



EMC TEST REPORT FCC 47 CFR Part 15B Industry Canada ICES-003 Electromagnetic compatibility - Unintentional radiators	
Report Reference No.	G0M-1710-6928-EF0115B-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	<div style="text-align: center;">   </div> <p>A2LA Accredited Testing Laboratory, Certificate No.: 1983.01 FCC Test Firm Designation Number: DE0008 IC Testing Laboratory site: 3470A-2</p>
Applicant's name	Leica Geosystems AG
Address	Heinrich Wild Strasse 9435 Heerbrugg SWITZERLAND
Test specification:	
Standard.....	47 CFR Part 15 Subpart B ICES-003, Issue 6:2016 ANSI C63.4:2014
Equipment under test (EUT):	
Product description	Laser Distance Meter
Model No.	Leica DISTO X4-1
Additional Models	none
Hardware version	V 09
Firmware / Software version	V 05
Contains	FCC-ID: RFF-LD3BT IC: 3177A-LD3BT
Test result	Passed

Possible test case verdicts:

- not applicable to test object: N/A
- test object does meet the requirement.....: P (Pass)
- test object does not meet the requirement.....: F (Fail)

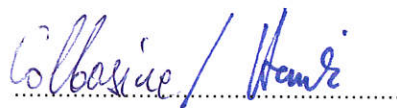
Testing:

Date of receipt of test item: 2017-11-06

Date (s) of performance of tests: 2018-01-16

Compiled by: Ruslan Colbasiuc

Tested by (+ signature).....: R. Colbasiuc / M. Handrik



 Approved by (+ signature): Jens Marquardt
 Deputy Head of Lab



Date of issue: 2018-02-12

Total number of pages: 23

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:

The listed models were not tested, evaluated or assessed in no way:

Description	Laser Distance meter
Model	Leica Disto X3-1

Version History

Version	Issue Date	Remarks	Revised by
V01	2018-02-12	Initial Release	

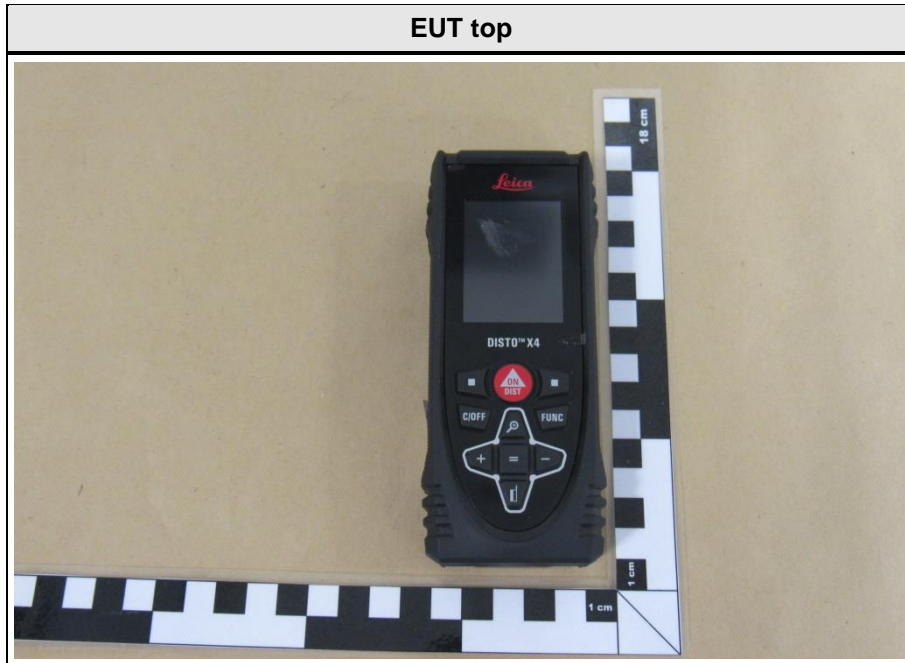
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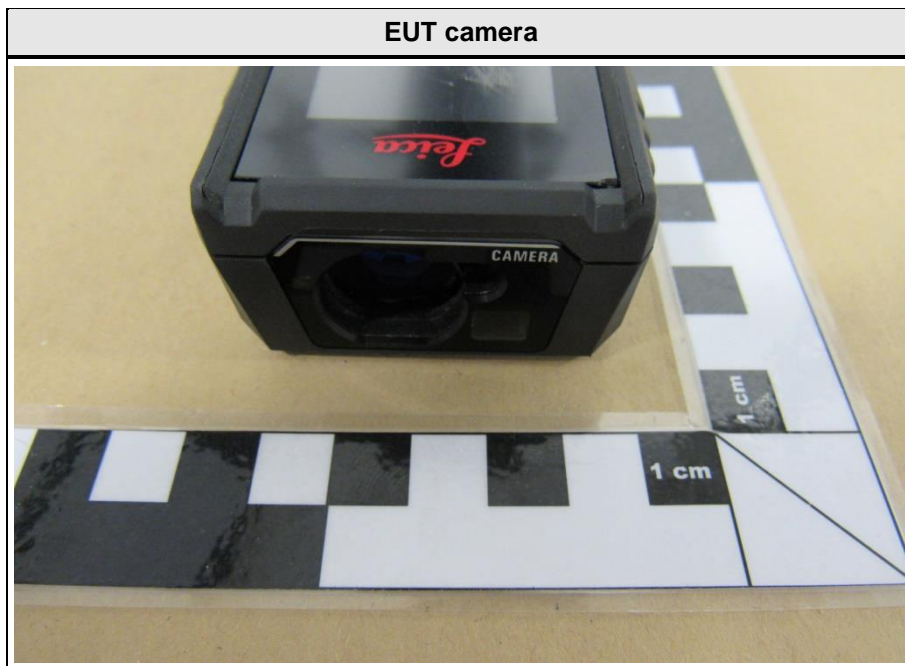
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1 Equipment (Test item) Description

Description	Laser Distance Meter
Model	Leica DISTO X4-1
Additional Models	None
Serial number	1673220256
Hardware version	V 09
Software / Firmware version	V 05
Contains FCC-ID	RFF-LD3BT
Contains IC	3177A-LD3BT
Power supply	3 VDC non rechargeable battery
Manufacturer	Leica Geosystems AG Heinrich Wild Strasse 9435 Heerbrugg SWITZERLAND
Highest emission frequency	Fmax[MHz]=2480
Device classification	Class B
Equipment type	Tabletop
Number of tested samples	1

1.1 Photos – Equipment external





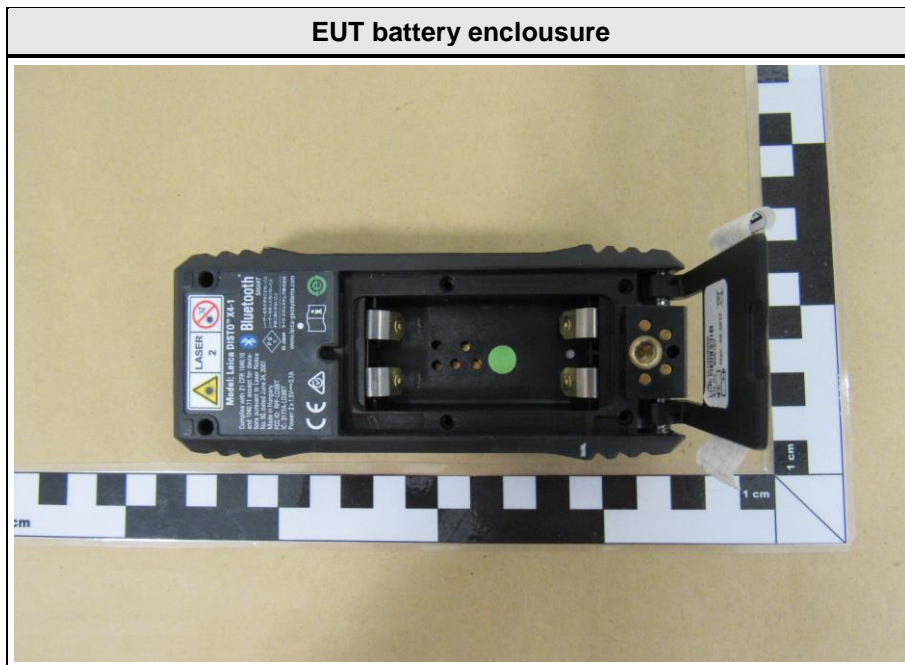
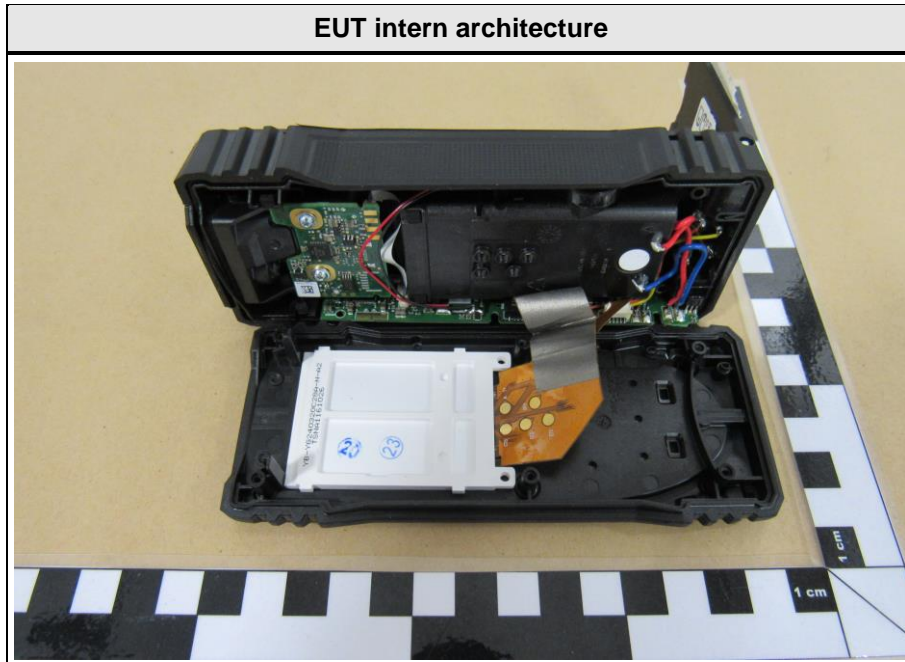
EUT label

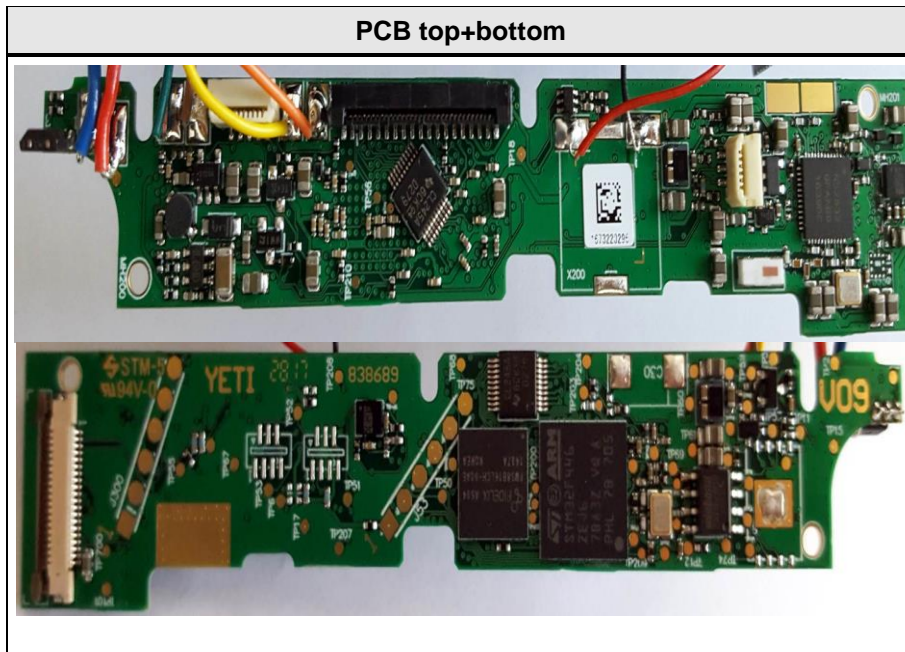


EUT S/N

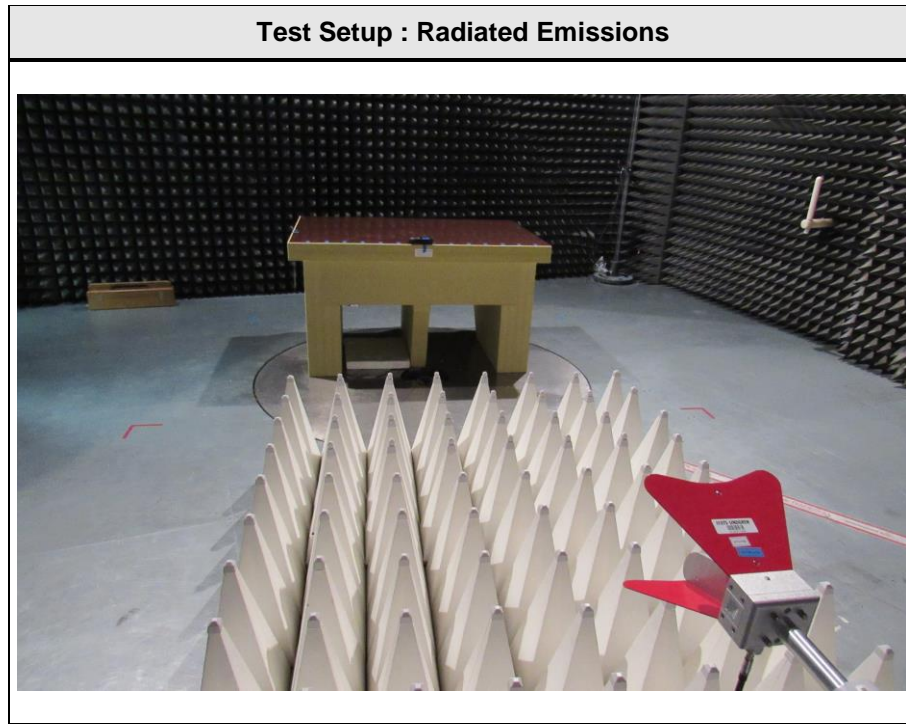


1.2 Photos – Equipment internal





1.3 Photos – Test setup



1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments (e.g. serial no.)
None				
<p>*Note: Use the following abbreviations:</p> <p>AE : Auxiliary/Associated Equipment, or</p> <p>SIM : Simulator (Not Subjected to Test)</p> <p>CABL : Connecting cables</p>				

1.5 Input / Output Ports

Port #	Name	Type*	Max. Cable Length	Cable Shielded	Comments (e.g. Cat. of Cable)
1	UART	I/O	-	No	UART for Disco
<p>*Note: Use the following abbreviations:</p> <p>AC : AC power port</p> <p>DC : DC power port</p> <p>N/E : Non electrical</p> <p>I/O : Signal input or output port</p> <p>TP : Telecommunication port</p>					

1.6 Operating Modes and Configurations

Mode #	Description
1	Continuous measurement

Configuration #	EUT Configuration
1	Device powered up. Bluetooth module on, continuous measurement function active.

1.7 Test Equipment Used During Testing

Measurement Software			
Description	Manufacturer	Name	Version
EMC Test Software	Dare Instruments	Radimation	2016.1.10

Radiated emissions AC1					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Biconical antenna	Rohde & Schwarz Vertriebs GmbH	HK116	EF00186	2016-02	2018-02
LPD Antenna	R&S	HL 223	EF00187	2016-05	2019-05
Horn antenna	Schwarzbeck	BBHA 9120D	EF00018	2016-09	2019-09
MXE EMI Receiver	Keysight Technologies	N9038A- 526/WXP	EF01070	2017-08	2018-08
RF Cable			-	System Cal.	System Cal
RF Cable			-	System Cal.	System Cal

1.8 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 dB μ V. 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:

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

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of dB μ V/m). The FCC limits are given in units of μ V/m. The following formula is used to convert the units of μ V/m to dB μ V/m:

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

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:

$$\begin{array}{rclcl} \text{Reading} & + & \text{AF} & = & \text{Net Reading} & : & \text{Net reading - FCC limit} & = & \text{Margin} \\ 21.5 \text{ dB}\mu\text{V} & + & 26 \text{ dB} & = & 47.5 \text{ dB}\mu\text{V/m} & : & 47.5 \text{ dB}\mu\text{V/m} - 57.0 \text{ dB}\mu\text{V/m} & = & -9.5 \text{ dB} \end{array}$$

2 Result Summary

FCC 47 CFR Part 15B, Industry Canada ICES-003				
Product Specific Standard	Requirement – Test	Reference Method	Result	Remarks
47 CFR 15.109 ICES-003 Item 6.2	Radiated emissions	ANSI C 63.4	PASS	
47 CFR 15.107 ICES-003 Item 6.1	AC power line conducted emissions	ANSI C63.4	N/A	Battery powered device, no rechargeable battery
Remarks:				

3 Test Conditions and Results

3.1 Test Conditions and Results – Radiated emissions

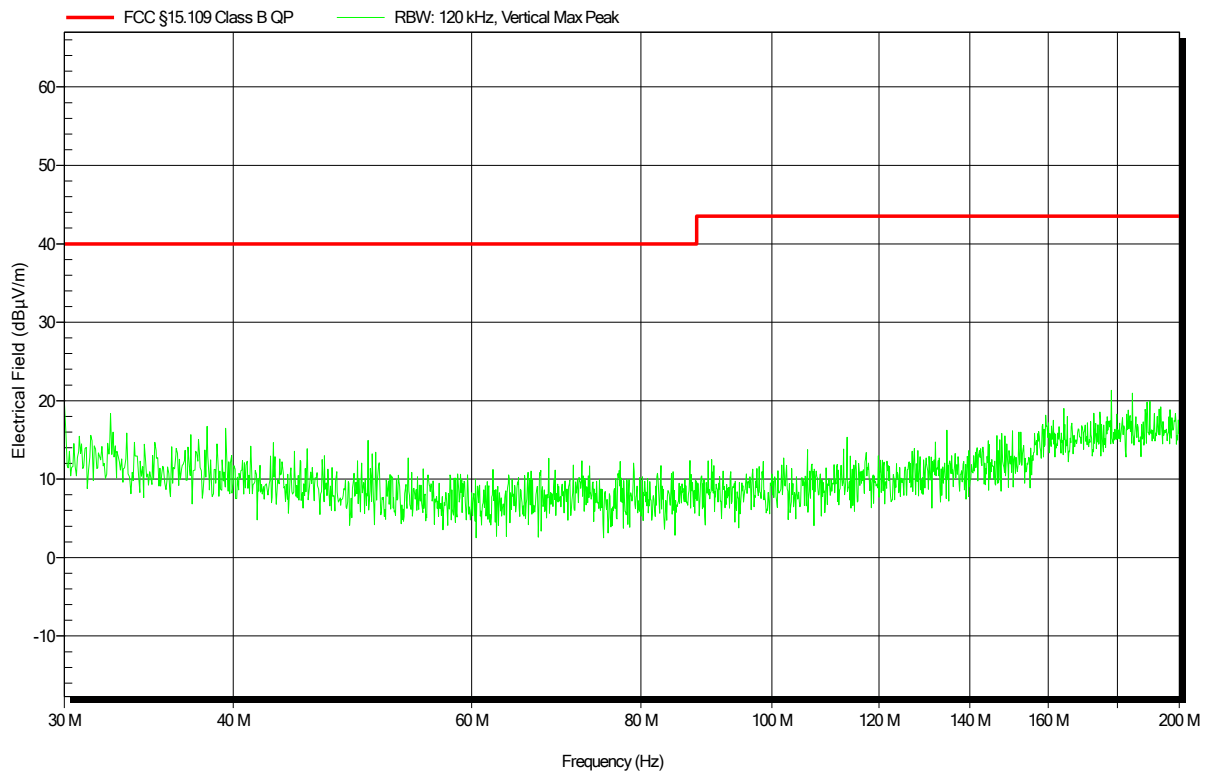
Radiated emissions acc. FCC 47 CFR 15.109 / ICES-003				Verdict: PASS		
Laboratory Parameters:		Required prior to the test		During the test		
Ambient Temperature		15 to 35 °C		25 °C		
Relative Humidity		30 to 60 %		30 %		
Test according referenced standards		Reference Method				
		ANSI C63.4				
Sample is tested with respect to the requirements of the equipment class		Equipment class				
		Class B				
Test frequency range determined from highest emission frequency		Highest emission frequency				
		Fmax [MHz] = 2480				
Fully configured sample scanned over the following frequency range		Frequency range				
		30 MHz to 13 GHz				
Operating mode		1				
Configuration		1				
Limits and results Class B						
Frequency [MHz]	Quasi-Peak [dB μ V/m]	Result	Average [dB μ V/m]	Result	Peak [dB μ V/m]	Result
30 – 88	40	PASS	-		-	-
88 – 216	43.5	PASS	-		-	-
216 – 960	46	PASS	-		-	-
960 – 1000	54	PASS	-		-	-
1000- 13000	-	-	54	PASS	74	PASS
Comments:						

Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1710-6928

Applicant:	Leica Geosystems AG
EUT Name:	Laser Distance Meter
Model:	Leica DISTO X4-1
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Colbasiuc
Test Conditions:	Tnom: 25°C, Unom: 3 VDC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3m
Mode:	1
Test Date:	2018-01-16
Note:	

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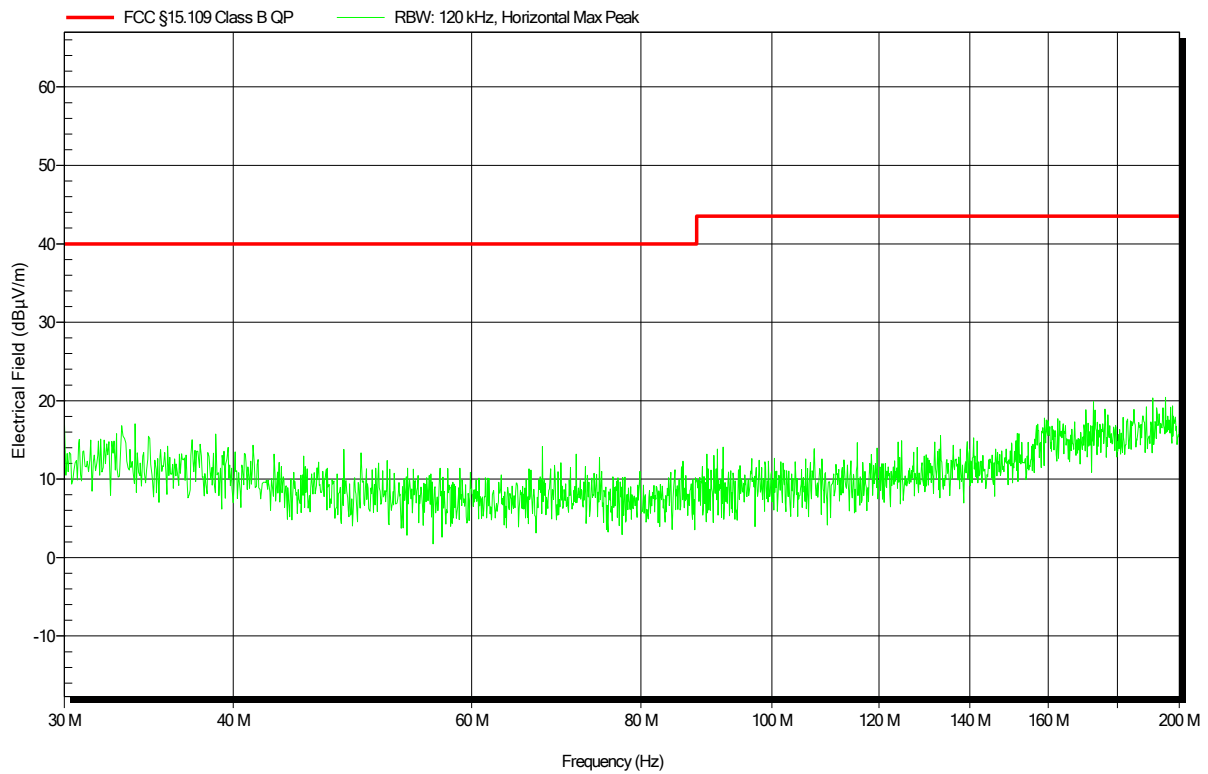


Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1710-6928

Applicant:	Leica Geosystems AG
EUT Name:	Laser Distance Meter
Model:	Leica DISTO X4-1
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Colbasiuc
Test Conditions:	Tnom: 25°C, Unom: 3 VDC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3m
Mode:	1
Test Date:	2018-01-16
Note:	

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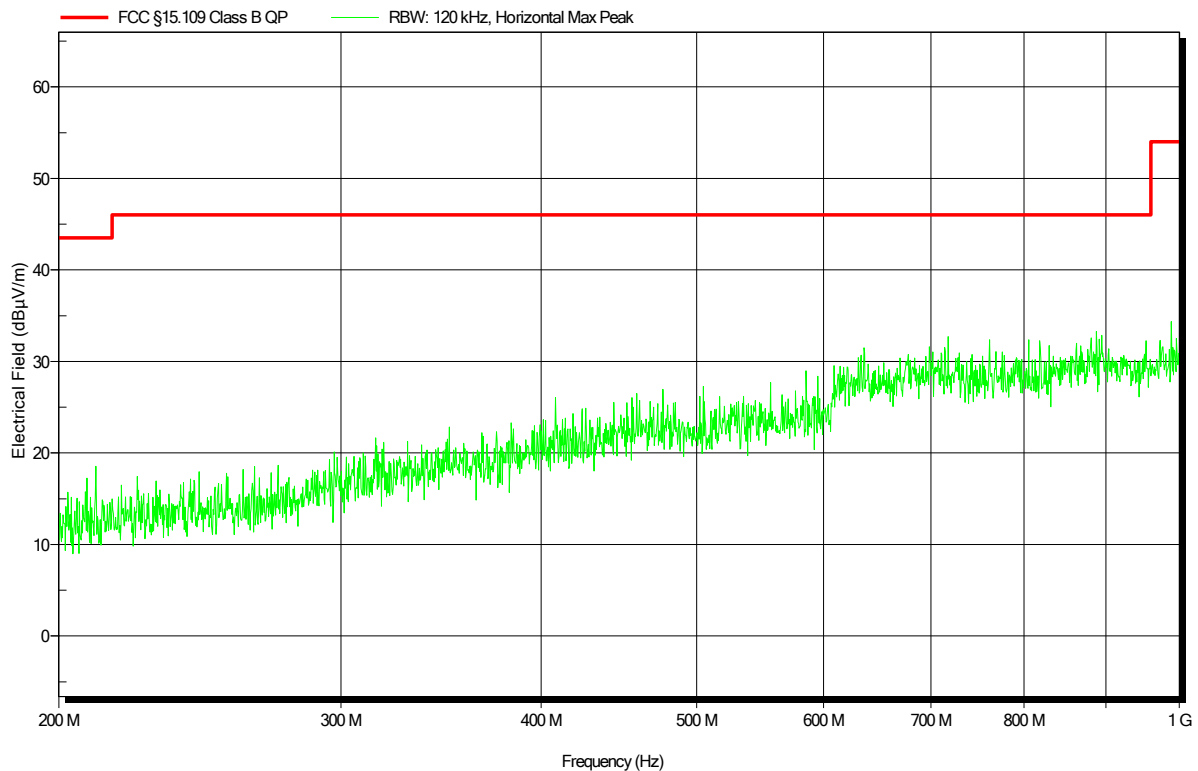


Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1710-6928

Applicant:	Leica Geosystems AG
EUT Name:	Laser Distance Meter
Model:	Leica DISTO X4-1
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Colbasiuc
Test Conditions:	Tnom: 25°C, Unom: 3 VDC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3m
Mode:	1
Test Date:	2018-01-16
Note:	

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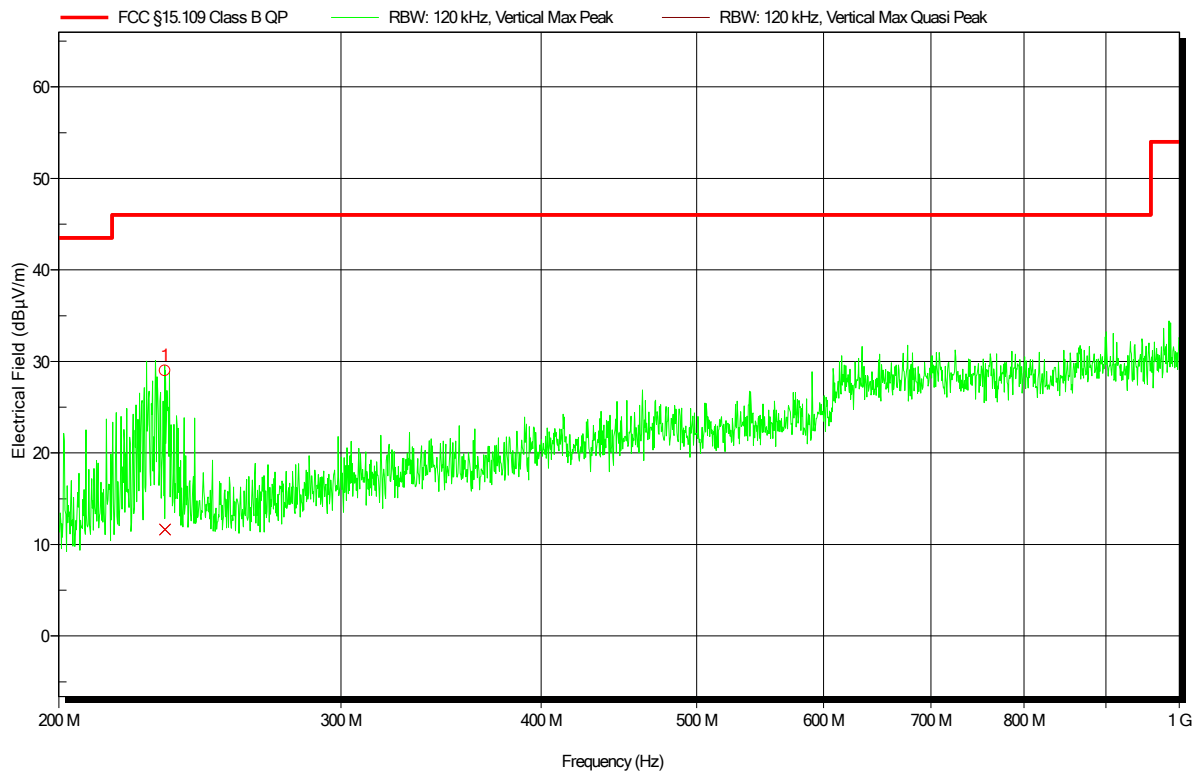


Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1710-6928

Applicant: Leica Geosystems AG
 EUT Name: Laser Distance Meter
 Model: Leica DISTO X4-1
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Colbasiuc
 Test Conditions: Tnom: 25°C, Unom: 3 VDC
 Antenna: Rohde & Schwarz HL 223, Vertical
 Measurement distance: 3m
 Mode: 1
 Test Date: 2018-01-16
 Note:

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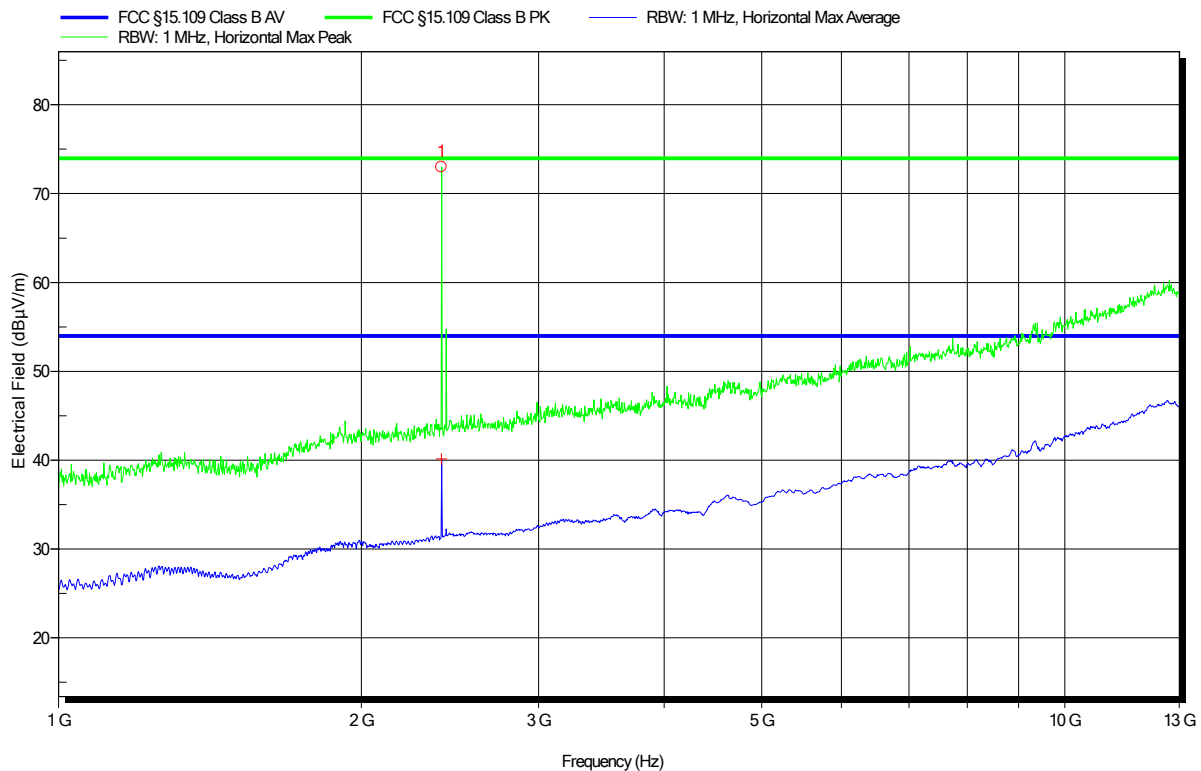
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	233.089 MHz	11.63 dBµV/m	46.02 dBµV/m	-34.39 dB	Pass	-45 Degree	1 m

Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1710-6928

Applicant: Leica Geosystems AG
 EUT Name: Laser Distance Meter
 Model: Leica DISTO X4-1
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Colbasiuc
 Test Conditions: Tnom: 25°C, Unom: 3 VDC
 Antenna: ETS-Lindgren 3117, Horizontal
 Measurement distance: 3m
 Mode: 1
 Test Date: 2018-01-16
 Note: Peak 1: Bt carrier

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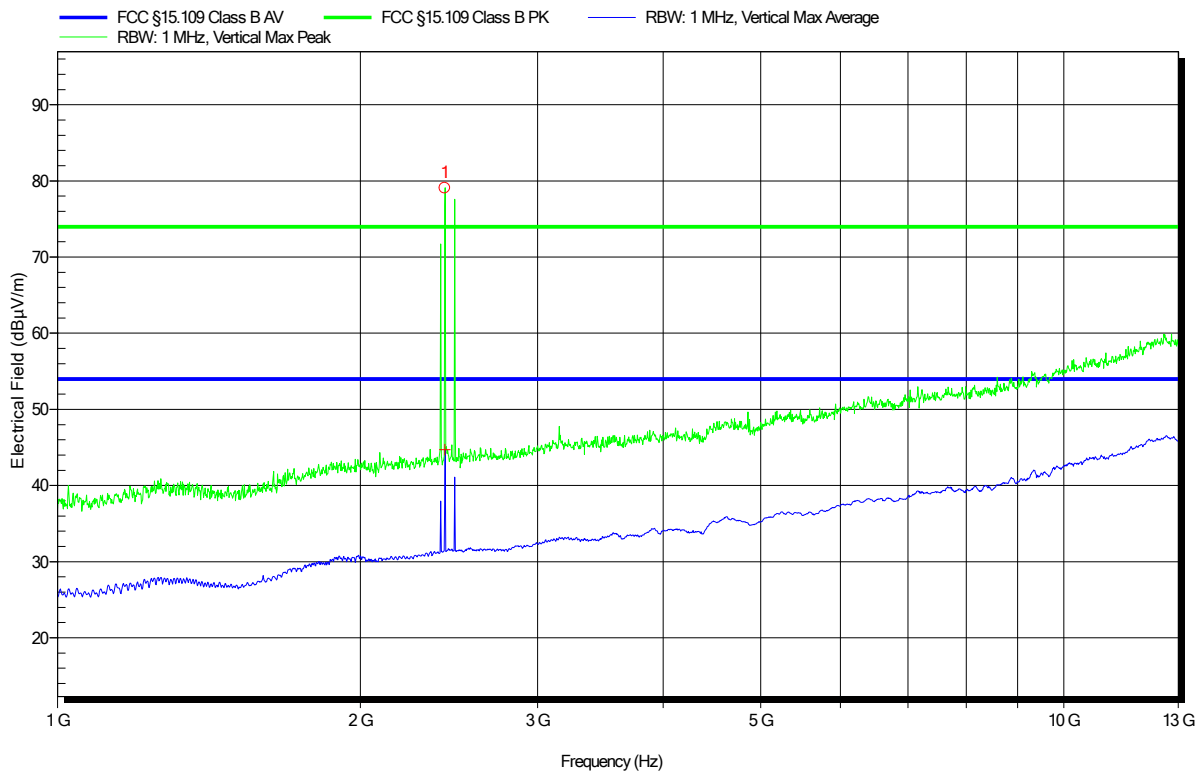
Peak Number	Frequency	Bluetooth carrier
1	2.402 GHz	

Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1710-6928

Applicant: Leica Geosystems AG
 EUT Name: Laser Distance Meter
 Model: Leica DISTO X4-1
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Colbasiuc
 Test Conditions: Tnom: 25°C, Unom: 3 VDC
 Antenna: ETS-Lindgren 3117, Vertical
 Measurement distance: 3m
 Mode: 1
 Test Date: 2018-01-16
 Note:

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Peak Number	Frequency	Bluetooth carrier
1	2.426 GHz	Bluetooth carrier