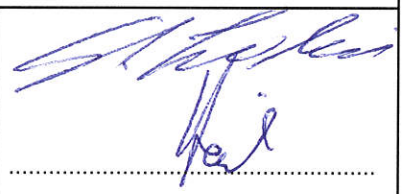
EMC TEST REPORT

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

Report Reference No	G0M-1803-7309-EF0215B-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	Dräger Safety AG & Co. KGaA
Address	Revalstraße 1 23560 Lübeck 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	Repeater for ISA100 wireless Network
Model(s)	Polytron Repeater ISA
Additional Model(s)	None
Brand Name(s)	None
Hardware Version(s)	8327000-00
Software Version(s)	GSTox image 8326059 V0.12.1, SW Murata ISA 100 8328374 R1.01.13, SW Telit BLT V3.12.0002
FCC-ID	X6O-RC001
IC	5895F-RC001
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	2019-05-20	
Report:		
Compiled by	Stephan Liebich	
Tested by (+ signature) (Responsible for Test)	Stephan Liebich Matthias Handrik	
Approved by (+ signature) (Deputy Head of Lab)	Jens Marquardt	
Date of Issue	2019-10-02	
Total number of pages	46	
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	2019-10-02	Initial Release	

REPORT INDEX

1 Equipment (Test Item) Under Test

Description	Repeater for ISA100 wireless Network	
Model	Polytron Repeater ISA	
Additional Model(s)	None	
Brand Name(s)	None	
Serial Number(s)	ARME-0006	
Hardware Version(s)	8327000-00	
Software Version(s)	GSTox image 8326059 V0.12.1, SW Murata ISA 100 8328374 R1.01.13, SW Telit BLT V3.12.0002	
FCC-ID	X6O-RC001	
IC	5895F-RC001	
Class	Class B	
Equipment type	Table top	
Highest internal frequency [MHz]	2480	
Radio Module 1	Type	Bluetooth
	Model	BlueMod + S42 ATEX
	Manufacturer	Telit Communication
	FCC-ID	RFRMS42
	IC	4957A-MS42
Radio Module 2	Type	IEEE 802.15.4
	Model	LBBA0ZZ1EU-951
	Manufacturer	Murata Manufacturing Co.
	FCC-ID	VPYLB1EU
	IC	772C-LB1EU
Supply Voltage	V_{NOM}	14.4 V DC (internal battery) 24 V DC (external power supply)
AC/DC-Adaptor	None	
Manufacturer	Dräger Safety AG & Co. KGaA Revalstraße 1 23560 Lübeck GERMANY	

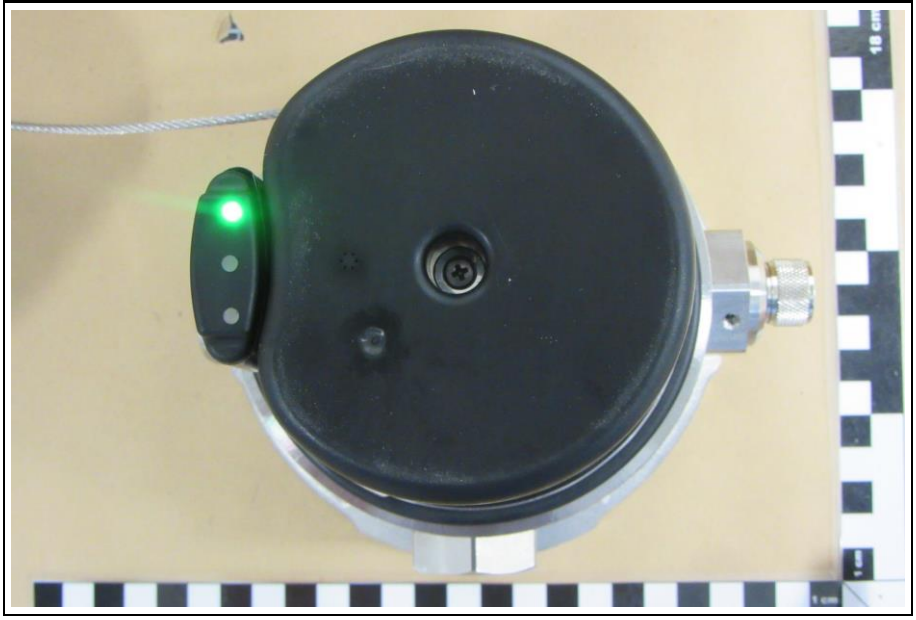
1.1 Equipment Ports

Name	Type	Attributes		Comment
Mains	DC	Count: Direction: Service only:	1 In No	-
Antenna	IO	Count: Direction: Service only:	1 IO No	-

Description:	
AC	AC mains power input/output port
DC	DC power input/output port
IO	Input/Output port
TP	Telecommunication port
NE	Non-electrical port

1.2 Equipment Photos - Internal

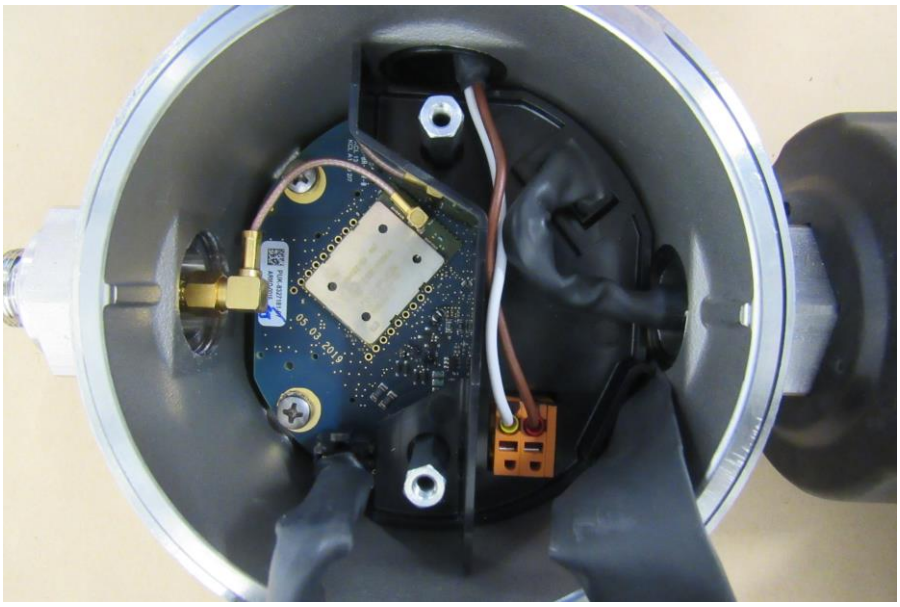
EUT BATTERY

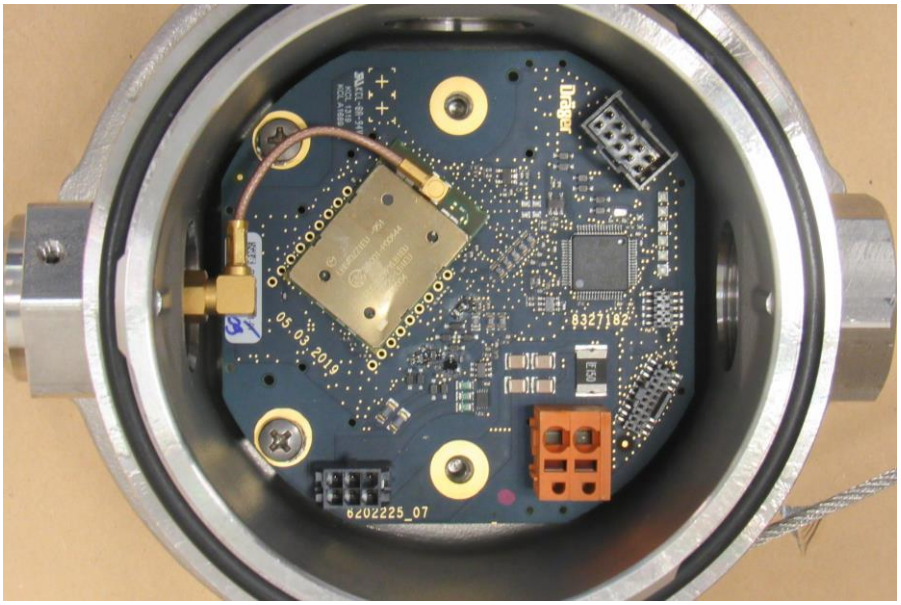


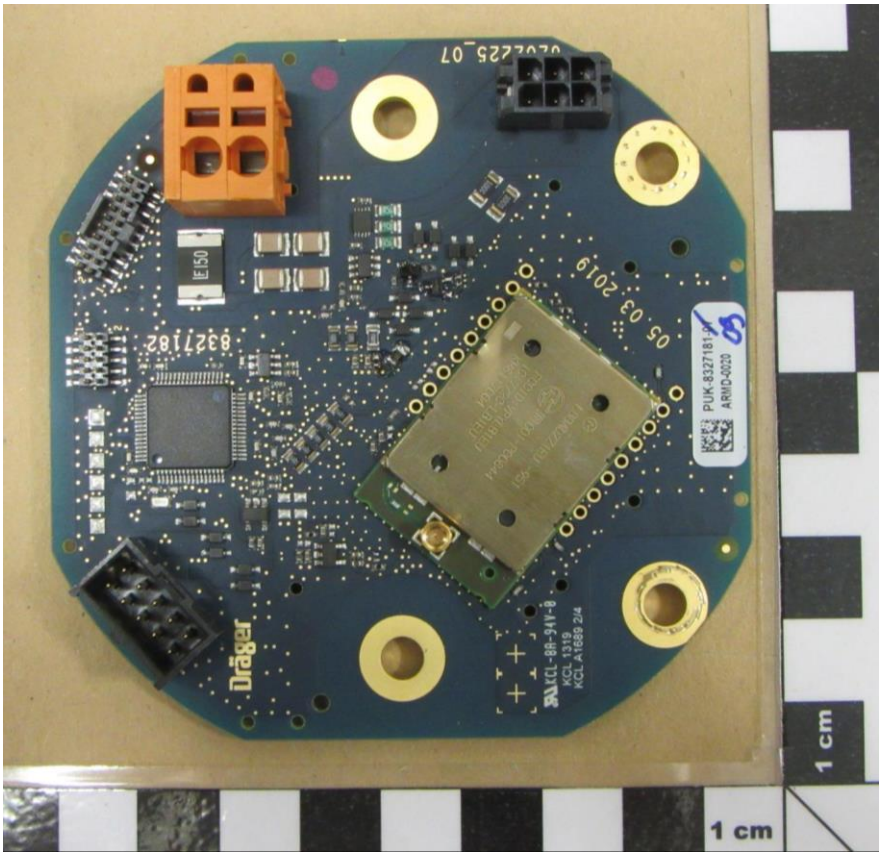
EUT BATTERY CASE

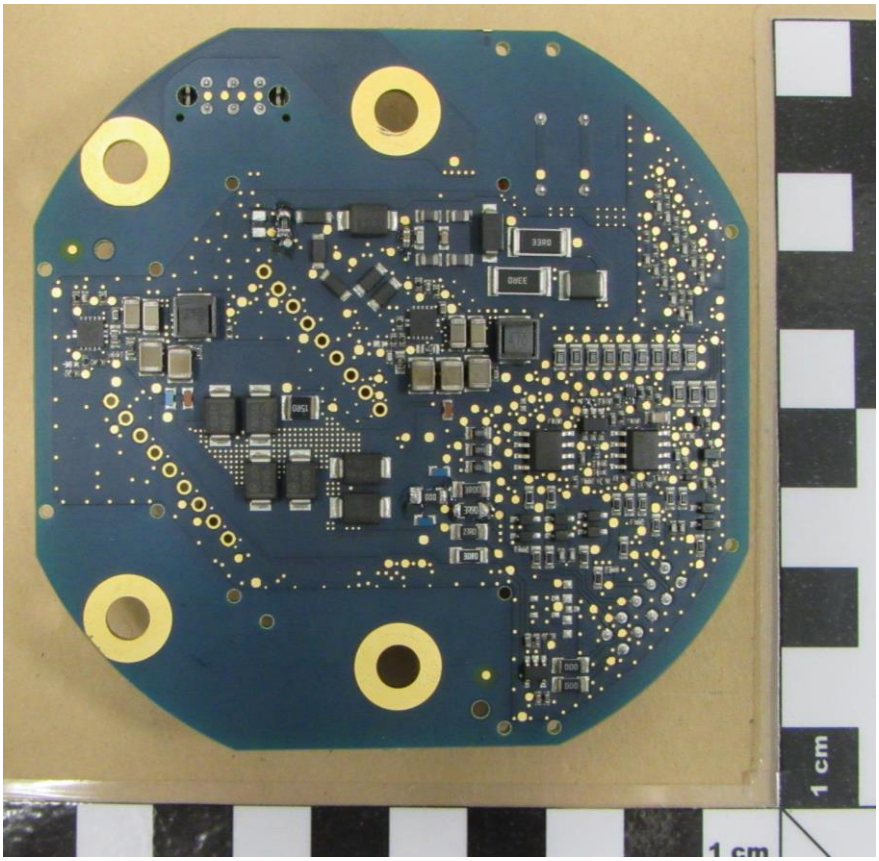
EUT LID

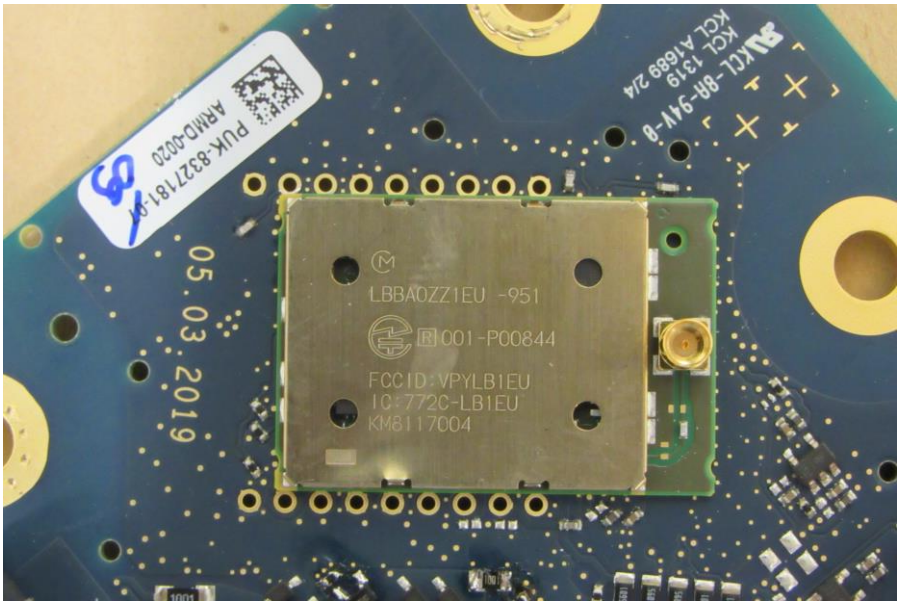
EUT WITHOUT BATTERY CASE

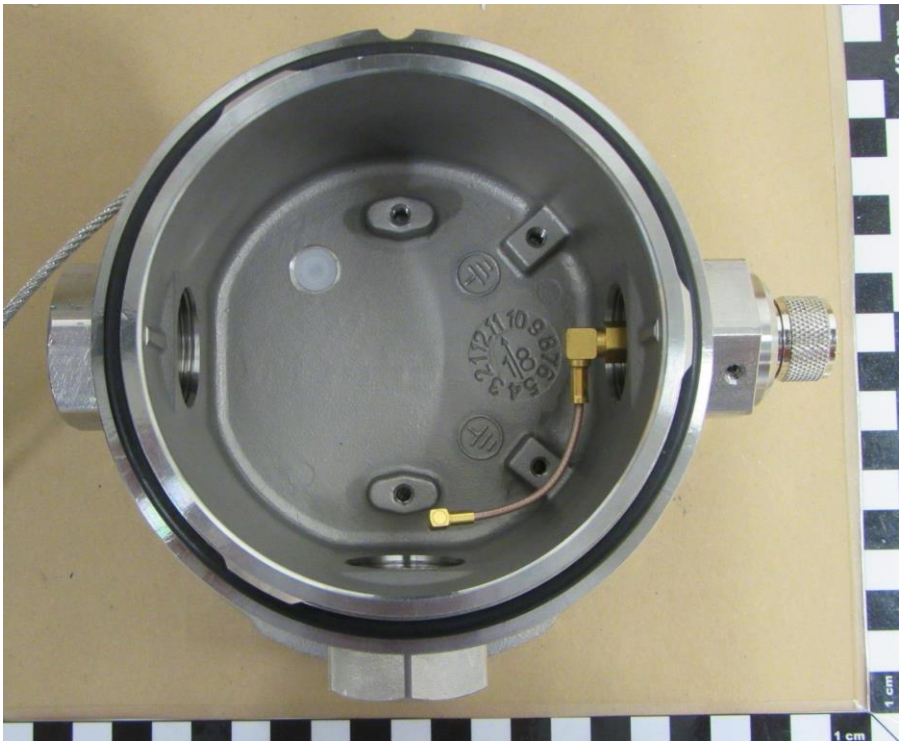


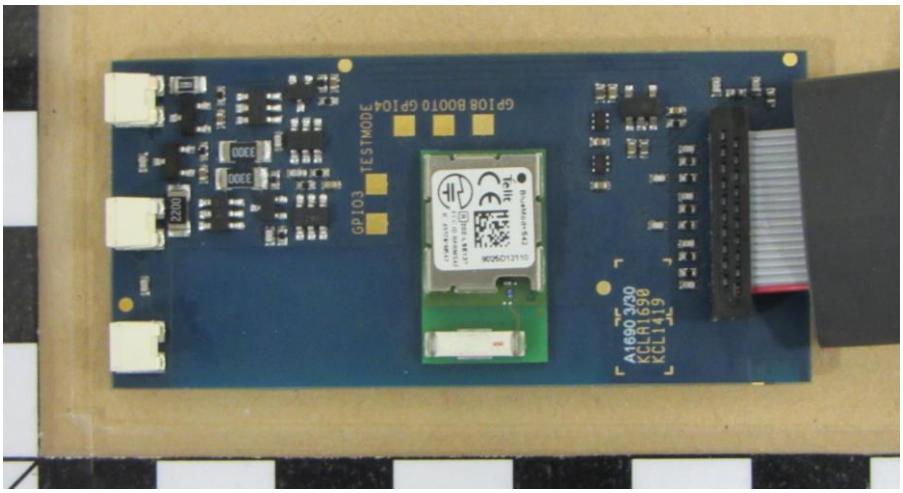
EUT WITH OPEN CASE


EUT MAIN BOARD TOP SIDE


EUT MAIN BOARD BOTTOM SIDE


EUT MAIN BOARD TOP SIDE FOCUS


EUT WITHOUT MAIN BOARD


DISPLAY CIRCUIT BOARD TOP SIDE


DISPLAY CIRCUIT BOARD BOTTOM SIDE

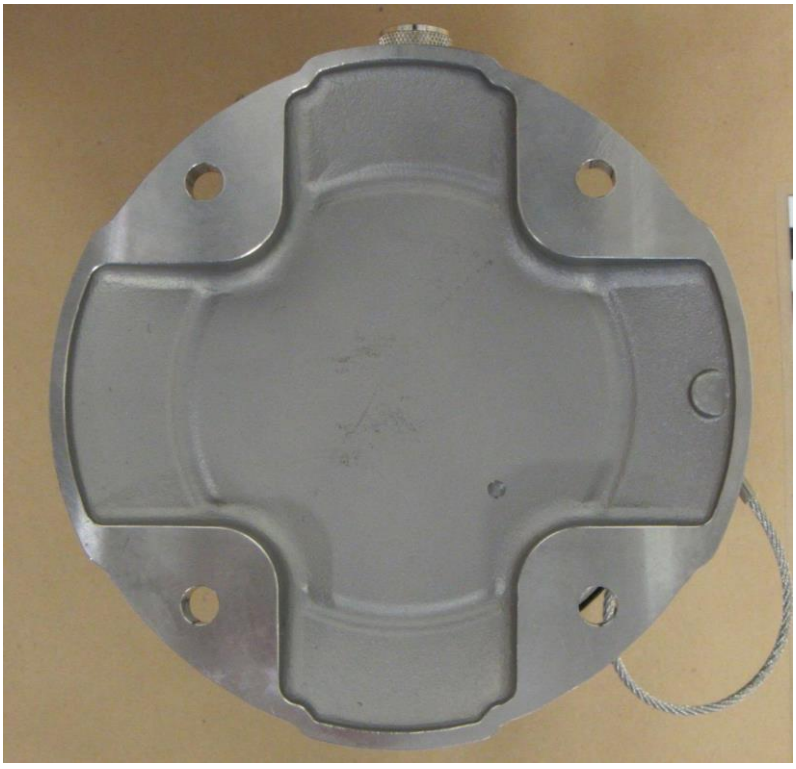

1.3 Equipment Photos - External

EUT WITH LOCAL ANTENNA AND INTERNAL BATTERY


EUT WITH REMOTE ANTENNA AND EXTERNAL POWER SUPPLY

EUT TOP SIDE

EUT BOTTOM SIDE



EUT FRONT SIDE (GAS SENSOR PLUG)


EUT LEFT SIDE


EUT BACK SIDE (ANTENNA PLUG)

EUT RIGHT SIDE (POWER SUPPLY PLUG)

1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	Antenna local	Huber+Suhner	1399.17.0237	-
AE	Fixed Gas Detector	Dräger	P6100	-
AE	Antenna remote	Huber+Suhner	1324.17.0114	-
CBL	Remote antenna cable 2 m	Atem	216.41.41.2000A	RG213/U
MON	Notebook	DELL	Latitude 4590	-
MON	Software	Dräger	GSTerm2 V1.20.0	-
AE	Access Point	Yokogawa	YFGW510	-
AE	Management Station	Yokogawa	YFGW410	-
AE	USB Bluetooth Dongle	Logitech	USB Bluetooth V4.0 Dongle	-
AE	AC/DC Adapter	Phoenix Contact	Uno Power	24 VDC
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
MON	Monitoring Equipment			
CBL	Connecting Cable			
Comment:				

1.5 Operational Modes

Mode #	Description
1	Measure & Maintenance mode (in alarm condition) + Bluetooth idle + IEEE 802.15.4 idle (EUT is in status Idle and has no connection to devices)
2	Measure & Maintenance mode (in alarm condition) + Bluetooth Tx + IEEE 802.15.4 Tx (EUT receives gas detection data from Fixed Gas Detector and send this data every second via ISA 100 / Bluetooth to Access Point / Notebook)
Comment:	

1.6 EUT Configuration

Configuration #	Description
1	EUT powered up and powered with internal battery (14.1 V DC). Local antenna is connected with EUT. Fixed Gas Detector is placed in chamber. Access Point and Management Station is behind the irradiation antenna and connected with each other via LAN. Management Station is connected with Notebook via LAN. EUT is connected with Notebook via Bluetooth, too. Software GSTerm2 V1.20.0 on Notebook is for monitoring the EUT. Notebook is placed outside the chamber.
2	EUT powered up and powered with external power supply (24 V DC). Remote antenna is connected with EUT via 2 m cable. Fixed Gas Detector is placed in chamber. Access Point and Management Station is behind the irradiation antenna and connected with each other via LAN. Management Station is connected with Notebook via LAN. EUT is connected with Notebook via Bluetooth, too. Software GSTerm2 V1.20.0 on Notebook is for monitoring the EUT. Notebook is placed outside the chamber.
3	EUT powered up and powered via AC/DC adapter (120 V / 60 Hz). Remote antenna is connected with EUT via 2 m cable. Fixed Gas Detector is placed in chamber. Access Point and Management Station is behind the irradiation antenna and connected with each other via LAN. Management Station is connected with Notebook via LAN. EUT is connected with Notebook via Bluetooth, too. Software GSTerm2 V1.20.0 on Notebook is for monitoring the EUT. Notebook is placed outside the 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	1
FCC 15.107 ICES-003, 8, 6.2	AC power line conducted emissions	ANSI C63.4:2014	PASS	1
Comment: 1 → The test data of the worst-case conditions were recorded and shown on the next pages.				

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

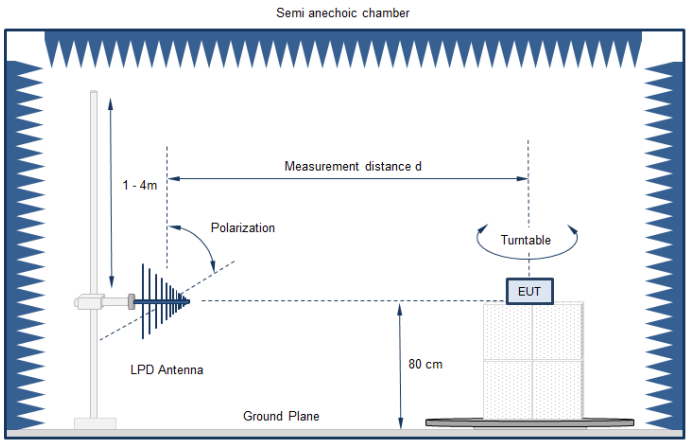
2.1 Test Conditions and Results - Radiated emissions acc. to ANSI C63.4

2.1.1 Information

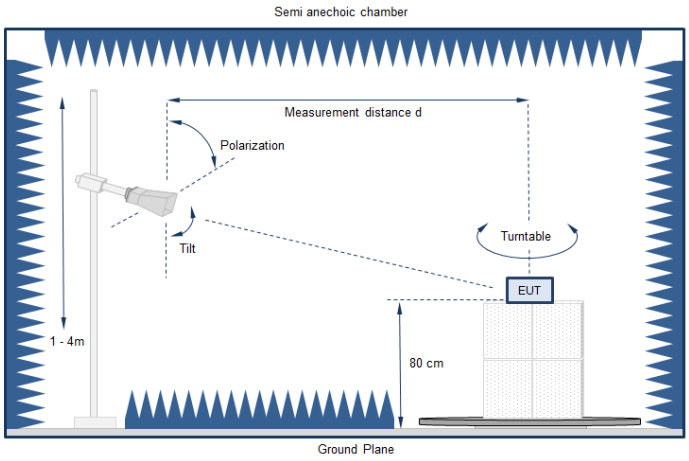
Test Information	
Reference	FCC 15.109, ICES-003, 8, 6.1
Reference method	ANSI C63.4:2014 Section 8
Equipment class	Class B
Equipment type	Table top
Highest internal frequency [MHz]	2480
Measurement range	30 MHz to 13000 MHz
Temperature [°C]	21
Humidity [%]	40
Operator	Stephan Liebich supervised by Matthias Handrik
Date	2019-09-11

2.1.2 Setup

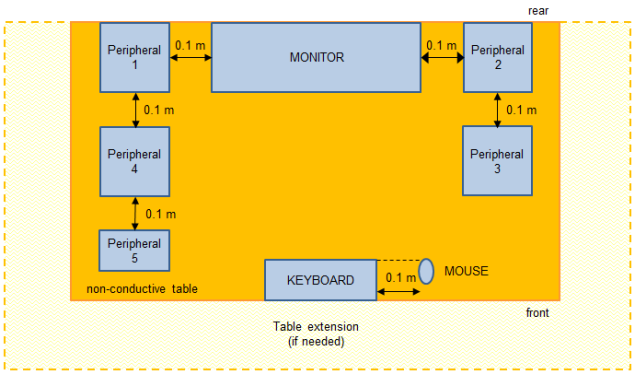
Measurement up to 1 GHz



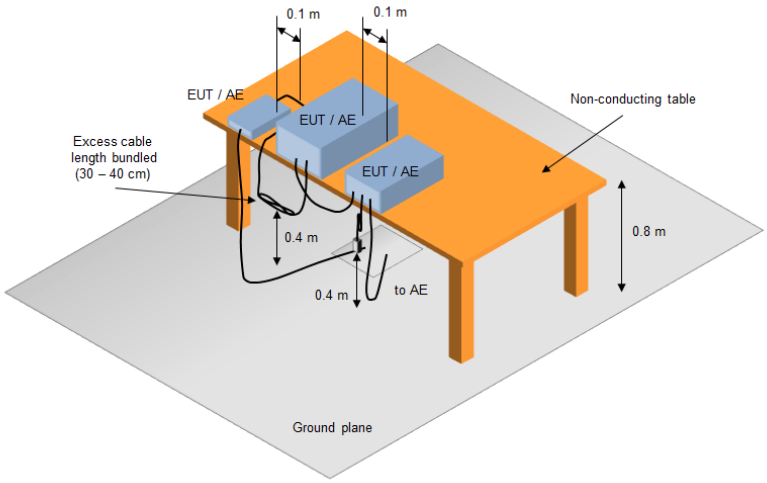
Measurement above 1 GHz



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	Rohde & Schwarz Vertriebs GmbH	ESR7	EF00943	2019-07	2020-07
Spectrum analyzer	Rohde & Schwarz Vertriebs GmbH	FSU 26	EF01407	2019-07	2020-07
Biconical Antenna	R&S	HK 116	EF00030	2019-04	2022-04
LPD antenna	Rohde & Schwarz Vertriebs GmbH	HL223	EF00013	2018-06	2020-06
Horn antenna	Schwarzbeck	BBHA 9120D (1-18GHz)	EF00018	2016-09	2019-09

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

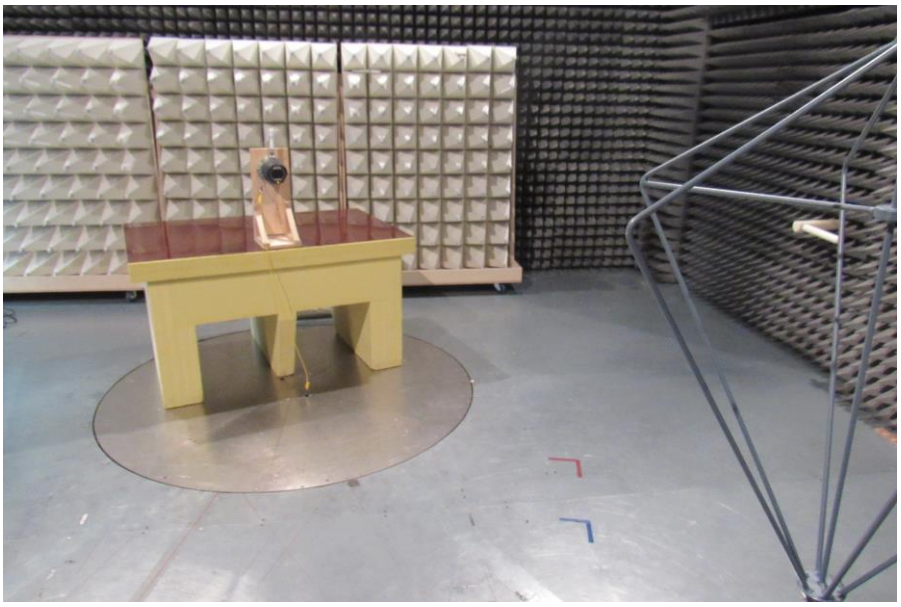
Class B @ 3 m		
Frequency [MHz]	Detector	Limit [dBµV/m]
30 - 88	Quasi-peak	40
88 - 216	Quasi-peak	43.5
216 - 960	Quasi-peak	46
960 - 1000	Quasi-peak	54
> 1000	Peak Average	74 54

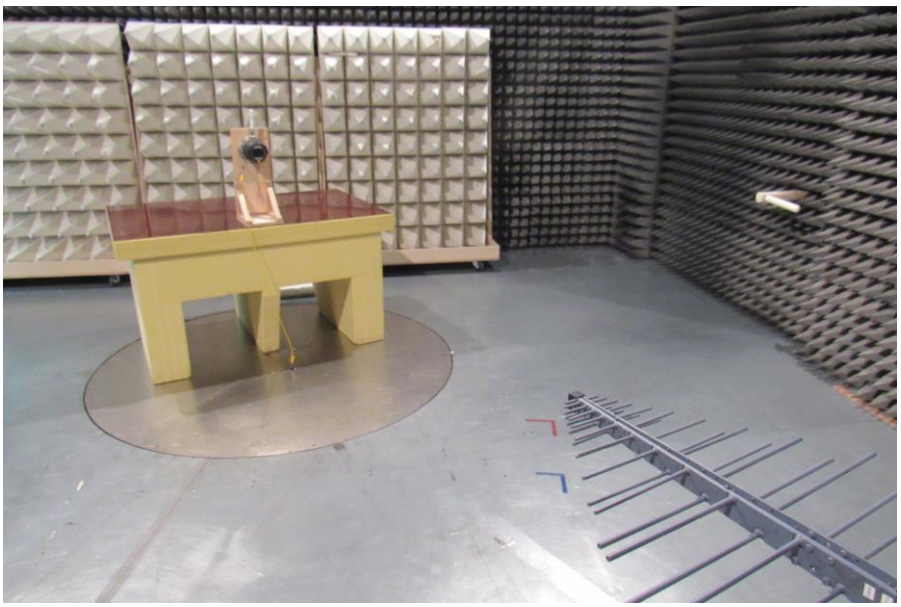
Class A @ 10 m		
Frequency [MHz]	Detector	Limit [dBµV/m]
30 - 88	Quasi-peak	39
88 - 216	Quasi-peak	43.5
216 - 960	Quasi-peak	46.5
960 - 1000	Quasi-peak	49.5
> 1000	Peak Average	69.5 49.5

2.1.6 Results

Test Results			
Operational mode	EUT Configuration	Verdict	Remark
2	1	PASS	1
2	2	PASS	1
Comment: 1 → The test data of the worst-case conditions were recorded and shown on the next pages.			

2.1.7 Setup Photos

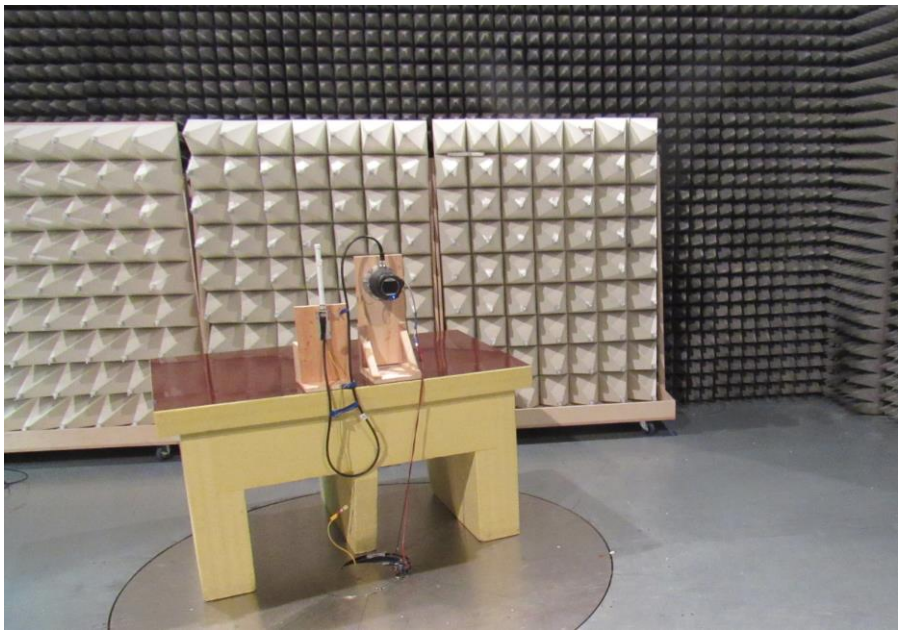
TEST SETUP EUT CONFIGURATION 1: RADIATED EMISSION < 200 MHz


TEST SETUP EUT CONFIGURATION 1: RADIATED EMISSION < 1 GHz


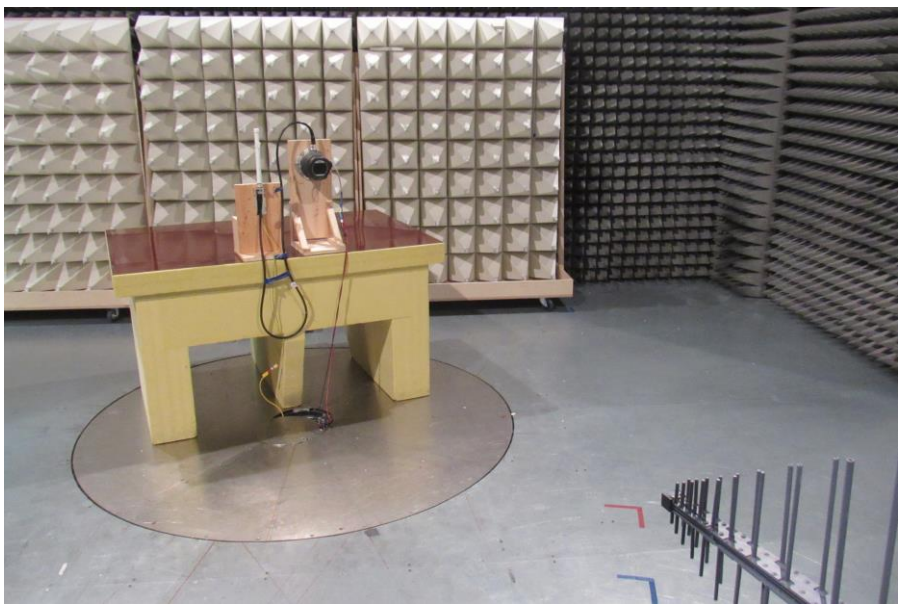
TEST SETUP EUT CONFIGURATION 1: RADIATED EMISSION > 1 GHz

TEST SETUP EUT CONFIGURATION 1 FOCUS: RADIATED EMISSION

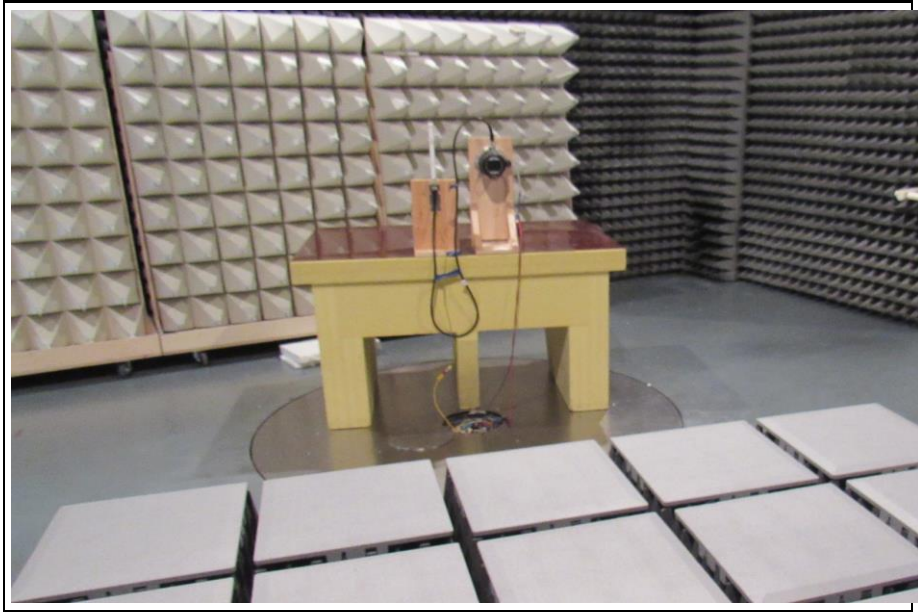
TEST SETUP EUT CONFIGURATION 2: RADIATED EMISSION < 200 MHz



TEST SETUP EUT CONFIGURATION 2: RADIATED EMISSION < 1 GHz



TEST SETUP EUT CONFIGURATION 2: RADIATED EMISSION > 1 GHz



TEST SETUP EUT CONFIGURATION 2 FOCUS: RADIATED EMISSION

2.1.8 Records

Radiated emissions according to FCC Part 15b

Project number: G0M-1803-7309

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Repeater for ISA100 wireless Network
Model:	Polytron Repeater ISA
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 21°C, Unom: 14.4 V DC (internal battery)
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	2
Test Date:	2019-09-11

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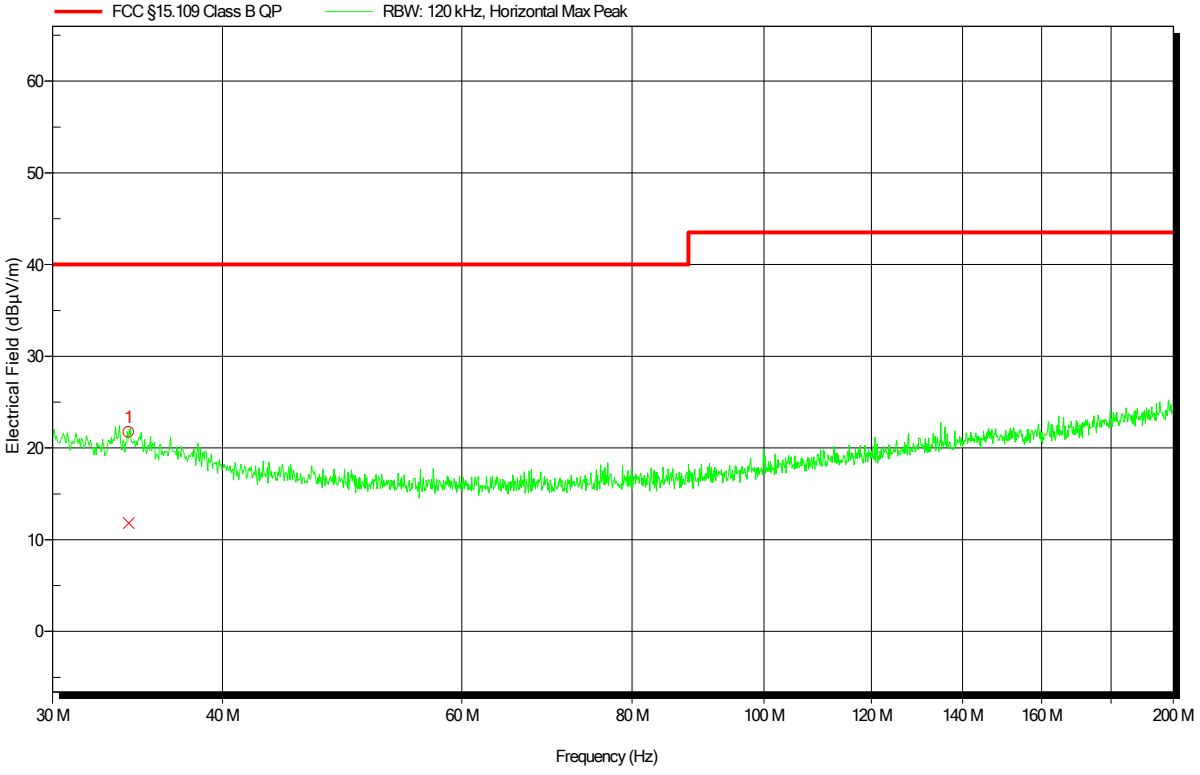

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	34.14 MHz	11.82 dBµV/m	40 dBµV/m	-28.18 dB	Pass	0 Degree	1 m

Radiated emissions according to FCC Part 15b

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Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Repeater for ISA100 wireless Network
Model:	Polytron Repeater ISA
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 21°C, Unom: 14.4 V DC (internal battery)
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	2
Test Date:	2019-09-11

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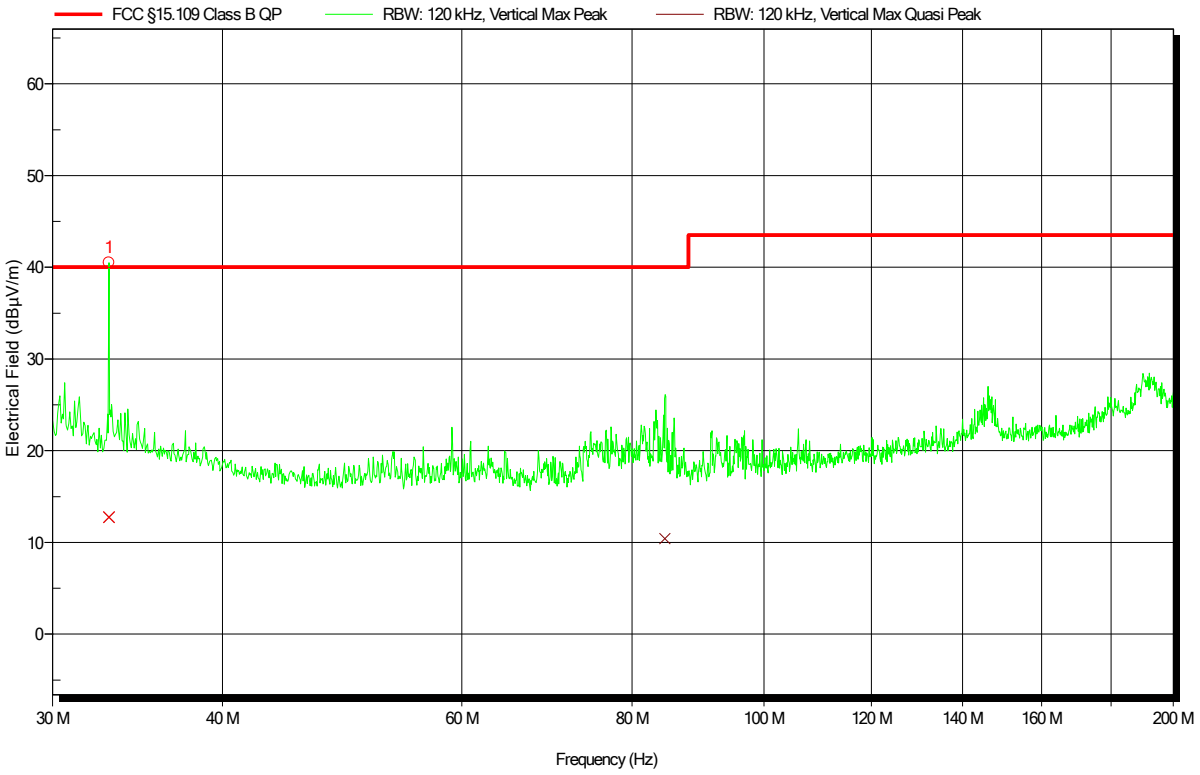

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	33.018 MHz	12.77 dBµV/m	40 dBµV/m	-27.23 dB	Pass	0 Degree	1 m

Radiated emissions according to FCC Part 15b

Project number: G0M-1803-7309

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EUT Name:	Repeater for ISA100 wireless Network
Model:	Polytron Repeater ISA
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 21°C, Unom: 14.4 V DC (internal battery)
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	2
Test Date:	2019-09-11

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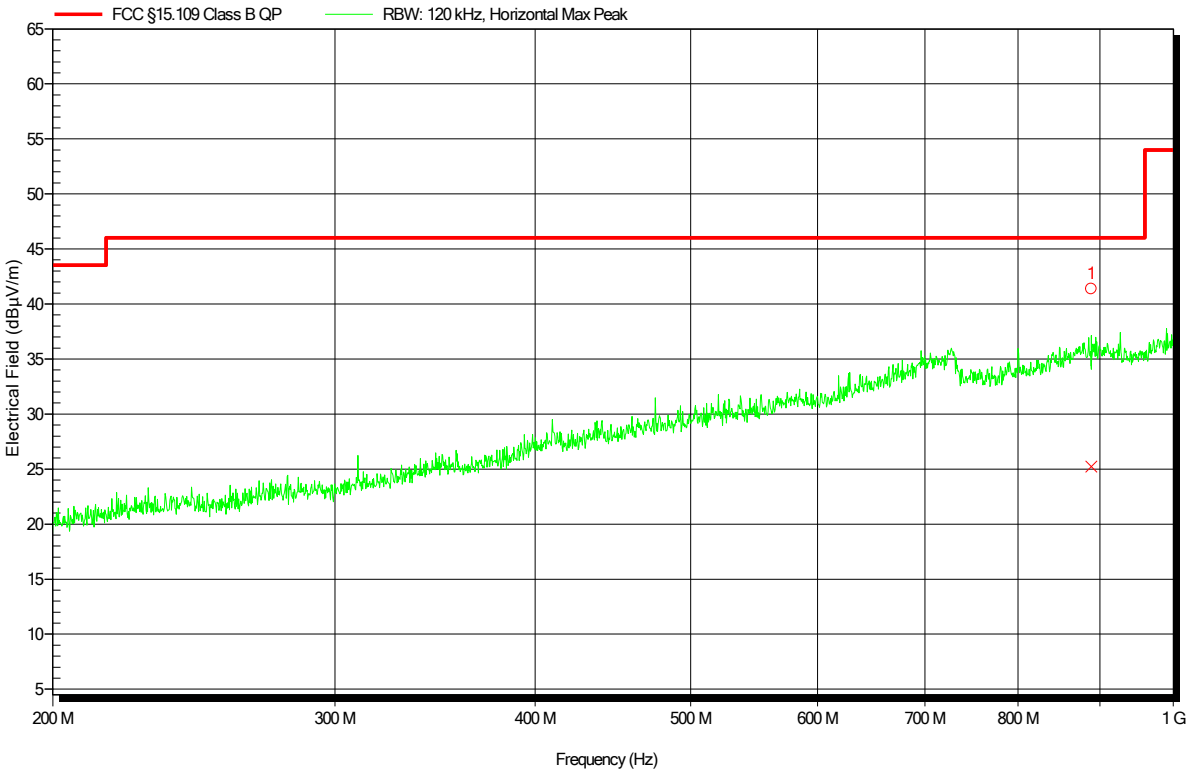

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	888.8 MHz	25.23 dBµV/m	46.02 dBµV/m	-20.79 dB	Pass	0 Degree	1 m

Radiated emissions according to FCC Part 15b

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Operator:	Mr. Liebich
Test Conditions:	Tnom: 21°C, Unom: 14.4 V DC (internal battery)
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	2
Test Date:	2019-09-11

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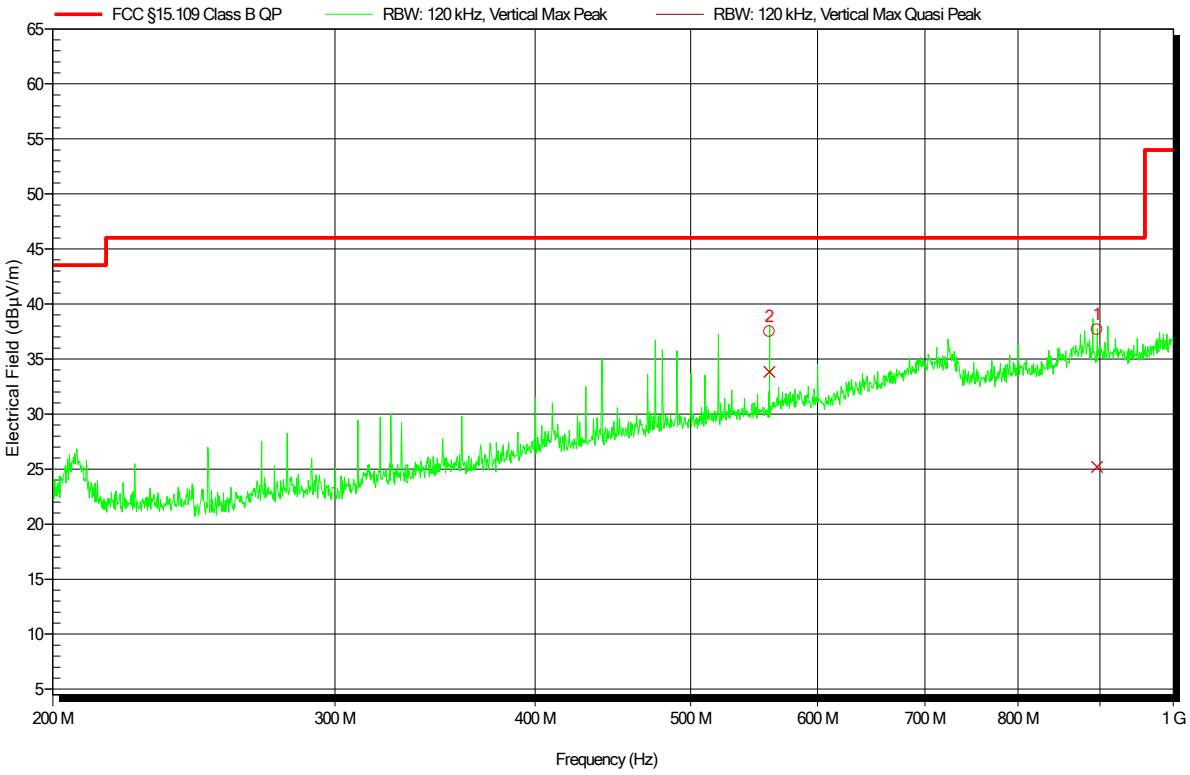

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	896.36 MHz	25.18 dBµV/m	46.02 dBµV/m	-20.84 dB	Pass	0 Degree	1 m
2	559.994 MHz	33.83 dBµV/m	46.02 dBµV/m	-12.19 dB	Pass	0 Degree	1 m

Radiated emissions according to FCC Part 15b

Project number: G0M-1803-7309

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Repeater for ISA100 wireless Network
Model:	Polytron Repeater ISA
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 21°C, Unom: 14.4 V DC (internal battery)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	2
Test Date:	2019-09-11

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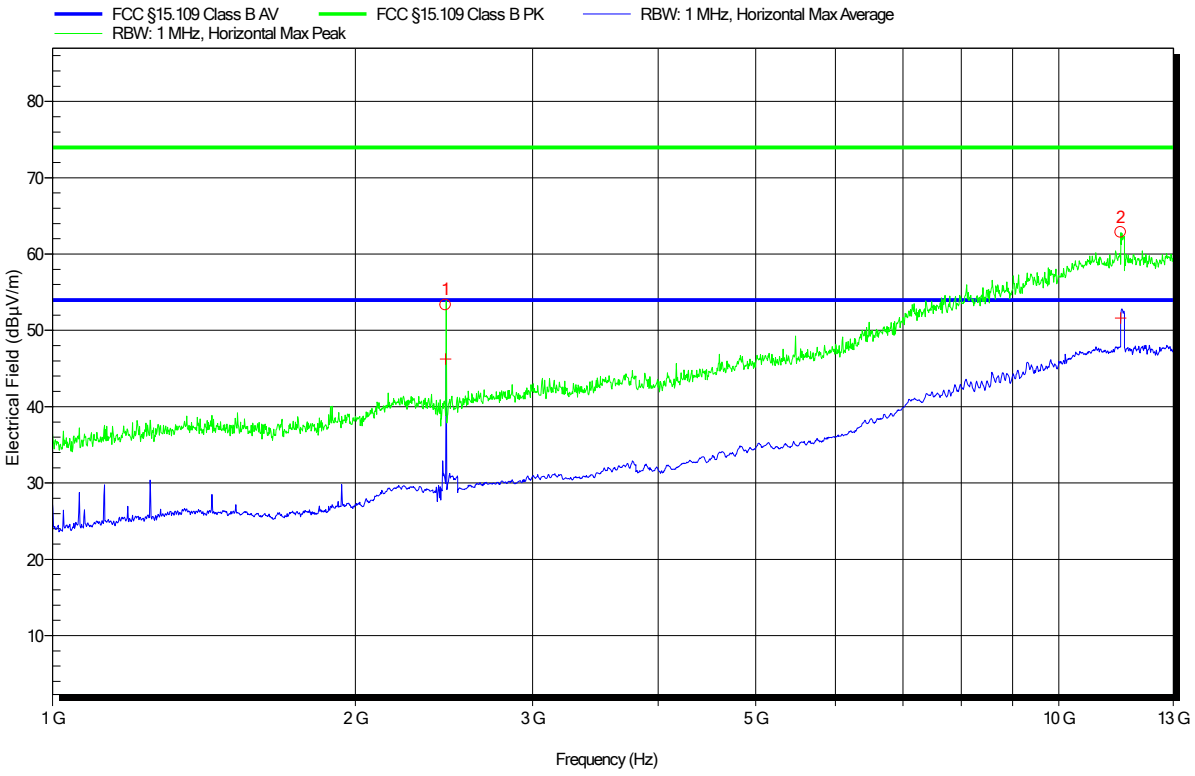

Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	2.459 GHz	53.32 dBµV/m	73.98 dBµV/m	-20.66 dB	Pass	0 Degree	1 m
2	11.523 GHz	62.84 dBµV/m	73.98 dBµV/m	-11.14 dB	Pass	0 Degree	1 m

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	2.459 GHz	46.26 dBµV/m	53.98 dBµV/m	-7.72 dB	Pass	0 Degree	1 m
2	11.523 GHz	51.62 dBµV/m	53.98 dBµV/m	-2.36 dB	Pass	0 Degree	1 m

Radiated emissions according to FCC Part 15b

Project number: G0M-1803-7309

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Repeater for ISA100 wireless Network
Model:	Polytron Repeater ISA
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 21°C, Unom: 14.4 V DC (internal battery)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	2
Test Date:	2019-09-11

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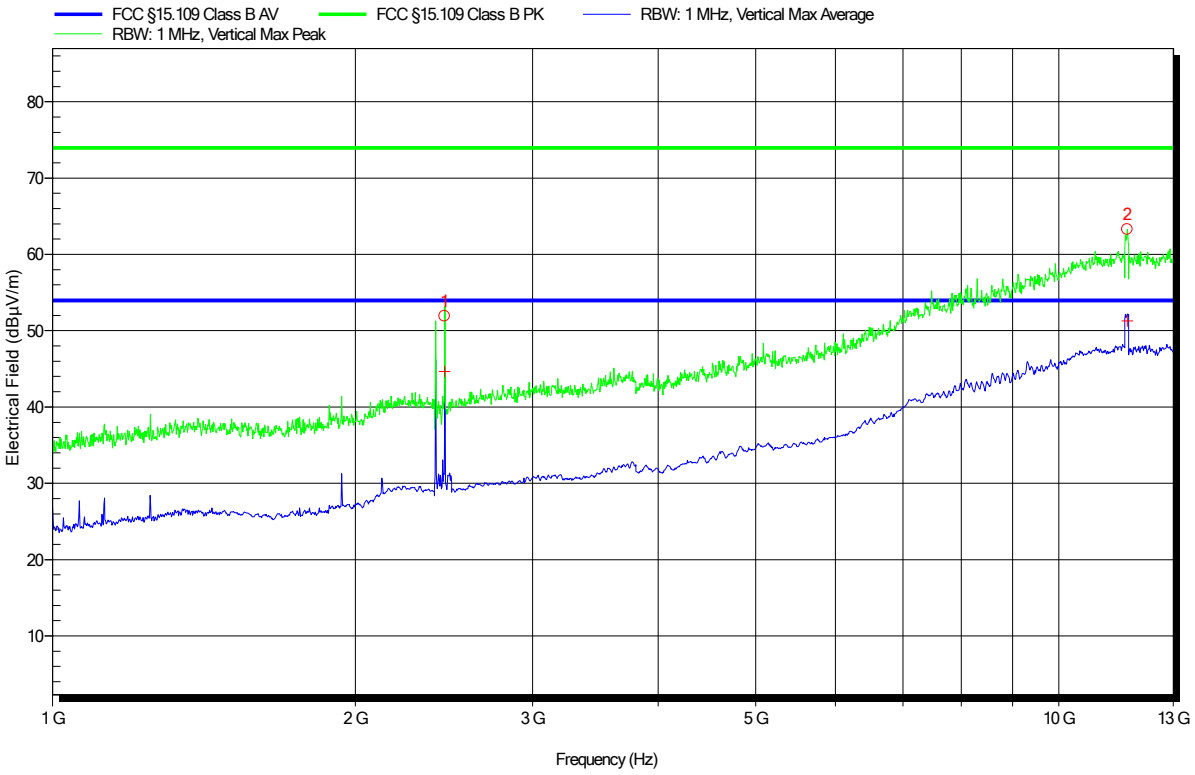

Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	2.453 GHz	51.89 dBµV/m	73.98 dBµV/m	-22.09 dB	Pass	0 Degree	1 m
2	11.697 GHz	63.27 dBµV/m	73.98 dBµV/m	-10.71 dB	Pass	0 Degree	1 m

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	2.453 GHz	44.66 dBµV/m	53.98 dBµV/m	-9.32 dB	Pass	0 Degree	1 m
2	11.697 GHz	51.27 dBµV/m	53.98 dBµV/m	-2.71 dB	Pass	0 Degree	1 m

Radiated emissions according to FCC Part 15b

Project number: G0M-1803-7309

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Repeater for ISA100 wireless Network
Model:	Polytron Repeater ISA
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 21°C, Unom: 24 V DC (external power supply)
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	2
Test Date:	2019-09-11

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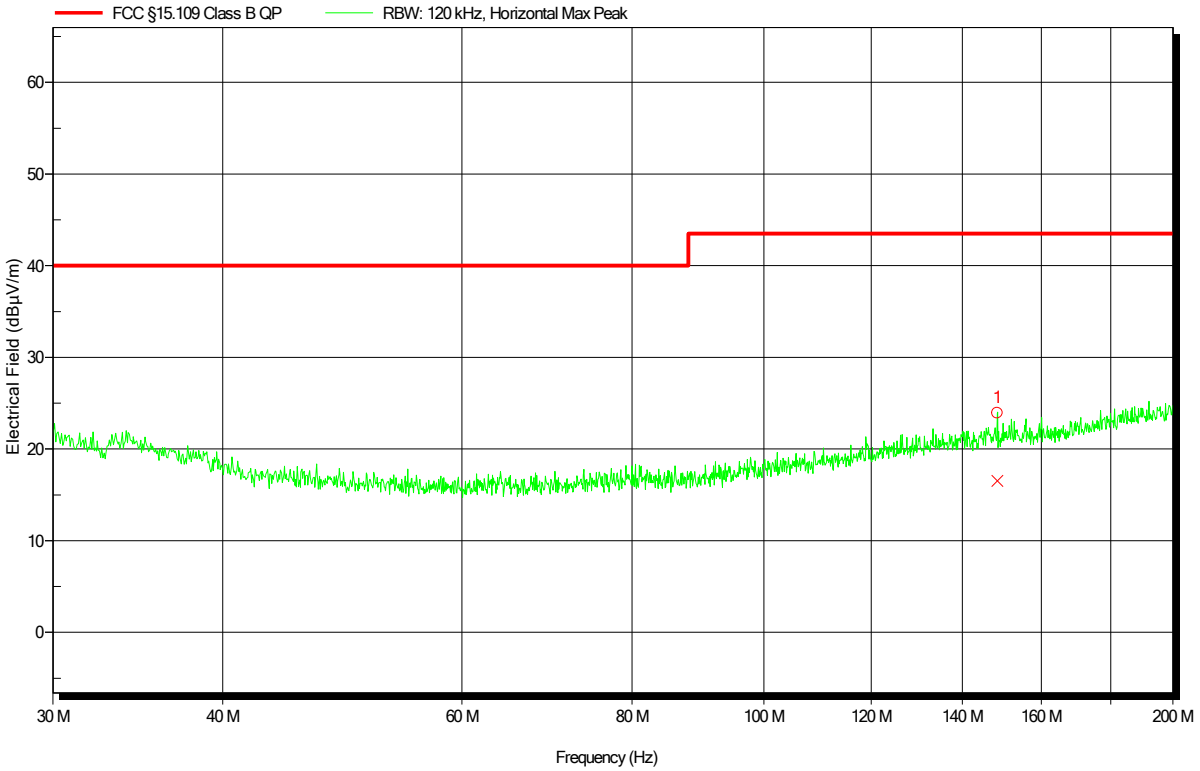

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	148.5 MHz	16.54 dBµV/m	43.52 dBµV/m	-26.98 dB	Pass	0 Degree	1 m

Radiated emissions according to FCC Part 15b

Project number: G0M-1803-7309

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Repeater for ISA100 wireless Network
Model:	Polytron Repeater ISA
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 21°C, Unom: 24 V DC (external power supply)
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	2
Test Date:	2019-09-11

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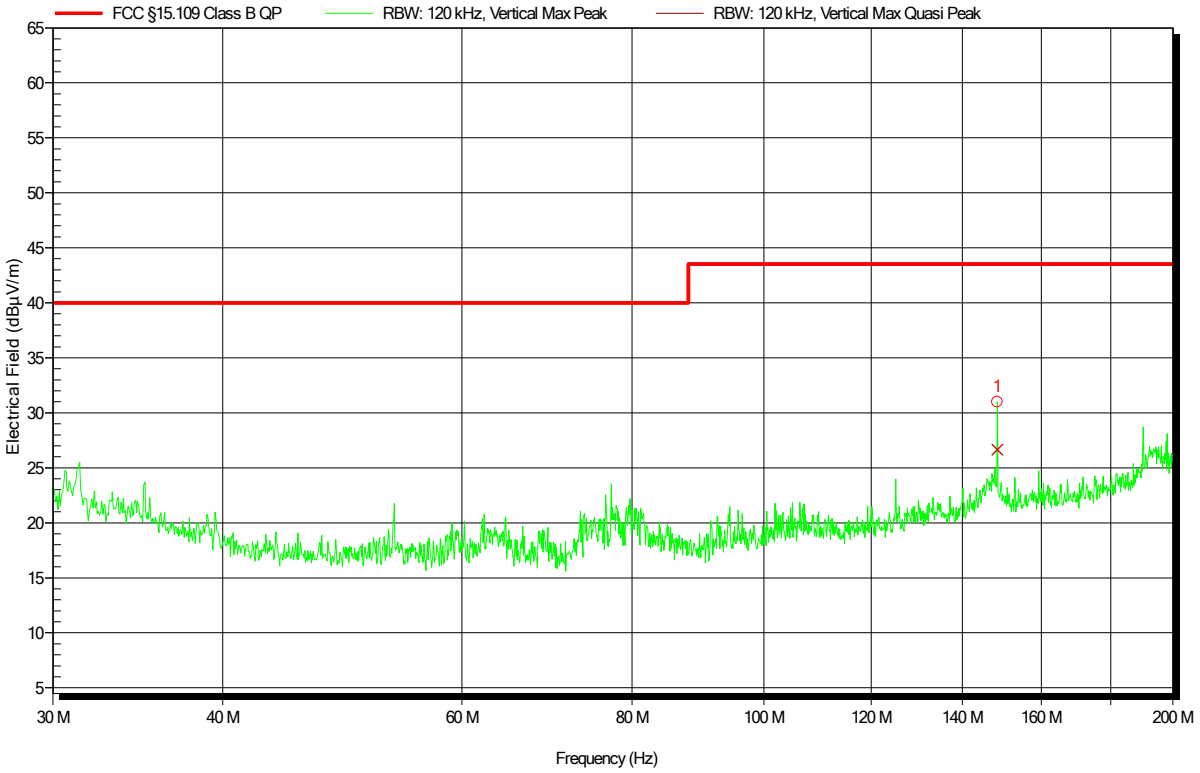

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	148.506 MHz	26.66 dBµV/m	43.52 dBµV/m	-16.86 dB	Pass	0 Degree	1 m

Radiated emissions according to FCC Part 15b

Project number: G0M-1803-7309

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Repeater for ISA100 wireless Network
Model:	Polytron Repeater ISA
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 21°C, Unom: 24 V DC (external power supply)
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	2
Test Date:	2019-09-11

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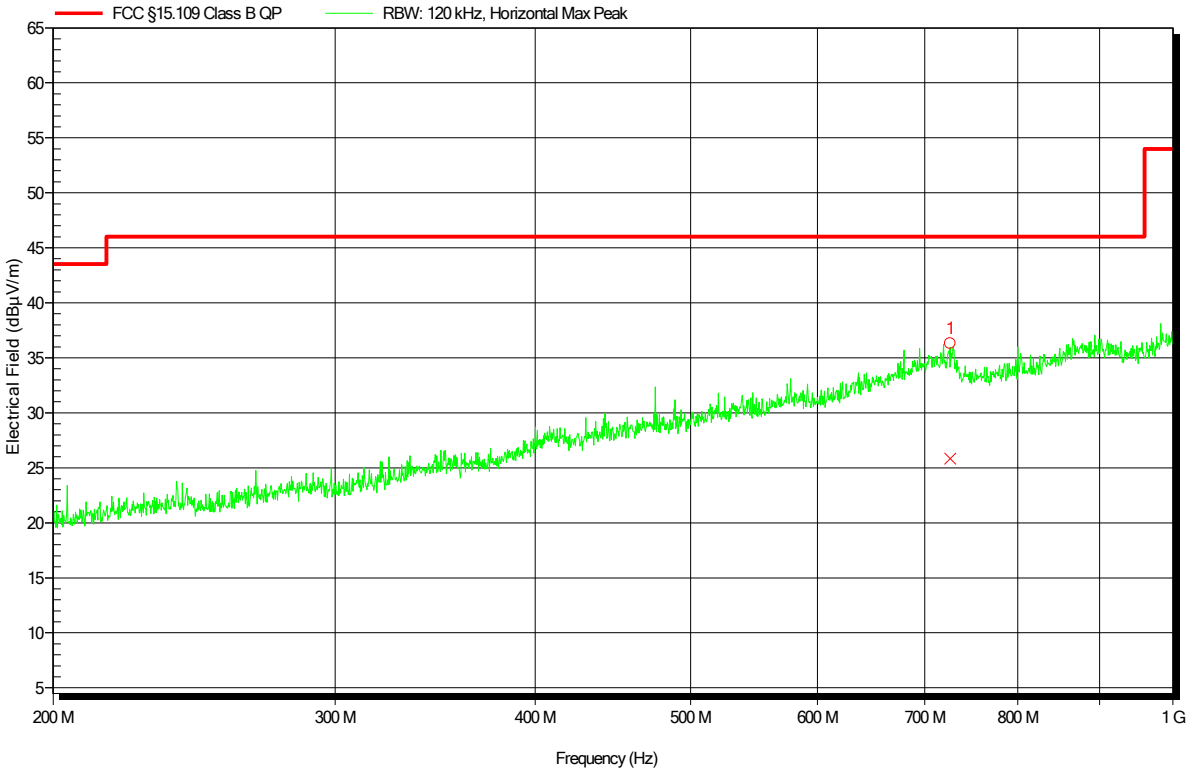

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	726.08 MHz	25.85 dBµV/m	46.02 dBµV/m	-20.17 dB	Pass	0 Degree	1 m

Radiated emissions according to FCC Part 15b

Project number: G0M-1803-7309

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Repeater for ISA100 wireless Network
Model:	Polytron Repeater ISA
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 21°C, Unom: 24 V DC (external power supply)
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	2
Test Date:	2019-09-11

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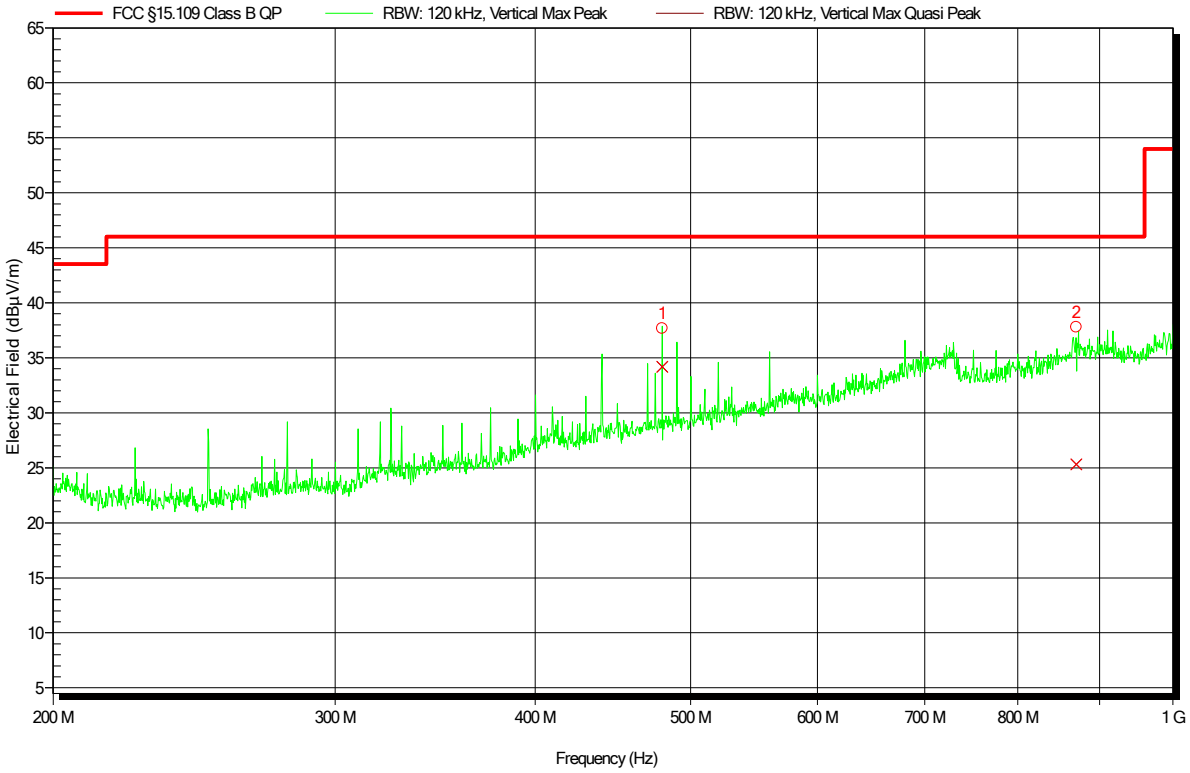

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	479.996 MHz	34.19 dBµV/m	46.02 dBµV/m	-11.83 dB	Pass	0 Degree	1 m
2	870.44 MHz	25.31 dBµV/m	46.02 dBµV/m	-20.71 dB	Pass	0 Degree	1 m

Radiated emissions according to FCC Part 15b

Project number: G0M-1803-7309

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Repeater for ISA100 wireless Network
Model:	Polytron Repeater ISA
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 21°C, Unom: 24 V DC (external power supply)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	2
Test Date:	2019-09-11

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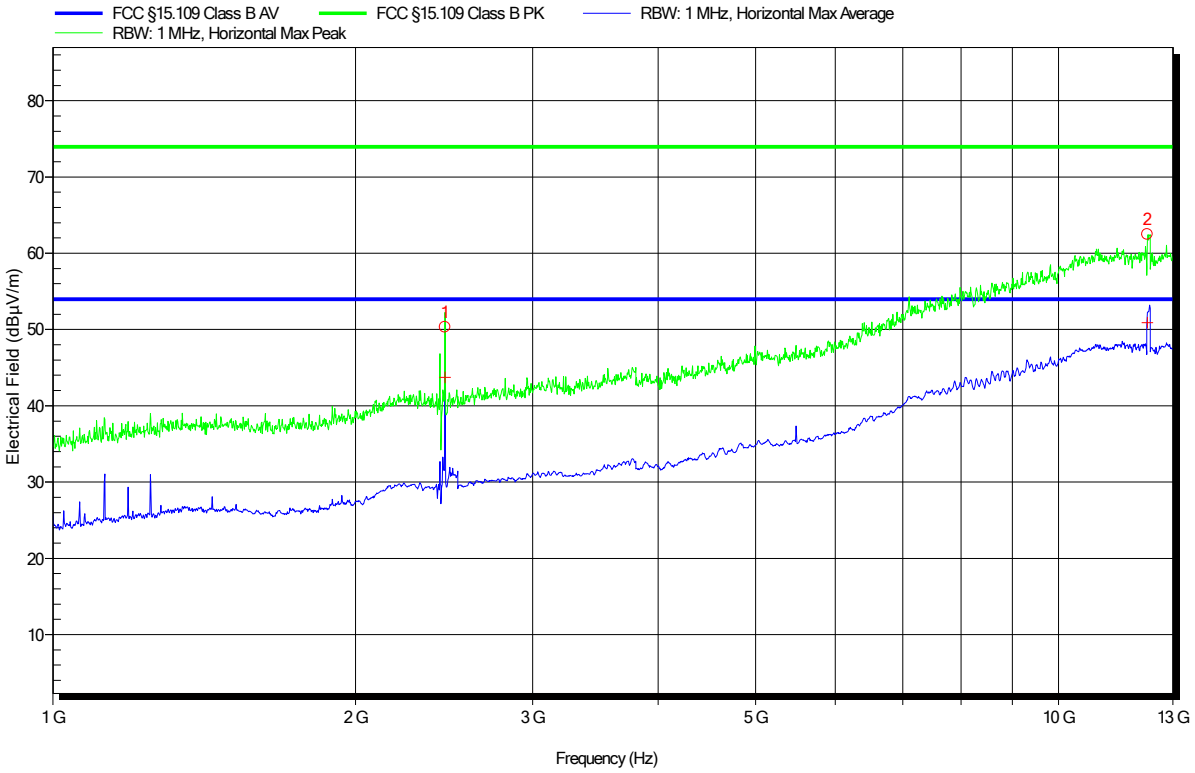

Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	2.454 GHz	50.31 dBµV/m	73.98 dBµV/m	-23.67dB	Pass	0 Degree	1 m
2	12.262 GHz	62.46 dBµV/m	73.98 dBµV/m	-11.52 dB	Pass	0 Degree	1 m

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	2.454 GHz	43.73 dBµV/m	53.98 dBµV/m	-10.25 dB	Pass	0 Degree	1 m
2	12.262 GHz	50.88 dBµV/m	53.98 dBµV/m	-3.1 dB	Pass	0 Degree	1 m

Radiated emissions according to FCC Part 15b

Project number: G0M-1803-7309

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Repeater for ISA100 wireless Network
Model:	Polytron Repeater ISA
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 21°C, Unom: 24 V DC (external power supply)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	2
Test Date:	2019-09-11

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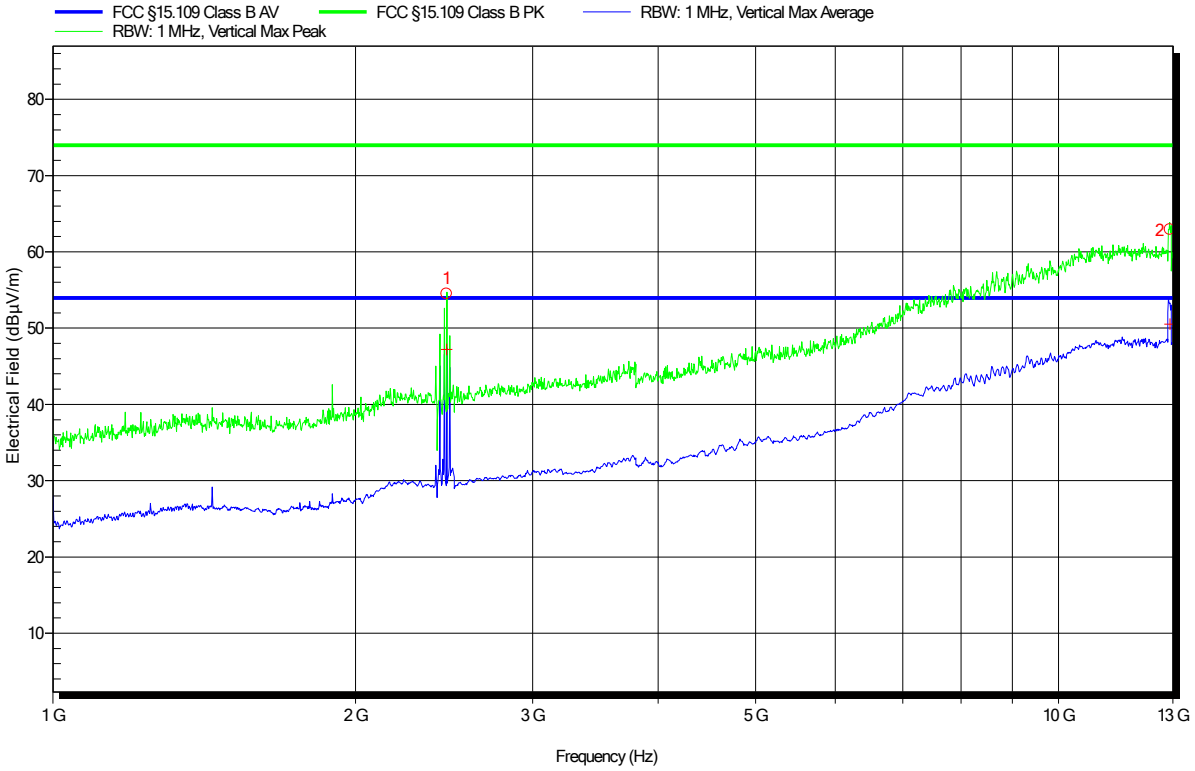


Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	2.463 GHz	54.5 dBµV/m	73.98 dBµV/m	-19.48 dB	Pass	0 Degree	1 m
2	12.911 GHz	62.93 dBµV/m	73.98 dBµV/m	-11.05 dB	Pass	0 Degree	1 m

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	2.463 GHz	47.19 dBµV/m	53.98 dBµV/m	-6.79 dB	Pass	0 Degree	1 m
2	12.911 GHz	50.53 dBµV/m	53.98 dBµV/m	-3.45 dB	Pass	0 Degree	1 m

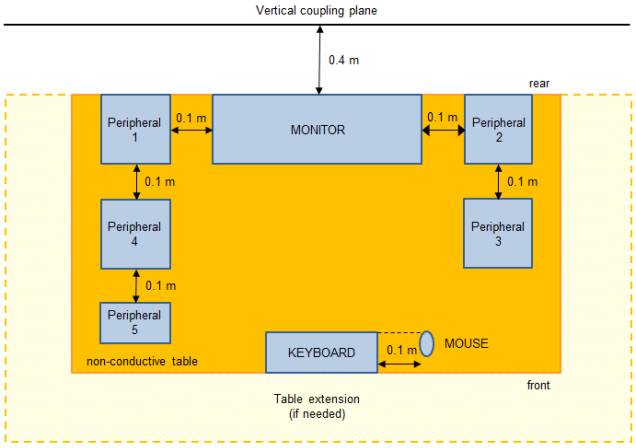
2.2 Test Conditions and Results - Conducted emissions acc. to ANSI C63.4

2.2.1 Information

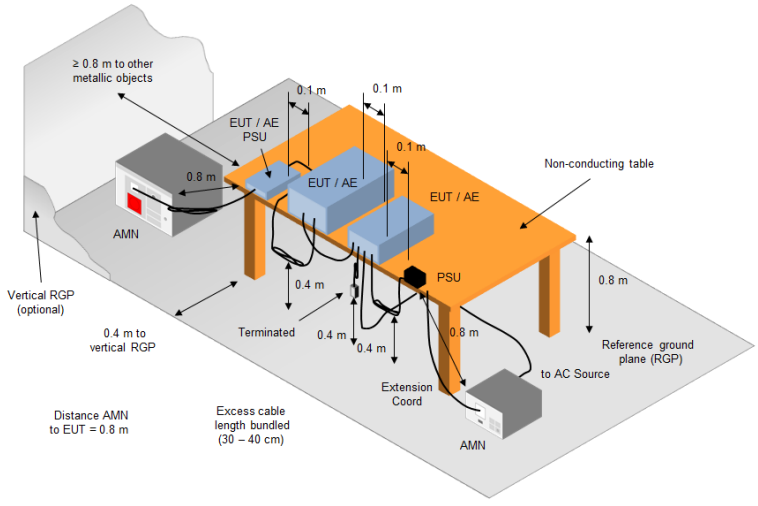
Test Information	
Reference	FCC 15.107, ICES-003, 8, 6.2
Reference method	ANSI C63.4:2014 Section 12
Measurement range	150 kHz to 30 MHz
Equipment class	Class B
Equipment type	Table top
Temperature [°C]	22
Humidity [%]	55
Operator	Stephan Liebich supervised by Matthias Handrik
Date	2019-09-12

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	Rohde & Schwarz Vertriebs GmbH	ESCS 30	EF00295	2019-07	2020-07

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

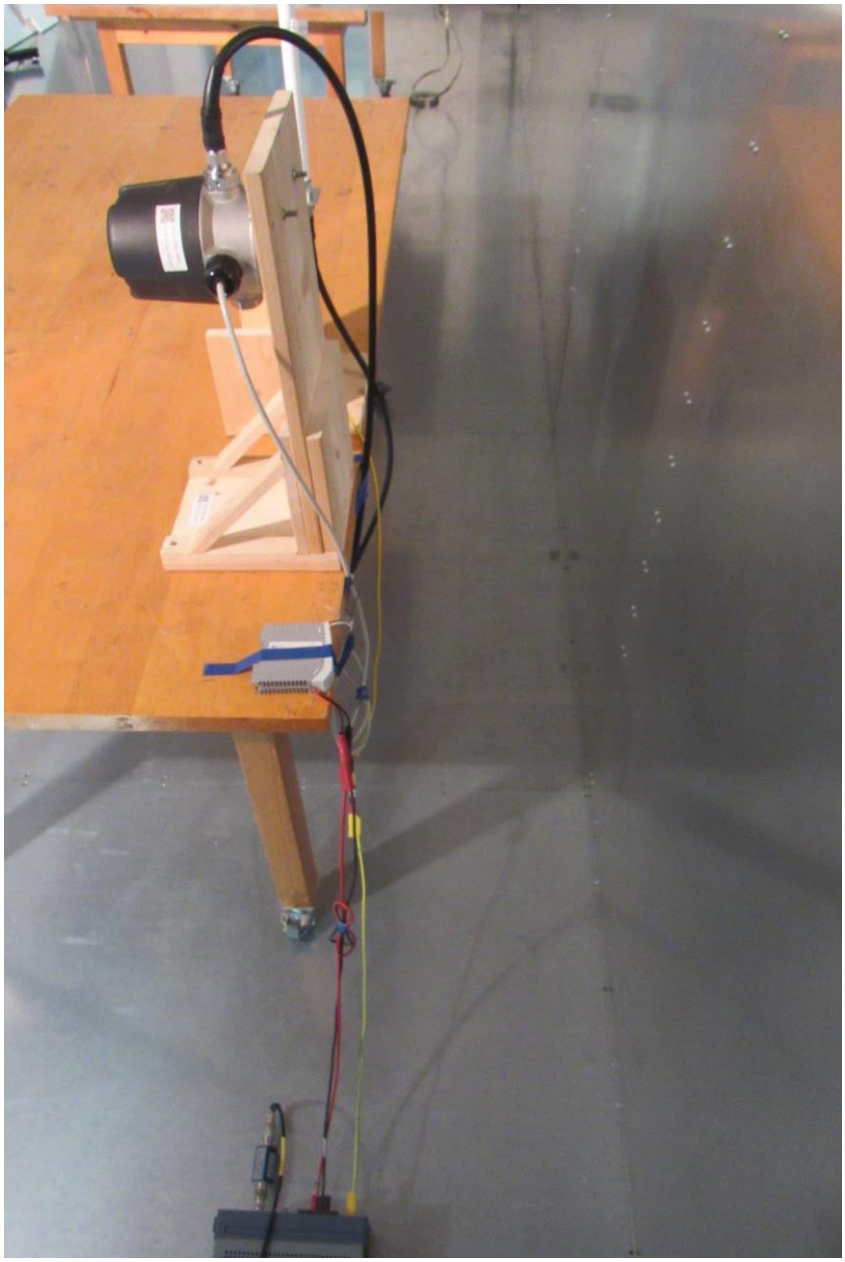
Class B		
Frequency [MHz]	Quasi-peak Limit [dBµV]	Average Limit [dBµV]
0.15 - 0.5	66 - 56 *	56 - 46 *
0.5 - 5	56	46
5 - 30	60	50
* Decreases with the logarithm of the frequency		

2.2.6 Results

AC power line conducted emissions					
Port	Coupling	Operational mode	EUT Configuration	Verdict	Remark
Mains	AMN	2	3	PASS	1
Comment: 1 → The test data of the worst-case conditions were recorded and shown on the next pages.					

2.2.7 Setup Photos

TEST SETUP EUT CONFIGURATION 3: CONDUCTED EMISSION



2.2.8 Records

EMI voltage test in the ac-mains according to FCC Part 15b, ICES-003

Project number: G0M-1803-7309

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Repeater for ISA100 wireless Network
Model:	Polytron Repeater ISA
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 22°C, Unom: 120 V / 60 Hz
LISN:	ESH3-Z5 (N)
Mode:	2
Test Date:	2019-09-12
Note:	

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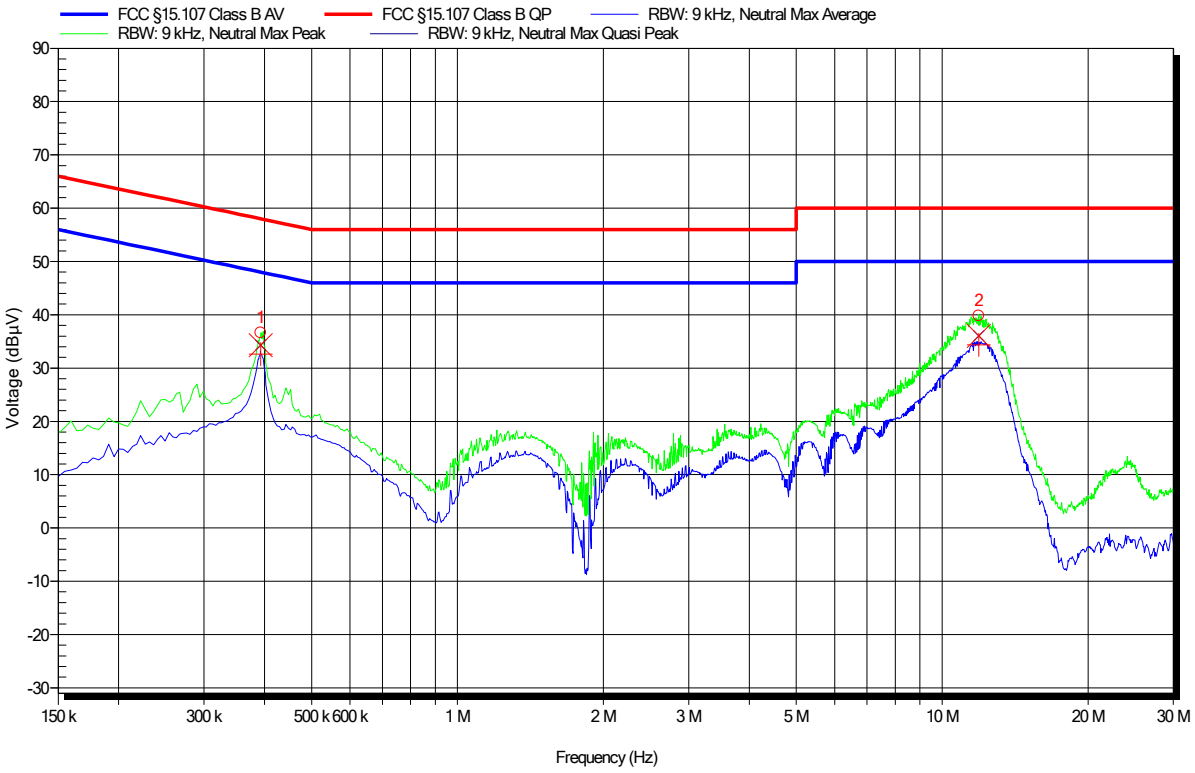

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	392.55 kHz	34.31 dBµV	58.01 dBµV	-23.7 dB	Pass
2	11.895 MHz	36.05 dBµV	60 dBµV	-23.95 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	392.55 kHz	32.59 dBµV	48.01 dBµV	-15.42 dB	Pass
2	11.895 MHz	34.37 dBµV	50 dBµV	-15.63 dB	Pass

EMI voltage test in the ac-mains according to FCC Part 15b, ICES-003

Project number: G0M-1803-7309

Applicant:	Dräger Safety AG & Co. KGaA
EUT Name:	Repeater for ISA100 wireless Network
Model:	Polytron Repeater ISA
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 22°C, Unom: 120 V / 60 Hz
LISN:	ESH3-Z5 (L)
Mode:	2
Test Date:	2019-09-12
Note:	

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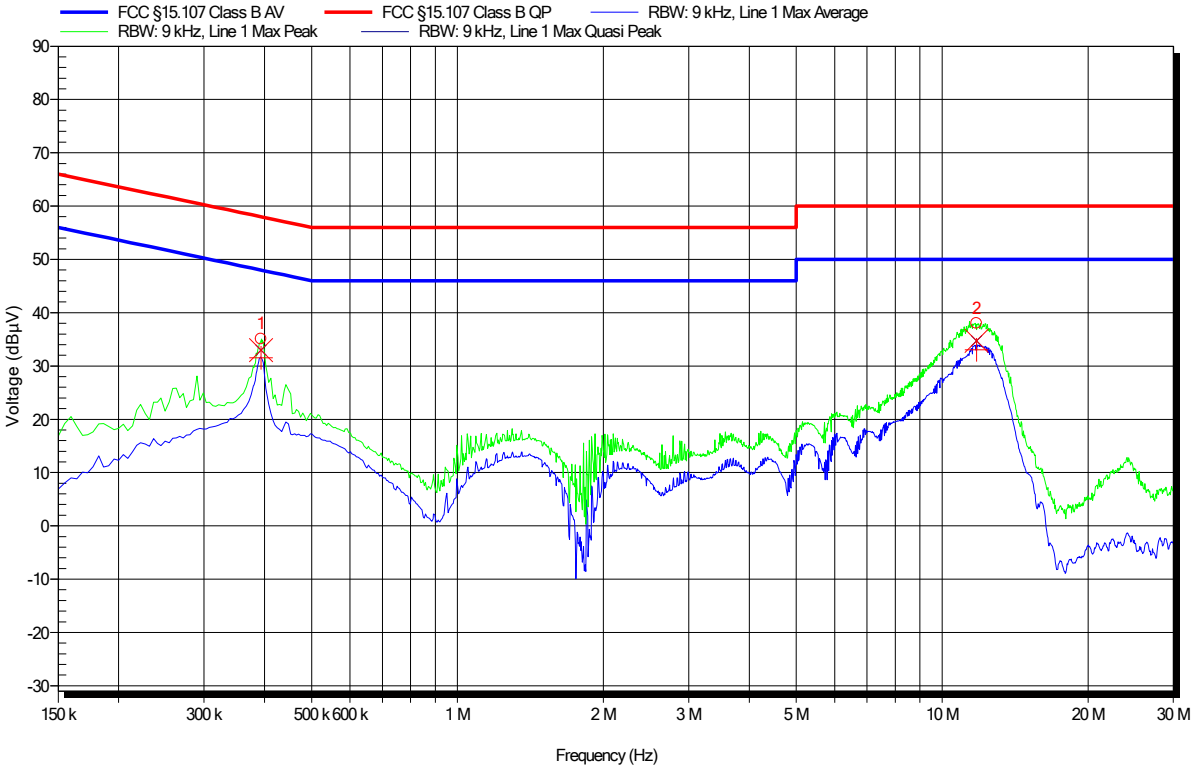

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	393.45 kHz	32.99 dBµV	57.99 dBµV	-25 dB	Pass
2	11.783 MHz	34.71 dBµV	60 dBµV	-25.29 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	393.45 kHz	31.51 dBµV	47.99 dBµV	-16.48 dB	Pass
2	11.783 MHz	33.03 dBµV	50 dBµV	-16.97 dB	Pass