

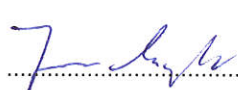


EMC TEST REPORT FCC 47 CFR Part 15B, ISED ICES-003 Issue 6	
Report Reference No	G0M-1801-7167-EF0115B-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	 <p>A2LA Accredited Testing Laboratory, Certificate No.: 1983.01 FCC Filed Test Laboratory, Reg.-No.: 96970 IC Testing Laboratory site: 3470A-2</p>
Applicant	Leica Geosystems AG
Address	Heinrich Wild Strasse 9435 Heerbrugg SWITZERLAND
Test Specification	Full compliance test
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	Laser Distance Meter
Model(s)	Leica BLK3D
Additional Model(s)	None
Brand Name(s)	Leica Geosystems AG
Hardware Version(s)	V02
Software Version(s)	Android Version 7.1.2, API 25, Kernel Version 3.18.31, BSP Version 3.5
FCC-ID	RFF-IIS01
IC	3177A-IIS01
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	2018-02-16	
Report:		
Compiled by	Matthias Handrik	
Tested by (+ signature) (Responsible for Test)	Manuel Engel	
	Matthias Handrik	
Approved by (+ signature) (Deputy Head of Lab)	Jens Marquardt	
Date of Issue	2018-05-23	
Total number of pages	40	
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:		

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	2018-05-15	Initial Release	

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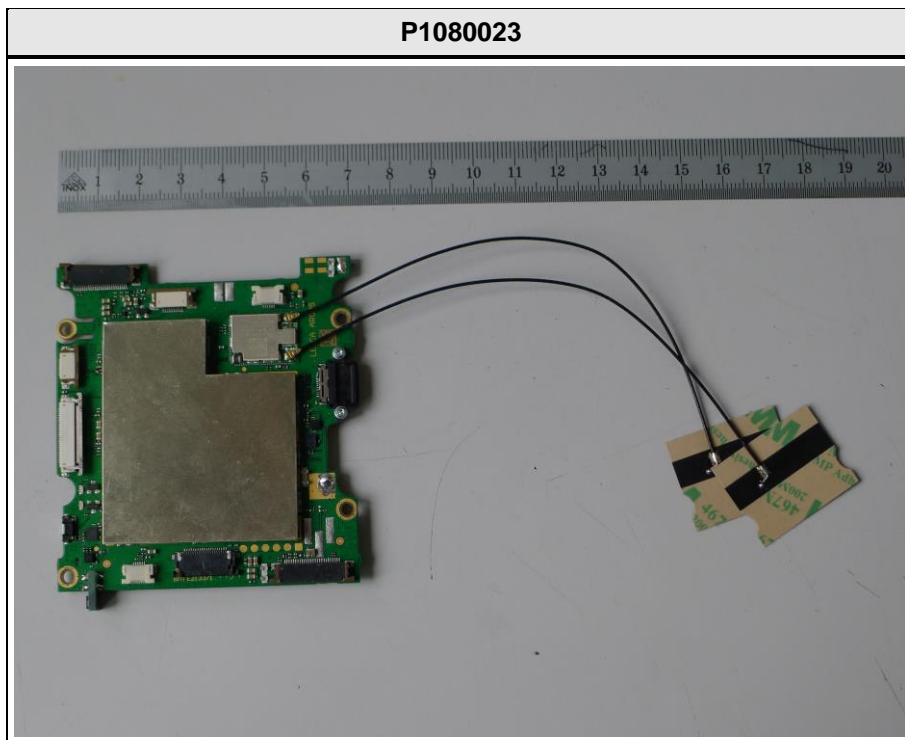
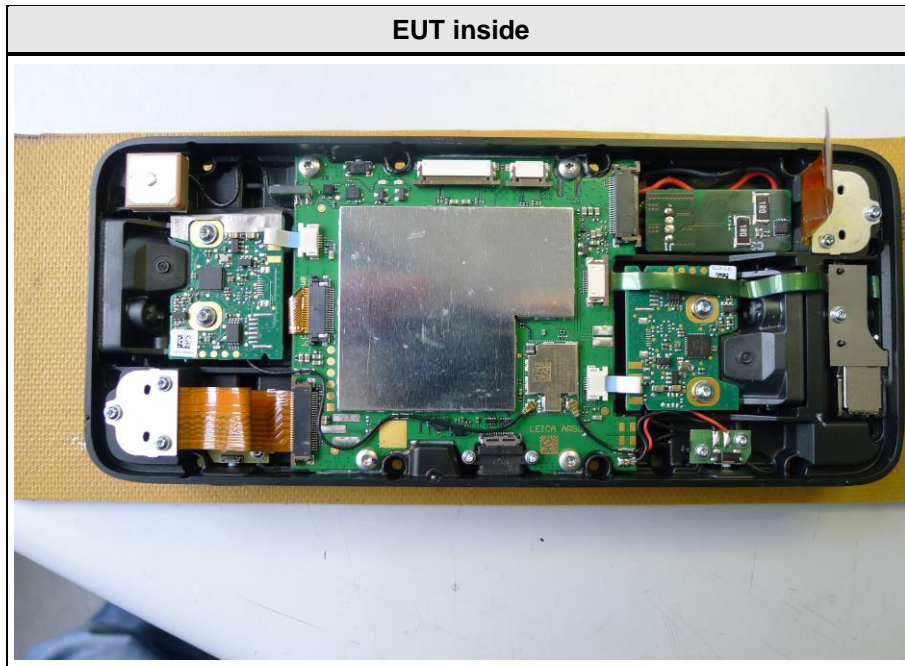
1 Equipment (Test Item) Under Test

Description	Laser Distance Meter	
Model	Leica BLK3D	
Additional Model(s)	None	
Brand Name(s)	Leica Geosystems AG	
Serial Number(s)	unspecified	
Hardware Version(s)	V02	
Software Version(s)	Android Version 7.1.2, API 25, Kernel Version 3.18.31, BSP Version 3.5	
FCC-ID	RFF-IIS01	
IC	3177A-IIS01	
Class	Class B	
Equipment type	Table top	
Highest internal frequency [MHz]	2480	
Radio Module Bluetooth	Type	Bluetooth
	Model	NFA324A-12H32
	Manufacturer	FOXCONN
	HW Version	V02
	SW Version	BSP 3.5
	FCC-ID	PPD-QCNFA324
	IC	4104A-QCNFA324220202697905L0
Radio Module WLAN	Type	WLAN
	Model	NFA324A-12H32
	Manufacturer	FOXCONN
	HW Version	V02
	SW Version	BSP 3.5
	FCC-ID	PPD-QCNFA324
	IC	4104AQCENFA324220202697905L0
Supply Voltage	V_{NOM}	3.8 VDC
AC/DC-Adaptor	Model	KSA29A0500300D5
	Vendor	Ktec
	Input	100-240 VAC
	Output	5 VDC
Manufacturer	Leica Geosystems AG Heinrich Wild Strasse 9435 Heerbrugg SWITZERLAND	

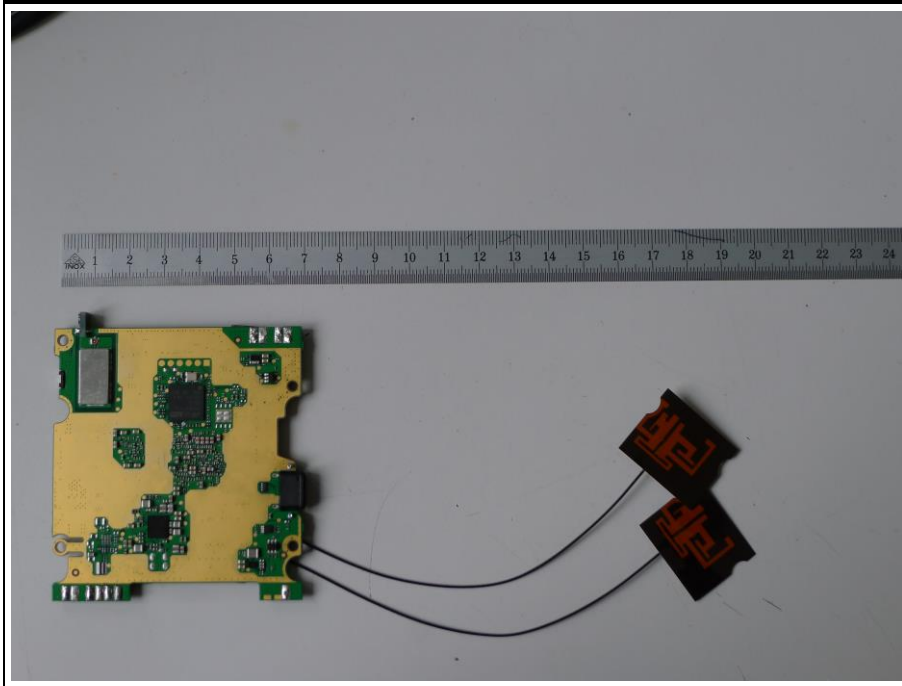
1.1 Equipment Ports

Name	Type	Attributes	Comment
USB 3.0	DC/IO	Count: 1 Direction: In Service only: 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		

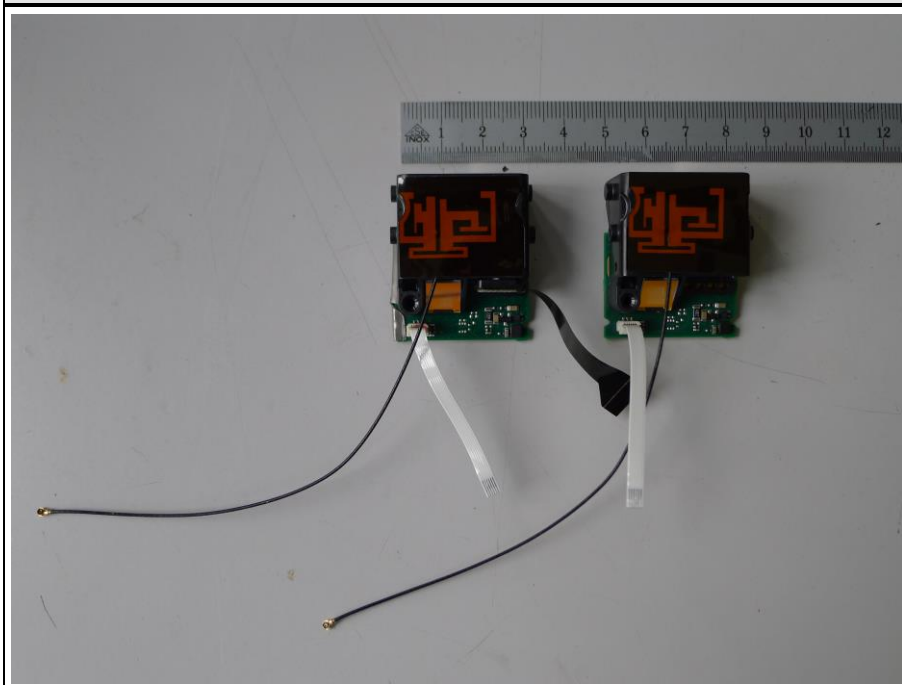
1.2 Equipment Photos - Internal

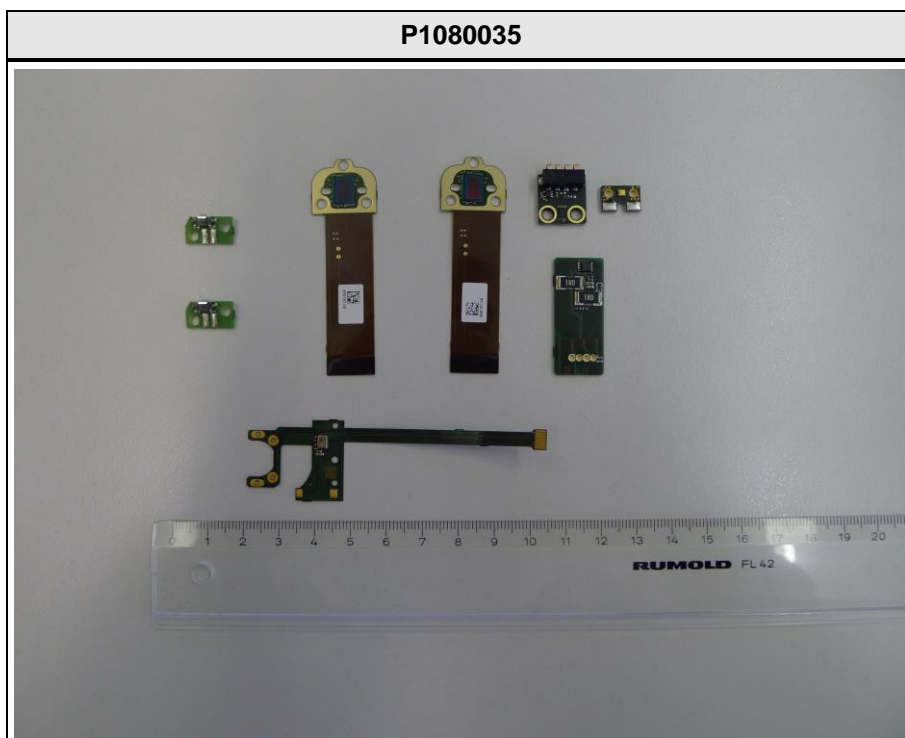
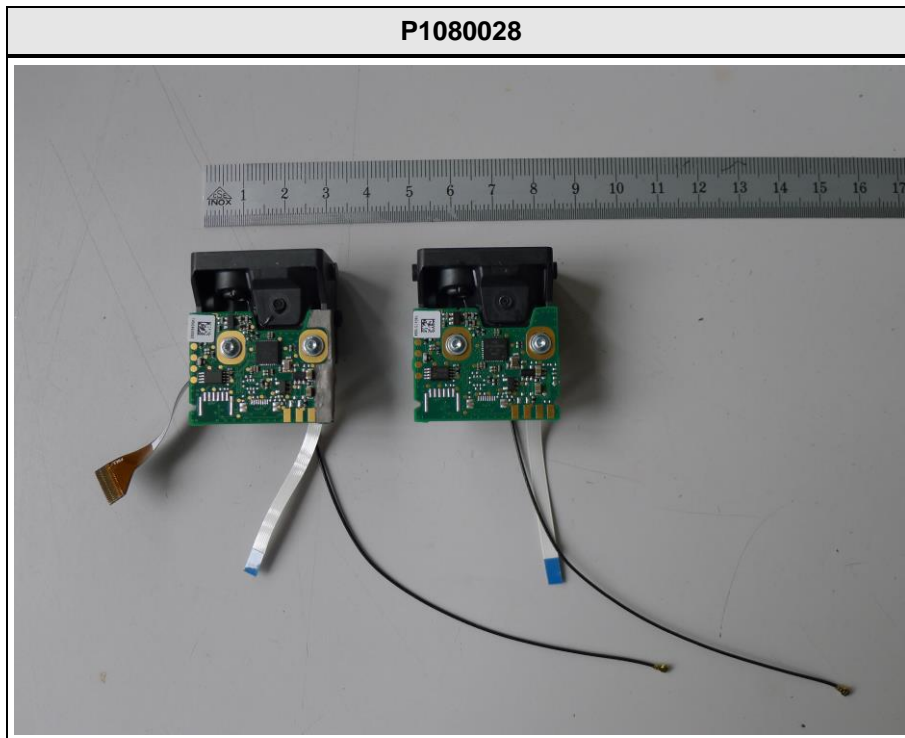


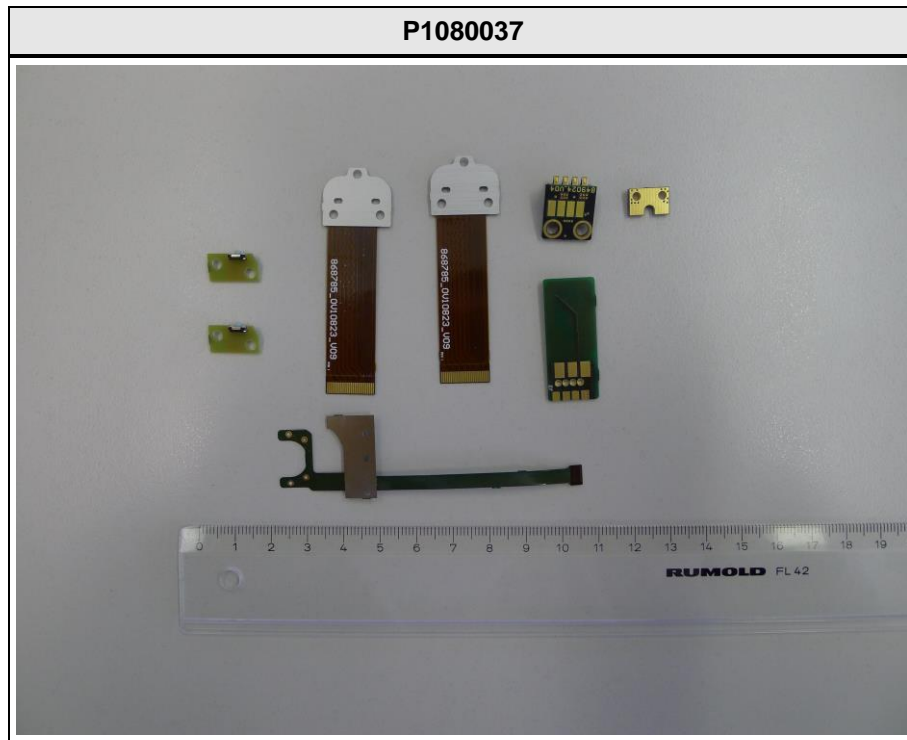
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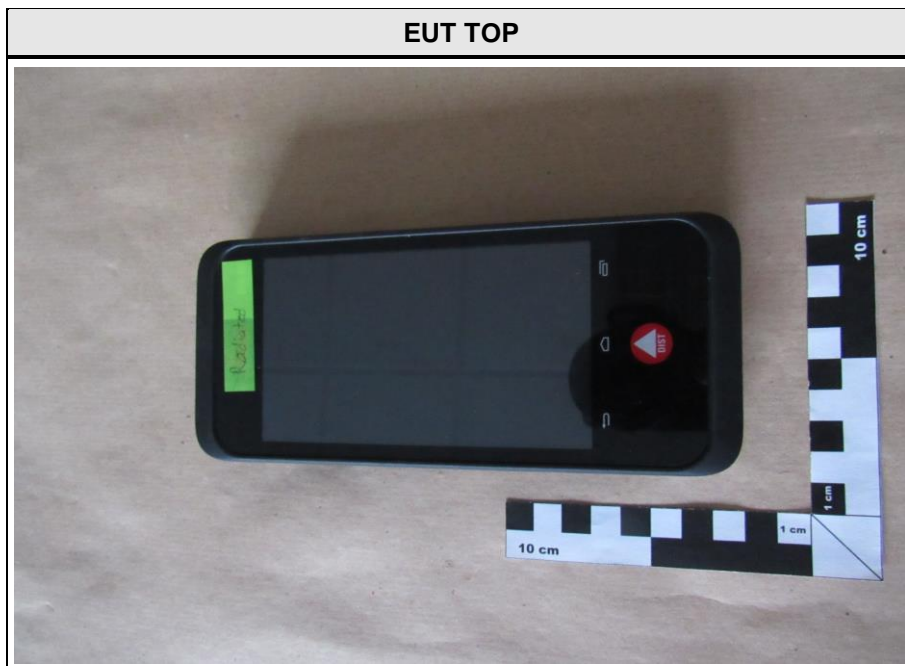
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1.3 Equipment Photos - External





EUT FRONT



EUT BACK



1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	Bluetooth loudspeaker	unspecified	unspecified	
AE	Toughpad	Panasonic	FZ-M1	
AE	Laptop	lenovo	L430	
Description:				
AE	Auxillary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
Comment:				

1.5 Operational Modes

Mode #	Description
1	<ul style="list-style-type: none"> - EUT powered via battery - Stereocamera running with tracking mode - WLAN connection during transmitting pictures from cameras - BT connection during transmitting music from device - Receive GPS signal local position
2	<ul style="list-style-type: none"> - EUT powered via AC/DC adaptor - Stereocamera running with tracking mode - WLAN connection during transmitting pictures from cameras - BT connection during transmitting music from device - Receive GPS signal local position
Comment:	

1.6 EUT Configuration

Configuration #	Description
1	EUT is placed in measurement chamber and powered via internal battery. Active Bluetooth connection to loudspeaker, EUT play an MP3-File. Active WLAN connection to toughpad, EUT transmitting life picture to toughpad.
2	EUT is placed in measurement chamber and powered via AC/DC adaptor. Active Bluetooth connection to loudspeaker, EUT play an MP3-File. Active WLAN connection to toughpad, EUT transmitting life picture to toughpad.
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 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:

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

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 = 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	PASS	
Comment:				

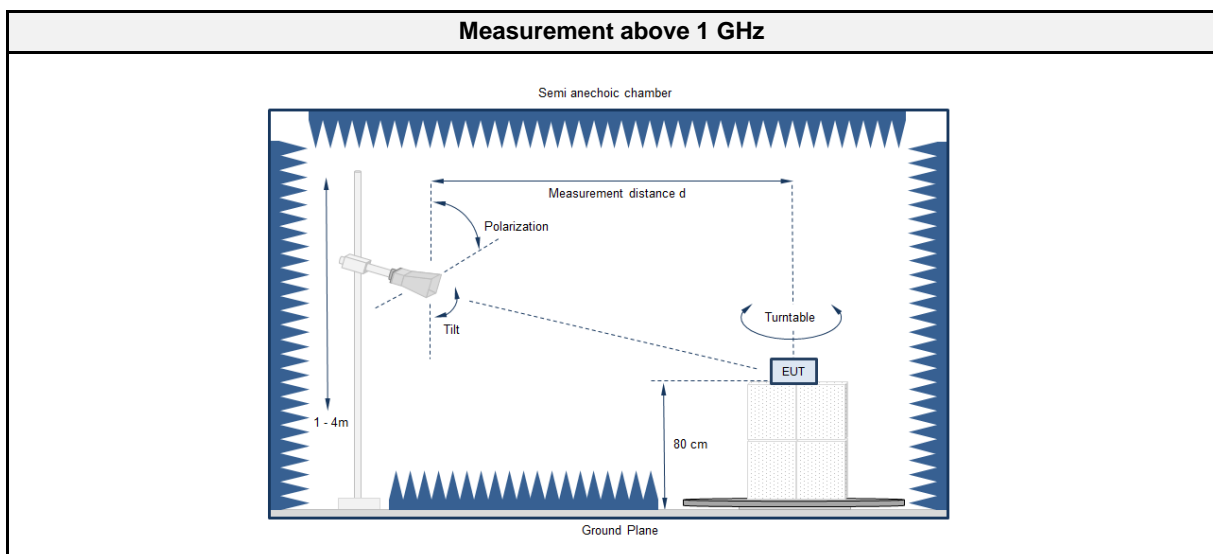
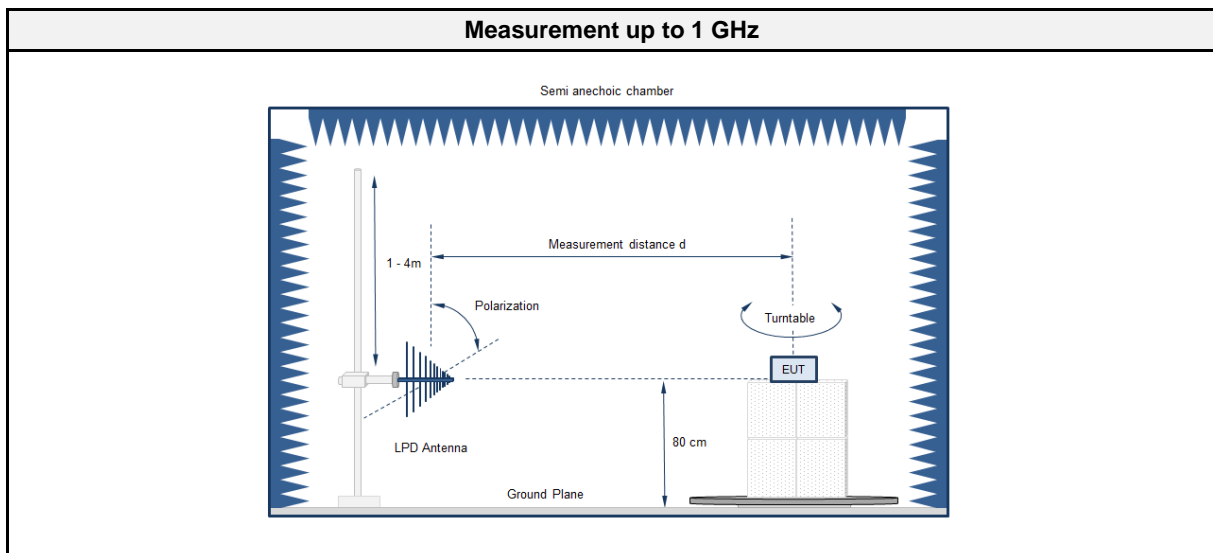
Possible Test Case Verdicts	
PASS	Test object does meet the requirements
FAIL	Test object does not meet the requirements
N/T	Required by standard but not tested
N/R	Not required by standard for the test object

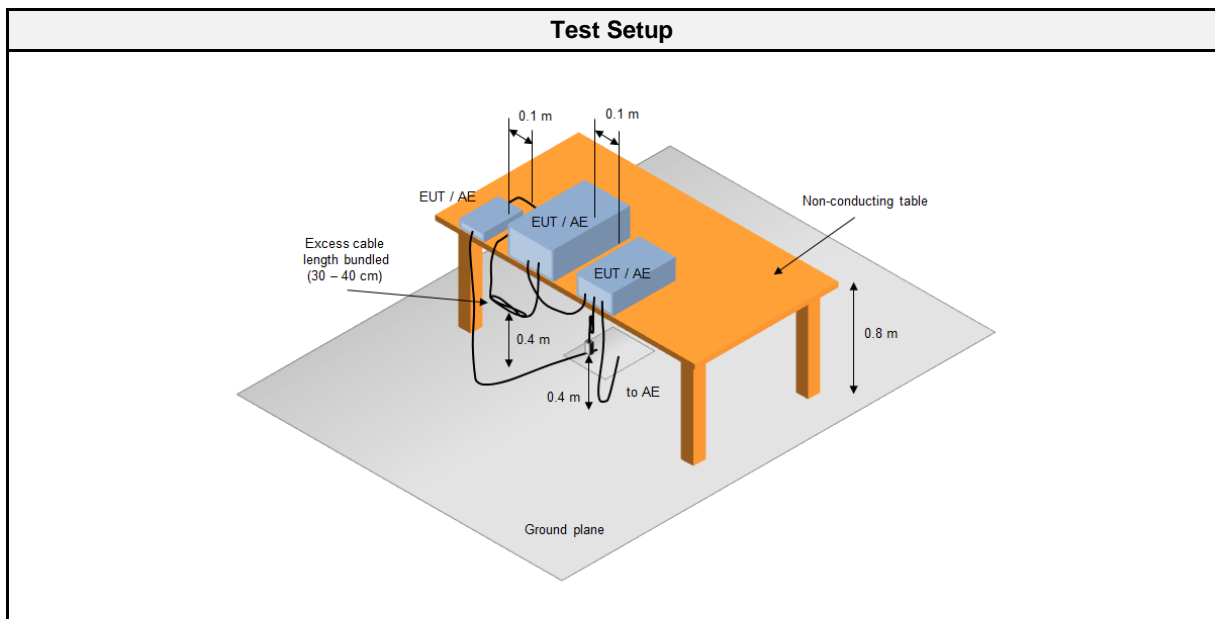
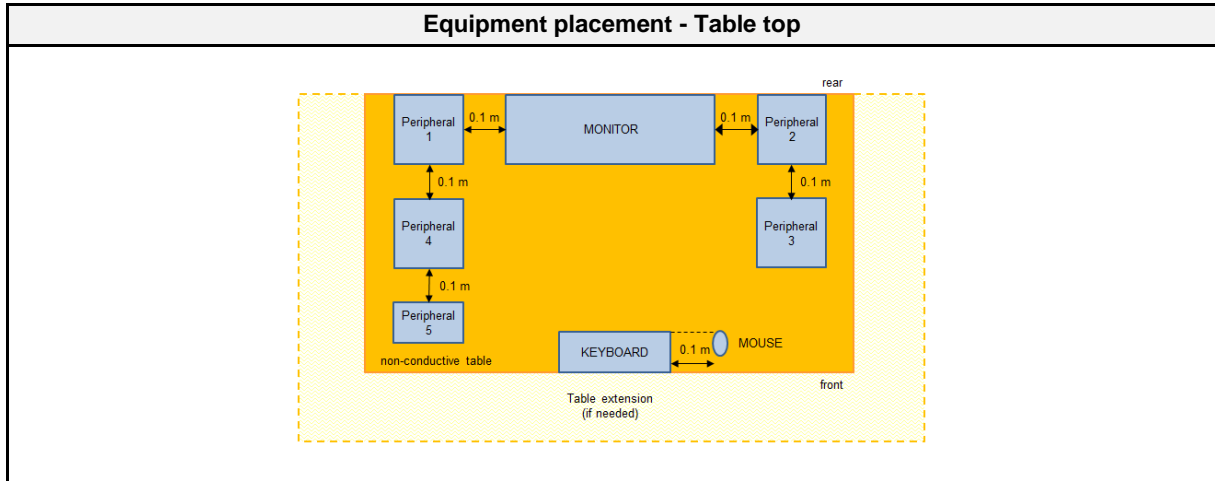
2.1 Test Conditions and Results - Radiated emissions acc. to ANSI C63.4

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	10 MHz to 12400 MHz
Temperature [°C]	23 C°
Humidity [%]	42 %
Operator	Manuel Engel
Date	2018-05-02

2.1.2 Setup





2.1.3 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic chamber	Frankonia	AC1	EF00200	functional test	functional test
Keysight	EMI Test Receiver	N9038A-526/WXP	EF01070	2017-08	2018-08
R&S	Biconical Antenna	HK 116	EF00186	2018-03	2020-03
R&S	LPD Antenna	HL 223	EF00187	2016-05	2019-05
ETS-Lindgren	Horn Antenna	3117	EF01256	2017-07	2018-07

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

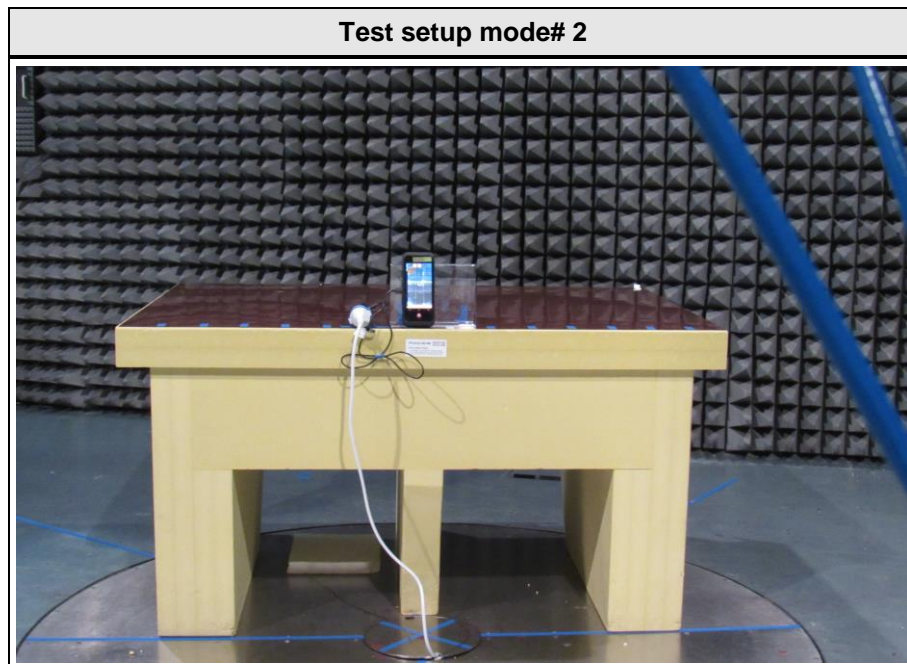
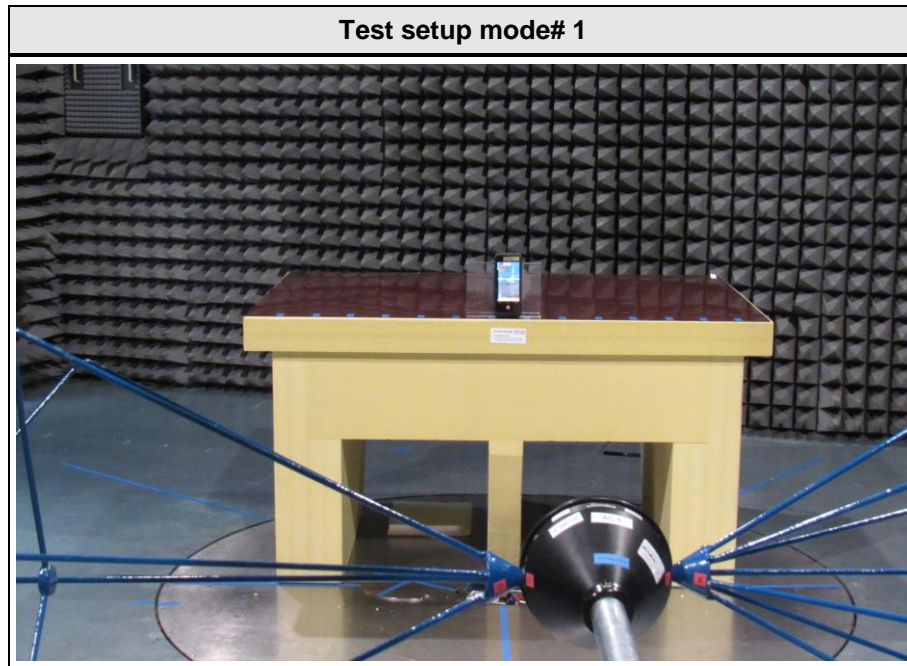
Class B @ 3 m		
Frequency [MHz]	Detector	Limit [dB μ V/m]
30 - 88	Quasi-peak	40
88 - 216	Quasi-peak	43.5
216 - 960	Quasi-peak	46
960 - 1000	Quasi-peak	54
> 1000	Peak Average	74 54

Class A @ 10 m		
Frequency [MHz]	Detector	Limit [dB μ V/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
1	1	PASS	
2	2	PASS	

2.1.7 Setup Photos



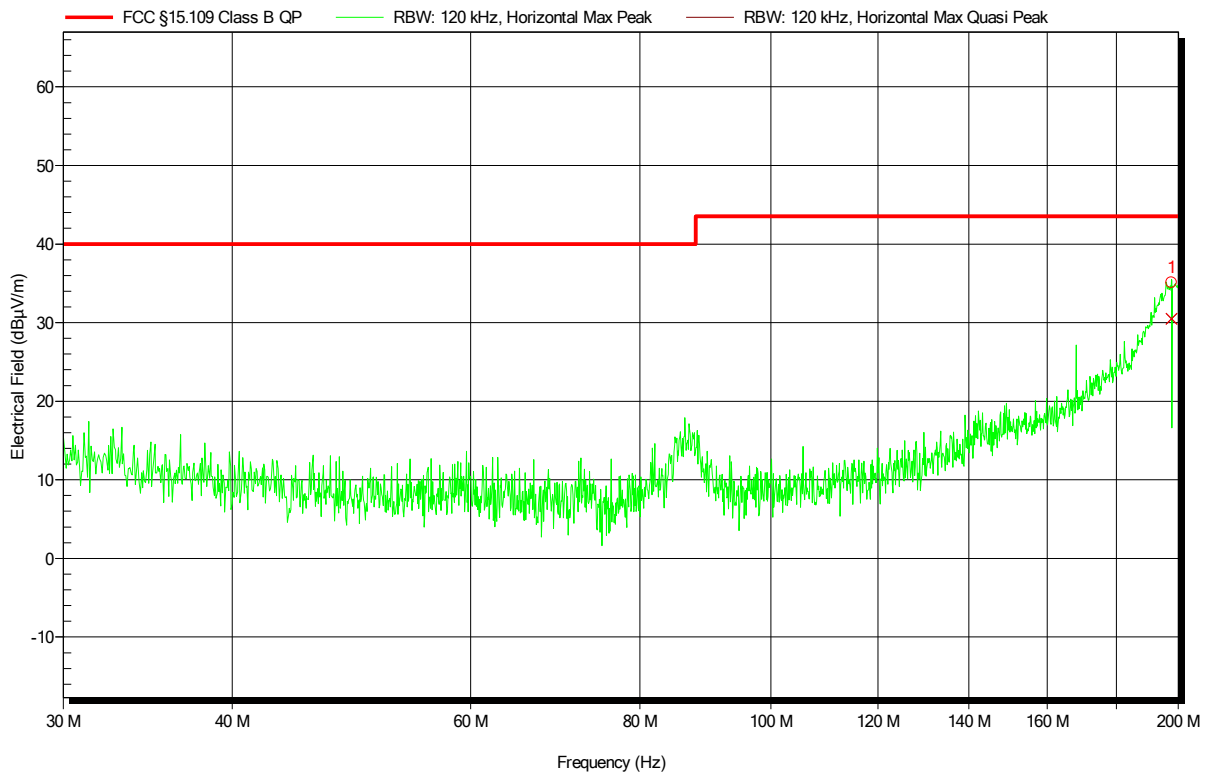
2.1.8 Records

Radiated emissions under normal conditions according to FCC Part 15B

Project number: G0M-1801-7167

Applicant: Leica Geosystems AG
 EUT Name: Laser Distance Meter
 Model: Leica BLK3D
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Engel
 Test Conditions: Tnom: 23°C, Unom: 120 VAC
 Antenna: Rohde & Schwarz HK 116, Horizontal
 Measurement distance: 3m
 Mode: Mode #2
 Test Date: 2018-05-02
 Note:

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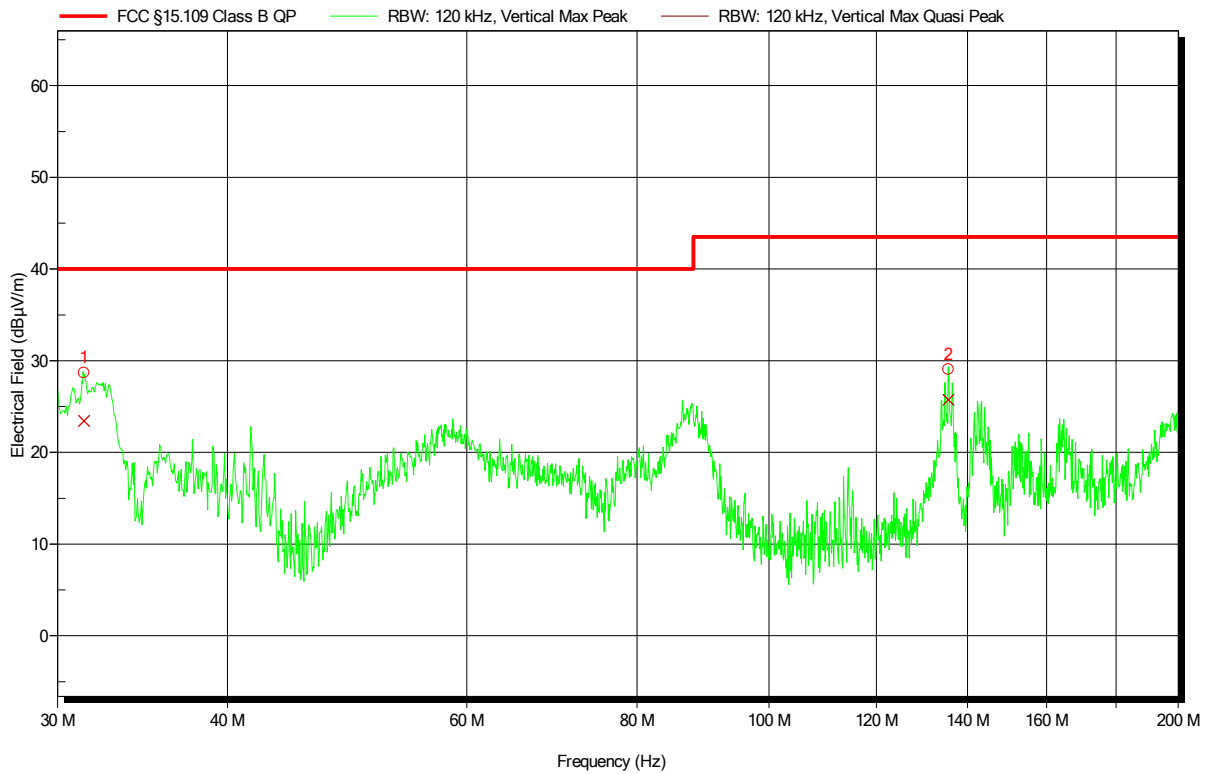
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	197.705 MHz	30.5 dBµV/m	43.52 dBµV/m	-13.02 dB	Pass	140 Degree	1 m

Radiated emissions under normal conditions according to FCC Part 15B

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 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Engel
 Test Conditions: Tnom: 23°C, Unom: 120 VAC
 Antenna: Rohde & Schwarz HK 116, Vertical
 Measurement distance: 3m
 Mode: Mode #2
 Test Date: 2018-05-02
 Note:

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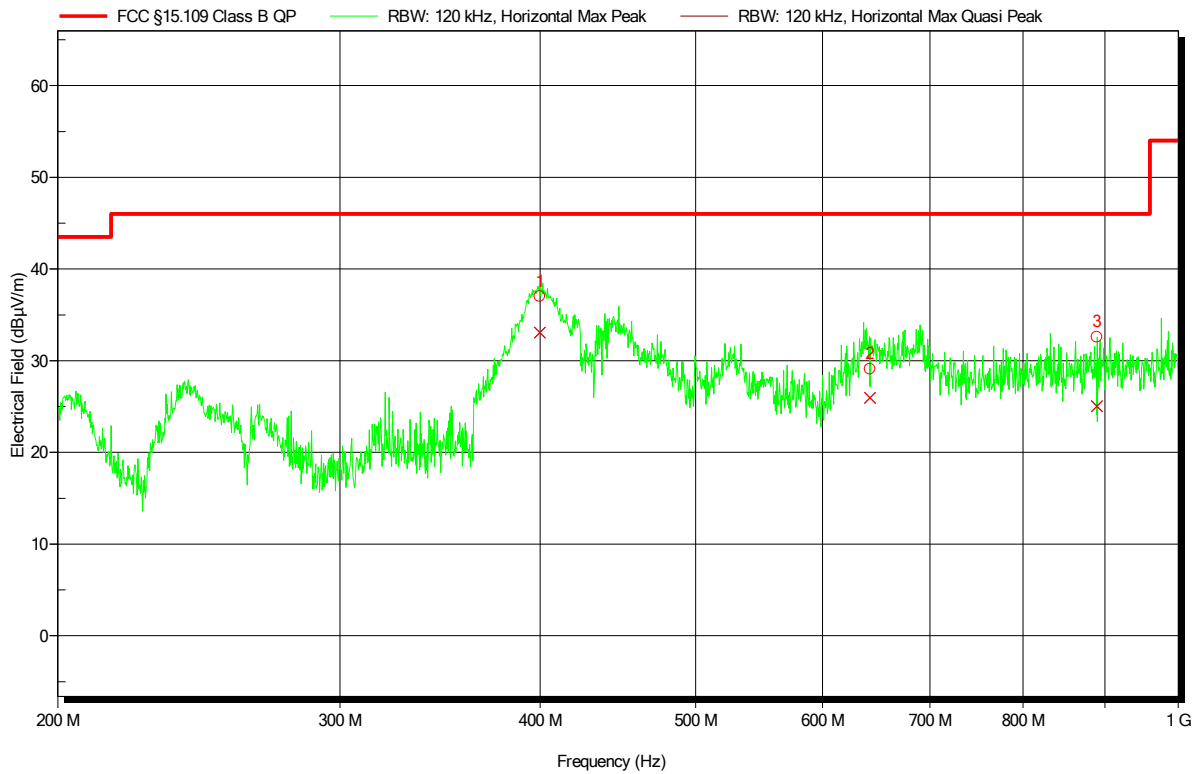
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	31.381 MHz	23.44 dBµV/m	40 dBµV/m	-16.56 dB	Pass	30 Degree	1 m
2	135.53 MHz	25.76 dBµV/m	43.52 dBµV/m	-17.77 dB	Pass	30 Degree	1 m

Radiated emissions under normal conditions according to FCC Part 15B

Project number: G0M-1801-7167

Applicant: Leica Geosystems AG
 EUT Name: Laser Distance Meter
 Model: Leica BLK3D
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Engel
 Test Conditions: Tnom: 23°C, Unom: 120 VAC
 Antenna: Rohde & Schwarz HL 223, Horizontal
 Measurement distance: 3m
 Mode: Mode# 2
 Test Date: 2018-05-07
 Note:

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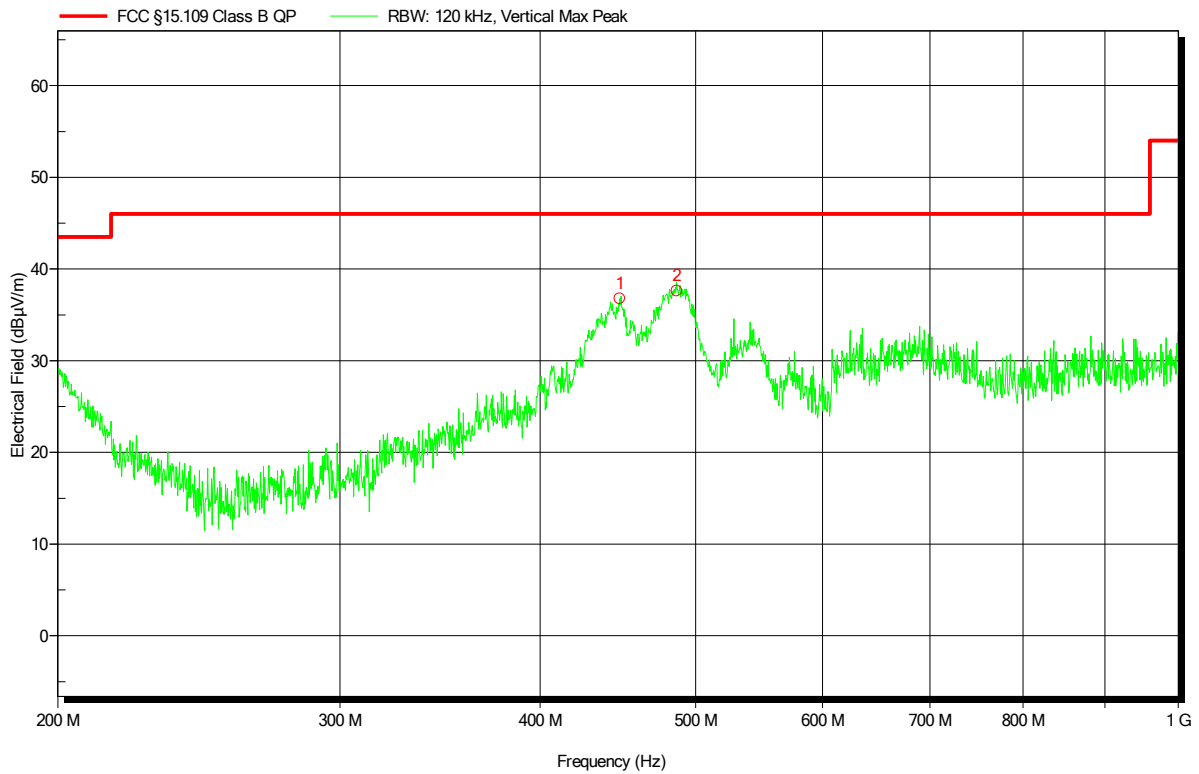
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	399.85 MHz	33.07 dBµV/m	46.02 dBµV/m	-12.95 dB	Pass	40 Degree	1 m
2	642.359 MHz	25.94 dBµV/m	46.02 dBµV/m	-20.08 dB	Pass	40 Degree	1 m
3	889.805 MHz	25.04 dBµV/m	46.02 dBµV/m	-20.98 dB	Pass	40 Degree	1 m

Radiated emissions under normal conditions according to FCC Part 15B

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 Test Conditions: Tnom: 23°C, Unom: 120 VAC
 Antenna: Rohde & Schwarz HL 223, Vertical
 Measurement distance: 3m
 Mode: Mode# 2
 Test Date: 2018-05-07
 Note:

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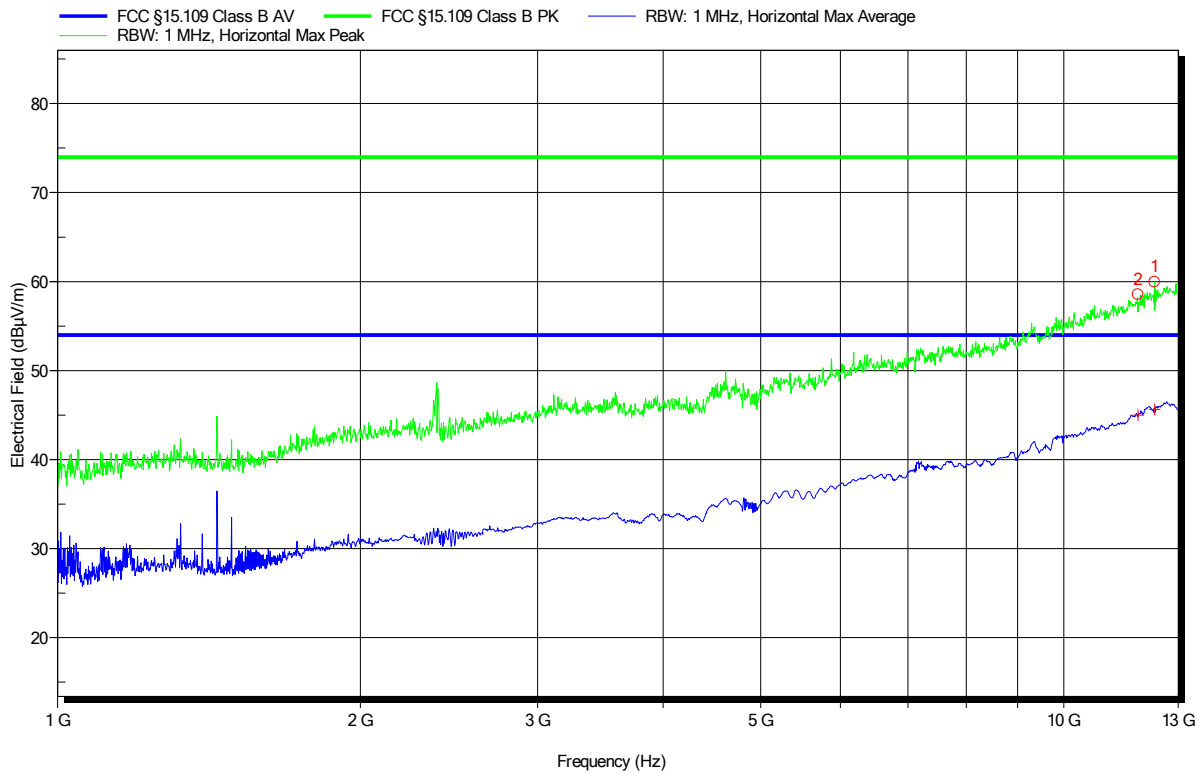


Radiated emissions under normal conditions according to FCC Part 15B

Project number: G0M-1801-7167

Applicant: Leica Geosystems AG
 EUT Name: Laser Distance Meter
 Model: Leica BLK3D
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Engel
 Test Conditions: Tnom: 23°C, Unom: 120 VAC
 Antenna: ETS-Lindgren 3117, Horizontal
 Measurement distance: 3m
 Mode: Mode# 2
 Test Date: 2018-05-07
 Note:

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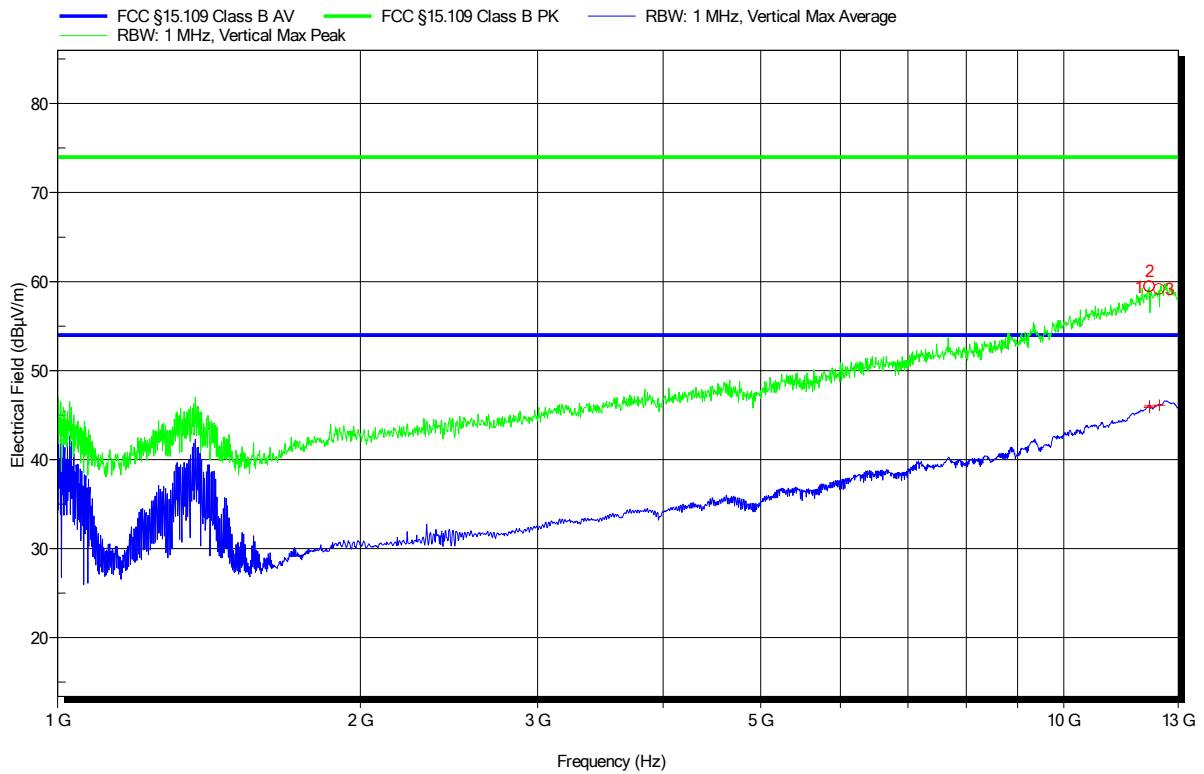


Radiated emissions under normal conditions according to FCC Part 15B

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 EUT Name: Laser Distance Meter
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 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Engel
 Test Conditions: Tnom: 23°C, Unom: 120 VAC
 Antenna: ETS-Lindgren 3117, Vertical
 Measurement distance: 3m
 Mode: Mode# 2
 Test Date: 2018-05-07
 Note:

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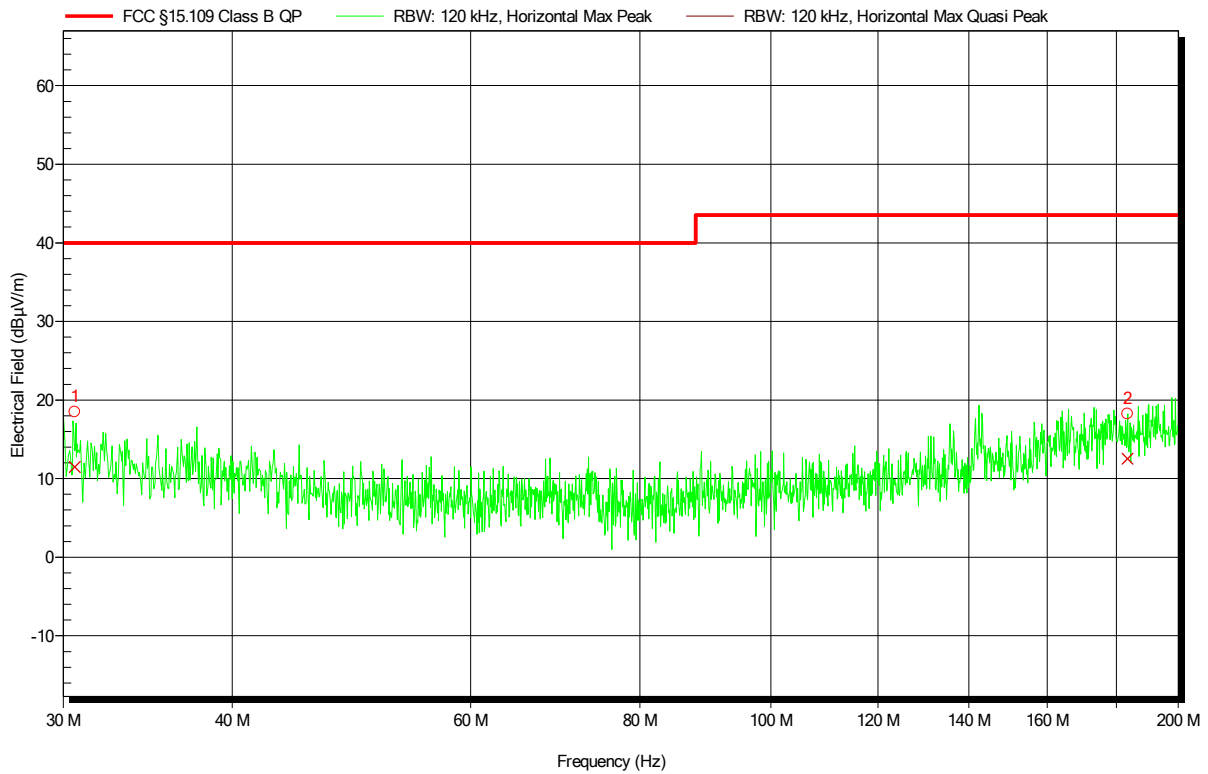


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Project number: G0M-1801-7167

Applicant: Leica Geosystems AG
 EUT Name: Laser Distance Meter
 Model: Leica BLK3D
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Engel
 Test Conditions: Tnom: 23°C, Unom: 3.8 VDC
 Antenna: Rohde & Schwarz HK 116, Horizontal
 Measurement distance: 3m
 Mode: Mode# 1
 Test Date: 2018-05-02
 Note:

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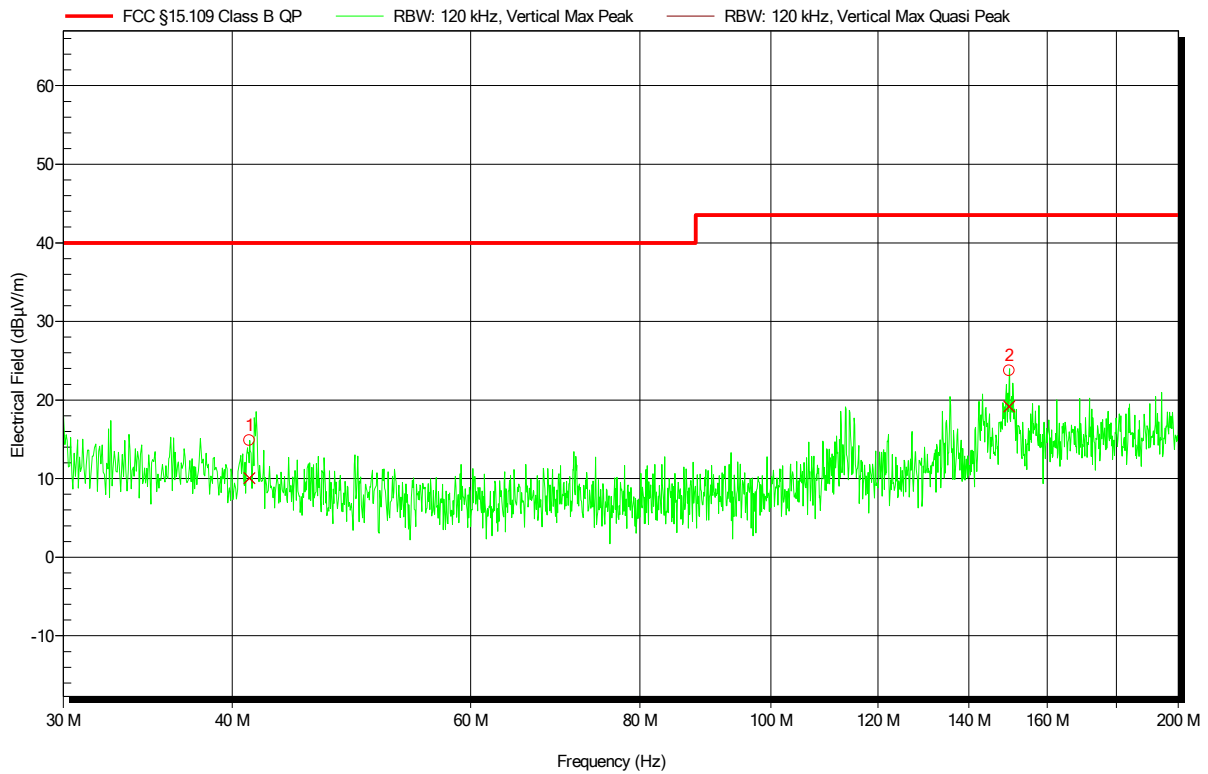
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	30.6 MHz	11.48 dBµV/m	40 dBµV/m	-28.52 dB	Pass	0 Degree	1 m
2	183.432 MHz	12.55 dBµV/m	43.52 dBµV/m	-30.97 dB	Pass	0 Degree	1 m

Radiated emissions under normal conditions according to FCC Part 15B

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 Test Conditions: Tnom: 23°C, Unom: 3.8 VDC
 Antenna: Rohde & Schwarz HK 116, Vertical
 Measurement distance: 3m
 Mode: Mode# 1
 Test Date: 2018-05-02
 Note:

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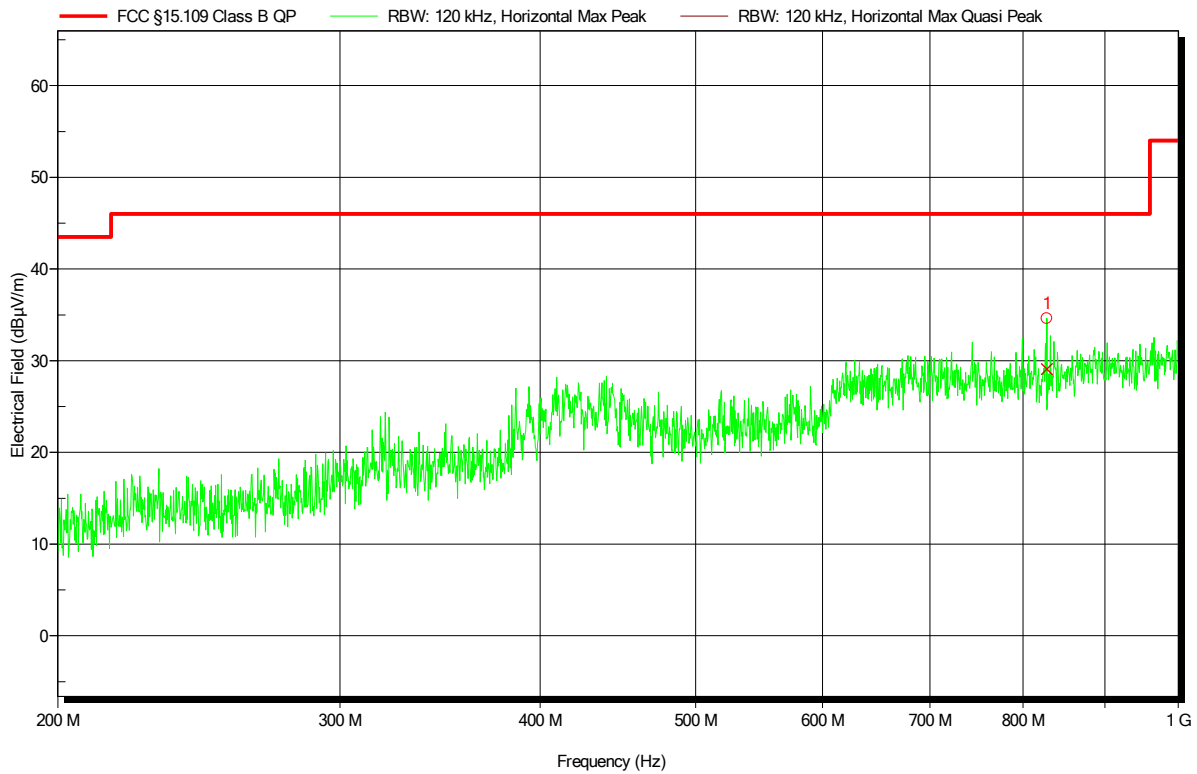
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	41.181 MHz	10.03 dBµV/m	40 dBµV/m	-29.97 dB	Pass	0 Degree	1 m
2	150.032 MHz	19.17 dBµV/m	43.52 dBµV/m	-24.35 dB	Pass	0 Degree	1 m

Radiated emissions under normal conditions according to FCC Part 15B

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 Antenna: Rohde & Schwarz HL 223, Horizontal
 Measurement distance: 3m
 Mode: Mode# 1
 Test Date: 2018-05-07
 Note:

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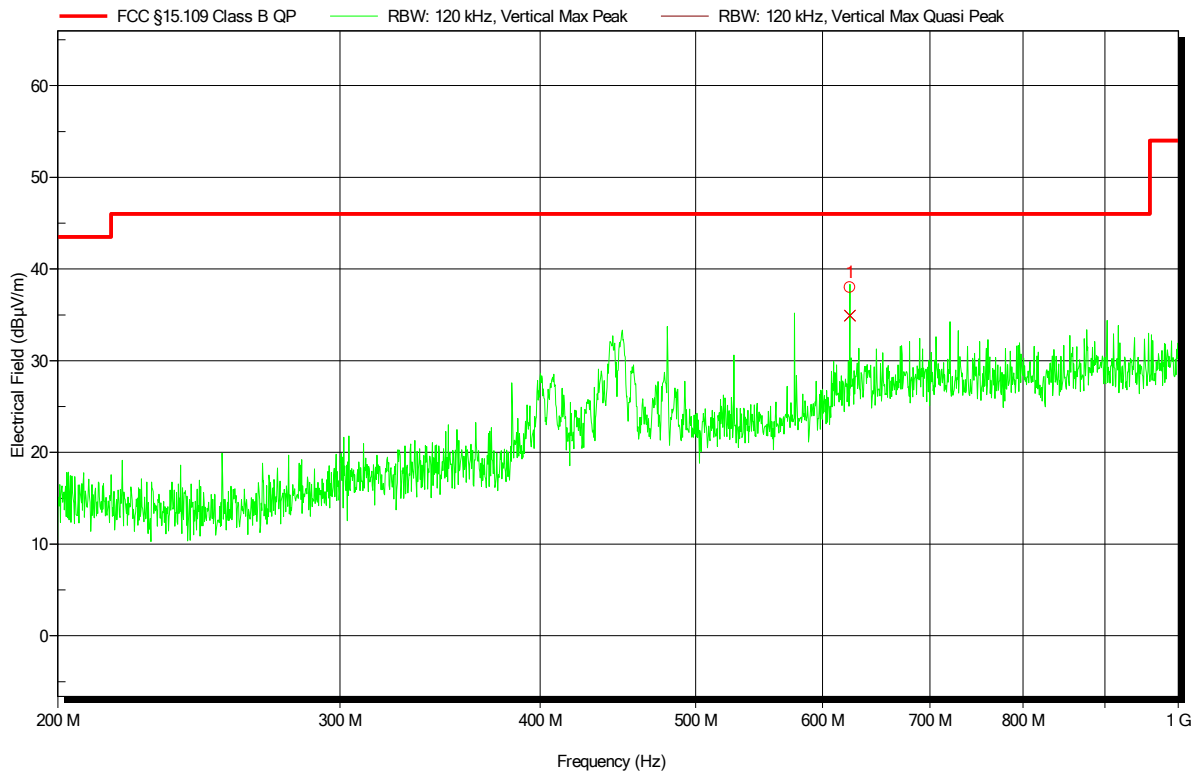
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	827.991 MHz	29.1 dBµV/m	46.02 dBµV/m	-16.92 dB	Pass	60 Degree	1 m

Radiated emissions under normal conditions according to FCC Part 15B

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 Measurement distance: 3m
 Mode: Mode# 1
 Test Date: 2018-05-07
 Note:

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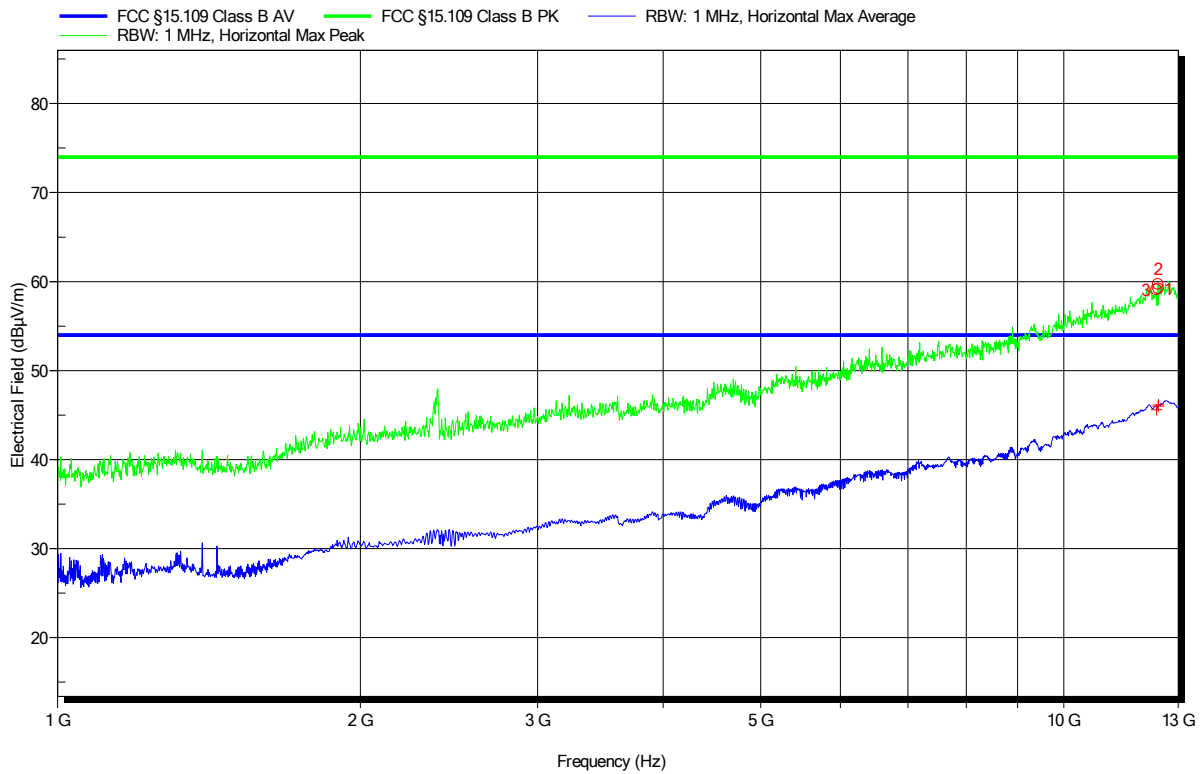
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	624.01 MHz	34.93 dBµV/m	46.02 dBµV/m	-11.09 dB	Pass	0 Degree	1 m

Radiated emissions under normal conditions according to FCC Part 15B

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 Operator: Mr. Engel
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 Antenna: ETS-Lindgren 3117, Horizontal
 Measurement distance: 3m
 Mode: Mode# 1
 Test Date: 2018-05-07
 Note:

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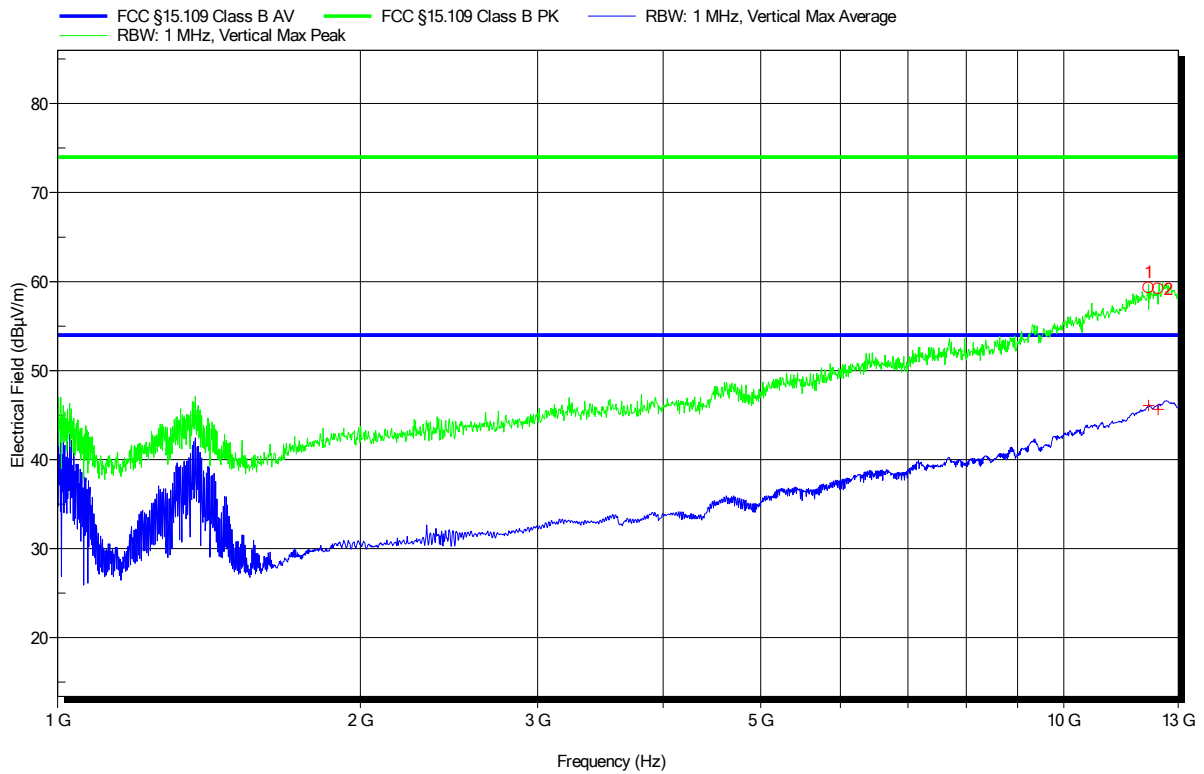


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 Test Date: 2018-05-07
 Note:

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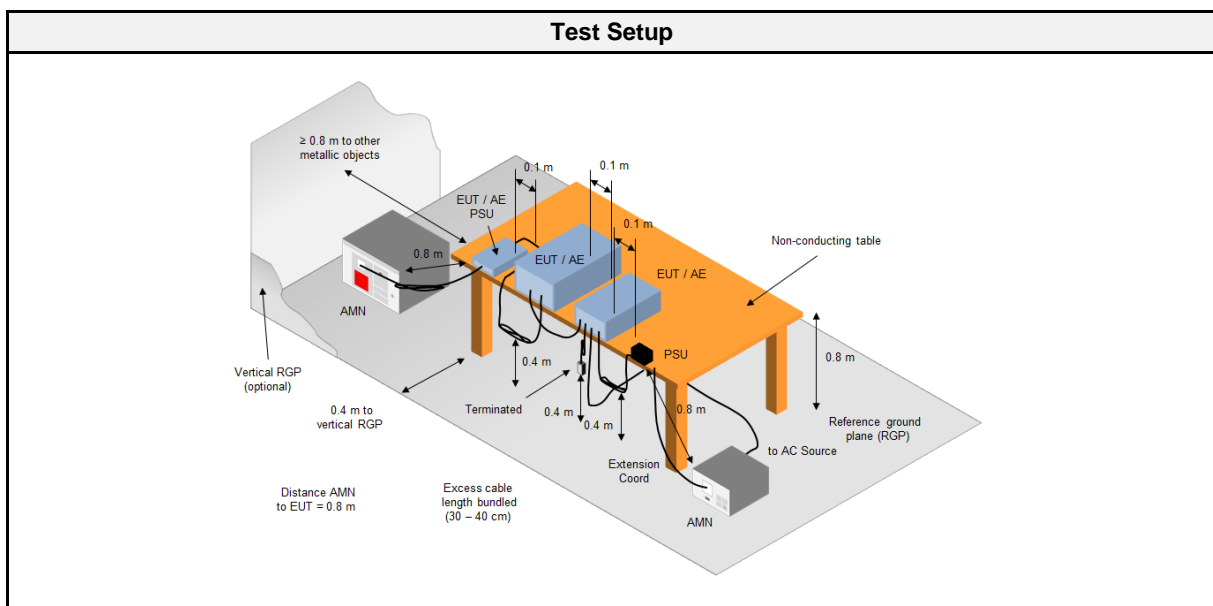
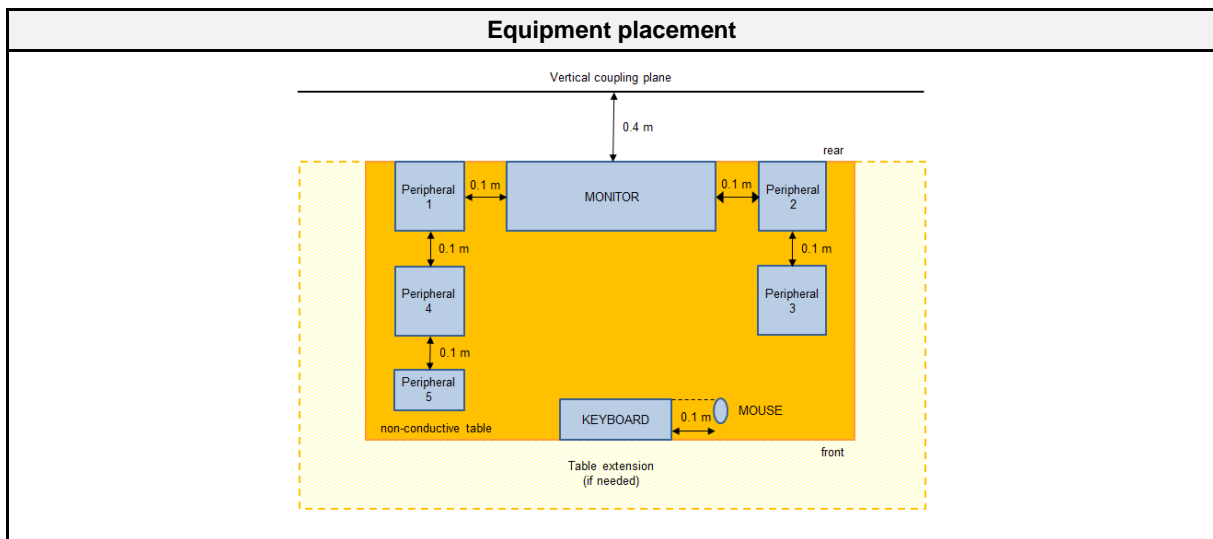


2.2 Test Conditions and Results - Conducted emissions acc. to ANSI C63.4

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 C°
Humidity [%]	43 %
Operator	Manuel Engel
Date	2018-05-02

2.2.2 Setup



2.2.3 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
R&S	AMN	ESH2-Z5	EF00182	2017-01	2019-01
R&S	Pulse Limiter	ESH3-Z2	EF01063	2017-07	2018-07
R&S	EMI Test Receiver	ESR 7	EF00943	2017-07	2018-07

2.2.4 Procedure

Exploratory measurement
<ol style="list-style-type: none"> 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) The power cord that is normally supplied or recommended by the manufacturer was connected to the LISN. 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). The LISN measurement port was connected to a measurement receiver I/O cables were bundled not longer than 0.4 m Measurement was performed in the frequency range 0.15 – 30MHz on each current-carrying conductor To maximize the emissions the cable positions were manipulated The worst configuration of EUT and cables is shown on a test setup picture at item 1.3

Final measurement
<ol style="list-style-type: none"> 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) The power cord that is normally supplied or recommended by the manufacturer was connected to the LISN. 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). The LISN measurement port was connected to a measurement receiver The EUT and cable arrangement were based on the exploratory measurement results The test data of the worst-case conditions were recorded and shown on the next pages

2.2.5 Limits

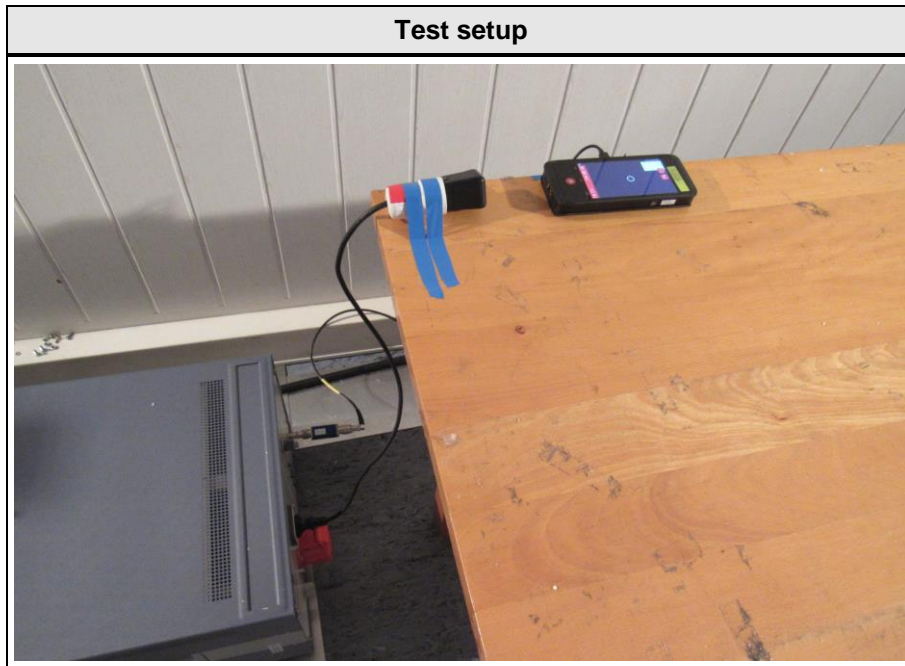
Class B		
Frequency [MHz]	Quasi-peak Limit [dBµV]	Average Limit [dBµV]
0.15 - 0.5	66 - 56 *	56 - 46 *
0.5 - 5	56	46
5 - 30	60	50

* Decreases with the logarithm of the frequency

2.2.6 Results

Test Results				
Port	Operational mode	EUT Configuration	Verdict	Remark
power	2	2	PASS	
Notes:				

2.2.7 Setup Photos



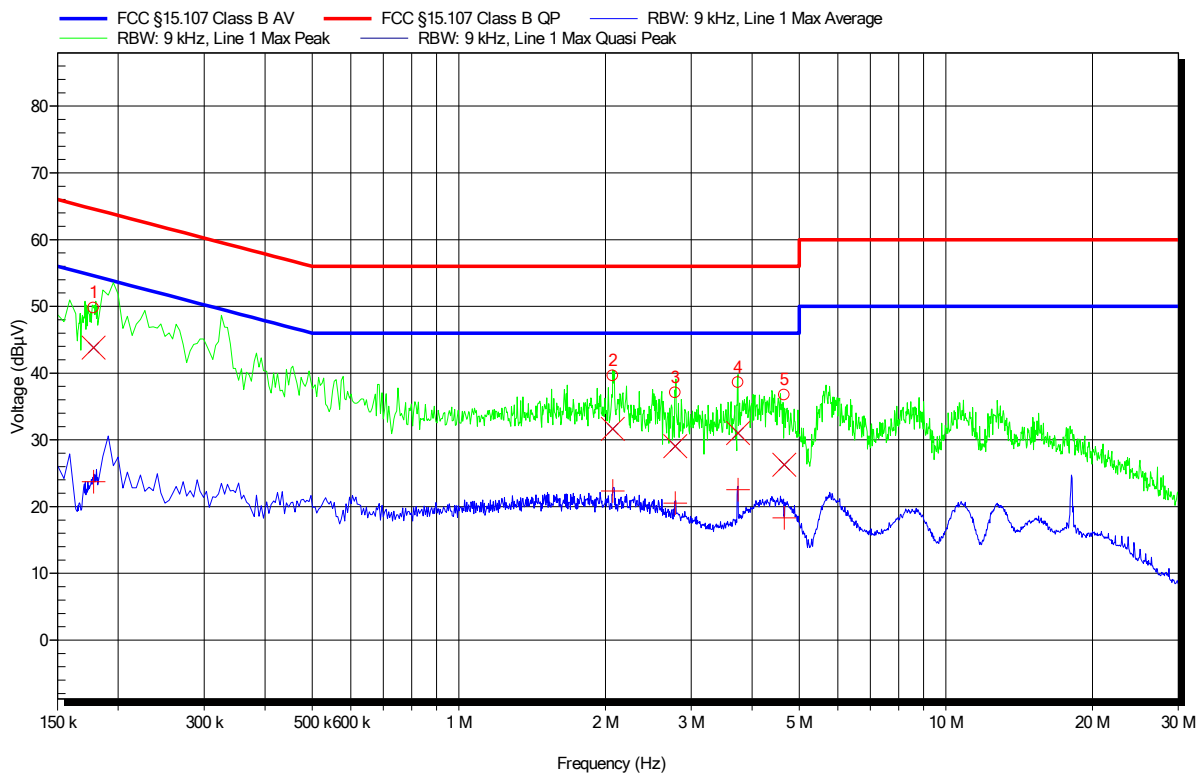
2.2.8 Records

EMI voltage test in the ac-mains according to FCC part 15B

Project number: G0M-1712-7102

Applicant: Leica Geosystems AG
 EUT Name: Laser Distance Meter
 Model: Leica BLK3D
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Engel
 Test Conditions: Tnom: 22°C, Unom: 120 VAC
 LISN: ESH2-Z5 L
 Mode: Mode #2
 Test Date: 2018-05-02
 Note:

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Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	177.9 kHz	43.8 dBµV	64.58 dBµV	-20.78 dB	Pass
2	2.069 MHz	31.66 dBµV	56 dBµV	-24.34 dB	Pass
3	2.783 MHz	29.03 dBµV	56 dBµV	-26.97 dB	Pass
4	3.746 MHz	31.01 dBµV	56 dBµV	-24.99 dB	Pass
5	4.655 MHz	26.29 dBµV	56 dBµV	-29.71 dB	Pass

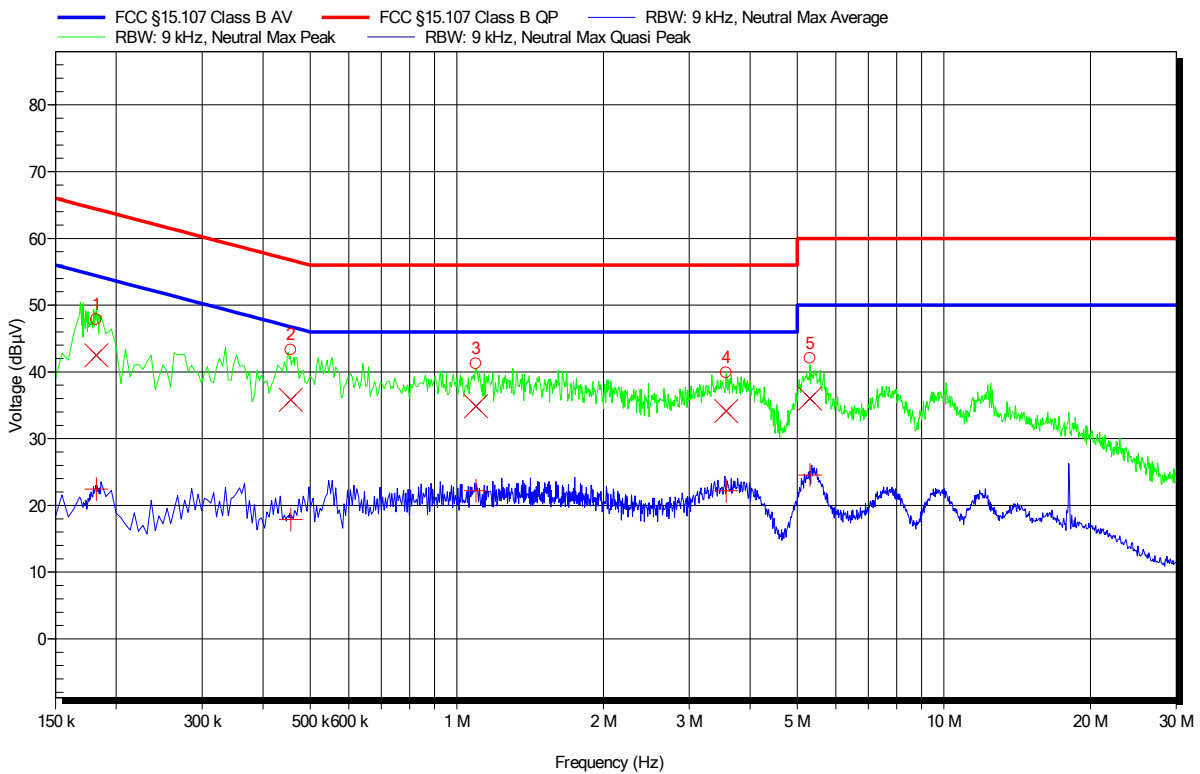
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	177.9 kHz	23.71 dBµV	54.58 dBµV	-30.87 dB	Pass
2	2.069 MHz	22.34 dBµV	46 dBµV	-23.66 dB	Pass
3	2.783 MHz	20.54 dBµV	46 dBµV	-25.46 dB	Pass
4	3.746 MHz	22.52 dBµV	46 dBµV	-23.48 dB	Pass
5	4.655 MHz	18.31 dBµV	46 dBµV	-27.69 dB	Pass

EMI voltage test in the ac-mains according to FCC part 15B

Project number: G0M-1712-7102

Applicant: Leica Geosystems AG
 EUT Name: Laser Distance Meter
 Model: Leica BLK3D
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Engel
 Test Conditions: Tnom: 22°C, Unom: 120 VAC
 LISN: ESH2-Z5 N
 Mode: Mode #2
 Test Date: 2018-05-02
 Note:

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Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	181.95 kHz	42.5 dBµV	64.4 dBµV	-21.9 dB	Pass
2	456 kHz	35.82 dBµV	56.77 dBµV	-20.94 dB	Pass
3	1.095 MHz	34.87 dBµV	56 dBµV	-21.13 dB	Pass
4	3.575 MHz	34.12 dBµV	56 dBµV	-21.88 dB	Pass
5	5.312 MHz	36 dBµV	60 dBµV	-24 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	181.95 kHz	22.45 dBµV	54.4 dBµV	-31.94 dB	Pass
2	456 kHz	17.86 dBµV	46.77 dBµV	-28.9 dB	Pass
3	1.095 MHz	22.21 dBµV	46 dBµV	-23.79 dB	Pass
4	3.575 MHz	22.19 dBµV	46 dBµV	-23.81 dB	Pass
5	5.312 MHz	24.53 dBµV	50 dBµV	-25.47 dB	Pass