




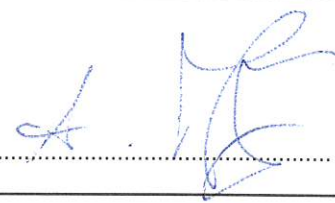


EMC TEST REPORT FCC CFR Title 47 / Chapter I / Subchapter A / Part 15 / Subpart B ISED ICES-003 Issue 7	
Report Reference No	G0M-2206-1501-EF0115B-V02
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	    <p> A2LA - Registration number: 1983.01 (ISED) ISED wireless device testing laboratory: CN 3470A DAKKS - Registration number : D-PL-12092-01-04 (FCC) FCC Filed Test Laboratory, Reg.-No.: 96970 </p>
Applicant	Leica Geosystems AG
Address	Heinrich-Wild-Strasse 9435 Heerbrugg SWITZERLAND
Test Specification Standard(s)	FCC CFR Title 47 / Chapter I / Subchapter A / Part 15 / Subpart B ISED ICES-Gen Issue 1 ; Amendment 1 (February 2021) ISED ICES-003 Issue 7 ANSI C63.4:2014+A1:2017
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	Field Controller Win EC7
Model(s)	CS20 LTE
Additional Model(s)	None
Brand Name(s)	Leica Geosystems
Hardware Version(s)	1.2
Software Version(s)	v7.07.19.1040033
FCC-ID	RFD-CSNGG
IC	3177A-CSNGG
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	2022-06-02	
Report:		
Compiled by	Matthias Handrik	
Tested by (+ signature) (Responsible for Test)	Matthias Handrik	
Approved by (+ signature) (Test Lab Engineer)	Andreas Pflug	
Date of Issue	2023-07-10	
Total number of pages	39	
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>		
<p>Statement concerning the uncertainty of the measurement systems used for decisions on conformity (decision rule):</p> <p>The Decision Rule is applied on the basis of CISPR16-4-2 and/or IEC61000-4-x (TR61000-1-6) and their national publications. These standards provide guidance on how to calculate and apply measurement uncertainty whilst providing maximum uncertainties allowance. In all cases due consideration will be given to ILAC-G8:09/2019.</p> <p>Compliance or non-compliance with a disturbance limit is determined in the following manner.</p> <ul style="list-style-type: none"> - If U_{lab} is less than or equal to U_{cisp}, then: compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit; non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit. - If U_{lab} is greater than U_{cisp}, then: compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cisp})$, exceeds the disturbance limit; non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cisp})$, exceeds the disturbance limit. <p>Where appropriate for the test, for example for EMC pulsed immunity tests, the laboratory has demonstrated, by calibrating its equipment and facilities, that it complies with the above requirements and therefore no allowance of uncertainties has been given to the tolerances.</p>		

Additional Comments:

This report is based on project G0M-1812-7888 (master report), it refers to EUT changes.
This report based on existing FCC-Listing (FCC ID: RFD-CSNGG) and ISED-Listing (IC: 3177A-CSNGG) (Project G0M-1812-7888) and this report accounts only hardware change:

- see customer declaration "TCD HW Amber CS20.docx" (2022-02-15)
- configuration see test report G0M-1812-7888

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	2022-10-26	Initial Release	-
02	2023-07-10	<p>Replaced document: G0M-2206-1501-EF0115B-V01 Replaced by: G0M-2206-1501-EF0115B-V02</p> <p>Reason: HVIN / PMN for Canada added and additional model removed.</p>	M. Handrik

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1 Equipment (Test Item) Under Test

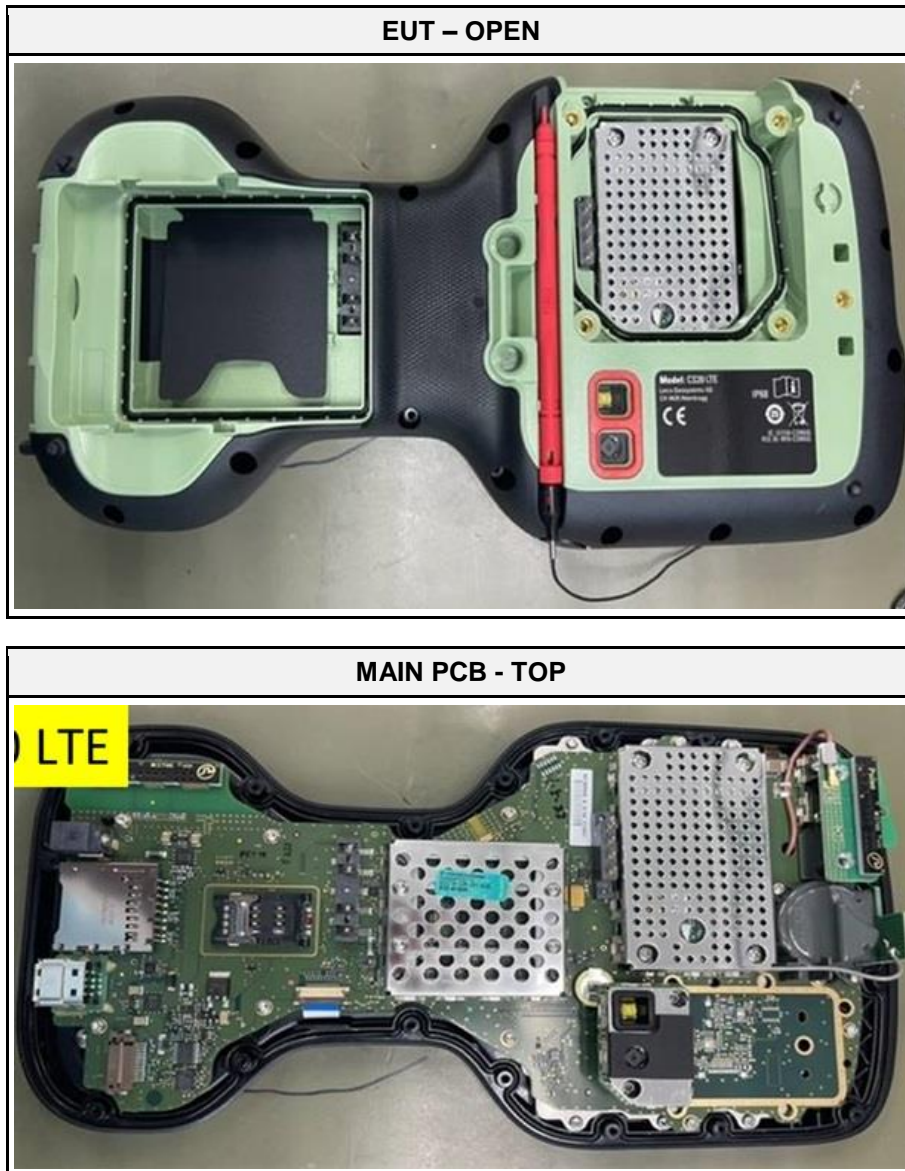
Description	Field Controller Win EC7		
Intended Use	<ul style="list-style-type: none"> • Remote control of several products • Data communication with external equipment • Recording measurements • Computing with software • Carrying out measurement tasks using various GNSS measuring techniques • Recording GNSS and point related data • Measuring raw data and computing coordinates using carrier phase and code signal from GNSS satellites (GNSS systems) • Laser distance meter (Laser class 2) 		
Model	CS20 LTE		
Additional Model(s)	None		
Brand Name(s)	Leica Geosystems		
Hardware Version(s)	1.2		
Software Version(s)	v7.07.19.1040033		
Number of tested samples	1		
Sample Identification	EUT #	Sample-ID	Serial Number
	EUT 1	40998	2462903
EUT Dimensions [cm]	28.4 x 15.0 x 4.9		
FCC-ID	RFD-CSNGG		
IC	3177A-CSNGG		
HVIN	CS20 LTE		
PMN	CS20 LTE		
HMN	-/-		
FVIN	-/-		
Class	Class B		
Equipment type	Table top		
Highest internal frequency [MHz]	1000MHz (CPU Clock); 2480 (BT/WLAN)		
Protective Earth	No		
Radio Module I	Type	Bluetooth module	
	Model	TIWI-BLE	
	Manufacturer	Laird Technologies (LRBT)	
	FCC-ID	RFD-BTWCO	
	IC	3177A-BTWCO	
Radio Module II	Type	Bluetooth LR module	
	Model	cB-OBS421x-c1	
	Manufacturer	connectBlue/U-blox	
	FCC-ID	PVH0946	
	IC	5235A-0946	
Radio Module III	Type	WLAN module (IEEE 802.11)	
	Model	TIWI-BLE	
	Manufacturer	Laird Technologies (LSR)	
	FCC-ID	RFD-BTWCO	
	IC	3177A-BTWCO	
Radio Module IV	Type	Mobile communication module LTE	
	Model	PLAS9-X	
	Manufacturer	Gemalto	
	FCC-ID	QIPPLAS9-X	
	IC	7830A-PLAS9X	

Supply Voltage	V _{NOM}	10.8V DC Li-Ion battery
	V _{NOM}	15V DC via (AC/DC adaptor)
AC/DC-Adaptor	Model	AEL40US15-XE0557 (GEV276)
	Vendor	XP-Power
	Input	100-240V AC 47-63Hz
	Output	15V DC
Manufacturer	Leica Geosystems AG Heinrich-Wild-Strasse 9435 Heerbrugg SWITZERLAND	
Factory	Leica Geosystems Technologies Pte Ltd 2 Woodlands Sector 1 #01-10 Woodlands Spectrum 1 738068 Singapore Singapore	

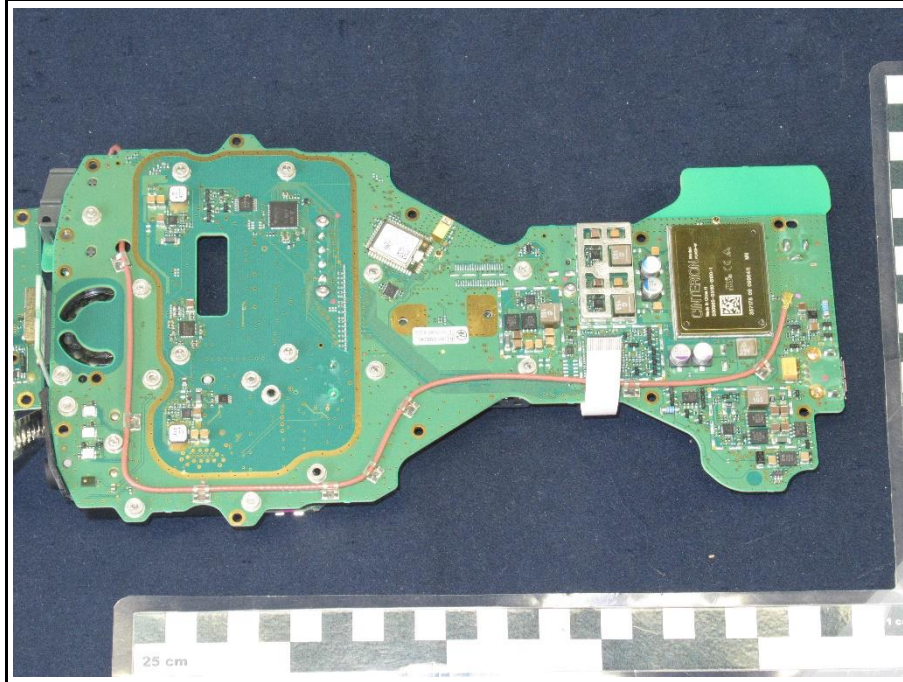
1.1 Equipment Ports

Name	Type	Attributes	Comment
Power	AC	Count: 1 Cable length [m]: >3 Direction: IN Service only: No Shielded: No	AC-port of AC/DC adaptor length=1m DC-port of AC/DC adaptor length=1.3m
RS232 (Lemo)	IO / DC	Count: 1 Cable length [m]: <1.8 Direction: IO Service only: No Shielded: Yes	Lemo GeoCom interface (GEV261) Not connected during test.
SD Card	IO	Count: 1 Cable length [m]: 0 Direction: IO Service only: No Shielded: Yes	a SD card was plugged directly into the port (test software stored)
USB Host	IO	Count: 1 Cable length [m]: 0 Direction: IO Service only: No Shielded: Yes	High Speed Not connected during test.
USB	IO	Count: 1 Cable length [m]: 0 Direction: IO Service only: No Shielded: Yes	Expansion Pack Not connected during test.
Description:			
AC	AC mains power input/output port		
DC	DC power input/output port		
BAT	DC power input port connected to external battery		
IO	Input/Output port		
TP	Telecommunication port		
NE	Non-electrical port		

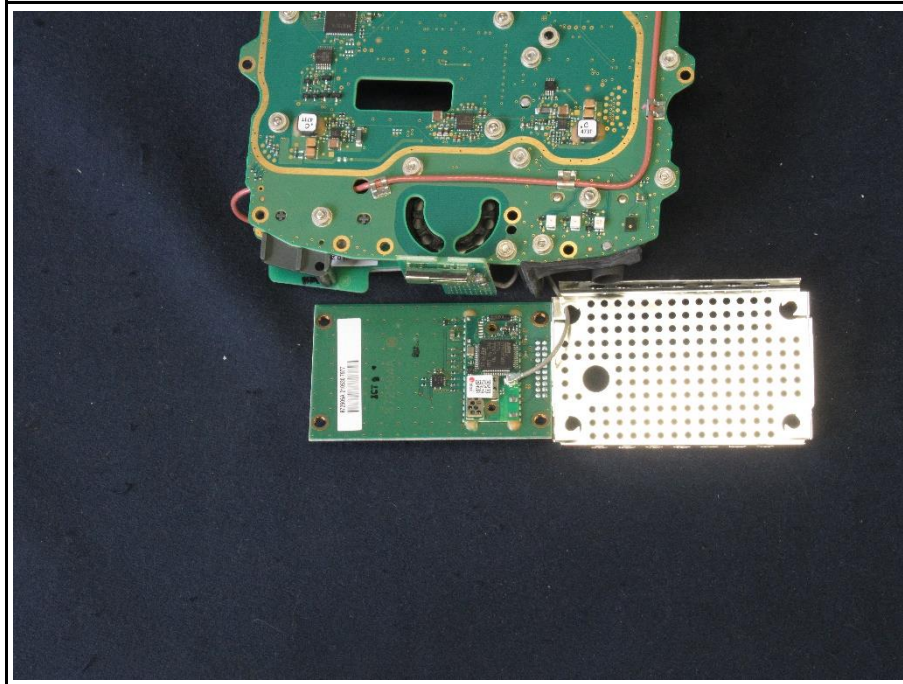
1.2 Equipment Photos – Internal (provided by customer)



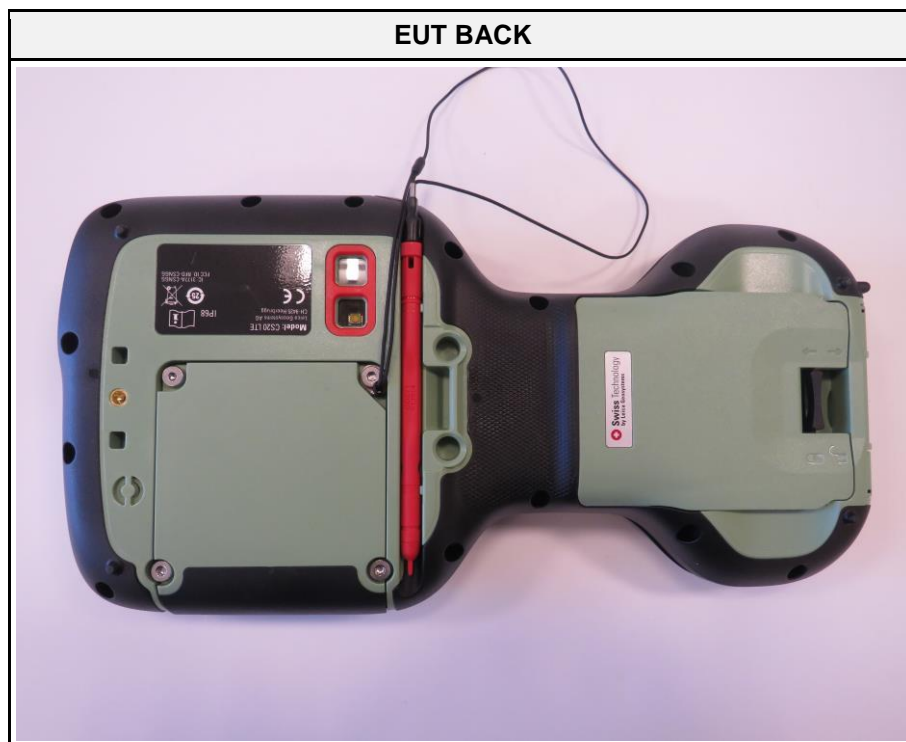
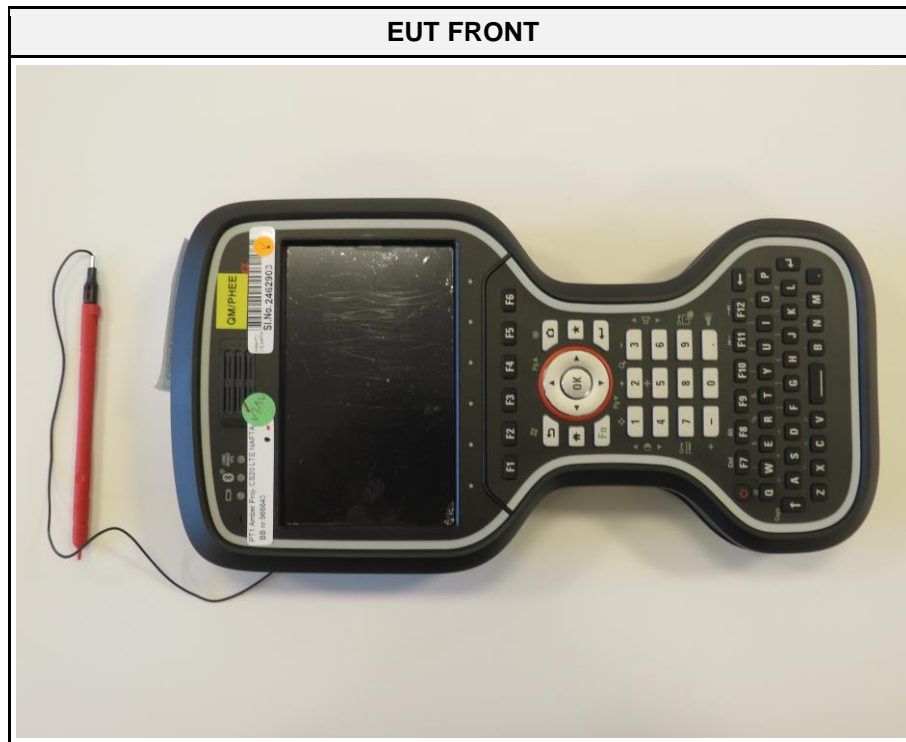
MAIN PCB - BOTTOM



PCB BT LR board - TOP



1.3 Equipment Photos - External



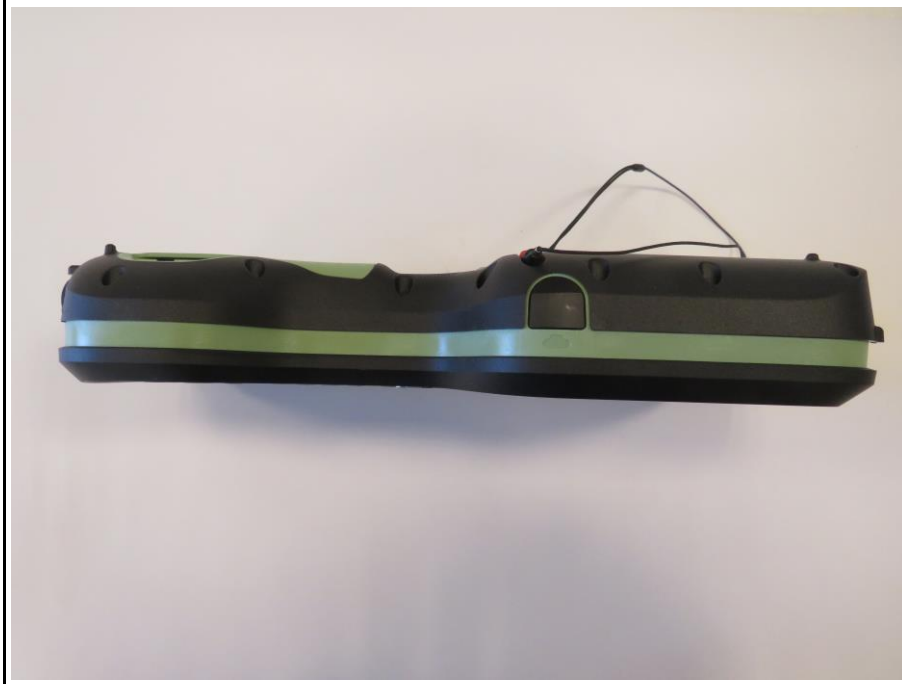
EUT TOP



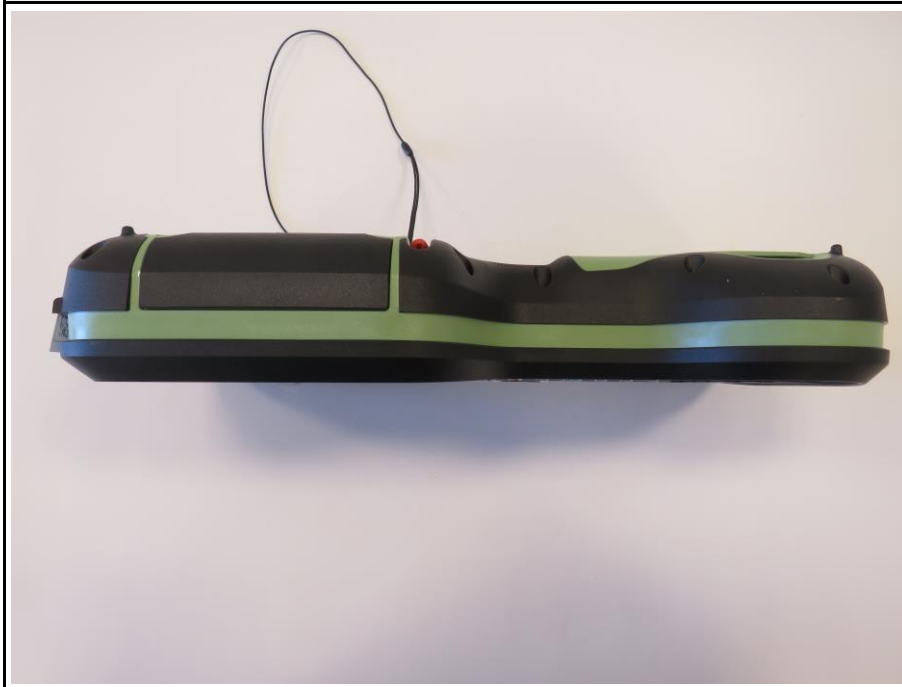
EUT BOTTOM



EUT LEFT



EUT RIGHT



EUT LABEL FRONT



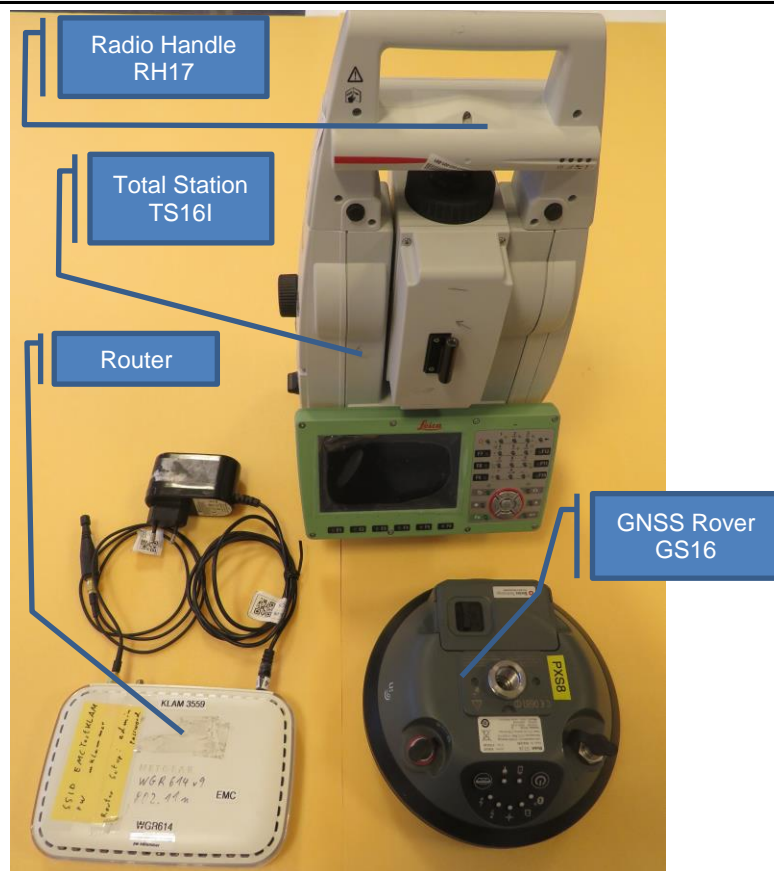
EUT BACK LABEL



AC/DC ADAPTOR LABEL



AE Equipment



EUT BATTERY TOP



EUT BATTERY BOTTOM



1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	AC/DC adaptor	XP-Power	AEK40US15-XE0557	Customer Support Equipment (GEV276)
AE	GNSS Rover (measuring device)	Leica Geosystems AG	GS16	Customer Support Equipment companion device (S.No.: 3706168)
AE	Total Station	Leica Geosystems AG	TS16l + RH17	Customer Support Equipment S.No.: 3011422 S.No.: 3107180
AE	Li-Ion Battery	Leica Geosystems AG	GEB331	Customer Support Equipment
AE	SD Card	Leica Geosystems AG	MSD1000 1GB	Customer Support Equipment
AE	WLAN Router	Netgear	WGR 614 v9	Customer Support Equipment
AE	SIM card	COMPRIO	-	Provided by Eurofins
SIM	Radio Communication Tester	R&S	CMW290	Provided by Eurofins EF01367
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
MON	Monitoring Equipment			
CBL	Connecting Cable			
Comment:				

1.5 Operational Modes

Mode #	Description
1	<p>RF connection to corresponding companion device as described in chapter 1.6 "EUT Configuration":</p> <ul style="list-style-type: none"> • 2.4GHz WLAN • Bluetooth classic • Bluetooth Long Range and • LTE FDD 2 channel 18900 with TPC "max power"
Comment:	

1.6 EUT Configuration

Configuration #	Description
1	<p>EUT assembled with battery and connected to the AC/DC adaptor, which is powered with 120V/60Hz.</p> <p>A cellular connection as defined in the table above ("Operational Modes") to radio communication simulator is established. To do this, the modem of the EUT is activated via two scripts (first "Cell_Start_PLAS9.bat" and then "Init_PLS9-X.bat", both located on the SD card).</p> <p>The Bluetooth connection is established between EUT and GNSS Rover GS16 and the Bluetooth Long Range connection is established to the Total Station TS16I with Radio Handle RH17, which houses this technology.</p> <p>With the help of the Netgear Router a WLAN connection is established to EUT.</p>
Comment: Test without battery powered	

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

Title 47 CFR Part 15B, ISED ICES-003 Issue 7				
Reference	Requirement	Reference Method	Result	Remarks
Emission				
FCC 15.109 ICES-003, 3.2.2	Radiated emissions	ANSI C63.4:2014 +A1:2017	PASS	-
FCC 15.107 ICES-003, 3.2.1	AC power line conducted emissions	ANSI C63.4:2014 +A1:2017	PASS	-
Comment:				

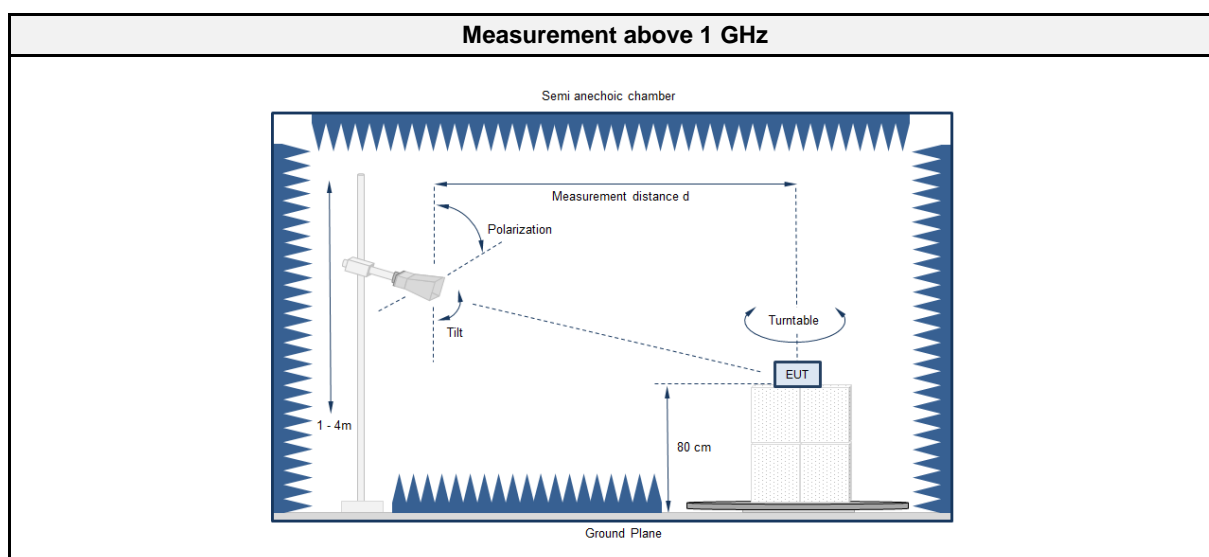
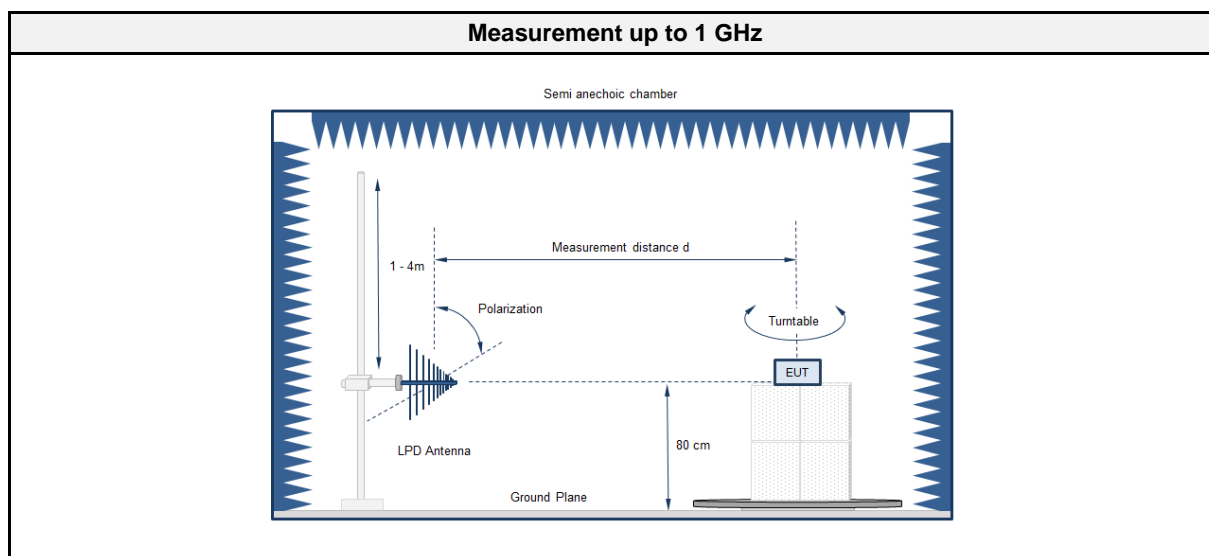
Possible Test Case Verdicts	
PASS	Test object does meet the requirements
FAIL	Test object does not meet the requirements
N/T	Required by standard but not tested
N/R	Not required by standard for the test object

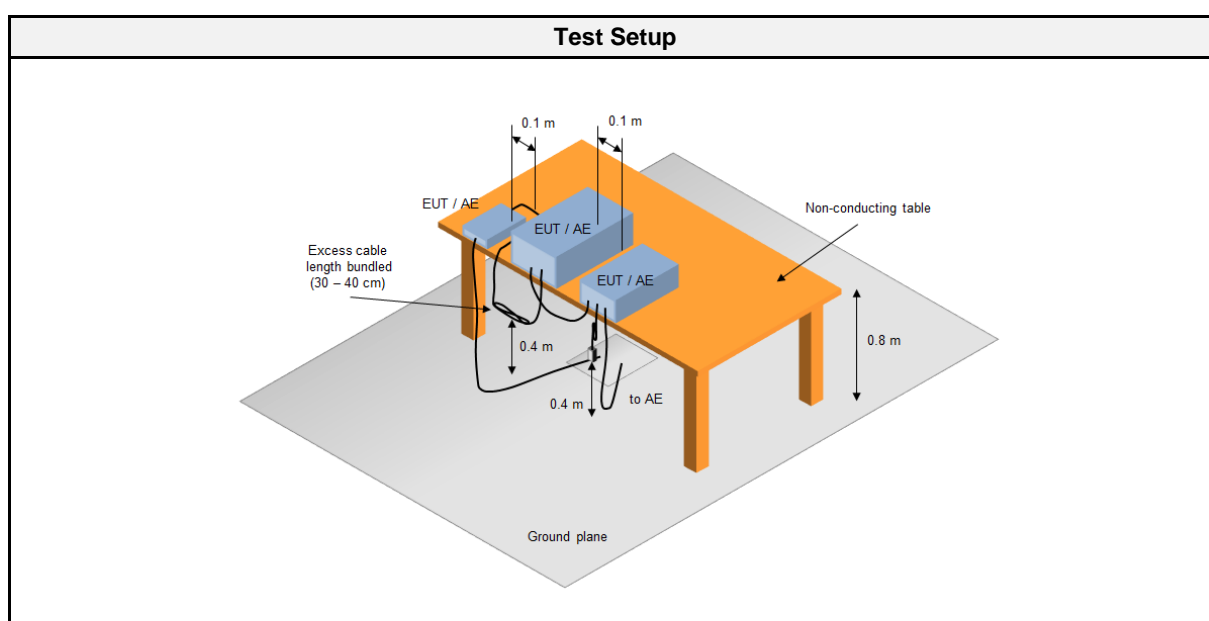
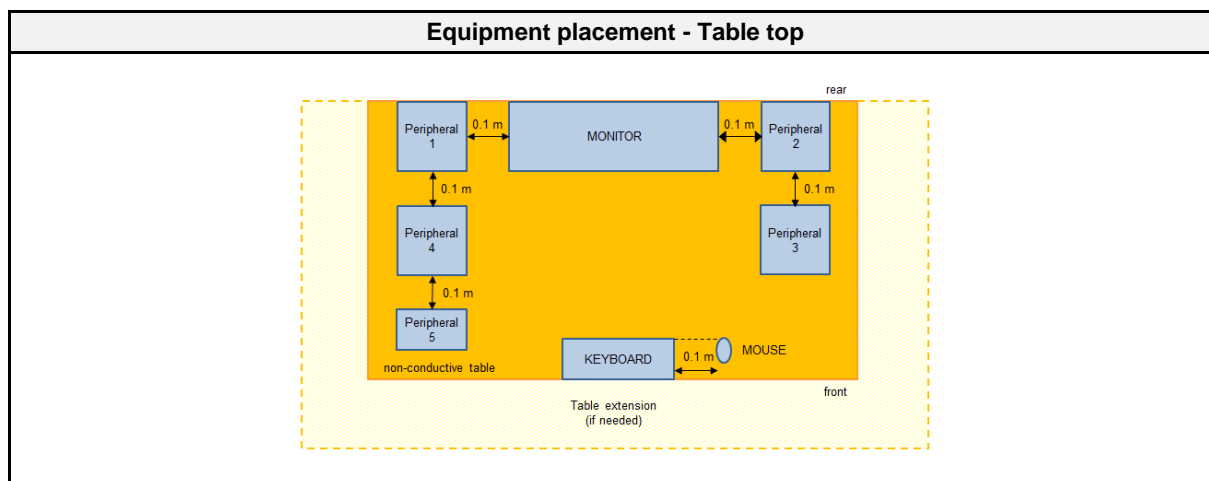
2.1 Test Conditions and Results - Radiated emissions acc. to ANSI C63.4

2.1.1 Information

Test Information	
Reference	FCC 15.109, ICES-003, 3.2.2
Reference method	ANSI C63.4:2014+A1:2017 Section 8
Equipment class	Class B
Equipment type	Table top
Highest internal frequency [MHz]	2480
Measurement range	30 MHz to 13000 MHz
Temperature [°C]	20 ±3
Humidity [%]	55 ±5
Operator	Stefan Dose
Date	2022-08-31

2.1.2 Setup





2.1.3 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	Radimation	2020.1.8

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic chamber (NSA)	Frankonia	AC1	EF00062	2021-02	2024-02
Anechoic chamber (SVSWR)	Frankonia	AC 1	EF01011	2022-06	2025-06
Programmable AC Source	Chroma ATE Inc.	61604	EF01068	2021-07	2023-07
EMI Test Receiver	Keysight	N9038A-526/WXP	EF01070	2021-07	2023-01
Biconical Antenna	R&S	HK 116	EF00030	2021-05	2024-05
LPD Antenna	R&S	HL 223	EF01565	2020-03	2023-03
Horn Antenna	Schwarzbeck	BBHA9120D	EF00018	2019-10	2022-10
Climatic Sensor	Embedded Data Systems, LLC.	2800100000254 17E	EF01054	2022-04	2023-04

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 2.1.2

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.

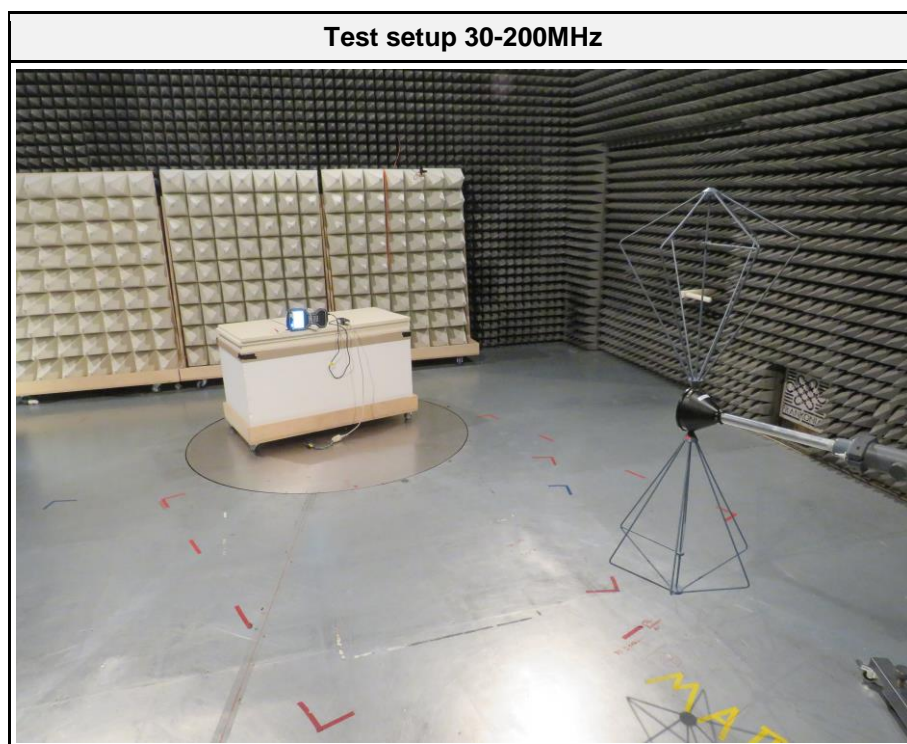
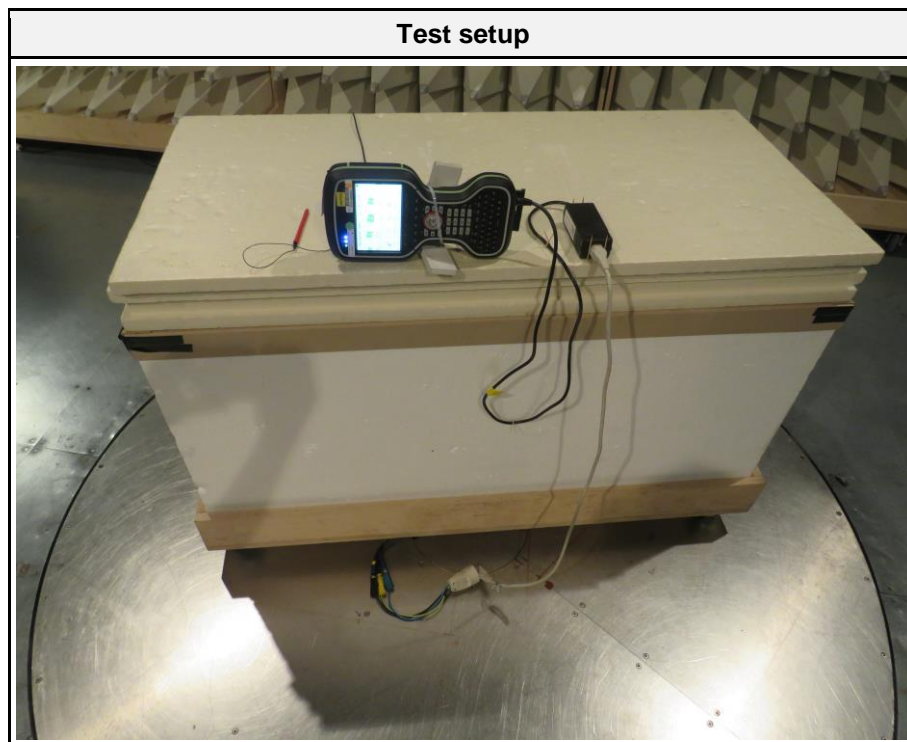
2.1.5 Limits

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	74
	Average	54

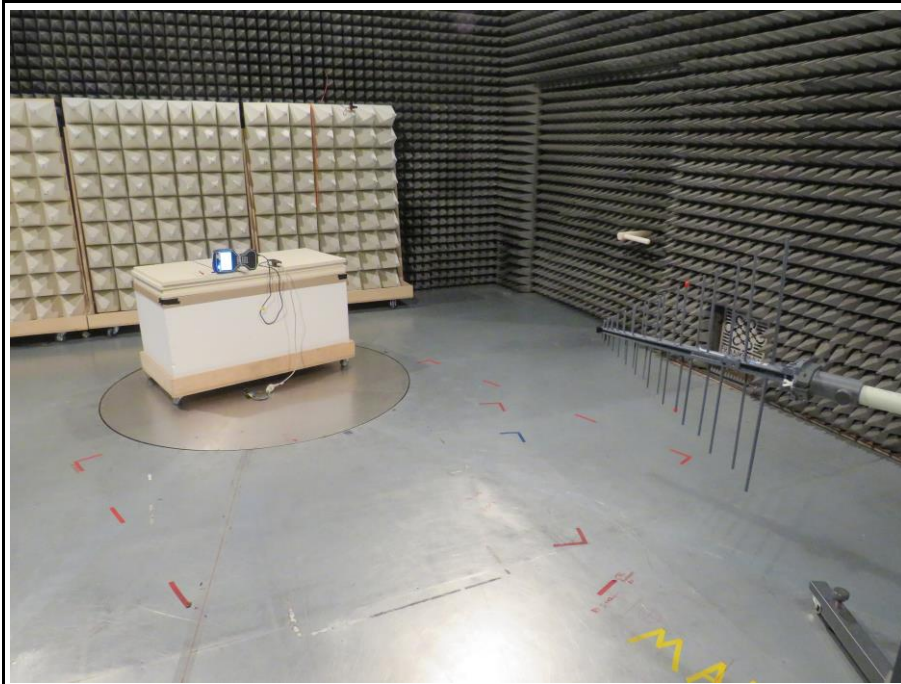
2.1.6 Results

Test Results			
Operational mode	EUT Configuration	Verdict	Remark
1	1	PASS	-

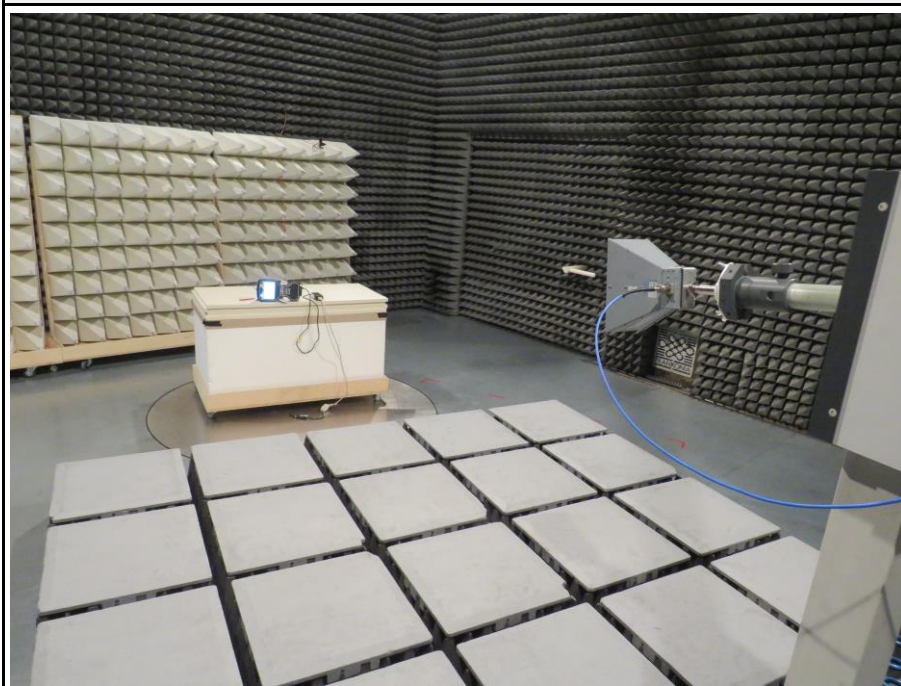
2.1.7 Setup Photos



Test setup 200-1000MHz



Test setup 1000-13000MHz



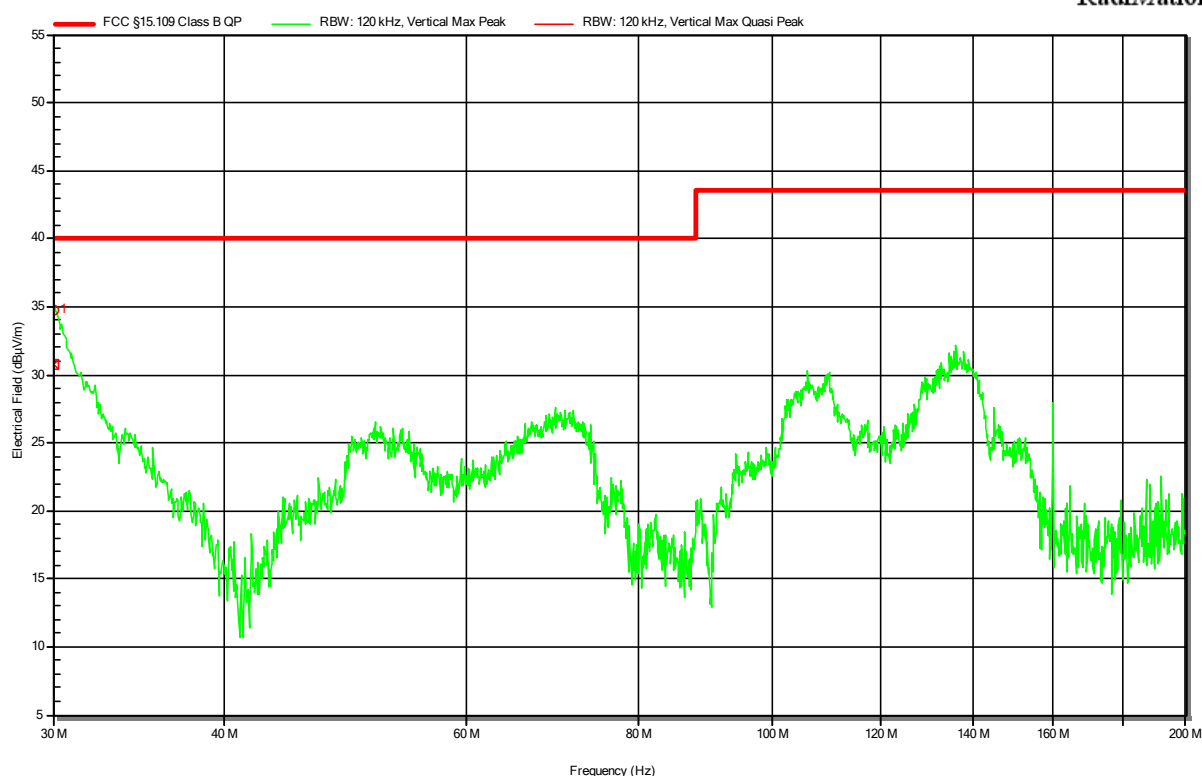
2.1.8 Records

**Radiated emissions
according to FCC part 15B**

Project Number: G0M-2206-1501
 Applicant: Leica Geosystems Technologies Pte Ltd
 Model Description: Field Controller Win EC7
 Model: CS20 LTE
 Test Sample ID: 40998
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Dose
 Test Date: 2022-08-31
 Operating Conditions: ambient temperature: 19 °Celsius
 power input: 120VAC/60Hz
 Antenna: Rohde & Schwarz HK 116, Vertical
 Measurement Distance: 3m
 Operational Mode: 1
 EUT Configuration: 1
 Note 1:

Index 1

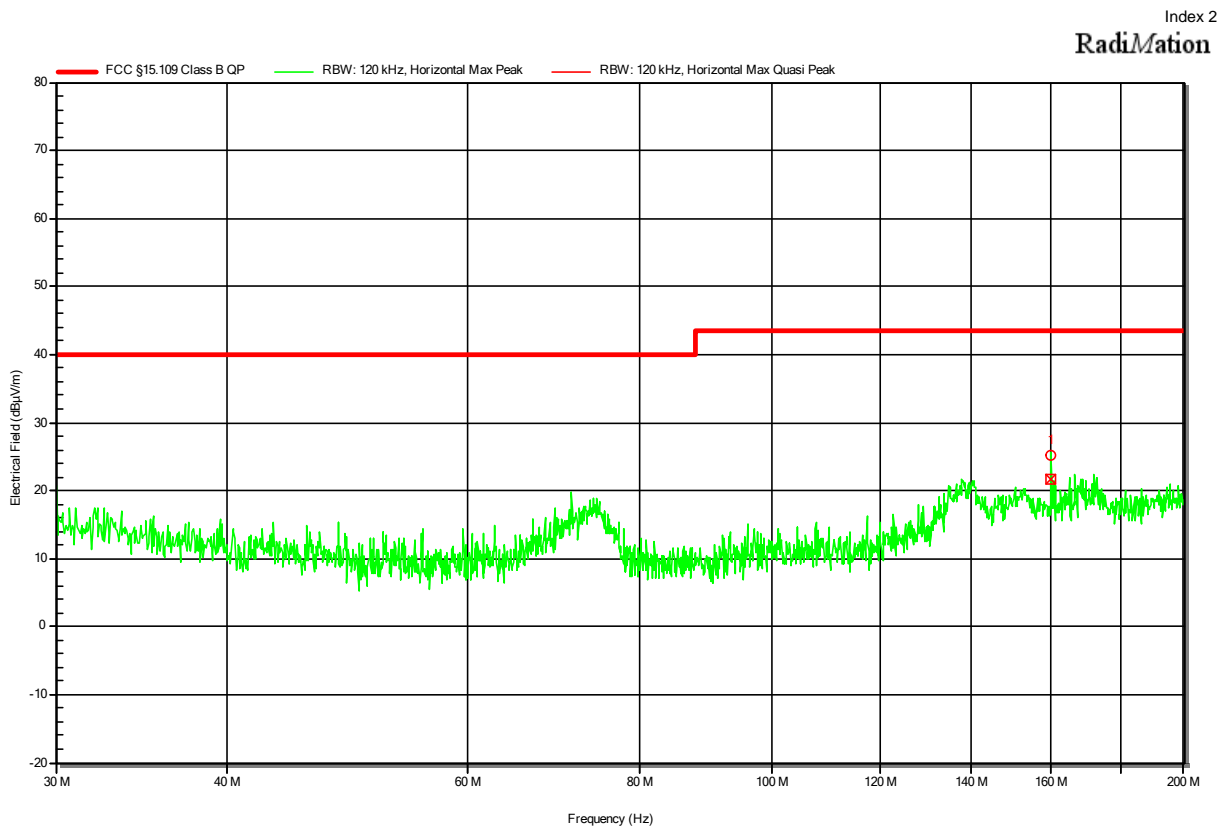
RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	30.006 MHz	30.71 dBµV/m	40 dBµV/m	-9.29 dB	Pass	0 degrees	1 m

Radiated emissions according to FCC part 15B

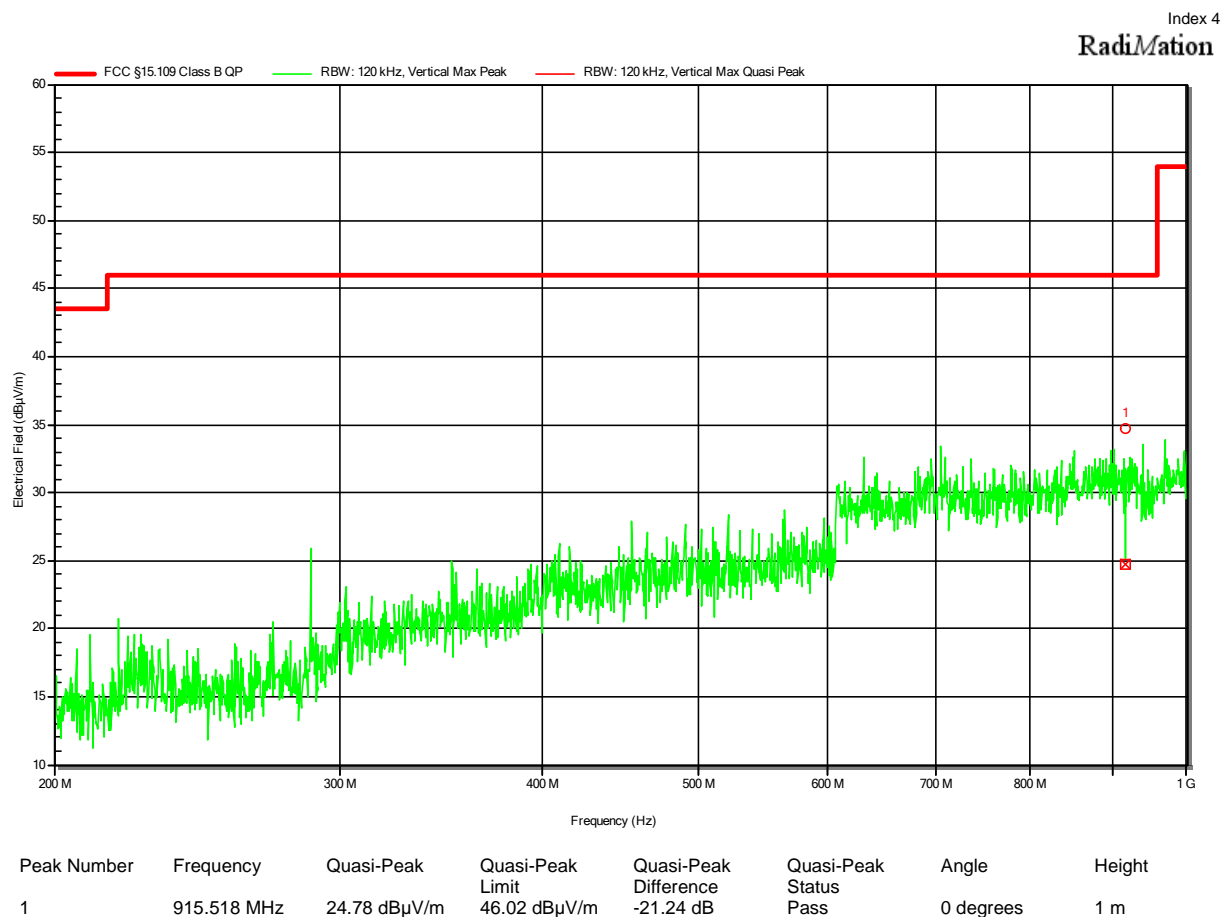
Project Number: G0M-2206-1501
 Applicant: Leica Geosystems Technologies Pte Ltd
 Model Description: Field Controller Win EC7
 Model: CS20 LTE
 Test Sample ID: 40998
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Dose
 Test Date: 2022-08-31
 Operating Conditions: ambient temperature: 19 °Celsius
 power input: 120VAC/60Hz
 Antenna: Rohde & Schwarz HK 116, Horizontal
 Measurement Distance: 3m
 Operational Mode: 1
 EUT Configuration: 1
 Note 1:



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	160.005 MHz	21.77 dBµV/m	43.52 dBµV/m	-21.75 dB	Pass	0 degrees	1 m

**Radiated emissions
according to FCC part 15B**

Project Number: G0M-2206-1501
 Applicant: Leica Geosystems Technologies Pte Ltd
 Model Description: Field Controller Win EC7
 Model: CS20 LTE
 Test Sample ID: 40998
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Dose
 Test Date: 2022-08-31
 Operating Conditions: ambient temperature: 19 °Celsius
 power input: 120VAC/60Hz
 Antenna: Rohde & Schwarz HL 223, Vertical
 Measurement Distance: 3m
 Operational Mode: 1
 EUT Configuration: 1
 Note 1:

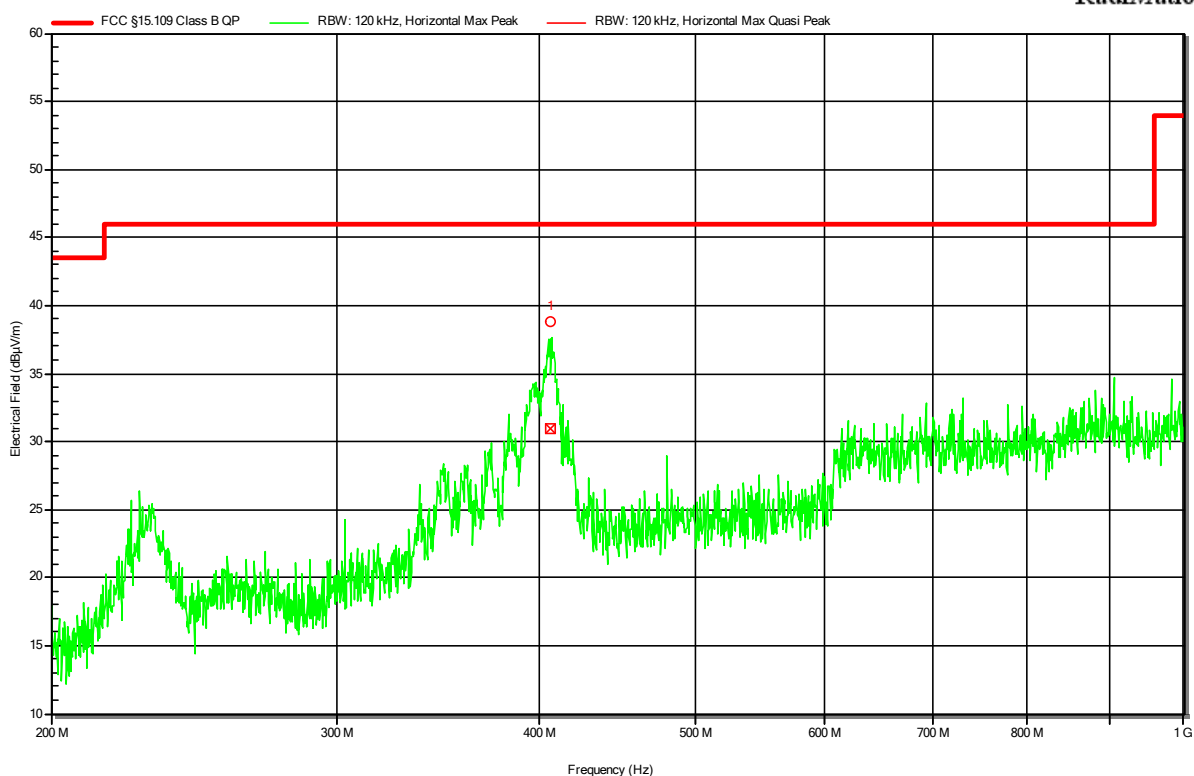


Radiated emissions according to FCC part 15B

Project Number: G0M-2206-1501
Applicant: Leica Geosystems Technologies Pte Ltd
Model Description: Field Controller Win EC7
Model: CS20 LTE
Test Sample ID: 40998
Test Site: Eurofins Product Service GmbH
Operator: Mr. Dose
Test Date: 2022-08-31
Operating Conditions: ambient temperature: 19 °Celsius
power input: 120VAC/60Hz
Antenna: Rohde & Schwarz HL 223, Horizontal
Measurement Distance: 3m
Operational Mode: 1
EUT Configuration: 1
Note 1:

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RadiMation



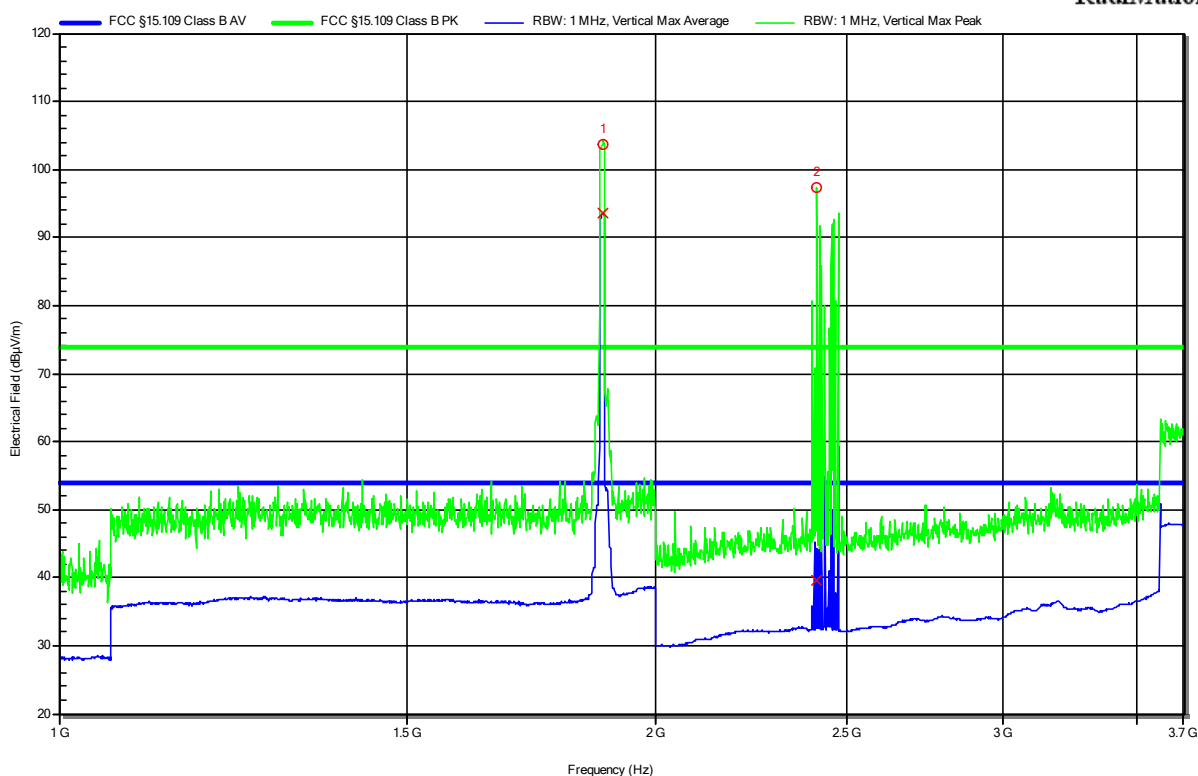
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	406.765 MHz	30.99 dBμV/m	46.02 dBμV/m	-15.03 dB	Pass	0 degrees	1 m

Radiated emissions according to FCC part 15B

Project Number: G0M-2206-1501
 Applicant: Leica Geosystems Technologies Pte Ltd
 Model Description: Field Controller Win EC7
 Model: CS20 LTE
 Test Sample ID: 40998
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Dose
 Test Date: 2022-08-31
 Operating Conditions: ambient temperature: 18 °Celsius
 power input: 120VAC/60Hz
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement Distance: 3m
 Operational Mode: 1
 EUT Configuration: 1
 Note 1:

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RadiMation



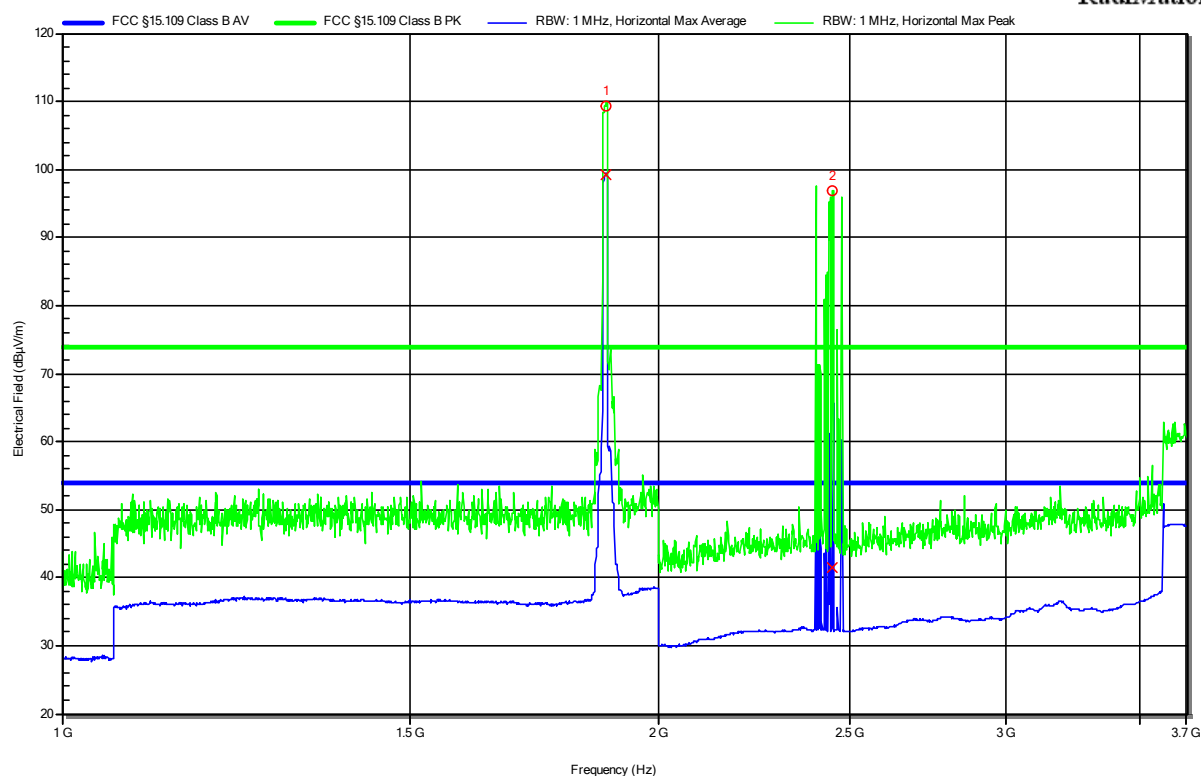
Peak Number	Frequency	LTE carrier	Angle	Height
1	1.882 GHz	LTE carrier	0 degrees	1.5 m
2	2.414 GHz	WLAN/BT	0 degrees	1.5 m

Radiated emissions according to FCC part 15B

Project Number: G0M-2206-1501
Applicant: Leica Geosystems Technologies Pte Ltd
Model Description: Field Controller Win EC7
Model: CS20 LTE
Test Sample ID: 40998
Test Site: Eurofins Product Service GmbH
Operator: Mr. Dose
Test Date: 2022-08-31
Operating Conditions: ambient temperature: 19 °Celsius
power input: 120VAC/60Hz
Antenna: Schwarzbeck BBHA 9120D, Horizontal
Measurement Distance: 3m
Operational Mode: 1
EUT Configuration: 1
Note 1:

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RadiMation



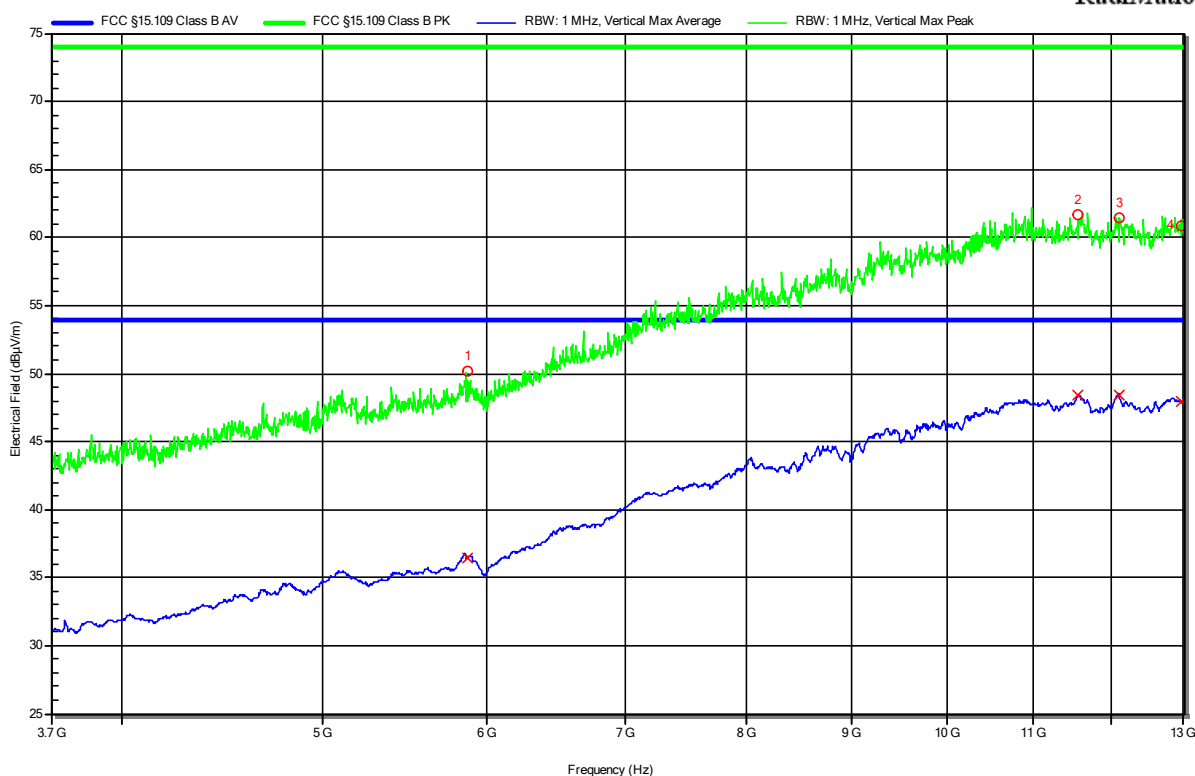
Peak Number	Frequency	LTE carrier	Angle	Height
1	1.882 GHz	WLAN/BT	0 degrees	1.5 m
2	2.451 GHz		0 degrees	1.5 m

Radiated emissions according to FCC part 15B

Project Number: G0M-2206-1501
Applicant: Leica Geosystems Technologies Pte Ltd
Model Description: Field Controller Win EC7
Model: CS20 LTE
Test Sample ID: 40998
Test Site: Eurofins Product Service GmbH
Operator: Mr. Dose
Test Date: 2022-08-31
Operating Conditions: ambient temperature: 20 °Celsius
power input: 120VAC/60Hz
Antenna: Schwarzbeck BBHA 9120D, Vertical
Measurement Distance: 3m
Operational Mode: 1
EUT Configuration: 1
Note 1:

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RadiMation



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	5.869 GHz	50.15 dBµV/m	73.98 dBµV/m	-23.83 dB	Pass	0 degrees	1.3 m
2	11.557 GHz	61.67 dBµV/m	73.98 dBµV/m	-12.31 dB	Pass	0 degrees	1.3 m
3	12.094 GHz	61.49 dBµV/m	73.98 dBµV/m	-12.49 dB	Pass	0 degrees	1.3 m
4	12.968 GHz	60.83 dBµV/m	73.98 dBµV/m	-13.15 dB	Pass	0 degrees	1.3 m
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	5.869 GHz	36.5 dBµV/m	53.98 dBµV/m	-17.48 dB	Pass	0 degrees	1.3 m
2	11.557 GHz	48.36 dBµV/m	53.98 dBµV/m	-5.62 dB	Pass	0 degrees	1.3 m
3	12.094 GHz	48.44 dBµV/m	53.98 dBµV/m	-5.54 dB	Pass	0 degrees	1.3 m
4	12.968 GHz	47.93 dBµV/m	53.98 dBµV/m	-6.05 dB	Pass	0 degrees	1.3 m

Test Report No.: G0M-2206-1501-EF0115B-V02

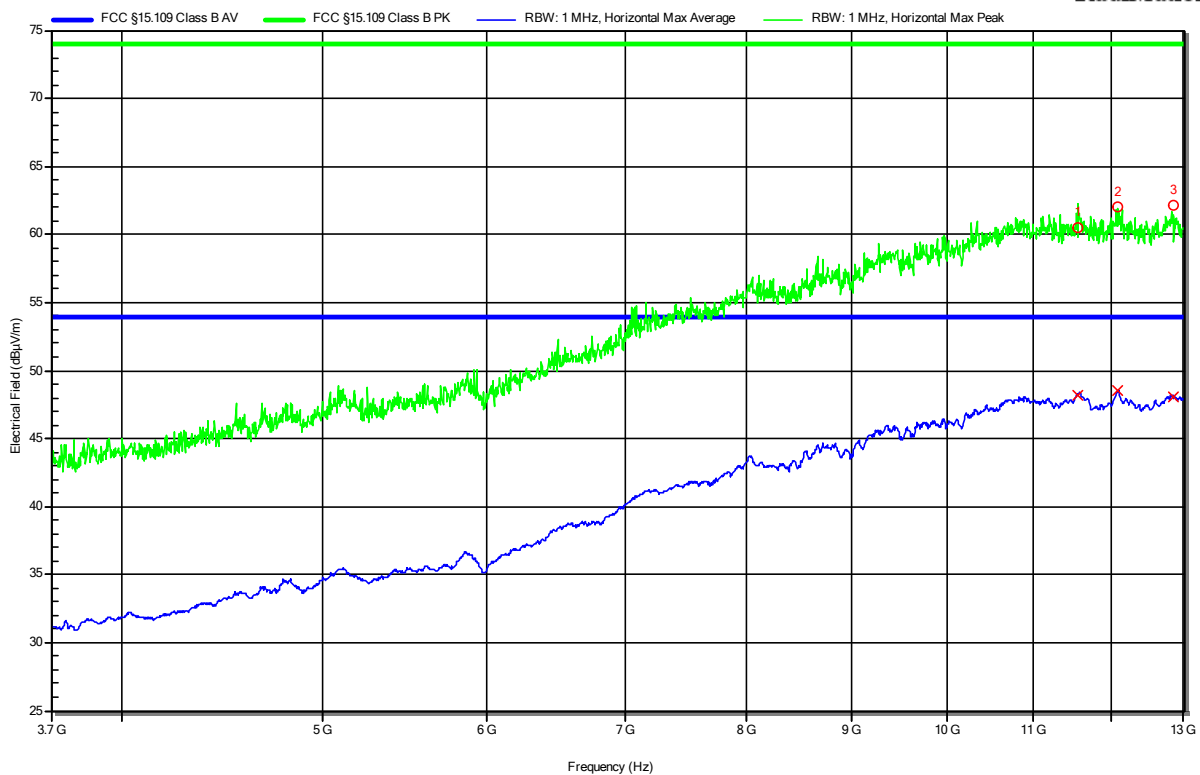
Eurofins Product Service GmbH
Storkower Str. 38c, D-15526 Reichenwalde, Germany

Radiated emissions according to FCC part 15B

Project Number: G0M-2206-1501
 Applicant: Leica Geosystems Technologies Pte Ltd
 Model Description: Field Controller Win EC7
 Model: CS20 LTE
 Test Sample ID: 40998
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Dose
 Test Date: 2022-08-31
 Operating Conditions: ambient temperature: 20 °Celsius
 power input: 120VAC/60Hz
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement Distance: 3m
 Operational Mode: 1
 EUT Configuration: 1
 Note 1:

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Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	11.555 GHz	60.53 dBμV/m	73.98 dBμV/m	-13.45 dB	Pass	0 degrees	1.25 m
2	12.091 GHz	62.08 dBμV/m	73.98 dBμV/m	-11.9 dB	Pass	0 degrees	1.25 m
3	12.858 GHz	62.19 dBμV/m	73.98 dBμV/m	-11.79 dB	Pass	0 degrees	1.25 m
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	11.555 GHz	48.22 dBμV/m	53.98 dBμV/m	-5.76 dB	Pass	0 degrees	1.25 m
2	12.091 GHz	48.5 dBμV/m	53.98 dBμV/m	-5.48 dB	Pass	0 degrees	1.25 m
3	12.858 GHz	48.05 dBμV/m	53.98 dBμV/m	-5.93 dB	Pass	0 degrees	1.25 m

Test Report No.: G0M-2206-1501-EF0115B-V02

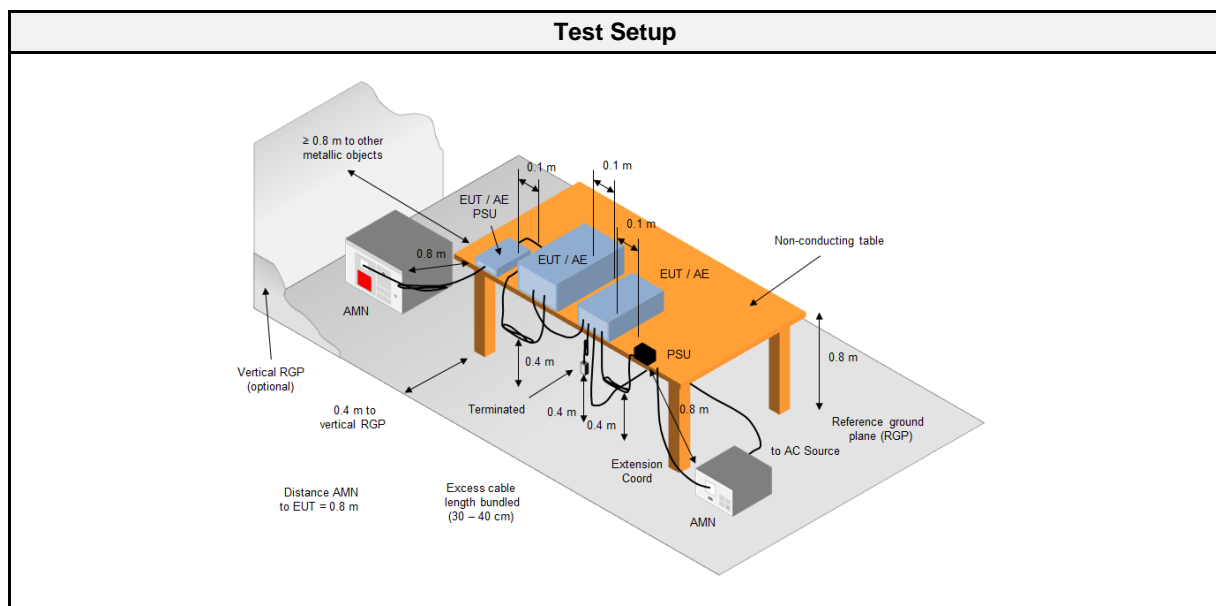
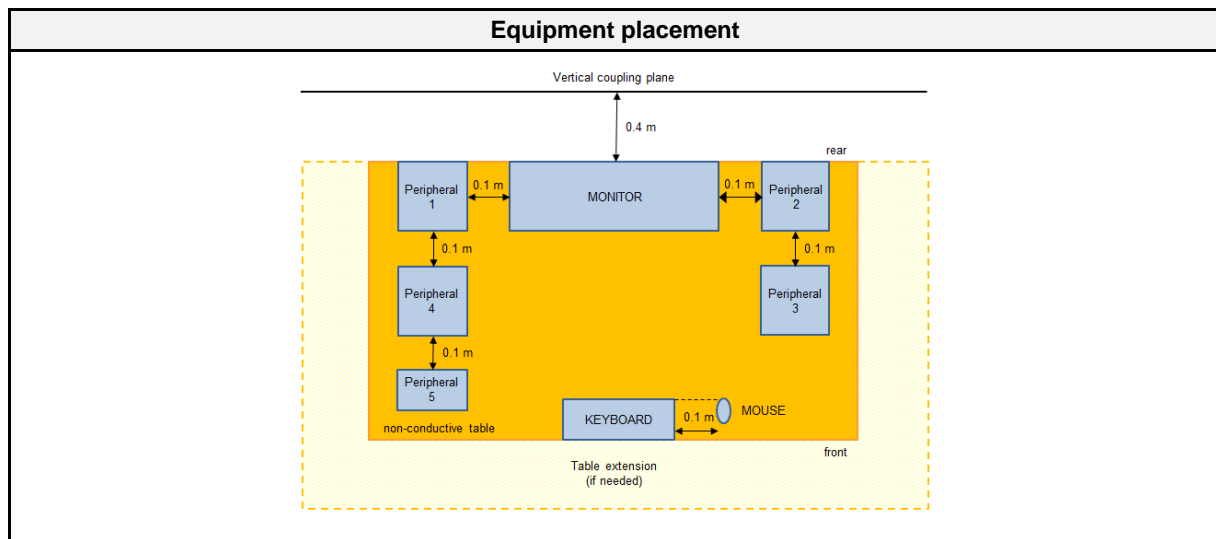
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

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, 3.2.1
Reference method	ANSI C63.4:2014+A1:2017 Section 12
Measurement range	150 kHz to 30 MHz
Equipment class	Class B
Equipment type	Table top
Temperature [°C]	20 ±3
Humidity [%]	55 ±5
Operator	Stefan Dose
Date	2022-08-31

2.2.2 Setup



2.2.3 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	Radimation	2020.1.8

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
AMN	Schwarzbeck	NSLK 8127	EF01592	2021-07	2023-07
Pulse Limiter	R&S	ESH3-Z2	EF01063	2021-07	2023-07
EMI Test Receiver	R&S	ESR 7	EF00943	2022-08	2023-08
Climatic Sensor	Embedded Data Systems, LLC.	2800100000254 17E	EF01054	2022-04	2023-04

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 2.2.2

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

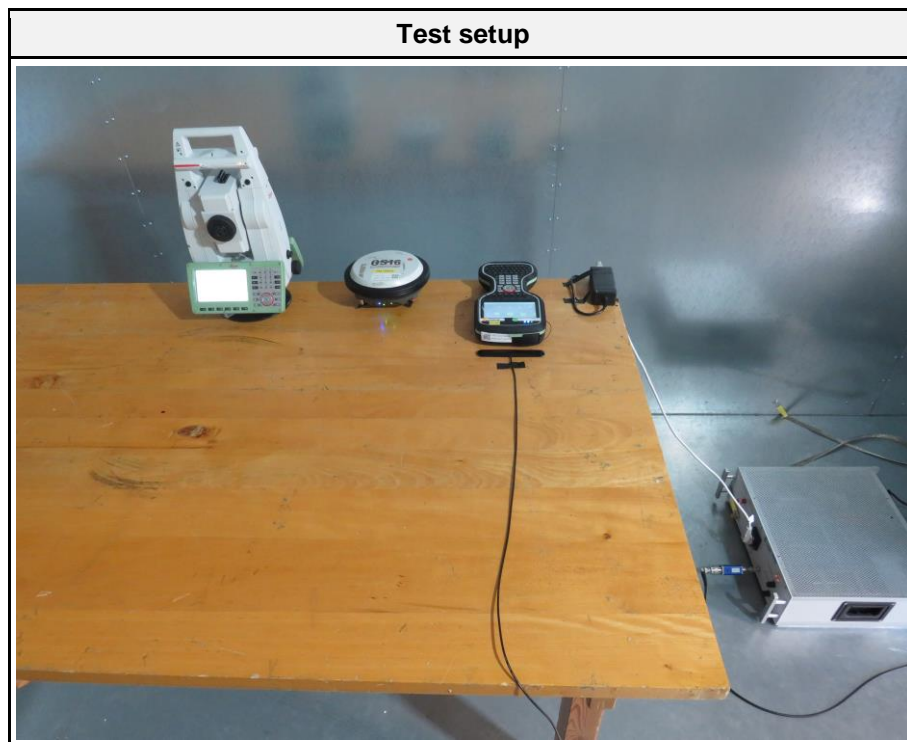
Class B		
Frequency [MHz]	Quasi-peak Limit [dBμV]	Average Limit [dBμV]
0.15 - 0.5	66 - 56 *	56 - 46 *
0.5 - 5	56	46
5 - 30	60	50

* Decreases with the logarithm of the frequency

2.2.6 Results

AC power line conducted emissions					
Port	Coupling	Operational mode	EUT Configuration	Verdict	Remark
Power	AMN	1	1	PASS	-

2.2.7 Setup Photos



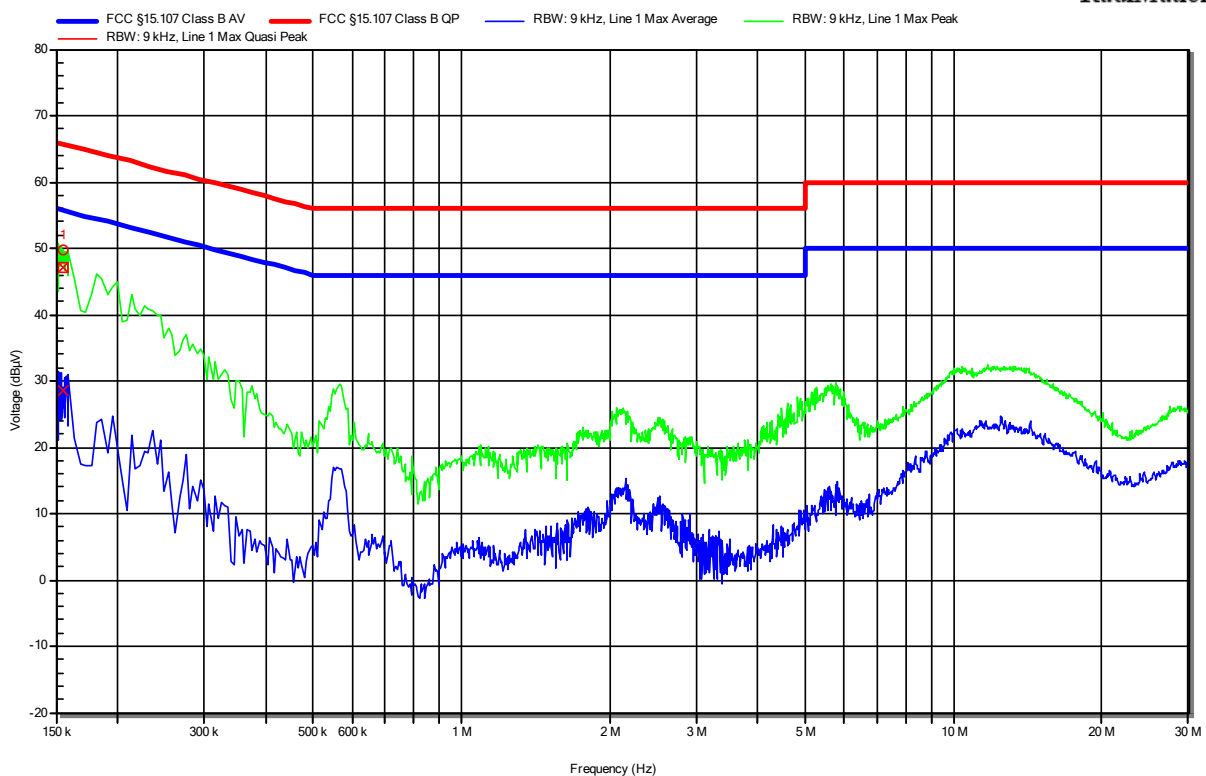
2.2.8 Records

Conducted emissions at the mains power port according to FCC part 15B

Project Number: G0M-2206-1501
 Applicant: Leica Geosystems Technologies Pte Ltd
 Model Description: Field Controller Win EC7
 Model: CS20 LTE
 Test Sample ID: 40998
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Dose
 Test Date: 2022-08-31
 Operating Conditions: ambient temperature: 21 °Celsius
 power input: 120VAC/60Hz
 LISN: Schwarzbeck NSLK 8127 L1
 Operational Mode: 1
 EUT Configuration: 1
 Applied to Port: Power
 Note 1:

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RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	155.4 kHz	47.13 dBμV	65.71 dBμV	-18.58 dB	Pass	Line 1
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	155.4 kHz	28.58 dBμV	55.71 dBμV	-27.13 dB	Pass	Line 1

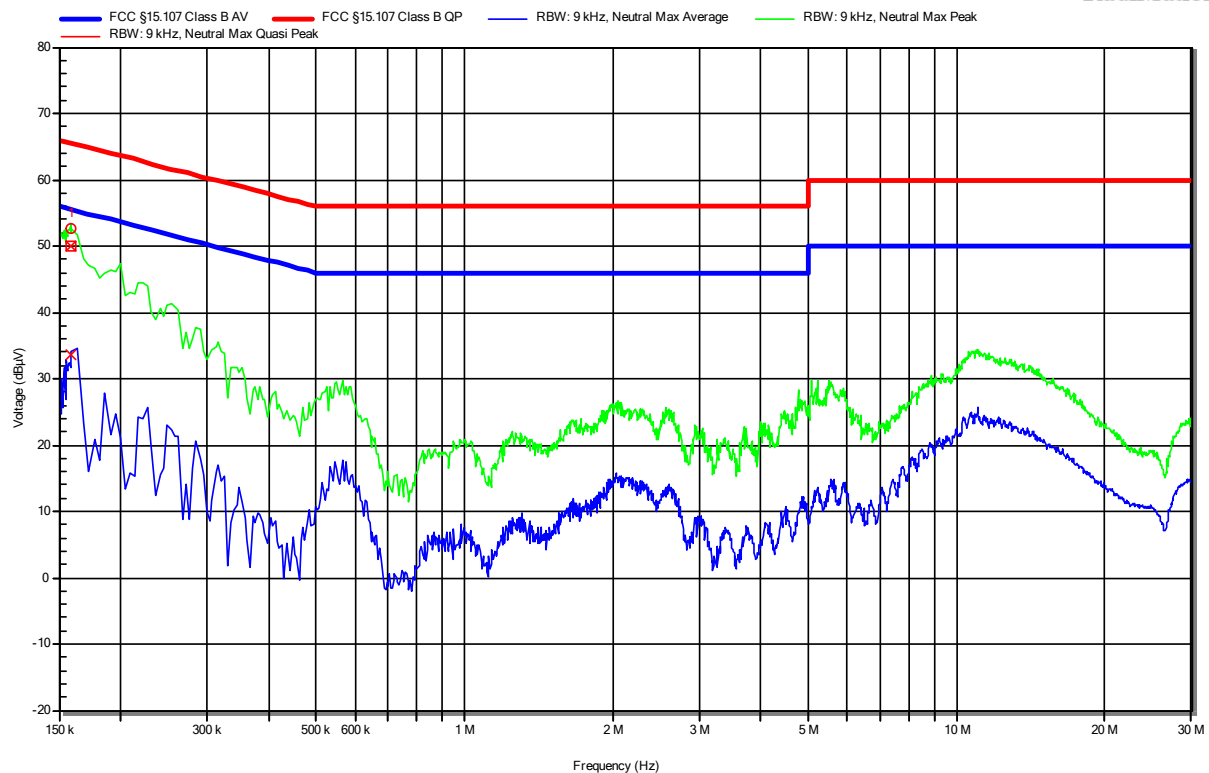
Test Report No.: G0M-2206-1501-EF0115B-V02

Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

**Conducted emissions at the mains power port
according to FCC part 15B**

Project Number: G0M-2206-1501
 Applicant: Leica Geosystems Technologies Pte Ltd
 Model Description: Field Controller Win EC7
 Model: CS20 LTE
 Test Sample ID: 40998
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Dose
 Test Date: 2022-08-31
 Operating Conditions: ambient temperature: 20 °Celsius
 power input: 120VAC/60Hz
 LISN: Schwarzbeck NSLK 8127 N
 Operational Mode: 1
 EUT Configuration: 1
 Applied to Port: Power
 Note 1:

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RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	159 kHz	50.09 dBµV	65.52 dBµV	-15.43 dB	Pass	Neutral
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	159 kHz	33.72 dBµV	55.52 dBµV	-21.79 dB	Pass	Neutral

Test Report No.: G0M-2206-1501-EF0115B-V02

Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

3 Measurement Uncertainty

All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2.

Test Name	Measurement Uncertainty
Conducted emissions at the mains power port	150kHz to 30MHz, 3.35dB
Radiated Emission	30MHz to 200MHz @ 3m, 5.1dB 200MHz to 1GHz @ 3m, 5.3dB >1GHz to 14GHz @3m, 5.95dB