RADIO REPORT

FCC 47 CFR Part 15C
ISED Canada RSS-247

Frequency hopping systems operating within the 2400.0 MHz - 2483.5 MHz MHz band

Report Reference No	G0M-2209-1656-TFC247BTBR-V03
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 Heebrugg Switzerland
Test Specification	47 CFR Part 15C RSS-247, Issue 3, 2023-08 RSS-Gen, Issue 5, Amendment 2, 2021-02
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	Field Controller Win EC7
Model(s)	CS20 Basic
Additional Model(s)	None
Brand Name(s)	Leica Geosystems
Hardware Version(s)	V1.2
Software Version(s)	v7.07.19.1040033
FCC ID	RFD-CSNGP
IC	3177A-CSNGP
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	2022-09-26	
Report:		
Compiled by	Burkhard Pudell	
Tested by (+ signature) (Responsible for Test)	Burkhard Pudell	
Approved by (+ signature) (Test Lab Engineer)	Radwan Jaafar	
Date of Issue	2024-04-09	
Total number of pages	53	
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:		
None		

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2022-11-09	Initial Release	--
02	2024-02-05	Replaced document: G0M-2209-1656-TFC247BTBR-V01 Replaced by: G0M-2209-1656-TFC247BTBR-V02 Reason: - RSS-247 Issue 2 updated to RSS-247 Issue 3 and new evaluation - Additional Variants deleted - Summary table remarks updated	G. Offorji
03	2024-04-09	Replaced document: G0M-2209-1656-TFC247BTBR-V02 Replaced by: G0M-2209-1656-TFC247BTBR-V03 Reason: - Correction of radio module and antenna information	St. Liebich

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
BR	Basic Rate (Bluetooth)
EDR	Enhanced Data Rate (Bluetooth)
EUT	Equipment Under Test
FCC	Federal Communications Commission
ISED	Innovation, Science and Economic Development Canada
RBW	Resolution bandwidth
RMS	Root mean square
VBW	Video bandwidth
V_{NOM}	Nominal supply voltage

REPORT INDEX

1 Equipment (Test Item) Under Test 6
1.1 Photos – Equipment External 7
1.2 Photos – Equipment Internal 11
1.3 Support Equipment 15
1.4 Test Modes 15
1.5 Test Frequencies 15
1.6 Sample emission level calculation 16
2 Result Summary 17
3 Test Conditions and Results 18
3.1 Test Conditions and Results - AC powerline conducted emissions 18
3.2 Test Conditions and Results - Transmitter radiated emissions 22
3.3 Test Conditions and Results - Receiver radiated emissions 30

ANNEX A Transmitter spurious emissions 36
ANNEX B Receiver spurious emissions 49

1 Equipment (Test Item) Under Test

Description	Field Controller Win EC7	
Model	CS20 Basic	
Additional Model(s)	None	
Brand Name(s)	Leica Geosystems	
Serial Number(s)	2495073	
Test Sample Id(s)	41411	
Hardware Version(s)	V1.2	
Software Version(s)	v7.07.19.1040033	
PMN	CS20 Basic	
HVIN	CS20 Basic	
FVIN	n/a	
HMN	n/a	
FCC ID	RFD-CSNGP	
IC	3177A-CSNGP	
Equipment type	End Product	
Radio type	Transceiver	
Assigned frequency bands	2400.0 MHz - 2483.5 MHz	
Radio technology	Bluetooth	
Modulation	GFSK, PI/4-DQPSK, 8-DPSK	
Number of antenna ports	1	
Radio Module	Type	Integred Transceiver Module IEEE802.11 b,g,n, BLE & BT
	Model	TiWi-BLE
	Manufacturer	Leica Geosystems
	HW Version	1.0
	SW Version	4.0
	FCC-ID	RFD-BTWCO
	IC	3177A-BTWCO
Antenna	Type	integrated
	Model	W3008C
	Manufacturer	Pulse Electronics
	Gain	1.3 dBi
Battery Voltage	V_{NOM}	11.1 VDC (Li-Ion GEB331)
Operating Temperature	T_{NOM}	25 °C
AC/DC-Adaptor	Model	GEV276 (AEL40US15)
	Vendor	Leica Geosystems (XP Power)
	Input	100 – 240 V AC
	Output	15 V DC
Manufacturer	Leica Geosystems Technologies Pte Ltd 2 Woodlands Sector 1 #01-10 Woodlands Spectrum 1 738068 Singapore SINGAPORE	

1.1 Photos – Equipment External

EUT FRONT


EUT BACK


EUT BACK open Battery Case


BATTERY

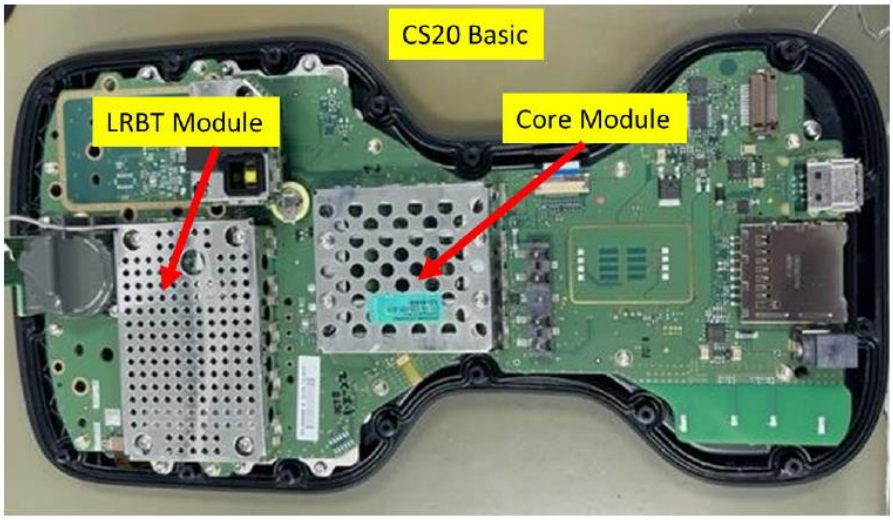

EUT LEFT SIDE

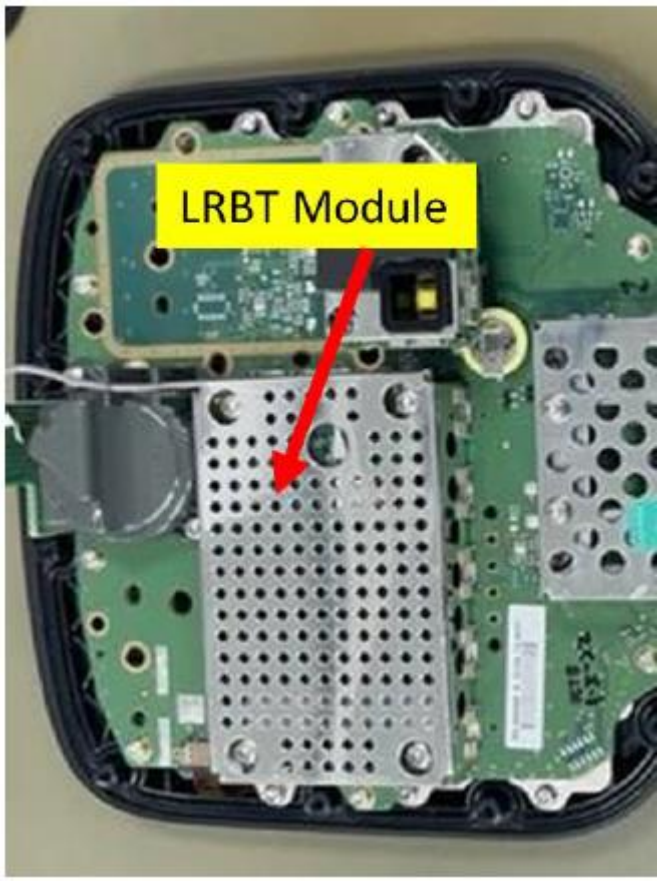

EUT BOTTOM open Interface


Interface Cable

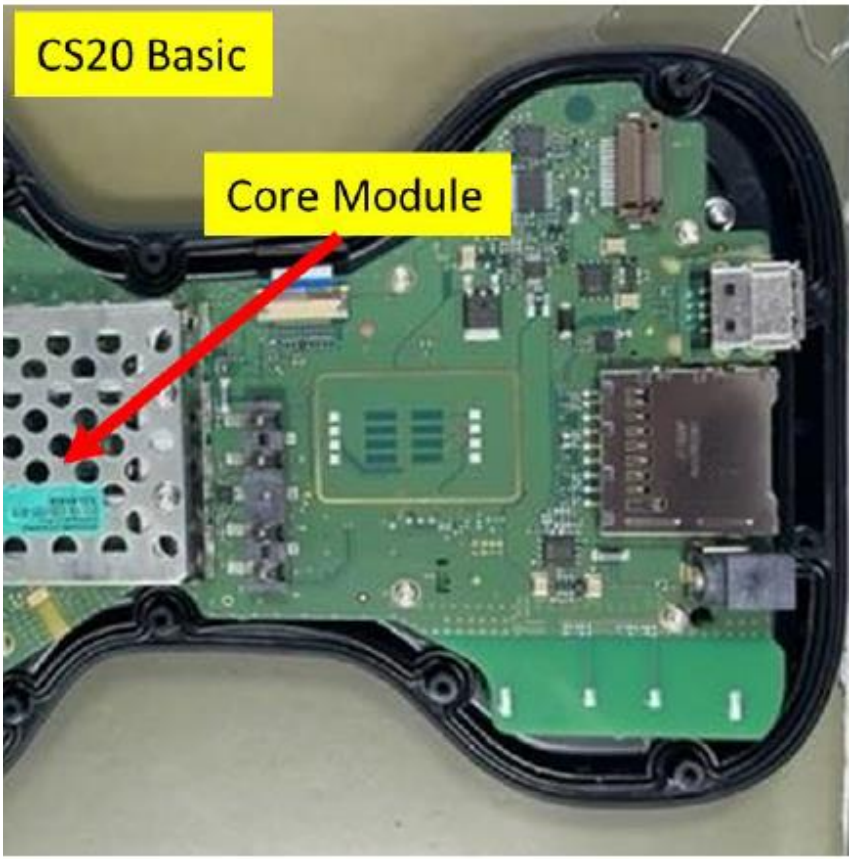

Power Adapter


1.2 Photos – Equipment Internal

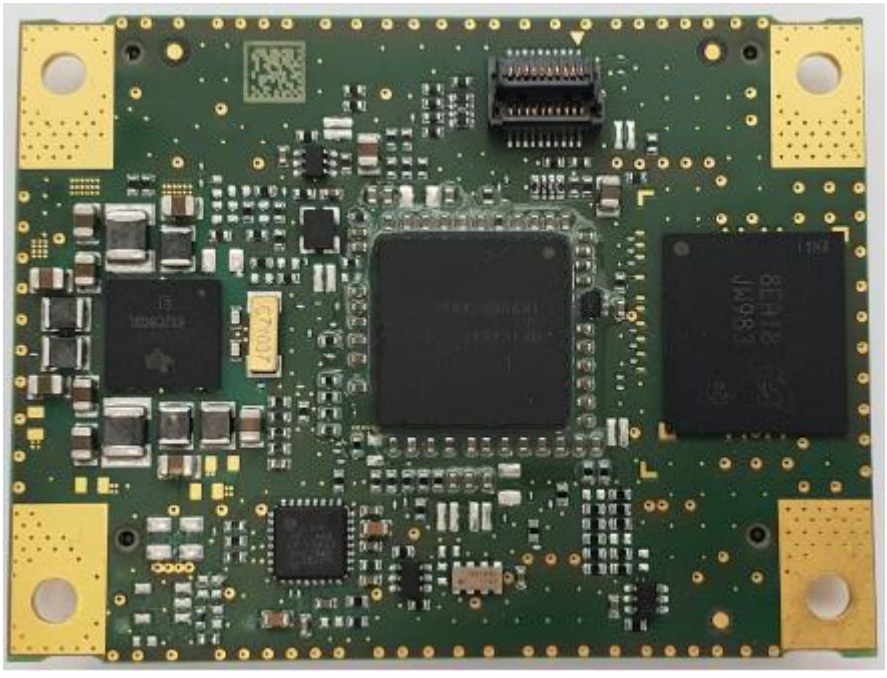
EUT WITH OPEN COVER


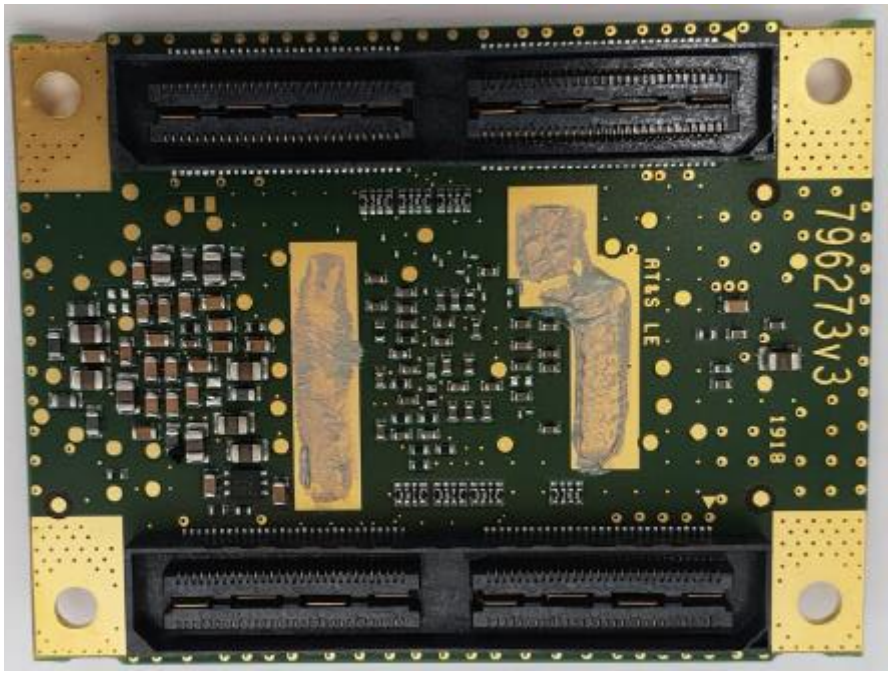
EUT PCB TOP SIDE FOCUS I


EUT PCB TOP SIDE FOCUS II



EUT PCB CORE MODULE BOARD TOP SIDE



EUT PCB CORE MODULE BOARD BOTTOM SIDE


EUT PCB LONG-RANGE BLUETOOTH BOARD TOP SIDE


EUT PCB LONG-RANGE BLUETOOTH BOARD BOTTOM SIDE


1.3 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
SIM	Communication Tester	R&S	CBT	BT-Tester
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
Comment:				

1.4 Test Modes

Mode	Description
3-DH5 Single	Mode = Transmit (DUT mode) Modulation = 8-DPSK Spreading = None Packet type = 3-DH5 Duty cycle = 78%
Receive	Mode = Scan mode
Comment: Test mode selection is based on pre-compliance measurement of output power of all operational modes. The operational modes with the highest output power were selected for compliance tests.	

1.5 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Tx / Rx	0	2402
F2	Tx / Rx	40	2442
F3	Tx / Rx	78	2480

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)(1) ISED RSS-247 § 5.1 Issue 3	20 dB Bandwidth	ANSI C63.10-2013	N/T	1
FCC § 15.247(a)(1)(iii) ISED RSS-247, Issue 3 (section 5.1)	Number of hopping frequencies	ANSI C63.10-2013	N/R	For FHSS only
FCC § 15.247(a)(1) ISED RSS-247, Issue 3 (section 5.1)	Frequency hopping channel separation	ANSI C63.10-2013	N/R	For FHSS only
FCC § 15.247(a)(1)(iii) ISED RSS-247, Issue 3 (section 5.1)	Time of occupancy (Dwell time)	ANSI C63.10-2013	N/R	For FHSS only
FCC § 15.247(b) ISED RSS-247, Issue 3 (section 5.4)	Maximum peak conducted power	ANSI C63.10-2013	N/T	1
FCC § 15.207 ISED RSS-247, Issue 3 (section 3.1)	AC power line conducted emissions	ANSI C63.10-2013	PASS	--
FCC § 15.247(d) ISED RSS-247, Issue 3 (section 5.5)	Band edge compliance	ANSI C63.10-2013	N/T	1
FCC § 15.247(d) ISED RSS-247, Issue 3 (section 5.5)	Conducted spurious emissions	ANSI C63.10-2013	N/T	1
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 3 (section 3.1)	Receiver radiated spurious emissions	ANSI C63.4-2014	PASS	--
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. 1 → see module report G0M-1410-4214-TFC247BT-V01 from Eurofins Product Service GmbH, Issue date 2015-05-12				

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 - AC powerline conducted emissions

3.1.1 Information

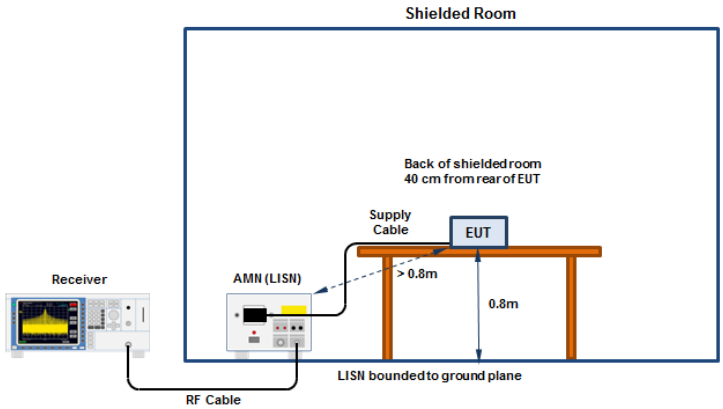
Test Information	
Reference	FCC § 15.207; ISED RSS-247, Issue 3 (section 3.1)
Measurement Method	ANSI C63.10 6.2
Measurement Uncertainty	± 3.82 dB
Operator	Mr. Liebich
Date	2022-10-24

3.1.2 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		

3.1.3 Setup

Test Setup



3.1.4 Equipment

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

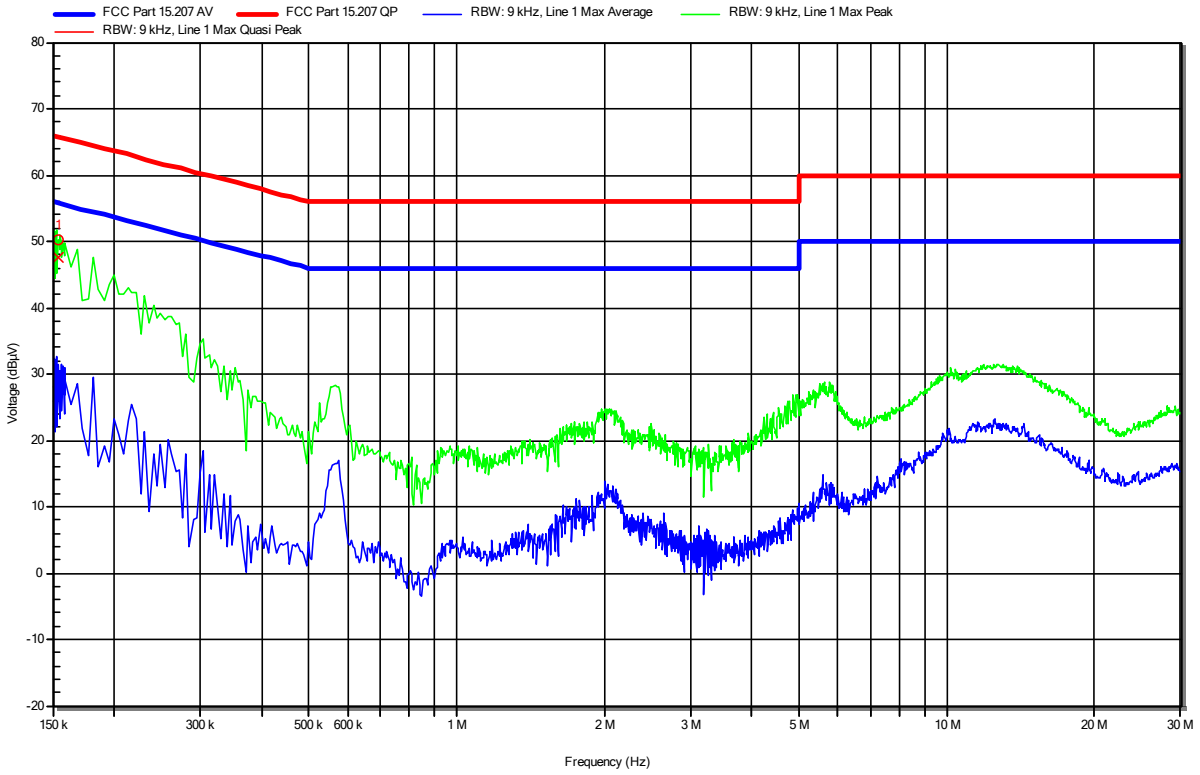
Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	R&S	ESR7	EF00943	2022-07	2023-07
Pulse Limiter	R&S	ESH3-Z2	EF01222	2021-07	2023-07
LISN	Schwarzbeck	NSLK 8127 RC	EF01592	2021-07	2023-07

Conducted emissions at the mains power port according to FCC 47 CFR 15.207

Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems AG
Model Description:	Field Controller Win EC7
Model:	CS20 Basic
Test Sample ID:	41411
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Date:	2022-10-24
Operating Conditions:	ambient temperature: 22 °Celsius power input: 15 V DC via dedicated AC/DC-adapter by 110 V AC / 60 Hz
LISN:	Schwarzbeck NSLK 8127 RC L1
Operational Mode: EUT Configuration:	Bluetooth link to GNSS System + Bluetooth-LR link to Motorized Imaging Total Station + WLAN link to WLAN access point
Applied to Port:	L1
Note 1:	Charging via dedicated AC/DC-adapter (GEV276)

Index 16

RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	154.05 kHz	47.66 dBµV	65.78 dBµV	-18.12 dB	Pass	Line 1

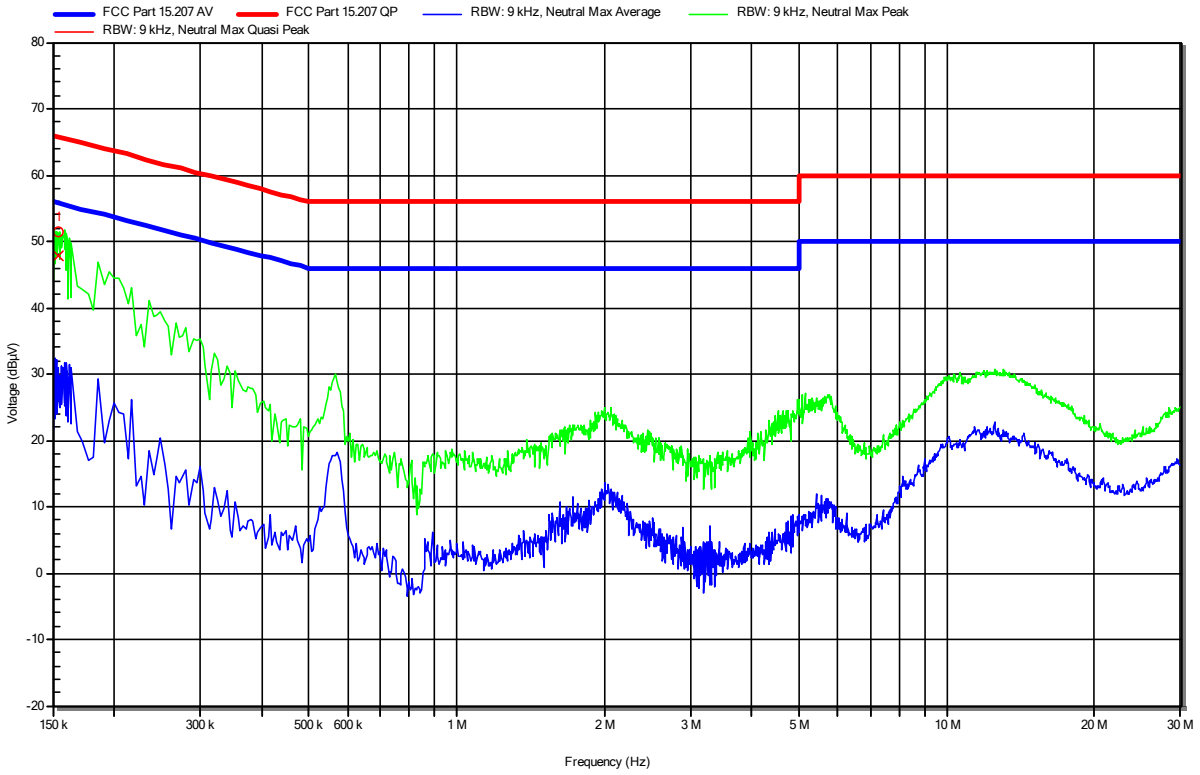
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	154.05 kHz	28.92 dBµV	55.78 dBµV	-26.86 dB	Pass	Line 1

Conducted emissions at the mains power port according to FCC 47 CFR 15.207

Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems AG
Model Description:	Field Controller Win EC7
Model:	CS20 Basic
Test Sample ID:	41411
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Date:	2022-10-24
Operating Conditions:	ambient temperature: 22 °Celsius power input: 15 V DC via dedicated AC/DC-adapter by 110 V AC / 60 Hz
LISN:	Schwarzbeck NSLK 8127
Operational Mode: EUT Configuration:	Bluetooth link to GNSS System + Bluetooth-LR link to Motorized Imaging Total Station + WLAN link to WLAN access point
Applied to Port:	N
Note 1:	Charging via dedicated AC/DC-adapter (GEV276)

Index 15

RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	154.5 kHz	47.93 dBµV	65.75 dBµV	-17.83 dB	Pass	Neutral

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	154.5 kHz	29.32 dBµV	55.75 dBµV	-26.44 dB	Pass	Neutral

3.1.5 Setup Photos

TEST SETUP - AC Mains


3.2 Test Conditions and Results - Transmitter radiated emissions

3.2.1 Information

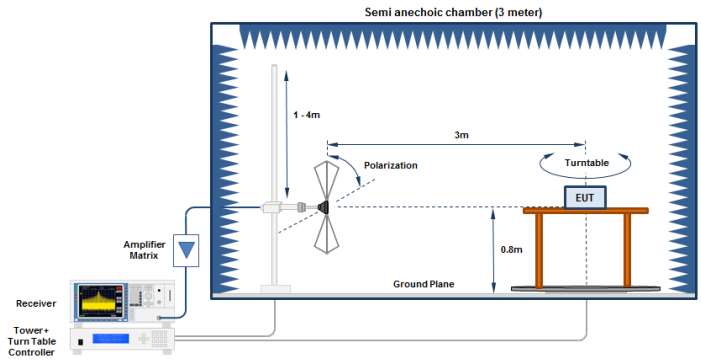
Test Information	
Reference	FCC § 15.247(d); FCC § 15.209; ISED RSS-Gen, Issue 5 A2 (section 6.13)
Measurement Uncertainty	± 5.95 dB
Measurement Method	ANSI C63.10 6.4, 6.5, 6.6
Operator	Burkhard Pudell
Date	2022-10-10

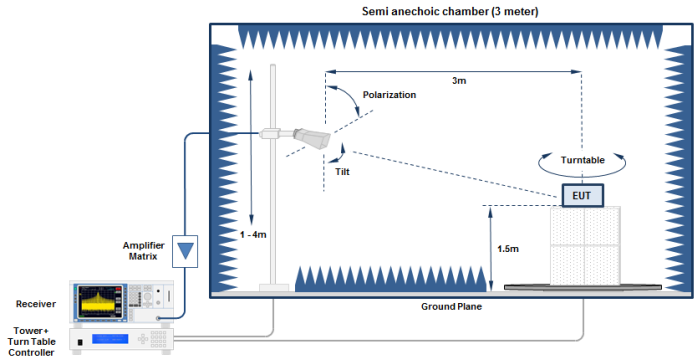
3.2.2 Limits

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

3.2.3 Setup

Test Setup 30 MHz - 1000 MHz



Test Setup > 1 GHz


3.2.4 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	functional test	functional test
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	EF00212	2022-08	2025-08

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic chamber	Frankonia	AC 2	EF01616	functional test	functional test
Spectrum analyzer	R&S	FSU43	EF01631	2022-08	2023-08
Horn antenna	Schwarzbeck	BBHA 9120B	EF01678	2021-03	2024-03
Horn Antenna	Schwarzbeck	HWRD 650	EF01679	2021-03	2024-03
Horn Antenna	Amplifier Research	AT4560	EF00302	2021-06	2023-06
Horn Antenna	Flann Microwave Ltd	22240-25	EF00301	2019-12	2022-12

3.2.5 Procedure

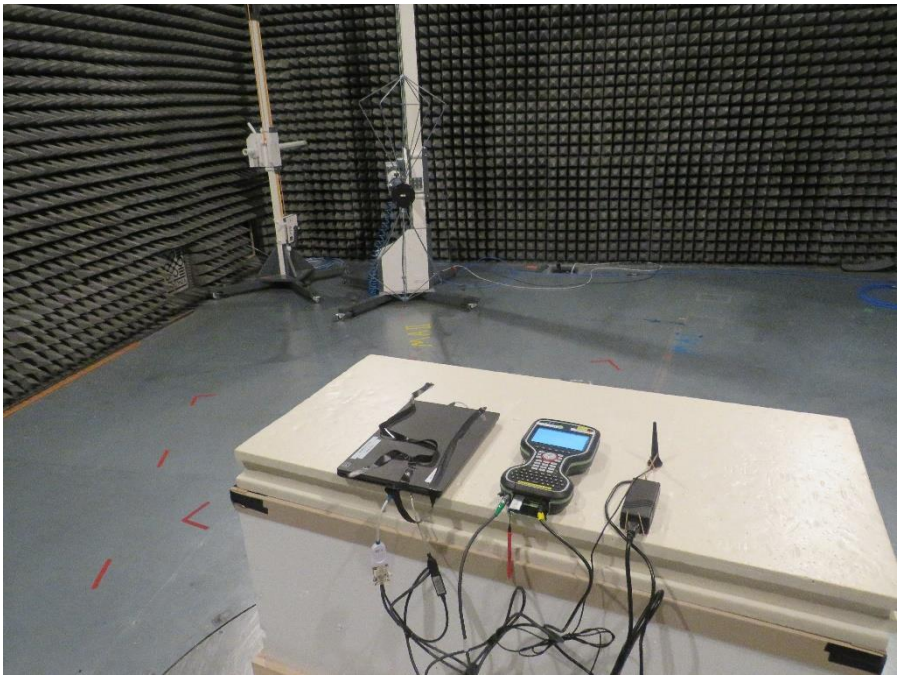
Test Procedure 30 MHz - 1000 MHz
1. EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground
2. EUT set to test mode
3. The receiver is set to peak detection with max hold
4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m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

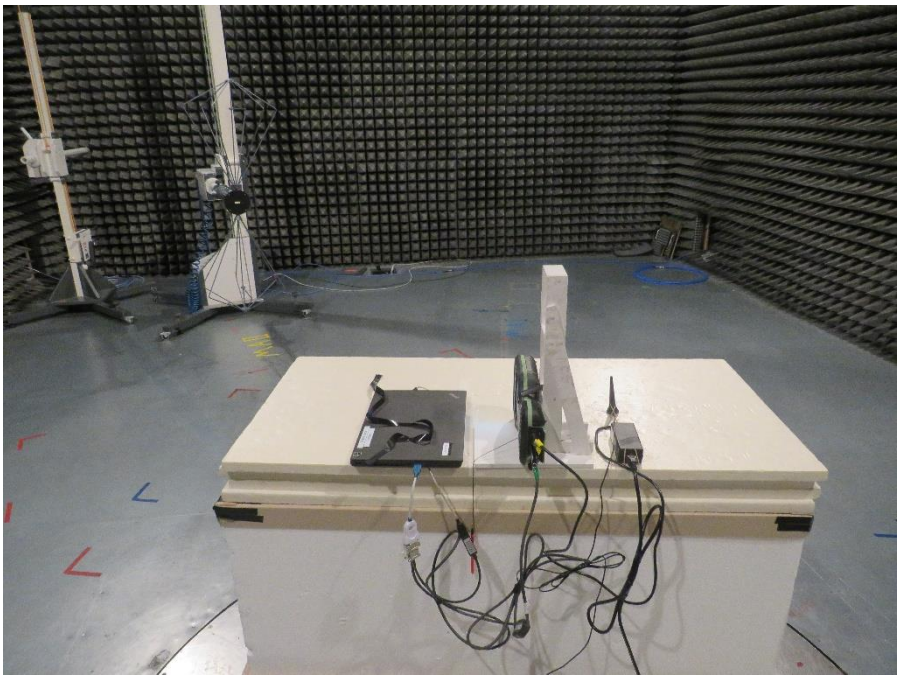
Test Procedure > 1 GHz
1. EUT is placed on a non conducting support at the center of a turn table 1.5 m above the ground
2. EUT set to test mode
3. The receiver is set to peak detection with max hold
4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m
5. All significant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

3.2.6 Results

Test Results - 3-DH5						
Channel [MHz]	Emission [MHz]	Level [dBµV/m]	Det.	Pol.	Limit [dBµV/m]	Margin [dB]
2402	134.1845	32.30	pk	hor	43.50	-11.21
2402	134.1845	27.00	qpk	hor	43.50	-16.52
2402	409.7	35.60	pk	ver	46.00	-10.44
2442	4882.5	37.88	avg	ver	54.00	-16.12
2480	No significant spurious emissions					

3.2.7 Setup Photos

Testsetup below 1 GHz


Testsetup below 1 GHz


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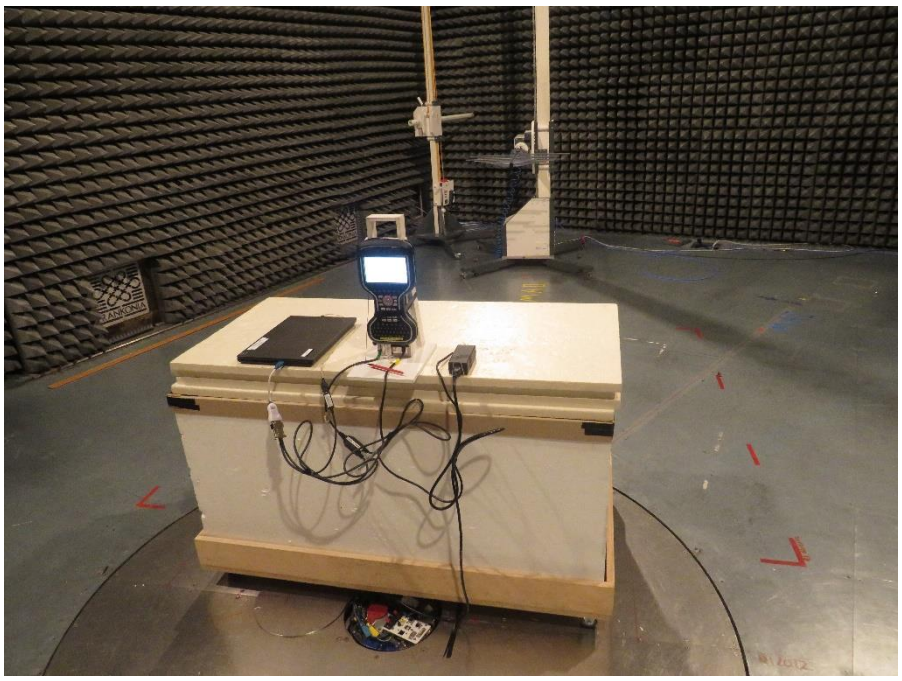
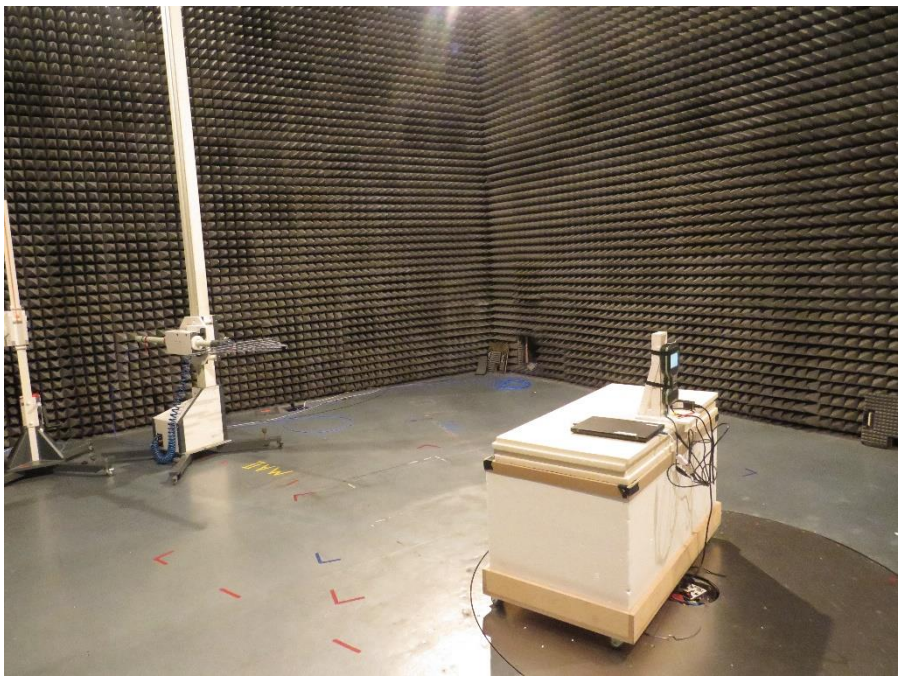
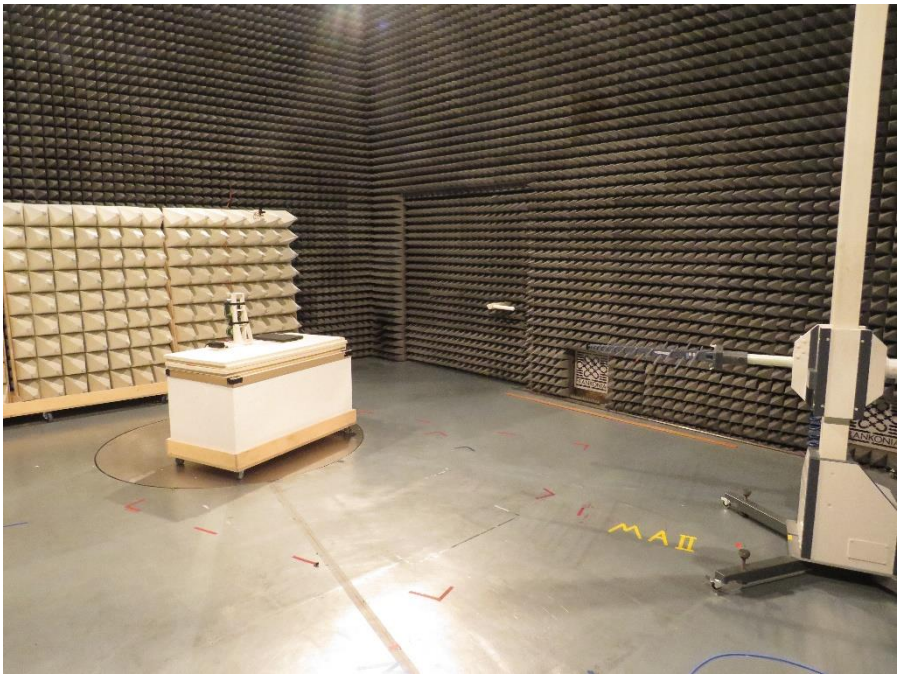
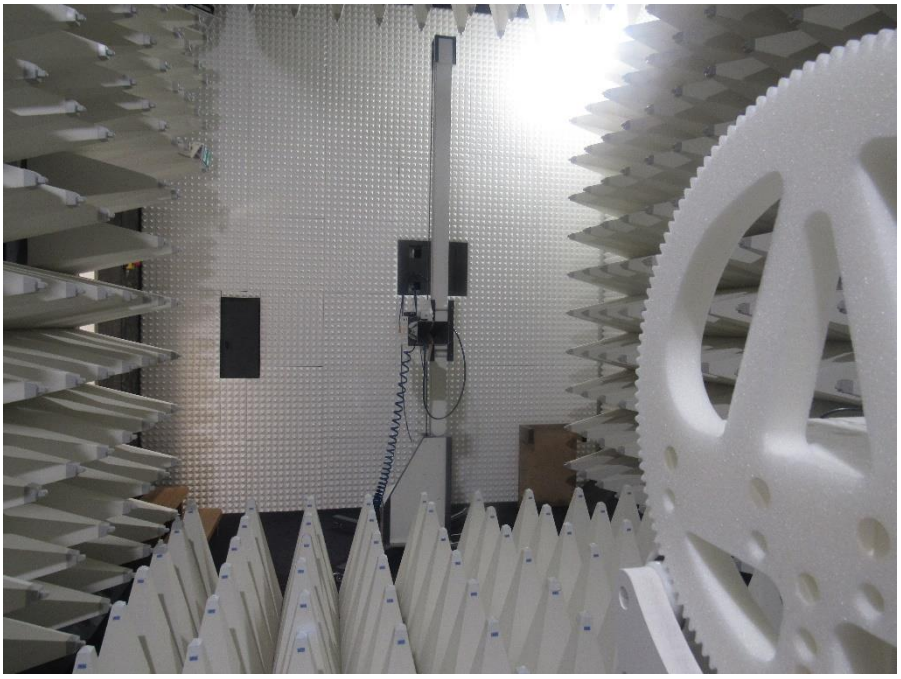


Testsetup below 1 GHz


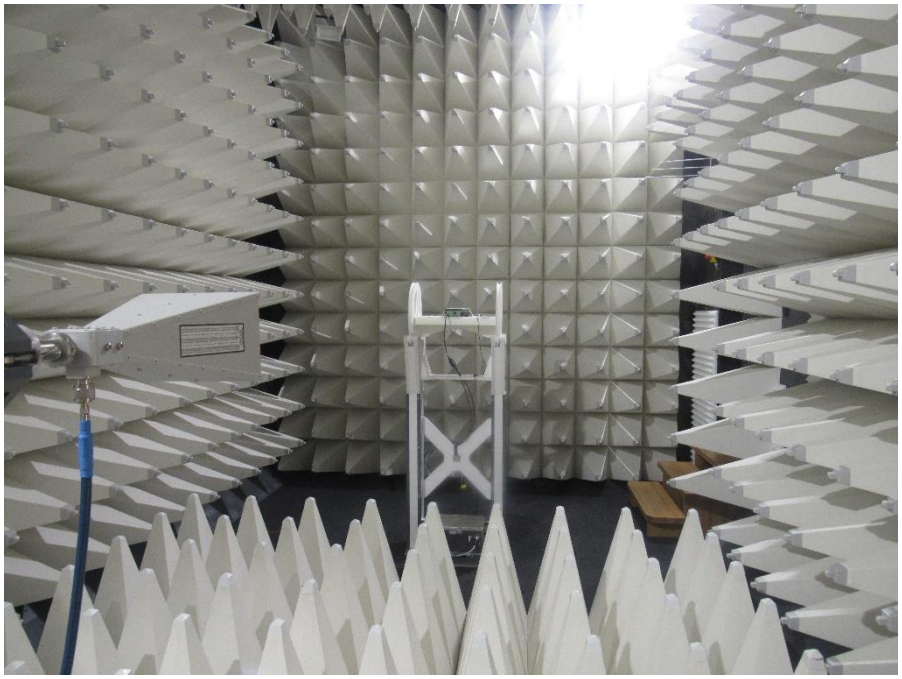
Testsetup below 1 GHz



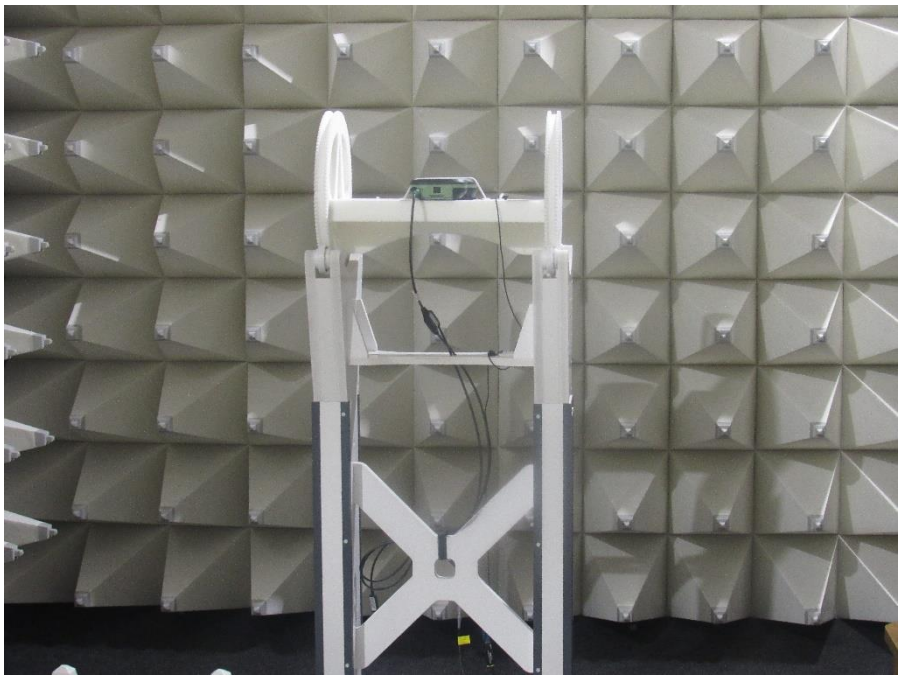
Testsetup above 1 GHz



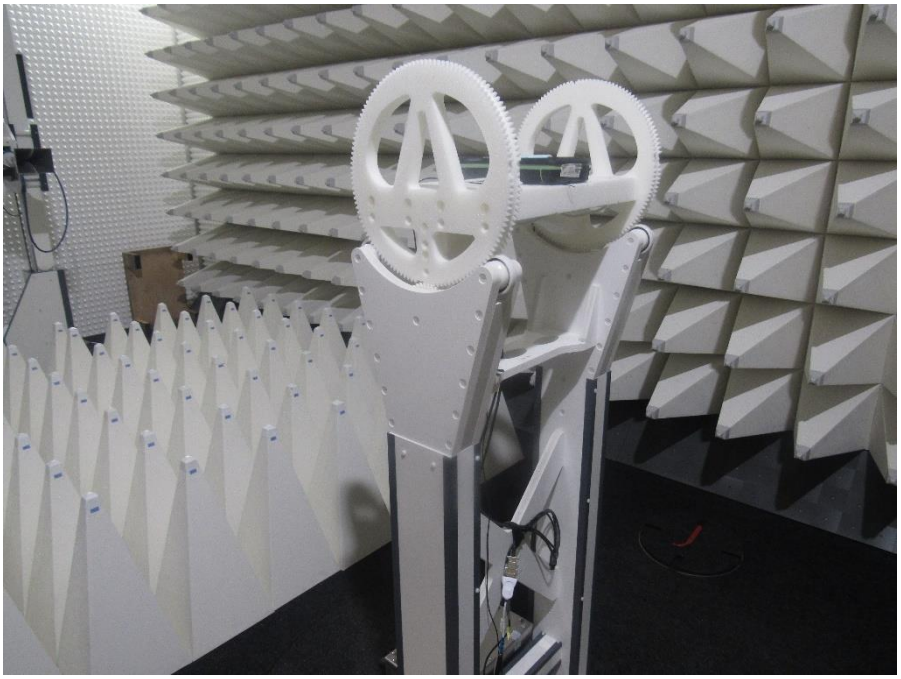
Testsetup above 1 GHz



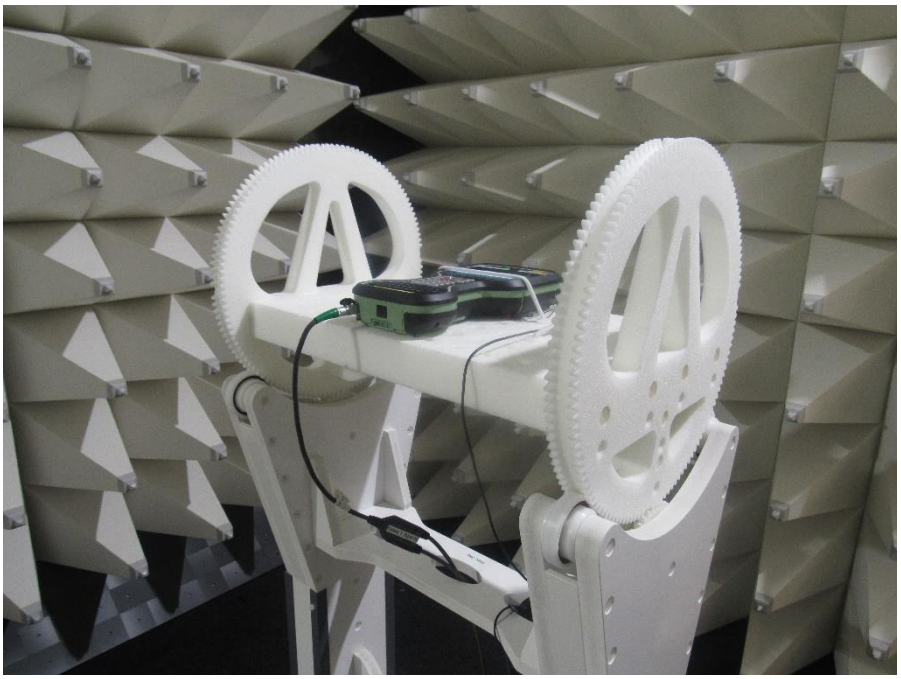
Testsetup above 1 GHz



Testsetup above 1 GHz



Testsetup above 1 GHz



3.3 Test Conditions and Results - Receiver radiated emissions

3.3.1 Information

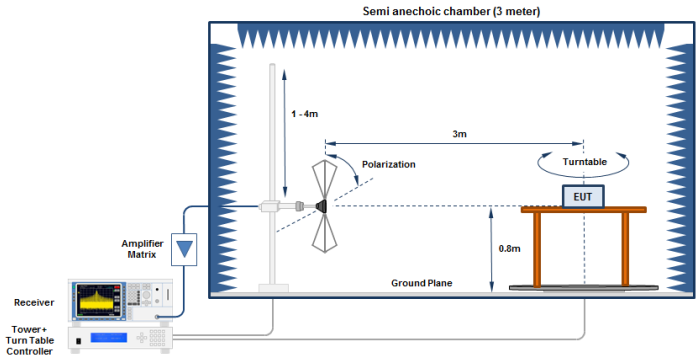
Test Information	
Reference	ISED RSS-247, Issue 3 (section 3.1)
Measurement Uncertainty	± 5.95 dB
Measurement Method	ANSI C63.4-2014 8.1-8.3
Operator	Florian Voigt
Date	2022-10-21

3.3.2 Limits

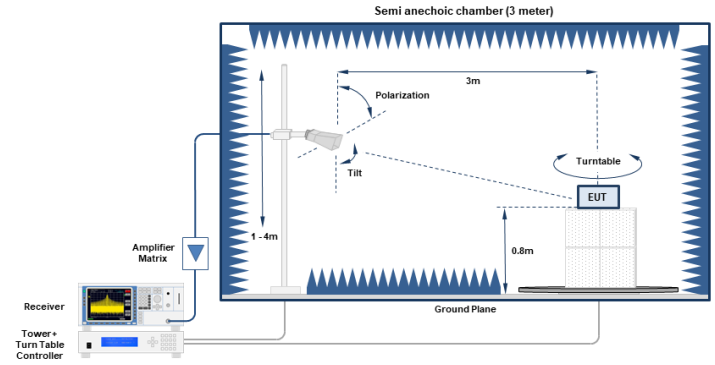
Limits			
Frequency range [MHz]	Detector	Field strength [µV/m]	Measurement distance [m]
30 - 88	Quasi-Peak	100	3
88 - 216	Quasi-Peak	150	3
216 - 960	Quasi-Peak	200	3
960 - 1000	Quasi-Peak	500	3
>1000	Average	500	3

3.3.3 Setup

Test Setup 30 MHz - 1000 MHz



Test Setup > 1 GHz



3.3.4 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	EF01011	functional test	functional test
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	EF00212	2022-08	2025-08

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF01011	functional test	functional test
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2021-07	2023-01
Horn antenna	Schwarzbeck	BBHA 9120D	EF00019	2020-11	2022-11
Horn antenna	Schwarzbeck	HWRD 650	EF01679	2021-03	2024-03

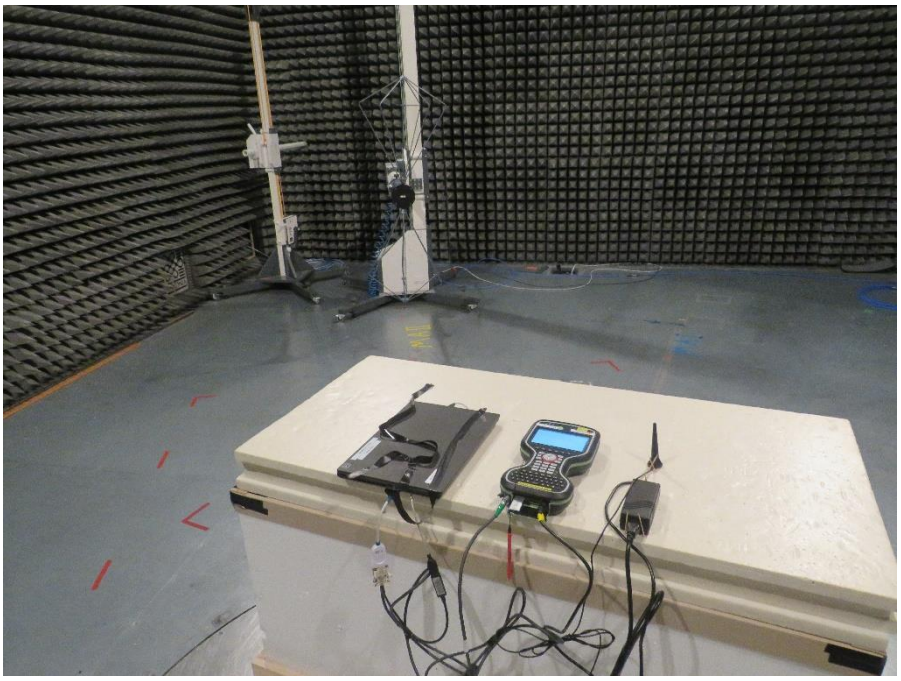
3.3.5 Procedure

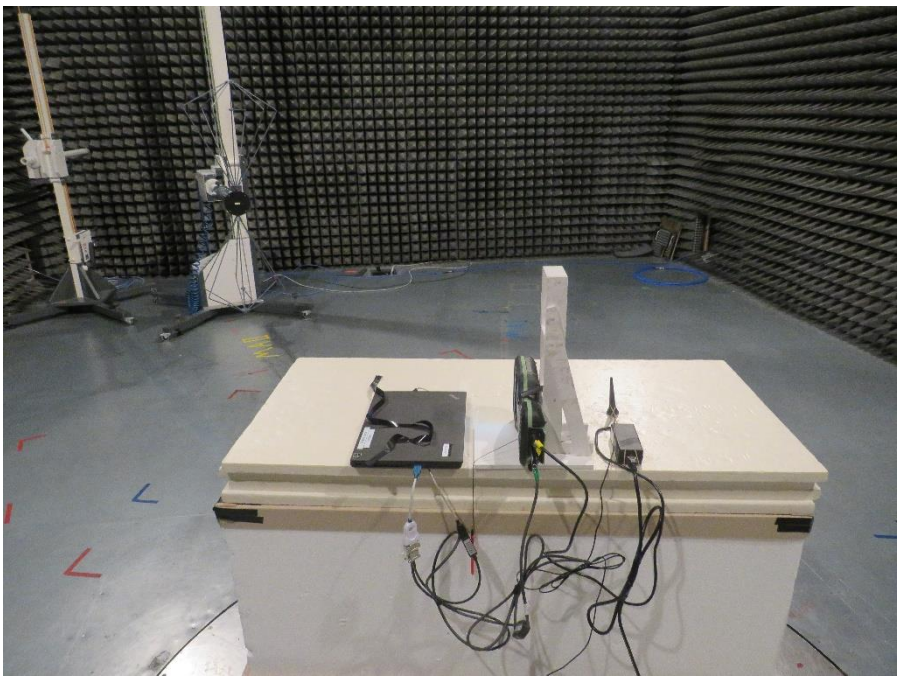
Test Procedure
1. EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground
2. EUT is set to test mode
3. The receiver is set to peak detection with max hold
4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m
5. All significant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

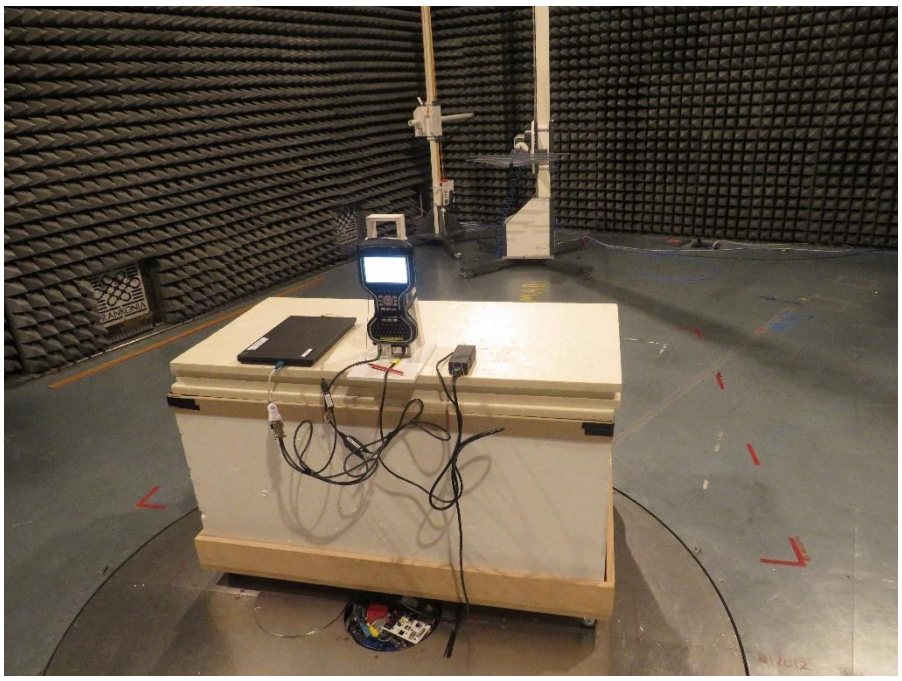
3.3.6 Results

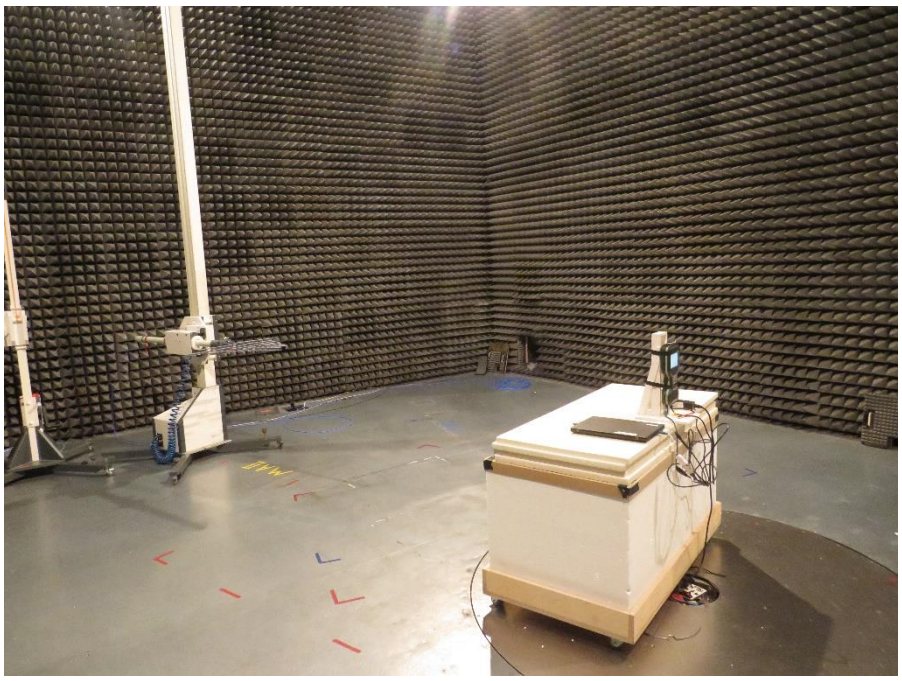
Test Results						
Channel [MHz]	Emission [MHz]	Level [dBµV/m]	Det.	Pol.	Limit [dBµV/m]	Margin [dB]
Scan mode	30.0425	28.60	qpk	hor	40.00	-11.36
Scan mode	30.5396	39.00	qpk	hor	40.00	-01.03
Scan mode	96.0195	33.30	qpk	hor	43.50	-10.24
Scan mode	103.593	31.30	qpk	ver	43.50	-12.20
Scan mode	2600	37.79	avg	hor	53.98	-16.19
Scan mode	4919	42.42	avg	hor	53.98	-11.56

3.3.7 Setup Photos

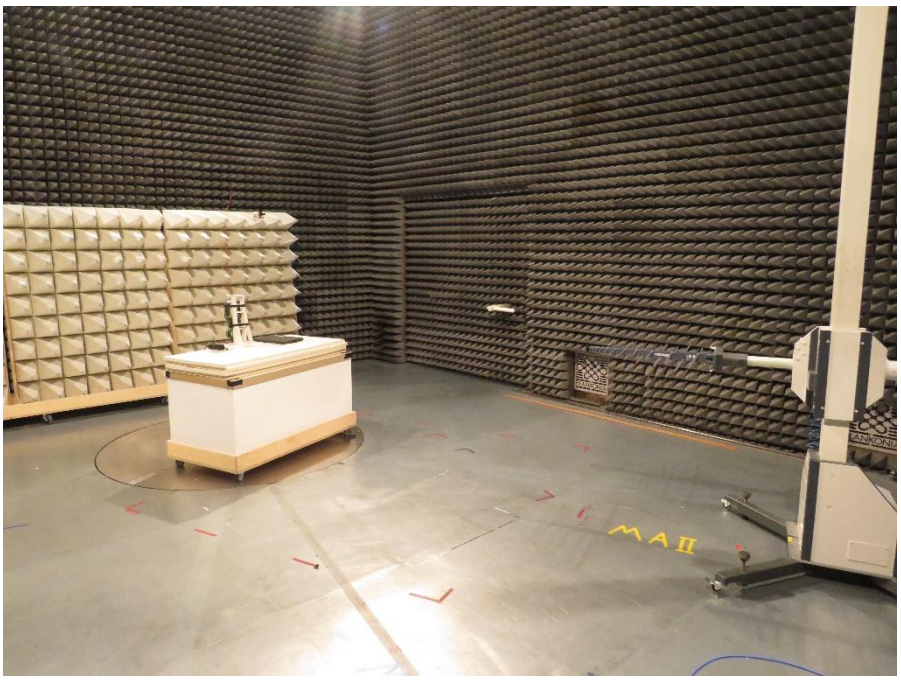
Testsetup below 1 GHz


Testsetup below 1 GHz


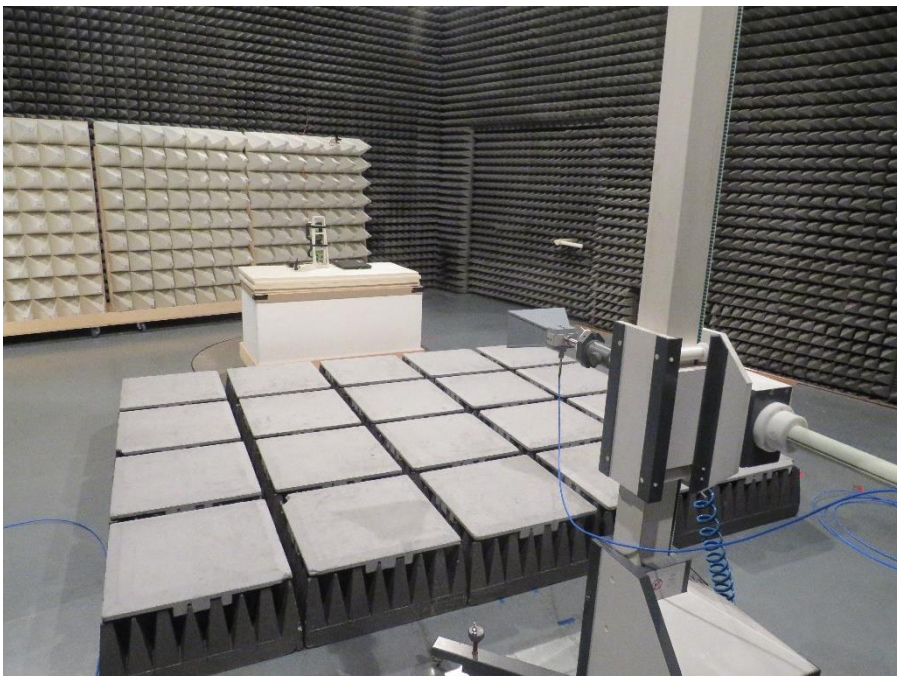
Testsetup below 1 GHz


Testsetup below 1 GHz


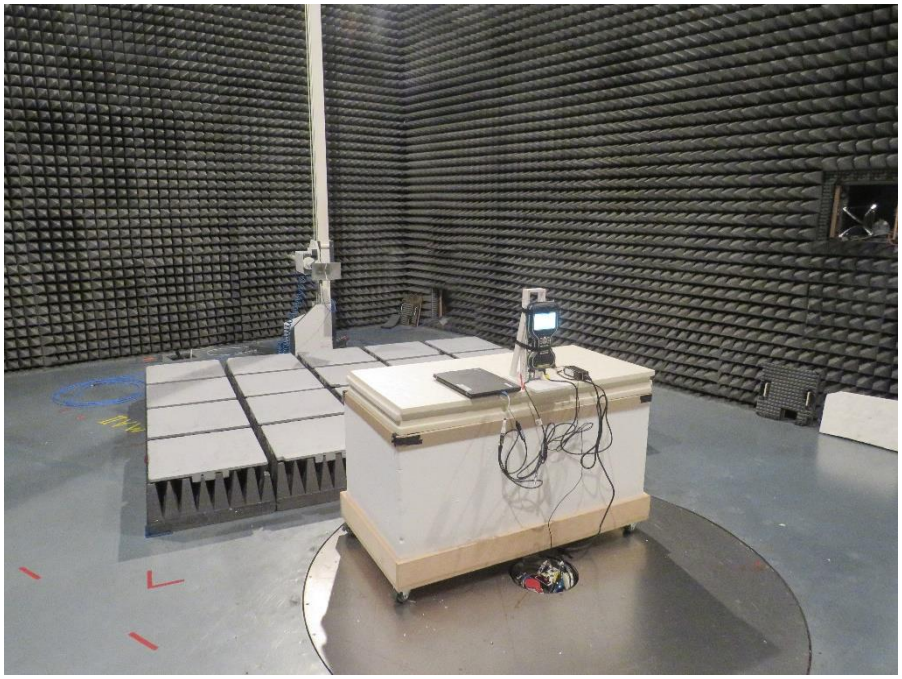
Testsetup below 1 GHz



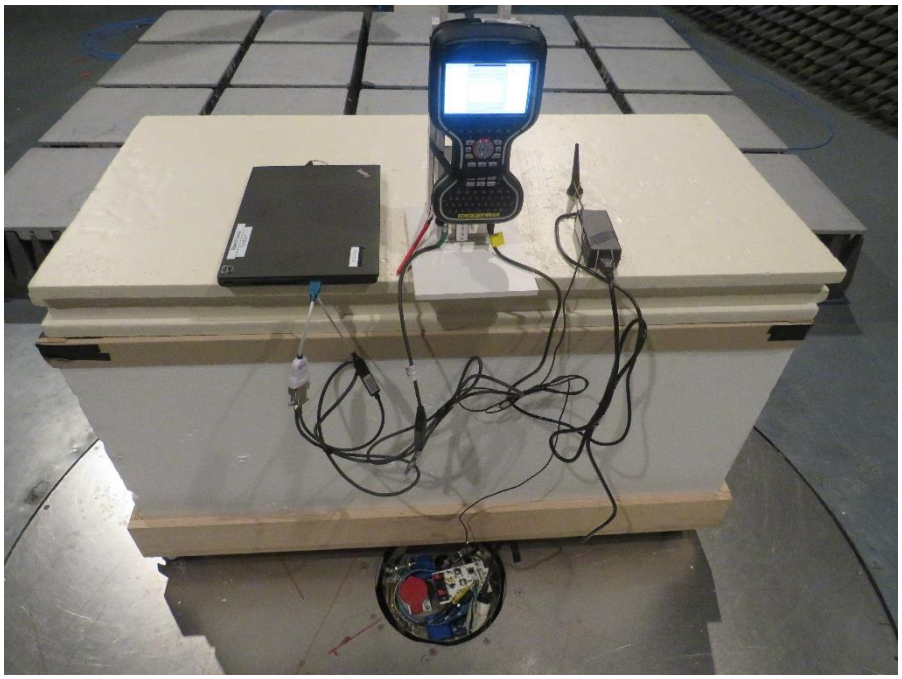
Testsetup above 1 GHz



Testsetup above 1 GHz



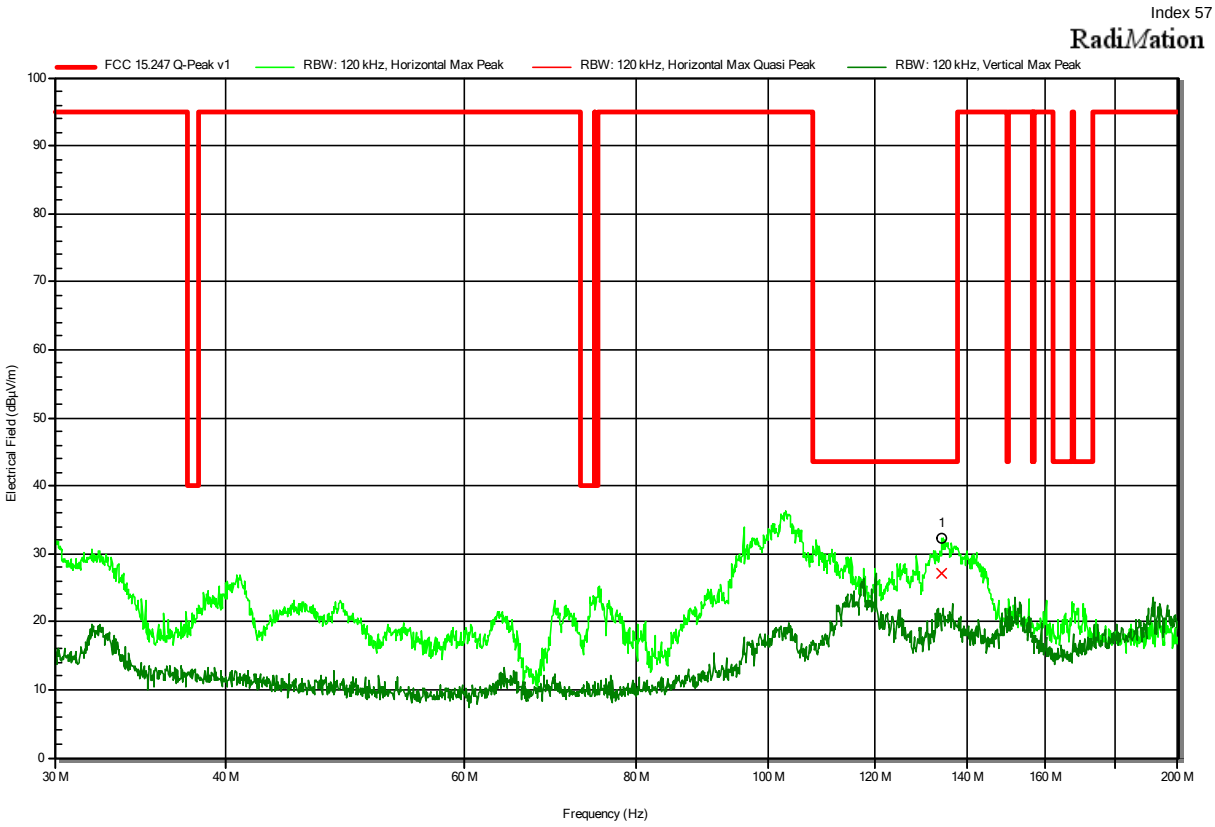
Testsetup above 1 GHz



ANNEX A Transmitter spurious emissions

Radiated Spurious Emissions according to 47 CFR Part 15.247, RSS-247, Issue 3

Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems Technologies Pte Ltd
Model Description:	Field Controller Win EC7
Model:	CS20 Basic (Amber)
Test Sample ID:	41411 (SN: 2495073)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 120V AC (intern 11.1 V DC)
Antenna:	Rohde & Schwarz HK 116
Measurement distance:	3 m
Mode:	Tx; BT-EDR_CH 0 (2402 MHz)_8-DPSK_3-DH5_PN9_DUT-mode
Test Date:	2022-10-21
Note:	

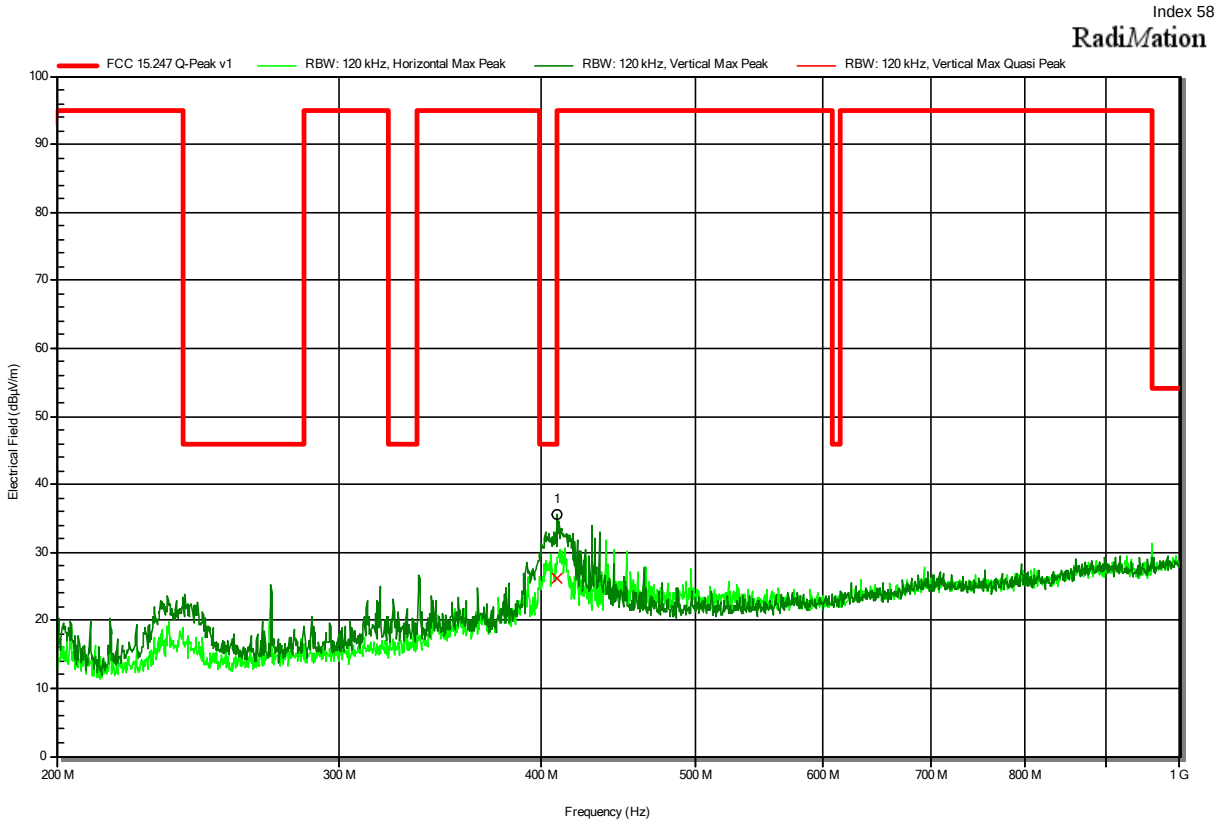


Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
134.1845 MHz	32.3 dBµV/m	43.5 dBµV/m	-11.21 dB	Pass	Horizontal

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Polarization
134.1845 MHz	27 dBµV/m	43.5 dBµV/m	-16.52 dB	Pass	Horizontal

Radiated Spurious Emissions according to 47 CFR Part 15.247, RSS-247, Issue 3

Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems Technologies Pte Ltd
Model Description:	Field Controller Win EC7
Model:	CS20 Basic (Amber)
Test Sample ID:	41411 (SN: 2495073)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 120V AC (intern 11.1 V DC)
Antenna:	Rohde & Schwarz HL 223
Measurement distance:	3 m
Mode:	Tx; BT-EDR_CH 0 (2402 MHz)_8-DPSK_3-DH5_PN9_DUT-mode
Test Date:	2022-10-21
Note:	EUT horizontal

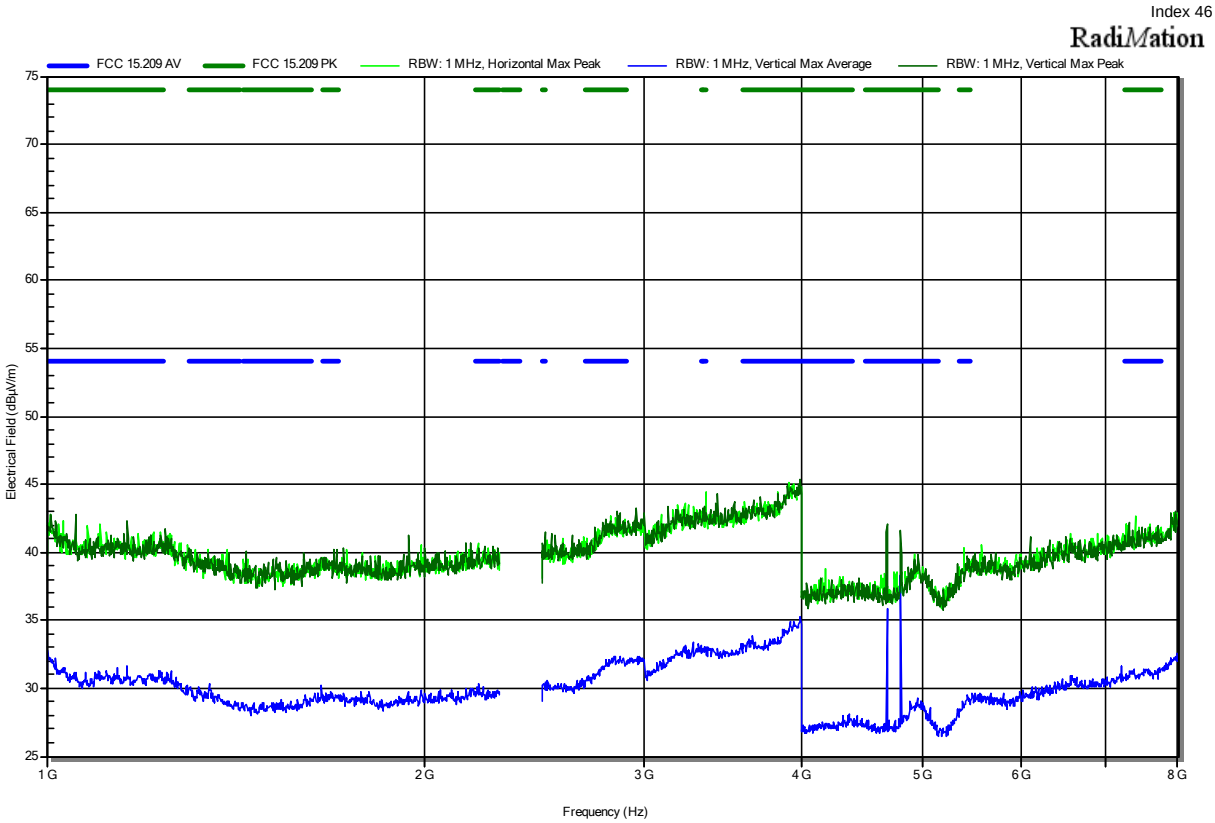


Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
409.7 MHz	35.6 dBµV/m	46 dBµV/m	-10.44 dB	Pass	Vertical

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Polarization
409.7 MHz	26.1 dBµV/m	46 dBµV/m	-19.89 dB	Pass	Vertical

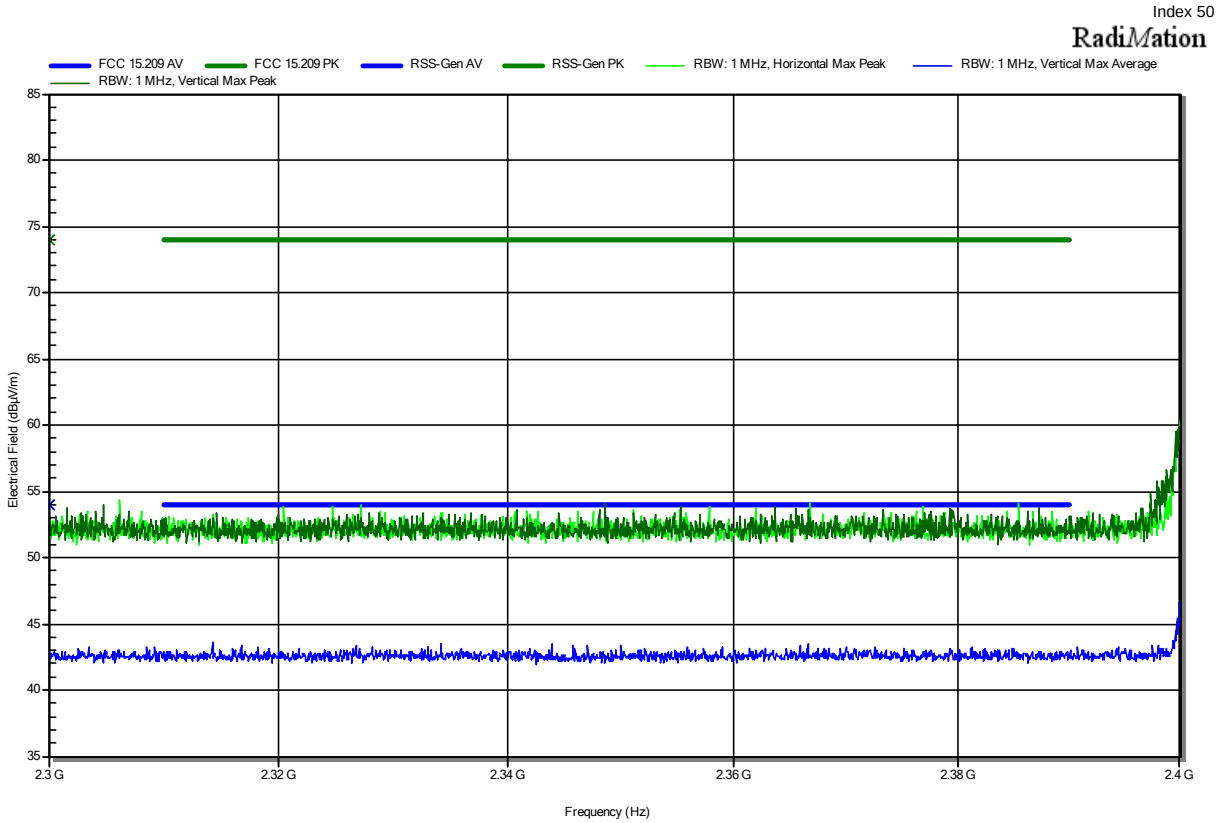
Radiated Spurious Emissions according to 47 CFR Part 15.247, RSS-247, Issue 3

Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems Technologies Pte Ltd
Model Description:	Field Controller Win EC7
Model:	CS20 Basic (Amber)
Test Sample ID:	41411 (SN: 2495073)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 120V AC (intern 11.1 V DC)
Antenna:	Schwarzbeck BBHA 9120B
Measurement distance:	3 m
Mode:	Tx; BT-EDR_CH 0 (2402 MHz)_8-DPSK_3-DH5_PN9_DUT-mode
Test Date:	2022-10-10
Note:	EUT horizontal



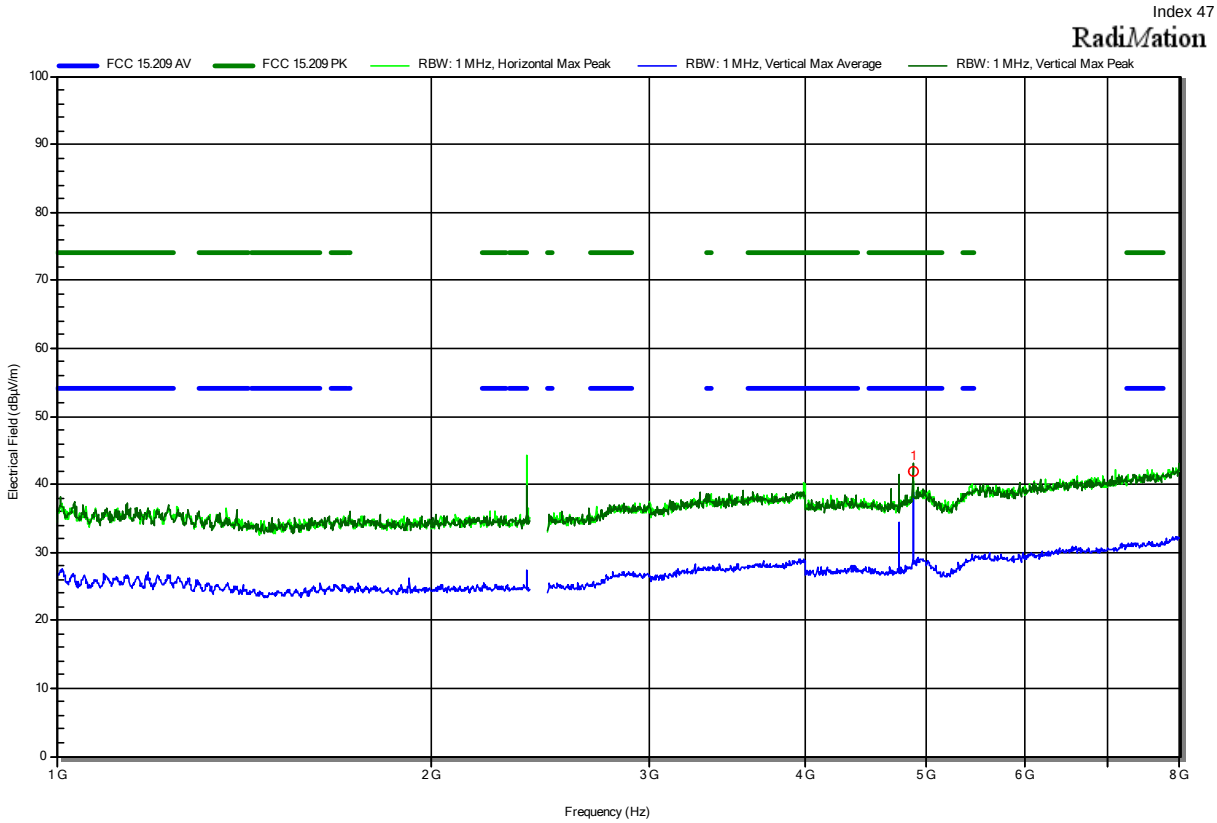
Radiated Spurious Emissions according to 47 CFR Part 15.247, RSS-247, Issue 3

Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems Technologies Pte Ltd
Model Description:	Field Controller Win EC7
Model:	CS20 Basic (Amber)
Test Sample ID:	41411 (SN: 2495073)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 120V AC (intern 11.1 V DC)
Antenna:	Schwarzbeck BBHA 9120B
Measurement distance:	3 m
Mode:	Tx; BT-EDR_CH 0 (2402 MHz)_8-DPSK_3-DH5_PN9_DUT-mode
Test Date:	2022-10-10
Note:	lower bandedge; EUT horizontal



Radiated Spurious Emissions according to 47 CFR Part 15.247, RSS-247, Issue 3

Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems Technologies Pte Ltd
Model Description:	Field Controller Win EC7
Model:	CS20 Basic (Amber)
Test Sample ID:	41411 (SN: 2495073)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 120V AC (intern 11.1 V DC)
Antenna:	Schwarzbeck BBHA 9120B
Measurement distance:	3 m
Mode:	Tx; BT-EDR_CH 40 (2442 MHz)_8-DPSK_3-DH5_PN9_DUT-mode
Test Date:	2022-10-10
Note:	EUT horizontal

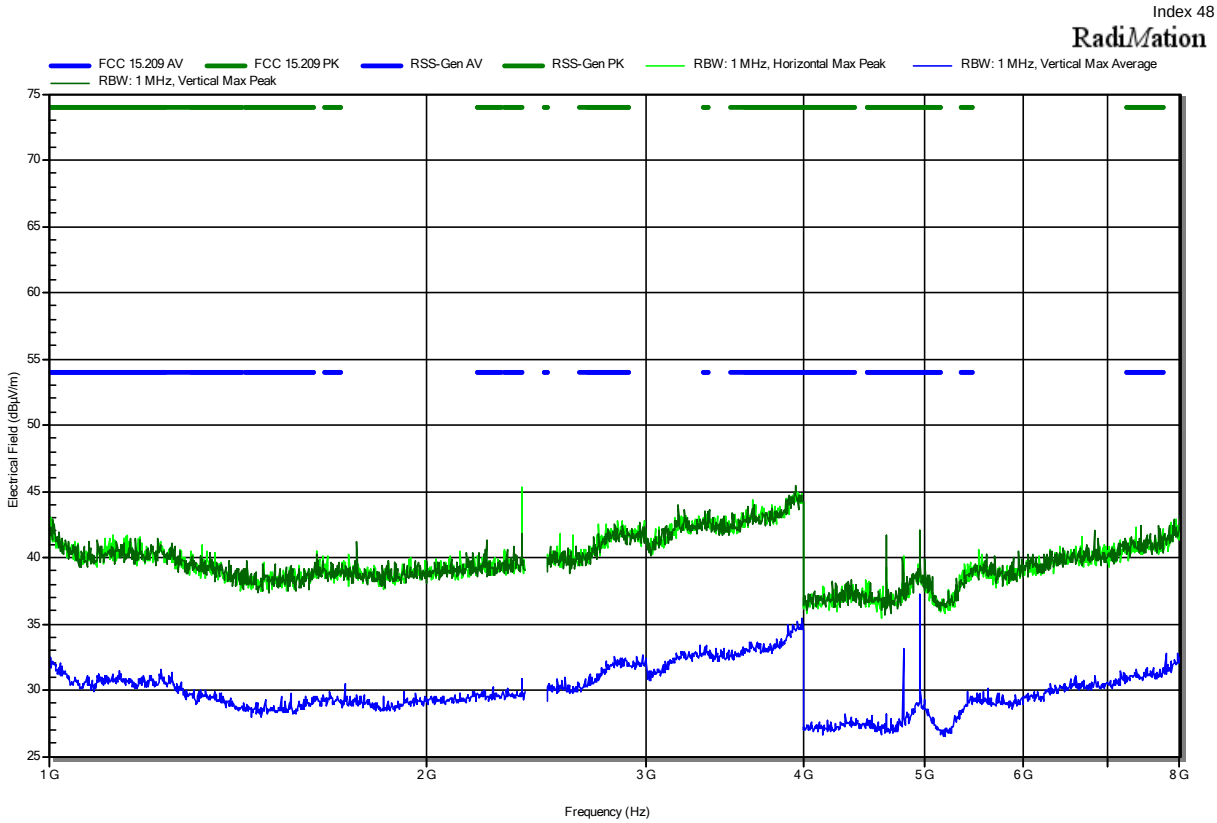


Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
4.8825 GHz	41.82 dBµV/m	74 dBµV/m	-32.18 dB	Pass	Vertical

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
4.8825 GHz	37.88 dBµV/m	54 dBµV/m	-16.12 dB	Pass	Vertical

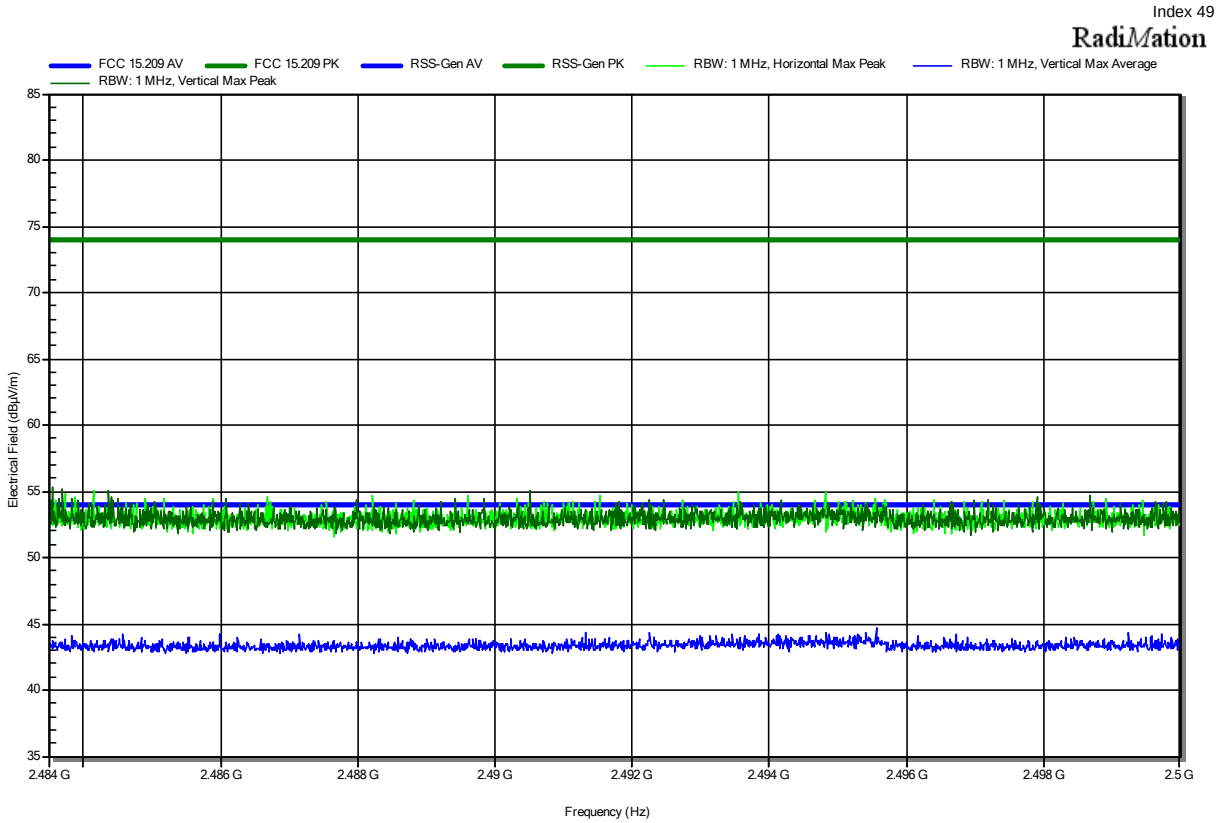
Radiated Spurious Emissions according to 47 CFR Part 15.247, RSS-247, Issue 3

Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems Technologies Pte Ltd
Model Description:	Field Controller Win EC7
Model:	CS20 Basic (Amber)
Test Sample ID:	41411 (SN: 2495073)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 120V AC (intern 11.1 V DC)
Antenna:	Schwarzbeck BBHA 9120B
Measurement distance:	3 m
Mode:	Tx; BT-EDR_CH 78 (2480 MHz)_8-DPSK_3-DH5_PN9_DUT-mode
Test Date:	2022-10-10
Note:	EUT horizontal



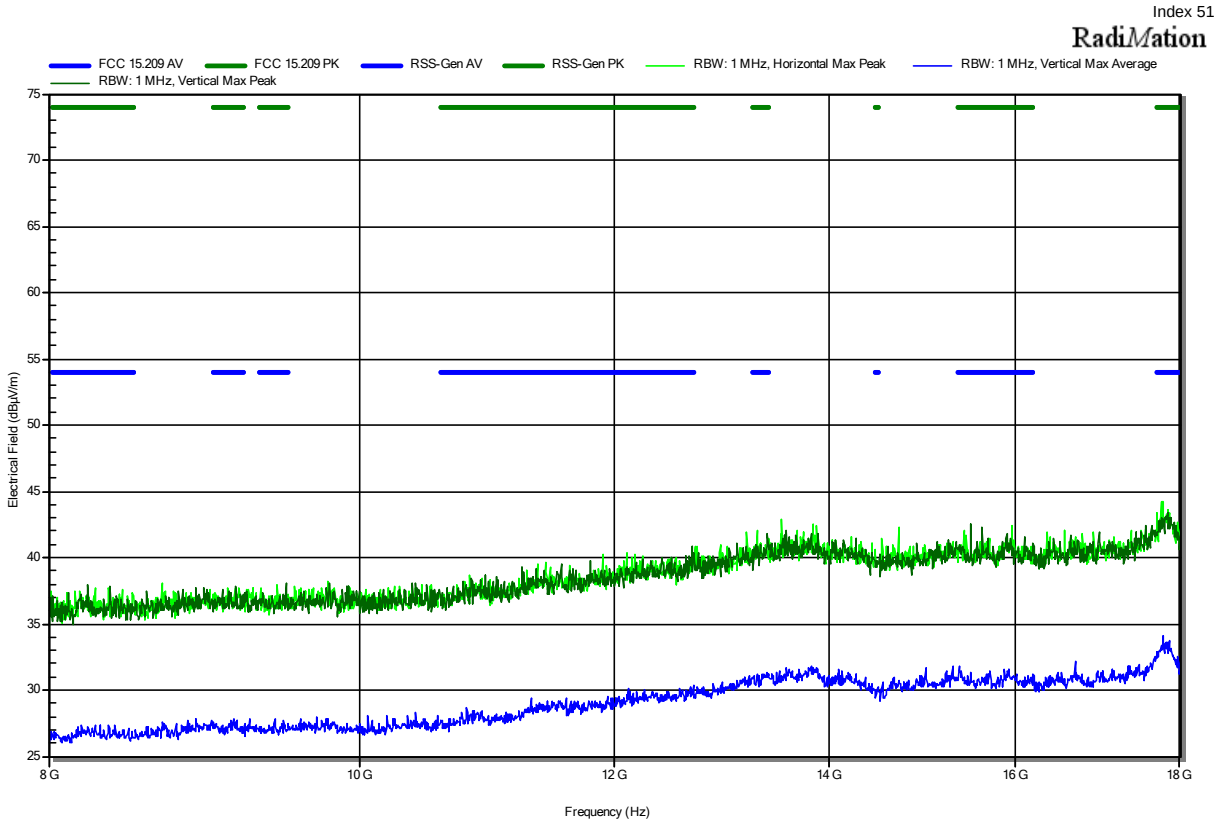
Radiated Spurious Emissions according to 47 CFR Part 15.247, RSS-247, Issue 3

Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems Technologies Pte Ltd
Model Description:	Field Controller Win EC7
Model:	CS20 Basic (Amber)
Test Sample ID:	41411 (SN: 2495073)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 120V AC (intern 11.1 V DC)
Antenna:	Schwarzbeck BBHA 9120B
Measurement distance:	3 m
Mode:	Tx; BT-EDR_CH 78 (2480 MHz)_8-DPSK_3-DH5_PN9_DUT-mode
Test Date:	2022-10-10
Note:	upper bandedge; EUT horizontal



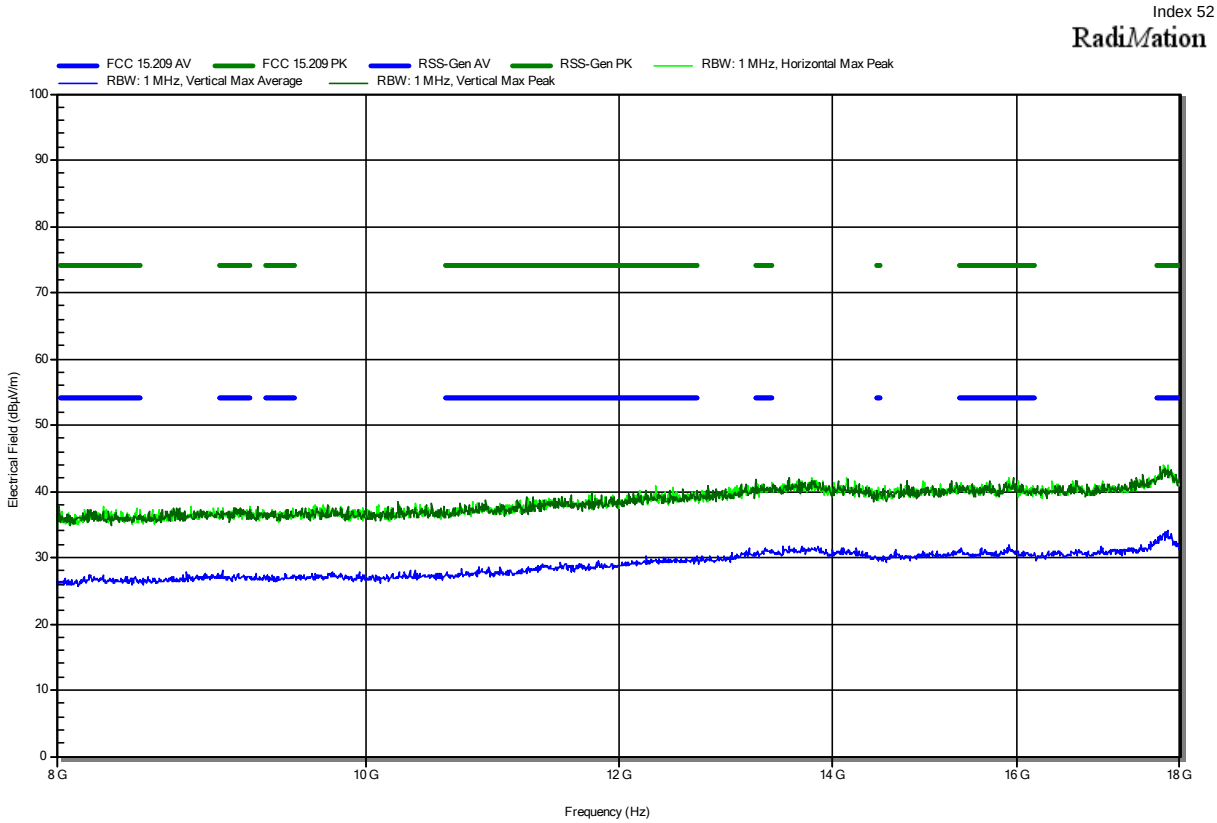
Radiated Spurious Emissions according to 47 CFR Part 15.247, RSS-247, Issue 3

Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems Technologies Pte Ltd
Model Description:	Field Controller Win EC7
Model:	CS20 Basic (Amber)
Test Sample ID:	41411 (SN: 2495073)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 120V AC (intern 11.1 V DC)
Antenna:	Schwarzbeck HWRD 650
Measurement distance:	3 m
Mode:	Tx; BT-EDR_CH 0 (2402 MHz)_8-DPSK_3-DH5_PN9_DUT-mode
Test Date:	2022-10-10
Note:	EUT horizontal



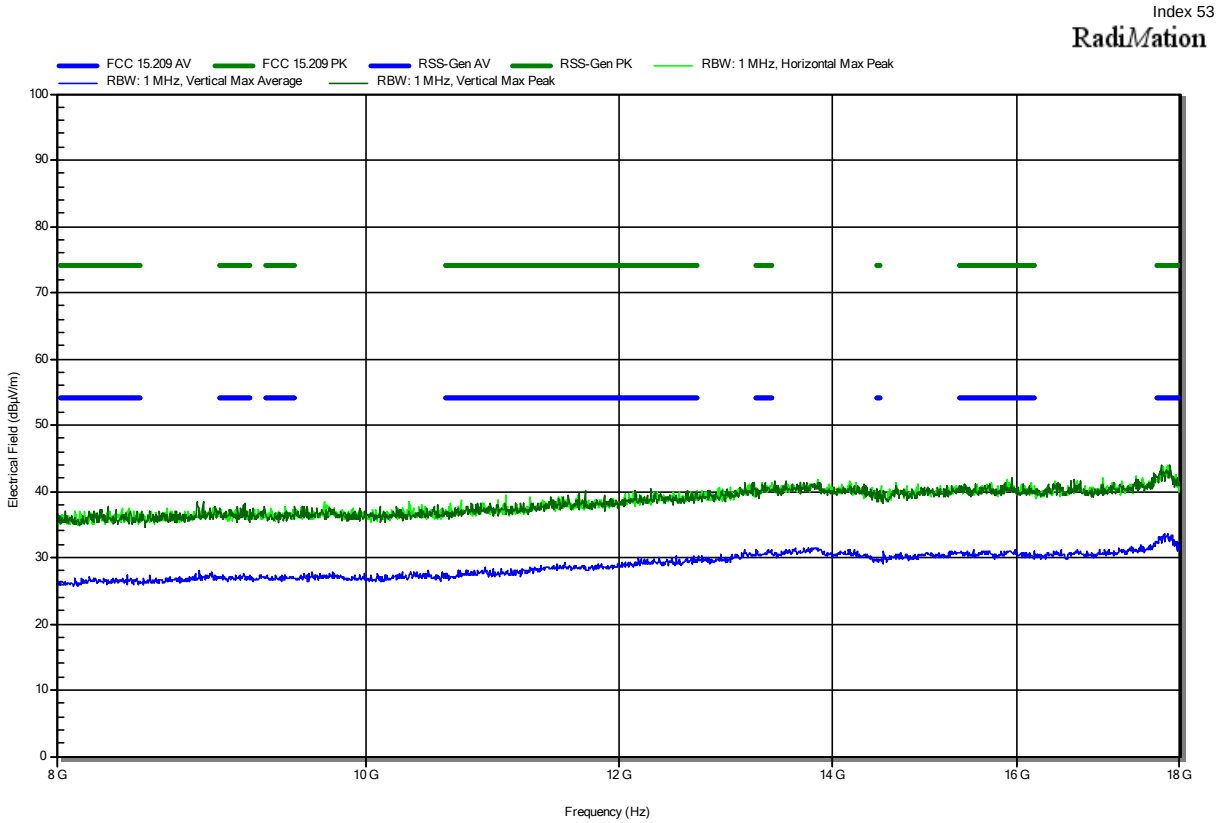
Radiated Spurious Emissions according to 47 CFR Part 15.247, RSS-247, Issue 3

Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems Technologies Pte Ltd
Model Description:	Field Controller Win EC7
Model:	CS20 Basic (Amber)
Test Sample ID:	41411 (SN: 2495073)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 120V AC (intern 11.1 V DC)
Antenna:	Schwarzbeck HWRD 650
Measurement distance:	3 m
Mode:	Tx; BT-EDR_CH 40 (2442 MHz)_8-DPSK_3-DH5_PN9_DUT-mode
Test Date:	2022-10-10
Note:	EUT horizontal



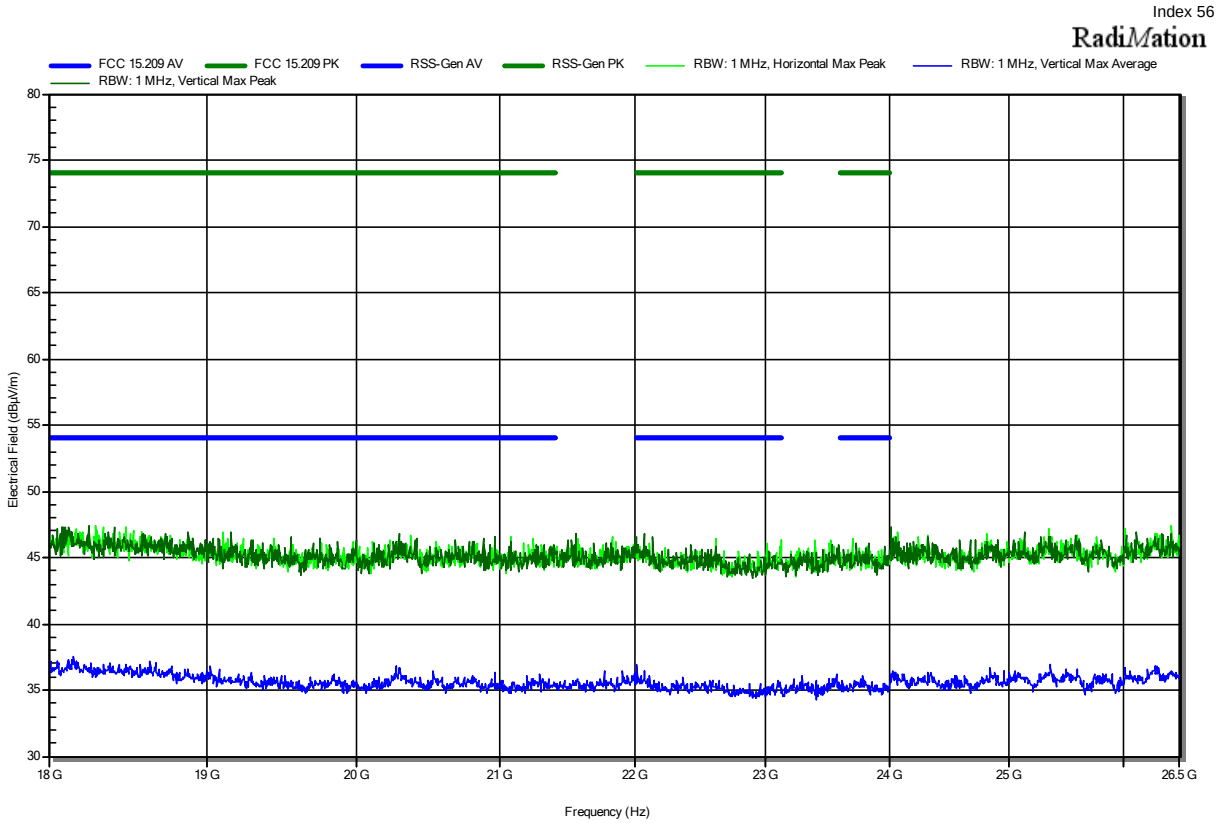
Radiated Spurious Emissions according to 47 CFR Part 15.247, RSS-247, Issue 3

Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems Technologies Pte Ltd
Model Description:	Field Controller Win EC7
Model:	CS20 Basic (Amber)
Test Sample ID:	41411 (SN: 2495073)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 120V AC (intern 11.1 V DC)
Antenna:	Schwarzbeck HWRD 650
Measurement distance:	3 m
Mode:	Tx; BT-EDR_CH 78 (2480 MHz)_8-DPSK_3-DH5_PN9_DUT-mode
Test Date:	2022-10-10
Note:	EUT horizontal



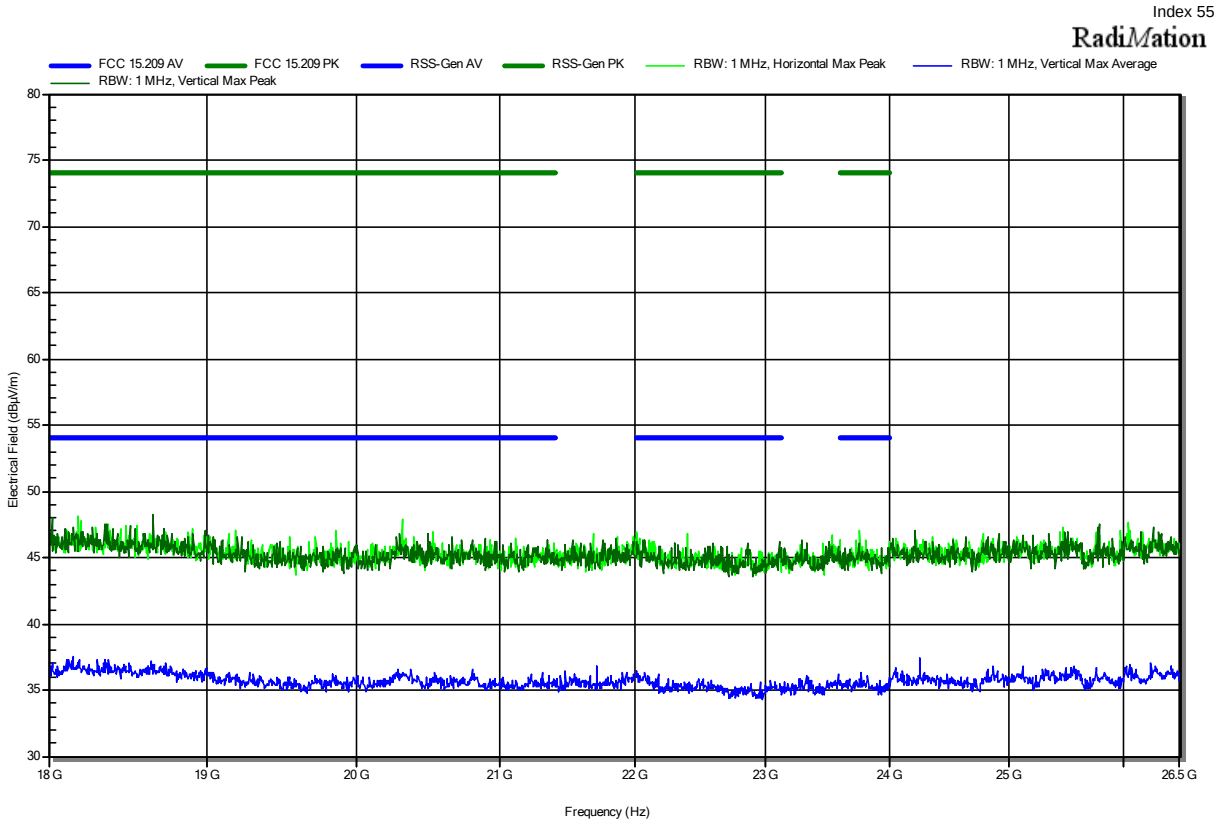
Radiated Spurious Emissions according to 47 CFR Part 15.247, RSS-247, Issue 3

Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems Technologies Pte Ltd
Model Description:	Field Controller Win EC7
Model:	CS20 Basic (Amber)
Test Sample ID:	41411 (SN: 2495073)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 120V AC (intern 11.1 V DC)
Antenna:	Amplifier Research AT4560
Measurement distance:	3 m
Mode:	Tx; BT-EDR_CH 0 (2402 MHz)_8-DPSK_3-DH5_PN9_DUT-mode
Test Date:	2022-10-10
Note:	EUT horizontal



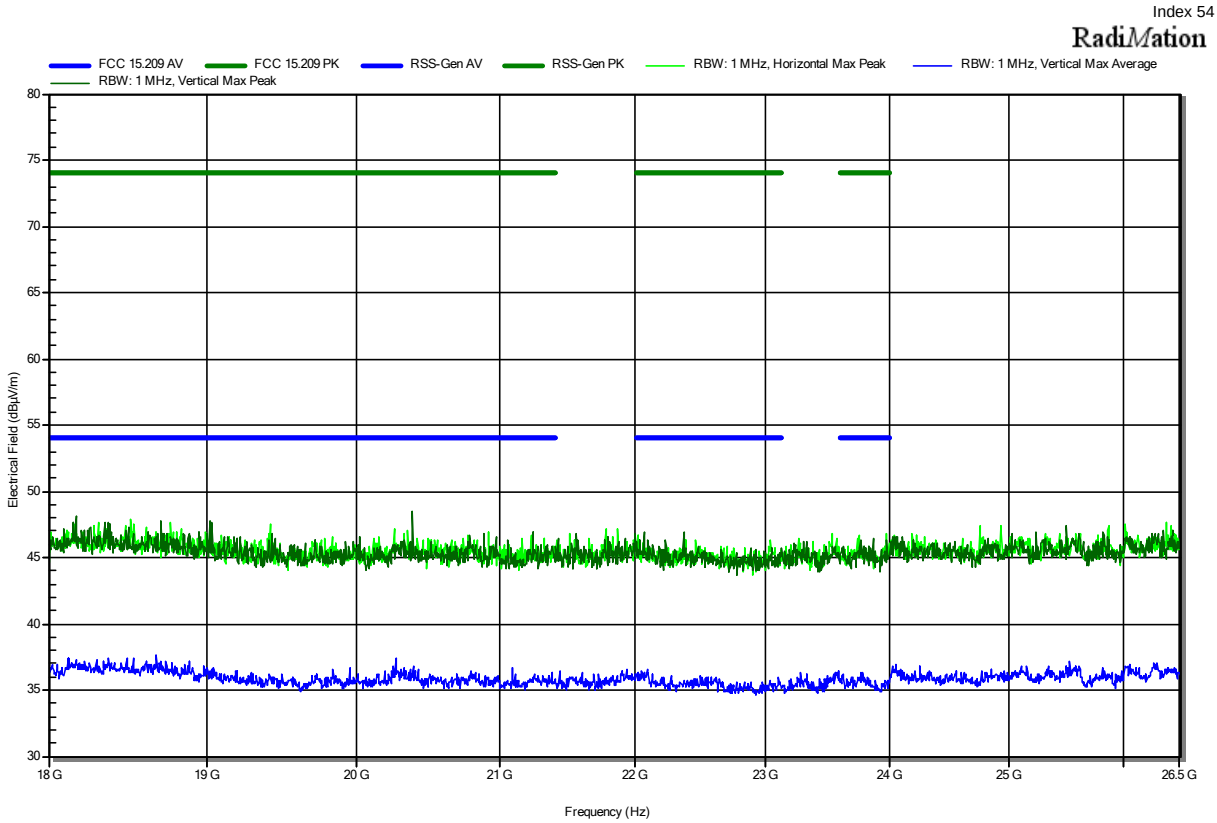
Radiated Spurious Emissions according to 47 CFR Part 15.247, RSS-247, Issue 3

Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems Technologies Pte Ltd
Model Description:	Field Controller Win EC7
Model:	CS20 Basic (Amber)
Test Sample ID:	41411 (SN: 2495073)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 120V AC (intern 11.1 V DC)
Antenna:	Amplifier Research AT4560
Measurement distance:	3 m
Mode:	Tx; BT-EDR_CH 40 (2442 MHz)_8-DPSK_3-DH5_PN9_DUT-mode
Test Date:	2022-10-10
Note:	EUT horizontal



Radiated Spurious Emissions according to 47 CFR Part 15.247, RSS-247, Issue 3

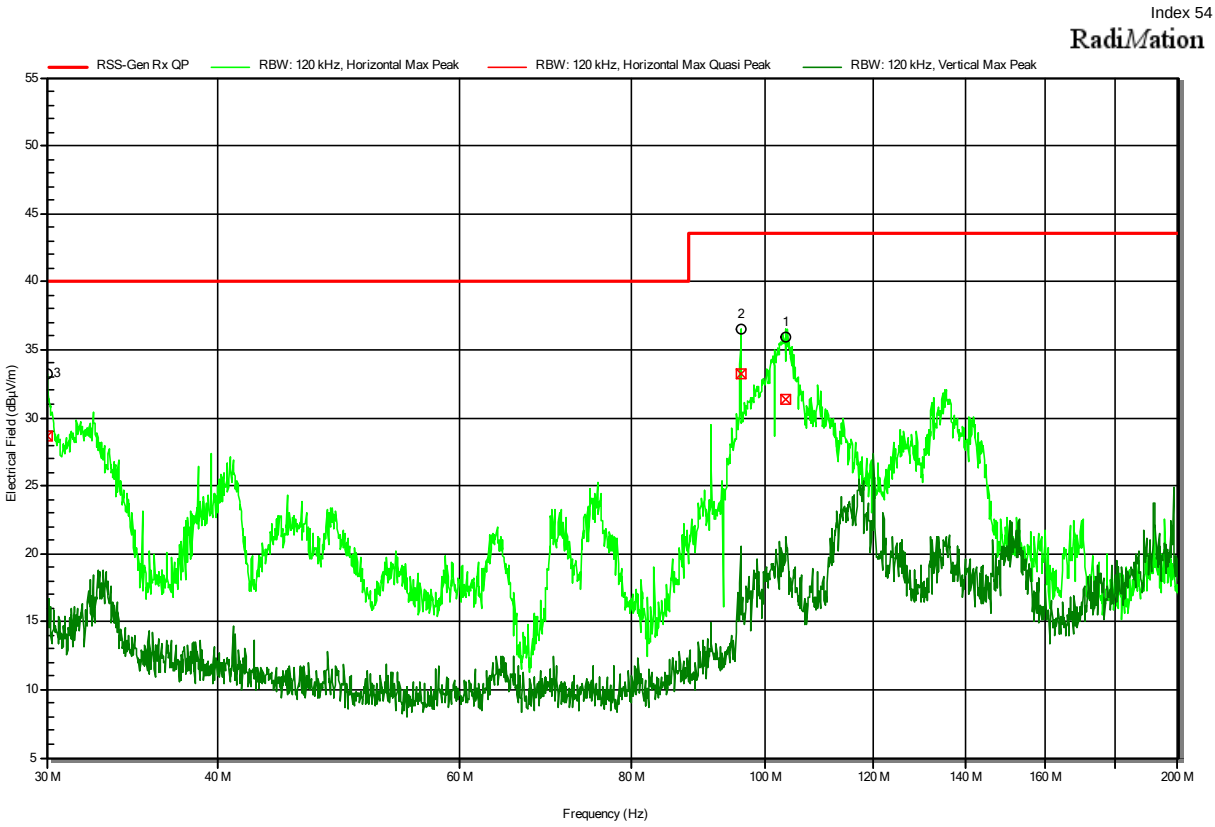
Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems Technologies Pte Ltd
Model Description:	Field Controller Win EC7
Model:	CS20 Basic (Amber)
Test Sample ID:	41411 (SN: 2495073)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 22 °Celsius, Vnom: 120V AC (intern 11.1 V DC)
Antenna:	Amplifier Research AT4560
Measurement distance:	3 m
Mode:	Tx; BT-EDR_CH 78 (2480 MHz)_8-DPSK_3-DH5_PN9_DUT-mode
Test Date:	2022-10-10
Note:	EUT horizontal



ANNEX B Receiver spurious emissions

Radiated Spurious Emissions according to RSS-247 Issue 3

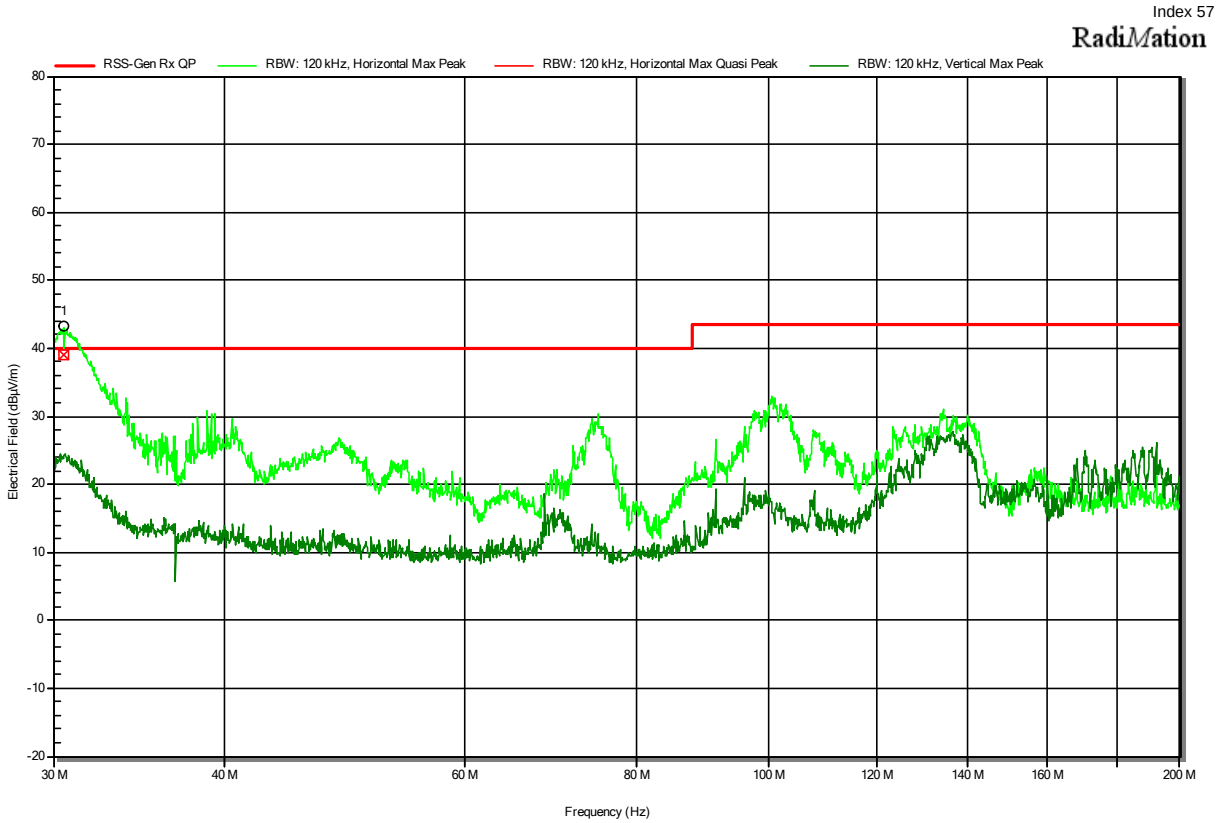
Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems Technologies Pte Ltd
Model Description:	Field Controller Win EC7
Model:	CS20 Basic (Amber)
Test Sample ID:	41411 (SN: 2495073)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 120V AC (intern 11.1 V DC)
Antenna:	Rohde & Schwarz HK 116
Measurement distance:	3 m
Mode:	Rx; Bluetooth; scan mode
Test Date:	2022-10-21
Note:	EUT horizontal



Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Polarization
30.0425 MHz	28.6 dBµV/m	40 dBµV/m	-11.36 dB	Pass	Horizontal
96.0195 MHz	33.3 dBµV/m	43.5 dBµV/m	-10.24 dB	Pass	Horizontal
103.593 MHz	31.3 dBµV/m	43.5 dBµV/m	-12.2 dB	Pass	Horizontal

Radiated Spurious Emissions according to RSS-247 Issue 3

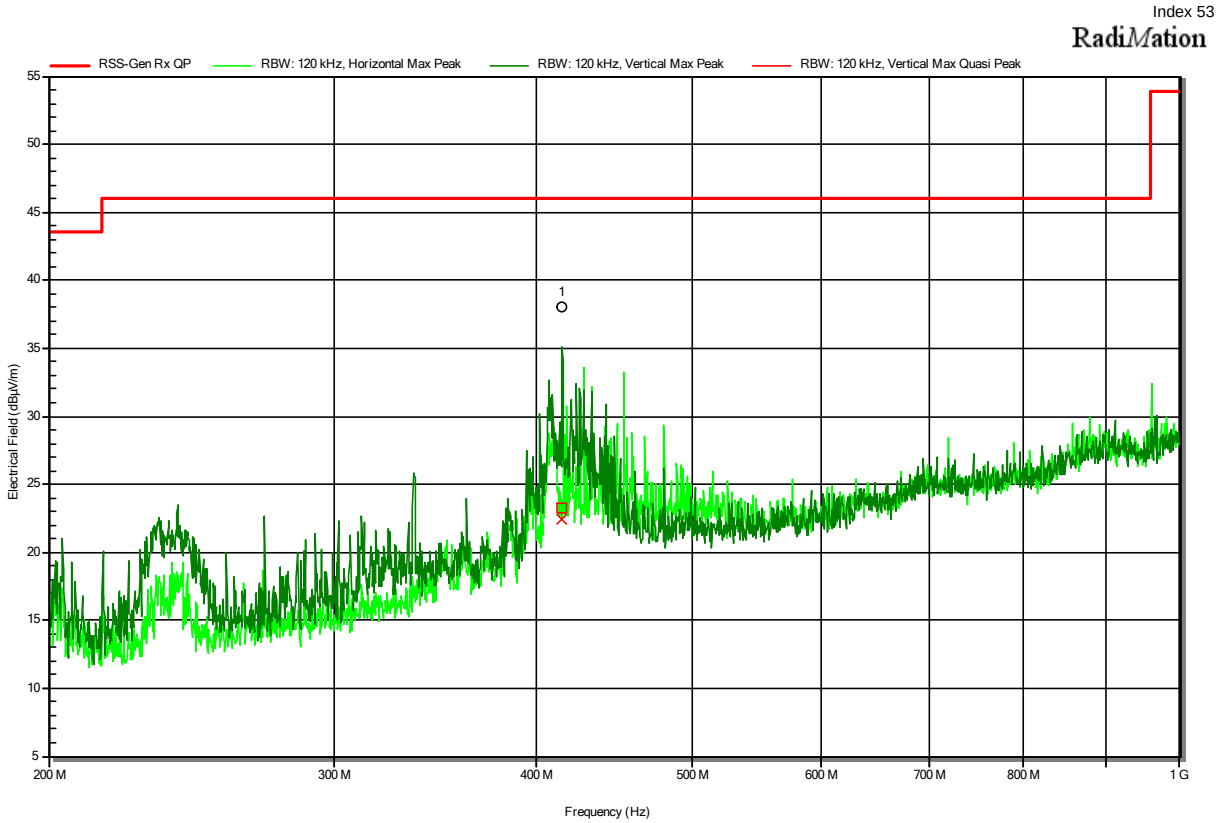
Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems Technologies Pte Ltd
Model Description:	Field Controller Win EC7
Model:	CS20 Basic (Amber)
Test Sample ID:	41411 (SN: 2495073)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 120V AC (intern 11.1 V DC)
Antenna:	Rohde & Schwarz HK 116
Measurement distance:	3 m
Mode:	Rx; Bluetooth; scan mode
Test Date:	2022-10-24
Note:	EUT horizontal2



Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Polarization
30.5396 MHz	39 dBµV/m	40 dBµV/m	-1.03 dB	Pass	Horizontal

Radiated Spurious Emissions according to RSS-247 Issue 3

Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems Technologies Pte Ltd
Model Description:	Field Controller Win EC7
Model:	CS20 Basic (Amber)
Test Sample ID:	41411 (SN: 2495073)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 120V AC (intern 11.1 V DC)
Antenna:	Rohde & Schwarz HL 223
Measurement distance:	3 m
Mode:	Rx; Bluetooth; scan mode
Test Date:	2022-10-21
Note:	EUT vertical



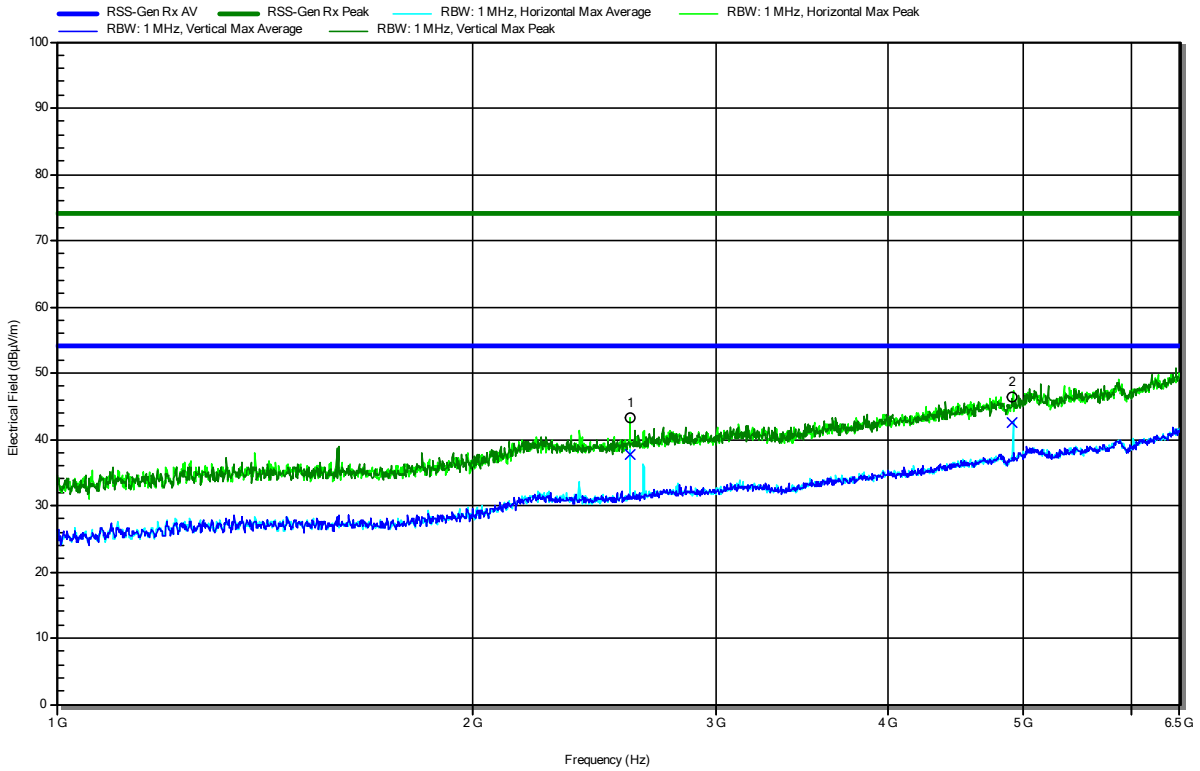
Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Polarization
415.44 MHz	23.2 dBµV/m	46 dBµV/m	-22.77 dB	Pass	Vertical

Radiated Spurious Emissions according to RSS-247 Issue 3

Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems Technologies Pte Ltd
Model Description:	Field Controller Win EC7
Model:	CS20 Basic (Amber)
Test Sample ID:	41411 (SN: 2495073)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 120V AC (intern 11.1 V DC)
Antenna:	Schwarzbeck BBHA 9120D
Measurement distance:	3 m
Mode:	Rx; Bluetooth; scan mode
Test Date:	2022-10-24
Note:	EUT vertical

Index 55

RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
2.6 GHz	43.34 dBµV/m	74 dBµV/m	-30.66 dB	Pass	Horizontal
4.919 GHz	46.5 dBµV/m	74 dBµV/m	-27.5 dB	Pass	Horizontal

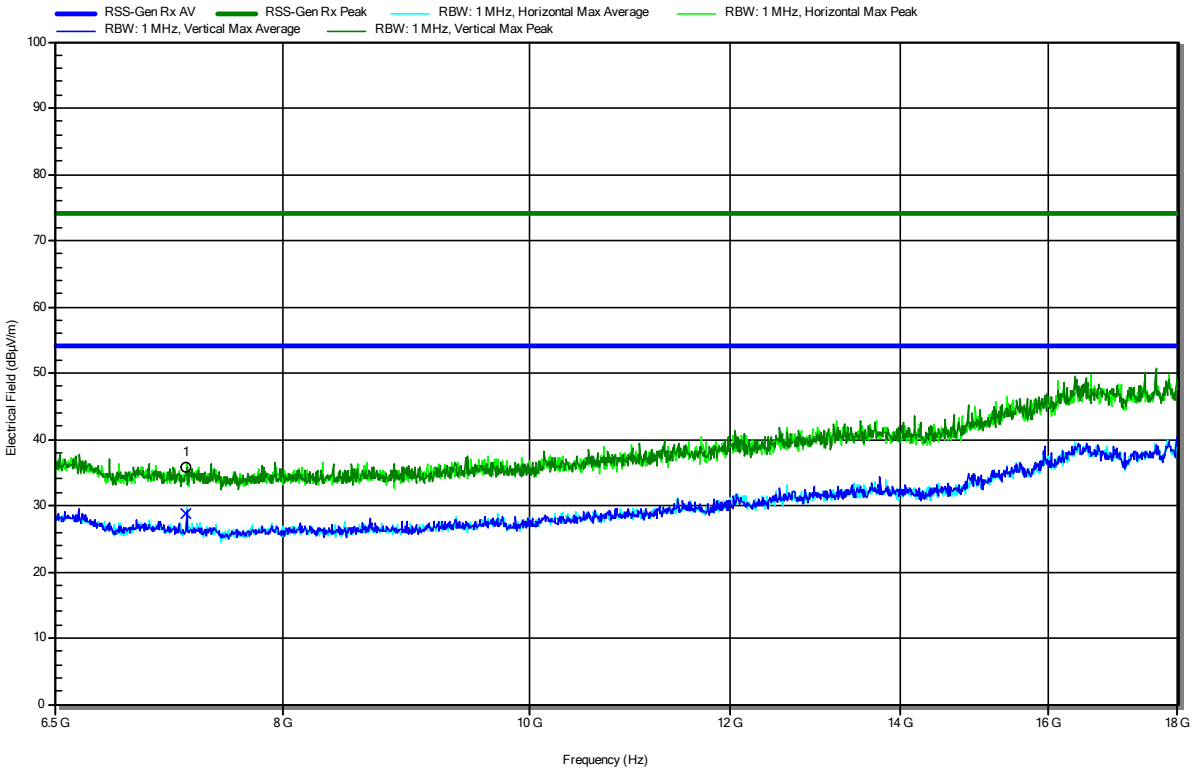
Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
2.6 GHz	37.79 dBµV/m	53.98 dBµV/m	-16.19 dB	Pass	Horizontal
4.919 GHz	42.42 dBµV/m	53.98 dBµV/m	-11.56 dB	Pass	Horizontal

Radiated Spurious Emissions according to RSS-247 Issue 3

Project Number:	G0M-2209-1656
Applicant:	Leica Geosystems Technologies Pte Ltd
Model Description:	Field Controller Win EC7
Model:	CS20 Basic (Amber)
Test Sample ID:	41411 (SN: 2495073)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Voigt
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 23 °Celsius, Vnom: 120V AC (intern 11.1 V DC)
Antenna:	Schwarzbeck HWRD 650
Measurement distance:	3 m
Mode:	Rx; Bluetooth; scan mode
Test Date:	2022-10-24
Note:	EUT vertical

Index 56

RadiMation



Frequency 7.326 GHz	Peak 35.67 dBµV/m	Peak Limit 74 dBµV/m	Peak Difference -38.33 dB	Peak Status Pass	Polarization Vertical
Frequency 7.326 GHz	Average 28.88 dBµV/m	Average Limit 53.98 dBµV/m	Average Difference -25.1 dB	Average Status Pass	Polarization Vertical

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