RADIO REPORT

FCC 47 CFR Part 15C
ISED Canada RSS-247

Digital transmission systems operating within the 2400.0 MHz - 2483.5 MHz band

Report Reference No	G0M-2205-1481-TFC247WF-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	DAkkS - Registration number : D-PL-12092-01-03 (ISED) ISED Testing Laboratory site: 3470A DAkkS - Registration number : D-PL-12092-01-04 (FCC) FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant	Leica Geosystems AG
Address	Heinrich-Wild-Strasse 9435 Heerbrugg SWITZERLAND
Test Specification	47 CFR Part 15C RSS-247, Issue 2, 2017-02 RSS-Gen, Issue 5, Amendment 2, 2021-02
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	GNSS Reference Server with WLAN
Model(s)	GR50
Additional Model(s)	None
Brand Name(s)	Leica
Hardware Version(s)	B
Software Version(s)	4.61
FCC ID	RFD-GR50W
IC	3177A-GR50W
Test Result	**PASSED**

Possible test case verdicts:		
Required by standard but not tested	N/T	
Not required by standard	N/R	
Not applicable to EUT	N/A	
Test object does meet the requirement	P(PASS)	
Test object does not meet the requirement	F(FAIL)	
Testing:		
Test Lab Temperature	20 °C - 30 °C	
Test Lab Humidity	25 % - 55 %	
Date of receipt of test item	2022-07-21	
Report:		
Compiled by	Odai Qawasmeh	
Tested by (+ signature) (Responsible for Test)	Odai Qawasmeh	O. Qawasmeh
Approved by (+ signature) (Test Lab Engineer)	Wilfried Treffke	W. Treffke
Date of Issue	2023-05-02	
Total number of pages	63	
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:		

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2023-05-02	Initial Release	

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
BPSK	Binary Phase Shift Keying
DSSS	Direct Sequence Spread Spectrum
EUT	Equipment Under Test
FCC	Federal Communications Commission
HT	High Throughput
IEEE 802.11	MAC and PHY Layer for WiFi
ISED	Innovation, Science and Economic Development Canada
OFDM	Orthogonal Frequency Division Multiplexing
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RBW	Resolution bandwidth
RMS	Root mean square
VBW	Video bandwidth
V_{NOM}	Nominal supply voltage

REPORT INDEX

1 Equipment (Test Item) Under Test

Description	GNSS Reference Server with WLAN	
Model	GR50	
Additional Model(s)	None	
Brand Name(s)	Leica	
Serial Number(s)	1873004	
Hardware Version(s)	B	
Software Version(s)	4.61	
PMN	GR50	
HVIN	841154; 841155	
FVIN	4.61	
HMN	N/A	
FCC ID	RFD-GR50W	
IC	3177A-GR50W	
Equipment type	End Product	
Radio type	Transceiver	
Assigned frequency bands	2400.0 MHz - 2483.5 MHz	
Radio technology	IEEE 802.11 b/g/n (HT20)	
Modulation	BPSK, QPSK, 16-QAM, 64-QAM	
Number of antenna ports	1	
Radio Module	Type	WiFi Radio Module
	Model	NINA-W131
	Manufacturer	u-Blox
	HW Version	08
	SW Version	4.0.0
	FCC-ID	XPYNINAW13
	IC	8595A-NINAW13
Antenna	Type	External
	Model	GEV263 (762858)
	Manufacturer	Radiall
	Gain	2 dBi
Supply Voltage	V_{NOM}	24 VDC (AC/DC Adapter) 14.8 VDC (Battery) 44 VDC (PoE)
Operating Temperature	T_{NOM}	25 °C
AC/DC-Adaptor	Model	GEV242
	Vendor	XP Power
	Input	110-240 VAC
	Output	24 VDC
Manufacturer	Leica Geosystems AG Heinrich-Wild-Strasse 9435 Heerbrugg SWITZERLAND	

1.1 Photos – Equipment External

EUT Front View


EUT Side View (left)

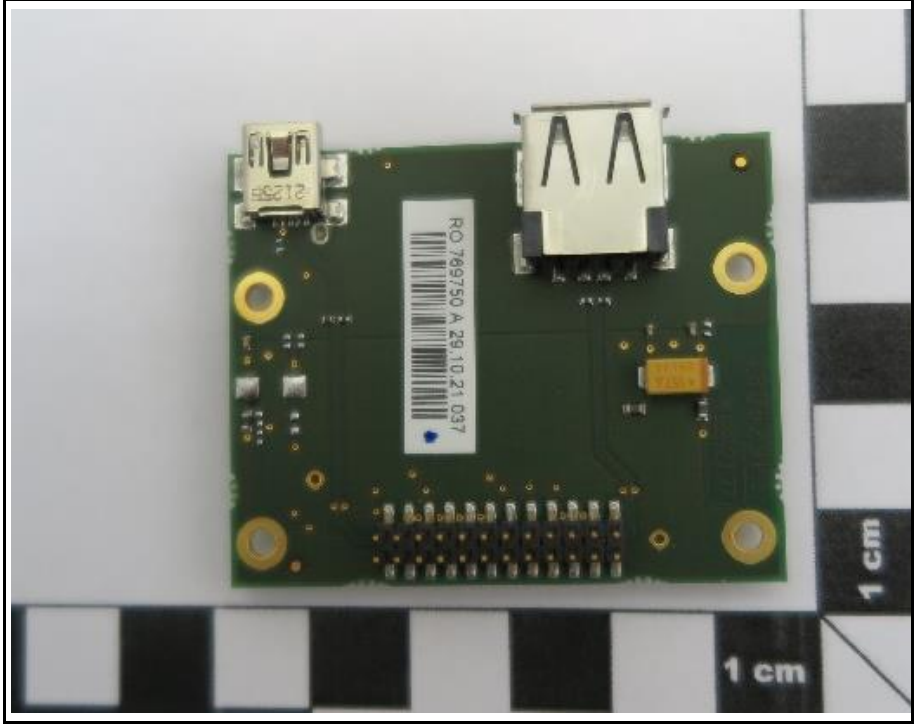

EUT Side View (right)


EUT Back View


EUT Top View


EUT Bottom View


1.2 Photos – Equipment Internal

PCB 1 TOP


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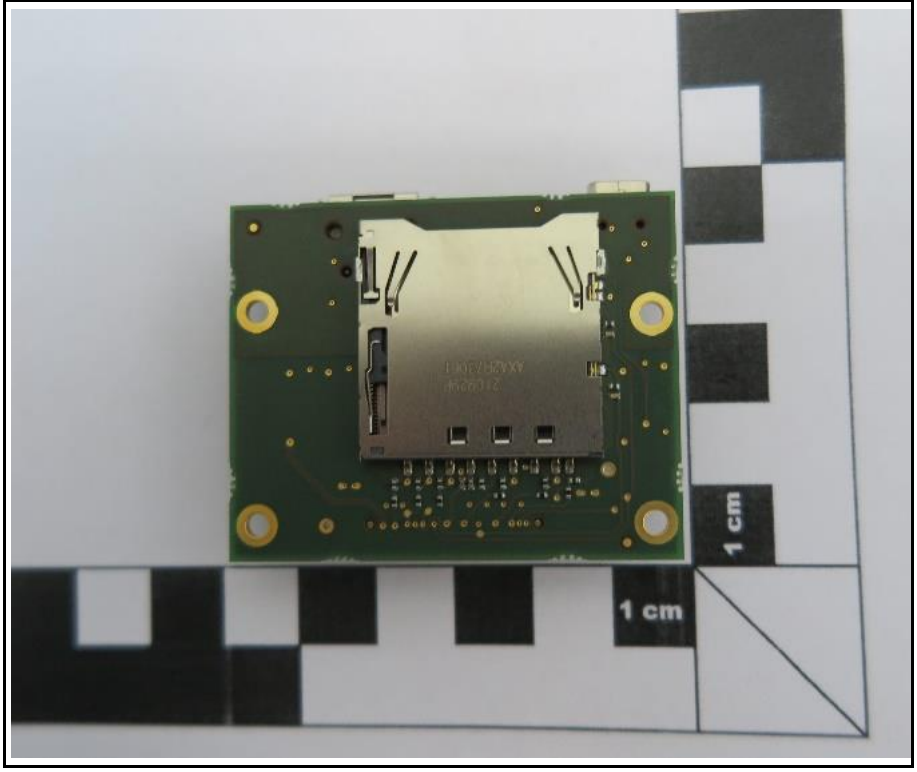

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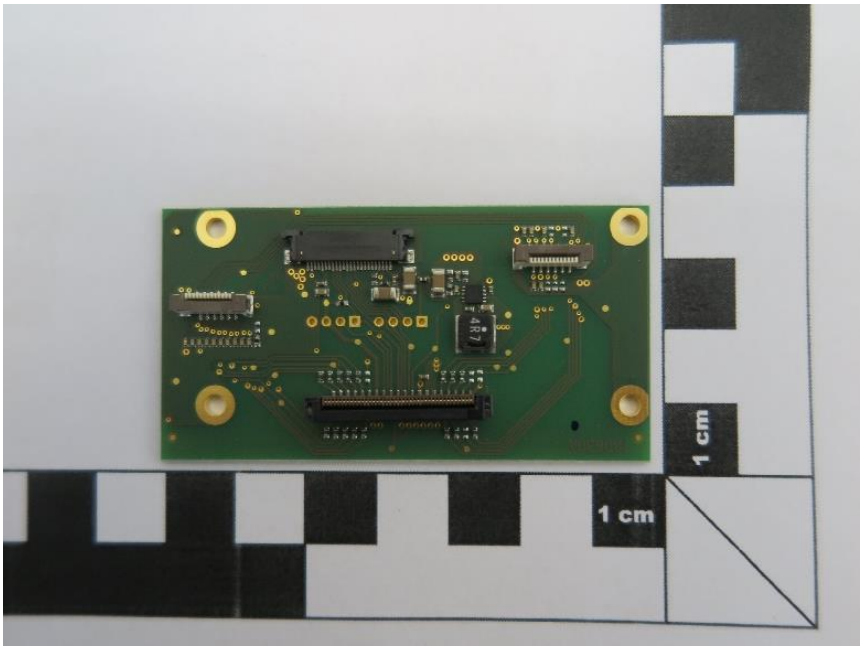

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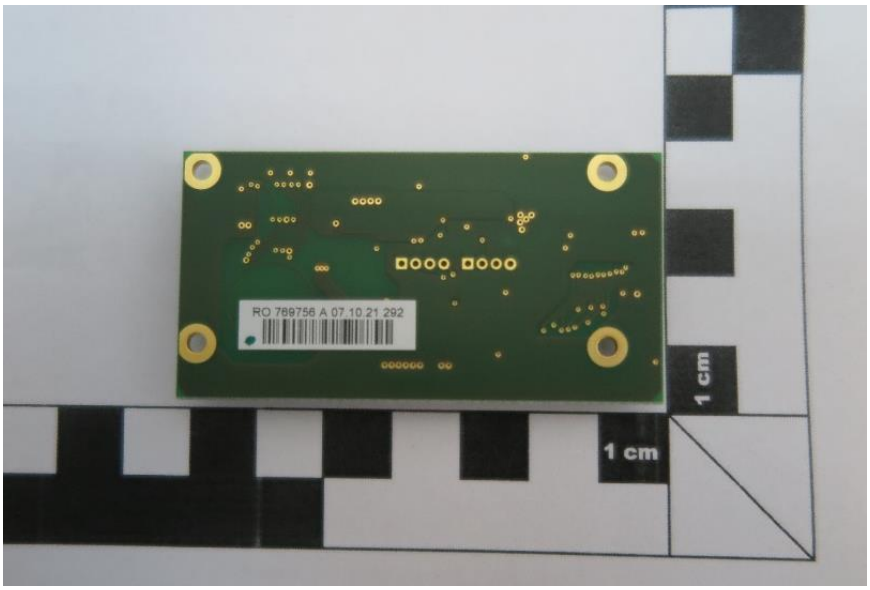

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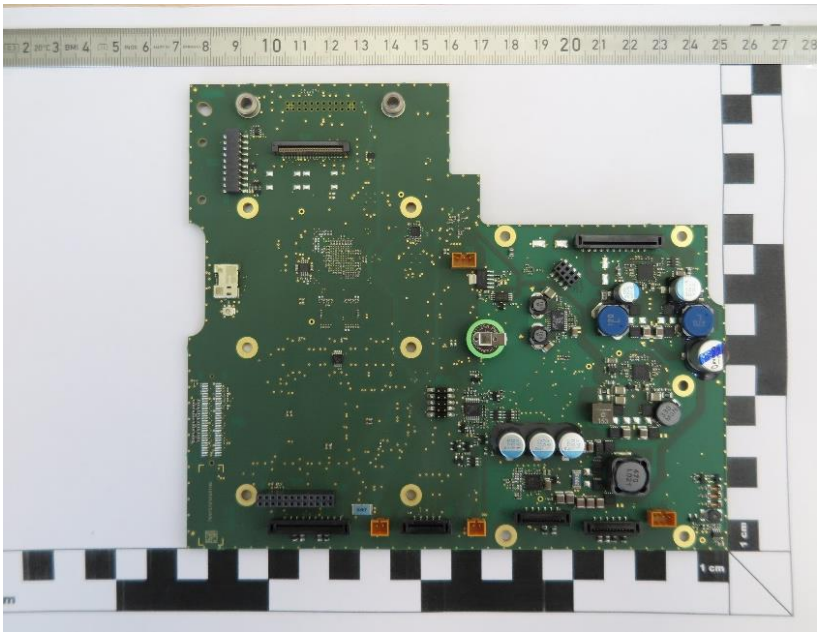

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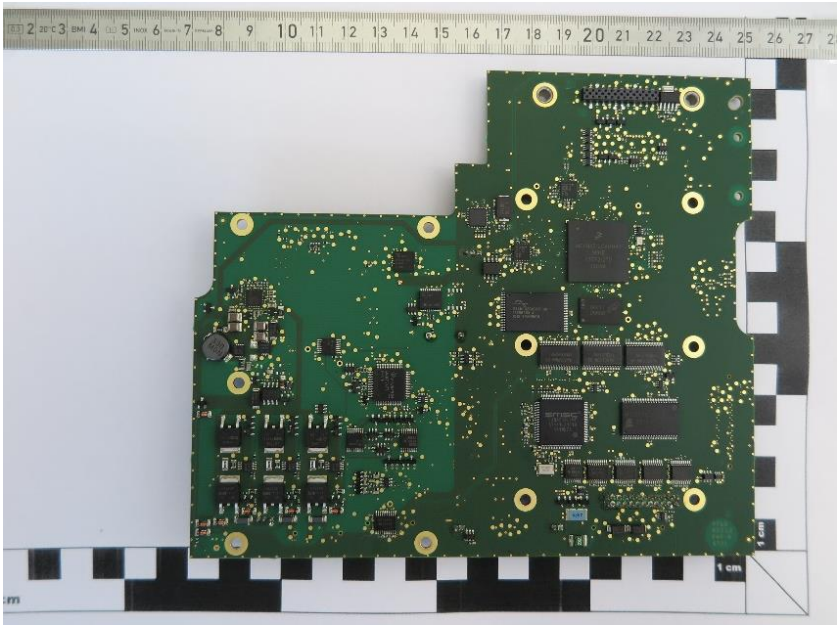

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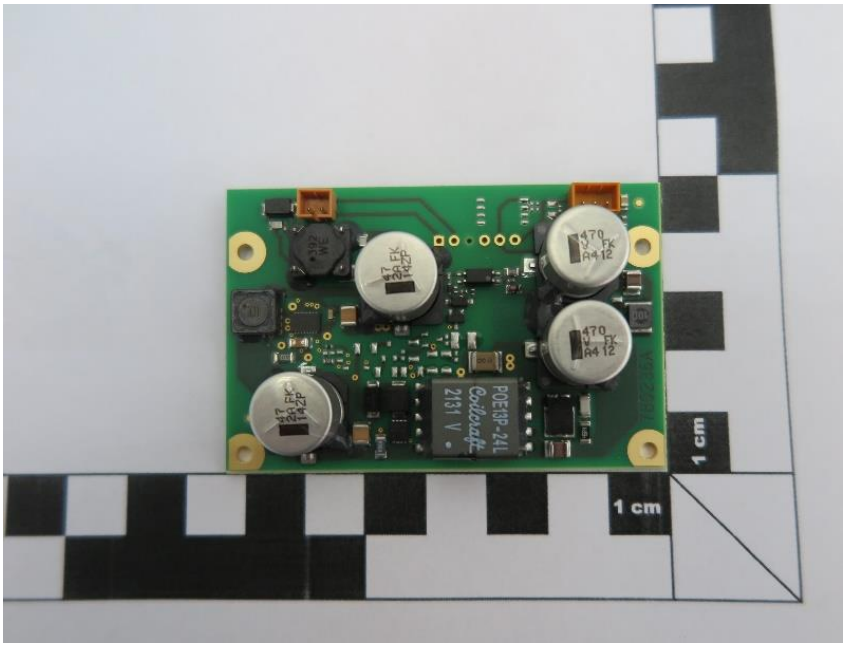

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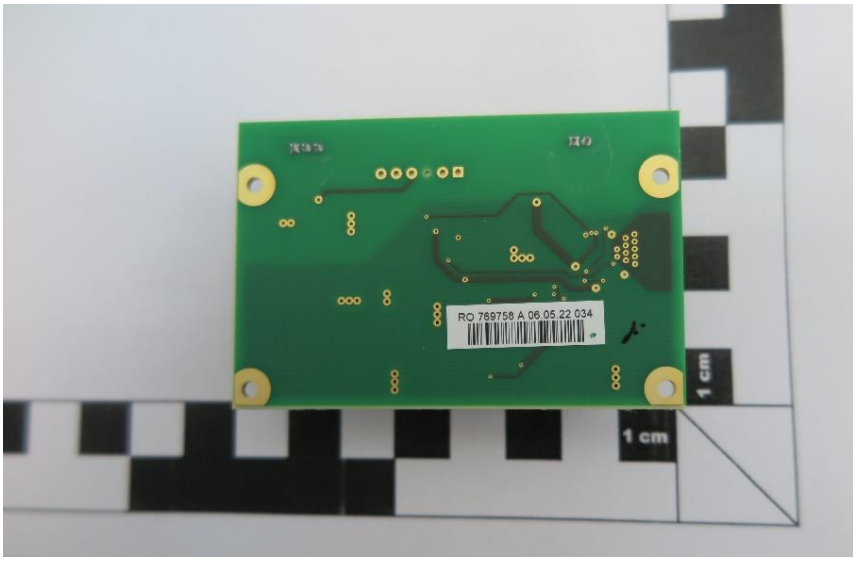

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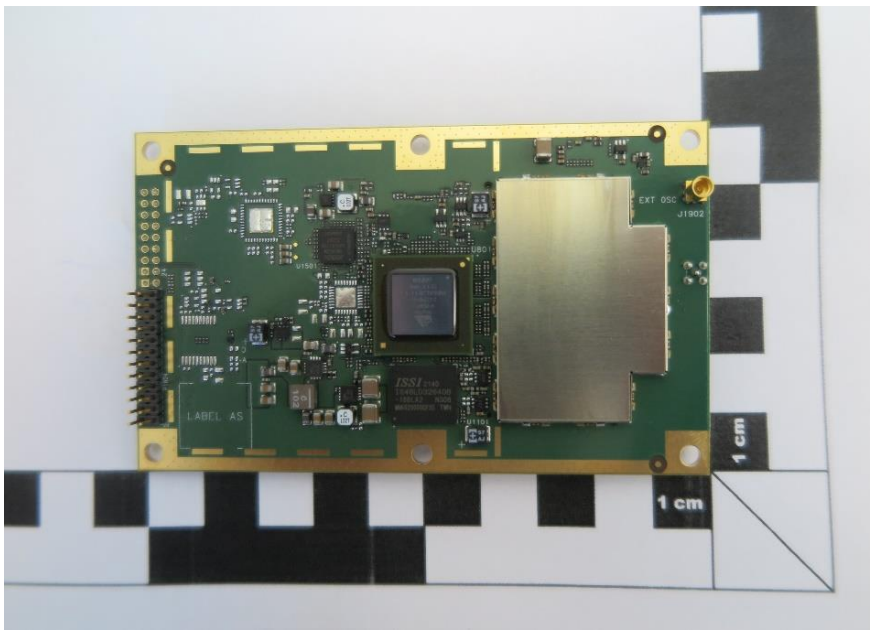

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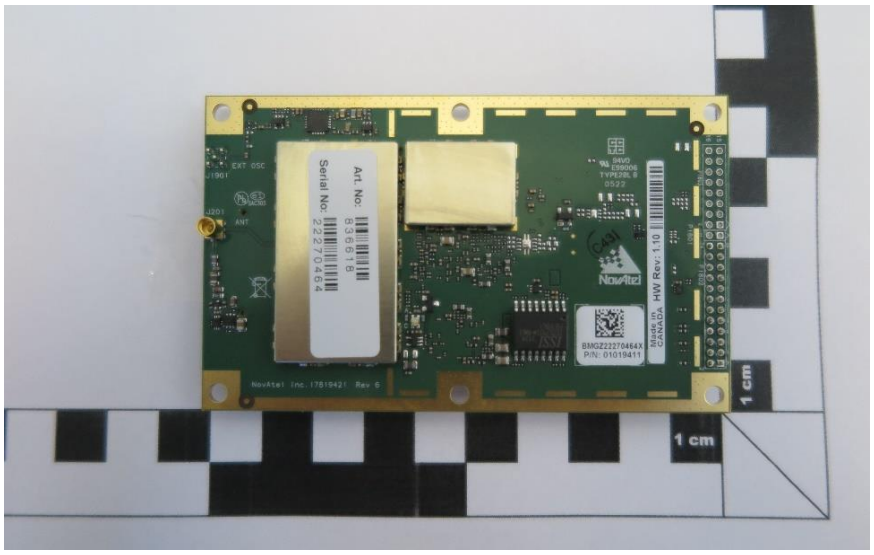

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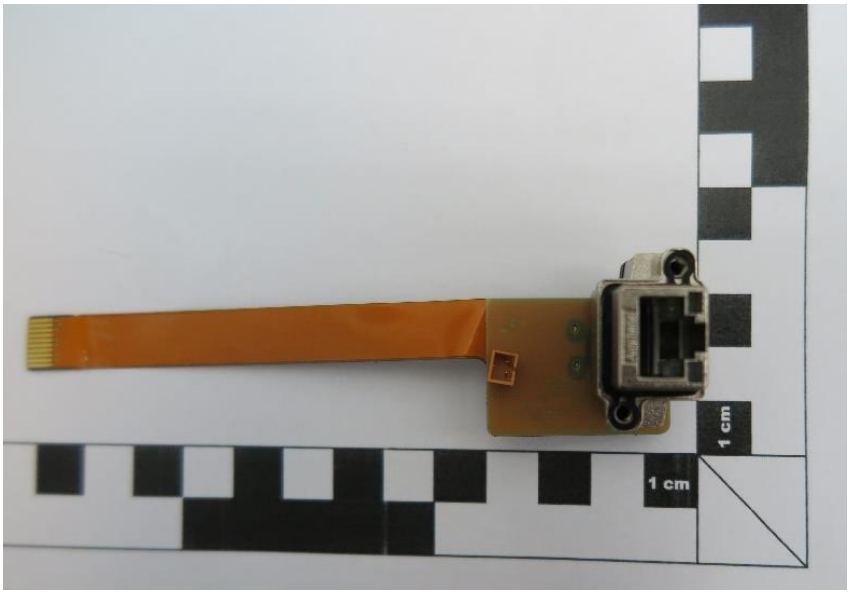

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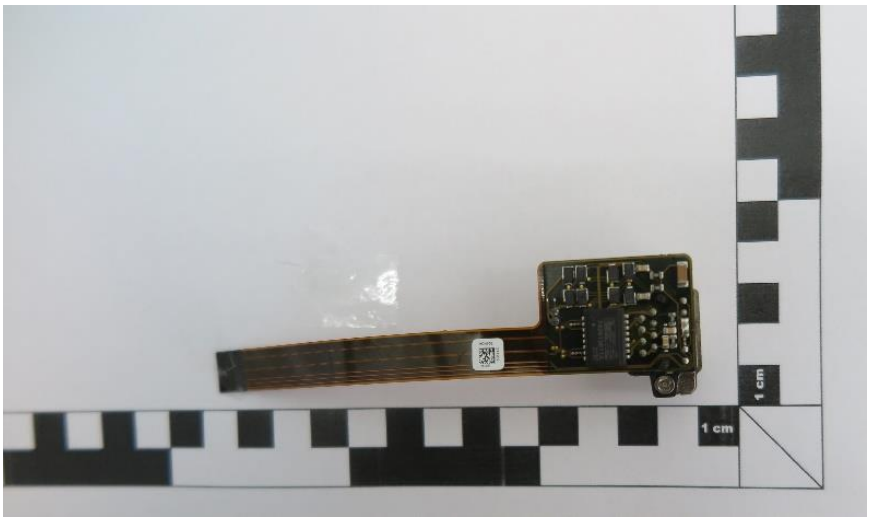

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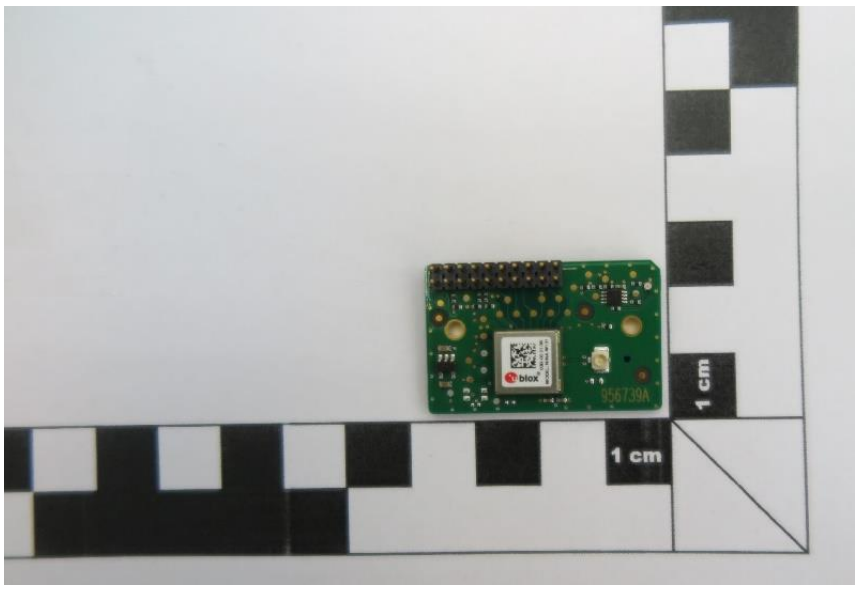

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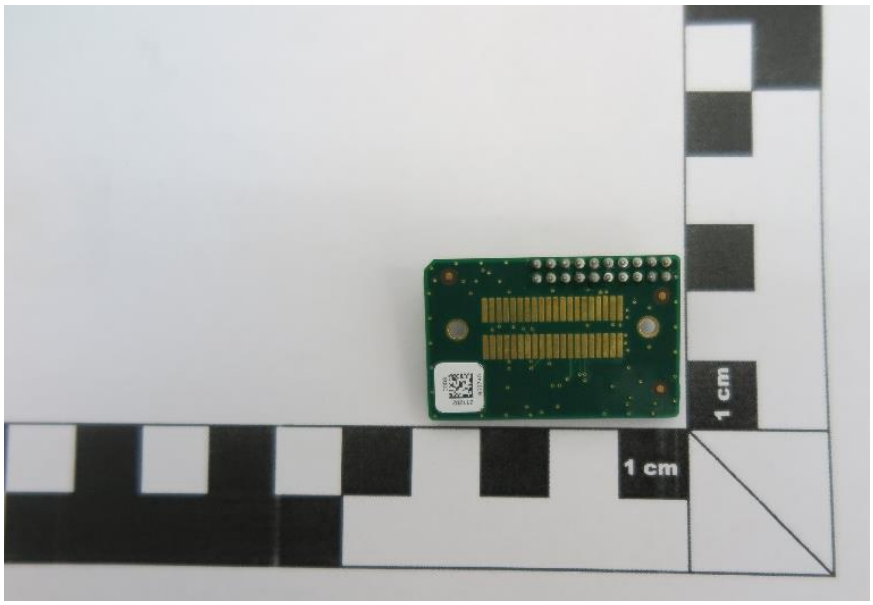


1.3 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	Notebook	HP	-	for configuring test modes
SFT	ESP32 Tool	ESP	-	
CBL	Serial Cable	Leica Geosystems	GEV160 (733 280)	
AE	PoE	Trendnet	TPE-115GI	Power over Ethernet Injector
CBL	Lemo Cable	Leica Geosystems	GEV233 (767 898)	Cable for third party sensors
CBL	OSC Cable	Leica Geosystems	GEV169 (733 293)	for oscillator input
CBL	Coax Cable	Leica Geosystems	GEV150 (667 744)	Puls per Second (PPS) Cable
CBL	Ethernet Cable	Dätwyler	Cat. 6e S/FTP	RJ45
AE	USB Stick	Sandisk	Sandisk Ultra Fit 32 GB	for Data Backup
AE	GNSS Antenna	Leica Geosystems	AS11 (892 561)	-
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
Comment:				

1.4 Test Modes

Mode	Description
OFDM (IEEE 802.11g)	Mode = Transmit Modulation = OFDM/BPSK Bandwidth = 20 MHz Duty cycle = 100% Power setting = Maximum Data rate = 6 Mbps
Receive	Mode = Receive
Comment: The above settings are found as worst case during evaluation of the original modular test report F170297E6, issued on 2018-02-26 by Phoenix Testlab. Conducted peak/average output power was evaluated to determine the worst case settings.	

1.5 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Tx	1	2412
F2	Tx / Rx	6	2437
F3	Tx	8	2447
F2	Tx	11	2462

1.6 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:

Reading on Analyzer (dBµV) + A.F. (dB/m) = Net field strength (dBµV/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:

Limit (dBµV/m) = 20*log (µV/m)

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

Reading + AF	= Net Reading	:	Net reading - FCC limit	= Margin
+21.5 dBµV + 26 dB/m	= 47.5 dBµV/m	:	47.5 dBµV/m - 57.0 dBµV/m	= -9.5 dB

2 Result Summary

FCC 47 CFR Part 15C, ISED RSS-247				
Product Standard Reference	**Requirement**	**Reference Method**	**Result**	**Remarks**
ISED RSS-Gen, Issue 5 A2 (section 6.7)	Occupied Bandwidth	ANSI C63.10-2013	N/R	Informational only
FCC § 15.247(a)(2) ISED RSS-247, Issue 2 (section 5.2)	6 dB Bandwidth	ANSI C63.10-2013	N/T	
FCC § 15.247(b) ISED RSS-247, Issue 2 (section 5.4)	Maximum peak conducted power	ANSI C63.10-2013	PASS	Note 1
FCC § 15.247(e) ISED RSS-247, Issue 2 (section 5.2)	Power spectral density	ANSI C63.10-2013	N/T	
FCC § 15.207 ISED RSS-247, Issue 2 (section 3.1)	AC power line conducted emissions	ANSI C63.10-2013	PASS	
FCC § 15.247(d) ISED RSS-247, Issue 2 (section 5.5)	Band edge compliance	ANSI C63.10-2013	PASS	Note 1
FCC § 15.247(d) ISED RSS-247, Issue 2 (section 5.5)	Conducted spurious emissions	ANSI C63.10-2013	N/T	
FCC § 15.247(d) FCC § 15.209 ISED RSS-Gen, Issue 5 A2 (section 6.13)	Transmitter radiated spurious emissions	ANSI C63.10-2013	PASS	
ISED RSS-247, Issue 2 (section 3.1)	Receiver radiated spurious emissions	ANSI C63.4-2014	PASS	
Note 1: Due to the integration of a pre-certified module, only partial and spot check tests were performed with reference to the original test report F170297E6 issued by Phoenix Testlab on 2018-02-26.				
Comment: The Decision Rule is applied on the basis of ETSI TR 102 273 and ETSI TR 100 028. 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. Where a result is considered conditional in respect of its proximity to the limit line, the customer would be made aware of situation so that they can make an informed decision on how to proceed.				

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

3 Test Conditions and Results

3.1 Test Conditions and Results - Maximum peak conducted output power

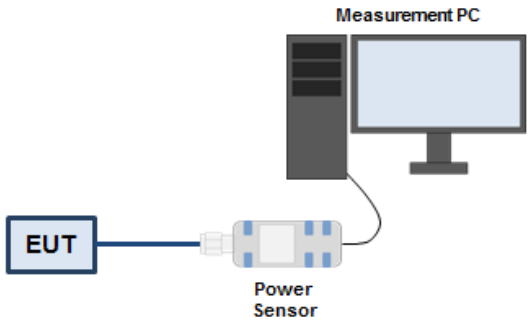
3.1.1 Information

Test Information	
Reference	ISED RSS-247, Issue 2 (section 5.4)
Measurement Method	ANSI C63.10 11.9.1
Measurement Uncertainty	± 2.86 dB
Operator	Odai Qawasmeh
Date	2022-12-16

3.1.2 Limits

Limits
1 W (30 dBm)
The conducted output power limit specified above is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in the table, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.1.3 Setup

Test Setup


3.1.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Power sensor	ETS-Lindgren USA	7002-006	EF00934	2022-07	2023-07

3.1.5 Procedure

Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. The EUT antenna port is connected to a wideband power sensor 3. The peak power is measured with the power sensor 4. If the EUT has more than one transmit chain the procedure is repeated for each transmit chain and the power is summed up

3.1.6 Results

Test Results				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2437	13.1	0.02	1.0	PASS

3.2 Test Conditions and Results - AC powerline conducted emissions

3.2.1 Information

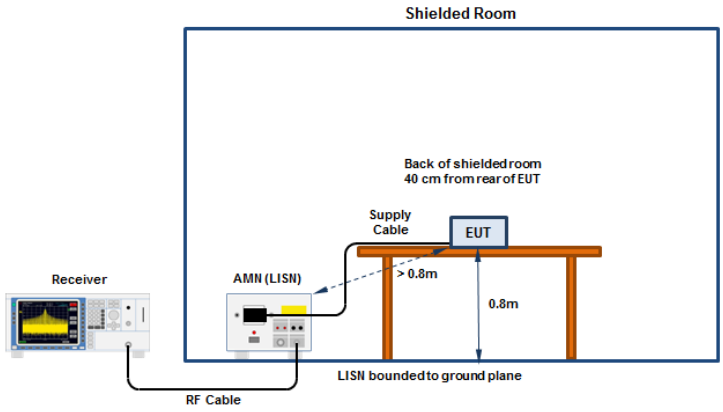
Test Information	
Reference	FCC § 15.207; ISED RSS-247, Issue 2 (section 3.1)
Measurement Method	ANSI C63.10 6.2
Measurement Uncertainty	± 3.82 dB
Operator	Odai Qawasmeh
Date	2022-08-24
Comment	Measurements were performed with provided AC/DC Adapter as well as PoE Injector.

3.2.2 Limits

Limits		
Frequency [MHz]	Quasi-Peak [dBµV]	Average [dBµV]
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5	56	46
5 - 30	60	50
* Limit decreases linearly with the logarithm of the frequency		

3.2.3 Setup

Test Setup



3.2.4 Equipment

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

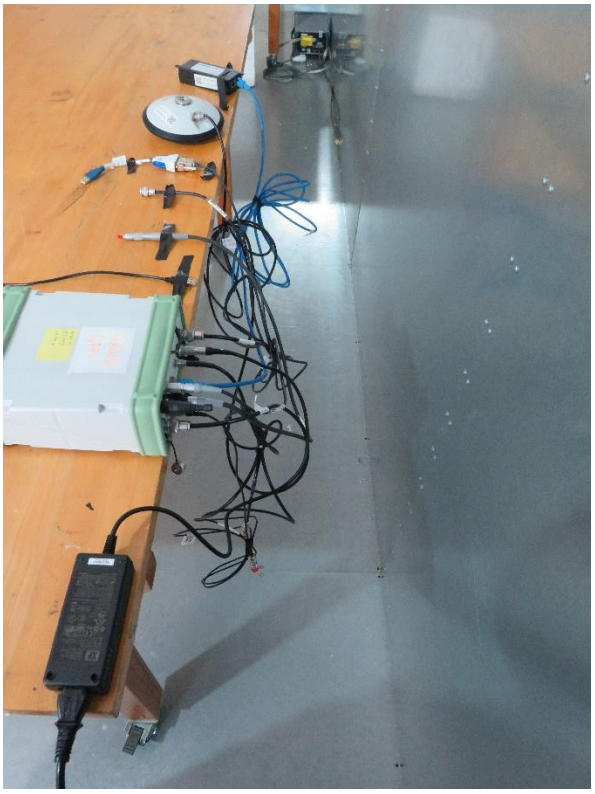
Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	R&S	ESR7	EF00943	2022-08	2023-08
Pulse Limiter	R&S	ESH3-Z2	EF01222	2021-07	2023-07
LISN	Schwarzbeck	NSLK 8127 RC	EF01592	2021-07	2023-07

3.2.5 Setup Photos

Setup for measurements 150 kHz – 30 MHz (with AC/DC Adapter)

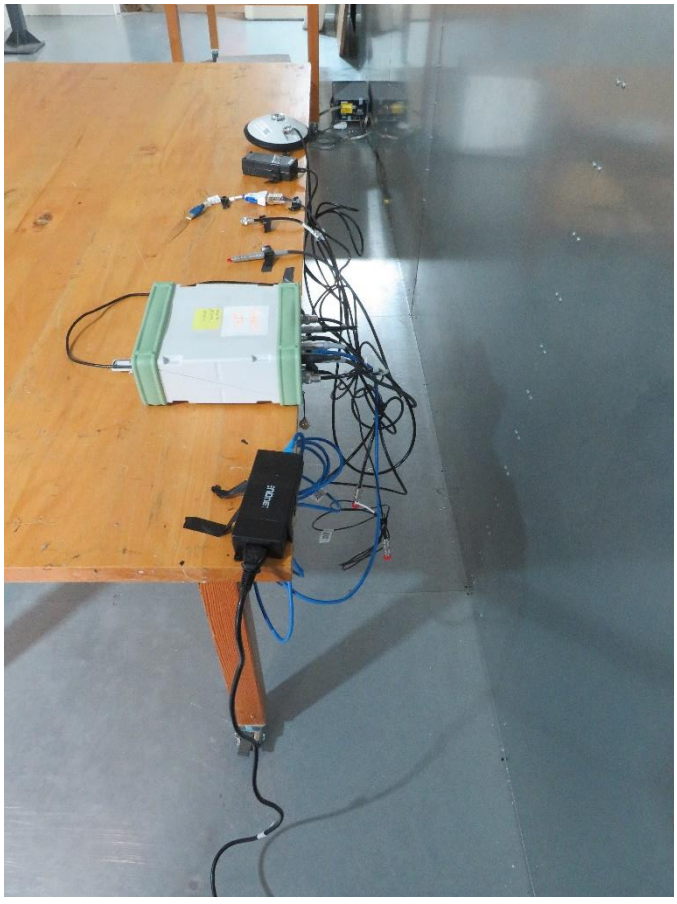

Setup for measurements 150 kHz – 30 MHz (with AC/DC Adapter)


Setup for measurements 150 kHz – 30 MHz (with AC/DC Adapter)



Setup for measurements 150 kHz – 30 MHz (with PoE)

Setup for measurements 150 kHz – 30 MHz (with PoE)


Setup for measurements 150 kHz – 30 MHz (with PoE)


Conducted emissions at the mains power port according to FCC 15.247, RSS-247 Issue 2

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40940
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Test Date:	2022-08-24
Operating Conditions:	ambient temperature: 27 °Celsius power input:
LISN:	Schwarzbeck NSLK 8127 RC L1
Operational Mode:	IEEE802.11 g, 2437 MHz, 24 Mbps, 20 MHz Bandwidth
EUT Configuration:	
Applied to Port:	120 VAC / 60 Hz
Note 1:	with AC/DC Adapter

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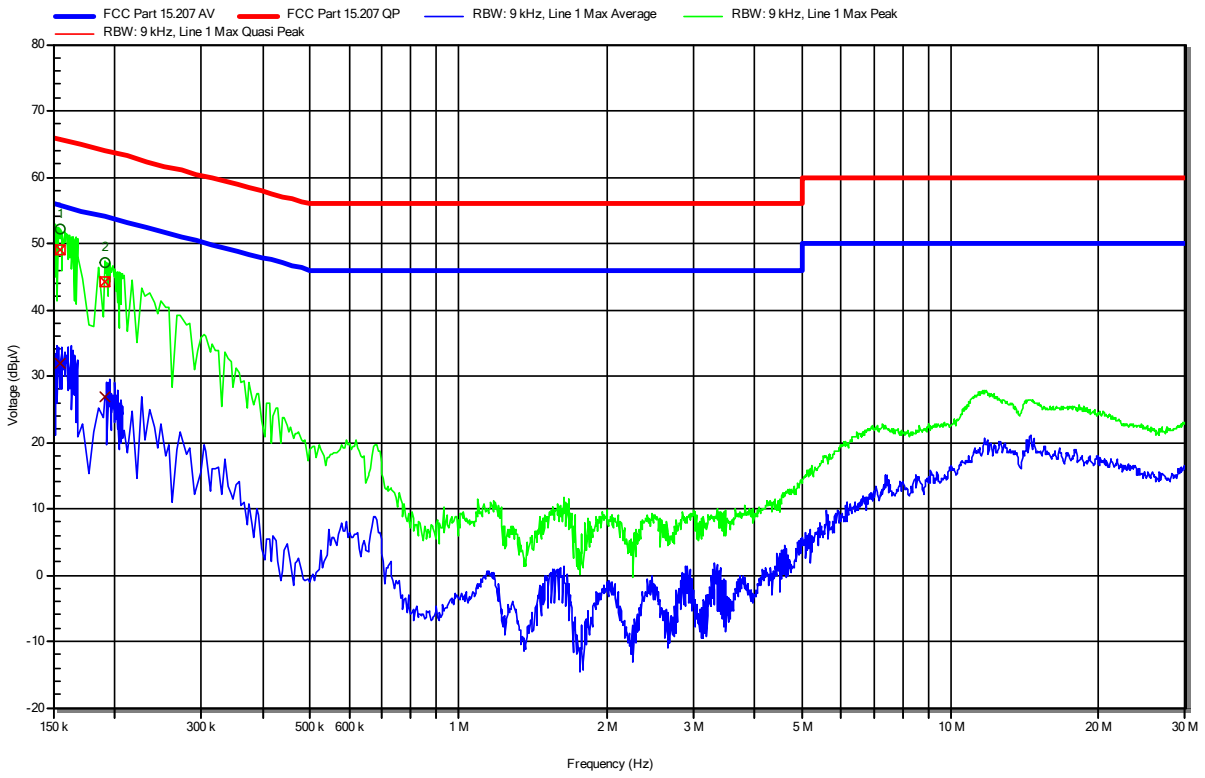
RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	155.4 kHz	49.13 dBµV	65.71 dBµV	-16.57 dB	Pass	Line 1
2	190.95 kHz	44.3 dBµV	64 dBµV	-19.69 dB	Pass	Line 1

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	155.4 kHz	32.04 dBµV	55.71 dBµV	-23.67 dB	Pass	Line 1
2	190.95 kHz	26.84 dBµV	54 dBµV	-27.16 dB	Pass	Line 1

Conducted emissions at the mains power port according to FCC 15.247, RSS-247 Issue 2

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40940
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Test Date:	2022-08-24
Operating Conditions:	ambient temperature: 27 °Celsius power input:
LISN:	Schwarzbeck NSLK 8127
Operational Mode:	IEEE802.11 g, 2437 MHz, 24 Mbps, 20 MHz Bandwidth
EUT Configuration:	
Applied to Port:	120 VAC / 60 Hz
Note 1:	with AC/DC Adapter

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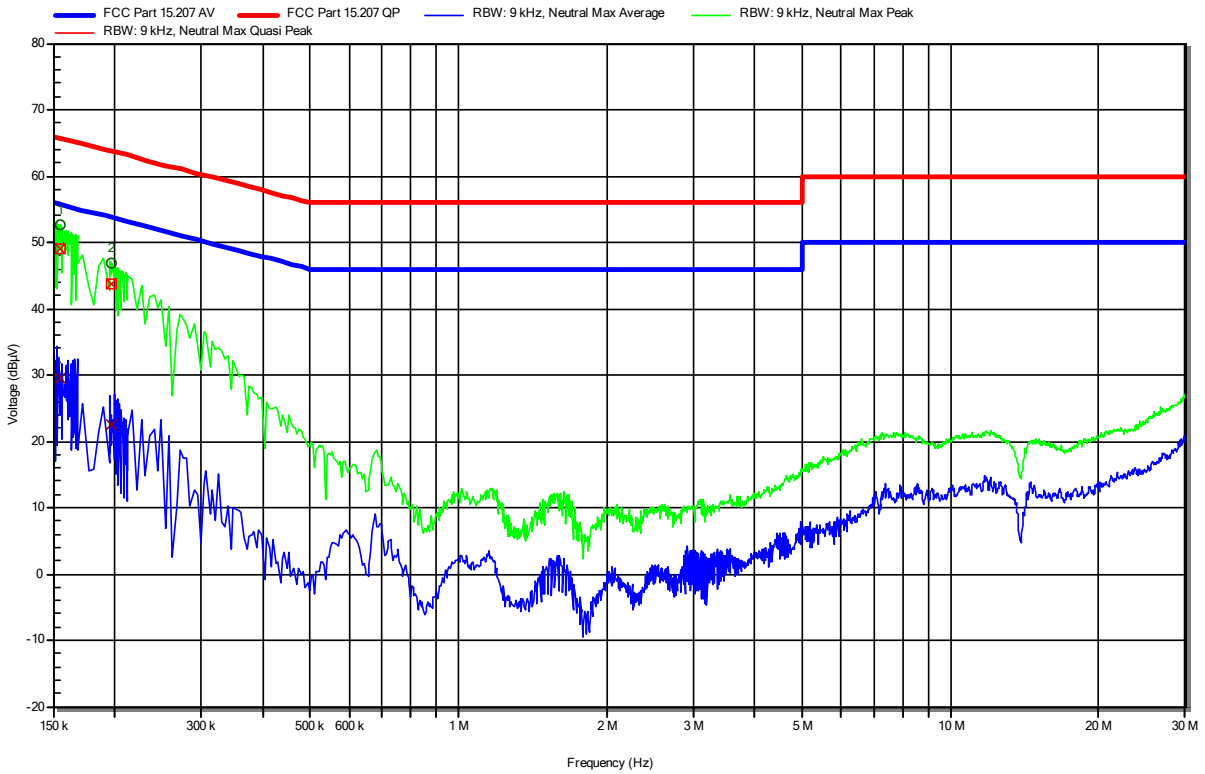
RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	155.4 kHz	49.14 dBµV	65.71 dBµV	-16.56 dB	Pass	Neutral
2	197.25 kHz	43.68 dBµV	63.73 dBµV	-20.05 dB	Pass	Neutral

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	155.4 kHz	29.41 dBµV	55.71 dBµV	-26.3 dB	Pass	Neutral
2	197.25 kHz	22.65 dBµV	53.73 dBµV	-31.08 dB	Pass	Neutral

Conducted emissions at the mains power port according to FCC 15.247, RSS-247 Issue 2

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40940
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Test Date:	2022-08-24
Operating Conditions:	ambient temperature: 27 °Celsius power input:
LISN:	Schwarzbeck NSLK 8127 RC L1
Operational Mode:	IEEE802.11 g, 2437 MHz, 24 Mbps, 20 MHz Bandwidth
EUT Configuration:	
Applied to Port:	120 VAC / 60 Hz
Note 1:	with PoE

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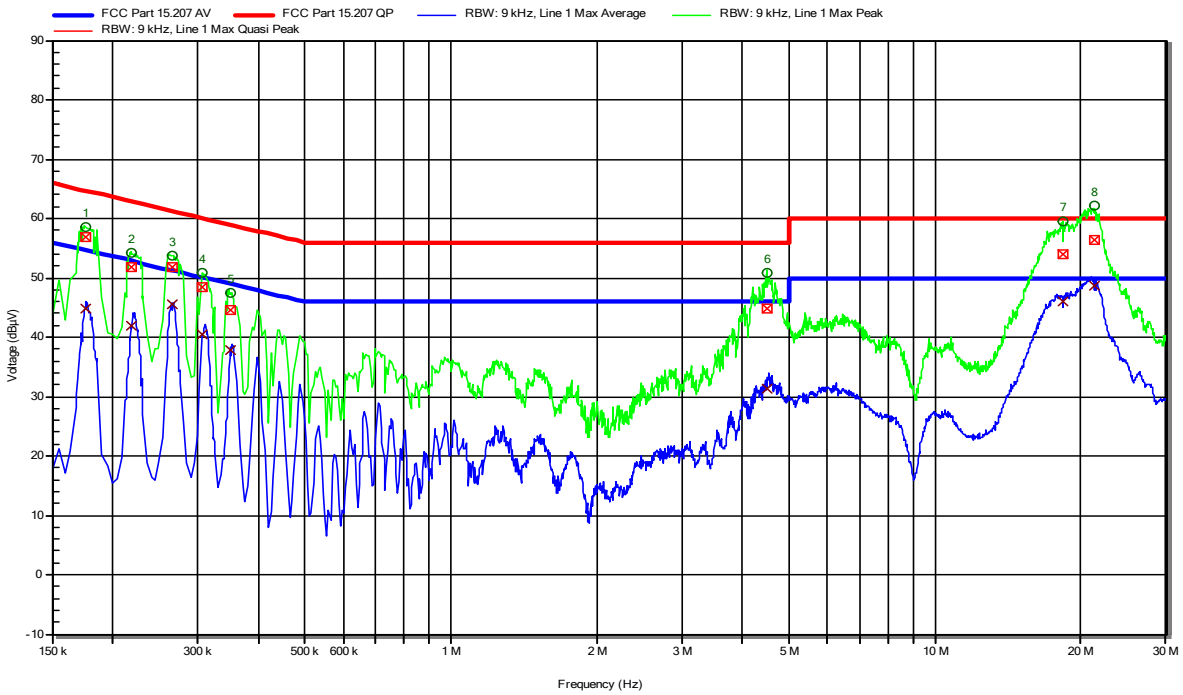
RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	175.65 kHz	56.77 dBµV	64.69 dBµV	-7.92 dB	Pass	Line 1
2	218.85 kHz	51.82 dBµV	62.86 dBµV	-11.04 dB	Pass	Line 1
3	266.1 kHz	51.8 dBµV	61.24 dBµV	-9.44 dB	Pass	Line 1
4	307.5 kHz	48.5 dBµV	60.04 dBµV	-11.54 dB	Pass	Line 1
5	351.6 kHz	44.69 dBµV	58.92 dBµV	-14.23 dB	Pass	Line 1
6	4.484 MHz	44.84 dBµV	56 dBµV	-11.16 dB	Pass	Line 1
7	18.344 MHz	53.89 dBµV	60 dBµV	-6.11 dB	Pass	Line 1
8	21.417 MHz	56.5 dBµV	60 dBµV	-3.5 dB	Pass	Line 1

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	175.65 kHz	44.81 dBµV	54.69 dBµV	-9.88 dB	Pass	Line 1
2	218.85 kHz	42.01 dBµV	52.86 dBµV	-10.85 dB	Pass	Line 1
3	266.1 kHz	45.49 dBµV	51.24 dBµV	-5.75 dB	Pass	Line 1
4	307.5 kHz	40.43 dBµV	50.04 dBµV	-9.61 dB	Pass	Line 1
5	351.6 kHz	37.87 dBµV	48.92 dBµV	-11.05 dB	Pass	Line 1
6	4.484 MHz	31.44 dBµV	46 dBµV	-14.56 dB	Pass	Line 1
7	18.344 MHz	45.93 dBµV	50 dBµV	-4.07 dB	Pass	Line 1
8	21.417 MHz	48.64 dBµV	50 dBµV	-1.36 dB	Pass	Line 1

Conducted emissions at the mains power port according to FCC 15.247, RSS-247 Issue 2

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40940
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Test Date:	2022-08-24
Operating Conditions:	ambient temperature: 27 °Celsius power input:
LISN:	Schwarzbeck NSLK 8127
Operational Mode:	IEEE802.11 g, 2437 MHz, 24 Mbps, 20 MHz Bandwidth
EUT Configuration:	
Applied to Port:	120 VAC / 60 Hz
Note 1:	with PoE

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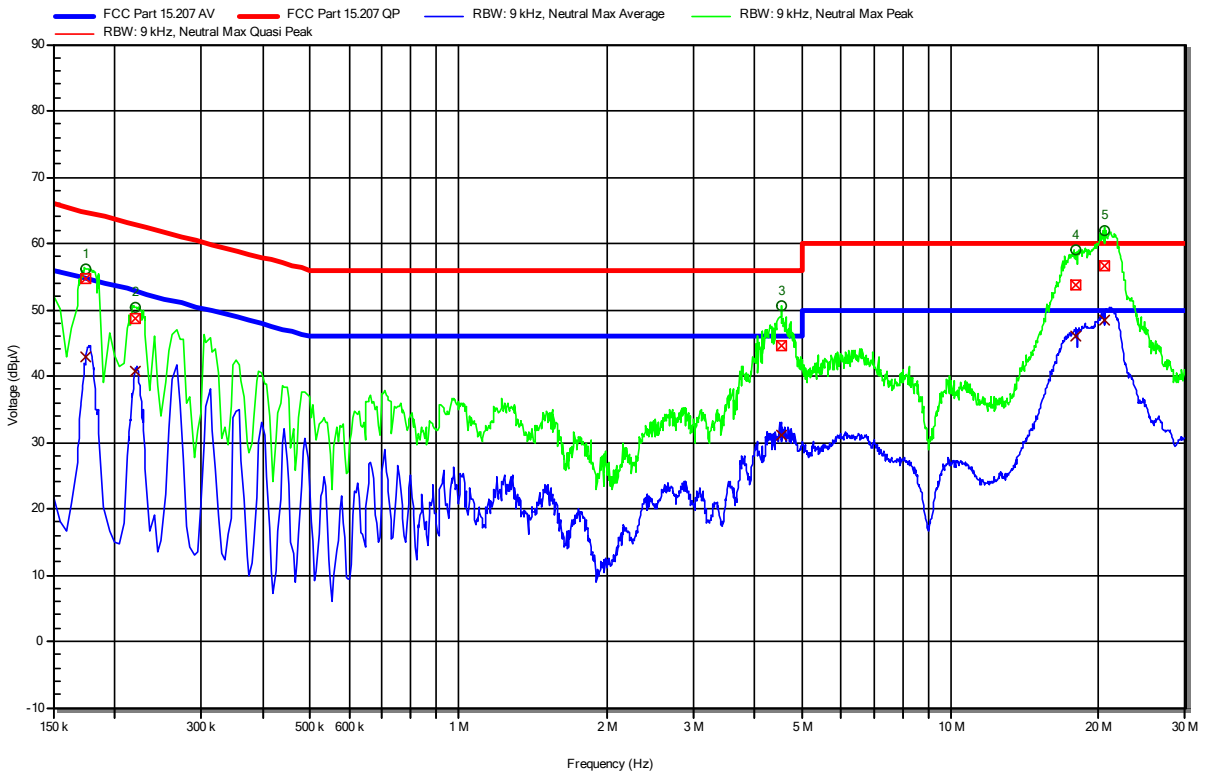
RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	174.75 kHz	54.67 dBµV	64.73 dBµV	-10.06 dB	Pass	Neutral
2	220.2 kHz	48.79 dBµV	62.81 dBµV	-14.02 dB	Pass	Neutral
3	4.538 MHz	44.6 dBµV	56 dBµV	-11.4 dB	Pass	Neutral
4	18.033 MHz	53.81 dBµV	60 dBµV	-6.19 dB	Pass	Neutral
5	20.504 MHz	56.54 dBµV	60 dBµV	-3.46 dB	Pass	Neutral

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	174.75 kHz	42.79 dBµV	54.73 dBµV	-11.94 dB	Pass	Neutral
2	220.2 kHz	40.71 dBµV	52.81 dBµV	-12.1 dB	Pass	Neutral
3	4.538 MHz	31.03 dBµV	46 dBµV	-14.97 dB	Pass	Neutral
4	18.033 MHz	45.92 dBµV	50 dBµV	-4.08 dB	Pass	Neutral
5	20.504 MHz	48.43 dBµV	50 dBµV	-1.57 dB	Pass	Neutral

Conducted emissions at the mains power port according to RSS-247 Issue 2, RSS-Gen Issue 5

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40940
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Test Date:	2022-08-24
Operating Conditions:	ambient temperature: 27 °Celsius power input:
LISN:	Schwarzbeck NSLK 8127 RC L1
Operational Mode:	IEEE802.11 g, 2437 MHz, 20 MHz Bandwidth
EUT Configuration:	
Applied to Port:	120 VAC / 60 Hz
Note 1:	with AC/DC Adapter

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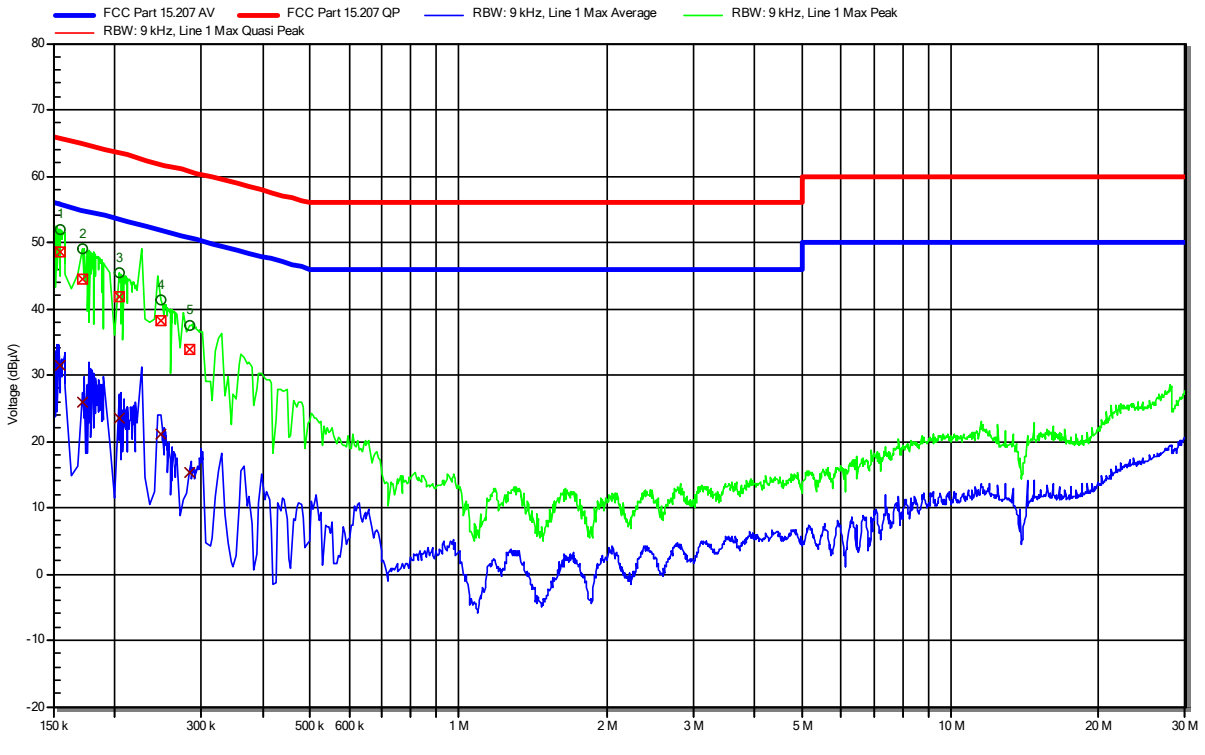
RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	155.4 kHz	48.57 dBµV	65.71 dBµV	-17.14 dB	Pass	Line 1
2	172.5 kHz	44.56 dBµV	64.84 dBµV	-20.27 dB	Pass	Line 1
3	204 kHz	41.89 dBµV	63.45 dBµV	-21.56 dB	Pass	Line 1
4	249 kHz	38.25 dBµV	61.79 dBµV	-23.54 dB	Pass	Line 1
5	285 kHz	33.84 dBµV	60.67 dBµV	-26.83 dB	Pass	Line 1

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	155.4 kHz	31.51 dBµV	55.71 dBµV	-24.2 dB	Pass	Line 1
2	172.5 kHz	25.83 dBµV	54.84 dBµV	-29.01 dB	Pass	Line 1
3	204 kHz	23.61 dBµV	53.45 dBµV	-29.84 dB	Pass	Line 1
4	249 kHz	21.12 dBµV	51.79 dBµV	-30.67 dB	Pass	Line 1
5	285 kHz	15.24 dBµV	50.67 dBµV	-35.43 dB	Pass	Line 1

Conducted emissions at the mains power port according to RSS-247 Issue 2, RSS-Gen Issue 5

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40940
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Test Date:	2022-08-24
Operating Conditions:	ambient temperature: 27 °Celsius power input:
LISN:	Schwarzbeck NSLK 8127
Operational Mode:	IEEE802.11 g, 2437 MHz, 20 MHz Bandwidth
EUT Configuration:	
Applied to Port:	120 VAC / 60 Hz
Note 1:	with AC/DC Adapter

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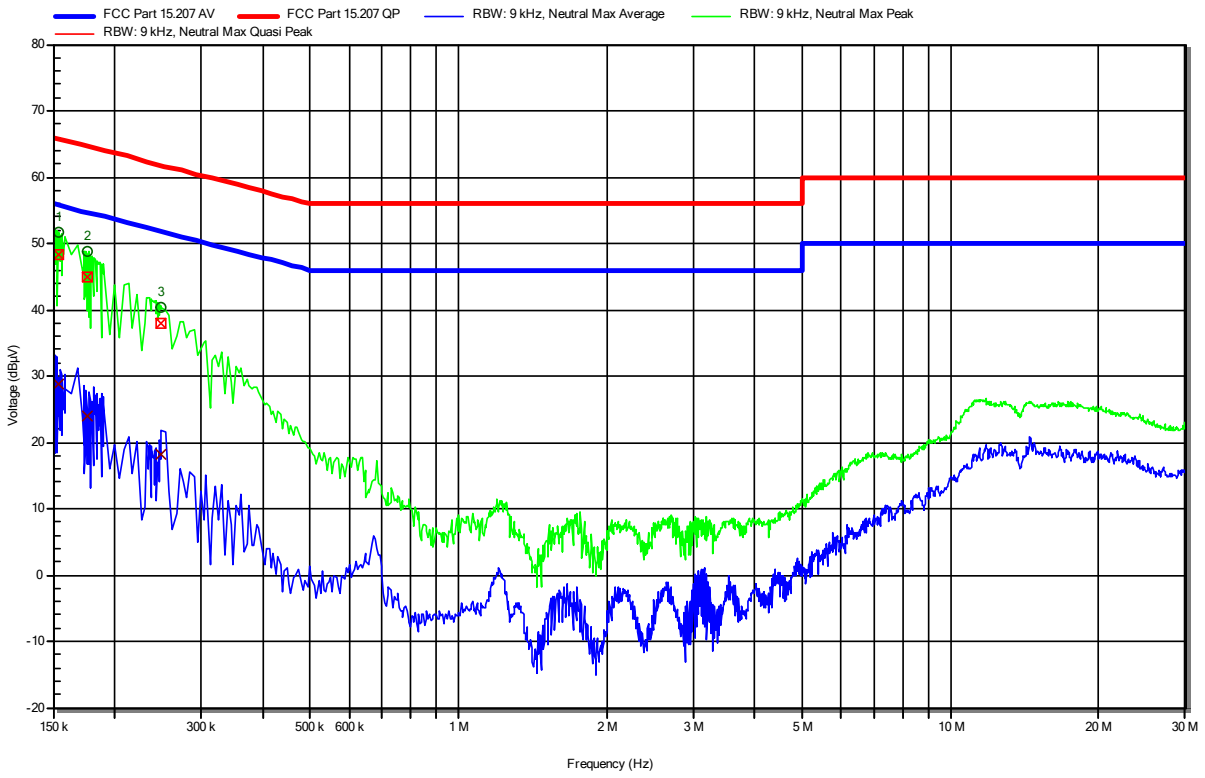
RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	154.05 kHz	48.36 dBµV	65.78 dBµV	-17.42 dB	Pass	Neutral
2	176.55 kHz	45.02 dBµV	64.65 dBµV	-19.63 dB	Pass	Neutral
3	249 kHz	38.04 dBµV	61.79 dBµV	-23.75 dB	Pass	Neutral

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	154.05 kHz	28.7 dBµV	55.78 dBµV	-27.08 dB	Pass	Neutral
2	176.55 kHz	24.09 dBµV	54.65 dBµV	-30.56 dB	Pass	Neutral
3	249 kHz	18.14 dBµV	51.79 dBµV	-33.65 dB	Pass	Neutral

Conducted emissions at the mains power port according to RSS-247 Issue 2, RSS-Gen Issue 5

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40940
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Test Date:	2022-08-24
Operating Conditions:	ambient temperature: 27 °Celsius power input:
LISN:	Schwarzbeck NSLK 8127 RC L1
Operational Mode:	IEEE802.11 g, 2437 MHz, 20 MHz Bandwidth
EUT Configuration:	
Applied to Port:	120 VAC / 60 Hz
Note 1:	with PoE

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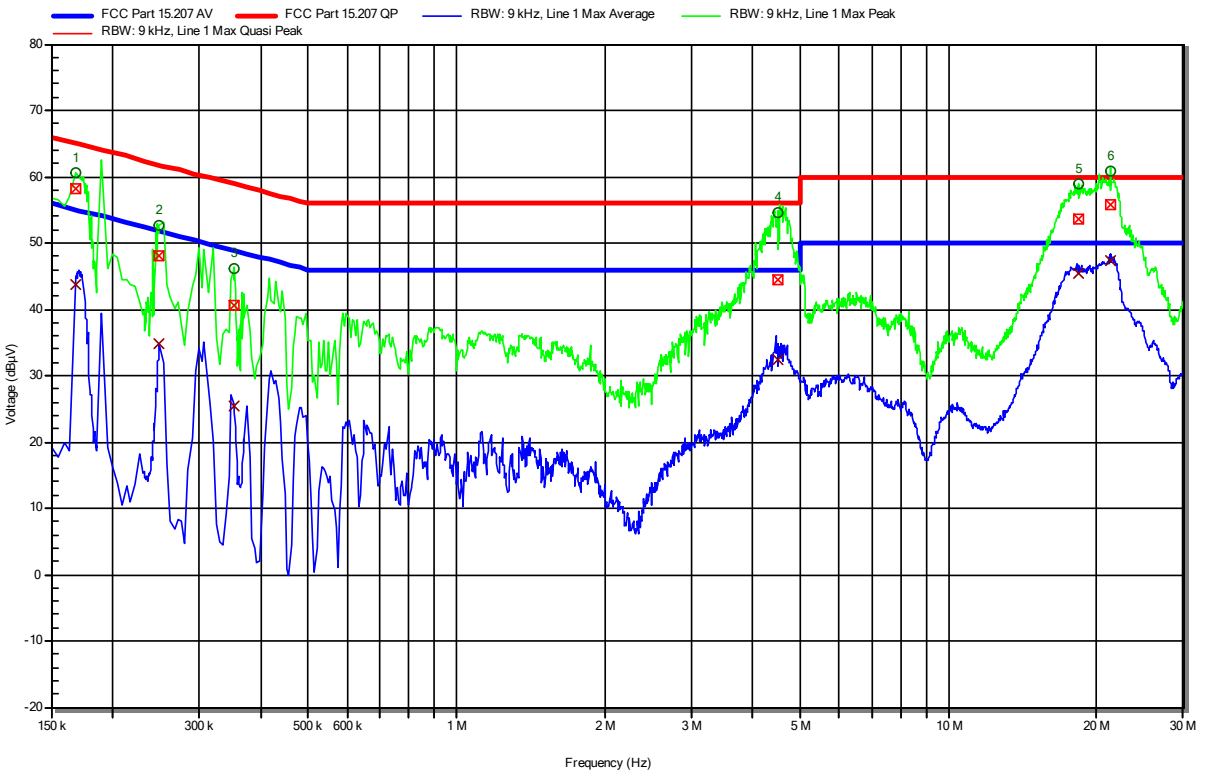
RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	168 kHz	58.26 dBµV	65.06 dBµV	-6.79 dB	Pass	Line 1
2	249 kHz	48 dBµV	61.79 dBµV	-13.79 dB	Pass	Line 1
3	352.5 kHz	40.48 dBµV	58.9 dBµV	-18.42 dB	Pass	Line 1
4	4.511 MHz	44.35 dBµV	56 dBµV	-11.65 dB	Pass	Line 1
5	18.393 MHz	53.66 dBµV	60 dBµV	-6.34 dB	Pass	Line 1
6	21.363 MHz	55.69 dBµV	60 dBµV	-4.31 dB	Pass	Line 1

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	168 kHz	43.69 dBµV	55.06 dBµV	-11.37 dB	Pass	Line 1
2	249 kHz	34.84 dBµV	51.79 dBµV	-16.95 dB	Pass	Line 1
3	352.5 kHz	25.53 dBµV	48.9 dBµV	-23.37 dB	Pass	Line 1
4	4.511 MHz	32.35 dBµV	46 dBµV	-13.65 dB	Pass	Line 1
5	18.393 MHz	45.5 dBµV	50 dBµV	-4.5 dB	Pass	Line 1
6	21.363 MHz	47.44 dBµV	50 dBµV	-2.56 dB	Pass	Line 1

Conducted emissions at the mains power port according to RSS-247 Issue 2, RSS-Gen Issue 5

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40940
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Test Date:	2022-08-24
Operating Conditions:	ambient temperature: 27 °Celsius power input:
LISN:	Schwarzbeck NSLK 8127
Operational Mode:	IEEE802.11 g, 2437 MHz, 20 MHz Bandwidth
EUT Configuration:	
Applied to Port:	120 VAC / 60 Hz
Note 1:	with PoE

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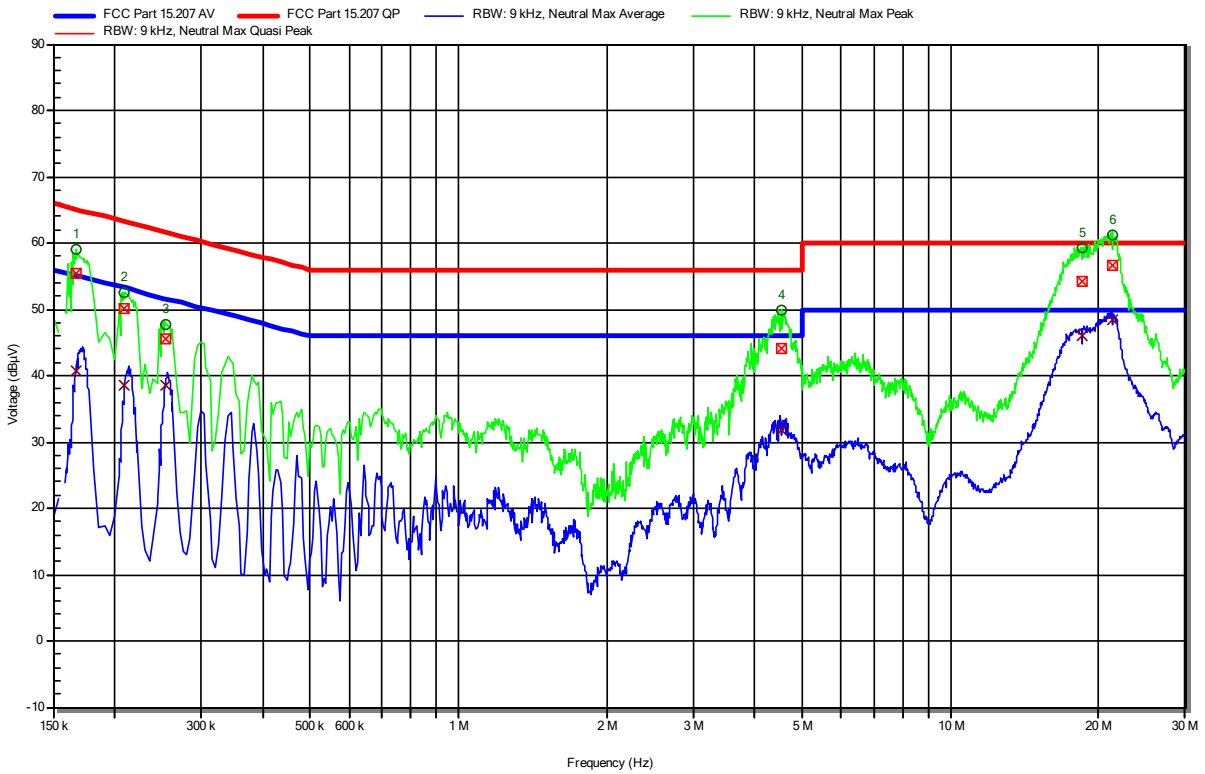
RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	166.65 kHz	55.54 dBµV	65.13 dBµV	-9.58 dB	Pass	Neutral
2	209.85 kHz	50.22 dBµV	63.21 dBµV	-12.99 dB	Pass	Neutral
3	253.5 kHz	45.57 dBµV	61.64 dBµV	-16.07 dB	Pass	Neutral
4	4.538 MHz	44.11 dBµV	56 dBµV	-11.89 dB	Pass	Neutral
5	18.492 MHz	54.13 dBµV	60 dBµV	-5.87 dB	Pass	Neutral
6	21.273 MHz	56.57 dBµV	60 dBµV	-3.43 dB	Pass	Neutral

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	166.65 kHz	40.72 dBµV	55.13 dBµV	-14.41 dB	Pass	Neutral
2	209.85 kHz	38.46 dBµV	53.21 dBµV	-14.76 dB	Pass	Neutral
3	253.5 kHz	38.49 dBµV	51.64 dBµV	-13.15 dB	Pass	Neutral
4	4.538 MHz	31.76 dBµV	46 dBµV	-14.24 dB	Pass	Neutral
5	18.492 MHz	45.93 dBµV	50 dBµV	-4.07 dB	Pass	Neutral
6	21.273 MHz	48.4 dBµV	50 dBµV	-1.6 dB	Pass	Neutral

3.3 Test Conditions and Results - Band-edge compliance

3.3.1 Information

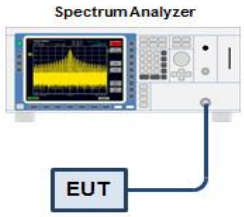
Test Information	
Reference	ISED RSS-247, Issue 2 (section 5.5)
Measurement Uncertainty	± 3.64 dB
Measurement Method	ANSI C63.10 11.13
Operator	Odai Qawasmeh
Date	2022-12-16

3.3.2 Limits

Limits	
Power Measurement	Out-of-band attenuation [dB]
Peak	20
RMS	30

3.3.3 Setup

Test Setup



3.3.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSU 26	EF01003	2022-07	2023-07
Cable	Gigalane	CAAAZ	EF00779	2022-02	2023-02

3.3.5 Procedure

Test Procedure

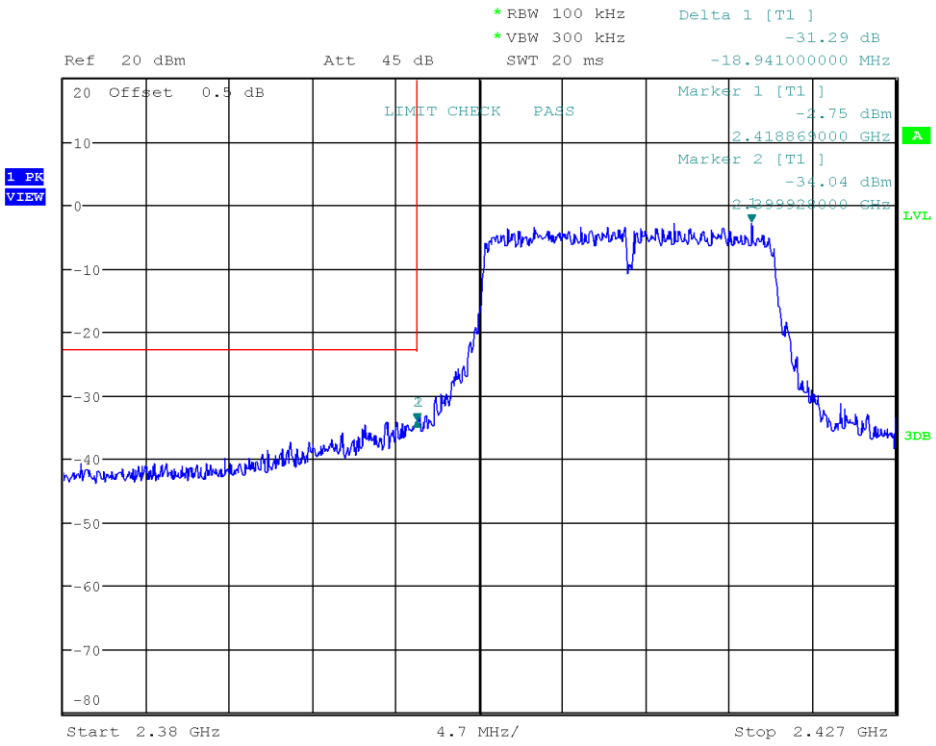
1. EUT set to test mode (Communication tester is used if needed)
2. Span set around lower band edge and detector is set to peak and max hold
3. Resolution bandwidth is set to 100 kHz
4. Markers are set to peak emission levels within frequency band and outside frequency band
5. Band edge attenuation is determined from level difference

3.3.6 Results

Test Results				
Mode	Channel [MHz]	Out-of-band Attenuation [dB]	Limit [dB]	Verdict
OFDM (IEEE 802.11g)	2412	-31.29	-20	PASS
OFDM (IEEE 802.11g)	2462	-37.34	-20	PASS

Emissions in nonrestricted frequency bands at the Band-edge

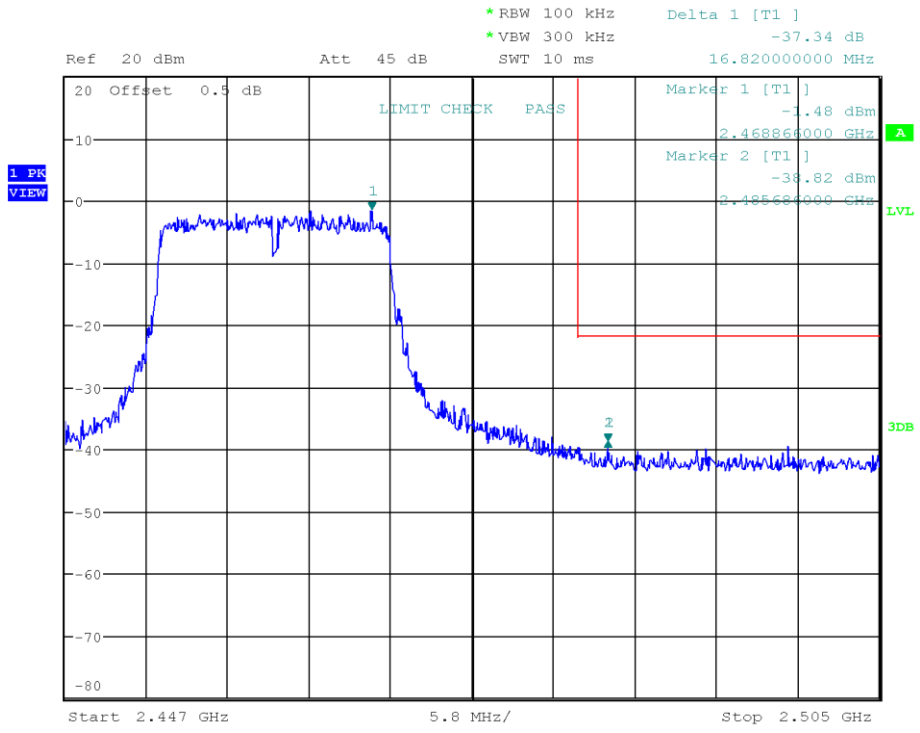
Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	Leica Geosystems AG
Model:	GR50
Test Sample ID:	GNSS Reference Server with WLAN
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11 g, Channel: 1, 2412 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Odai Qawasmeh
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-12-16
Note:	ISED Spot Check
Band-edge	Lower
In-band Frequency [MHz]:	2418.869
Max. in-band Level [dBm/100 kHz]:	-2.748
Out-of-band Frequency [MHz]:	2399.928
Max. out-of-band Level [dBm/100 kHz]:	-34.04
Attenuation [dB]:	-31.29



Date: 16.DEC.2022 15:25:12

Emissions in nonrestricted frequency bands at the Band-edge

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	Leica Geosystems AG
Model:	GR50
Test Sample ID:	GNSS Reference Server with WLAN
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11 g, Channel: 11, 2462 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Odai Qawasmeh
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-12-16
Note:	ISED Spot Check
Band-edge	Upper
In-band Frequency [MHz]:	2468.866
Max. in-band Level [dBm/100 kHz]:	-1.48
Out-of-band Frequency [MHz]:	2485.686
Max. out-of-band Level [dBm/100 kHz]:	-38.818
Attenuation [dB]:	-37.34



Date: 16.DEC.2022 15:26:29

3.4 Test Conditions and Results - Transmitter radiated emissions

3.4.1 Information

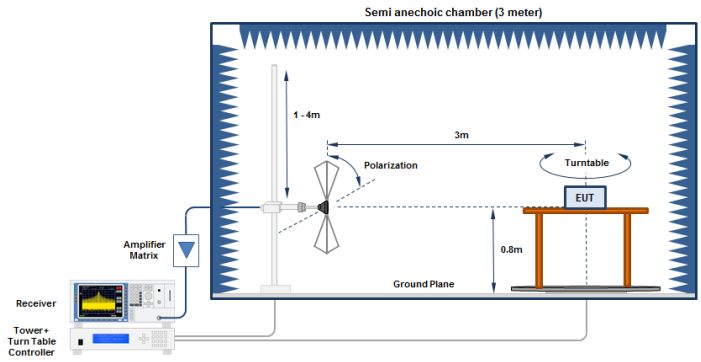
Test Information	
Reference	FCC § 15.247(d); FCC § 15.209; ISED RSS-Gen, Issue 5 A2 (section 6.13)
Measurement Uncertainty	± 5.95 dB
Measurement Method	ANSI C63.10 6.4, 6.5, 6.6, 11.12
Operator	Odai Qawasmeh
Date	2022-08-08

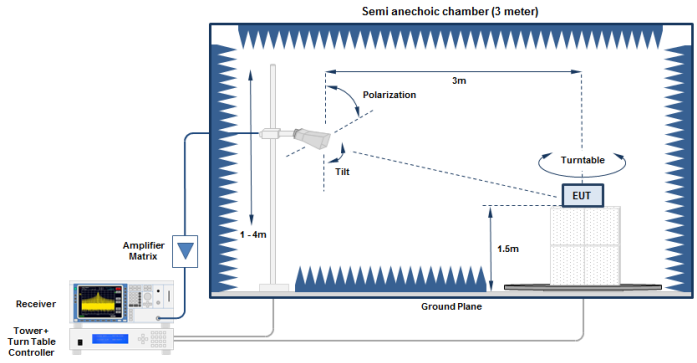
3.4.2 Limits

Limits			
Frequency range [MHz]	Detector	Field strength [µV/m]	Measurement distance [m]
0.009 - 0.09	Average	2400/F[kHz]	300
0.09 - 0.110	Quasi-Peak	2400/F[kHz]	300
0.110 - 0.490	Average	2400/F[kHz]	300
0.490 - 1.705	Quasi-Peak	24000/F[kHz]	30
1.705 - 30.0	Quasi-Peak	30	30
30 - 88	Quasi-Peak	100	3
88 - 216	Quasi-Peak	150	3
216 - 960	Quasi-Peak	200	3
960 - 1000	Quasi-Peak	500	3
>1000	Average	500	3

3.4.3 Setup

Test Setup 30 MHz - 1000 MHz



Test Setup > 1 GHz


3.4.4 Equipment

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

Test Equipment 30 MHz - 1000 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2022-11	2025-11
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2021-07	2023-01
Antenna	R&S	HK 116	EF00030	2021-05	2024-05
Antenna	R&S	HL 223	EF00187	2022-06	2025-06

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF01011	2022-06	2025-06
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2021-07	2023-01
Antenna	Schwarzbeck	BBHA 9120D	EF00018	2019-10	2022-10
Antenna	Schwarzbeck	HWRD 650	EF01679	2021-03	2024-03
Antenna	Amplifier Research	AT4560	EF00302	2021-06	2023-06

3.4.5 Procedure

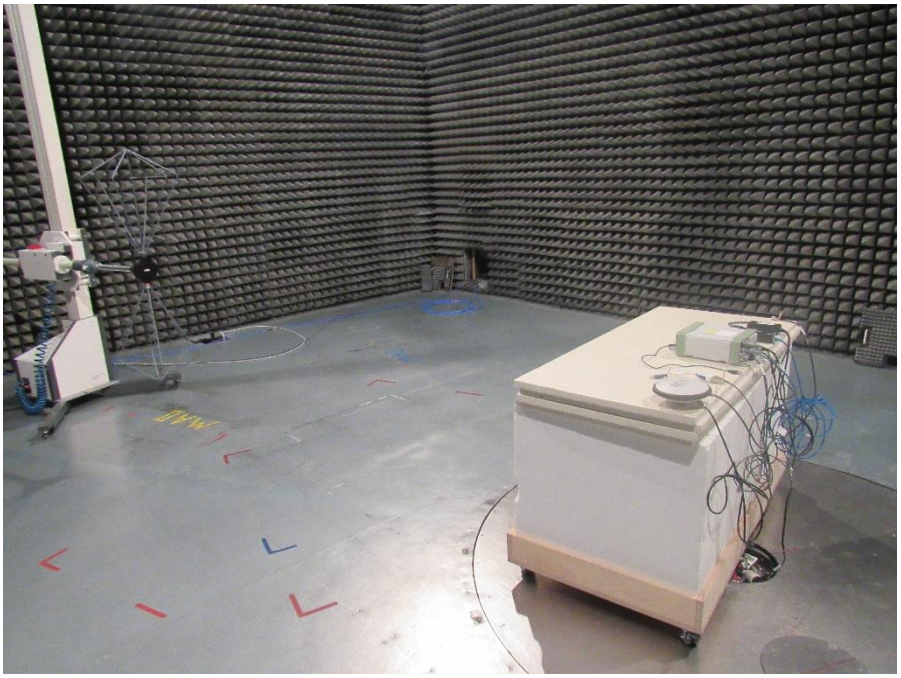
Test Procedure 30 MHz - 1000 MHz
1. EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground 2. EUT set to test mode 3. The receiver is set to peak detection with max hold 4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m 5. All significant emissions are measured again using the corresponding final detector

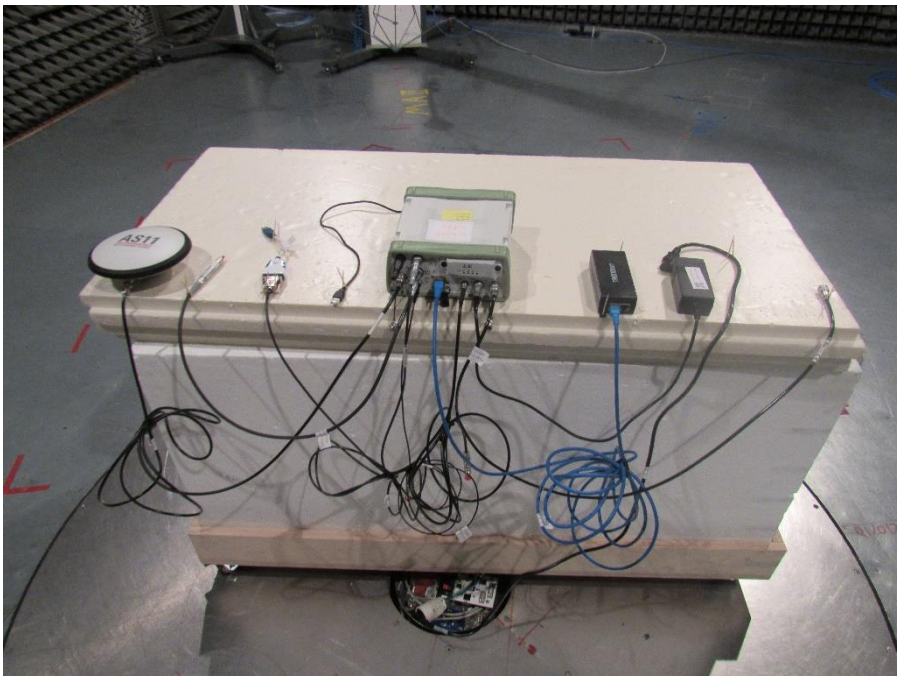
Test Procedure > 1 GHz
1. EUT is placed on a non conducting support at the center of a turn table 1.5 m above the ground 2. EUT set to test mode 3. The receiver is set to peak detection with max hold 4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m 5. All significant emissions are measured again using the corresponding final detector

3.4.6 Results

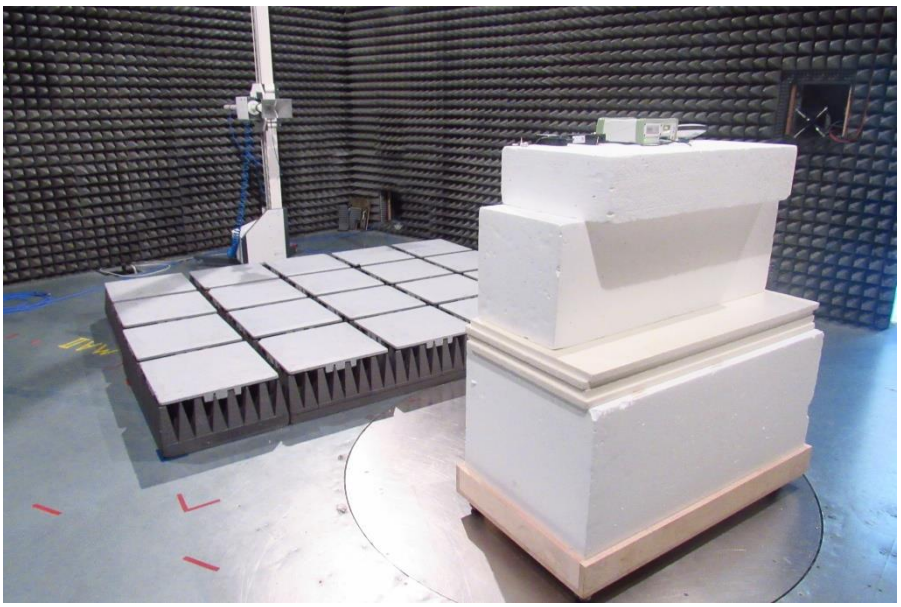
Test Results - OFDM						
Channel [MHz]	Emission [MHz]	Level [dBµV/m]	Det.	Pol.	Limit [dBµV/m]	Margin [dB]
2437	73.0567	34.50	pk	ver	40.00	-05.54
2437	118.8207	35.20	pk	ver	43.50	-08.28
2437	170.9215	37.50	pk	ver	43.50	-06.00
2437	956.5	49.60	pk	hor	95.00	-45.43
2437	956.52	49.60	pk	hor	95.00	-45.44
2437	978.7644	46.70	qpk	hor	54.00	-07.31
2437	1023.3	45.00	pk	hor	74.00	-29.00
2437	1023.3	43.27	avg	hor	54.00	-10.73
2437	1045.5	40.07	pk	hor	74.00	-33.93
2437	1045.5	36.20	avg	hor	54.00	-17.80
2437	4293.1	49.47	pk	ver	74.00	-24.53
2437	4293.1	31.85	avg	ver	54.00	-22.15
2437	17817	46.24	pk	hor	74.00	-27.76
2437	17817	35.85	avg	hor	54.00	-18.15
2437	22338	46.17	pk	ver	74.00	-27.83
2437	22338	33.41	avg	ver	54.00	-20.59
2447	1022.9	43.60	pk	ver	74.00	-30.40
2447	1022.9	39.13	avg	ver	54.00	-14.87
2447	1023.3	44.14	pk	hor	74.00	-29.86
2447	1023.3	42.35	avg	hor	54.00	-11.65
2447	1045.6	40.50	pk	hor	74.00	-33.50
2447	1045.6	36.66	avg	hor	54.00	-17.34
2447	3262.6	55.26	pk	hor	74.00	-18.74
2447	3262.6	53.68	avg	hor	54.00	-00.32
2447	3262.6	55.26	pk	hor	74.00	-18.74
2447	3262.6	53.62	avg	hor	54.00	-00.38

3.4.7 Setup Photos

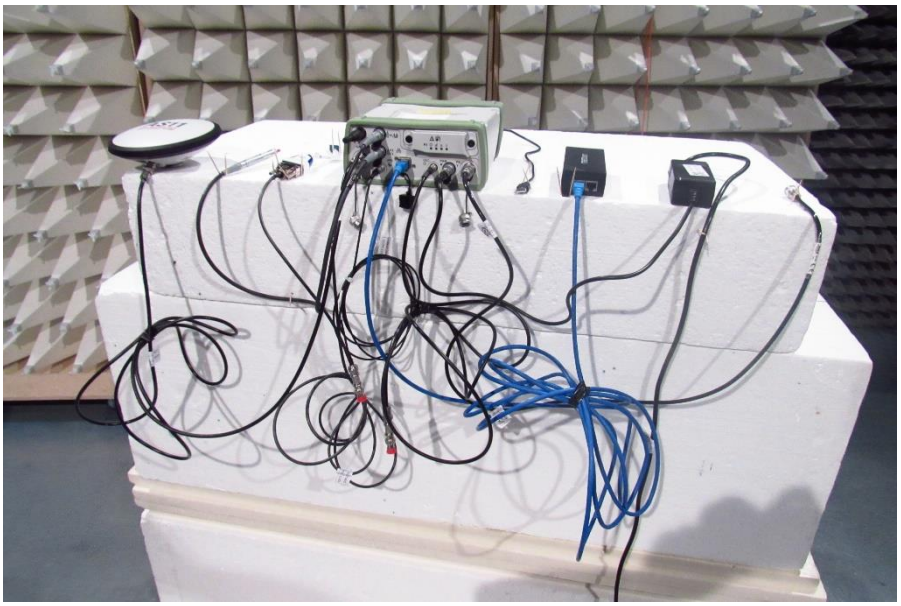
Setup for measurements below 1 GHz


EUT Test Setup


Setup for measurements above 1 GHz



EUT Test Setup



3.5 Test Conditions and Results - Receiver radiated emissions

3.5.1 Information

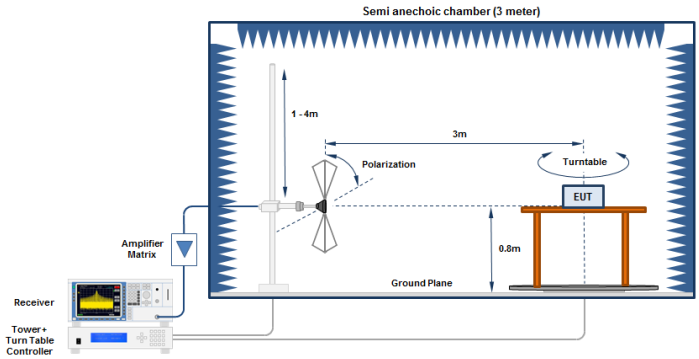
Test Information	
Reference	ISED RSS-247, Issue 2 (section 3.1)
Measurement Uncertainty	± 5.95 dB
Measurement Method	ANSI C63.4-2014 8.1-8.3
Operator	Odai Qawasmeh
Date	2022-08-08

3.5.2 Limits

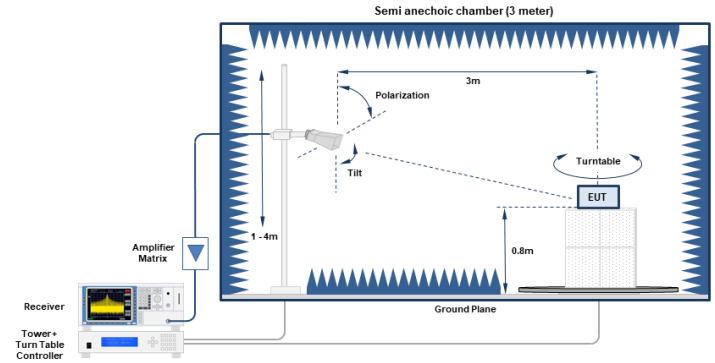
Limits			
Frequency range [MHz]	Detector	Field strength [µV/m]	Measurement distance [m]
30 - 88	Quasi-Peak	100	3
88 - 216	Quasi-Peak	150	3
216 - 960	Quasi-Peak	200	3
960 - 1000	Quasi-Peak	500	3
>1000	Average	500	3

3.5.3 Setup

Test Setup 30 MHz - 1000 MHz



Test Setup > 1 GHz



3.5.4 Equipment

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

Test Equipment 30 MHz - 1000 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2022-11	2025-11
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2021-07	2023-01
Antenna	R&S	HK 116	EF00030	2021-05	2024-05
Antenna	R&S	HL 223	EF00187	2022-06	2025-06

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF01011	2022-06	2025-06
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2021-07	2023-01
Antenna	Schwarzbeck	BBHA 9120D	EF00018	2019-10	2022-10
Antenna	Schwarzbeck	HWRD 650	EF01679	2021-03	2024-03

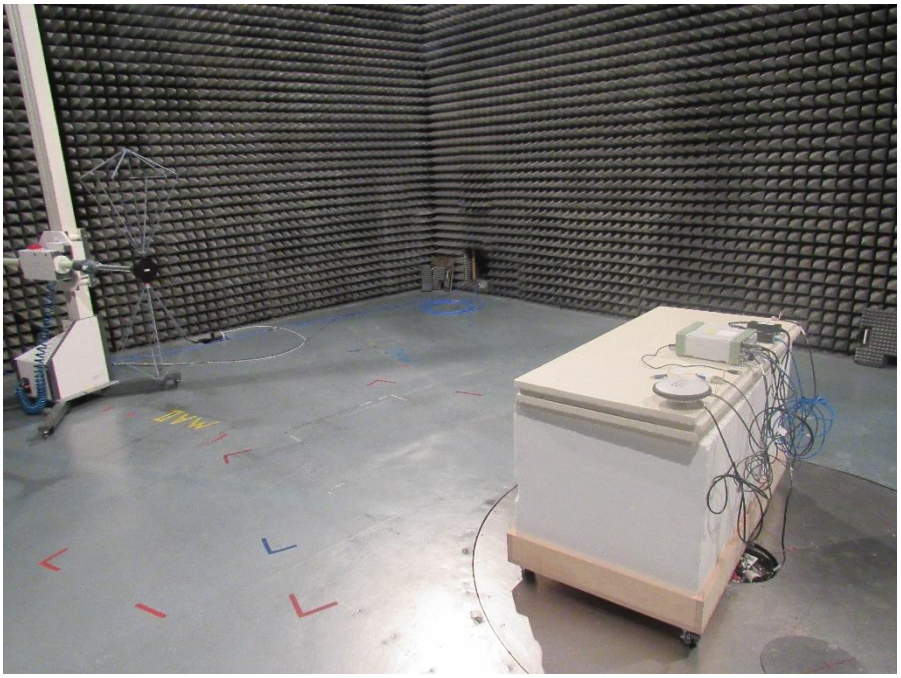
3.5.5 Procedure

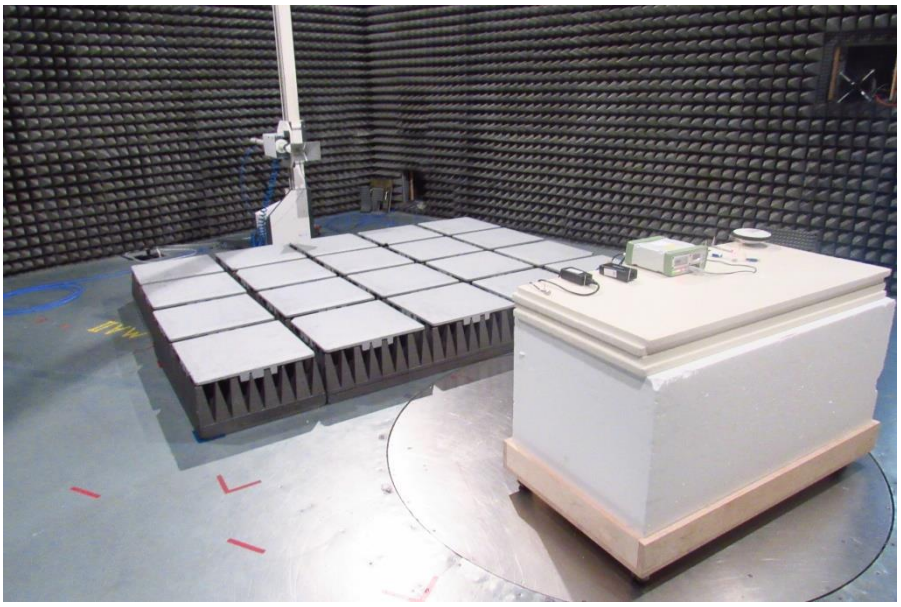
Test Procedure
1. EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground
2. EUT is set to test mode
3. The receiver is set to peak detection with max hold
4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m
5. All significant emissions are measured again using the corresponding final detector

3.5.6 Results

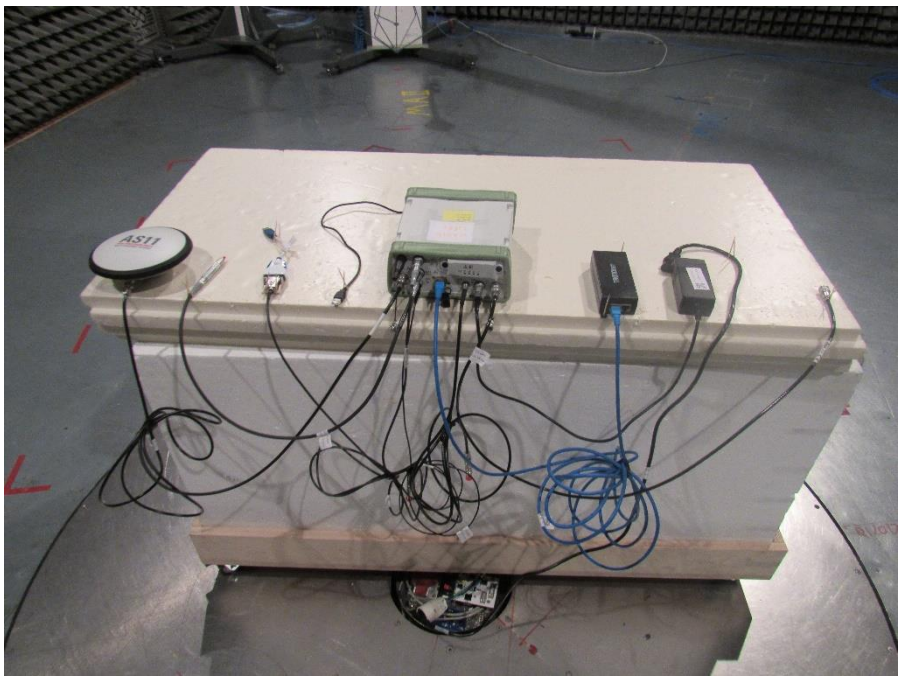
Test Results						
Channel [MHz]	Emission [MHz]	Level [dBµV/m]	Det.	Pol.	Limit [dBµV/m]	Margin [dB]
2437	76.2612	35.00	pk	hor	40.00	-05.01
2437	80.5835	34.50	pk	ver	40.00	-05.52
2437	116.9677	35.80	pk	ver	43.50	-07.69
2437	168.3673	39.90	pk	ver	43.50	-03.64
2437	209.46	29.40	pk	ver	43.50	-14.12
2437	311.34	31.10	pk	hor	46.00	-14.88
2437	1023	42.67	pk	hor	74.00	-31.33
2437	1023	38.96	avg	hor	53.98	-15.02
2437	1757	43.33	pk	hor	74.00	-30.67
2437	1757	40.46	avg	hor	53.98	-13.52
2437	2015	37.32	pk	ver	74.00	-36.68
2437	2015	40.98	avg	ver	53.98	-13.00
2437	17814	49.37	pk	ver	74.00	-24.63
2437	17814	38.51	avg	ver	53.98	-15.47

3.5.7 Setup Photos

Setup for measurements below 1 GHz


Setup for measurements above 1 GHz


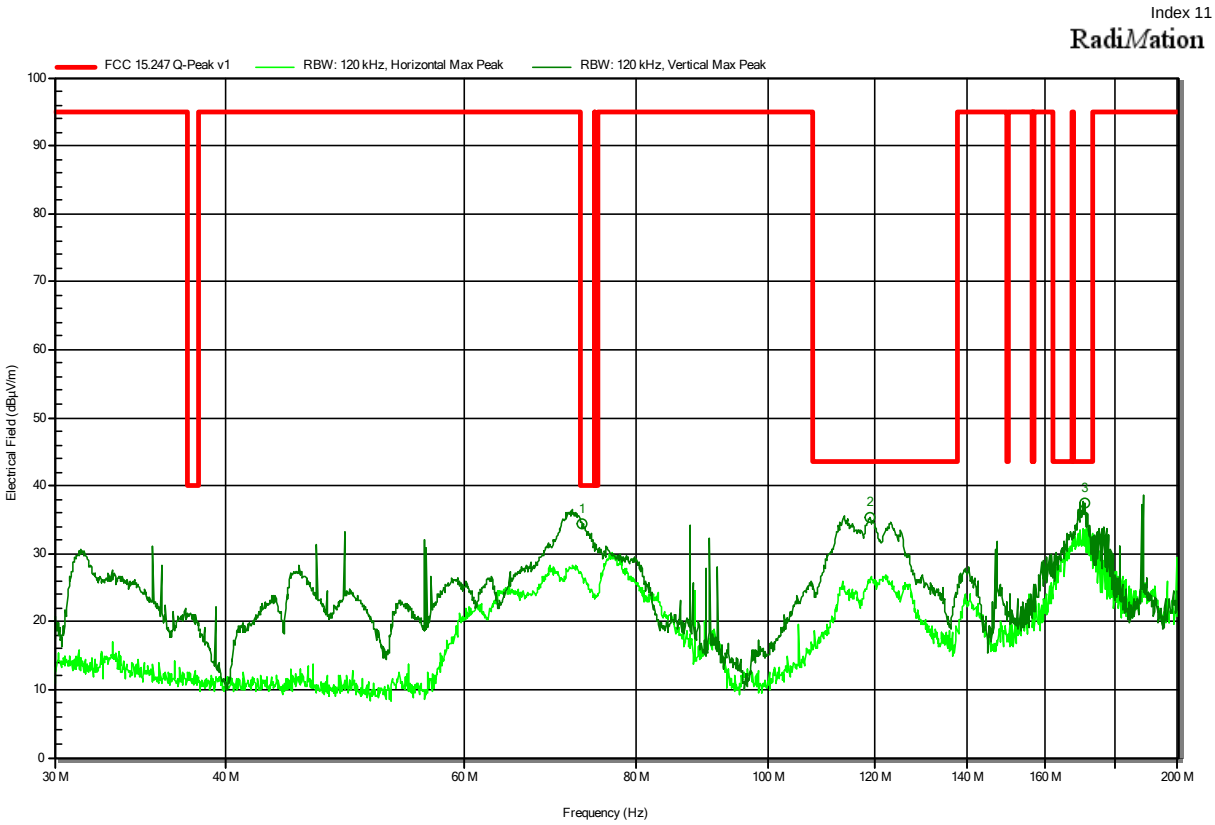
EUT Test Setup



ANNEX A Transmitter spurious emissions

Radiated Spurious Emissions according to FCC 15.247, RSS-247 Issue 2

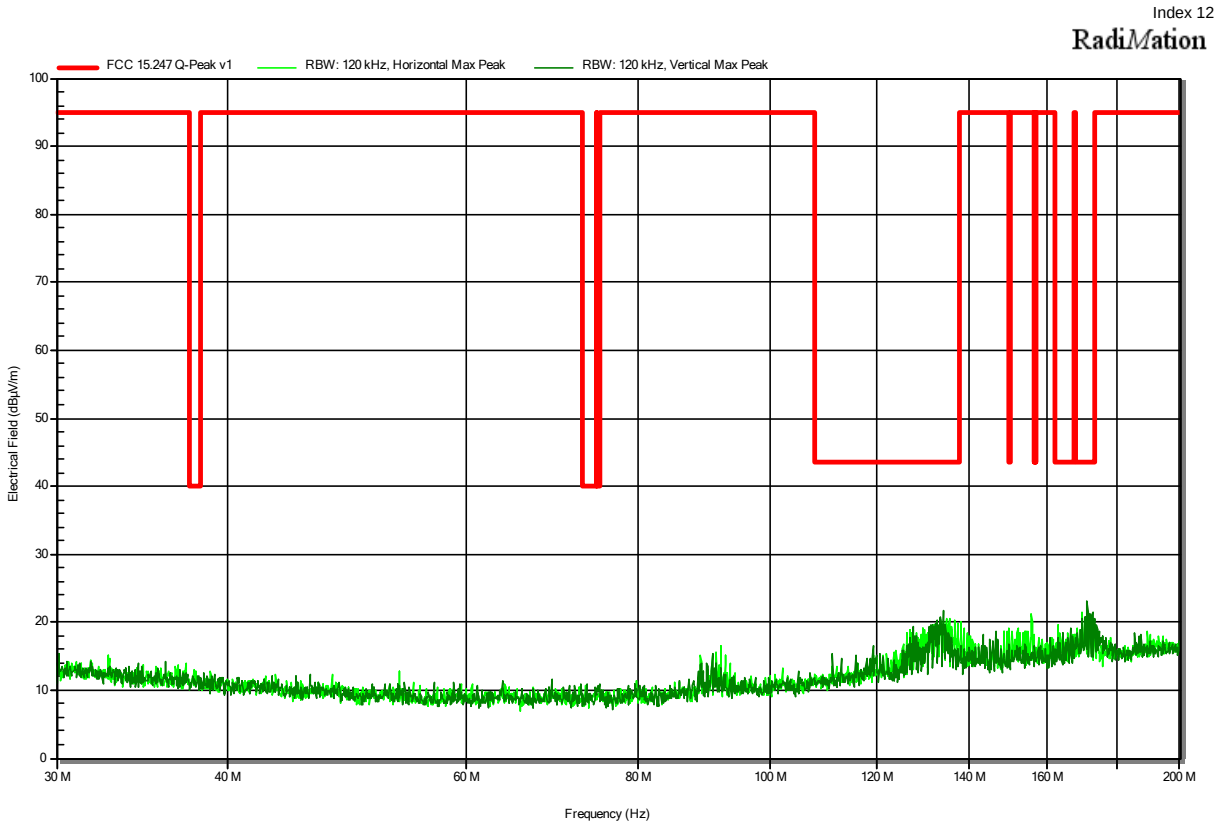
Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40490
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 27 °Celsius, Vnom: 24 VDC
Antenna:	Rohde & Schwarz HK 116
Measurement distance:	3 m
Mode:	Tx; IEEE802.11 g, 2437 MHz, 24 Mbps, 20 MHz Bandwidth
Test Date:	2022-08-11
Note:	



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
73.0567 MHz	34.5 dBµV/m	40 dBµV/m	-5.54 dB	Pass	Vertical
118.8207 MHz	35.2 dBµV/m	43.5 dBµV/m	-8.28 dB	Pass	Vertical
170.9215 MHz	37.5 dBµV/m	43.5 dBµV/m	-6 dB	Pass	Vertical

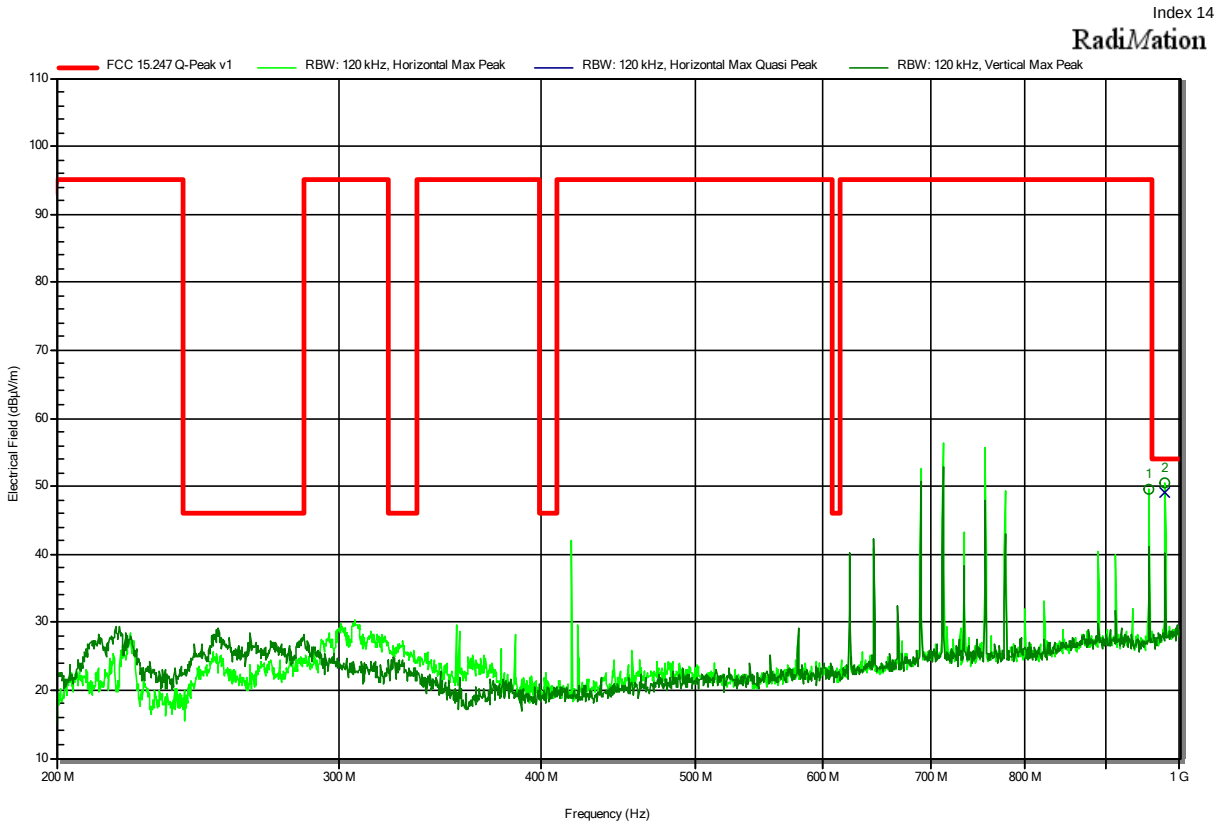
Radiated Spurious Emissions according to FCC 15.247, RSS-247 Issue 2

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40490
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 27 °Celsius, Vnom: 24 VDC
Antenna:	Rohde & Schwarz HK 116
Measurement distance:	3 m
Mode:	Tx; IEEE802.11 g, 2437 MHz, 24 Mbps, 20 MHz Bandwidth
Test Date:	2022-08-11
Note:	without AC/DC Adapter



Radiated Spurious Emissions according to FCC 15.247, RSS-247 Issue 2

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40490
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 27 °Celsius, Vnom: 24 VDC
Antenna:	Rohde & Schwarz HL 223
Measurement distance:	3 m
Mode:	Tx; IEEE802.11 g, 2437 MHz, 24 Mbps, 20 MHz Bandwidth
Test Date:	2022-08-11
Note:	

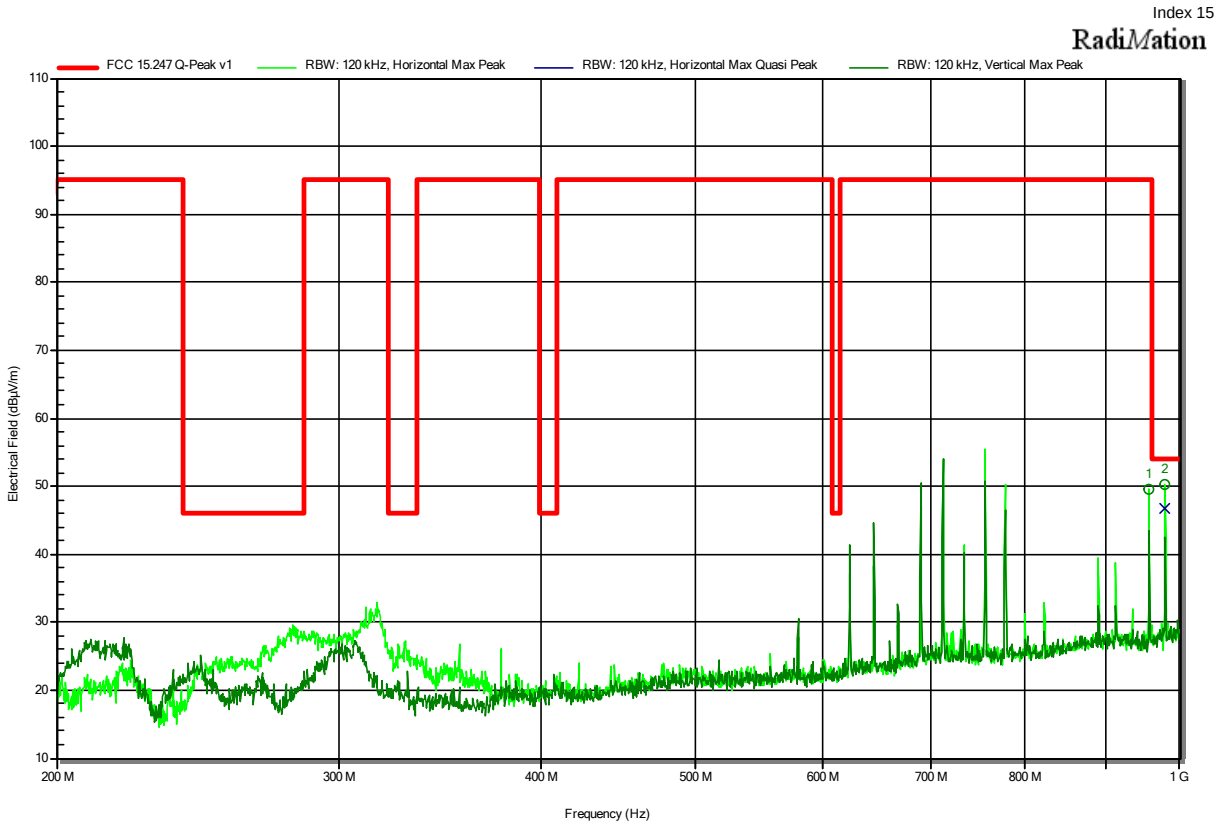


Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
956.52 MHz	49.6 dBµV/m	95 dBµV/m	-45.44 dB	Pass	Horizontal

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Polarization
978.7682 MHz	49.1 dBµV/m	54 dBµV/m	-4.93 dB	Pass	Horizontal

Radiated Spurious Emissions according to FCC 15.247, RSS-247 Issue 2

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40490
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 27 °Celsius, Vnom: 24 VDC
Antenna:	Rohde & Schwarz HL 223
Measurement distance:	3 m
Mode:	Tx; IEEE802.11 g, 2437 MHz, 24 Mbps, 20 MHz Bandwidth
Test Date:	2022-08-11
Note:	EUT vertical

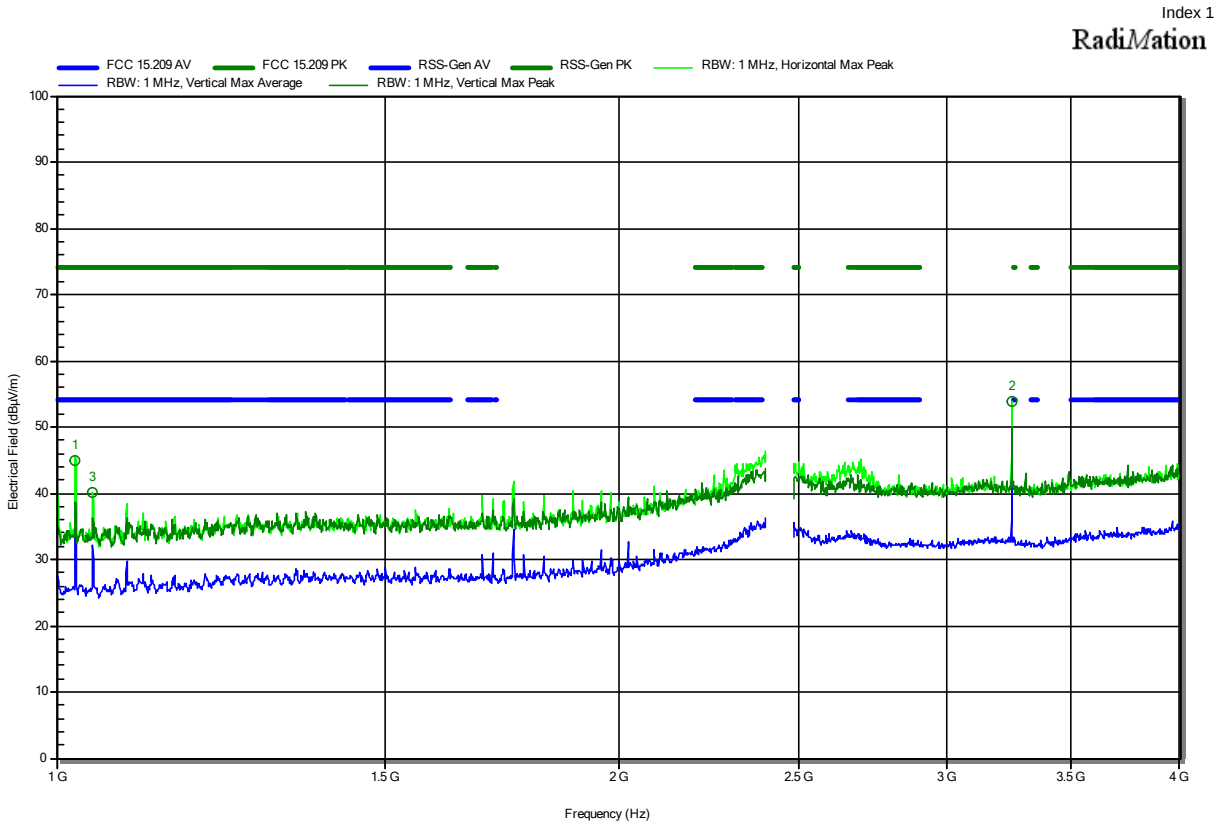


Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
956.5 MHz	49.6 dBµV/m	95 dBµV/m	-45.43 dB	Pass	Horizontal

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Polarization
978.7644 MHz	46.7 dBµV/m	54 dBµV/m	-7.31 dB	Pass	Horizontal

Radiated Spurious Emissions according to FCC 15.247, RSS-247 Issue 2

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40490
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 27 °Celsius, Vnom: 24 VDC
Antenna:	Schwarzbeck BBHA 9120D
Measurement distance:	3 m
Mode:	Tx; IEEE802.11 g, 2437 MHz, 24 Mbps, 20 MHz Bandwidth
Test Date:	2022-08-08
Note:	

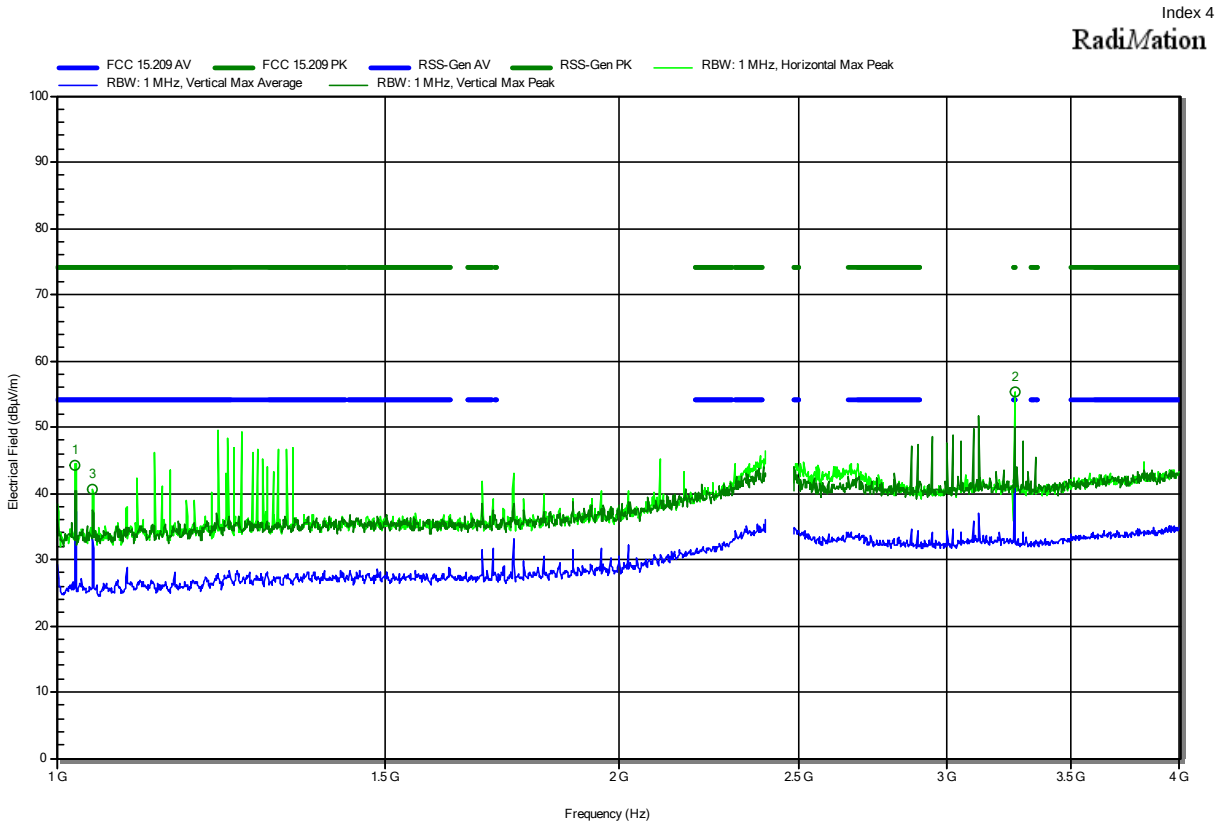


Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
1.0233 GHz	45 dBµV/m	74 dBµV/m	-29 dB	Pass	Horizontal
1.0455 GHz	40.07 dBµV/m	74 dBµV/m	-33.93 dB	Pass	Horizontal
3.2494 GHz	53.82 dBµV/m				Horizontal

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
1.0233 GHz	43.27 dBµV/m	54 dBµV/m	-10.73 dB	Pass	Horizontal
1.0455 GHz	36.2 dBµV/m	54 dBµV/m	-17.8 dB	Pass	Horizontal
3.2494 GHz	52.79 dBµV/m				Horizontal

Radiated Spurious Emissions according to FCC 15.247, RSS-247 Issue 2

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40490
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 27 °Celsius, Vnom: 24 VDC
Antenna:	Schwarzbeck BBHA 9120D
Measurement distance:	3 m
Mode:	Tx; IEEE802.11 g, 2447 MHz, 24 Mbps, 20 MHz Bandwidth
Test Date:	2022-08-08
Note:	other channel was used to determine if emission exceeds the limit line



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
1.0233 GHz	44.14 dBµV/m	74 dBµV/m	-29.86 dB	Pass	Horizontal
1.0456 GHz	40.5 dBµV/m	74 dBµV/m	-33.5 dB	Pass	Horizontal
3.2626 GHz	55.26 dBµV/m	74 dBµV/m	-18.74 dB	Pass	Horizontal

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
1.0233 GHz	42.35 dBµV/m	54 dBµV/m	-11.65 dB	Pass	Horizontal
1.0456 GHz	36.66 dBµV/m	54 dBµV/m	-17.34 dB	Pass	Horizontal
3.2626 GHz	53.68 dBµV/m	54 dBµV/m	-0.32 dB	Pass	Horizontal

Radiated Spurious Emissions according to FCC 15.247, RSS-247 Issue 2

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40490
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 27 °Celsius, Vnom: 24 VDC
Antenna:	Schwarzbeck BBHA 9120D
Measurement distance:	3 m
Mode:	Tx; IEEE802.11 g, 2447 MHz, 24 Mbps, 20 MHz Bandwidth
Test Date:	2022-08-09
Note:	other channel was used to determine if emission exceeds the limit line EUT vertical

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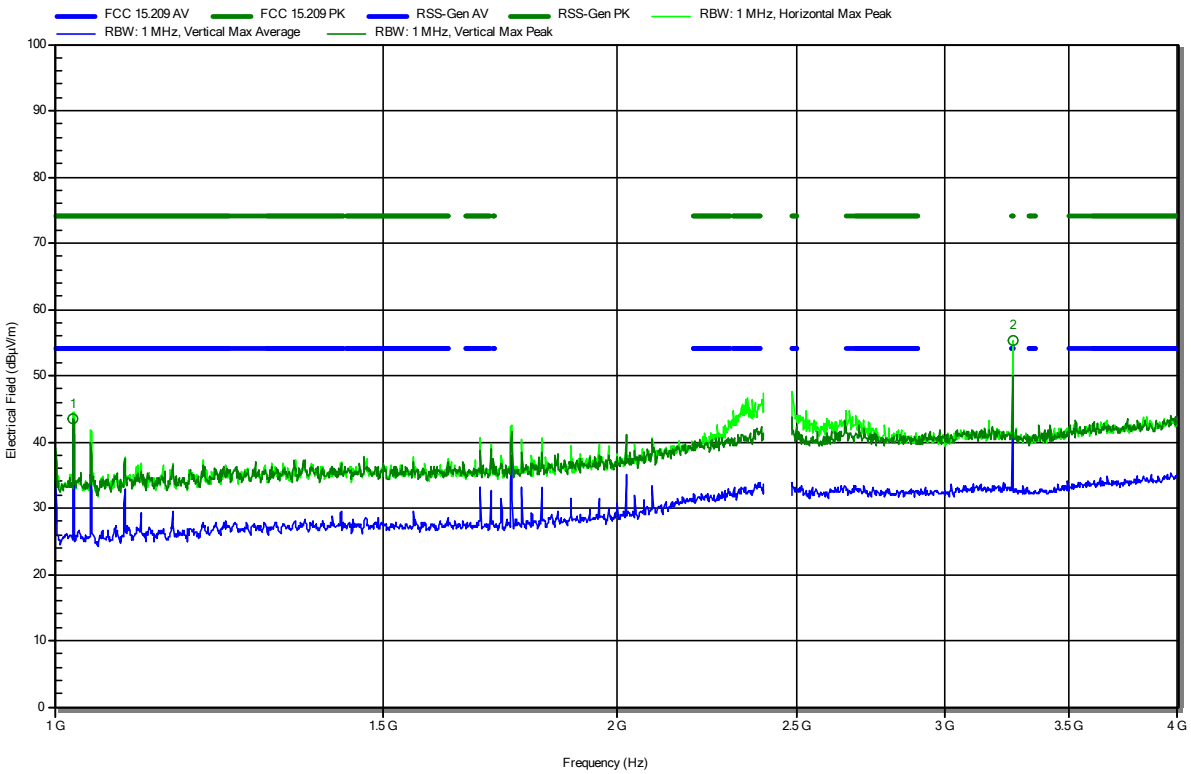
RadiMation

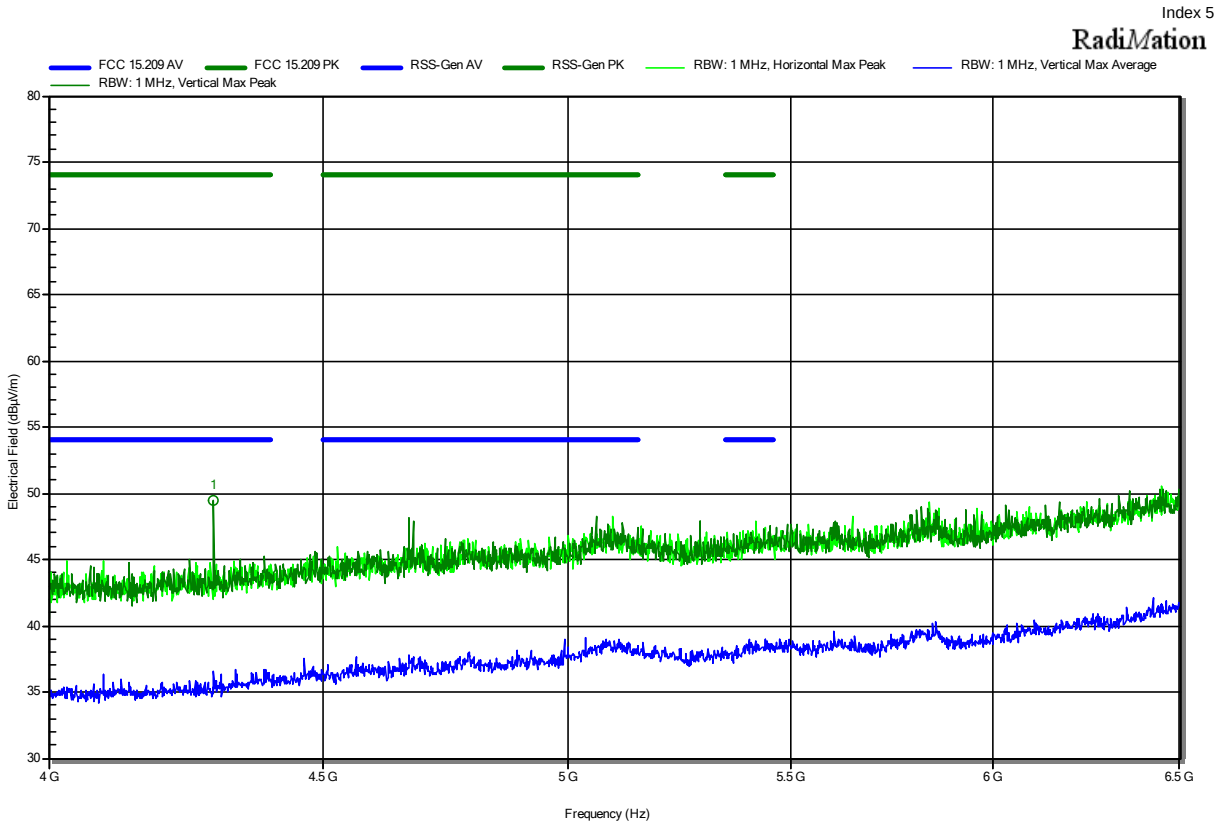


Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
1.0229 GHz	43.6 dBµV/m	74 dBµV/m	-30.4 dB	Pass	Vertical
3.2626 GHz	55.26 dBµV/m	74 dBµV/m	-18.74 dB	Pass	Horizontal

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
1.0229 GHz	39.13 dBµV/m	54 dBµV/m	-14.87 dB	Pass	Vertical
3.2626 GHz	53.62 dBµV/m	54 dBµV/m	-0.38 dB	Pass	Horizontal

Radiated Spurious Emissions according to FCC 15.247, RSS-247 Issue 2

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40490
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 27 °Celsius, Vnom: 24 VDC
Antenna:	Schwarzbeck BBHA 9120D
Measurement distance:	3 m
Mode:	Tx; IEEE802.11 g, 2437 MHz, 24 Mbps, 20 MHz Bandwidth
Test Date:	2022-08-08
Note:	

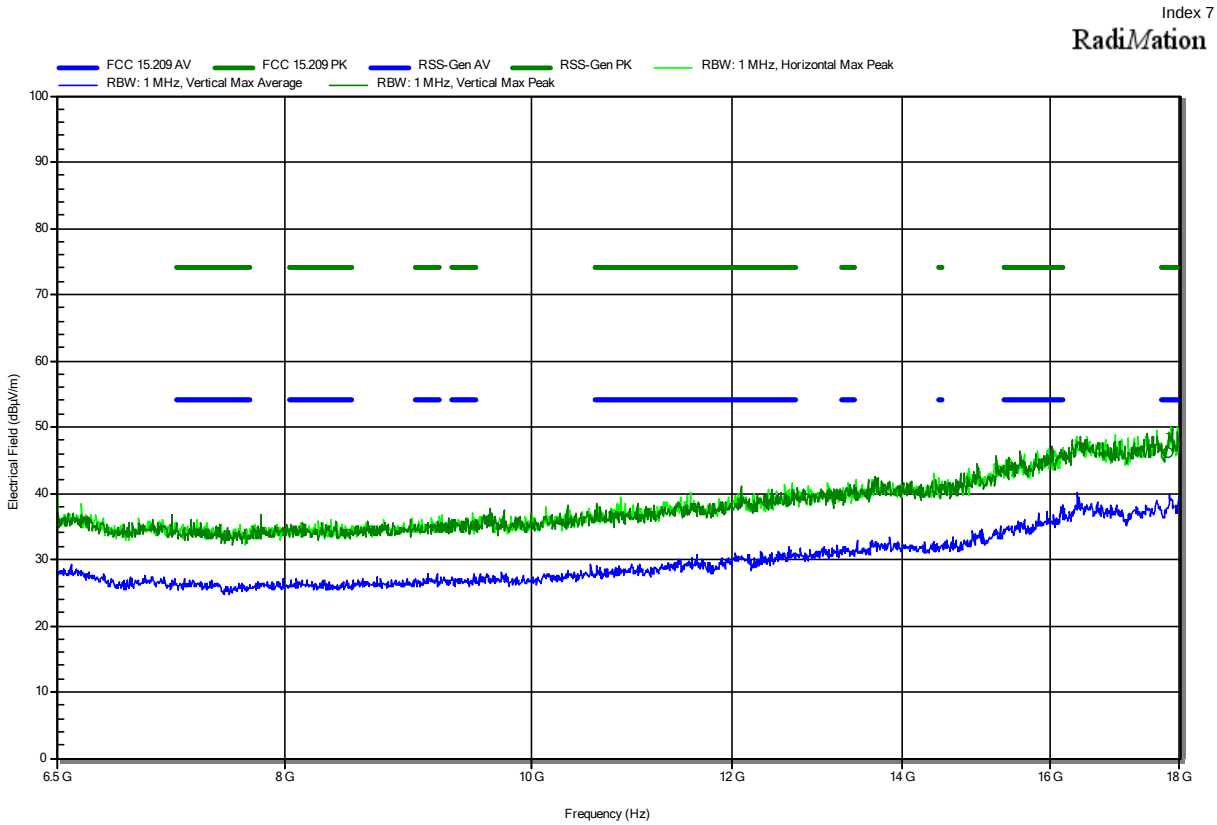


Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
4.2931 GHz	49.47 dBµV/m	74 dBµV/m	-24.53 dB	Pass	Vertical

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
4.2931 GHz	31.85 dBµV/m	54 dBµV/m	-22.15 dB	Pass	Vertical

Radiated Spurious Emissions according to FCC 15.247, RSS-247 Issue 2

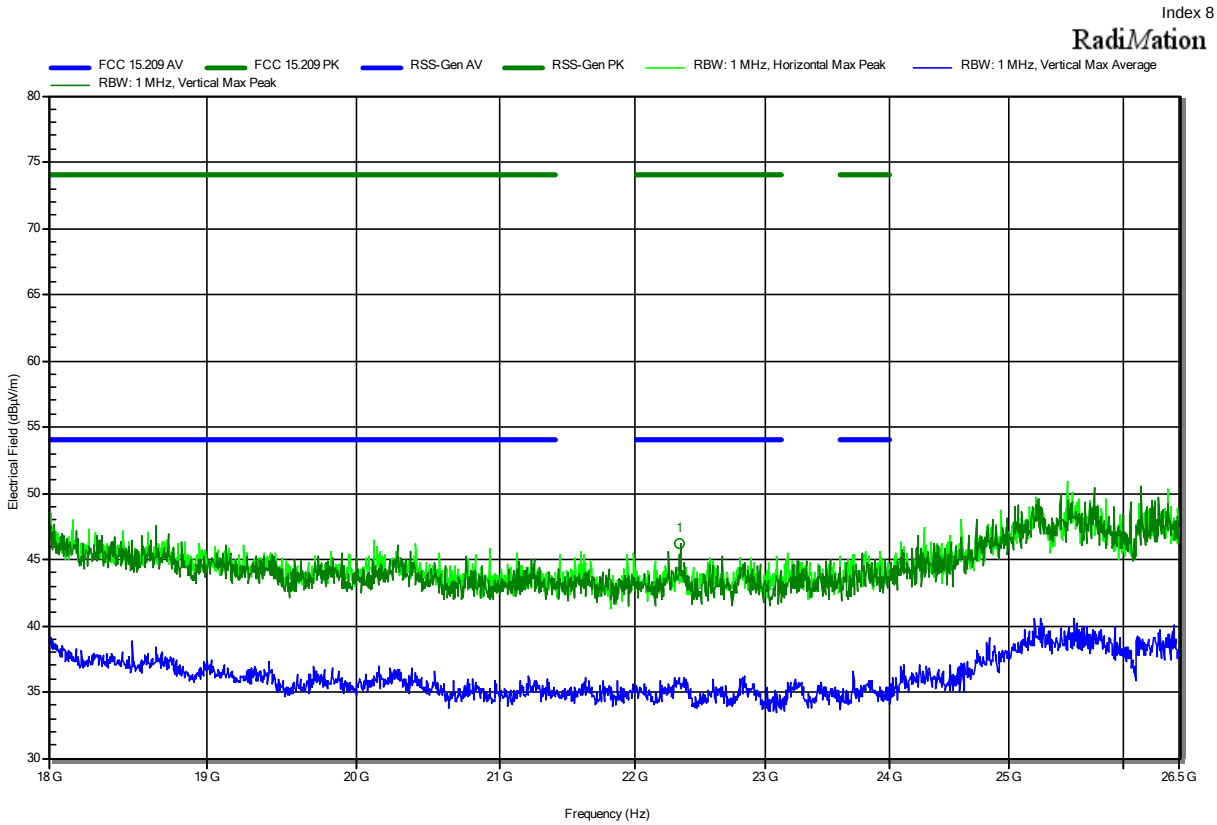
Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40490
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 27 °Celsius, Vnom: 24 VDC
Antenna:	Schwarzbeck HWRD 650
Measurement distance:	3 m
Mode:	Tx; IEEE802.11 g, 2437 MHz, 24 Mbps, 20 MHz Bandwidth
Test Date:	2022-08-08
Note:	



Frequency 17.817 GHz	Peak 46.24 dBµV/m	Peak Limit 74 dBµV/m	Peak Difference -27.76 dB	Peak Status Pass	Polarization Horizontal
Frequency 17.817 GHz	Average 35.85 dBµV/m	Average Limit 54 dBµV/m	Average Difference -18.15 dB	Average Status Pass	Polarization Horizontal

Radiated Spurious Emissions according to FCC 15.247, RSS-247 Issue 2

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40490
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 27 °Celsius, Vnom: 24 VDC
Antenna:	Amplifier Research AT4560
Measurement distance:	3 m
Mode:	Tx; IEEE802.11 g, 2437 MHz, 24 Mbps, 20 MHz Bandwidth
Test Date:	2022-08-08
Note:	



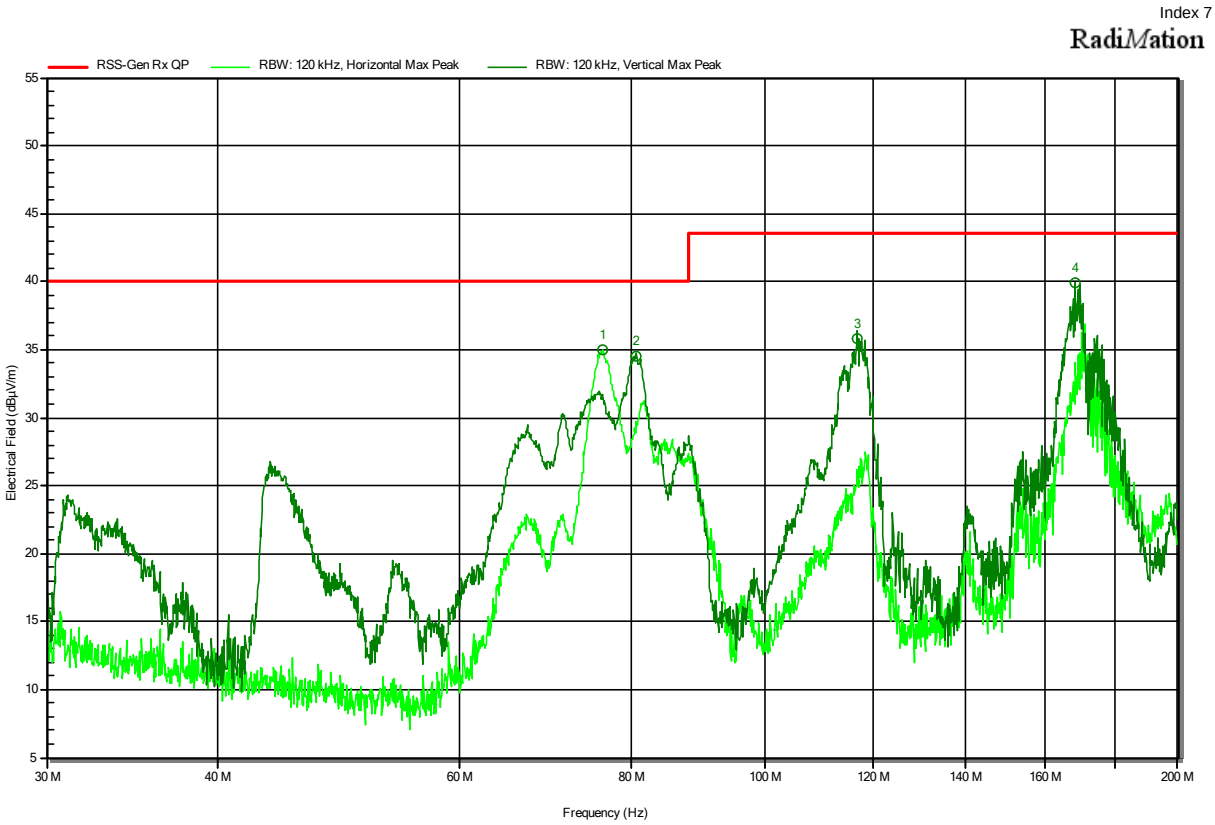
Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
22.338 GHz	46.17 dBµV/m	74 dBµV/m	-27.83 dB	Pass	Vertical

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
22.338 GHz	33.41 dBµV/m	54 dBµV/m	-20.59 dB	Pass	Vertical

ANNEX B Receiver spurious emissions

Radiated Spurious Emissions according to RSS-247 Issue 2, RSS-Gen Issue 5

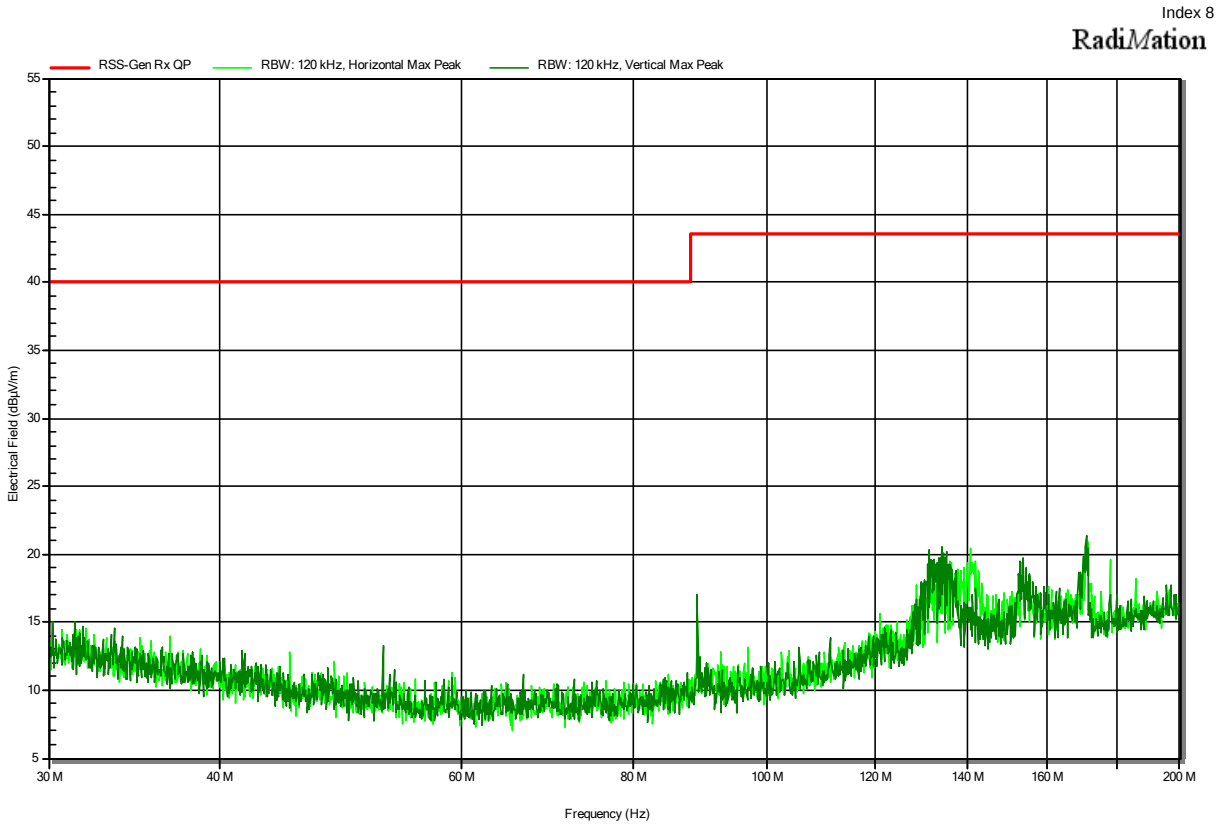
Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40490
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 27 °Celsius, Vnom: 24 VDC
Antenna:	Rohde & Schwarz HK 116
Measurement distance:	3 m
Mode:	Rx; IEEE802.11 g, 2437 MHz, 20 MHz Bandwidth
Test Date:	2022-08-11
Note:	Emissions not caused by radio module, see next page



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
76.2612 MHz	35 dBµV/m	40 dBµV/m	-5.01 dB	Pass	Horizontal
80.5835 MHz	34.5 dBµV/m	40 dBµV/m	-5.52 dB	Pass	Vertical
116.9677 MHz	35.8 dBµV/m	43.5 dBµV/m	-7.69 dB	Pass	Vertical
168.3673 MHz	39.9 dBµV/m	43.5 dBµV/m	-3.64 dB	Pass	Vertical

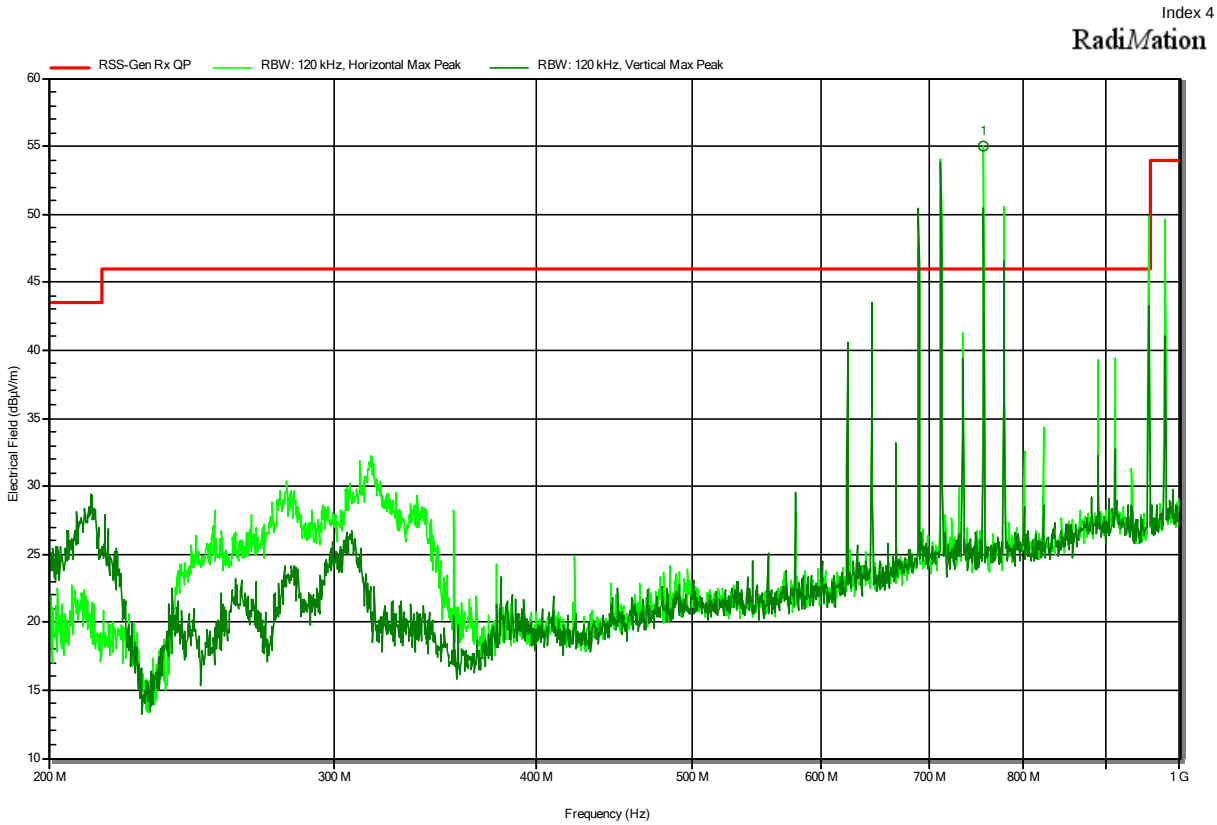
Radiated Spurious Emissions according to RSS-247 Issue 2, RSS-Gen Issue 5

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40490
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 27 °Celsius, Vnom: 24 VDC
Antenna:	Rohde & Schwarz HK 116
Measurement distance:	3 m
Mode:	Rx; IEEE802.11 g, 2437 MHz, 20 MHz Bandwidth
Test Date:	2022-08-11
Note:	without AC/DC Adapter



Radiated Spurious Emissions according to RSS-247 Issue 2, RSS-Gen Issue 5

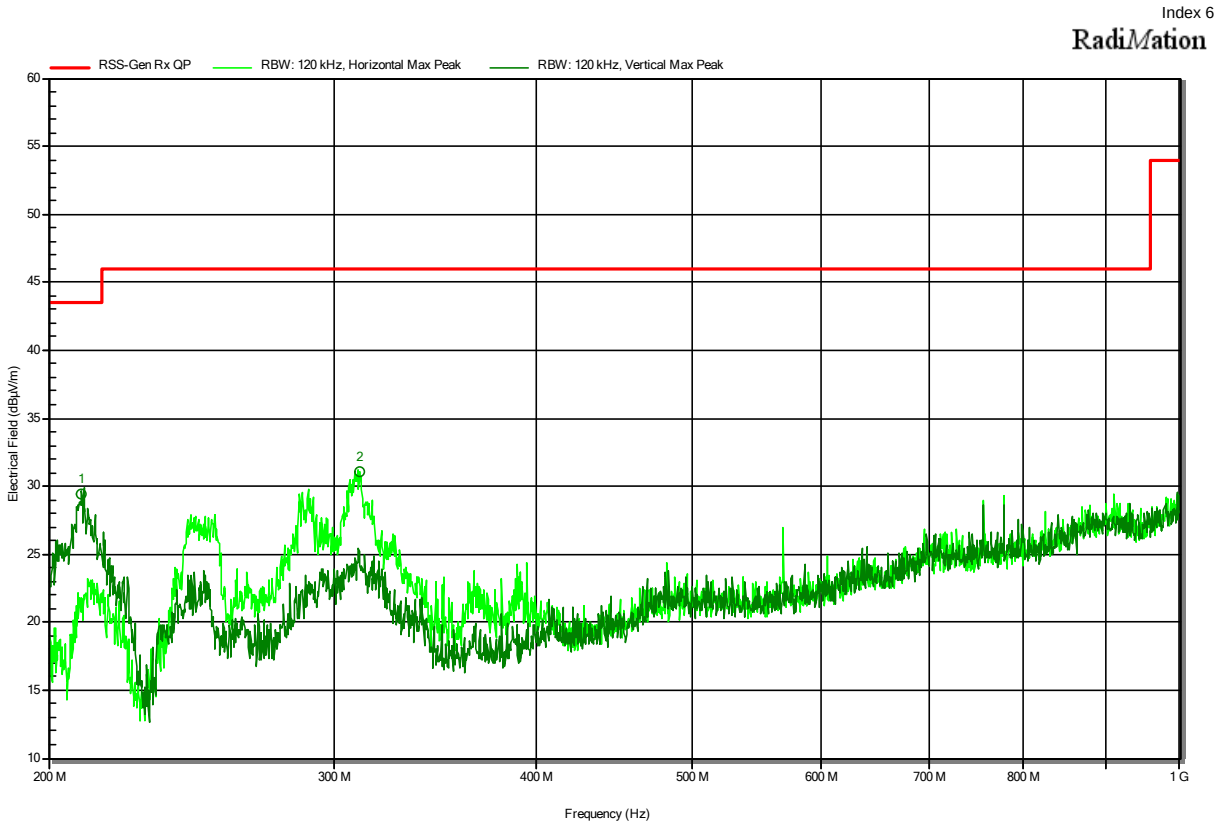
Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40490
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 27 °Celsius, Vnom: 24 VDC
Antenna:	Rohde & Schwarz HL 223
Measurement distance:	3 m
Mode:	Rx; IEEE802.11 g, 2437 MHz, 20 MHz Bandwidth
Test Date:	2022-08-11
Note:	Emissions not caused by radio module, see next page



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
756.34 MHz	55.1 dBµV/m	46 dBµV/m	9.06 dB	EMC Emission

Radiated Spurious Emissions according to RSS-247 Issue 2, RSS-Gen Issue 5

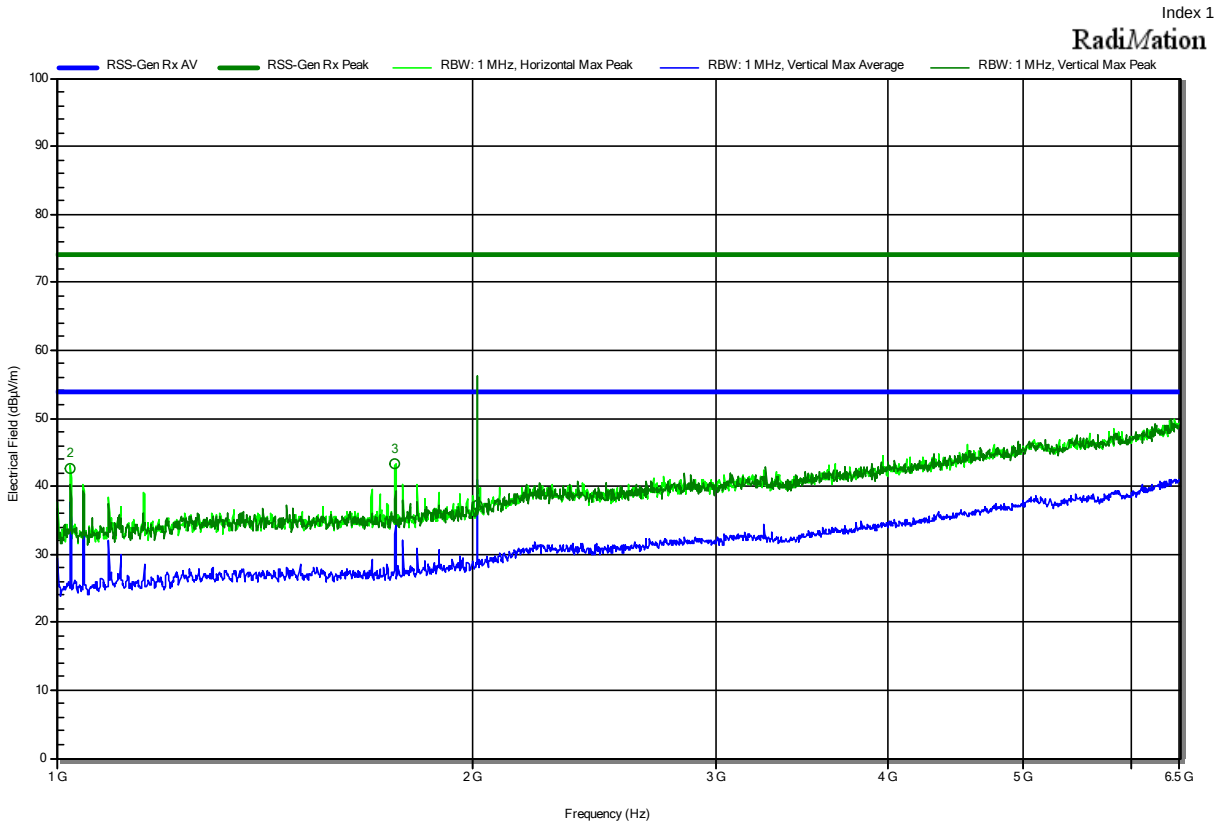
Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40490
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 27 °Celsius, Vnom: 24 VDC
Antenna:	Rohde & Schwarz HL 223
Measurement distance:	3 m
Mode:	Rx; IEEE802.11 g, 2437 MHz, 20 MHz Bandwidth
Test Date:	2022-08-11
Note:	without Micro USB



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
209.46 MHz	29.4 dBµV/m	43.5 dBµV/m	-14.12 dB	Pass	Vertical
311.34 MHz	31.1 dBµV/m	46 dBµV/m	-14.88 dB	Pass	Horizontal

Radiated Spurious Emissions according to RSS-247 Issue 2, RSS-Gen Issue 5

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40490
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 27 °Celsius, Vnom: 24 VDC
Antenna:	Schwarzbeck BBHA 9120D
Measurement distance:	3 m
Mode:	Rx; IEEE802.11 g, 2437 MHz, 20 MHz Bandwidth
Test Date:	2022-08-08
Note:	

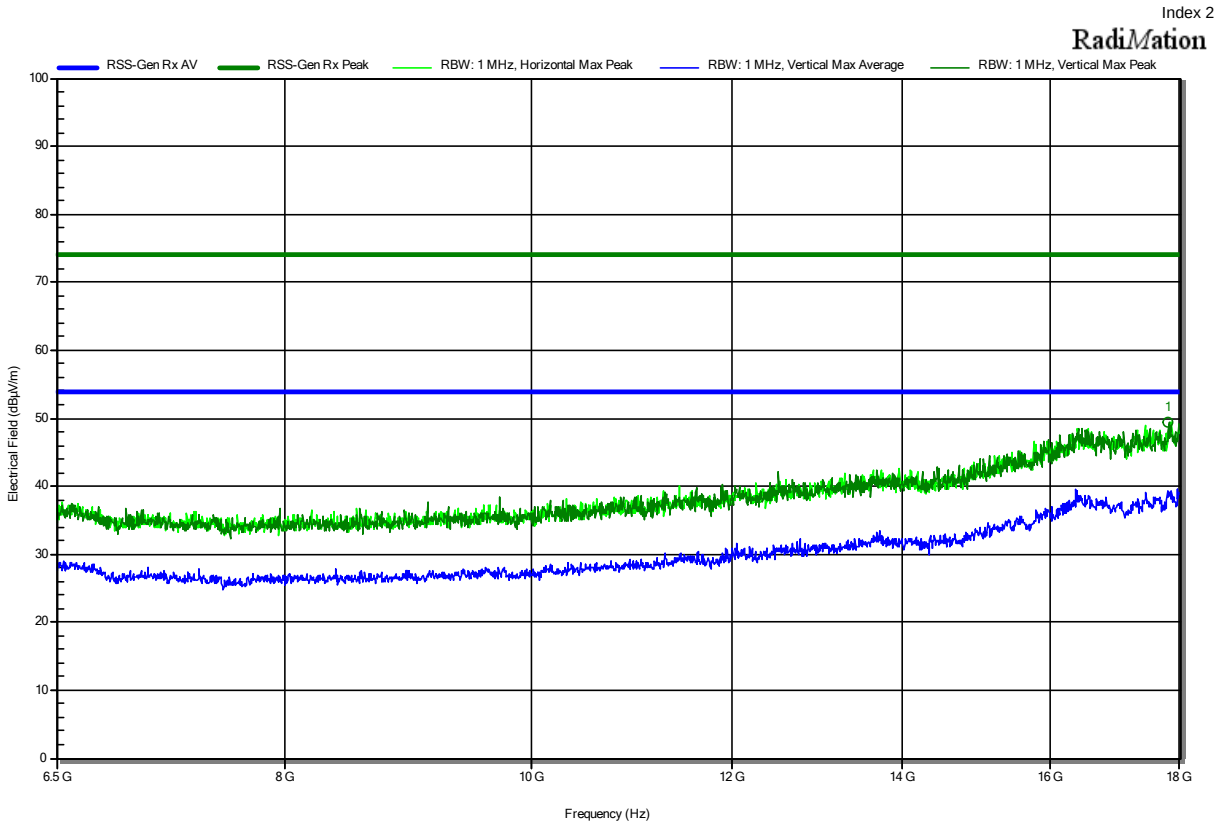


Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
1.023 GHz	42.67 dBµV/m	74 dBµV/m	-31.33 dB	Pass	Horizontal
1.757 GHz	43.33 dBµV/m	74 dBµV/m	-30.67 dB	Pass	Horizontal
2.015 GHz	37.32 dBµV/m	74 dBµV/m	-36.68 dB	Pass	Vertical

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
1.023 GHz	38.96 dBµV/m	53.98 dBµV/m	-15.02 dB	Pass	Horizontal
1.757 GHz	40.46 dBµV/m	53.98 dBµV/m	-13.52 dB	Pass	Horizontal
2.015 GHz	40.98 dBµV/m	53.98 dBµV/m	-13 dB	Pass	Vertical

Radiated Spurious Emissions according to RSS-247 Issue 2, RSS-Gen Issue 5

Project Number:	G0M-2205-1481
Applicant:	Leica Geosystems AG
Model Description:	GNSS Reference Server with WLAN
Model:	GR50
Test Sample ID:	40490
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Qawasmeh
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 27 °Celsius, Vnom: 24 VDC
Antenna:	Schwarzbeck HWRD 650
Measurement distance:	3 m
Mode:	Rx; IEEE802.11 g, 2437 MHz, 20 MHz Bandwidth
Test Date:	2022-08-08
Note:	



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
17.814 GHz	49.37 dBµV/m	74 dBµV/m	-24.63 dB	Pass	Vertical

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
17.814 GHz	38.51 dBµV/m	53.98 dBµV/m	-15.47 dB	Pass	Vertical

= = = END OF TEST REPORT = = =