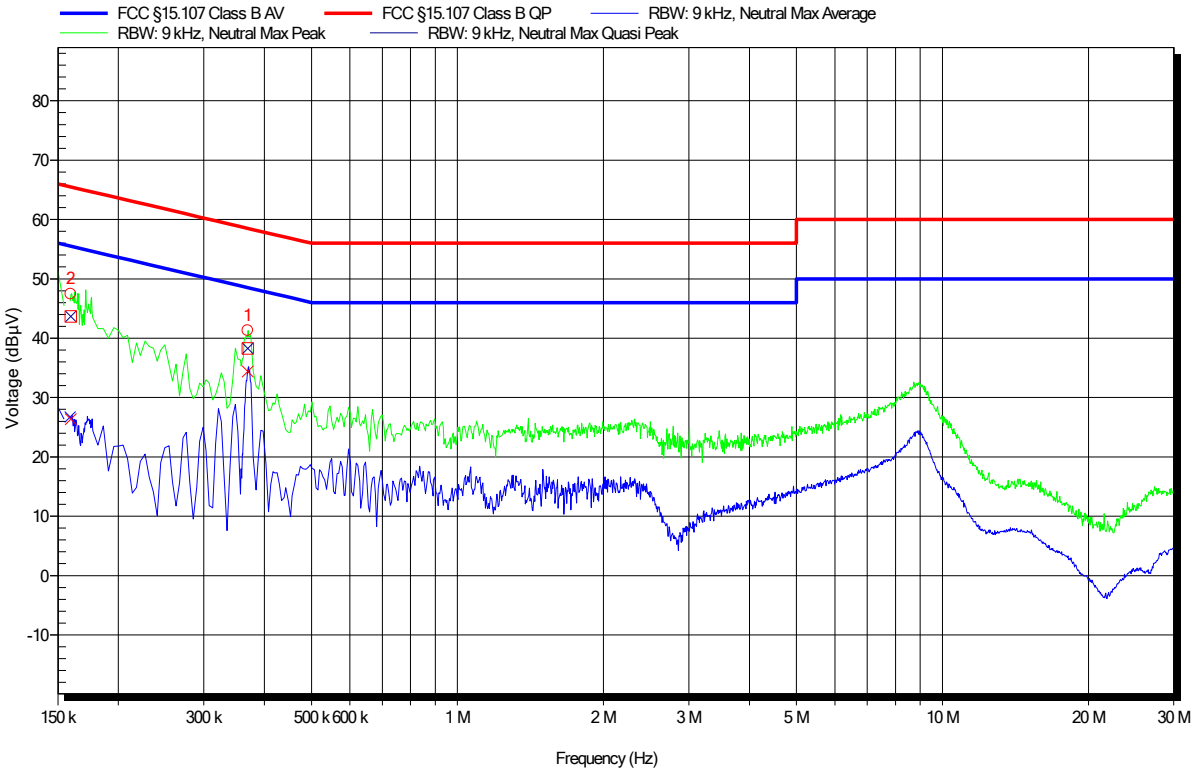
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	369.15 kHz	35.6 dBµV	48.5 dBµV	-13.0 dB	Pass
2	350.25 kHz	27.8 dBµV	49 dBµV	-21.2 dB	Pass
3	379.5 kHz	22.1 dBµV	48.3 dBµV	-26.2 dB	Pass

Conducted emissions according to FCC 15B, ICES-003

Project number: G0M-1908-8377

Applicant:	BIOTRONIK SE & Co. KG
EUT Name:	CardioMessenger Smart / Telemonitoring System
Model:	CardioMessenger Smart 4G
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Engel
Test Conditions:	Tnom: 20°C, Unom: 120 V 60 Hz
LISN:	Schwarzbeck NSLK 8128 (N)
Mode:	Mode 2 configuration 1
Test Date:	2019-09-20
Note:	Worst Band 4

Index 2



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	369.6 kHz	38.3 dBµV	58.5 dBµV	-20.2 dB	Pass
2	159.45 kHz	43.6 dBµV	65.5 dBµV	-21.8 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	369.6 kHz	34.4 dBµV	48.5 dBµV	-14.1 dB	Pass
2	159.45 kHz	26.4 dBµV	55.5 dBµV	-29.1 dB	Pass