RADIO REPORT

FCC 47 CFR Part 15C
ISED Canada RSS-210
ISED Canada RSS-Gen

Operation within the 13.110 – 14.010 MHz band

Report Reference No	G0M-1908-8412-TFC225RI-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	According to FCC/ISED rules
Standard	FCC 47 CFR Part 15C ISED RSS-210, Issue 9, 2016-08 ISED RSS-Gen, Issue 5, Amendment 1, 2019-03
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	Pump for Laparoscopy
Model(s)	PP110
Additional Model(s)	None
Brand Name(s)	LAP-Pump
Hardware Version(s)	09/2019
Software Version(s)	PP110_000_A_00.04
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	
Not applicable to EUT	N/A	
Test object does meet the requirement	P(PASS)	
Test object does not meet the requirement	F(FAIL)	
Testing:		
Test Lab Temperature	20 - 23 °C	
Test Lab Humidity	32 – 38 %	
Date of receipt of test item	2019-10-14	
Report:		
Compiled by	Wilfried Treffke	
Tested by (+ signature) (Responsible for Test)	Wilfried Treffke	W. Treff .....
Approved by (+ signature) (Deputy Head of Lab)	Toralf Jahn	T. J .....
Date of Issue	2019-12-18	
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:		

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2019-12-18	Initial Release	

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
EUT	Equipment Under Test
FCC	Federal Communications Commission
ISED	Innovation, Science and Economic Development Canada
RBW	Resolution bandwidth
RFID	Radio Frequency Identification
RMS	Root mean square
VBW	Video bandwidth
V_{NOM}	Nominal supply voltage

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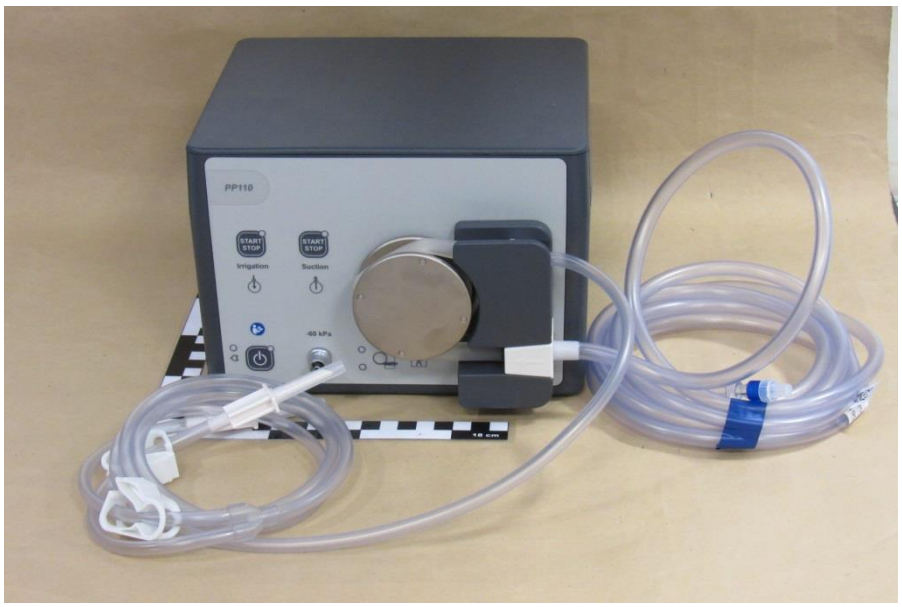
1 Equipment (Test Item) Under Test

Description	Pump for Laparoscopy	
Model	PP110	
Additional Model(s)	None	
Brand Name(s)	LAP-Pump	
Serial Number(s)	1909CE0389	
Hardware Version(s)	09/2019	
Software Version(s)	PP110_000_A_00.04	
PMN	TS-HW42	
HVIN	1430	
FVIN	None	
HMN	PP110	
FCC-ID	2AS5K-TSHW42	
IC	25004-TSHW42A	
Equipment type	End Product	
Radio type	Transceiver	
Assigned frequency bands	13.110 - 14.010 MHz	
Radio technology	RFID	
Modulation	ASK	
Radio Module (Limited Modular Approval)	Type	RFID Module
	Model	TS-HW42
	Manufacturer	GiS GmbH
	HW Version	HVIN: 1430
	SW Version	unspecified
	FCC-ID	2AS5K-TSHW42
	IC	25004-TSHW42A
Antenna	Type	External dedicated
	Model	TS-AH20
	Manufacturer	GiS GmbH
	Gain	N/A
Supply Voltage	V_{NOM}	120 VAC
Operating Temperature	T_{NOM}	25 °C
AC/DC-Adaptor	Model	None
	Vendor	None
	Input	None
	Output	None
Manufacturer	W.O.M. WORLD OF MEDICINE GmbH Salzufer 8 10587 Berlin GERMANY	

1.1 Photos – Equipment External

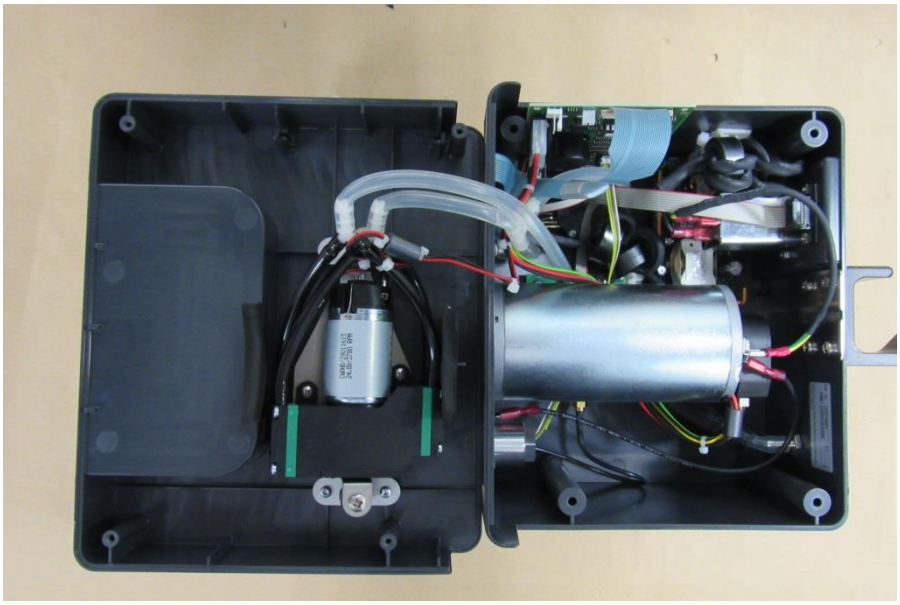
EUT Overview


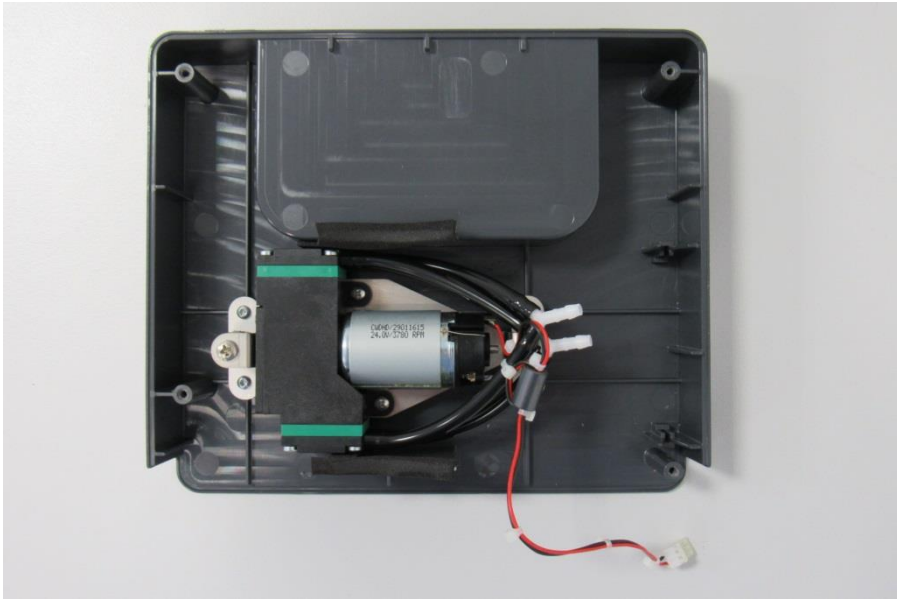
EUT Label

EUT Connector Side

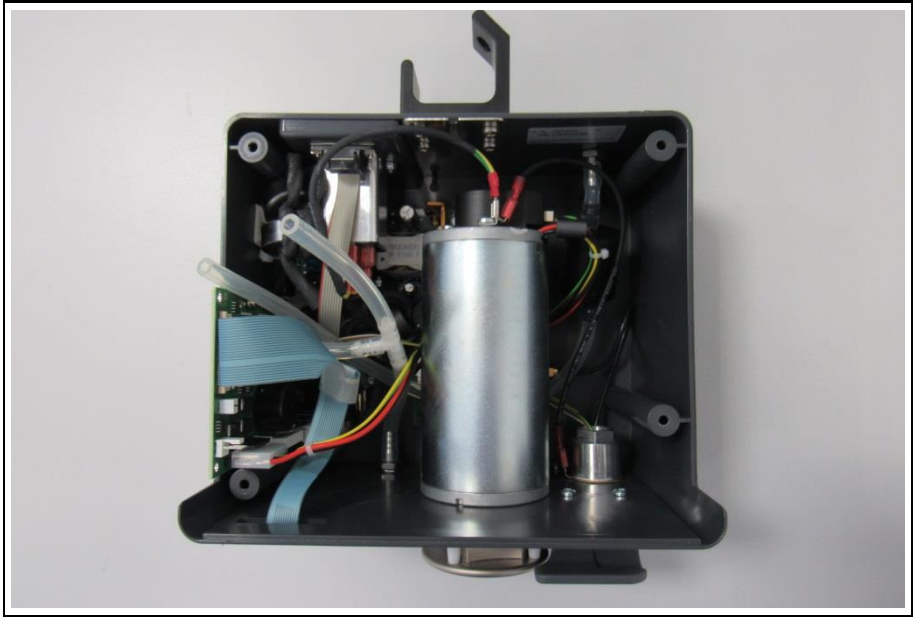
EUT Front Side

1.2 Photos – Equipment Internal

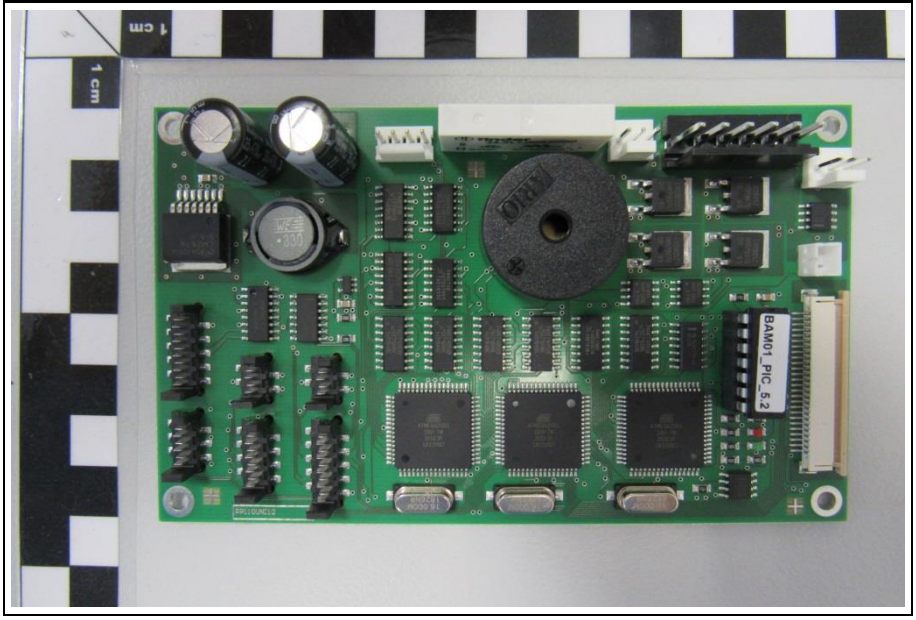
EUT Case Open


EUT Top Case


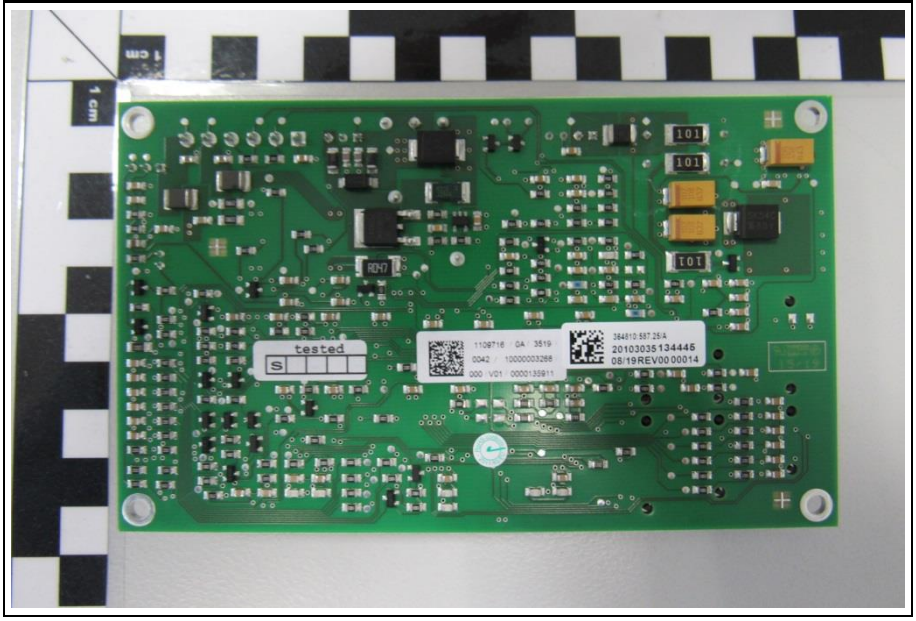
EUT Bottom Case



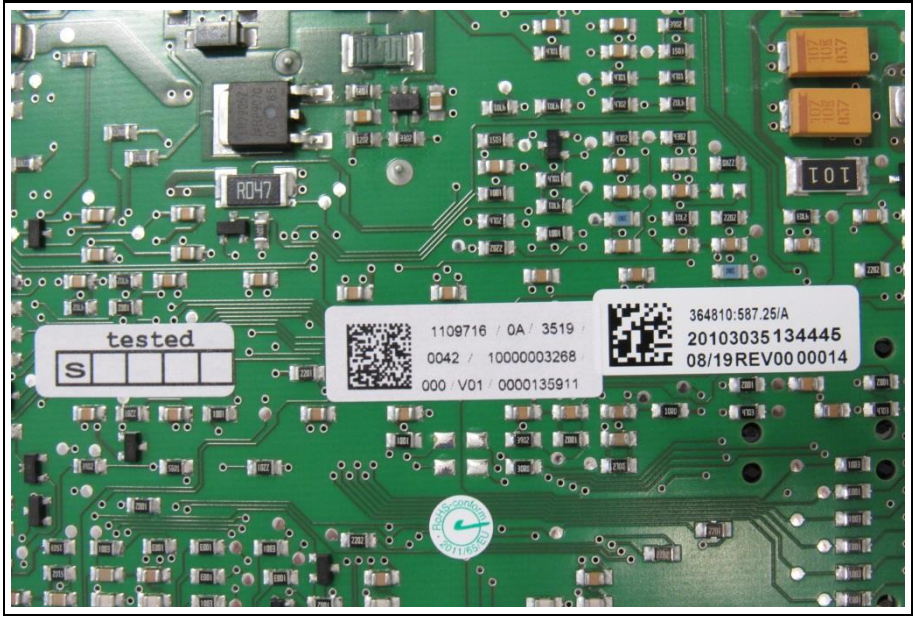
EUT PCB Top Side



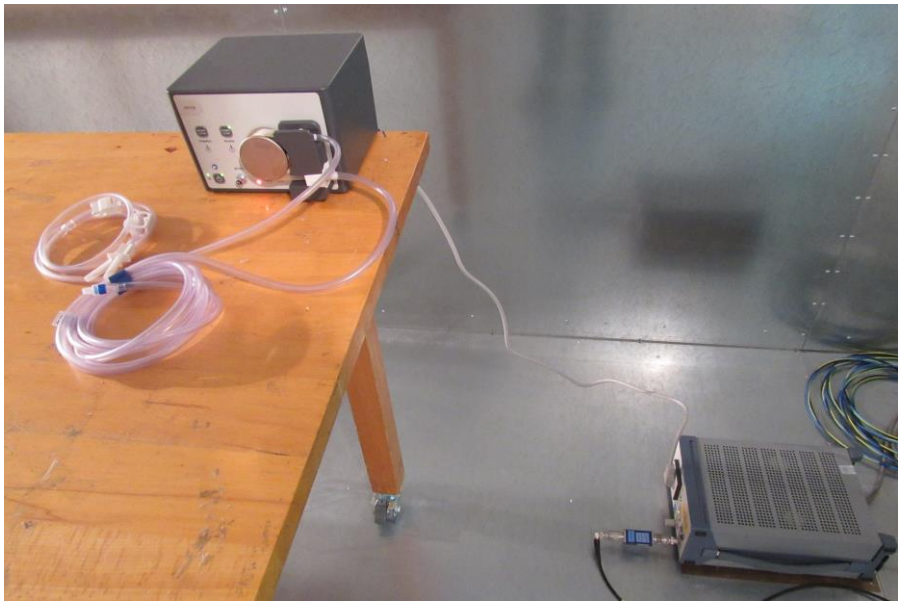
EUT PCB Bottom Side

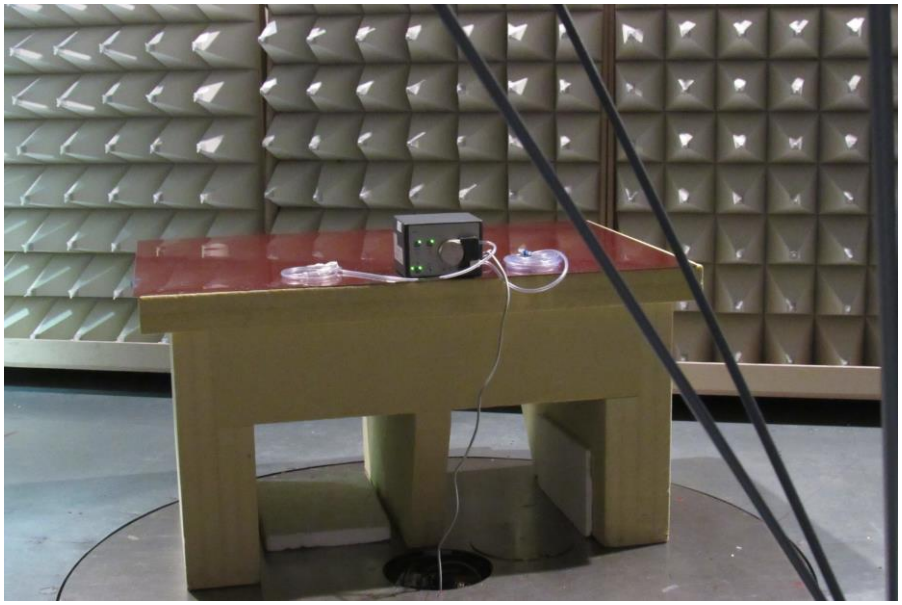


EUT PCB Label



1.3 Photos – Test Setup

Conducted Setup


Radiated Setup


1.4 Support Equipment.

Product Type	Device	Manufacturer	Model	Comment
AE	RFID-Service-Tag	W.O.M.	A127	Passive Tag
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
Comment:				

1.5 Test Modes

Mode	Description
Transmit	Mode = Transmit Modulation = ASK Duty cycle = 28 %
Comment:	

1.6 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Tx / Rx	0	13.5609

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 analyzer in dBµV. Any external preamplifiers used are taken into account through internal analyzer 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 analyzer. 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 Analyzer (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 15C, ISED RSS-210; ISED RSS GEN				
Product Standard Reference	**Requirement**	**Reference Method**	**Result**	**Remarks**
ISED RSS-Gen 6.7	Occupied Bandwidth	ANSI C63.10-2013	N/R	Informational only
FCC 47 CFR 15.225(a-c) ISED RSS-210 B.6(a)	Fundamental in-band field strength emissions	ANSI C63.10-2013	PASS	
FCC 47 CFR 15.225(d) FCC 47 CFR 15.209 ISED RSS-210 B.6(d)	Emission radiated outside the specified frequency band	ANSI C63.10-2013	PASS	
FCC 47 CFR 15.225(e) ISED RSS-210 B.6	Frequency stability	ANSI C63.10-2013	N/T	Class II Permissive Change (C2PC)
ISED RSS-Gen 4.10 ISED RSS-Gen 7.1	Receiver radiated spurious emissions	ANSI C63.10-2013	N/R	Permanently co-located transmitter
FCC 47 CFR 15.207 ISED RSS-Gen 8.8	AC power line conducted emissions	ANSI C63.10-2013	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

3 Test Conditions and Results

3.1 Test Conditions and Results - Occupied bandwidth

3.1.1 Information

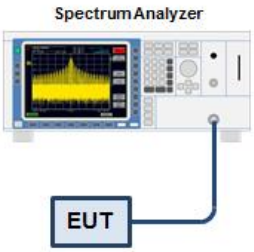
Test Information	
Product Standard Reference	ISED RSS-Gen 6.7
Measurement Method	Conducted
Operator	Wilfried Treffke
Date	2019-10-25

3.1.2 Limits

Limits
None (Informational only)

3.1.3 Setup

Test Setup



3.1.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07

3.1.5 Procedure

Test Procedure

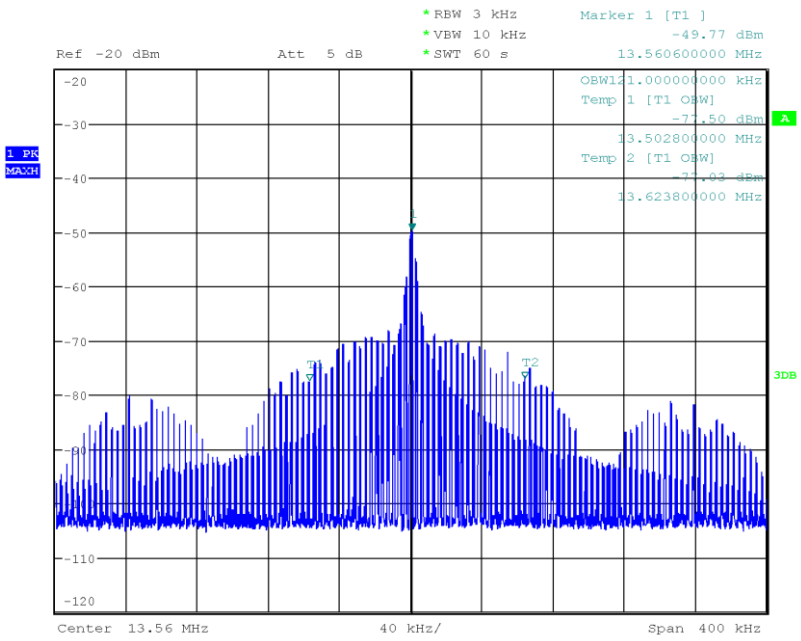
1. EUT set to test mode (Communication tester is used if needed)
2. Span set to at least twice the emission spectrum
3. Resolution bandwidth set between 1 % to 5 % of OBW
4. Occupied Bandwidth (99 %) measurement with spectrum analyzer built in measurement function

3.1.6 Results

Test Results	
Channel [MHz]	Bandwidth [kHz]
13.5609	0.121

Occupied Bandwidth

Project Number:	G0M-1908-8412
Applicant:	W.O.M. WORLD OF MEDICINE GmbH
Model Description:	Pump for Laparoscopy
Model:	PP110
Test Sample ID:	25890
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	ASK, Channel: 13.5609 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Wilfried Treffke
Test Site:	Eurofins Product Service GmbH
Test Date:	2019-10-25
Occupied Bandwidth [MHz]:	0.121



Date: 25.OCT.2019 16:05:37

3.2 Test Conditions and Results - Fundamental in-band field strength emissions

3.2.1 Information

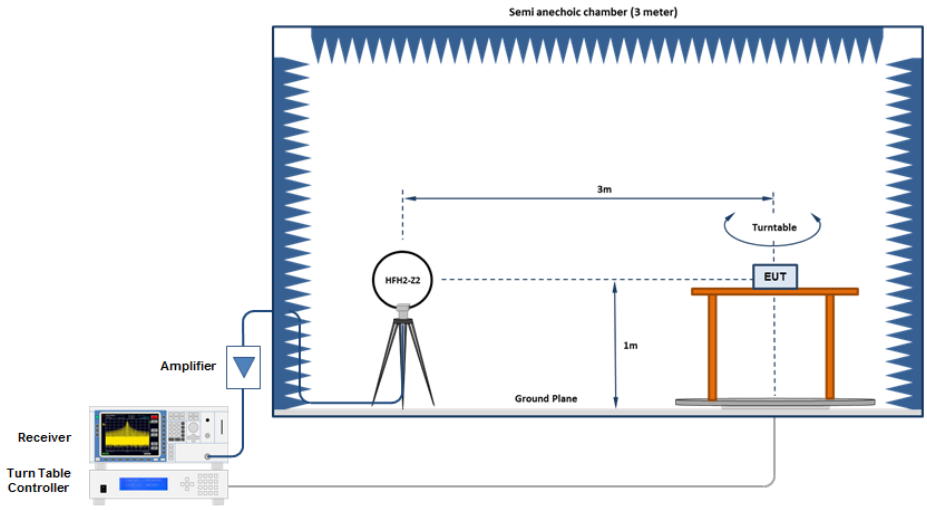
Test Information	
Product Standard Reference	FCC 47 CFR 15.225(a-c) / ISED RSS-210 B.6(a)
Measurement Method	Radiated
Operator	Wilfried Treffke
Date	2019-10-23

3.2.2 Limits

Limits			
Frequency ragne [MHz]	Limit [µV/m]	Limit [dBµV/m]	Limit Distance [m]
13.553 - 13.567	15848	84	30
13.410 - 13.553 13.567 - 13.710	334	50.5	30
13.110 - 13.410 13.710 - 14.010	106	40.5	30

3.2.3 Setup

Test Setup < 30 MHz



3.2.4 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2015.2.4

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Semi-Anechoic Chamber	Frankonia	AC1	EF00062	2018-07	2021-07
Spectrum Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07
Antenna	R&S	HFH2-Z2	EF00184	2017-12	2019-12

3.2.5 Procedure

Test Procedure
1. EUT set to test mode 2. Span it set according to measurement range 3. Resolution bandwidth below 1 GHz is set according to CISPR 16 with peak/quasi-peak detector 4. Below 30MHz an extrapolation according ANSI 63.10; 6.4.4.2 is used.

3.2.6 Results

Test Results						
Channel [MHz]	Emission [MHz]	Level @ 30 m [dBµV/m]	Detector	Polarization	Limit @ 30 m [dBµV/m]	Margin
13.5609	13.56	20.4	PK	hor	84	-63.6

3.3 Test Conditions and Results - Emissions radiated outside the specified frequency band

3.3.1 Information

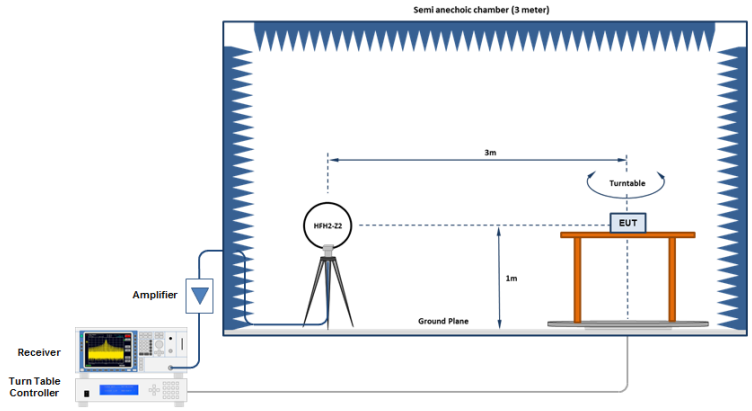
Test Information	
Product Standard Reference	FCC 47 CFR 15.225(d) / ISED RSS-210 B.6(d)
Measurement Method	Radiated
Operator	Wilfried Treffke
Date	2019-10-23

3.3.2 Limits

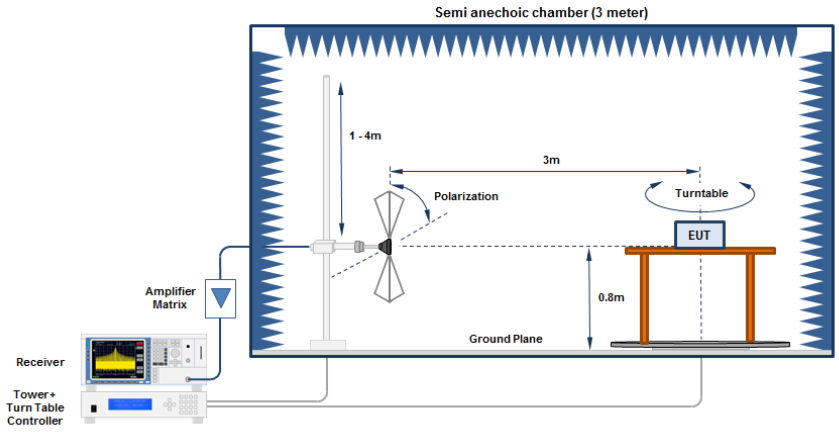
Limits				
Frequency range [MHz]	Detector	Limit [µV/m]	Limit [dBµV/m]	Limit Distance [m]
0.009 - 0.490	Quasi-Peak	2400/F[kHz]	48.5 - 13.8	300
0.490 - 1.705	Quasi-Peak	2400/F[kHz]	13.8 - 2.97	30
1.705 -30	Quasi-Peak	30	29.5	30
30 - 88	Quasi-Peak	100	40	3
88 -216	Quasi-Peak	150	43.5	3

3.3.3 Setup

Test Setup < 30 MHz



Test Setup 30 -216 MHz



3.3.4 Equipment

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

Test Equipment < 30 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Semi-Anechoic Chamber	Frankonia	AC2	EF00196	-	-
Spectrum Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07
Antenna	R&S	HFH2-Z2	EF00184	2017-12	2019-12
Test Equipment 30 - 216 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2018-07	2021-07
Spectrum Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07
Antenna	R&S	HK116	EF00203	2018-06	2020-06

3.3.5 Procedure

Test Procedure
1. EUT set to test mode 2. Span it set according to measurement range 3. Resolution bandwidth below 1 GHz is set according to CISPR 16 with peak/quasi-peak detector and RBW of 1 MHz with peak/average detector is used above 1 GHz 4. Below 30MHz an extrapolation according ANSI 63.10; 6.4.4.2 is used. 5. Markers are set to maximum emission levels

3.3.6 Results

Test Results						
Channel [MHz]	Emission [MHz]	Level [dBµV/m]	Detector	Polarization	Limit [dBµV/m]	Margin [dB]
13.5609	0.035351	-28.00	avg	ver	36.60	-64.59
13.5609	29.054	14.50	pk	ver	29.50	-15.00
13.5609	34.583	33.81	pk	hor	40.00	-06.19
13.5609	52.035	31.84	pk	hor	40.00	-08.16
13.5609	72.308	34.79	pk	hor	40.00	-05.21

3.4 Test Conditions and Results - AC powerline conducted emissions

3.4.1 Information

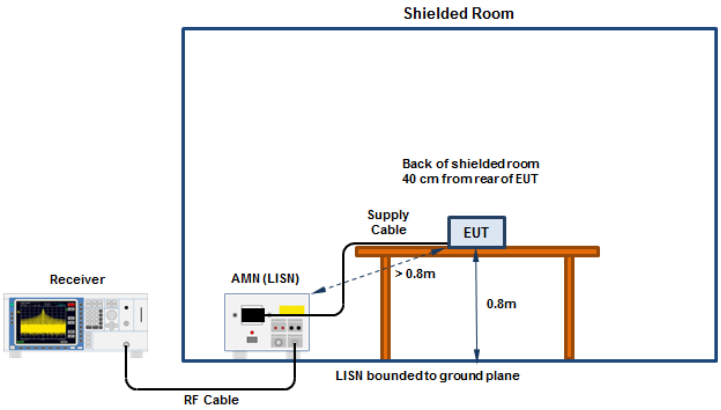
Test Information	
Reference	FCC 47 CFR 15.207; ISED RSS-Gen, Issue 5
Measurement Method	ANSI C63.10 6.2
Operator	Wilfried Treffke
Date	2019-10-26

3.4.2 Limits

Limits		
Frequency [MHz]	Quasi-Peak [dBµV]	Average [dBµV]
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5	56	46
5 - 30	60	50
* Limit decreases linearly with the logarithm of the frequency		

3.4.3 Setup

Test Setup



3.4.4 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
EMI Test Receiver	R&S	ESR7	EF00943	2019-10	2020-10
LISN	R&S	ESH3-Z5	EF00036	2019-07	2021-07

EMI voltage test in the ac-mains according to FCC 47 CFR 15.207; ISED RSS-Gen

Project number: G0M-1908-8412

Applicant:	W.O.M. WORLD OF MEDICINE GmbH
EUT Name:	Pump for Laparoscopy
Model:	PP110
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 23°C, Unom: 120 VAC / 60 Hz
LISN:	ESH3-Z5 (L)
Mode:	RFID 13.5609 MHz
Test Date:	2019-10-26
Note:	

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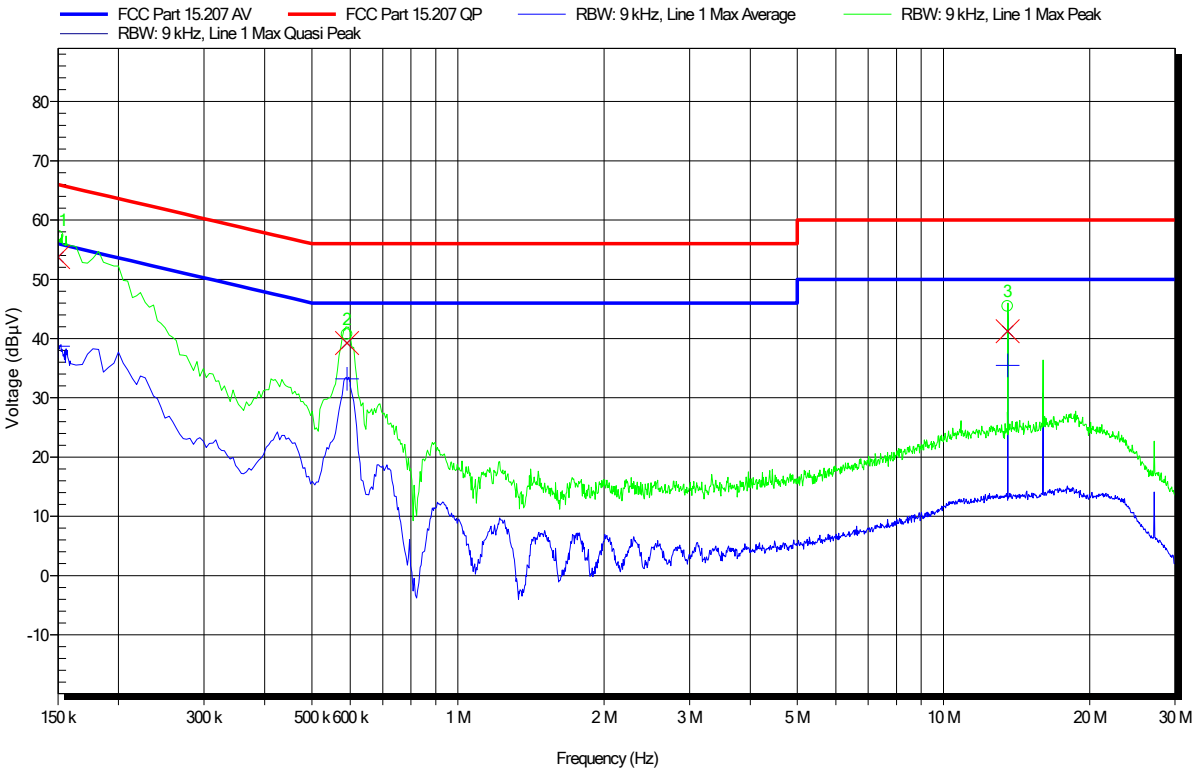

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	150 kHz	53.74 dBµV	66 dBµV	-12.26 dB	Pass
2	591 kHz	39.26 dBµV	56 dBµV	-16.74 dB	Pass
3	13.563 MHz	41.26 dBµV	60 dBµV	-18.74 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	150 kHz	38.72 dBµV	56 dBµV	-17.28 dB	Pass
2	591 kHz	33.21 dBµV	46 dBµV	-12.79 dB	Pass
3	13.563 MHz	35.48 dBµV	50 dBµV	-14.52 dB	Pass

EMI voltage test in the ac-mains according to FCC 47 CFR 15.207; ISED RSS-Gen

Project number: G0M-1908-8412

Applicant:	W.O.M. WORLD OF MEDICINE GmbH
EUT Name:	Pump for Laparoscopy
Model:	PP110
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 23°C, Unom: 120 VAC / 60Hz
LISN:	ESH3-Z5 (N)
Mode:	RFID 13.5609 MHz
Test Date:	2019-10-26
Note:	

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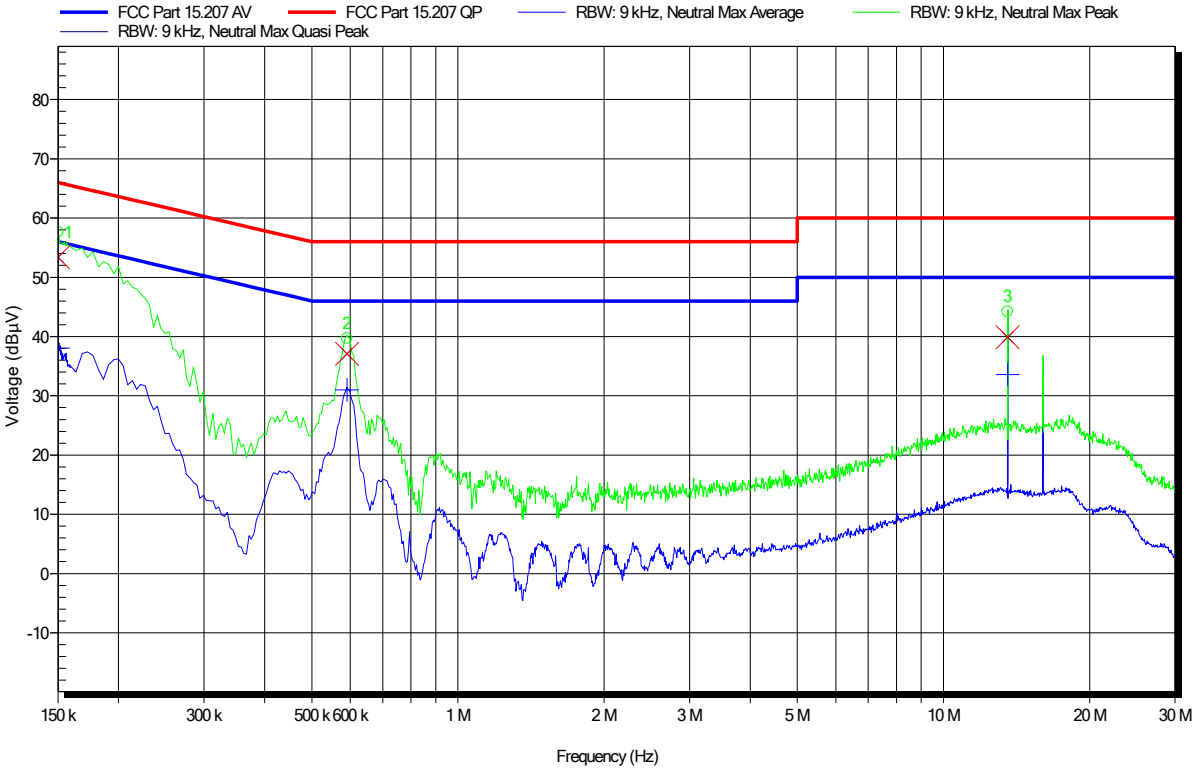


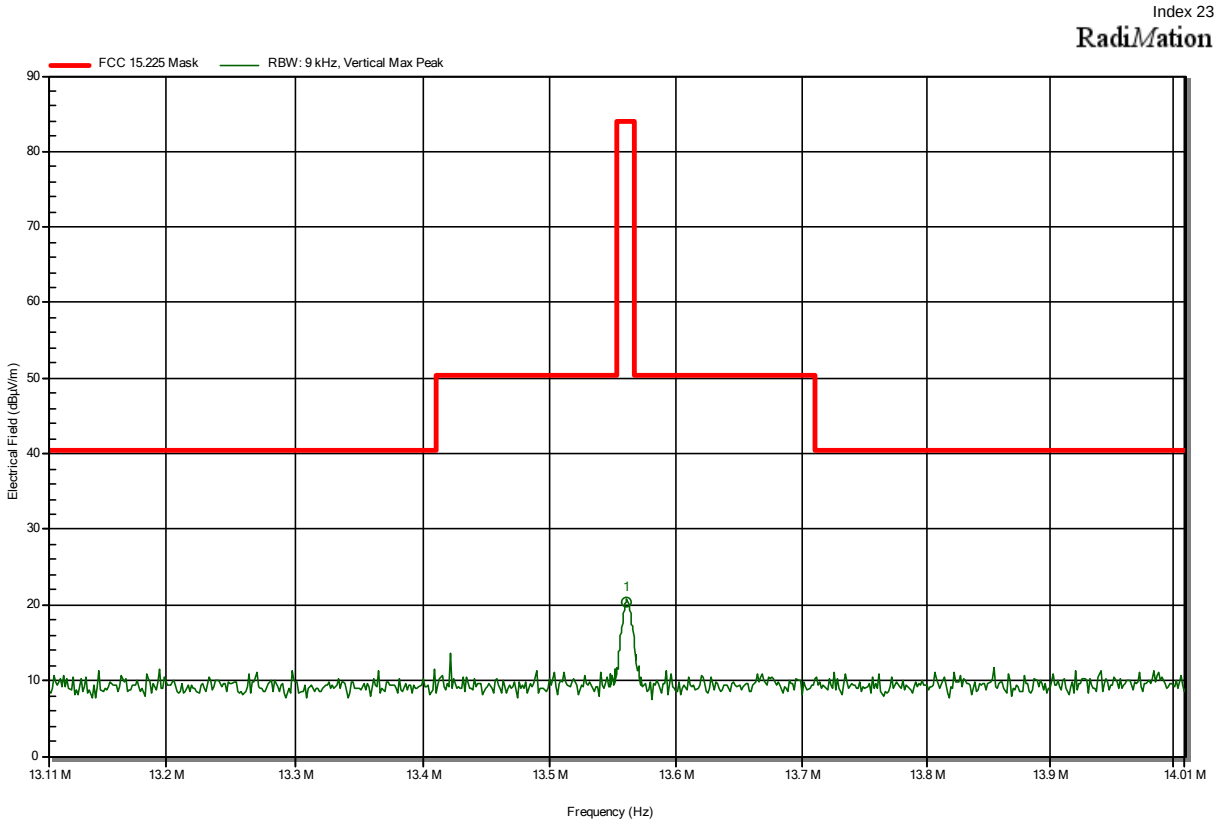
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	150 kHz	53.37 dBµV	66 dBµV	-12.63 dB	Pass
2	591 kHz	37.08 dBµV	56 dBµV	-18.92 dB	Pass
3	13.562 MHz	39.9 dBµV	60 dBµV	-20.1 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	150 kHz	38.07 dBµV	56 dBµV	-17.93 dB	Pass
2	591 kHz	30.97 dBµV	46 dBµV	-15.03 dB	Pass
3	13.562 MHz	33.55 dBµV	50 dBµV	-16.45 dB	Pass

ANNEX A Transmitter in-band emissions

Spurious emissions according to FCC 47 CFR 15.225 / ISED RSS-210

Project number:	G0M-1908-8412
Applicant:	W.O.M. WORLD OF MEDICINE GmbH
EUT Name:	Pump for Laparoscopy
Model:	PP110
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 23 °C, Vnom: 120 VAC / 60 Hz
Antenna:	HFH2-Z2
Measurement distance:	3 m converted to 30 m
Mode:	TX; ASK; 13.5609 MHz
Test Date:	2019-10-23
Note:	



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
13.56 MHz	20.4 dBµV/m	84 dBµV/m	-63.59 dB	Pass

ANNEX B Transmitter radiated spurious emissions

Spurious emissions according to FCC 47 CFR 15.225 / ISED RSS-210

Project number:	G0M-1908-8412
Applicant:	W.O.M. WORLD OF MEDICINE GmbH
EUT Name:	Pump for Laparoscopy
Model:	PP110
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 23 °C, Vnom: 120 VAC / 60 Hz
Antenna:	HFH2-Z2
Measurement distance:	3 m converted to 300 m
Mode:	TX; ASK; 13.5609 MHz
Test Date:	2019-10-23
Note:	

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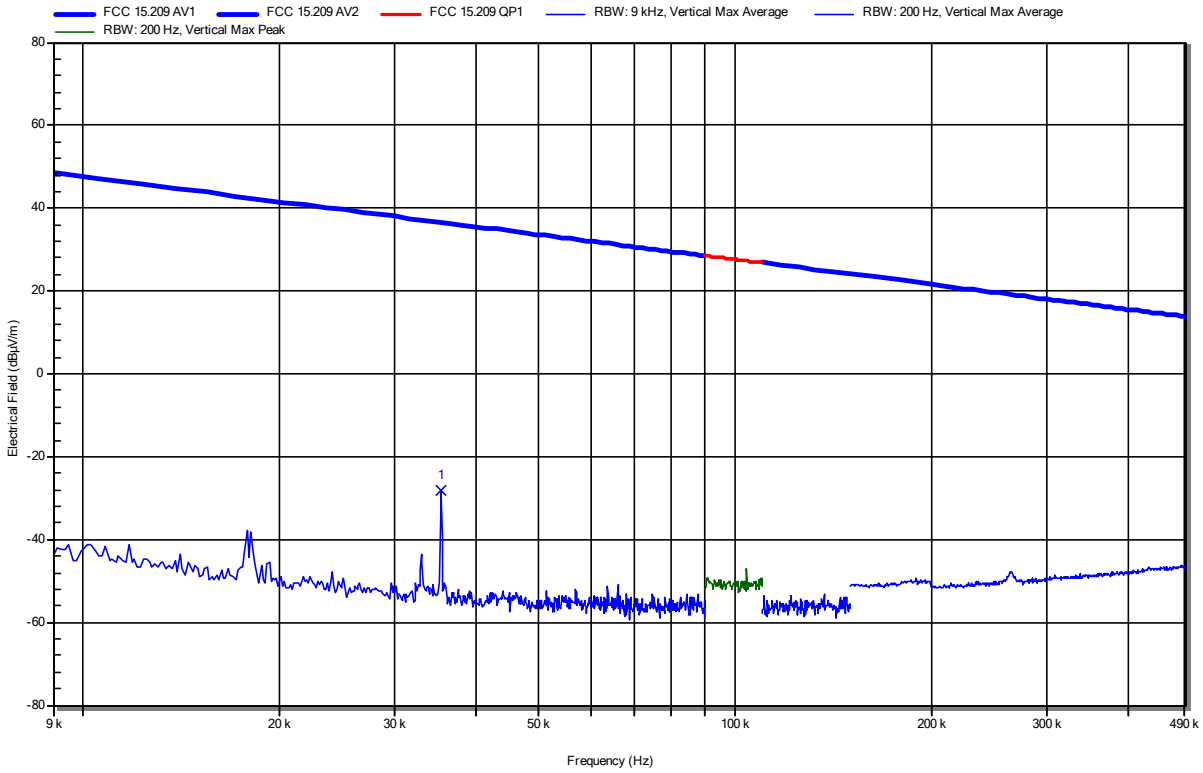
RadiMation



Frequency	Average	Average Limit	Average Difference	Average Status
35.351 kHz	-28 dBµV/m	36.6 dBµV/m	-64.59 dB	Pass

Spurious emissions according to FCC 47 CFR 15.225 / ISED RSS-210

Project number:	G0M-1908-8412
Applicant:	W.O.M. WORLD OF MEDICINE GmbH
EUT Name:	Pump for Laparoscopy
Model:	PP110
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 23 °C, Vnom: 120 VAC / 60 Hz
Antenna:	HFH2-Z2
Measurement distance:	3 m converted to 30 m
Mode:	TX; ASK; 13.5609 MHz
Test Date:	2019-10-23
Note:	

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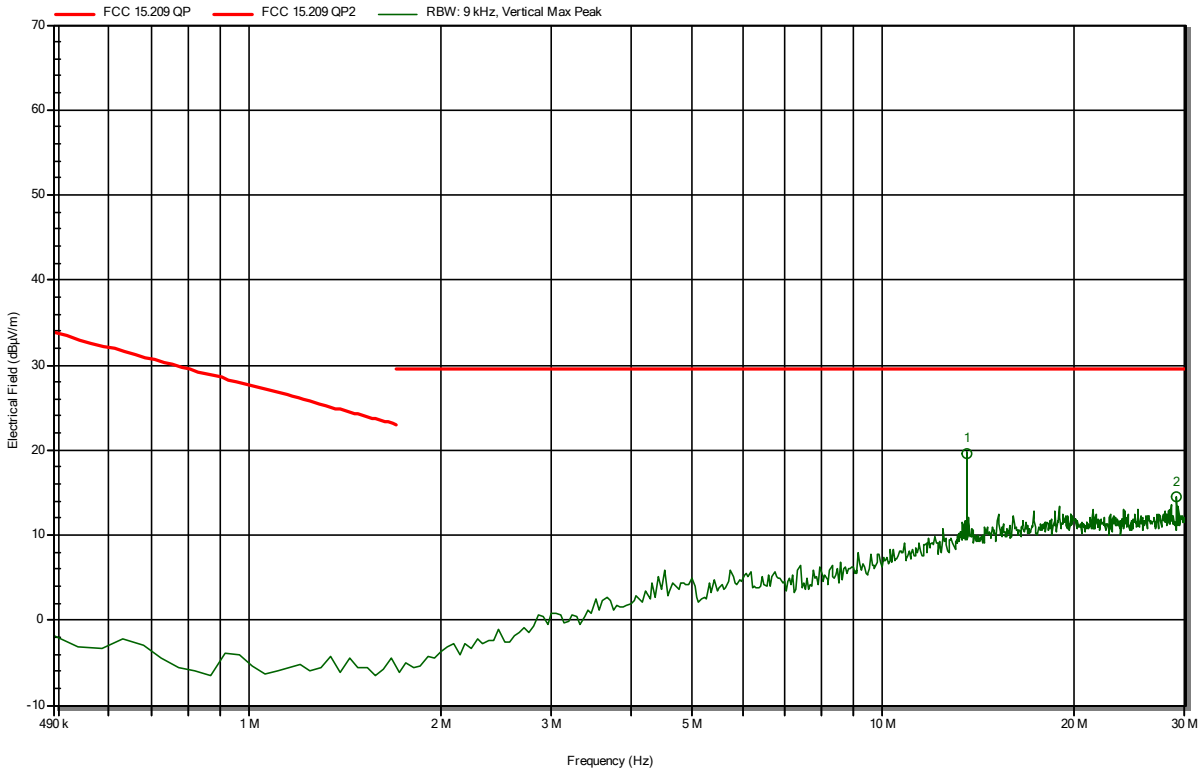
RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
13.562 MHz	19.6 dBµV/m	---	---	Carrier
29.054 MHz	14.5 dBµV/m	29.5 dBµV/m	-15 dB	Pass

Spurious emissions according to FCC 47 CFR 15.225 / ISED RSS-210

Project number:	G0M-1908-8412
Applicant:	W.O.M. WORLD OF MEDICINE GmbH
EUT Name:	Pump for Laparoscopy
Model:	PP110
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 23 °C, Vnom: 120 VAC / 60 Hz
Antenna:	HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; ASK; 13.5609 MHz
Test Date:	2019-10-23
Note:	worst case

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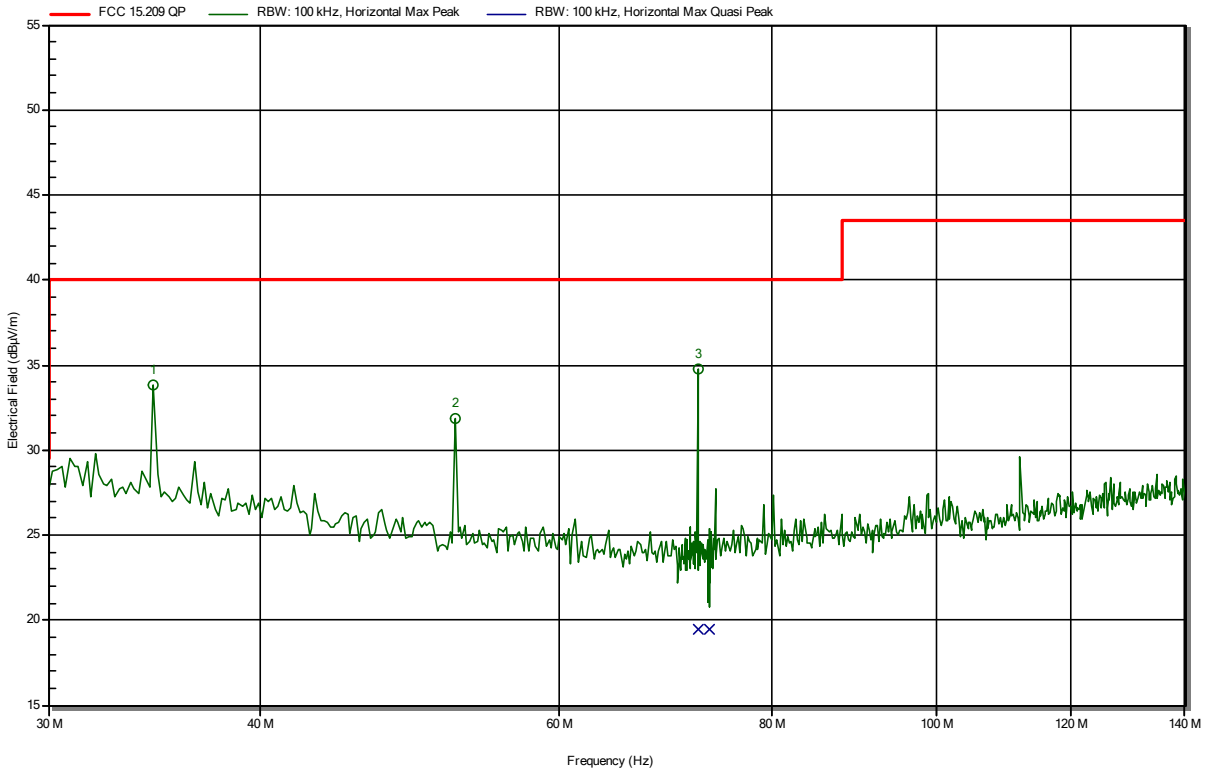

Frequency	Peak	Peak Limit	Peak Difference	Status
34.583 MHz	33.81 dBµV/m	40 dBµV/m	-6.19 dB	Pass
52.035 MHz	31.84 dBµV/m	40 dBµV/m	-8.16 dB	Pass
72.308 MHz	34.79 dBµV/m	40 dBµV/m	-5.21 dB	Pass

Spurious emissions according to FCC 47 CFR 15.225 / ISED RSS-210

Project number:	G0M-1908-8412
Applicant:	W.O.M. WORLD OF MEDICINE GmbH
EUT Name:	Pump for Laparoscopy
Model:	PP110
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 23 °C, Vnom: 120 VAC / 60 Hz
Antenna:	HK 116, Vertical
Measurement distance:	3 m
Mode:	RX; ASK; 13.5609 MHz
Test Date:	2019-10-23
Note:	worst case

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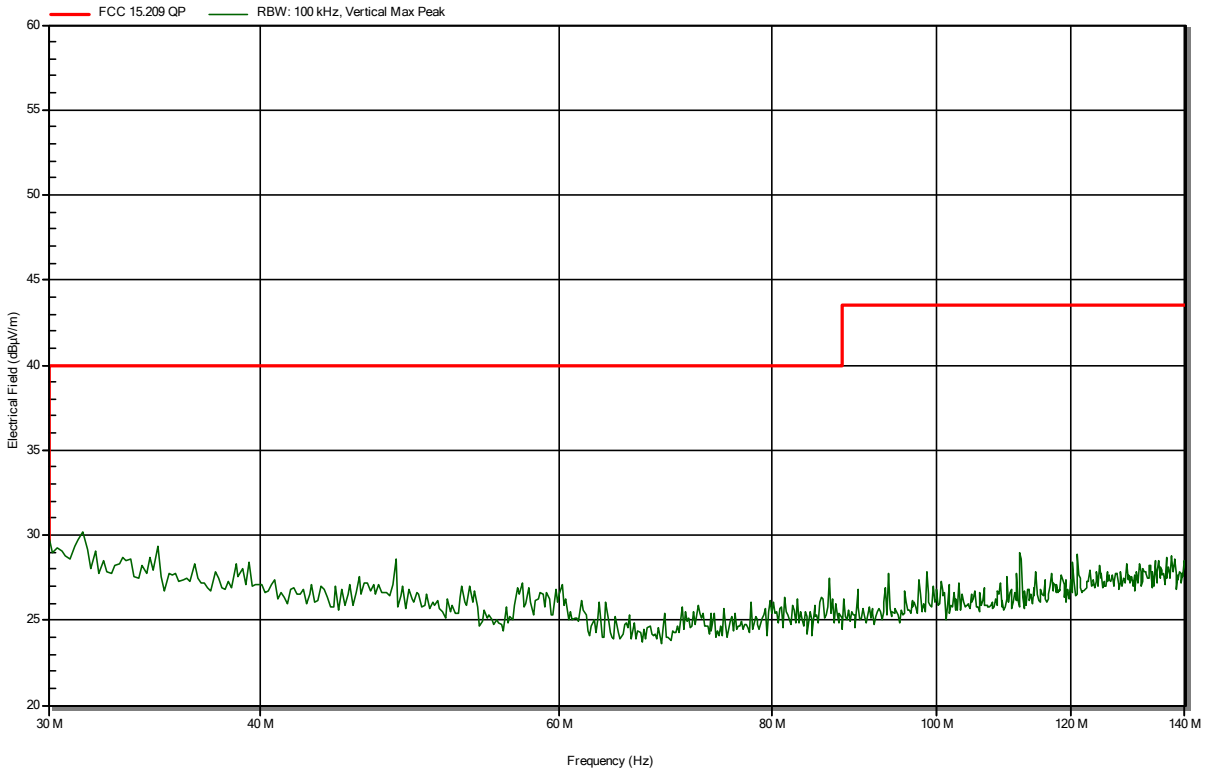
RadiMation