EMC TEST REPORT

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

Report Reference No	G0M-1908-8420-EF0115B-V01
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-2 DAkkS - Registration number : D-PL-12092-01-04 (FCC) FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant	W.O.M. WORLD OF MEDICINE GmbH
Address	Salzufer 8 10587 Berlin GERMANY
Test Specification Standard	47 CFR Part 15 Subpart B ISED ICES-003 Issue 6 ANSI C63.4:2014
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	Pump for Arthroscopy
Model(s)	A127
Additional Model(s)	None
Brand Name(s)	Pump for Arthroscopy
Hardware Version(s)	09/2019
Software Version(s)	A127_009_A_02.02
FCC-ID	2AS5K-TSHW42
IC	25004-TSHW42A
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	2019-10-14	
Report:		
Compiled by	Stephan Liebich	
Tested by (+ signature) (Responsible for Test)	Stephan Liebich Matthias Handrik	.....
Approved by (+ signature) (Head of Lab)	Christian Weber	.....
Date of Issue	2019-12-19	
Total number of pages	31	
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:		
None		

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	2019-12-19	Initial Release	

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1 Equipment (Test Item) Under Test

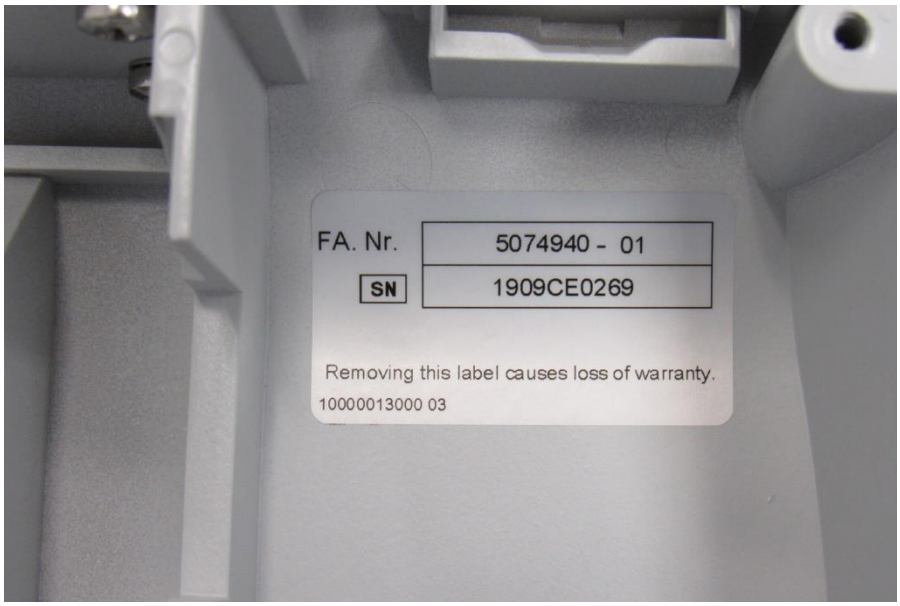
Description	Pump for Arthroscopy	
Model	A127	
Additional Model(s)	None	
Brand Name(s)	Pump for Arthroscopy	
Serial Number(s)	1909CE0269	
Hardware Version(s)	09/2019	
Software Version(s)	A127_009_A_02.02	
FCC-ID	2AS5K-TSHW42	
IC	25004-TSHW42A	
Class	Class B	
Equipment type	Table top	
Highest internal frequency [MHz]	16	
Radio Module	Type	RFID
	Model	TS-HW42
	Manufacturer	GiS GmbH
	FCC-ID	2AS5K-TSHW42
	IC	25004-TSHW42A
Supply Voltage	V_{NOM}	120 V / 60 Hz
AC/DC-Adaptor	None	
Manufacturer	W.O.M. WORLD OF MEDICINE GmbH Salzufer 8 10587 Berlin GERMANY	

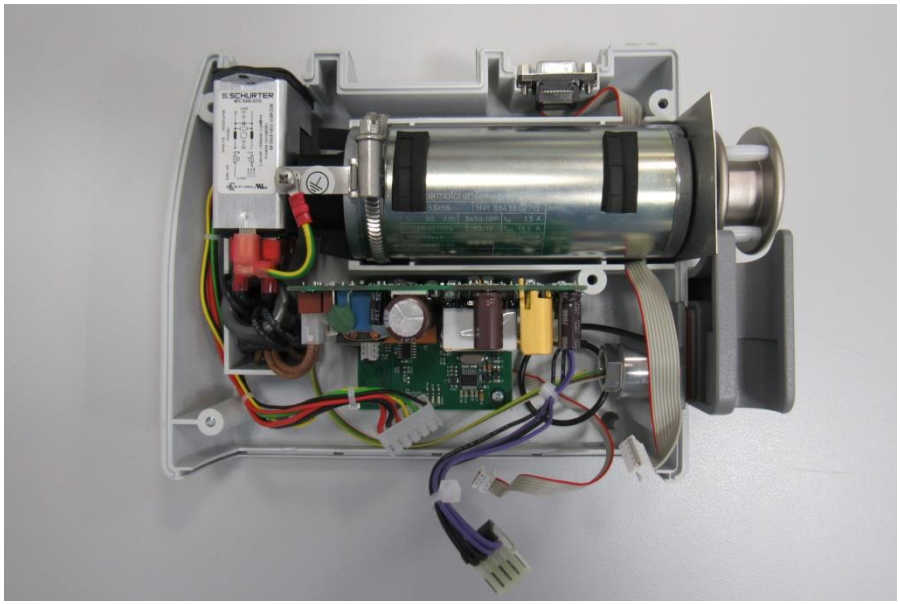
1.1 Equipment Ports

Name	Type	Attributes	Comment
Power	AC	Count: 1 Direction: In Service only: No	-
RS232	IO	Count: 1 Direction: IO Service only: Yes	-

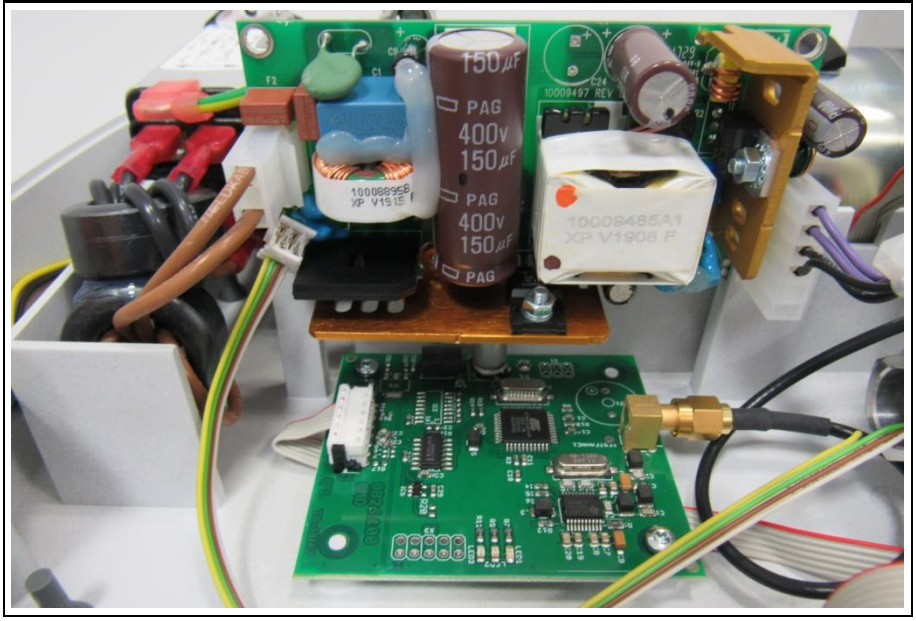
Description:	
AC	AC mains power input/output port
DC	DC power input/output port
BAT	DC power input port connected to external battery
IO	Input/Output port
TP	Telecommunication port
NE	Non-electrical port

1.2 Equipment Photos - Internal

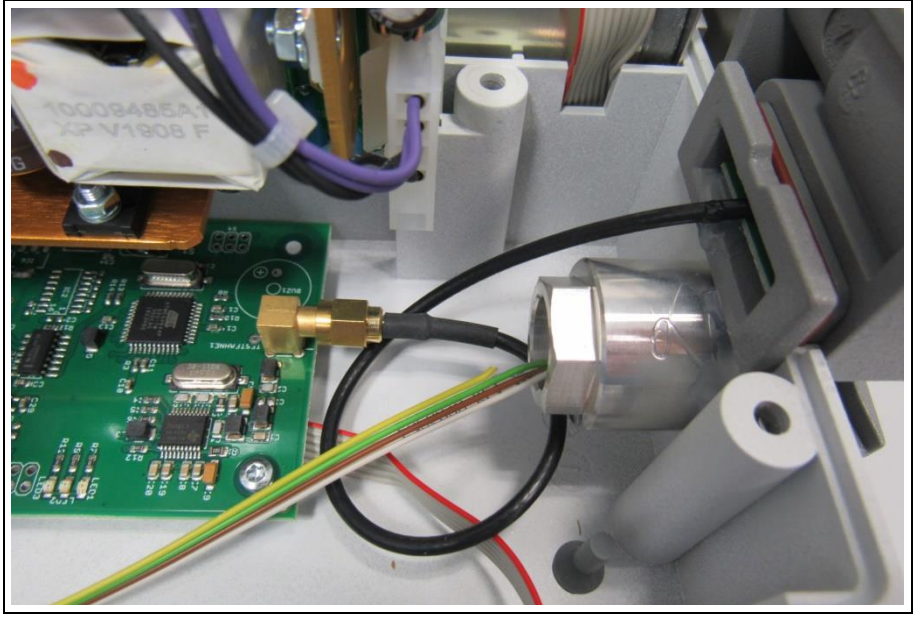
CASE LABEL


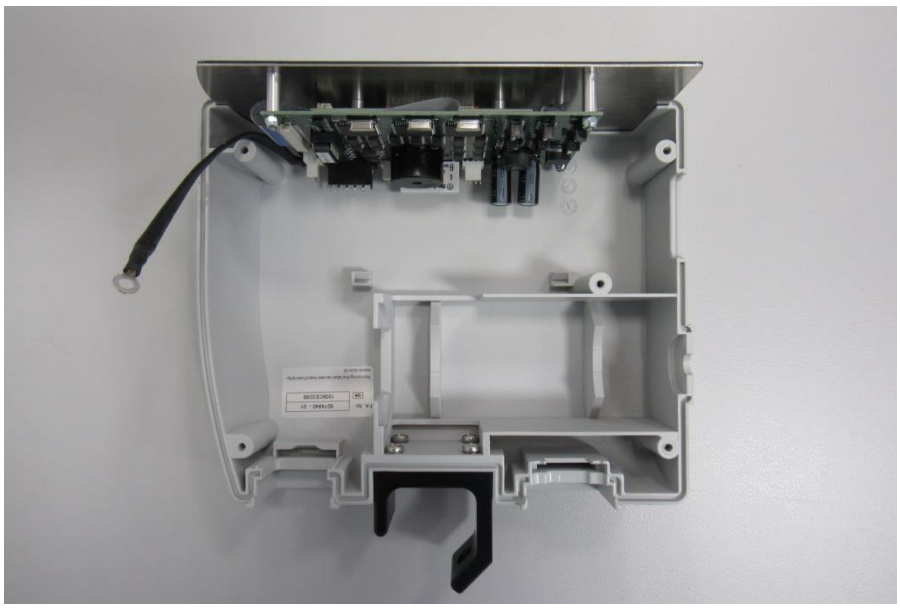
EUT BOTTOM CASE


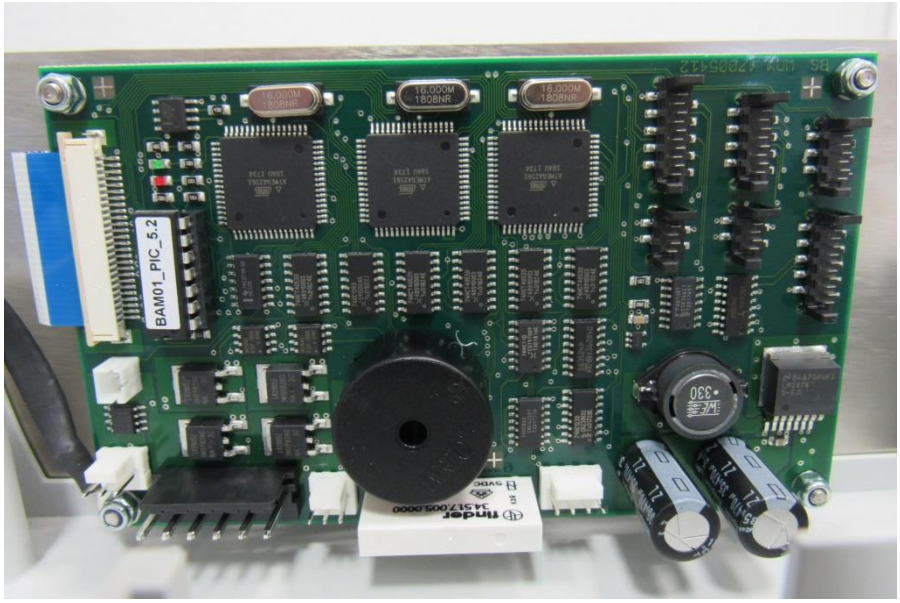
EUT INSIDE 1



EUT INSIDE 2



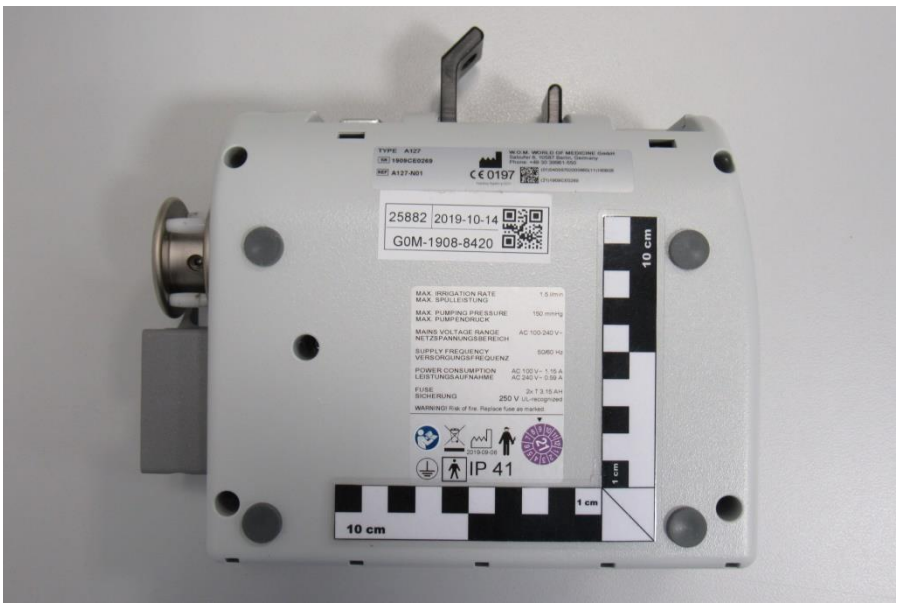
EUT TOP CASE


PCB 1


PCB 2

1.3 Equipment Photos - External

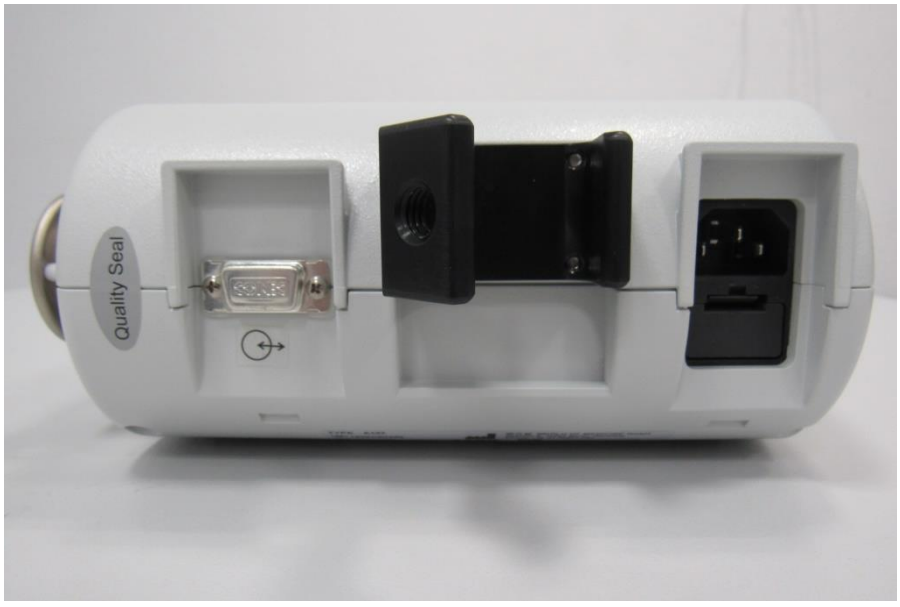
EUT FRONT SIDE

EUT BOTTOM SIDE


EUT LABEL 1

EUT LABEL 2

EUT LEFT SIDE

EUT REAR SIDE


EUT RIGHT SIDE

EUT TOP SIDE

1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
CBL	Power Cable	-	Z-0101-01	2.0 m
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
MON	Monitoring Equipment			
CBL	Connecting Cable			
Comment: --				

1.5 Operational Modes

Mode #	Description
1	RFID Tx (EUT scans permanently after RFID transponder, additional pressure set to 100 mmHg.)
Comment: --	

1.6 EUT Configuration

Configuration #	Description
1	EUT is powered up and powered with 120 V / 60 Hz external power supply. EUT scans permanently the inserted transponder from the Pressure chamber. Pressure set to 100 mmHg.
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 47 CFR 15.109 ISED ICES-003, 8, 6.1	Radiated emissions	ANSI C63.4:2014	PASS	-
FCC 47 CFR 15.107 ISED 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

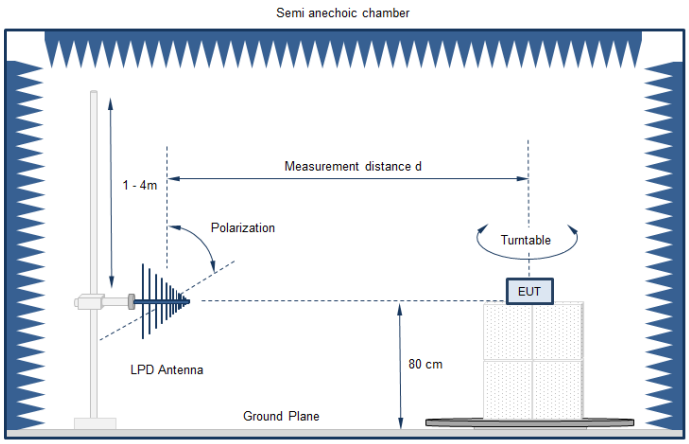
2.1 Test Conditions and Results - Radiated emissions acc. to ANSI C63.4

2.1.1 Information

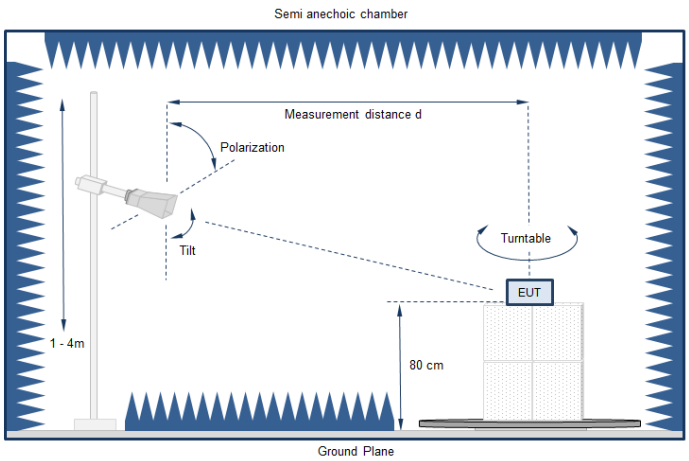
Test Information	
Reference	FCC 47 CFR 15.109, ISED ICES-003, 8, 6.1
Reference method	ANSI C63.4:2014 Section 8
Equipment class	Class B
Equipment type	Table top
Highest internal frequency [MHz]	16
Measurement range	30 MHz to 1 GHz
Temperature [°C]	24
Humidity [%]	43
Operator	Stephan Liebich
Date	2019-11-04

2.1.2 Setup

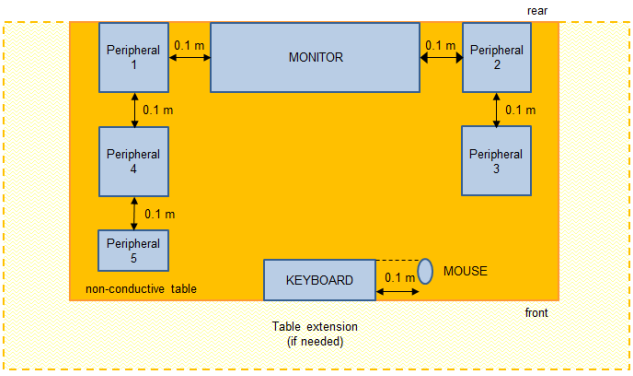
Measurement up to 1 GHz



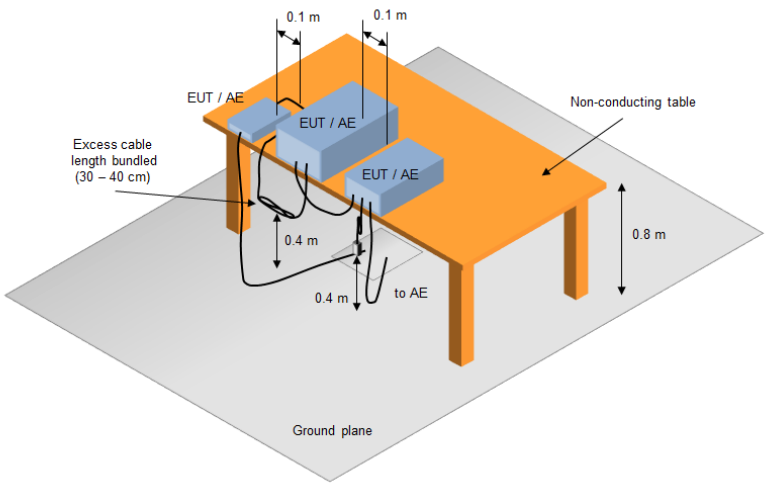
Measurement above 1 GHz



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	AC1	EF00062	2018-07	2021-07
EMI Test Receiver	Keysight	N9038A-526/WXP	EF01070	2019-09	2020-09
Biconical Antenna	R&S	HK 116	EF00030	2019-04	2022-04
LPD Antenna	R&S	HL 223	EF00187	2019-05	2022-05
Climatic Sensor	Embedded Data Systems, LLC.	280010000025417E	EF01054	2019-05	2020-05

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

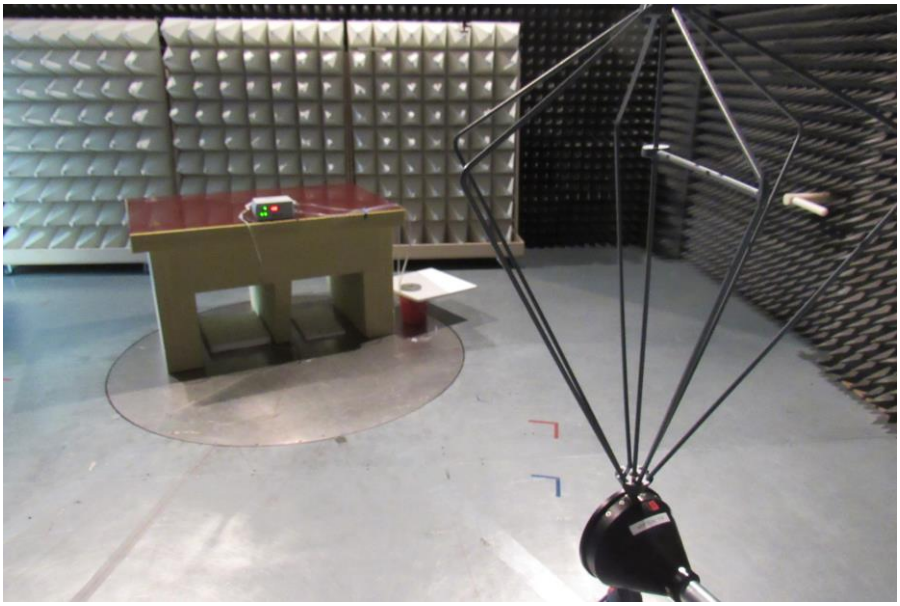
Class B @ 3 m		
Frequency [MHz]	Detector	Limit [dBµV/m]
30 - 88	Quasi-peak	40
88 - 216	Quasi-peak	43.5
216 - 960	Quasi-peak	46
960 - 1000	Quasi-peak	54
> 1000	Peak Average	74 54

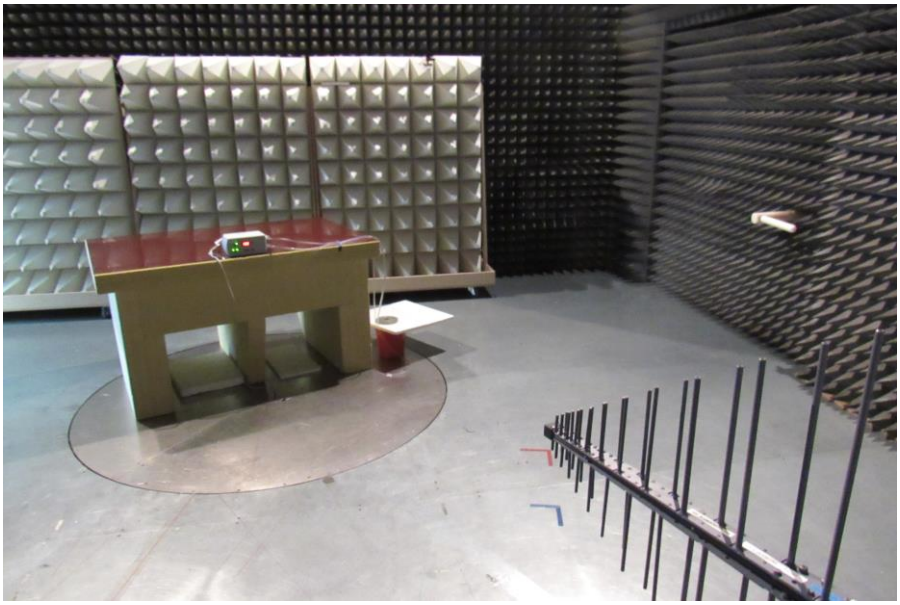
Class A @ 10 m		
Frequency [MHz]	Detector	Limit [dBµV/m]
30 - 88	Quasi-peak	39
88 - 216	Quasi-peak	43.5
216 - 960	Quasi-peak	46.5
960 - 1000	Quasi-peak	49.5
> 1000	Peak Average	69.5 49.5

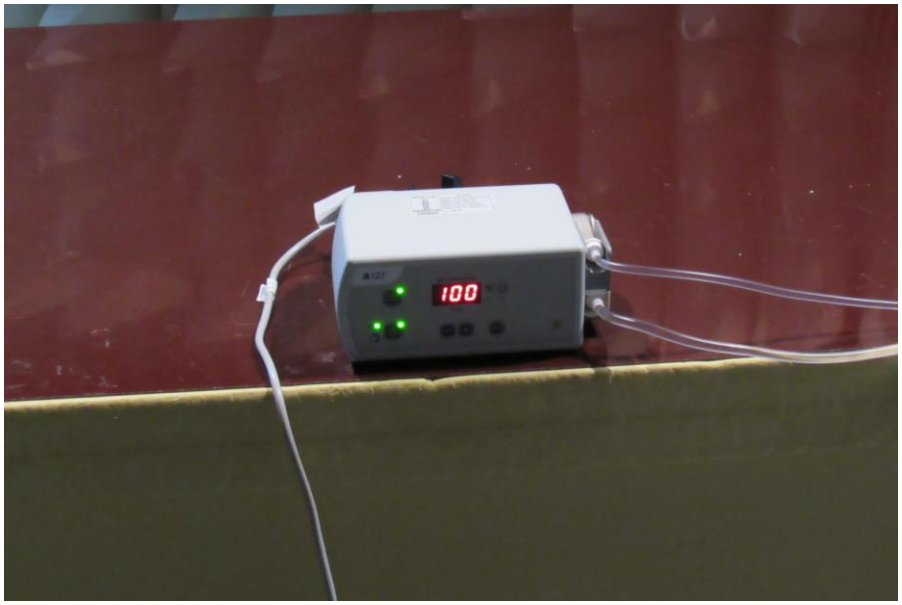
2.1.6 Results

Test Results			
Operational mode	EUT Configuration	Verdict	Remark
1	1	PASS	-

2.1.7 Setup Photos

TEST SETUP 1 RADIATED EMISSION


TEST SETUP 2 RADIATED EMISSION


TEST SETUP FOCUS RADIATED EMISSION


2.1.8 Records

Radiated emissions according to FCC 47 CFR 15.109

Project number: G0M-1908-8420

Applicant:	W.O.M. WORLD OF MEDICINE GmbH
EUT Name:	Pump for Arthroscopy
Model:	A127
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 24°C, Unom: 120 V / 60 Hz
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3m
Mode:	1
Test Date:	2019-11-04
Note:	

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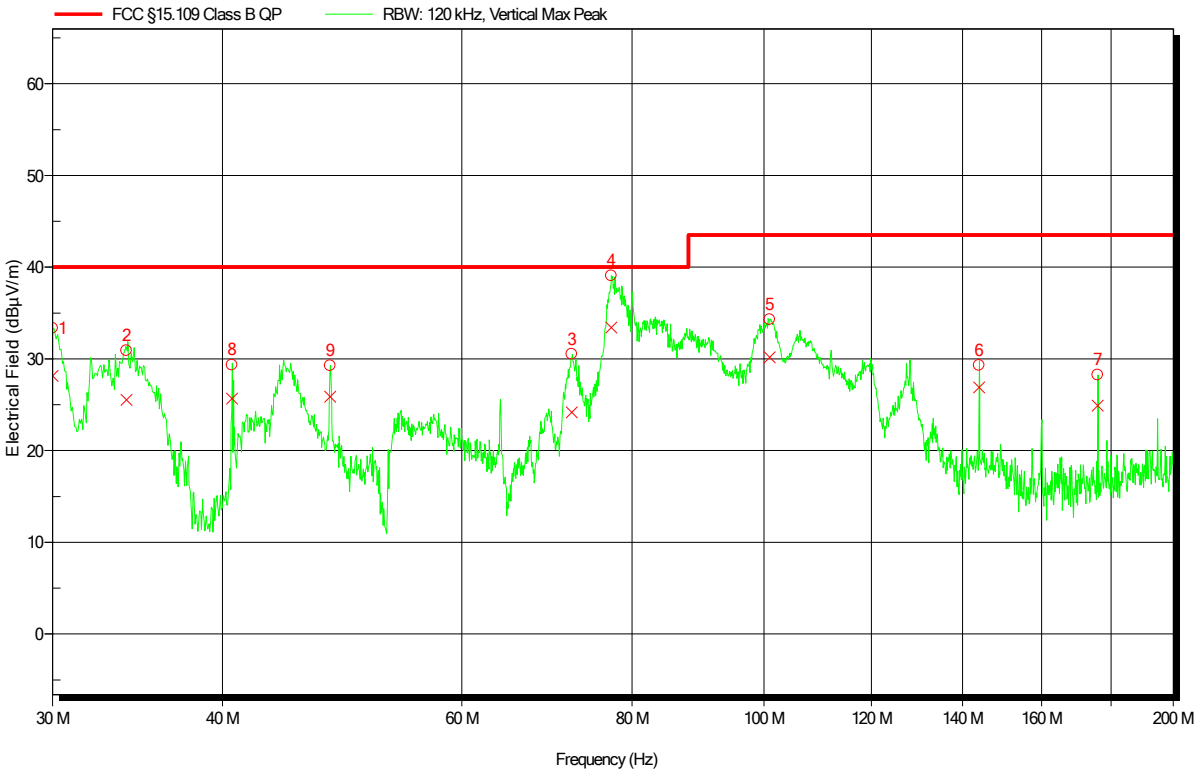

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	30 MHz	28.16 dBµV/m	40 dBµV/m	-11.84 dB	Pass	121 Degree	1 m
2	34.005 MHz	25.54 dBµV/m	40 dBµV/m	-14.46 dB	Pass	121 Degree	1 m
3	72.263 MHz	24.17 dBµV/m	40 dBµV/m	-15.83 dB	Pass	121 Degree	1 m
4	77.259 MHz	33.41 dBµV/m	40 dBµV/m	-6.59 dB	Pass	121 Degree	1 m
5	100.978 MHz	30.16 dBµV/m	43.52 dBµV/m	-13.36 dB	Pass	121 Degree	1 m
6	143.986 MHz	26.9 dBµV/m	43.52 dBµV/m	-16.62 dB	Pass	121 Degree	1 m
7	175.998 MHz	24.9 dBµV/m	43.52 dBµV/m	-18.62 dB	Pass	121 Degree	1 m
8	40.665 MHz	25.69 dBµV/m	40 dBµV/m	-14.31 dB	Pass	121 Degree	1 m
9	47.997 MHz	25.86 dBµV/m	40 dBµV/m	-14.14 dB	Pass	121 Degree	1 m

Radiated emissions according to FCC 47 CFR 15.109

Project number: G0M-1908-8420

Applicant:	W.O.M. WORLD OF MEDICINE GmbH
EUT Name:	Pump for Arthroscopy
Model:	A127
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 24°C, Unom: 120 V / 60 Hz
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3m
Mode:	1
Test Date:	2019-11-04
Note:	

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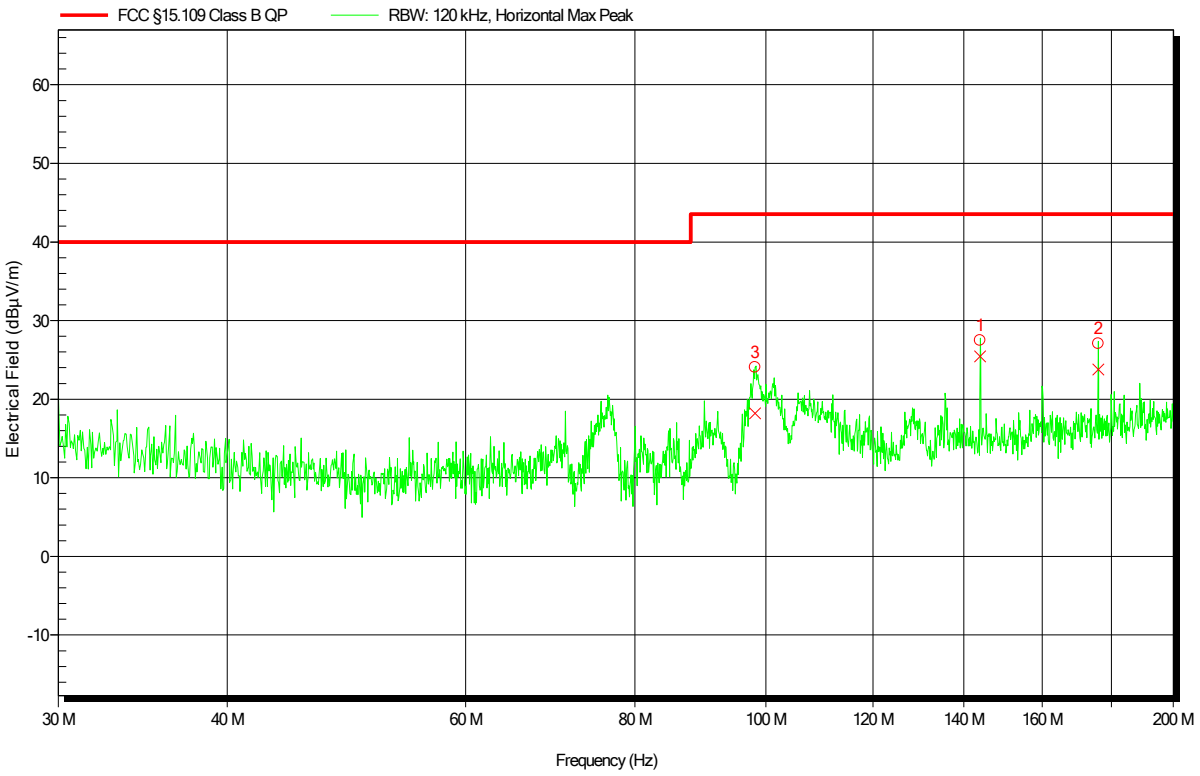

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	143.986 MHz	25.42 dBµV/m	43.52 dBµV/m	-18.1 dB	Pass	0 Degree	1 m
2	175.986 MHz	23.78 dBµV/m	43.52 dBµV/m	-19.74 dB	Pass	0 Degree	1 m
3	98.156 MHz	18.22 dBµV/m	43.52 dBµV/m	-25.31 dB	Pass	0 Degree	1 m

Radiated emissions according to FCC 47 CFR 15.109

Project number: G0M-1908-8420

Applicant:	W.O.M. WORLD OF MEDICINE GmbH
EUT Name:	Pump for Arthroscopy
Model:	A127
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 24°C, Unom: 120 V / 60 Hz
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3m
Mode:	1
Test Date:	2019-11-04
Note:	

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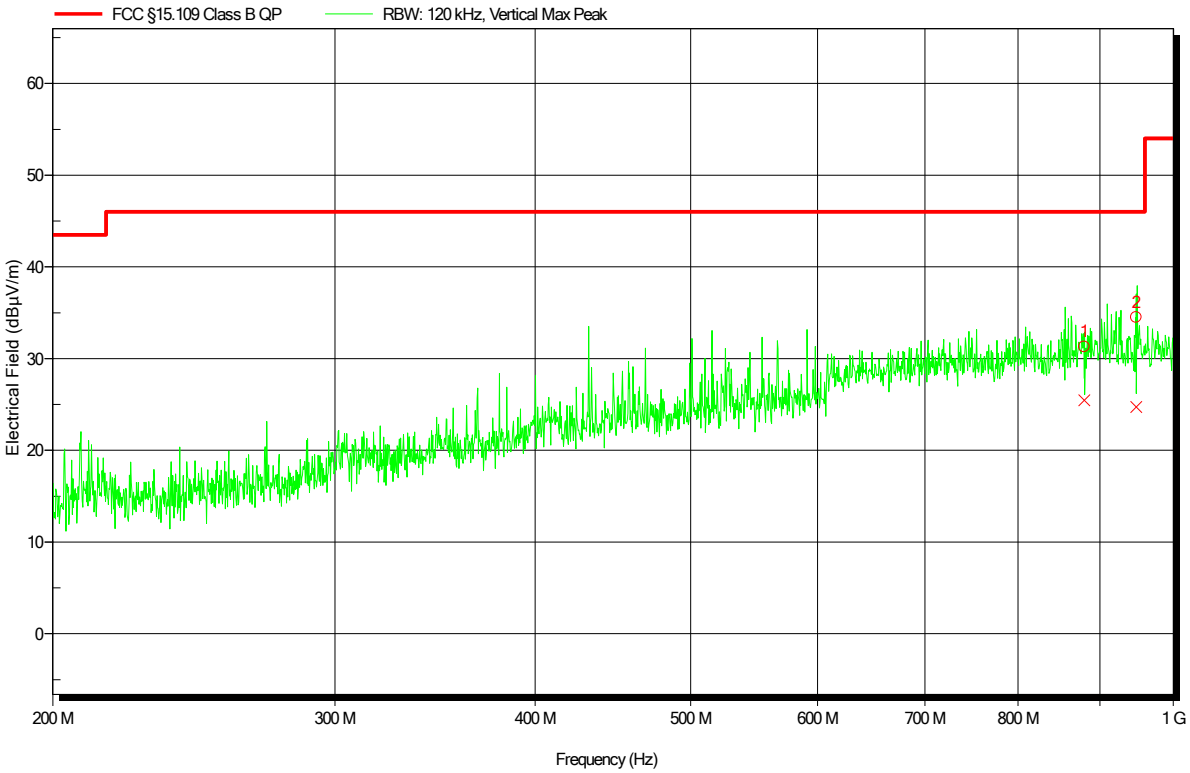


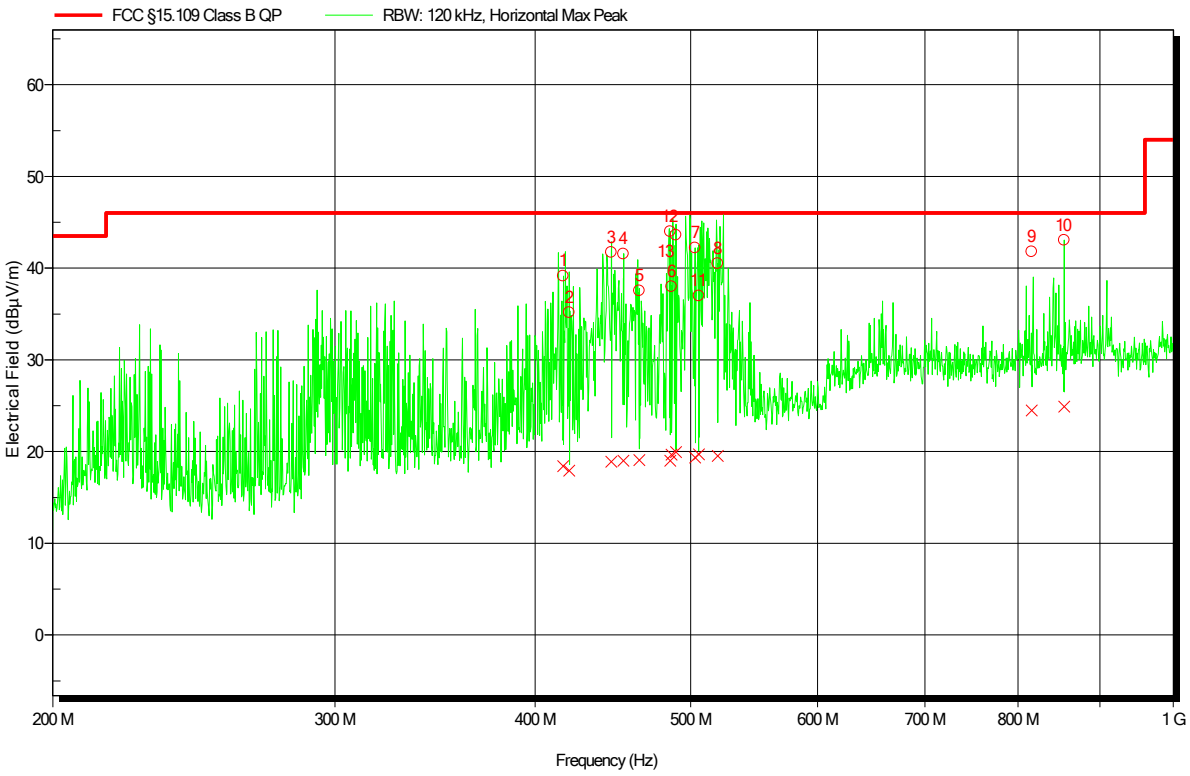
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	879.916 MHz	25.48 dBµV/m	46.02 dBµV/m	-20.55 dB	Pass	0 Degree	1 m
2	948.154 MHz	24.74 dBµV/m	46.02 dBµV/m	-21.28 dB	Pass	0 Degree	1 m

Radiated emissions according to FCC 47 CFR 15.109

Project number: G0M-1908-8420

Applicant:	W.O.M. WORLD OF MEDICINE GmbH
EUT Name:	Pump for Arthroscopy
Model:	A127
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 24°C, Unom: 120 V / 60 Hz
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3m
Mode:	1
Test Date:	2019-11-04
Note:	

Index 6



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	416.41 MHz	18.4 dBµV/m	46.02 dBµV/m	-27.62 dB	Pass	0 Degree	1 m
2	420.072 MHz	17.93 dBµV/m	46.02 dBµV/m	-28.09 dB	Pass	0 Degree	1 m
3	446.214 MHz	18.9 dBµV/m	46.02 dBµV/m	-27.12 dB	Pass	0 Degree	1 m
4	454.122 MHz	19 dBµV/m	46.02 dBµV/m	-27.02 dB	Pass	0 Degree	1 m
5	464.455 MHz	19.09 dBµV/m	46.02 dBµV/m	-26.93 dB	Pass	0 Degree	1 m
6	486.412 MHz	19.65 dBµV/m	46.02 dBµV/m	-26.37 dB	Pass	0 Degree	1 m
7	503.26 MHz	19.35 dBµV/m	46.02 dBµV/m	-26.67 dB	Pass	0 Degree	1 m
8	519.784 MHz	19.52 dBµV/m	46.02 dBµV/m	-26.5 dB	Pass	0 Degree	1 m
9	815.791 MHz	24.47 dBµV/m	46.02 dBµV/m	-21.56 dB	Pass	0 Degree	1 m
10	854.908 MHz	24.92 dBµV/m	46.02 dBµV/m	-21.1 dB	Pass	0 Degree	1 m
11	506.004 MHz	19.71 dBµV/m	46.02 dBµV/m	-26.31 dB	Pass	0 Degree	1 m
12	485.518 MHz	19.02 dBµV/m	46.02 dBµV/m	-27 dB	Pass	0 Degree	1 m
13	489.637 MHz	19.94 dBµV/m	46.02 dBµV/m	-26.08 dB	Pass	0 Degree	1 m

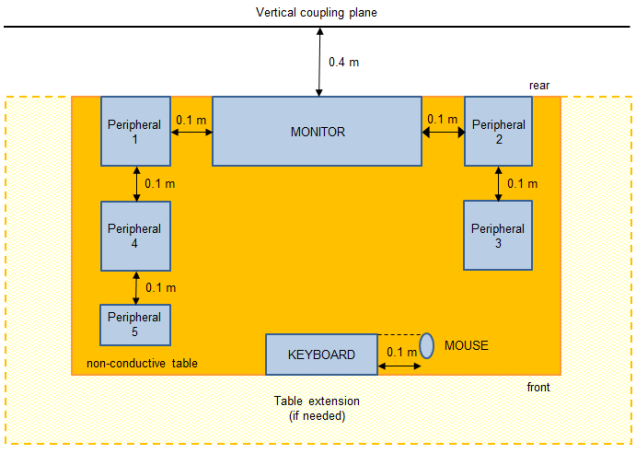
2.2 Test Conditions and Results - Conducted emissions acc. to ANSI C63.4

2.2.1 Information

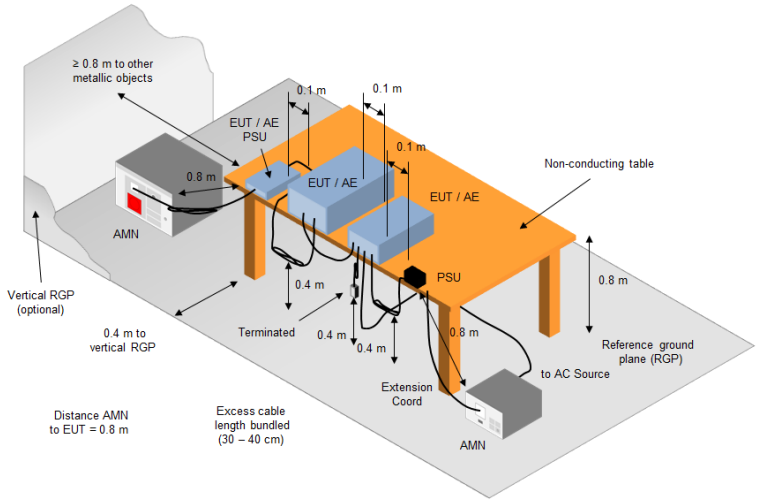
Test Information	
Reference	FCC 47 CFR 15.107, ISED ICES-003, 8, 6.2
Reference method	ANSI C63.4:2014 Section 12
Measurement range	150 kHz to 30 MHz
Equipment class	Class B
Equipment type	Table top
Temperature [°C]	23
Humidity [%]	43
Operator	Stephan Liebich
Date	2019-11-04

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	R&S	ESH3-Z5	EF00036	2019-07	2021-07
Pulse Limiter	R&S	ESH3-Z2	EF01063	2019-07	2020-07
EMI Test Receiver	R&S	ESR 7	EF00943	2019-10	2020-10
Climatic Sensor	Embedded Data Systems, LLC.	2800100000254 17E	EF01054	2019-05	2020-05

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	1	PASS	-

2.2.7 Setup Photos

TEST SETUP CONDUCTED EMISSION

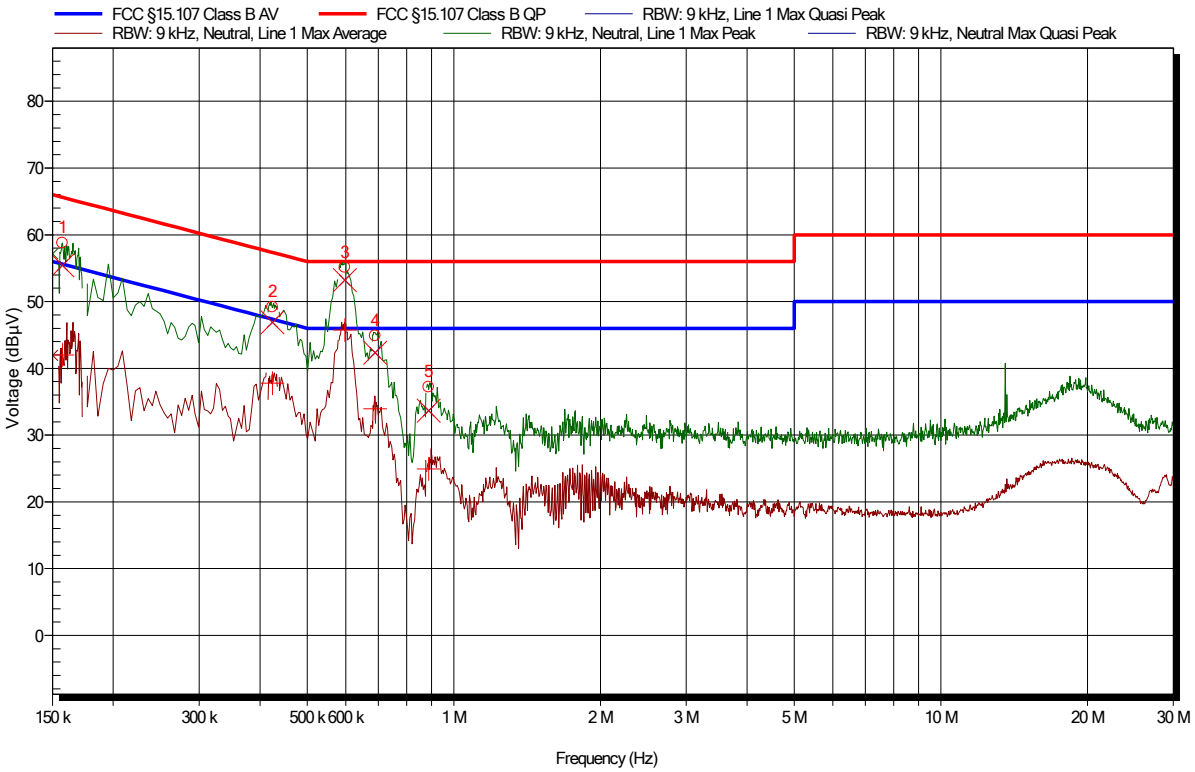
2.2.8 Records

Conducted emissions according to FCC 47 CFR 15.107

Project number: G0M-1908-8420

Applicant:	W.O.M. WORLD OF MEDICINE GmbH
EUT Name:	Pump for Arthroscopy
Model:	A127
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 23°C, Unom: 120 V / 60 Hz
LISN:	Rohde & Schwarz ESH3-Z5
Mode:	1
Test Date:	2019-11-04
Note:	

Index 2



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	157.2 kHz	55.44 dBµV	65.61 dBµV	-10.17 dB	Pass
2	424.5 kHz	46.89 dBµV	57.36 dBµV	-10.47 dB	Pass
3	597.75 kHz	53.23 dBµV	56 dBµV	-2.77 dB	Pass
4	690 kHz	42.32 dBµV	56 dBµV	-13.68 dB	Pass
5	888 kHz	33.66 dBµV	56 dBµV	-22.34 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	157.2 kHz	42.02 dBµV	55.61 dBµV	-13.59 dB	Pass
2	424.5 kHz	37.8 dBµV	47.36 dBµV	-9.56 dB	Pass
3	597.75 kHz	45.72 dBµV	46 dBµV	-0.28 dB	Pass
4	690 kHz	33.93 dBµV	46 dBµV	-12.07 dB	Pass
5	888 kHz	24.94 dBµV	46 dBµV	-21.06 dB	Pass