




EMC TEST REPORT FCC 47 CFR Part 15B, ISED ICES-003 Issue 6	
Report Reference No	G0M-1810-7792-EF0115B-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 Filed Test Laboratory, Reg.-No.: 96970 ISED Testing Laboratory site: 3470A-2</p>
Applicant	Kamstrup A/S
Address	Industrivej 28 8660 Skanderborg DENMARK
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	Ultrasonic water meter
Model(s)	FlowIQ 2250
Additional Model(s)	None
Brand Name(s)	Kamstrup
Hardware Version(s)	620120101 rev B1 / RF board 55501605 rev F1
Software Version(s)	50981336 rev M1, 55141570 rev D1
FCC-ID	OUY-FLOWX250
IC	none
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	2019-02-15	
Report:		
Compiled by	Stefan Dose	
Tested by (+ signature) (Responsible for Test)	Stefan Dose	 
	Matthias Handrik	
Approved by (+ signature) (Deputy Head of Lab)	Jens Marquardt	
Date of Issue	2019-03-27	
Total number of pages	25	
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:		
<p>Additional variants have been declared by the manufacturer. The listed models in table below were not tested, evaluated or assessed in no way.</p>		

additional not-tested models:				
	Product type	Model name	Hardware version	Software version
#1	Ultrasonic Water Meter	FlowIQ 2250	620120102 rev A3 / RF board 55501605 rev F1	50981336 rev M1 55141570 rev D1
#2	Ultrasonic Water Meter	FlowIQ 2250	620120103 rev A4 / RF board 55501605 rev F1	50981336 rev M1 55141570 rev D1
#3	Ultrasonic Water Meter	FlowIQ 3250	620220101 rev A5 / RF board 55501605 rev F1	50981336 rev M1 55141570 rev D1
#4	Ultrasonic Water Meter	FlowIQ 3250	620220102 rev 00 / RF board 55501605 rev F1	50981336 rev M1 55141570 rev D1
#5	Ultrasonic Water Meter	FlowIQ 3250	620220103 rev A4 / RF board 55501605 rev F1	50981336 rev M1 55141570 rev D1
#6	Ultrasonic Water Meter	FlowIQ 3250	620220104 rev 00 / RF board 55501605 rev F1	50981336 rev M1 55141570 rev D1
#7	Ultrasonic Water Meter	FlowIQ 3250	620220105 rev A3 / RF board 55501605 rev F1	50981336 rev M1 55141570 rev D1

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	2019-03-27	Initial Release	

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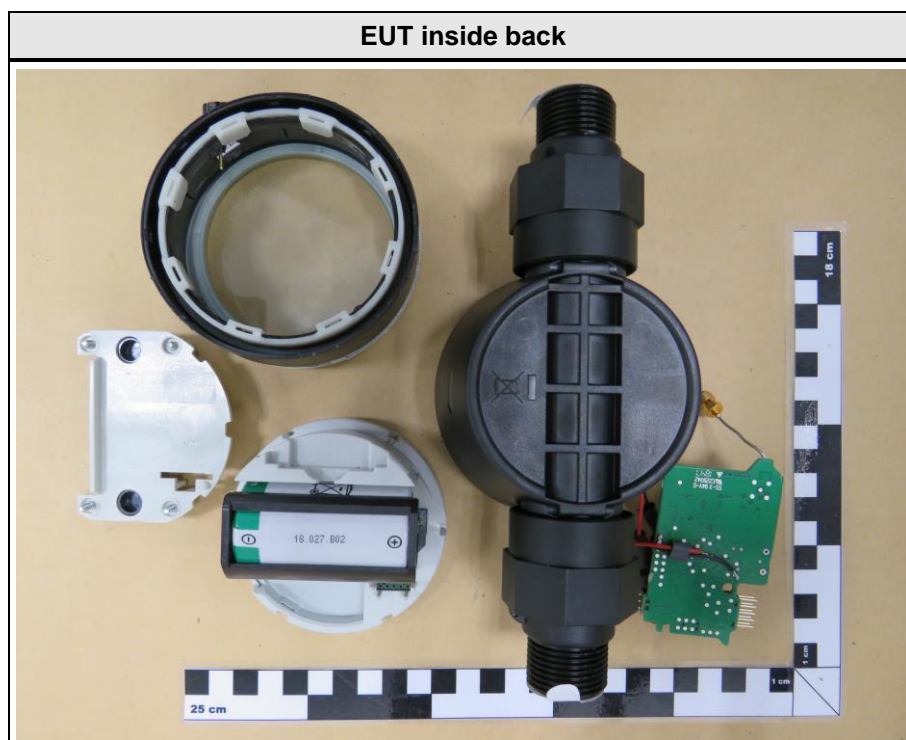
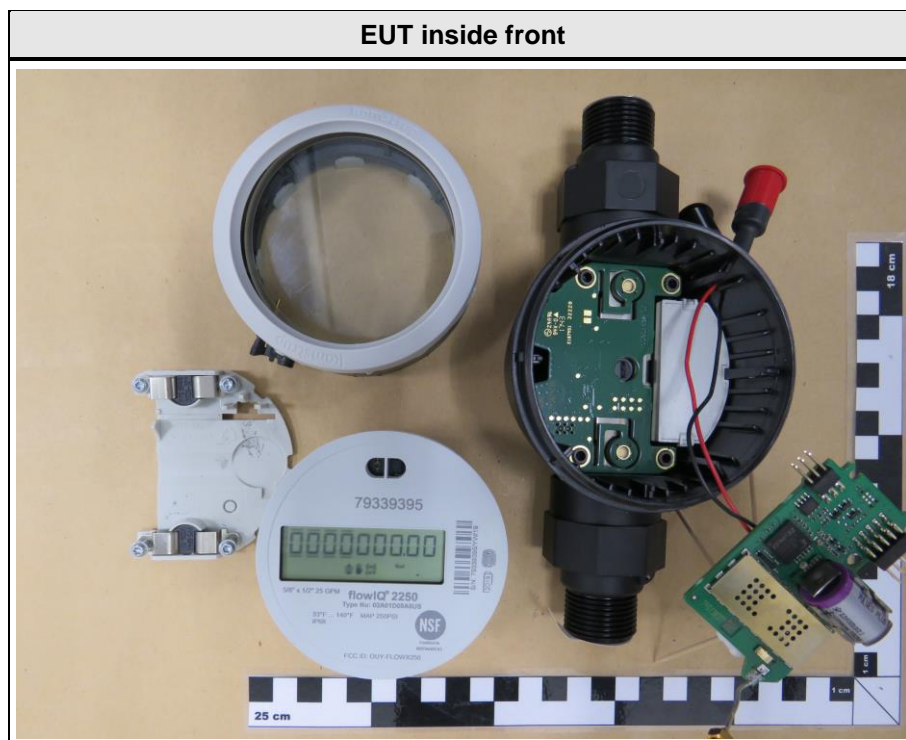
1 Equipment (Test Item) Under Test

Description	Ultrasonic water meter	
Model	FlowIQ 2250	
Additional Model(s)	None	
Brand Name(s)	Kamstrup	
Serial Number(s)	79339395/YW/19	
Hardware Version(s)	620120101 rev B1 / RF board 55501605 rev F1	
Software Version(s)	50981336 rev M1, 55141570 rev D1	
FCC-ID	OUY-FLOWX250	
IC	none	
Class	Class B	
Equipment type	Table top	
Highest internal frequency [MHz]	3759.9	
Radio Module 1	Type	SRD + LMR/PMR
	Model	unspecified
	Manufacturer	unspecified
Supply Voltage	V_{NOM}	3.66 VDC (internal battery)
AC/DC-Adaptor	none	
Manufacturer	Kamstrup A/S Industrivej 28 8660 Skanderborg DENMARK	

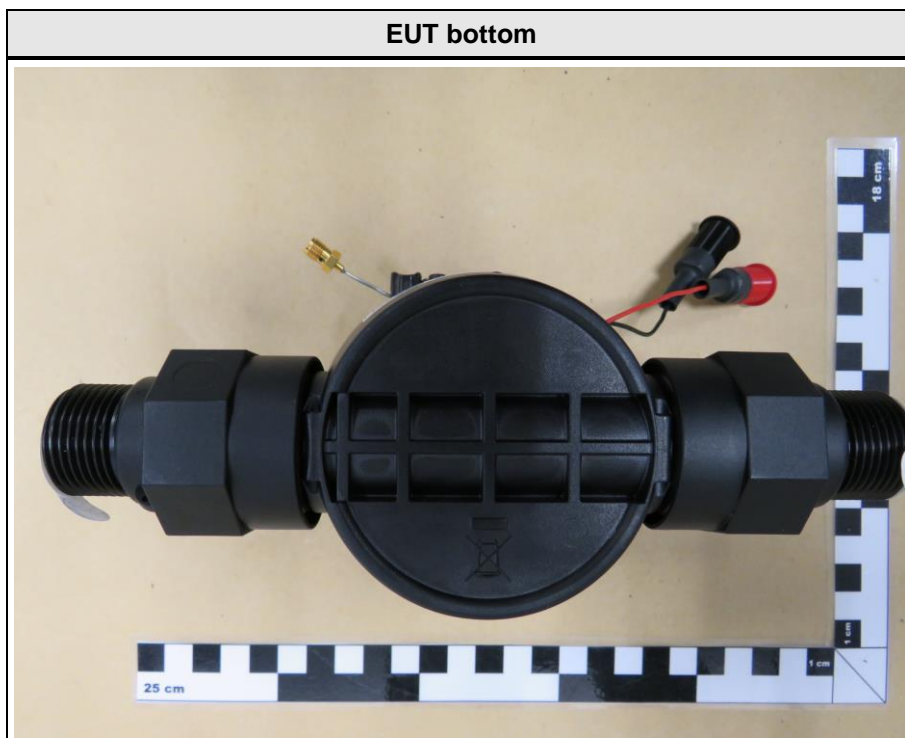
1.1 Equipment Ports

Name	Type	Attributes	Comment
-	-	-	note 1
comments: • note 1 → no external ports or interfaces defined by customer, but customer prepared sample with external power supply (see pictures), because internal battery (usual power supply) is not able to power the EUT with full power for the whole time of test			
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



1.3 Equipment Photos - External



1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
-	-	-	-	-
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
Comment:				

1.5 Operational Modes

Mode #	Description
1	EUT is sending via SRD (used frequency: 915MHz; modulation: random)
2	EUT is sending via LMR-PMR
Comment:	

1.6 EUT Configuration

Configuration #	Description
1	EUT is powered up via laboratory power supply, temporarily connection therefor is provided by customer
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:

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

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 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	-
FCC 15.107 ICES-003, 8, 6.2	AC power line conducted emissions	ANSI C63.4:2014	N/R	-
Comment:				

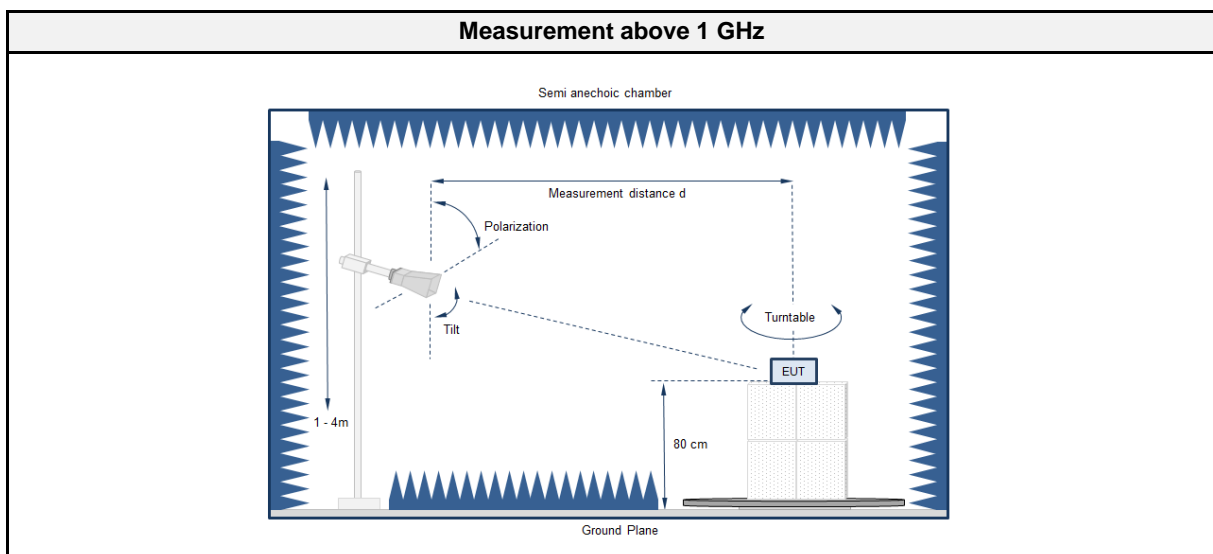
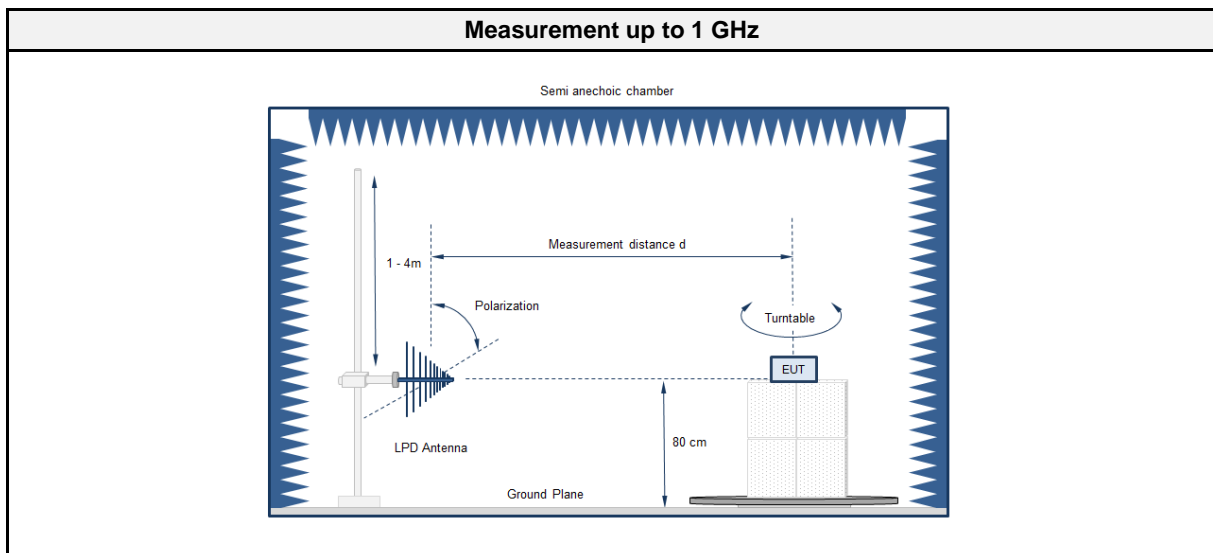
Possible Test Case Verdicts	
PASS	Test object does meet the requirements
FAIL	Test object does not meet the requirements
N/T	Required by standard but not tested
N/R	Not required by standard for the test object

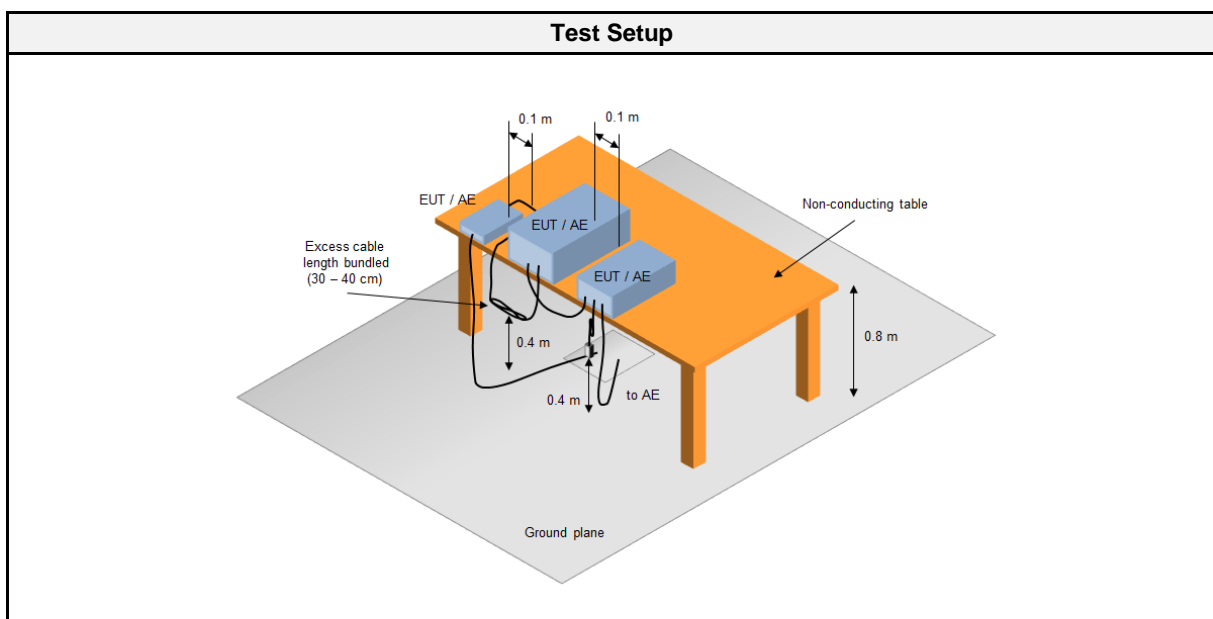
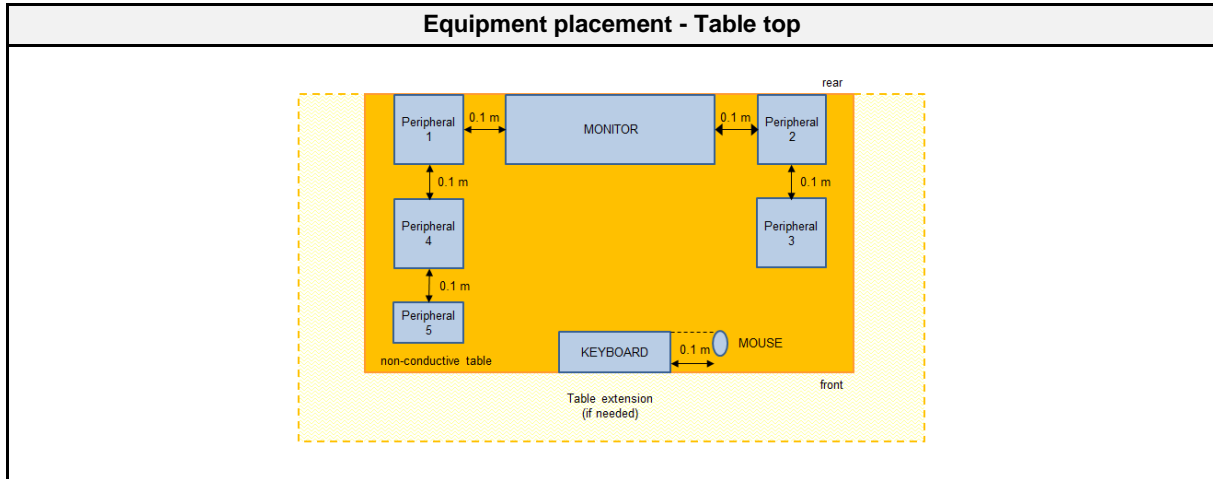
2.1 Test Conditions and Results - Radiated emissions acc. to ANSI C63.4

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]	3759.9
Measurement range	30 MHz to 18799.5 MHz
Temperature [°C]	20 - 23
Humidity [%]	24 - 35
Operator	Matthias Handrik
Date	2019-03-13 and 2019-03-15

2.1.2 Setup





2.1.3 Equipment

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

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic chamber	Frankonia	AC1	EF00062	2018-07	2021-07
EMI Test Receiver	Keysight	N9038A-526/WXP	EF01070	2018-08	2019-08
Biconical Antenna	R&S	HK 116	EF00030	2016-04	2019-04
LPD Antenna	R&S	HL 223	EF00186	2018-03	2020-03
Horn antenna	Schwarzbeck	BBHA 9120D (1-18GHz)	EF00018	2016-09	2019-09
40GHz High Gain Antenna	Amplifier Research	AT4560	EF00302	2018-04	2019-04

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

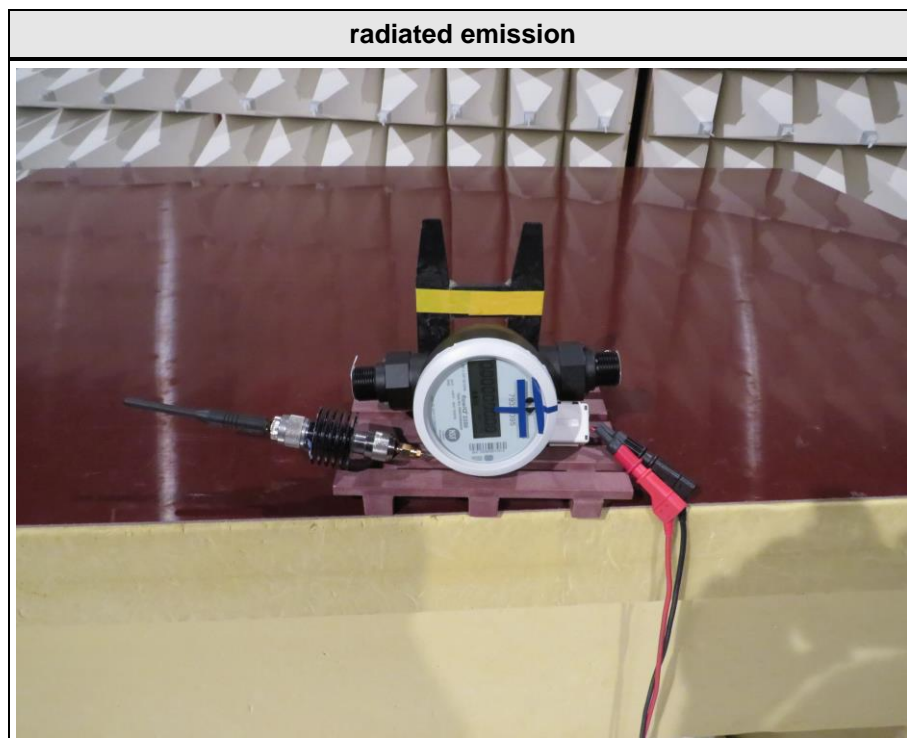
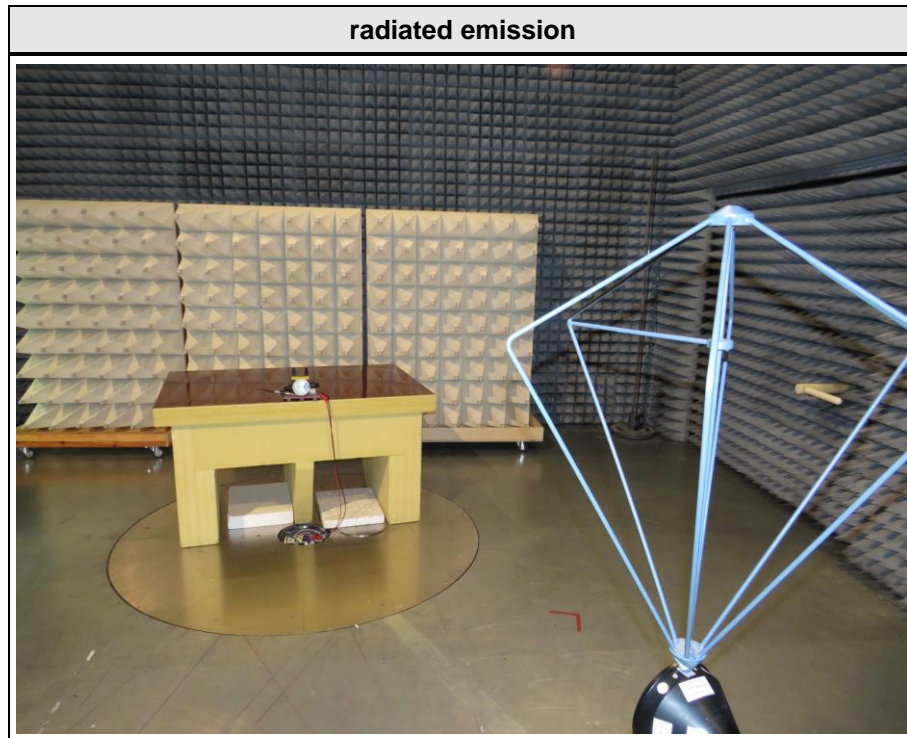
Class B @ 3 m		
Frequency [MHz]	Detector	Limit [dBµV/m]
30 - 88	Quasi-peak	40
88 - 216	Quasi-peak	43.5
216 - 960	Quasi-peak	46
960 - 1000	Quasi-peak	54
> 1000	Peak	74
	Average	54

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	69.5
	Average	49.5

2.1.6 Results

Test Results			
Operational mode	EUT Configuration	Verdict	Remark
1	1	PASS	note 2 & 3
Comment: • note 2 → after short check on spectrum analyser: SRD-mode (mode 1) is the worst case • note 3 → no significant emissions above 17GHz			

2.1.7 Setup Photos



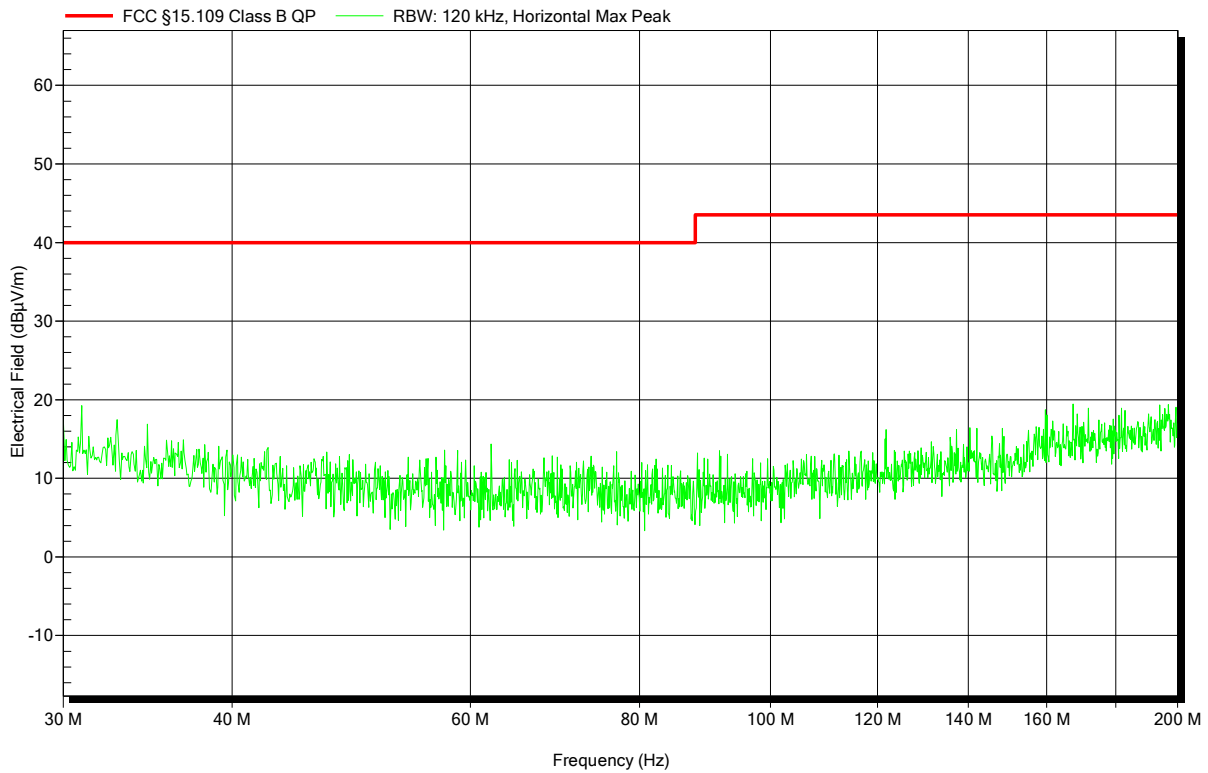
2.1.8 Records

Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1810-7792

Applicant:	Kamstrup A/S
EUT Name:	Ultrasonic water meter
Model:	FlowIQ 2250
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Dose
Test Conditions:	Tnom: 23°C, Unom: 3.66 VDC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3m
Mode:	1
Test Date:	2019-03-13

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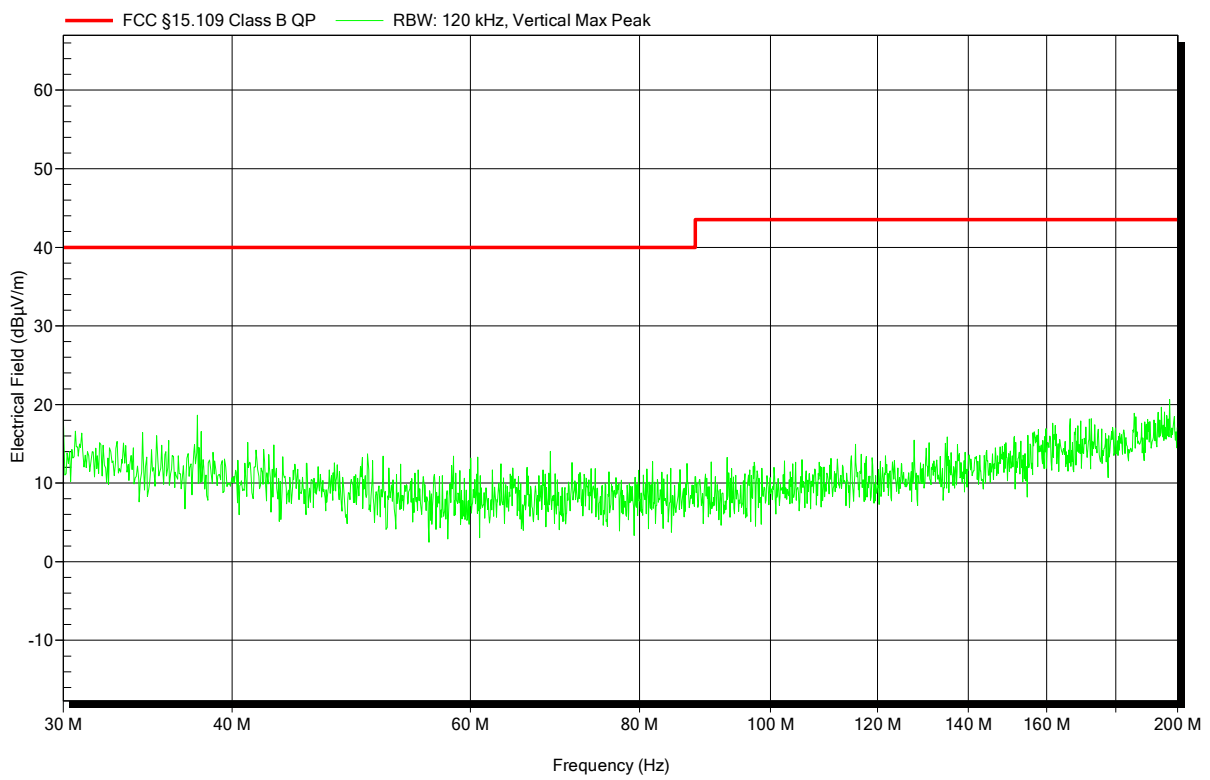


Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1810-7792

Applicant: Kamstrup A/S
 EUT Name: Ultrasonic water meter
 Model: FlowIQ 2250
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Dose
 Test Conditions: Tnom: 23°C, Unom: 3.66 VDC
 Antenna: Rohde & Schwarz HK 116, Vertical
 Measurement distance: 3m
 Mode: 1
 Test Date: 2019-03-13

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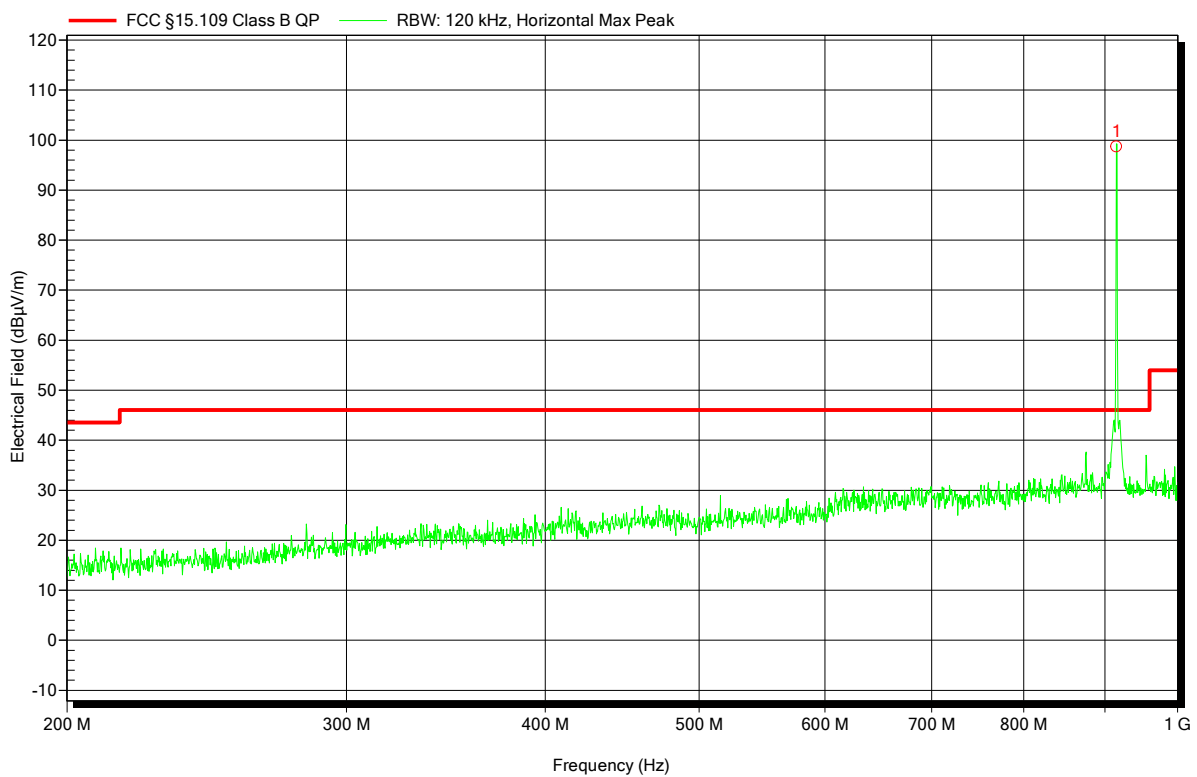


Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1810-7792

Applicant: Kamstrup A/S
 EUT Name: Ultrasonic water meter
 Model: FlowIQ 2250
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Dose
 Test Conditions: Tnom: 23°C, Unom: 3.66 VDC
 Antenna: Rohde & Schwarz HL 223, Horizontal
 Measurement distance: 3m
 Mode: 1
 Test Date: 2019-03-13

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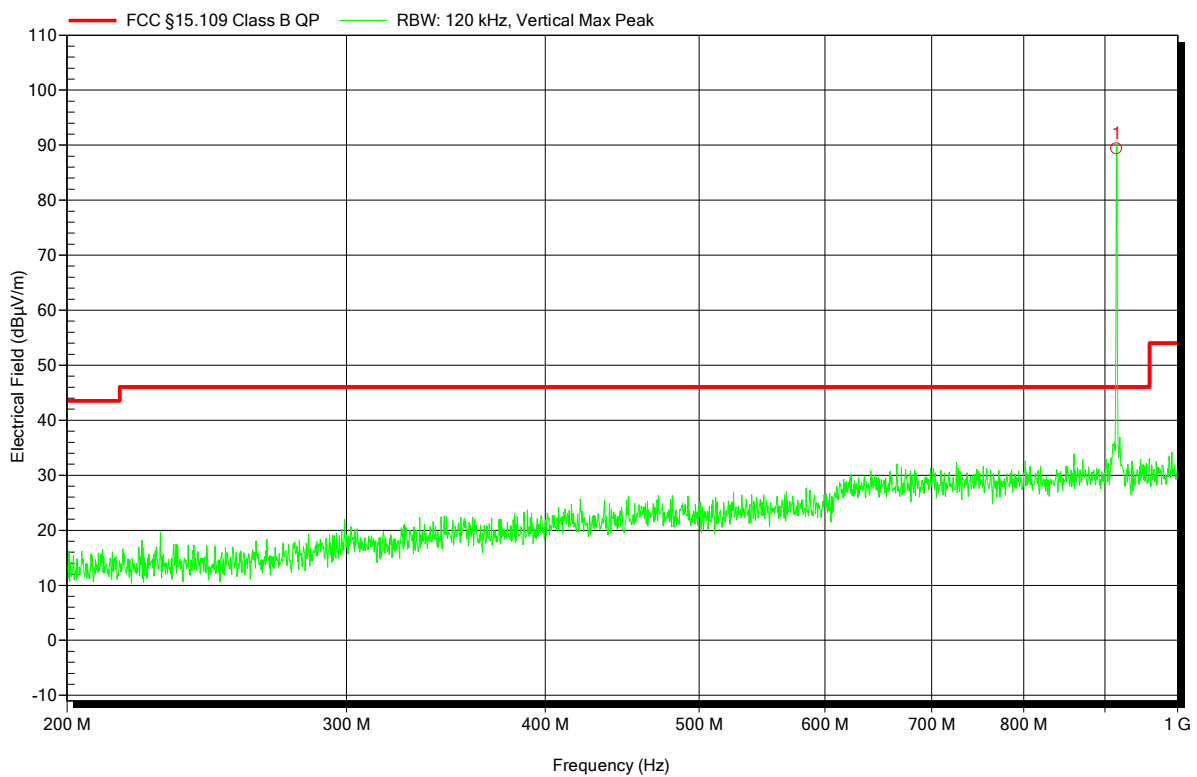
Peak Number	Frequency	SRD carrier
1	915.16 MHz	

Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1810-7792

Applicant: Kamstrup A/S
 EUT Name: Ultrasonic water meter
 Model: FlowIQ 2250
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Dose
 Test Conditions: Tnom: 23°C, Unom: 3.66 VDC
 Antenna: Rohde & Schwarz HL 223, Vertical
 Measurement distance: 3m
 Mode: 1
 Test Date: 2019-03-13

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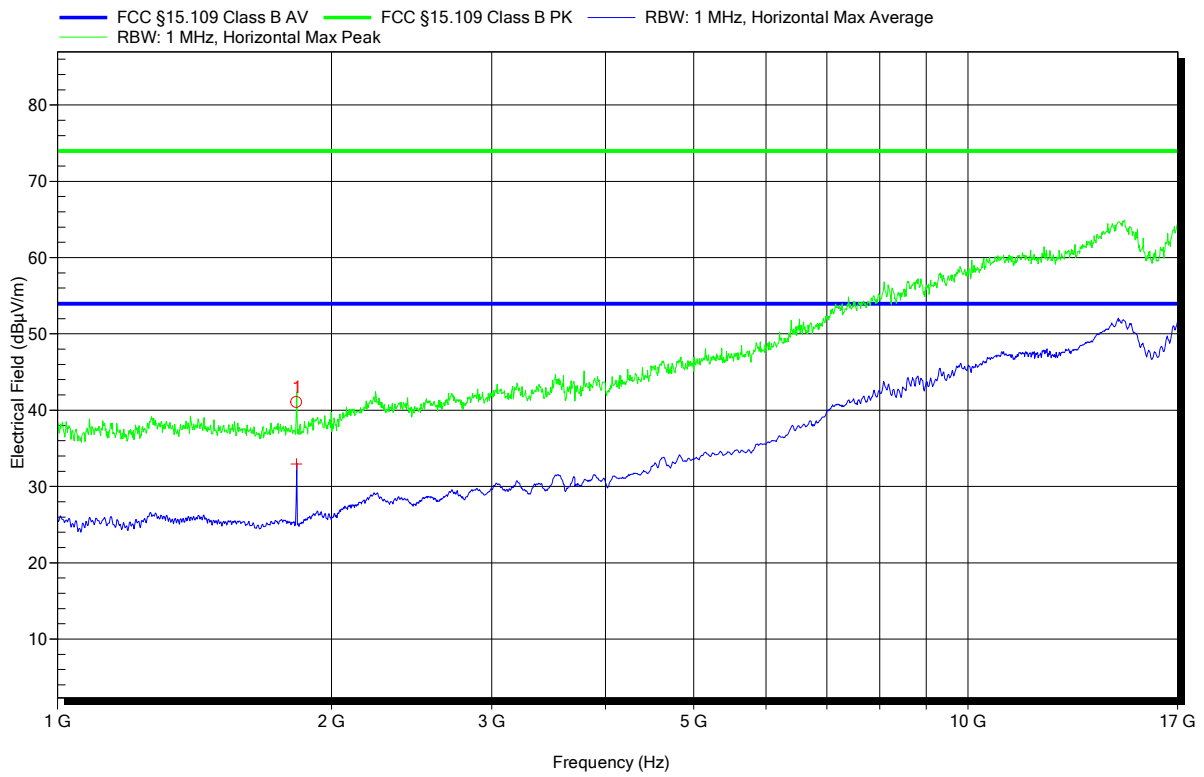
Peak Number	Frequency	SRD carrier
1	915.16 MHz	

Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1810-7792

Applicant: Kamstrup A/S
 EUT Name: Ultrasonic water meter
 Model: FlowIQ 2250
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Dose
 Test Conditions: Tnom: 20°C, Unom: 3.66 VDC
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3m
 Mode: 1
 Test Date: 2019-03-15

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Peak Number	Frequency	Peak	
1	1.83 GHz	41.04 dBµV/m	2 nd harmonic

Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1810-7792

Applicant: Kamstrup A/S
 EUT Name: Ultrasonic water meter
 Model: FlowIQ 2250
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Dose
 Test Conditions: Tnom: 20°C, Unom: 3.66 VDC
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 3m
 Mode: 1
 Test Date: 2019-03-15

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