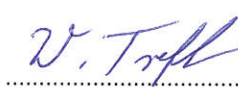



RADIO REPORT FCC 47 CFR Part 15C ISED Canada RSS-210 Operation within the 13.110 – 14.010 MHz band	
Report Reference No	G0M-1808-7604-TFC225RI-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	 <p>A2LA Accredited Testing Laboratory, Certificate No.: 1983.01 FCC Test Firm Designation Number: DE0008 ISED Testing Laboratory site: 3470A-2</p>
Applicant	Dräger Safety AG & Co. KGaA
Address	Revalstraße 1 23560 Lübeck GERMANY
Test Specification	According to FCC/ISED rules
Standard	47 CFR Part 15C RSS-210, Issue 9, 2016-08
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	Portable short-term gas measurement device
Model(s)	X-act 7000
Additional Model(s)	None
Brand Name(s)	None
Hardware Version(s)	8610820
Software Version(s)	v0.0.1102
FCC-ID	X6O-RF001
IC	5895F-RF001
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	2018-12-21	
Report:		
Compiled by	Wilfried Treffke	
Tested by (+ signature) (Responsible for Test)	Wilfried Treffke	
Approved by (+ signature) (Deputy Head of Lab)	Toralf Jahn	
Date of Issue	2019-01-24	
Total number of pages	29	
General Remarks:		
<p>The test results presented in this report relate only to the object tested.</p> <p>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.</p> <p>This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.</p>		
Additional Comments:		
In order to FCC 15.225(f) a passive tag (Micro tubes) is measured together with the test sample X-act 7000.		

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2019-01-24	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

REPORT INDEX

1	Equipment (Test Item) Under Test.....	6
1.1	Photos – Equipment External.....	7
1.2	Photos – Equipment Internal.....	9
1.3	Photos – Test Setup.....	11
1.4	Support Equipment.....	12
1.5	Test Modes.....	13
1.6	Test Frequencies.....	14
1.7	Sample emission level calculation.....	15
2	Result Summary.....	16
3	Test Conditions and Results.....	17
3.1	Test Conditions and Results - Occupied bandwidth.....	17
3.2	Test Conditions and Results - Fundamental in-band field strength emissions.....	19
3.3	Test Conditions and Results - Emissions radiated outside the specified frequency band.....	21
3.4	Test Conditions and Results - Frequency stability.....	23
ANNEX A	Transmitter in-band emissions.....	25
ANNEX B	Transmitter radiated spurious emissions.....	26

1 Equipment (Test Item) Under Test

Description	Portable short-term gas measurement device	
Model	X-act 7000	
Additional Model(s)	None	
Brand Name(s)	None	
Serial Number(s)	LRLH-0006	
Hardware Version(s)	8610820	
Software Version(s)	v0.0.1102	
PMN	X-act 7000	
HVIN	RF001	
FVIN	None	
HMN	None	
FCC-ID	X6O-RF001	
IC	5895F-RF001	
Equipment type	End Product	
Radio type	Transceiver	
Assigned frequency bands	13.110 - 14.010 MHz	
Radio technology	RFID	
Modulation	OOK	
Antenna	Type	Integrated loop coil antenna
	Model	unspecified
	Manufacturer	unspecified
	Gain	unspecified
Supply Voltage	V _{NOM}	7.5 VDC (5x 1.5V AA battery)
Operating Temperature	T _{NOM}	25 °C
AC/DC-Adaptor	Model	None
	Vendor	None
	Input	None
	Output	None
Manufacturer	Plexus Deutschland GmbH Bratustrasse 7 Darmstadt Design Center 64293 Darmstadt GERMANY	

1.1 Photos – Equipment External



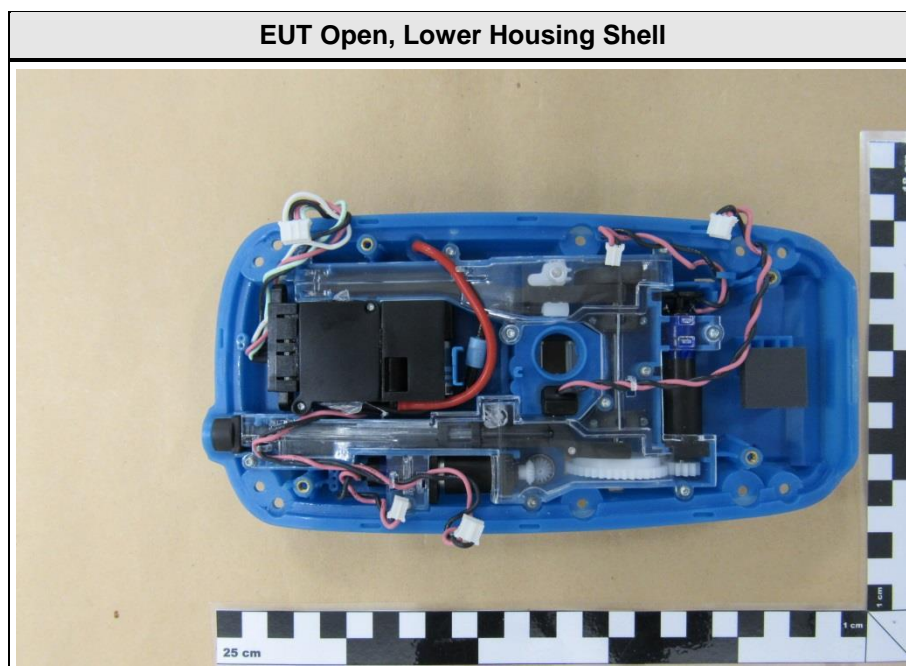
EUT Top



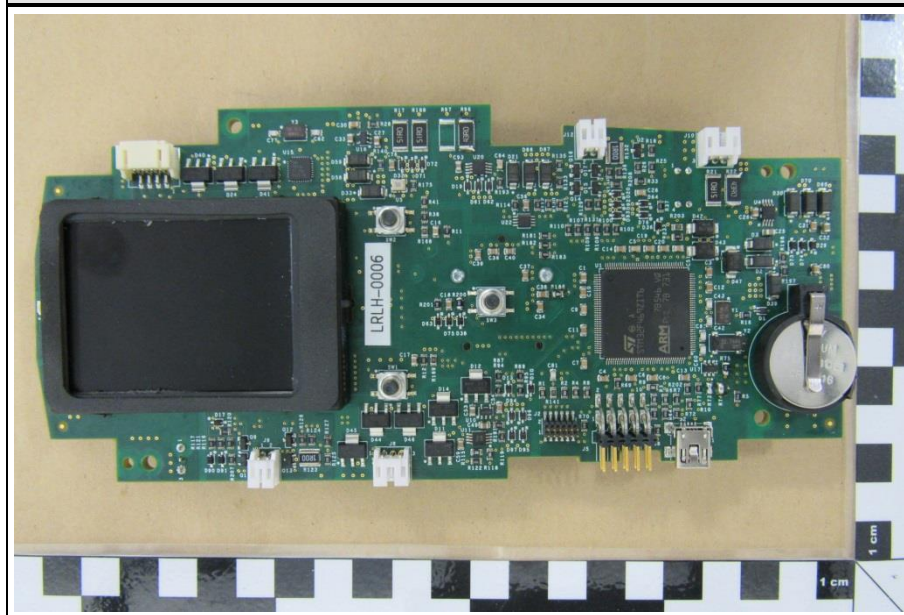
EUT Bootom



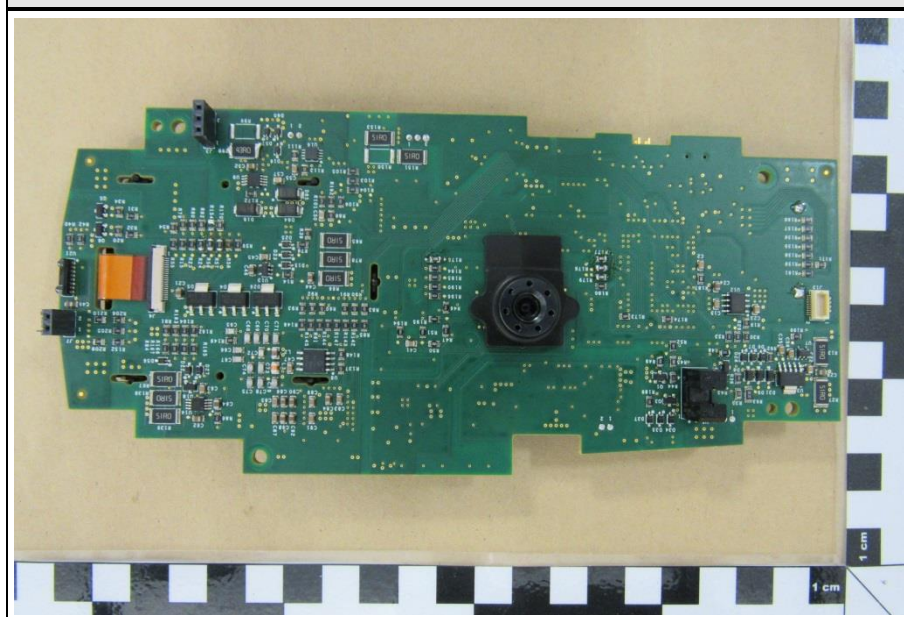
1.2 Photos – Equipment Internal



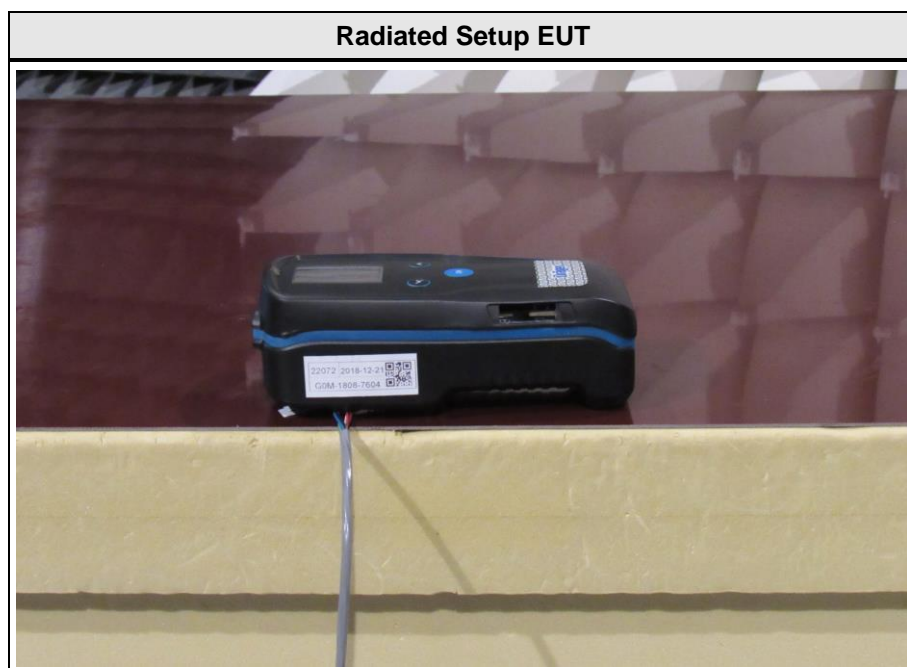
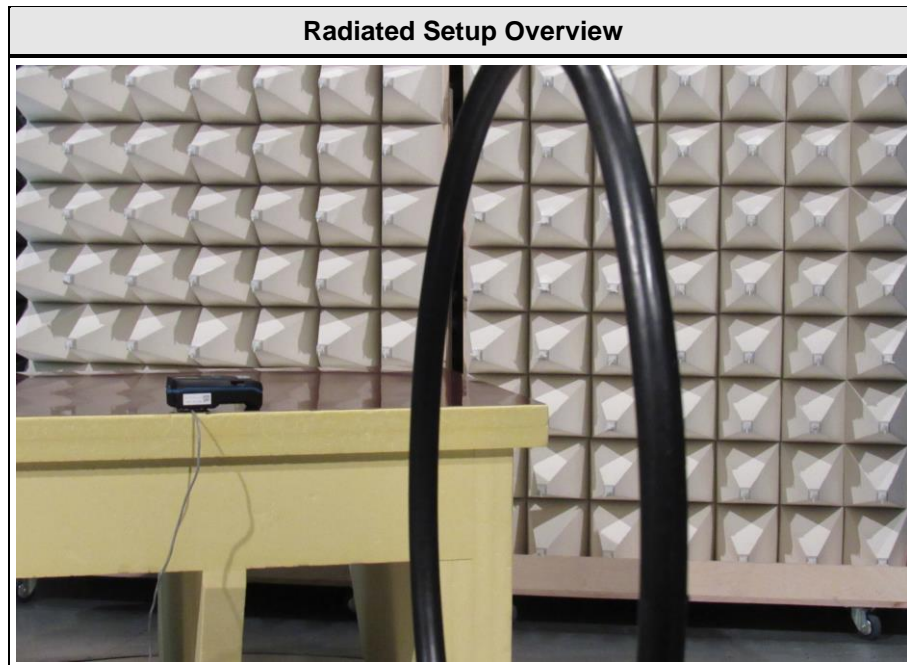
PCB Top



PCB Bottom



1.3 Photos – Test Setup



1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
None				
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
Comment:				

1.5 Test Modes

Mode	Description
Transmit	Mode = Transmit Modulation = OOK Duty cycle = 10 %
Comment:	

1.6 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Tx / Rx	0	13.56

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:

$$\text{Reading on Analyzer (dB}\mu\text{V)} + \text{A.F. (dB/m)} = \text{Net field strength (dB}\mu\text{V/m)}$$

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:

$$\text{Limit (dB}\mu\text{V/m)} = 20 \cdot \log(\mu\text{V/m})$$

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				
Product Standard Reference	Requirement	Reference Method	Result	Remarks
RSS-Gen 6.7	Occupied Bandwidth	ANSI C63.10-2013	N/R	Informational only
FCC 15.225(a-c) ISED RSS-210 B.6(a)	Fundamental in-band field strength emissions	ANSI C63.10-2013	PASS	
FCC 15.225(d) FCC 15.209 ISED RSS-210 B.6(d)	Emission radiated outside the specified frequency band	ANSI C63.10-2013	PASS	
FCC 15.225(e) ISED RSS-210 B.6	Frequency stability	ANSI C63.10-2013	PASS	
ISED RSS-Gen 4.10 ISED RSS-Gen 7.1	Receiver radiated spurious emissions	ANSI C63.10-2013	N/R	The receiver is co-located with transmitter. Receive only isn't possible.
47 CFR 15.207 RSS-Gen 8.8	AC power line conducted emissions	ANSI C63.10-2013	N/R	
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

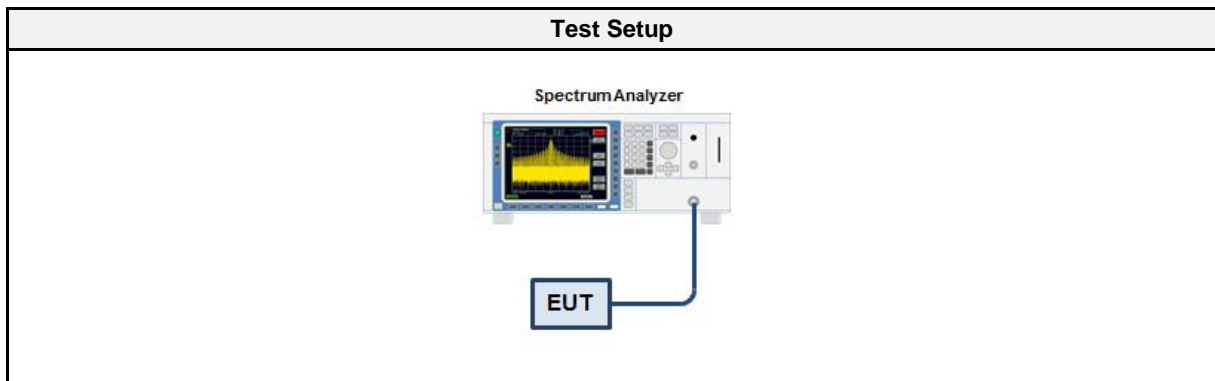
3.1.1 Information

Test Information	
Product Standard Reference	ISED RSS-Gen 6.7
Measurement Method	Conducted

3.1.2 Limits

Limits
None (Informational only)

3.1.3 Setup



3.1.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 3	EF00241	2017-07	2019-07

3.1.5 Procedure

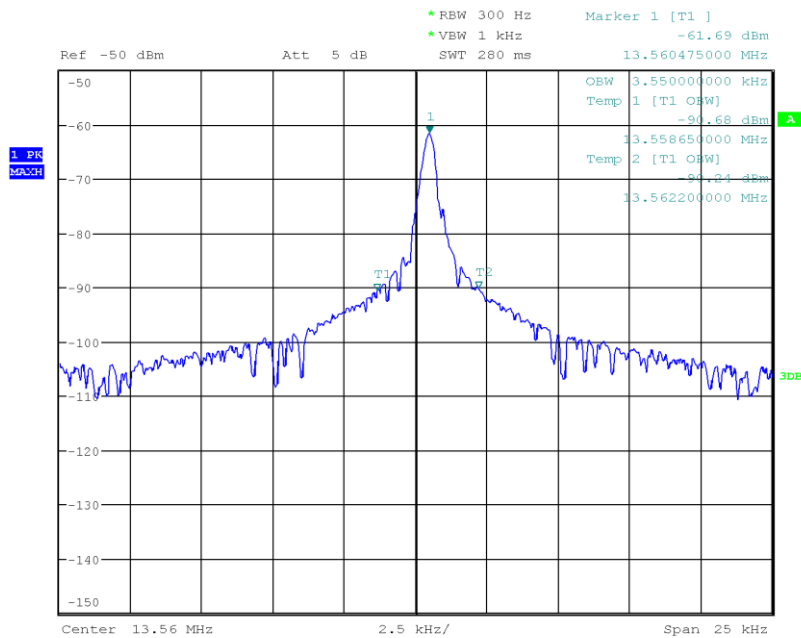
Test Procedure
<ol style="list-style-type: none"> 1. EUT set to test mode (Communication tester is used if needed) 2. Span set to at least twice the emission spectrum 3. Resolution bandwidth set between 1 % to 5 % of OBW 4. Occupied Bandwidth (99 %) measurement with spectrum analyzer built in measurement function

3.1.6 Results

Test Results	
Channel [MHz]	Bandwidth [kHz]
13.56	3.55

Occupied Bandwidth

Project Number: G0M-1808-7604
 Applicant: Dräger Safety AG & Co. KGaA
 Model Description: Portable short-term gas measurement device
 Model: X-act 7000
 Test Sample ID: 22072
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: OOK, 13.56 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2019-01-08
 Occupied Bandwidth [kHz]: 3.55



Date: 8.JAN.2019 14:49:26

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

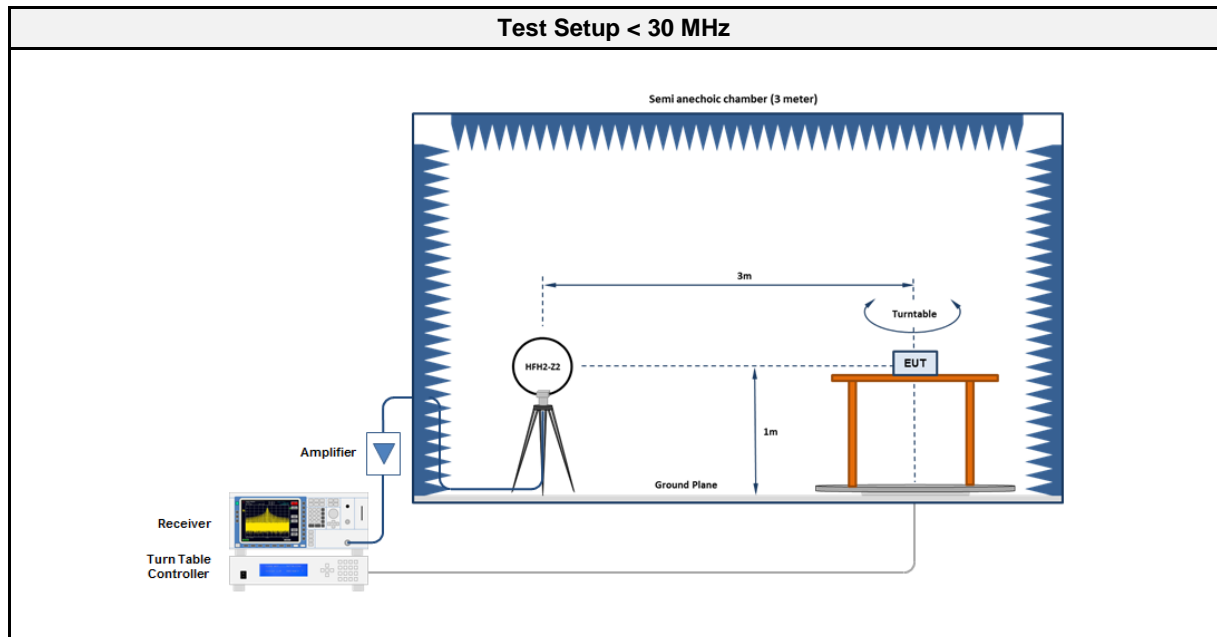
3.2.1 Information

Test Information	
Product Standard Reference	FCC 15.225(a-c) / ISED RSS-210 B.6(a)
Measurement Method	Radiated

3.2.2 Limits

Limits			
Frequency range [MHz]	Limit [$\mu\text{V}/\text{m}$]	Limit [$\text{dB}\mu\text{V}/\text{m}$]	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



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
EMI Test Receiver	Rohde & Schwarz Vertriebs GmbH	ESCS 30	EF00295	2018-07	2019-07
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 [dB μ V/m]	Detector	Polarization	Limit @ 30 m [dB μ V/m]	Margin
13.56	13.353	09.40	qpk	ver	40.50	-31.06 dB
13.56	13.56	26.80	qpk	ver	84.00	-57.2 dB

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

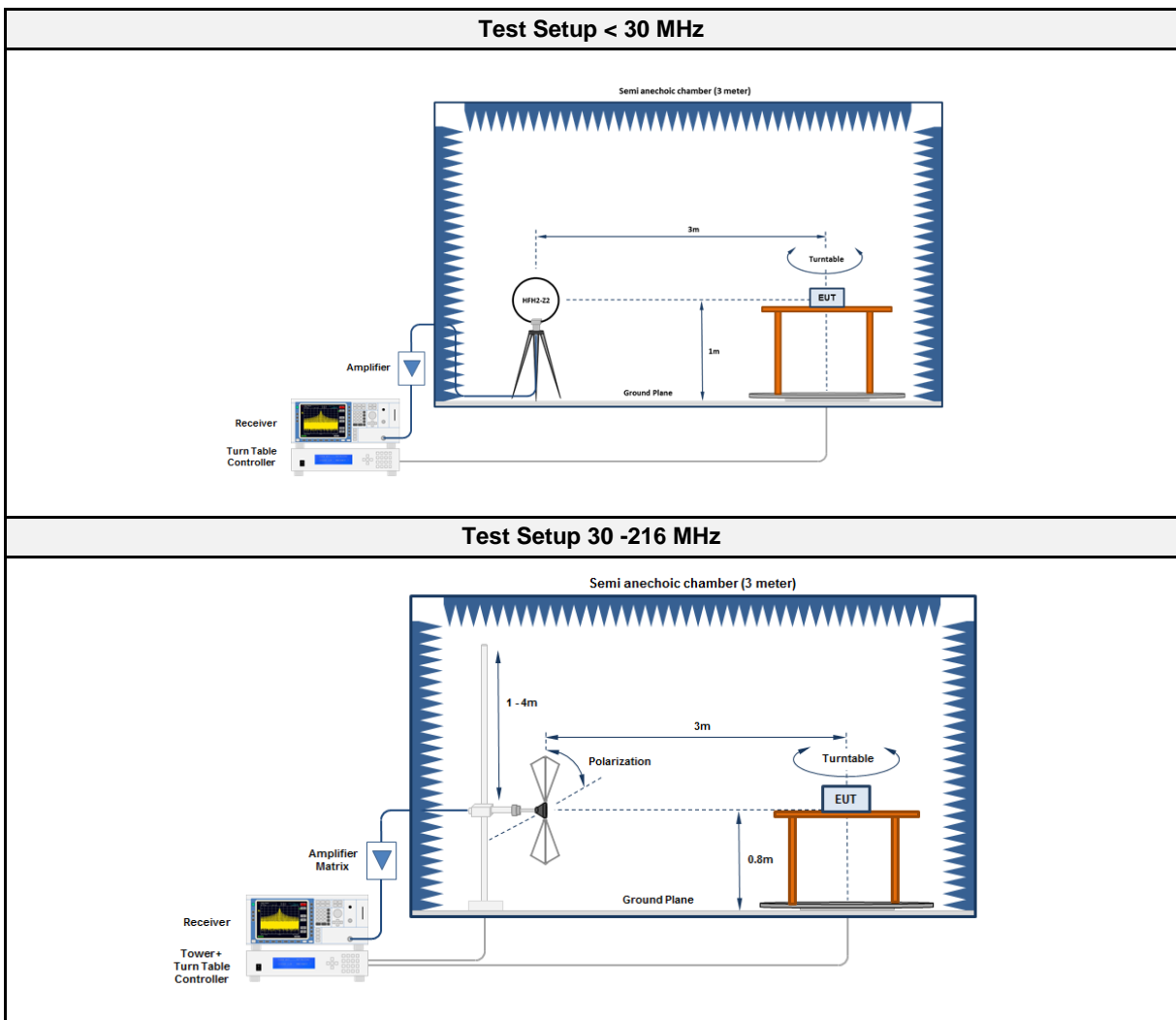
3.3.1 Information

Test Information	
Product Standard Reference	FCC 15.225(d) / ISED RSS-210 B.6(d)
Measurement Method	Radiated

3.3.2 Limits

Limits				
Frequency range [MHz]	Detector	Limit [$\mu\text{V}/\text{m}$]	Limit [$\text{dB}\mu\text{V}/\text{m}$]	Limit Distance [m]
0.009 - 0.490	Quasi-Peak	$2400/F[\text{kHz}]$	48.5 - 13.8	300
0.490 - 1.705	Quasi-Peak	$2400/F[\text{kHz}]$	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



3.3.4 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
Semi-Anechoic Chamber	Frankonia	AC1	EF00062	2018-07	2021-07
EMI Test Receiver	Rohde & Schwarz Vertriebs GmbH	ESCS 30	EF00295	2018-07	2019-07
Antenna	R&S	HFH2-Z2	EF00184	2017-12	2019-12

Test Equipment 30 - 216 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Semi-Anechoic Chamber	Frankonia	AC1	EF00062	2018-07	2021-07
EMI Test Receiver	Rohde & Schwarz Vertriebs GmbH	ESCS 30	EF00295	2018-07	2019-07
Antenna	R&S	HK116	EF00203	2018-06	2020-06

3.3.5 Procedure

Test Procedure
<ol style="list-style-type: none"> 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 [dB μ V/m]	Detector	Polarization	Limit [dB μ V/m]	Margin [dB]
13.56	30.528	29.74	pk	hor	40.00	-10.26
13.56	30.88	29.88	pk	ver	40.00	-10.12
13.56	120.816	28.60	pk	ver	43.50	-14.90
13.56	129.968	28.64	pk	hor	43.50	-14.86

3.4 Test Conditions and Results - Frequency stability

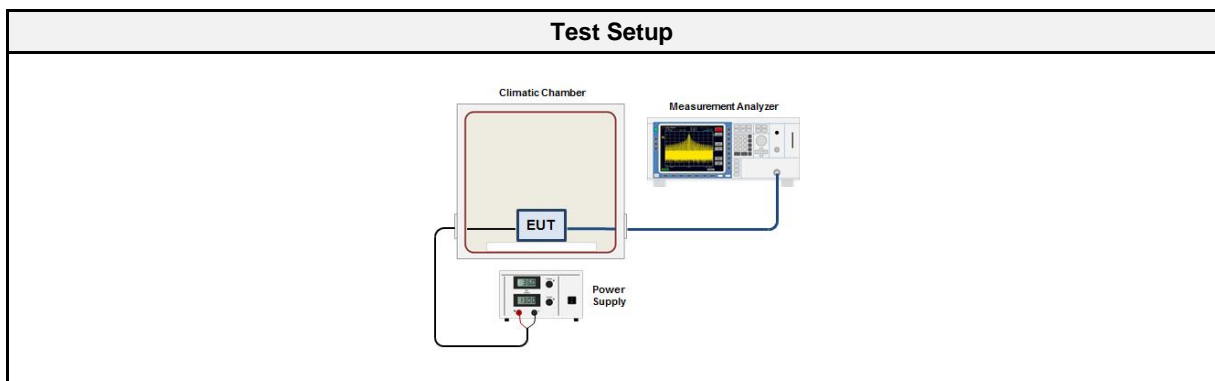
3.4.1 Information

Test Information	
Product Standard Reference	FCC 15.225(e) / ISED RSS-210 B.6
Measurement Method	Conducted

3.4.2 Limits

Limits
Frequency error limit
±0.01% (±100ppm)

3.4.3 Setup



3.4.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU3	EF00241	2017-07	2019-07
Climatic chamber	Vötsch GmbH	VT 4010	EF00134	2018-08	2019-08

3.4.5 Procedure

Test Procedure
<ol style="list-style-type: none"> 1. EUT set to test mode 2. The ambient temperature and supply voltage is set according to measurement conditions 3. Span is set to capture fundamental emission 4. Frequency error is measured with frequency counter measurement function

3.4.6 Results

Test Results - Variation of ambient temperature					
Nominal Frequency [MHz]	Voltage [V]	Temperature [°C]	Time after activation	Frequency [MHz]	Deviation [ppm]
13.56	7.5	50	0	13.561001	73.80
13.56	7.5	50	2	13.560429	31.60
13.56	7.5	50	5	13.560429	31.65
13.56	7.5	50	10	13.560461	33.96
13.56	7.5	40	0	13.560461	33.96
13.56	7.5	40	2	13.560448	33.02
13.56	7.5	40	5	13.560432	31.88
13.56	7.5	40	10	13.560411	30.33
13.56	7.5	30	0	13.560411	30.33
13.56	7.5	30	2	13.560465	34.26
13.56	7.5	30	5	13.560464	34.24
13.56	7.5	30	10	13.560461	33.98
13.56	7.5	20	0	13.560426	31.42
13.56	7.5	20	2	13.560442	32.60
13.56	7.5	20	5	13.560455	33.55
13.56	7.5	20	10	13.560422	31.12
13.56	7.5	10	0	13.560422	31.12
13.56	7.5	10	2	13.560353	26.03
13.56	7.5	10	5	13.560430	31.71
13.56	7.5	10	10	13.560399	29.42
13.56	7.5	0	0	13.560399	29.42
13.56	7.5	0	2	13.560419	30.90
13.56	7.5	0	5	13.560406	29.94
13.56	7.5	0	10	13.560384	28.32
13.56	7.5	-10	0	13.560384	28.32
13.56	7.5	-10	2	13.560402	29.65
13.56	7.5	-10	5	13.560414	30.53
13.56	7.5	-10	10	13.560386	28.47
13.56	7.5	-20	0	13.560386	28.47
13.56	7.5	-20	2	13.560397	29.28
13.56	7.5	-20	5	13.560350	25.81
13.56	7.5	-20	10	13.560402	29.65
Comment	Limit check: Pass				

ANNEX A Transmitter in-band emissions

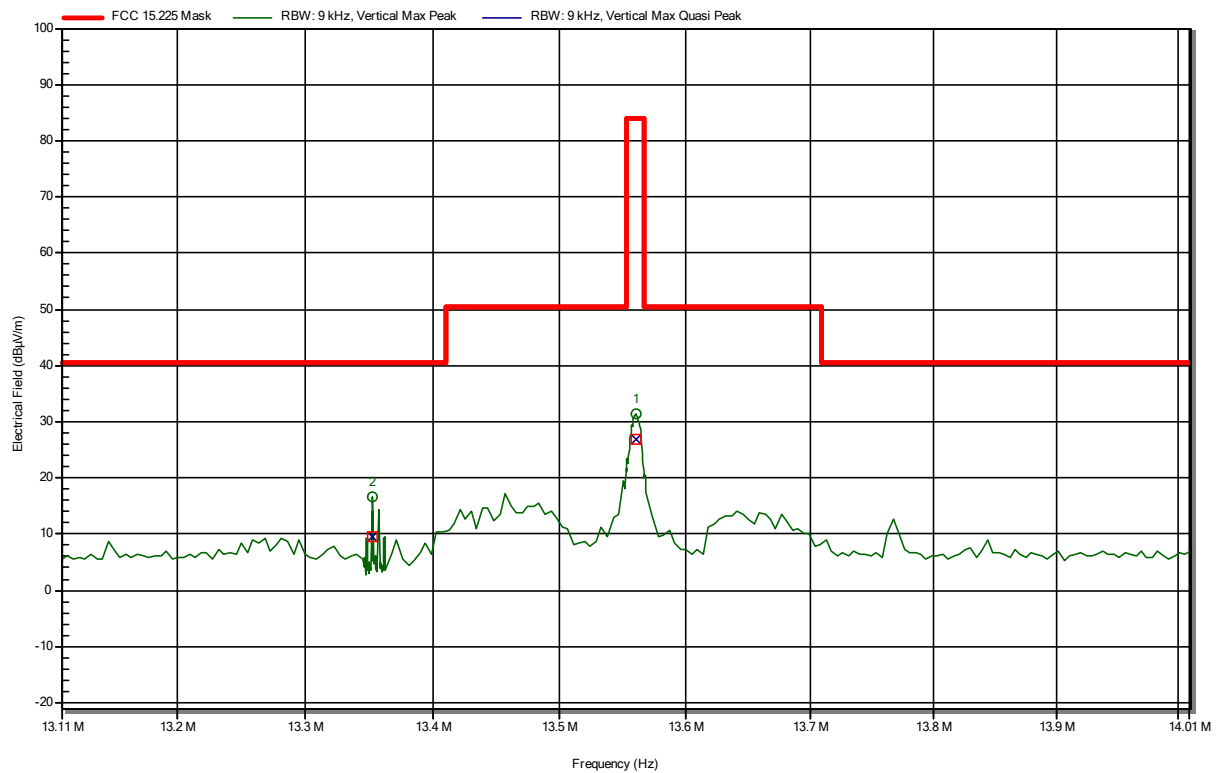
Spurious emissions according to FCC 15.225

Project number: G0M-1808-7604

Applicant: Dräger Safety AG & Co. KGaA
 EUT Name: Portable short-term gas measurement device
 Model: X-act 7000
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 23°C, Vnom: 7.5 VDC (battery)
 Antenna: Rohde & Schwarz HFH 2-Z2
 Measurement distance: 3 m converted to 30 m
 Mode: TX; OOK; 13.56 MHz
 Test Date: 2019-01-07
 Note:

Index 4

RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
13.353 MHz	16.7 dBµV/m	40.5 dBµV/m	-23.78 dB	Pass
13.56 MHz	31.5 dBµV/m	84 dBµV/m	-52.47 dB	Pass

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
13.353 MHz	9.4 dBµV/m	40.5 dBµV/m	-31.06 dB	Pass
13.56 MHz	26.8 dBµV/m	84 dBµV/m	-57.2 dB	Pass

ANNEX B Transmitter radiated spurious emissions

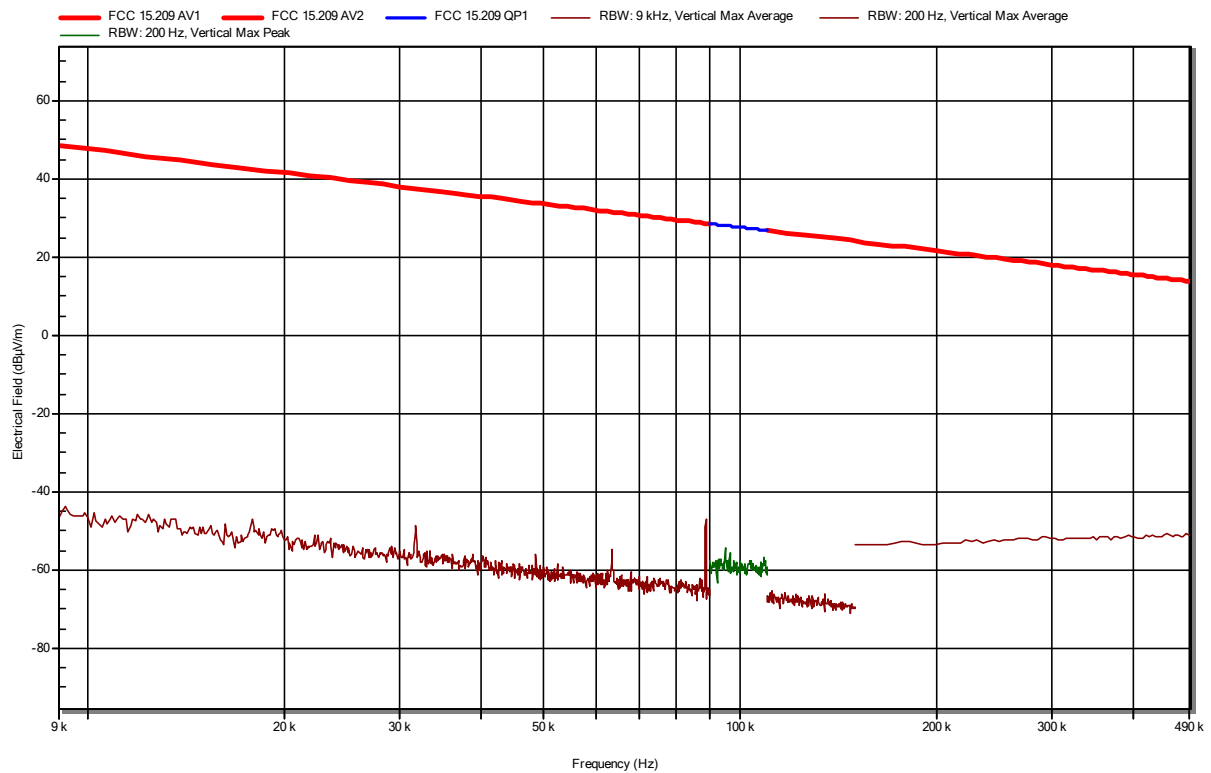
Spurious emissions according to FCC 15.225

Project number: G0M-1808-7604

Applicant: Dräger Safety AG & Co. KGaA
 EUT Name: Portable short-term gas measurement device
 Model: X-act 7000
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 23°C, Vnom: 7.5 VDC (battery)
 Antenna: Rohde & Schwarz HFH 2-Z2
 Measurement distance: 3 m converted to 300 m
 Mode: TX; OOK; 13.56 MHz
 Test Date: 2019-01-07
 Note:

Index 5

RadiMation



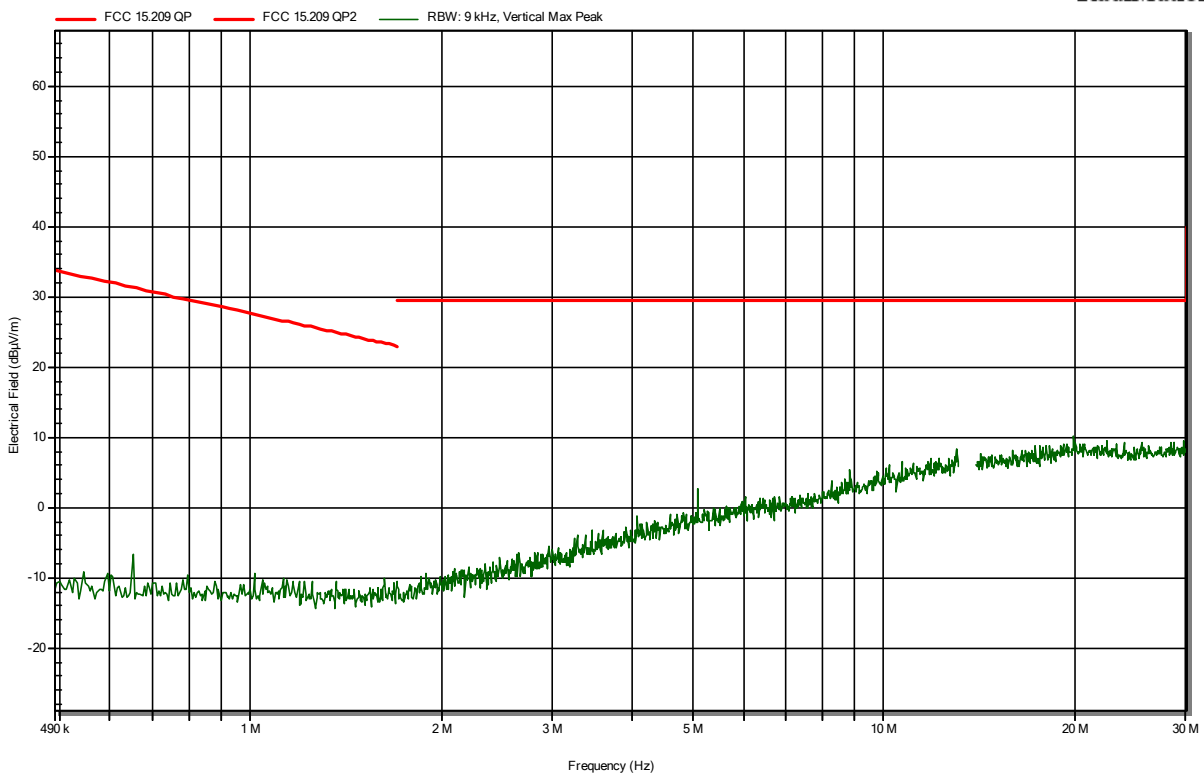
Spurious emissions according to FCC 15.225

Project number: G0M-1808-7604

Applicant: Dräger Safety AG & Co. KGaA
 EUT Name: Portable short-term gas measurement device
 Model: X-act 7000
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 23°C, Vnom: 7.5 VDC (battery)
 Antenna: Rohde & Schwarz HFH 2-Z2
 Measurement distance: 3 m converted to 30 m
 Mode: TX; OOK; 13.56 MHz
 Test Date: 2019-01-07
 Note: EUT vertical, measured without Tag continuously reading

Index 8

RadiMation

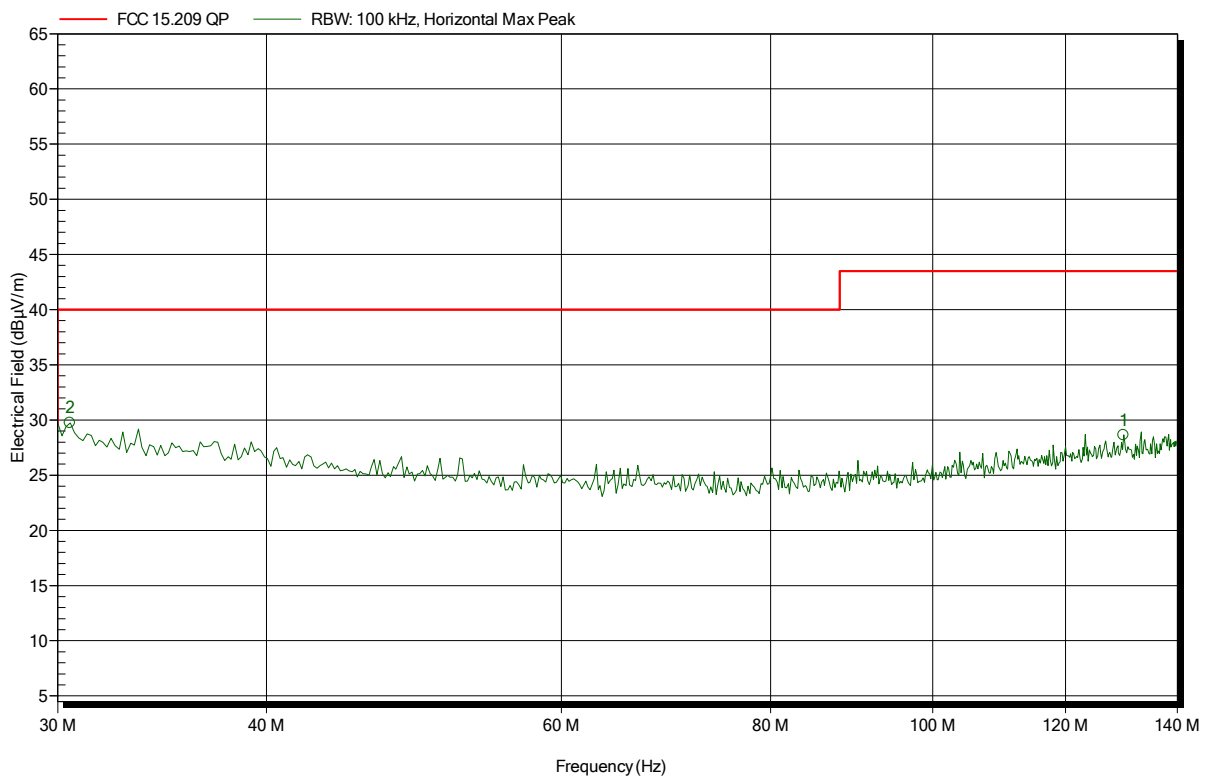


Spurious emissions according to FCC 15.225

Project number: G0M-1808-7604

Applicant: Dräger Safety AG & Co. KGaA
 EUT Name: Portable short-term gas measurement device
 Model: X-act 7000
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 23°C, Vnom: 7.5 VDC (battery)
 Antenna: Rohde & Schwarz HK 116, Horizontal
 Measurement distance: 3 m
 Mode: RX; OOK; 13.56 MHz
 Test Date: 2019-01-08
 Note: worst case

Index 5



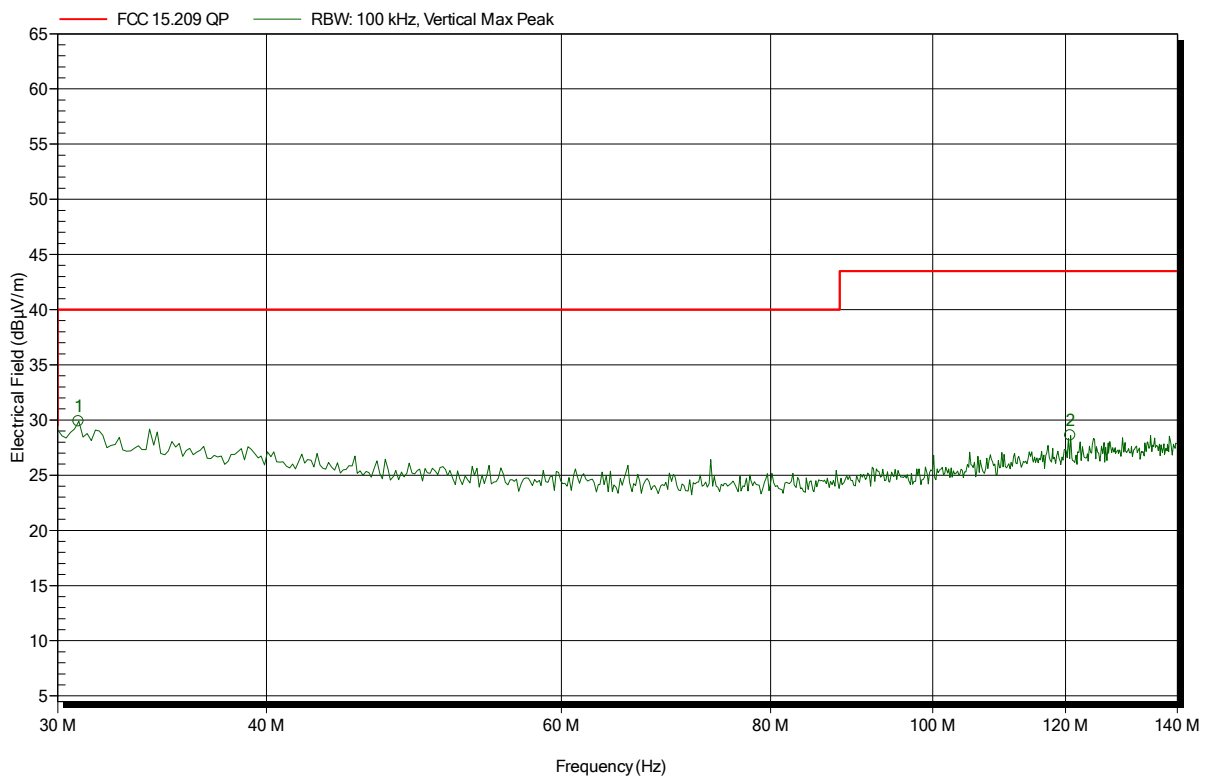
Frequency	Peak	Peak Limit	Peak Difference	Status
129.968 MHz	28.64 dBµV/m	43.5 dBµV/m	-14.86 dB	Pass
30.528 MHz	29.74 dBµV/m	40 dBµV/m	-10.26 dB	Pass

Spurious emissions according to FCC 15.225

Project number: G0M-1808-7604

Applicant: Dräger Safety AG & Co. KGaA
 EUT Name: Portable short-term gas measurement device
 Model: X-act 7000
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 23°C, Vnom: 7.5 VDC (battery)
 Antenna: Rohde & Schwarz HK 116, Vertical
 Measurement distance: 3 m
 Mode: RX; OOK; 13.56 MHz
 Test Date: 2019-01-08
 Note: worst case

Index 6



Frequency	Peak	Peak Limit	Peak Difference	Status
120.816 MHz	28.6 dBµV/m	43.5 dBµV/m	-14.9 dB	Pass
30.88 MHz	29.88 dBµV/m	40 dBµV/m	-10.12 dB	Pass