RADIO REPORT

FCC 47 CFR Part 15

Wireless Power Transfer Devices

Report Reference No	G0M-1801-7169-TFC209WC-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	A2LA Accredited Testing Laboratory, Certificate No.: 1983.01 FCC Test Firm Designation Number: DE0008 IC Testing Laboratory site: 3470A-2
Applicant	Dräger Safety AG & Co. KGaA
Address	Revalstraße 1 23560 Lübeck GERMANY
Test Specification	According to FCC/ISED rules
Standard	47 CFR Part 15/18 FCC MP-5:1986 ANSI C63.10:2013
Non-Standard Test Method	None
Test Scope	Full compliance test
Equipment under Test (EUT):	
Product Description	Inductive Charger
Model(s)	Induktive Power Unit
Additional Model(s)	None
Brand Name(s)	Dräger
Hardware Version(s)	8325825
Software Version(s)	8325897
FCC-ID	X6O-IC001
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	2018-06-06	
Report:		
Compiled by	Christian Weber	
Tested by (+ signature) (Responsible for Test)	Christian Weber	C. Weber .....
Approved by (+ signature) (Deputy Head of Lab)	Toralf Jahn	T. J .....
Date of Issue	2019-01-07	
Total number of pages	34	
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	2019-01-07	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
RMS	Root mean square
VBW	Video bandwidth
V_{NOM}	Nominal supply voltage

REPORT INDEX

Eurofins Product Service GmbH
Storkower Str. 38c, D-15526 Reichenwalde, Germany

1 Equipment (Test Item) Under Test

Description	Inductive Charger	
Model	Induktive Power Unit	
Additional Model(s)	None	
Brand Name(s)	Dräger	
Serial Number(s)	Unspecified	
Hardware Version(s)	8325825	
Software Version(s)	8325897	
FCC-ID	X6O-IC001	
WPT Source Subassembly	Type 3	
WPT Client Subassembly	No	
Wireless Module	No	
Radio technology	Communiction interface for wireless power transfer	
Operating frequency	2 MHz	
Modulation	ASK (Load modulation by client device)	
Highest internal frequency [MHz]	50	
Supply Voltage	V_{NOM}	24 VDC (10 – 30 VDC)
Operating Temperature	T_{NOM}	25 °C
AC/DC-Adaptor 1	Model	GT-41076-0612
	Vendor	Dräger
	Input	100-240 VAC / 50-60 Hz / 0.3A
	Output	12 VDC / 0.5 A
AC/DC-Adaptor 2	Model	GT-43004P15024-T3
	Vendor	Dräger
	Input	100-240 VAC / 50-60 Hz / 2A
	Output	24 VDC / 6.25 A
Manufacturer	Dräger Safety AG & Co. KGaA Revalstraße 1 23560 Lübeck GERMANY	

1.1 Photos – Equipment External

EUT TOP	EUT BOTTOM
	

EUT SIDE VIEW	EUT LABEL
	

AC/DC-ADAPTOR 1	AC/DC-ADAPTOR 1 LABEL
	

AC/DC-ADAPTOR 2	AC/DC-ADAPTOR 2 - ADAPTOR FOR EUT
	

AC/DC-ADAPTOR 2 - ADAPTOR FOR EUT - LABEL	AC/DC-ADAPTOR 2 - LABEL
	

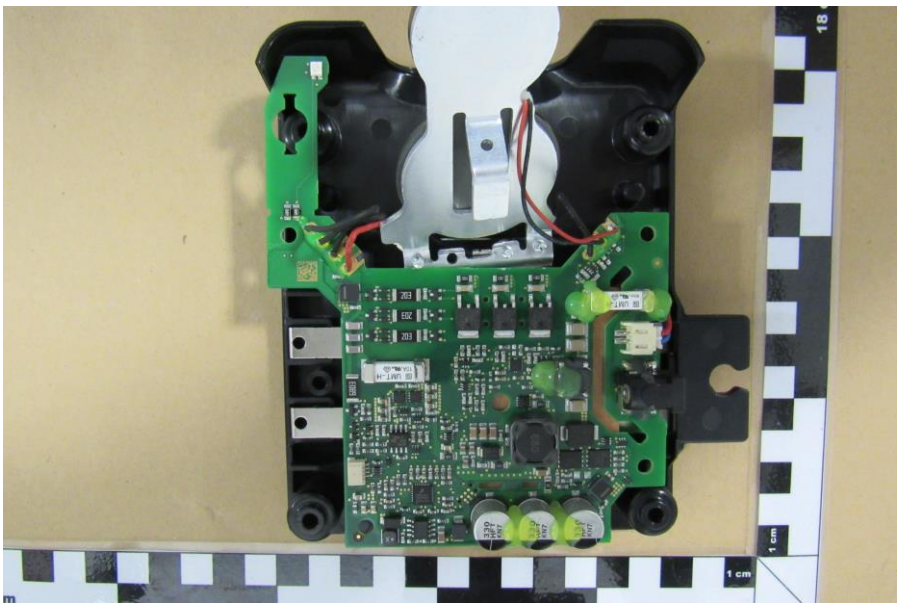
AE: CHARGING LOAD TOP	AE: CHARGING LOAD BOTTOM
	

AE: CHARGING LOAD LABEL	AE: CLIENT DEVICE TOP
	
AE: CLIENT DEVICE BOTTOM	**AE: CLIENT DEVICE LABEL**
	

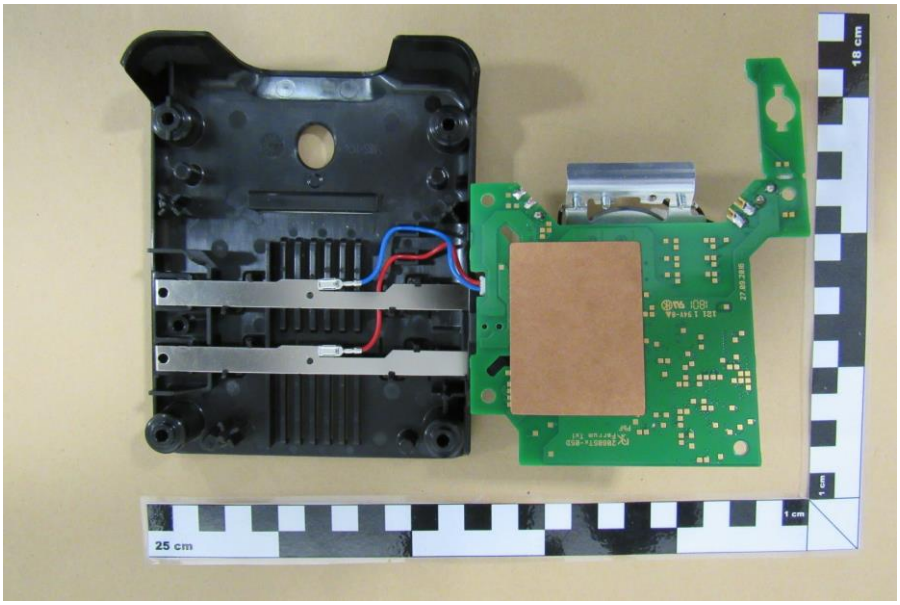
AE: CLIENT DEVICE LABEL 2


1.2 Photos – Equipment Internal

EUT INDUCTIVE COILS

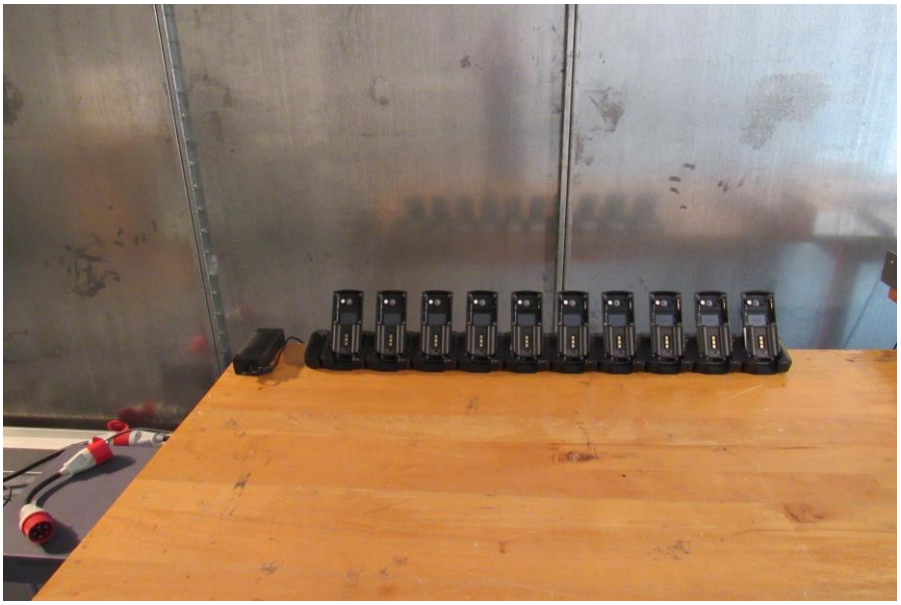

EUT PCB TOP


EUT PCB BOTTOM

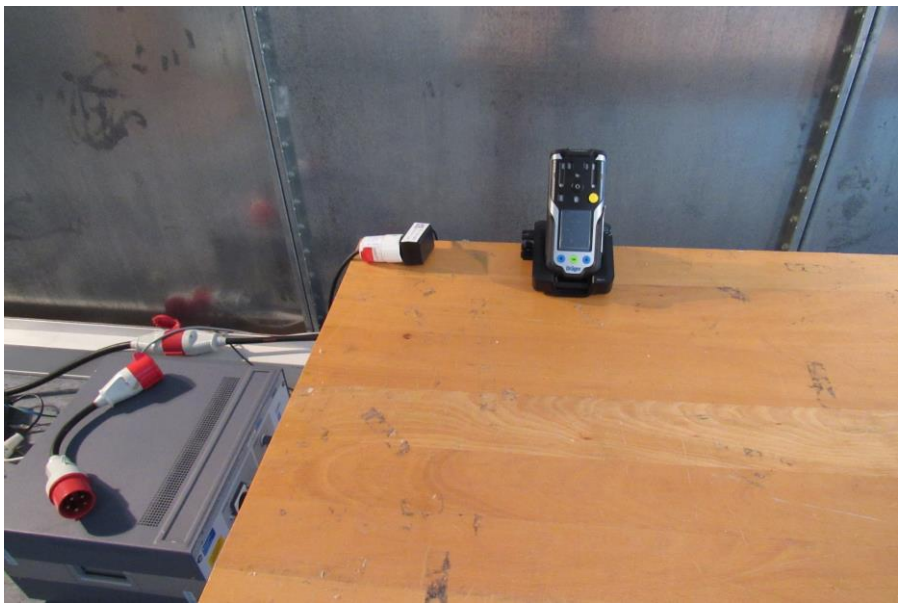


1.3 Photos – Test Setup

Radiated Emissions – 10 Chargers + Charging loads


Conducted Emissions: 10 Chargers + Charging loads


Conducted Emissions: 1 Charger + Charging load


Conducted Emissions: 1 Charger + Client device


1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	Charging load	Dräger	LBT 0200 power supply	
AE	Client Device	Dräger	X-am 8000	With LBT 0200 power supply
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
Comment:				

1.5 Test Modes

Mode	Description
Charging 1	Mode = Transmit Modulation = ASK (Load modulation from client device) Duty cycle = 100 % 10 cascaded chargers with charging loads
Charging 2	Mode = Transmit Modulation = ASK (Load modulation from client device) 1 charger with charging loads
Charging 3	Mode = Transmit Modulation = ASK (Load modulation from client device) Duty cycle = 100 % 1 charger with client device
Comment:	

Pre-tests were performed in order to determine the worst case emissions for a combination of up to 20 chargers supplied by a single ac/dc-adaptor. The combination of 10 chargers gave the worst case and is reported as worst case radiated emission case. For ac power line conducted emissions all three configurations (single charger with adaptor 1 and load, single charger with adaptor 1 and client and 10 chargers with adaptor 2 and loads) are reported

1.6 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Tx/Rx	0	2

2 Result Summary

FCC KDB 680106 D01, 47 CFR Part 15				
Product Standard Reference	**Requirement**	**Reference Method**	**Result**	**Remarks**
FCC KDB 680106 FCC 15.209	Wireless field strength emissions	ANSI C63.10:2013	PASS	
FCC KDB 680106 FCC 15.207	Wireless 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 - Wireless radiated field strength emissions

3.1.1 Information

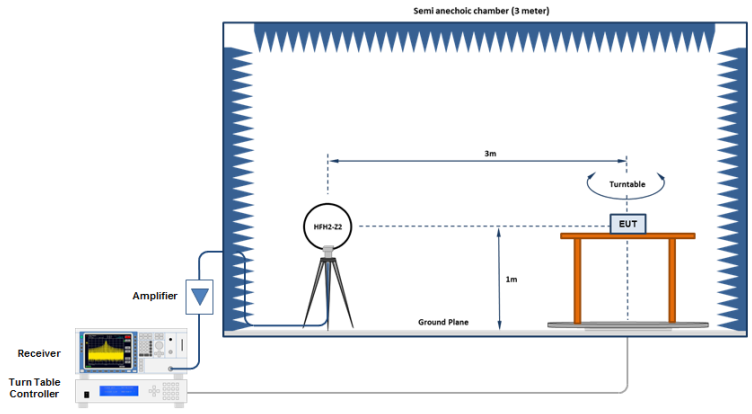
Test Information	
Product Standard Reference	FCC KDB 680106, FCC Part 15.209
Measurement Method	ANSI C63.10
Operator	Christian Weber
Mode	Charging 1
Date	2018-09-17

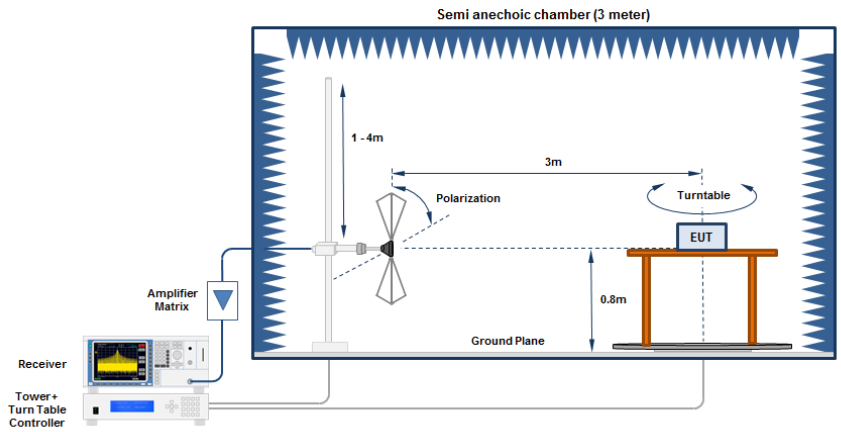
3.1.2 Limits

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	24000/F[kHz]	33.8 - 23	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
216 - 960	Quasi-Peak	200	46	3
960 - 1000	Quasi-Peak	500	54	3
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiatedemission limits in these three bands are based on measurements employing an average detector				

3.1.3 Setup

Test Setup < 30 MHz



Test Setup > 30 MHz


3.1.4 Equipment

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

Test Equipment < 30 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2017-02	2020-02
Loop Antenna	R&S	HFH2-Z2	EF00184	2017-12	2019-12
EMI Test Receiver	Rohde & Schwarz Vertriebs GmbH	ESR7	EF00943	2018-07	2019-07

Test Equipment 30 - 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2017-02	2020-02
Biconical antenna	Rohde & Schwarz Vertriebs GmbH	HK116	EF00030	2016-04	2019-04
EMI Test Receiver	Rohde & Schwarz Vertriebs GmbH	ESR7	EF00943	2018-07	2019-07
Antenna	R&S	HL223	EF00187	2016-05	2019-05

3.1.5 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

Radiated emissions under normal conditions according to FCC Part 15.209

Project number: G0M-1801-7169

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Inductive Charger
Model:	Induktive Power Unit
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 24.2°C, Unom: 120 VAC/60 Hz
Antenna:	Rohde & Schwarz HFH 2-Z2, Vertical
Mode:	WPT; 10 Chargers + Charging loads
Test Date:	2018-09-17
Note:	

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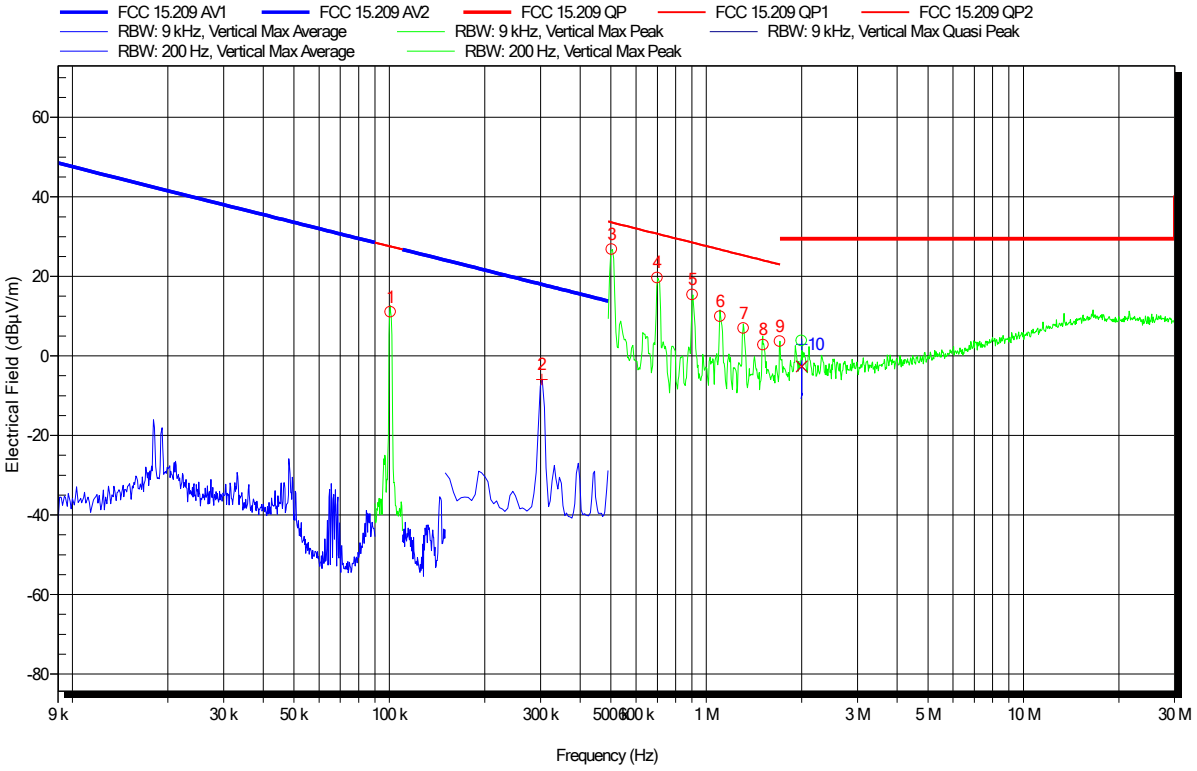

Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	100.8 kHz	Related to energy transfer (evaluated acc. to 47 cfr part 18)					
2	303 kHz	Related to energy transfer (evaluated acc. to 47 cfr part 18)					
3	503.5 kHz	Related to energy transfer (evaluated acc. to 47 cfr part 18)					
4	701.5 kHz	Related to energy transfer (evaluated acc. to 47 cfr part 18)					
5	904 kHz	Related to energy transfer (evaluated acc. to 47 cfr part 18)					
6	1.106 MHz	Related to energy transfer (evaluated acc. to 47 cfr part 18)					
7	1.309 MHz	Related to energy transfer (evaluated acc. to 47 cfr part 18)					
8	1.511 MHz	Related to energy transfer (evaluated acc. to 47 cfr part 18)					
9	1.705 MHz	Related to energy transfer (evaluated acc. to 47 cfr part 18)					
10	1.997 MHz	3.78 dBµV/m	29.5 dBµV/m	-25.72 dB	Pass	0 Degree	1 m

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
10	1.997 MHz	-2.61 dBµV/m	29.5 dBµV/m	-32.11 dB	Pass	0 Degree	1 m

Radiated emissions under normal conditions according to FCC Part 15.209

Project number: G0M-1801-7169

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Inductive Charger
Model:	Induktive Power Unit
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 24.2°C, Unom: 120 VAC/60 Hz
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	WPT; 10 Chargers + Charging loads
Test Date:	2018-09-17
Note:	

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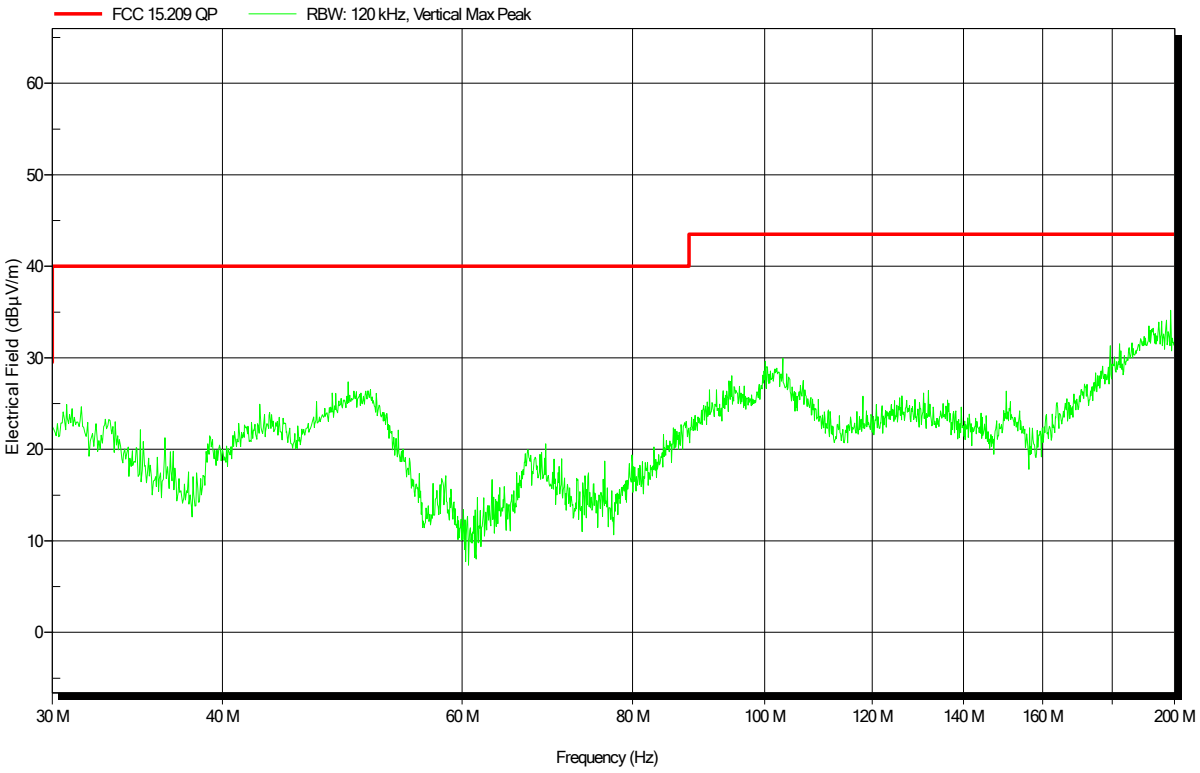

Radiated emissions under normal conditions according to FCC Part 15.209

Project number: G0M-1801-7169

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Inductive Charger
Model:	Induktive Power Unit
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 24.2°C, Unom: 120 VAC/60 Hz
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	WPT; 10 Chargers + Charging loads
Test Date:	2018-09-17
Note:	

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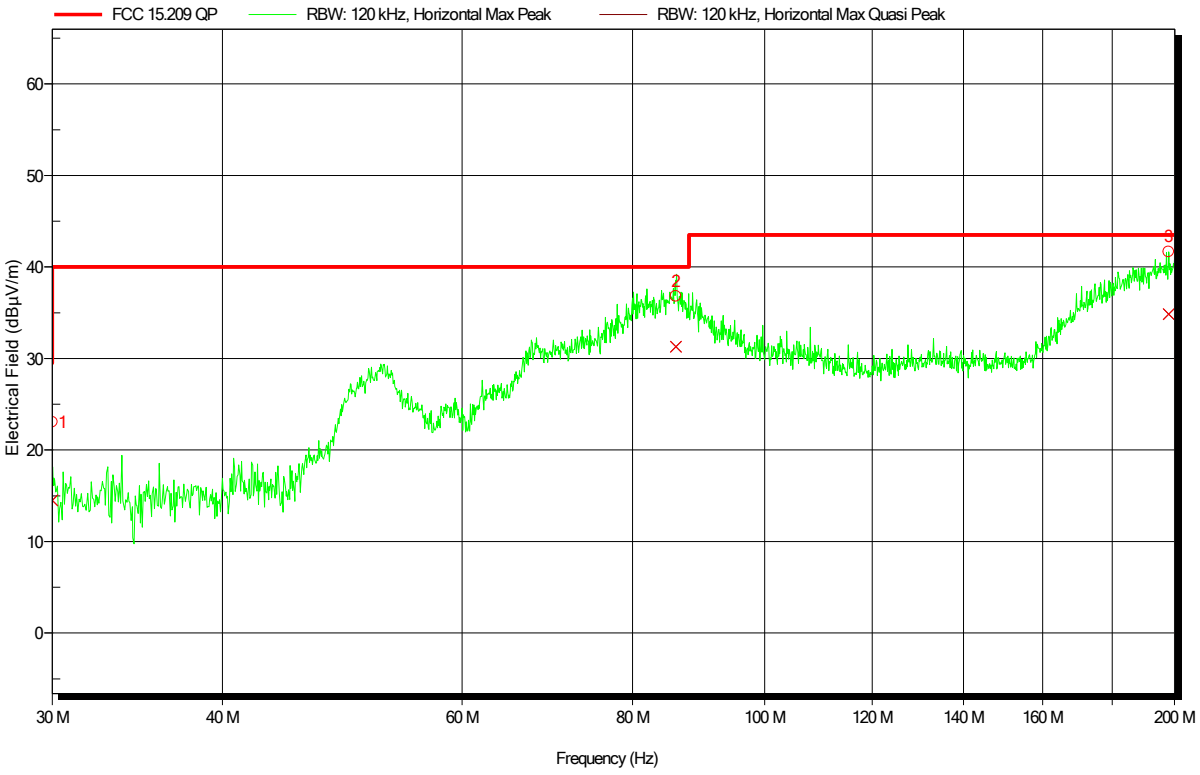

Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	30 MHz	23.05 dBµV/m	29.5 dBµV/m	-6.45 dB	Pass	30 Degree	2.2 m
2	86.086 MHz	36.79 dBµV/m	40 dBµV/m	-3.21 dB	Pass	30 Degree	2.2 m
3	197.969 MHz	41.66 dBµV/m	43.5 dBµV/m	-1.84 dB	Pass	30 Degree	2.2 m

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	30 MHz	14.5 dBµV/m	29.5 dBµV/m	-15 dB	Pass	30 Degree	2.2 m
2	86.086 MHz	31.3 dBµV/m	40 dBµV/m	-8.7 dB	Pass	30 Degree	2.2 m
3	197.969 MHz	34.84 dBµV/m	43.5 dBµV/m	-8.66 dB	Pass	30 Degree	2.2 m

Radiated emissions under normal conditions according to FCC Part 15.209

Project number: G0M-1801-7169

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Inductive Charger
Model:	Induktive Power Unit
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 24.2°C, Unom: 120 VAC/60 Hz
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	WPT; 10 Chargers + Charging loads
Test Date:	2018-09-17
Note:	

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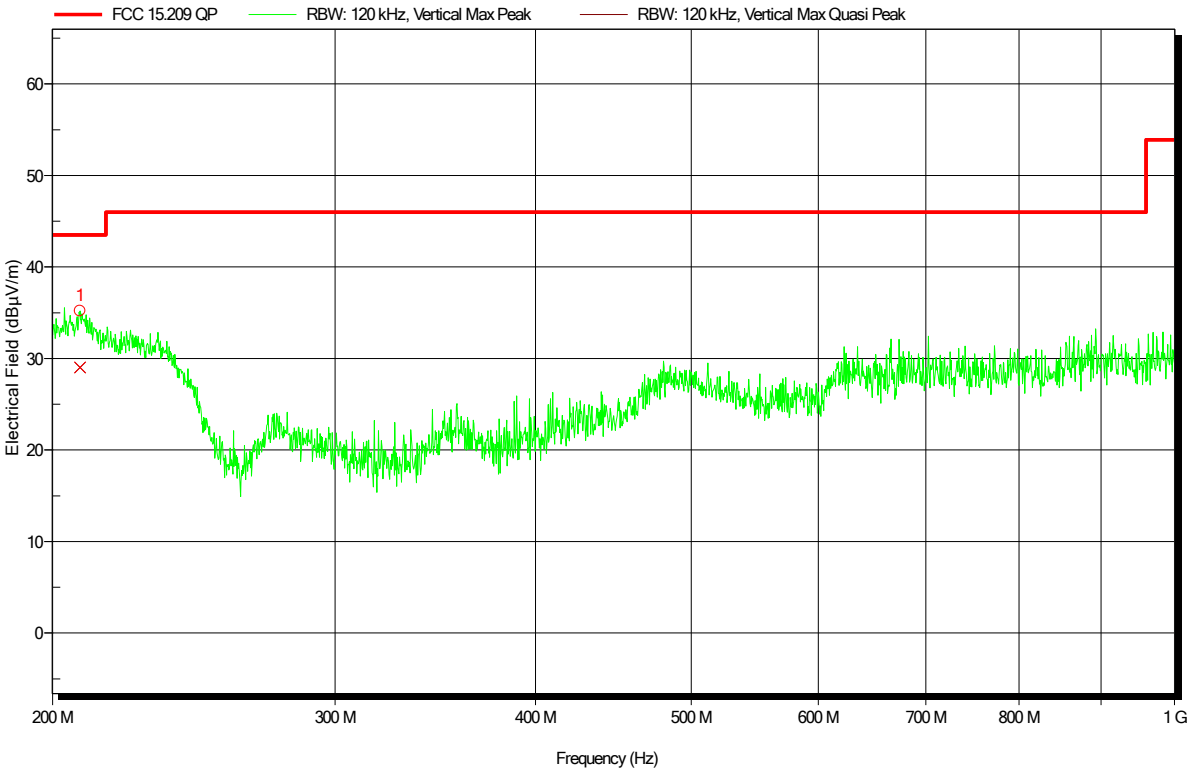

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	208.13 MHz	29.01 dBµV/m	43.5 dBµV/m	-14.49 dB	Pass	-120 Degree	1 m

Radiated emissions under normal conditions according to FCC Part 15.209

Project number: G0M-1801-7169

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Inductive Charger
Model:	Induktive Power Unit
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 24.2°C, Unom: 120 VAC/60 Hz
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	WPT; 10 Chargers + Charging loads
Test Date:	2018-09-17
Note:	

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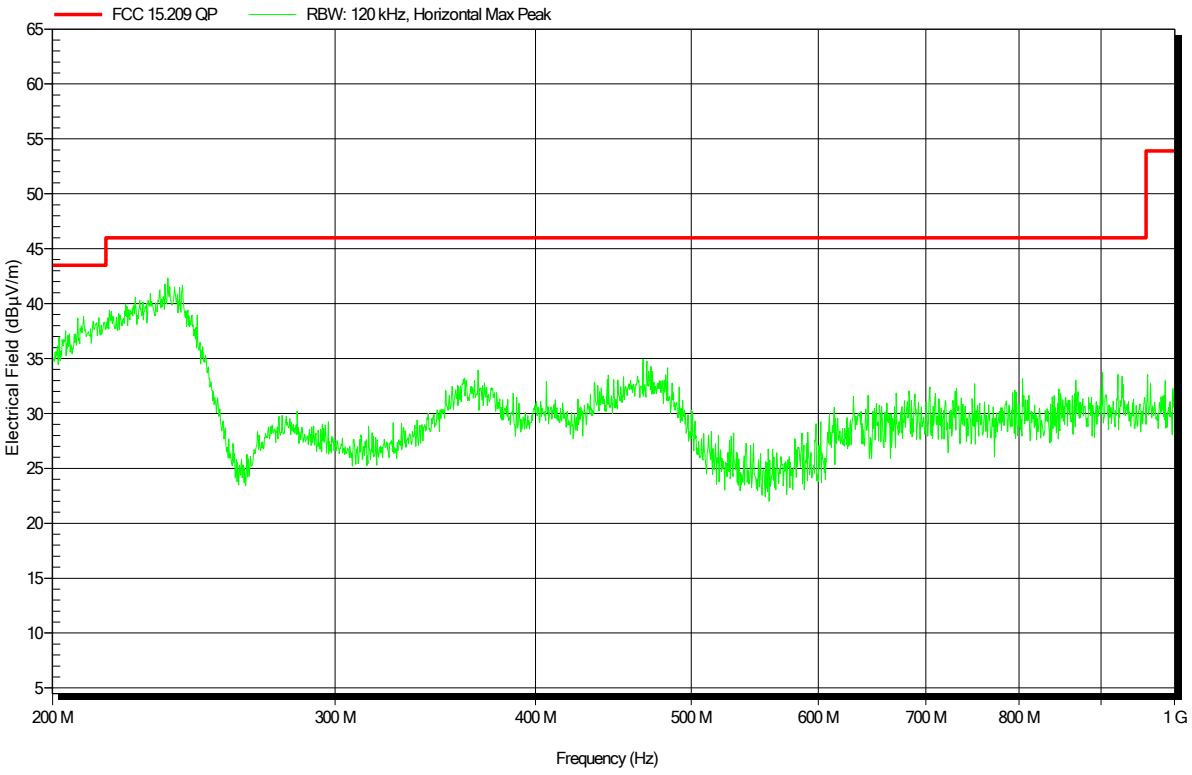


3.2 Test Conditions and Results - Wireless ac power line conducted emissions

3.2.1 Information

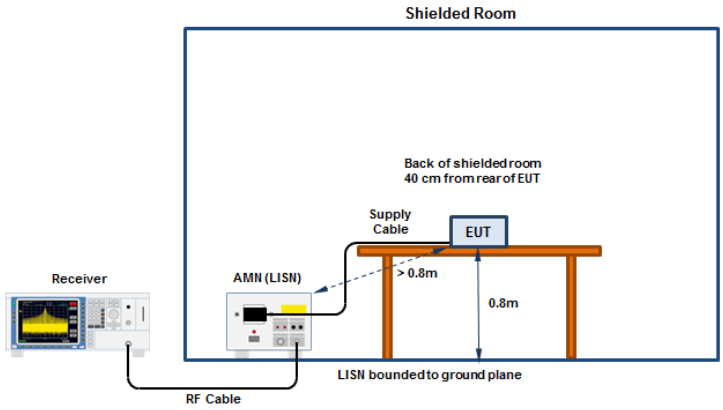
Test Information	
Reference	FCC § 15.207; ISED RSS-Gen, Issue 5
Measurement Method	ANSI C63.10 6.2
Operator	Christian Weber
Mode	Charging 1, Charging 2, Charging 3
Date	2018-09-18

3.2.2 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		

3.2.3 Setup

Test Setup



3.2.4 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
LISN	R&S	ESH2-Z5	EF00182	2017-01	2019-01
EMI Test Receiver	Rohde & Schwarz Vertriebs GmbH	ESR7	EF00943	2018-07	2019-07
Pulse Limiter	Rohde & Schwarz Vertriebs GmbH	ESH3-Z2	EF01063	2018-07	2019-07

EMI voltage test in the ac-mains according to FCC Part 15C/B

Project number: G0M-1801-7169

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Inductive Charger
Model:	Induktive Power Unit
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 24.2°C, Unom: 120 VAC/60 Hz
LISN:	ESH2-Z5 N
Mode:	WPT; 10 Chargers + Charging loads
Test Date:	2018-09-18
Note:	

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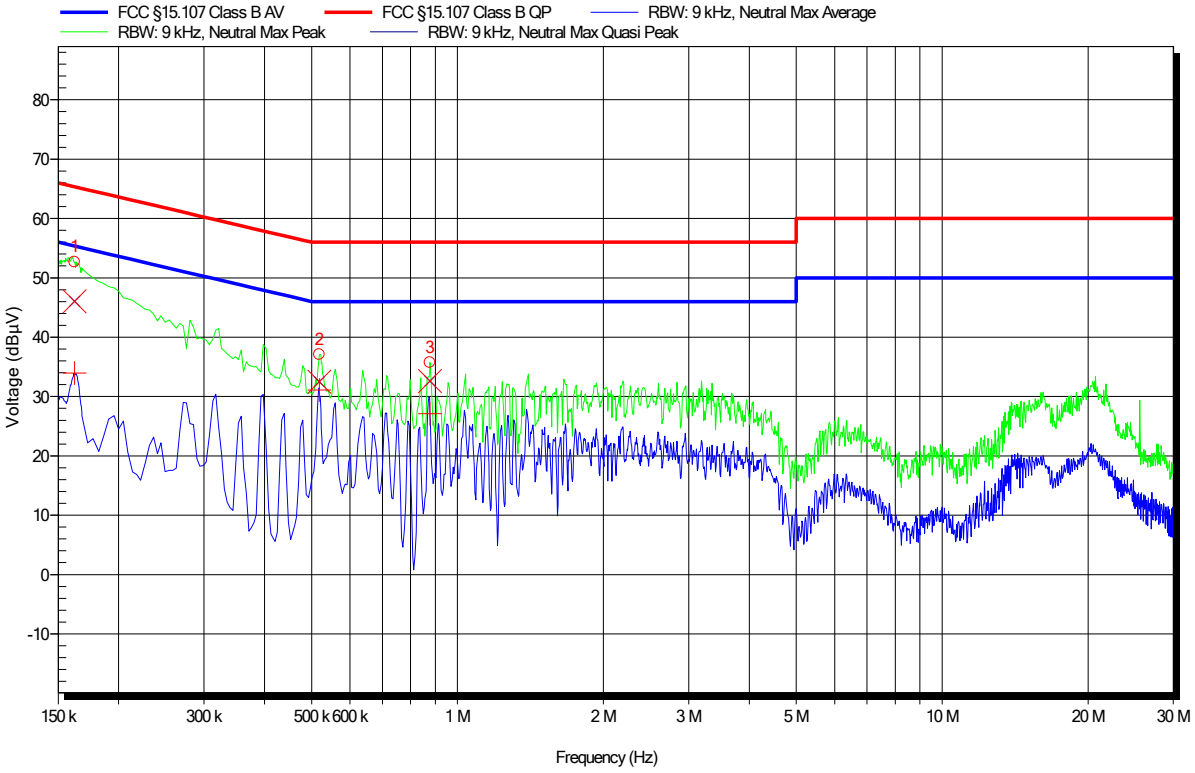

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	162.15 kHz	46.03 dBµV	65.35 dBµV	-19.32 dB	Pass
2	518.55 kHz	32.49 dBµV	56 dBµV	-23.51 dB	Pass
3	877.2 kHz	32.62 dBµV	56 dBµV	-23.38 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	162.15 kHz	33.95 dBµV	55.35 dBµV	-21.4 dB	Pass
2	518.55 kHz	31.11 dBµV	46 dBµV	-14.89 dB	Pass
3	877.2 kHz	27.12 dBµV	46 dBµV	-18.88 dB	Pass

EMI voltage test in the ac-mains according to FCC Part 15C/B

Project number: G0M-1801-7169

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Inductive Charger
Model:	Induktive Power Unit
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 24.2°C, Unom: 120 VAC/60 Hz
LISN:	ESH2-Z5 L
Mode:	WPT; 10 Chargers + Charging loads
Test Date:	2018-09-18
Note:	

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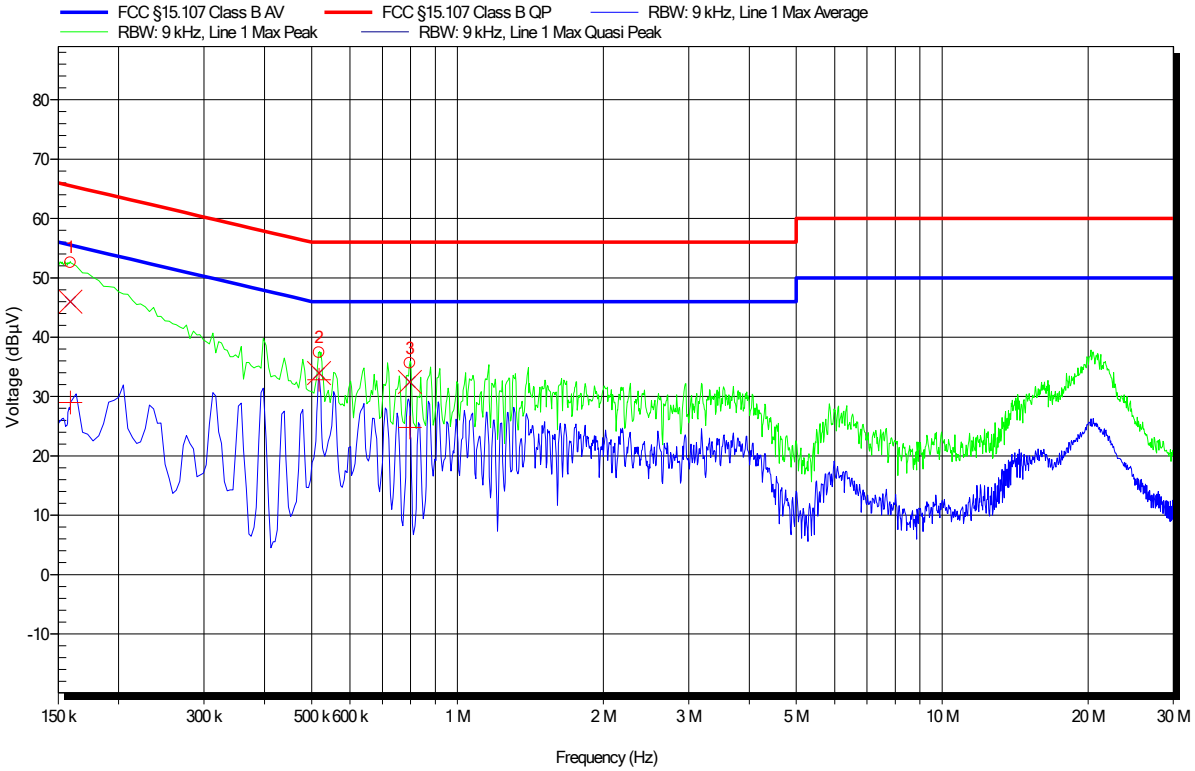

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	159 kHz	45.97 dBµV	65.52 dBµV	-19.54 dB	Pass
2	518.1 kHz	33.94 dBµV	56 dBµV	-22.06 dB	Pass
3	798 kHz	32.46 dBµV	56 dBµV	-23.54 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	159 kHz	29 dBµV	55.52 dBµV	-26.51 dB	Pass
2	518.1 kHz	32.83 dBµV	46 dBµV	-13.17 dB	Pass
3	798 kHz	24.77 dBµV	46 dBµV	-21.23 dB	Pass

EMI voltage test in the ac-mains according to FCC Part 15C/B

Project number: G0M-1801-7169

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Inductive Charger
Model:	Induktive Power Unit
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 24.2°C, Unom: 120 VAC/60 Hz
LISN:	ESH2-Z5 N
Mode:	WPT; 1 Charger + Charging load
Test Date:	2018-09-18
Note:	

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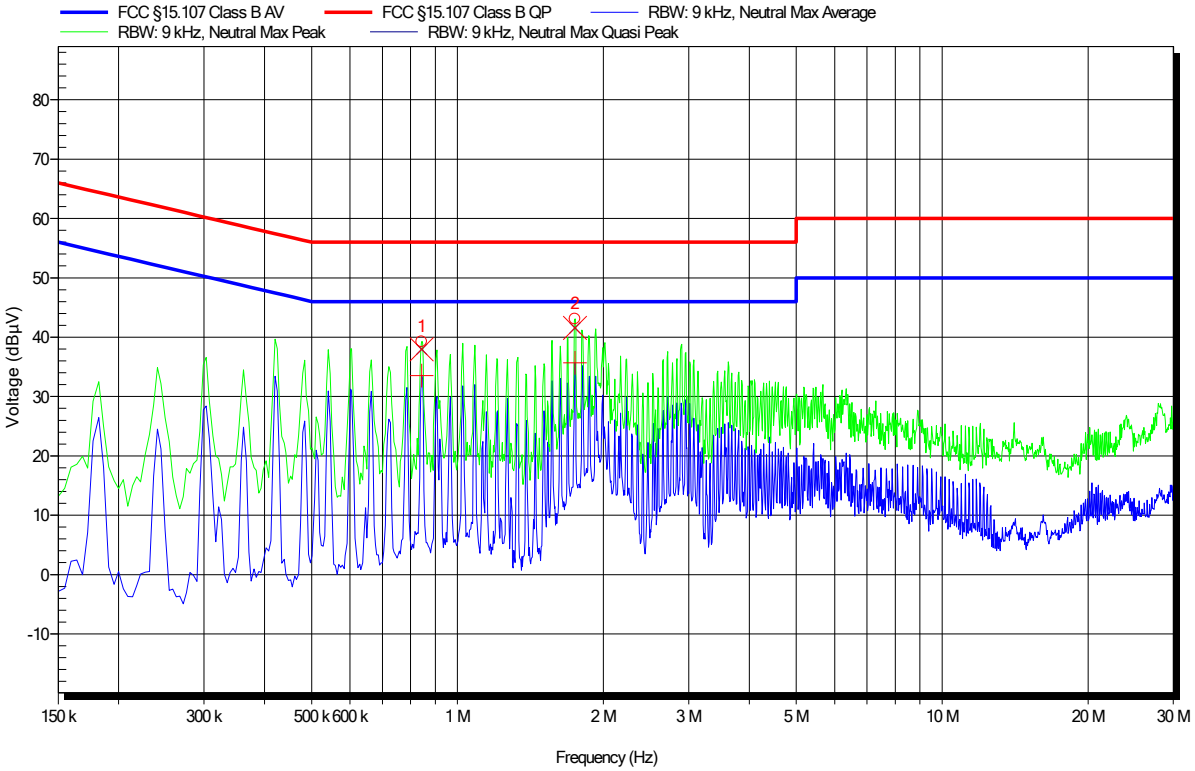

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	843.45 kHz	37.95 dBµV	56 dBµV	-18.05 dB	Pass
2	1.747 MHz	41.56 dBµV	56 dBµV	-14.44 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	843.45 kHz	33.53 dBµV	46 dBµV	-12.47 dB	Pass
2	1.747 MHz	35.7 dBµV	46 dBµV	-10.3 dB	Pass

EMI voltage test in the ac-mains according to FCC Part 15C/B

Project number: G0M-1801-7169

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Inductive Charger
Model:	Induktive Power Unit
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 24.2°C, Unom: 120 VAC/60 Hz
LISN:	ESH2-Z5 L
Mode:	WPT; 1 Charger + Charging load
Test Date:	2018-09-18
Note:	

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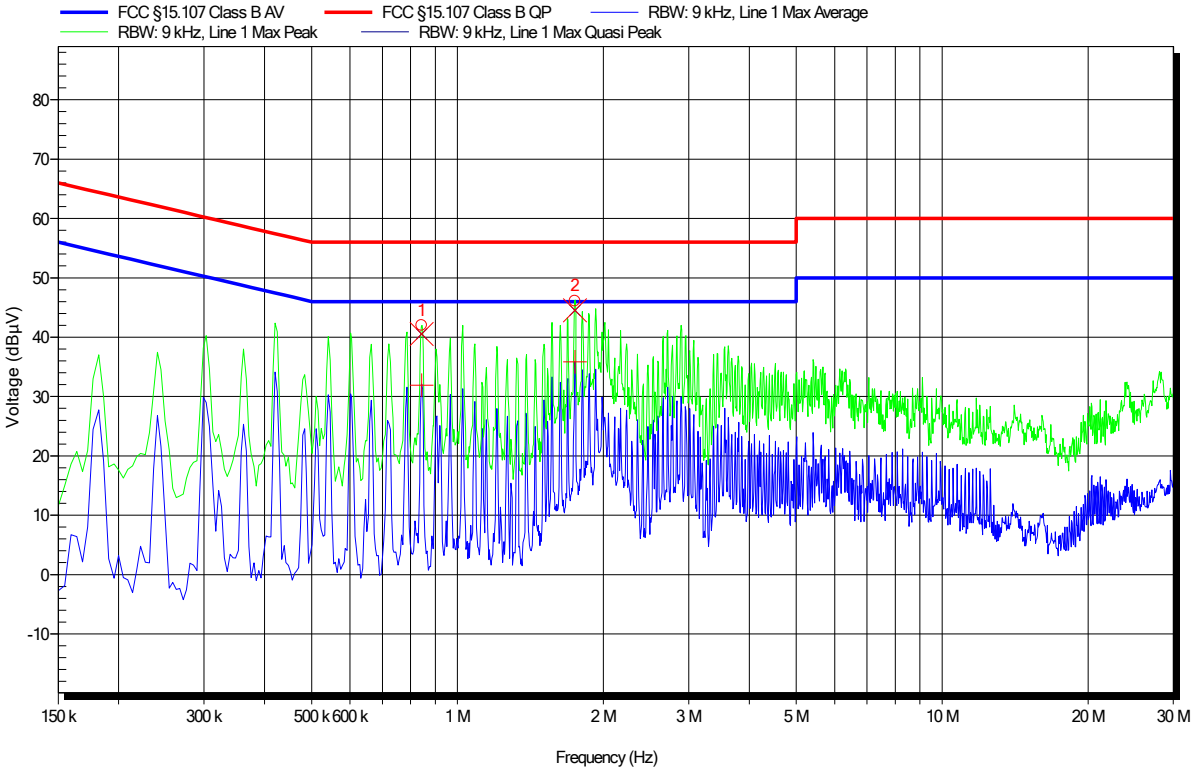

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	843 kHz	40.52 dBµV	56 dBµV	-15.48 dB	Pass
2	1.747 MHz	44.54 dBµV	56 dBµV	-11.46 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	843 kHz	31.91 dBµV	46 dBµV	-14.09 dB	Pass
2	1.747 MHz	35.86 dBµV	46 dBµV	-10.14 dB	Pass

EMI voltage test in the ac-mains according to FCC Part 15C/B

Project number: G0M-1801-7169

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Inductive Charger
Model:	Induktive Power Unit
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 24.2°C, Unom: 120 VAC/60 Hz
LISN:	ESH2-Z5 N
Mode:	WPT; 1 Charger + Client device
Test Date:	2018-09-18
Note:	

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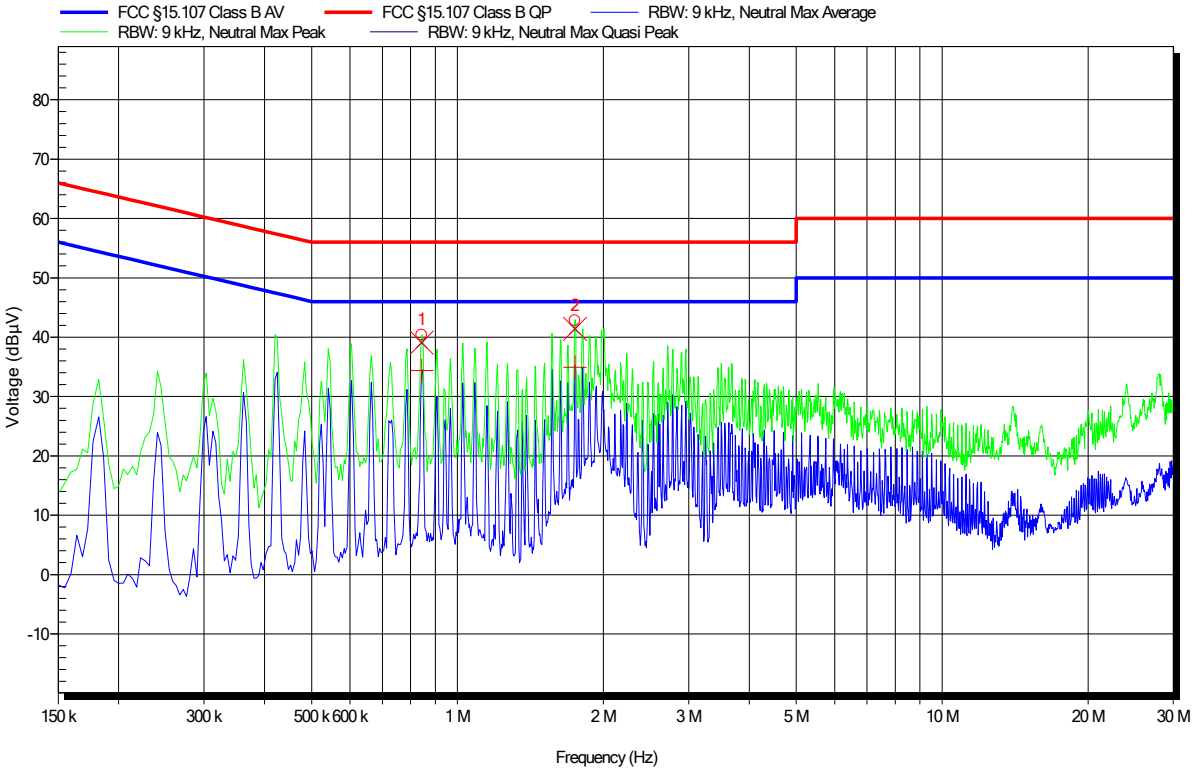

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	843.9 kHz	39.06 dBµV	56 dBµV	-16.94 dB	Pass
2	1.747 MHz	41.38 dBµV	56 dBµV	-14.62 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	843.9 kHz	34.37 dBµV	46 dBµV	-11.63 dB	Pass
2	1.747 MHz	34.95 dBµV	46 dBµV	-11.05 dB	Pass

EMI voltage test in the ac-mains according to FCC Part 15C/B

Project number: G0M-1801-7169

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Inductive Charger
Model:	Induktive Power Unit
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Weber
Test Conditions:	Tnom: 24.2°C, Unom: 120 VAC/60 Hz
LISN:	ESH2-Z5 L
Mode:	WPT; 1 Charger + Client device
Test Date:	2018-09-18
Note:	

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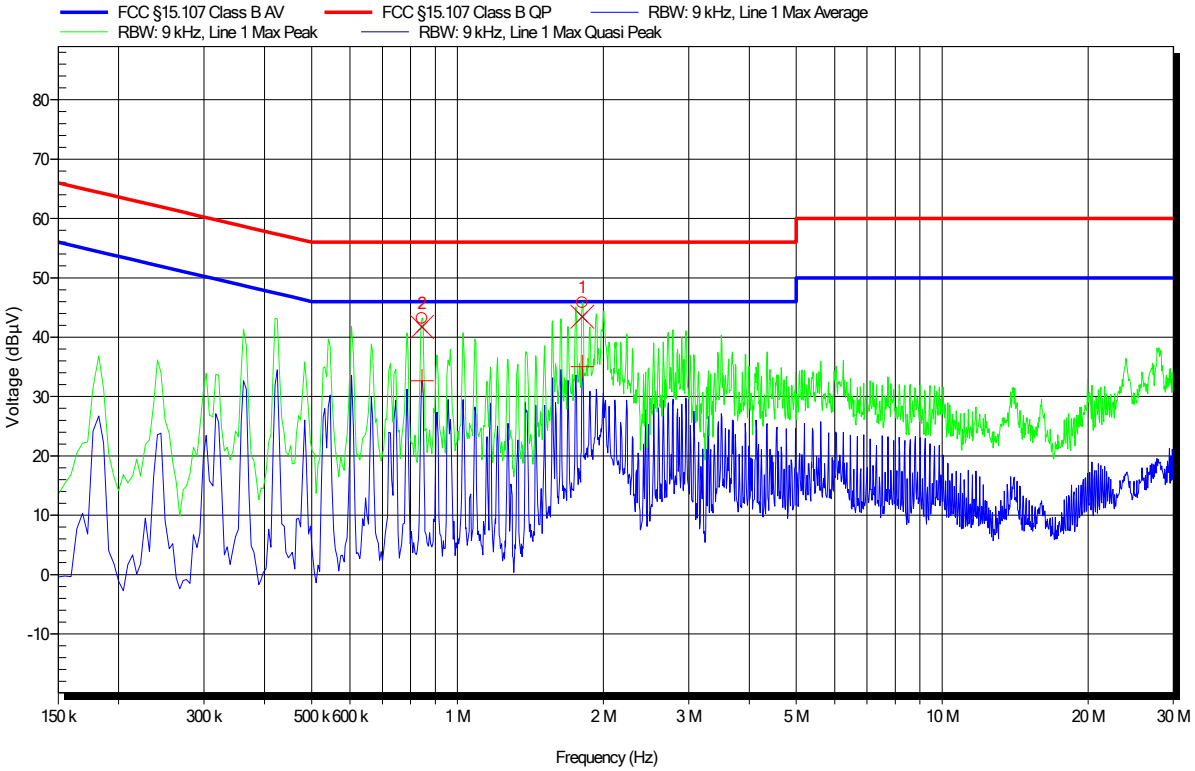

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	1.81 MHz	43.43 dBµV	56 dBµV	-12.57 dB	Pass
2	844.8 kHz	41.71 dBµV	56 dBµV	-14.29 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	1.81 MHz	35.05 dBµV	46 dBµV	-10.95 dB	Pass
2	844.8 kHz	32.68 dBµV	46 dBµV	-13.32 dB	Pass