

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-2201-1246-TFC247DT-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	Nanotron Technologies GmbH
Address	Alt-Moabit 60A 10555 Berlin GERMANY
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	Swarm Bee LE V3 with Development Kit
Model(s)	Swarm Bee LE V3
Additional Model(s)	None
Brand Name(s)	Swarm Bee LE V3 with Development Kit
Hardware Version(s)	382-20 and 386-20
Software Version(s)	0382-30-ver1.0.0
FCC ID	SIFSBLEV3DKPLUS
IC	7654A-SBLEV3DKPLS
Test Result	PASSED

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	2022-01-21	
Report:		
Compiled by	Wilfried Treffke	
Tested by (+ signature) (Responsible for Test)	Wilfried Treffke	
Approved by (+ signature) (Deputy Head of Lab)	Toralf Jahn	
Date of Issue	2022-04-06	
Total number of pages	72	
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	2022-04-06	Initial Release	

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
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

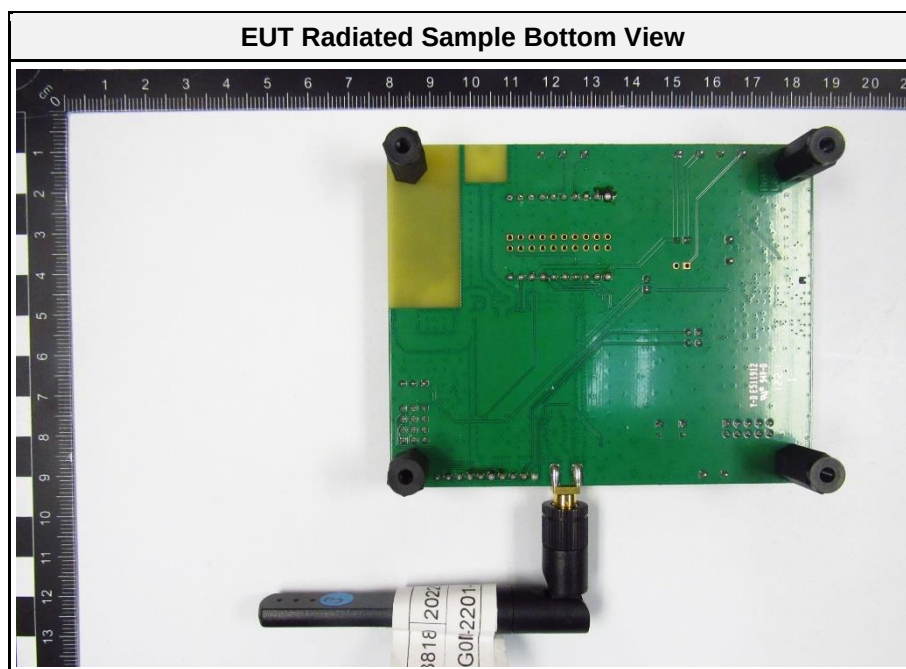
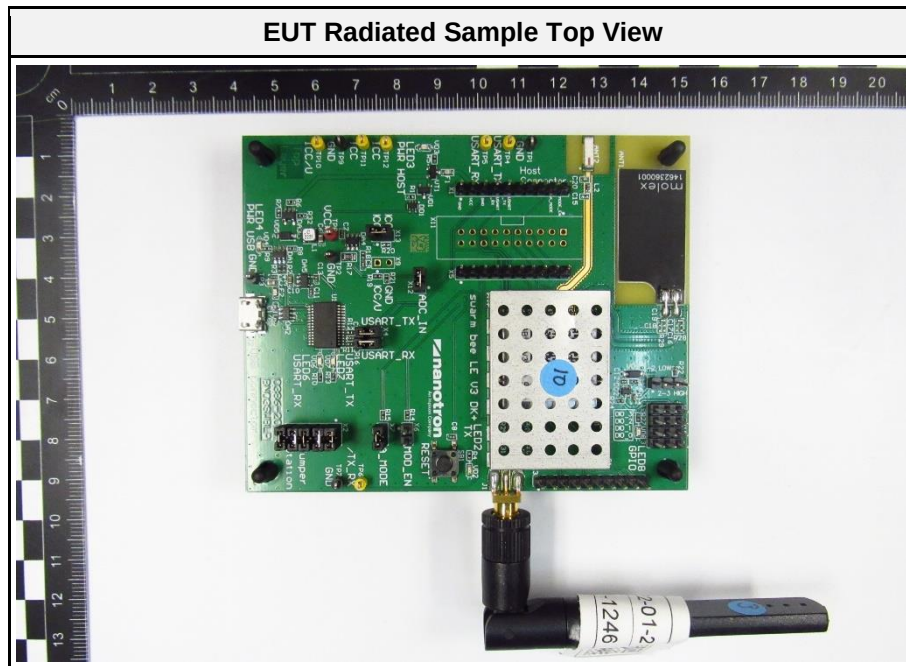
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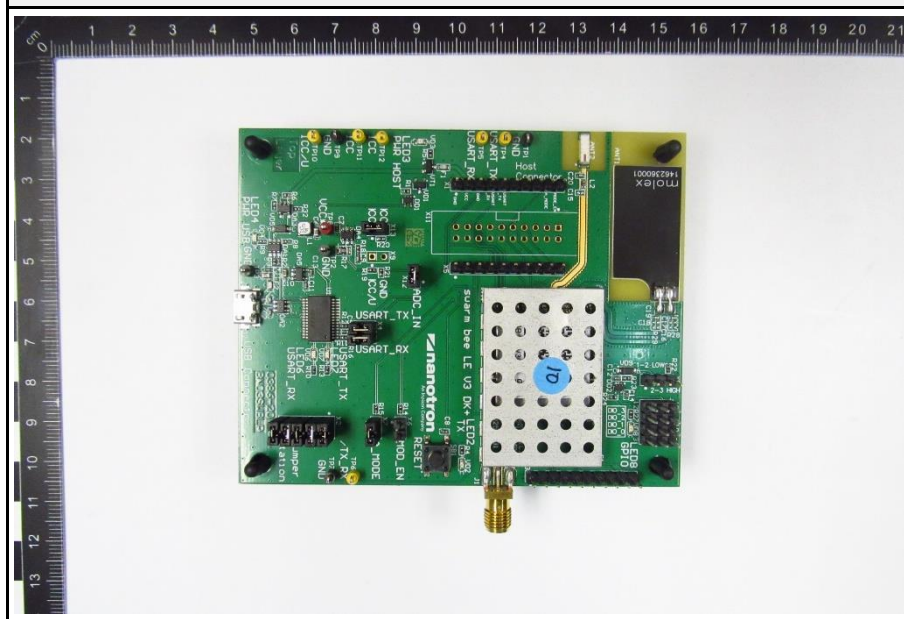
1 Equipment (Test Item) Under Test

Description	Swarm Bee LE V3 with Development Kit	
Model	Swarm Bee LE V3	
Additional Model(s)	None	
Brand Name(s)	Swarm Bee LE V3 with Development Kit	
Serial Number(s)	SB LE V3, Nr. 9 SB LE V3, Nr. 9	Radiated Test Sample ID 38173 Conducted Test Sample ID 38173
Hardware Version(s)	382-20 and 386-20	
Software Version(s)	0382-30-ver1.0.0	
PMN	SBLEV3DKPLS	
HVIN	MN03SWBLE-1.0	
FVIN	sb-le-v3-0382-30-ver1.0.0	
HMN	n/a	
FCC ID	SIFSBLEV3DKPLUS	
IC	7654A-SBLEV3DKPLS	
Equipment type	Radio Module	
Radio type	Transceiver	
Assigned frequency bands	2400.0 MHz - 2483.5 MHz	
Radio technology	CSS	
Modulation	Chirp Spread Spectrum	
Number of antenna ports	1	
Antenna	Type	Integrated
	Model	PSKN3-24/55S
	Manufacturer	MobileMark
	Gain	3 dBi (declared by customer)
Supply Voltage	V _{NOM}	5.0 VDC (USB powered)
Operating Temperature	T _{NOM}	25 °C
AC/DC-Adaptor	None	
Manufacturer	Nanotron Technologies GmbH Alt-Moabit 60A 10555 Berlin GERMANY	

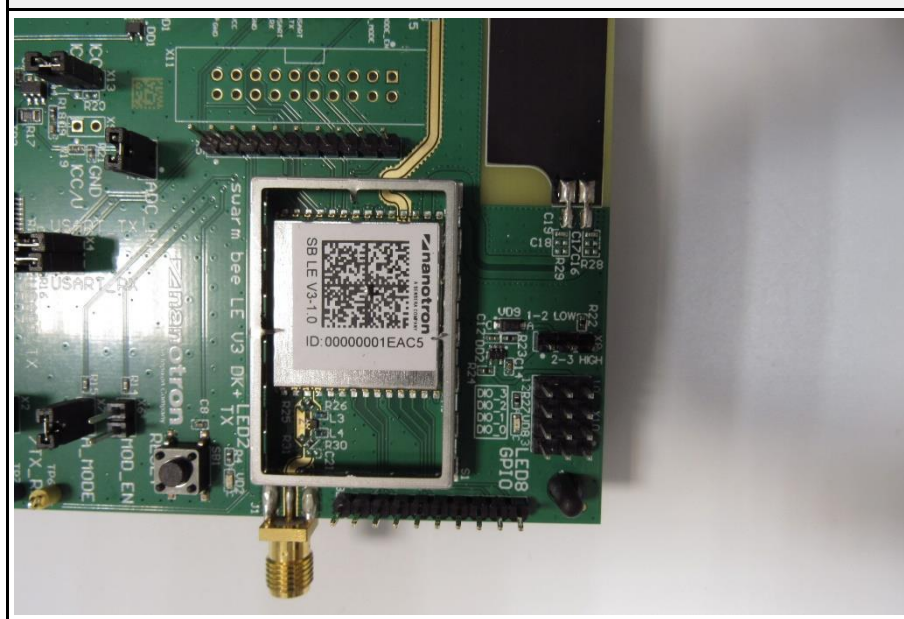
1.1 Photos – Equipment External



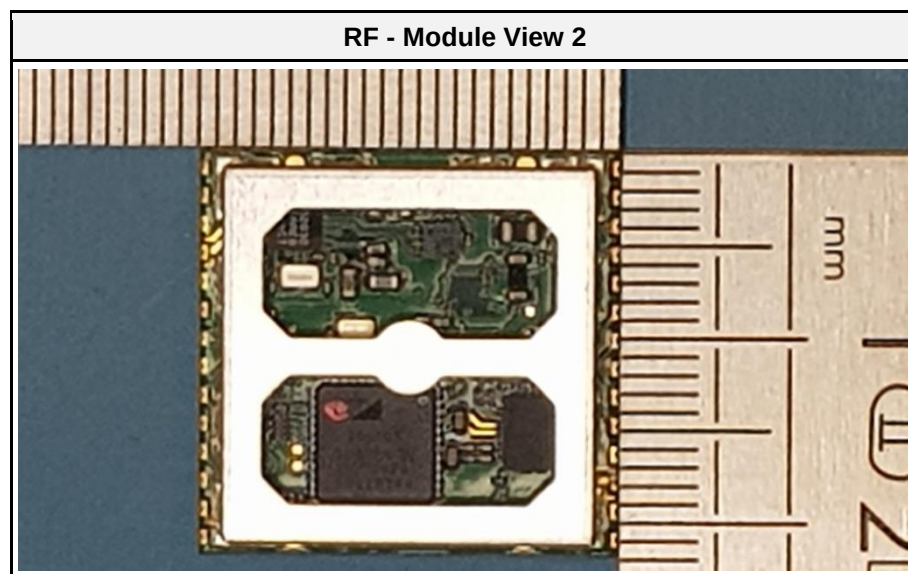
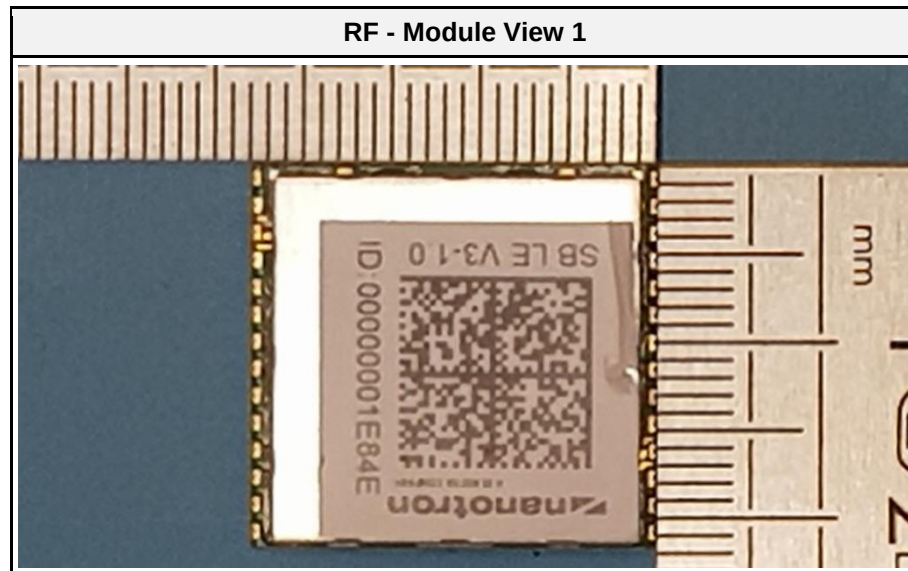
EUT Conducted Sample Top View



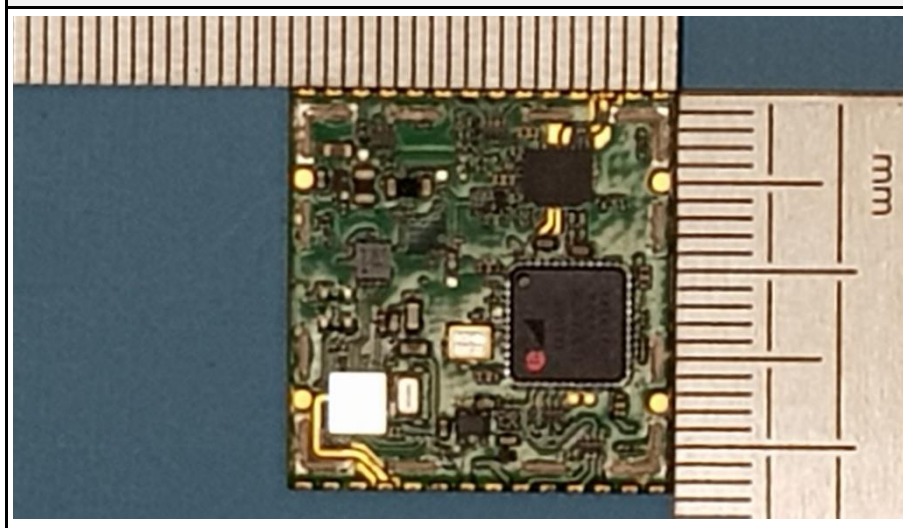
EUT Module Shielding Open



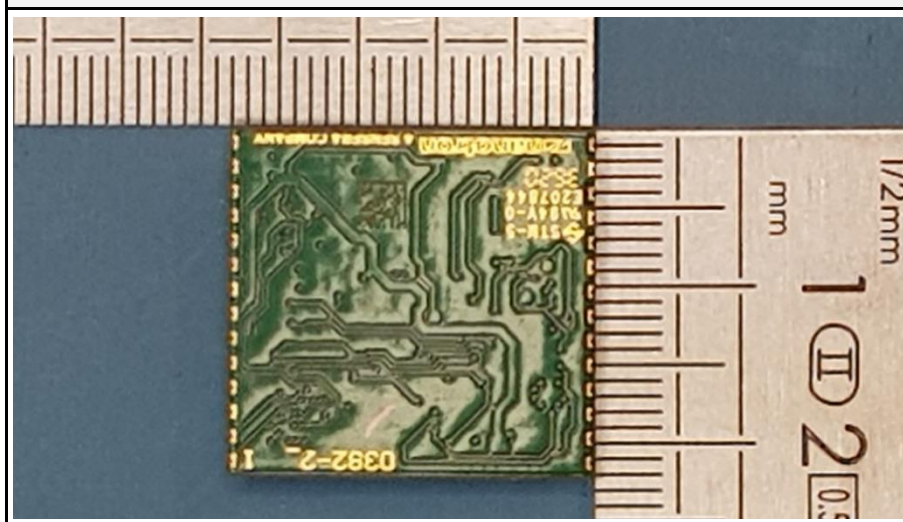
1.2 Photos – Equipment Internal



RF - Module View 3



RF - Module View 4



1.3 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
None				
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
Comment:				

1.4 Test Modes

Mode	Description
CSS 250k	Mode = Transmit Modulation = CSS Spreading = Chirp Data rate = 250 kbps Duty cycle = 100% Power setting = stxp:42 (Software setting)
CSS 1M	Mode = Transmit Modulation = CSS Spreading = Chirp Data rate = 1000 kbps Duty cycle = 100% Power setting = stxp:42 (Software setting)
Receive	Mode = Receive
Comment:	

1.5 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Tx / Rx	1	2440

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:

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

Net:

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

Limit:

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

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

Margin:

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

Example only:

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

2 Result Summary

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	PASS	
FCC § 15.247(b) ISED RSS-247, Issue 2 (section 5.4)	Maximum peak conducted power	ANSI C63.10-2013	PASS	
FCC § 15.247(e) ISED RSS-247, Issue 2 (section 5.2)	Power spectral density	ANSI C63.10-2013	PASS	
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	
FCC § 15.247(d) ISED RSS-247, Issue 2 (section 5.5)	Conducted spurious emissions	ANSI C63.10-2013	PASS	
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	
Comment:				

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

3 Test Conditions and Results

3.1 Test Conditions and Results - Occupied bandwidth

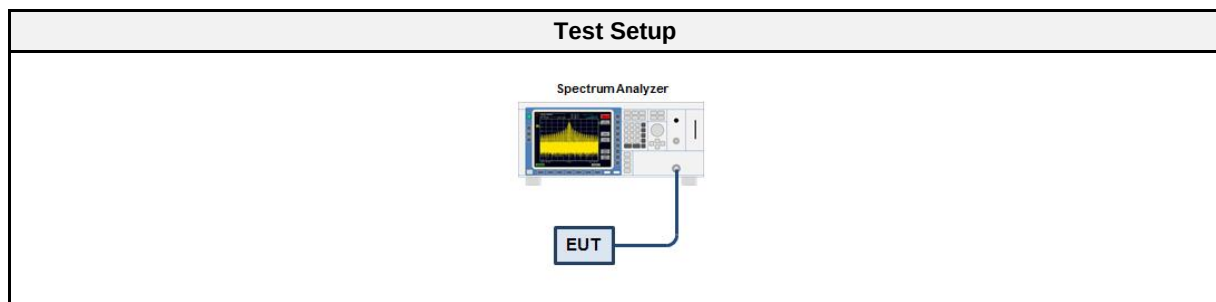
3.1.1 Information

Test Information	
Reference	ISED RSS-Gen, Issue 5 A2 (section 6.7)
Measurement Method	ANSI C63.10 6.9.3
Measurement Uncertainty	$\pm 1.26 \%$
Test Sample ID	38173
Operator	Wilfried Treffke
Date	2022-01-31

3.1.2 Limits

Limits
None (Informational only)

3.1.3 Setup



3.1.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSW 43	EF00896	2021-07	2022-07
Cable (diverse)	– (diverse)	CAABE	EF00779	2022-01	2023-01

3.1.5 Procedure

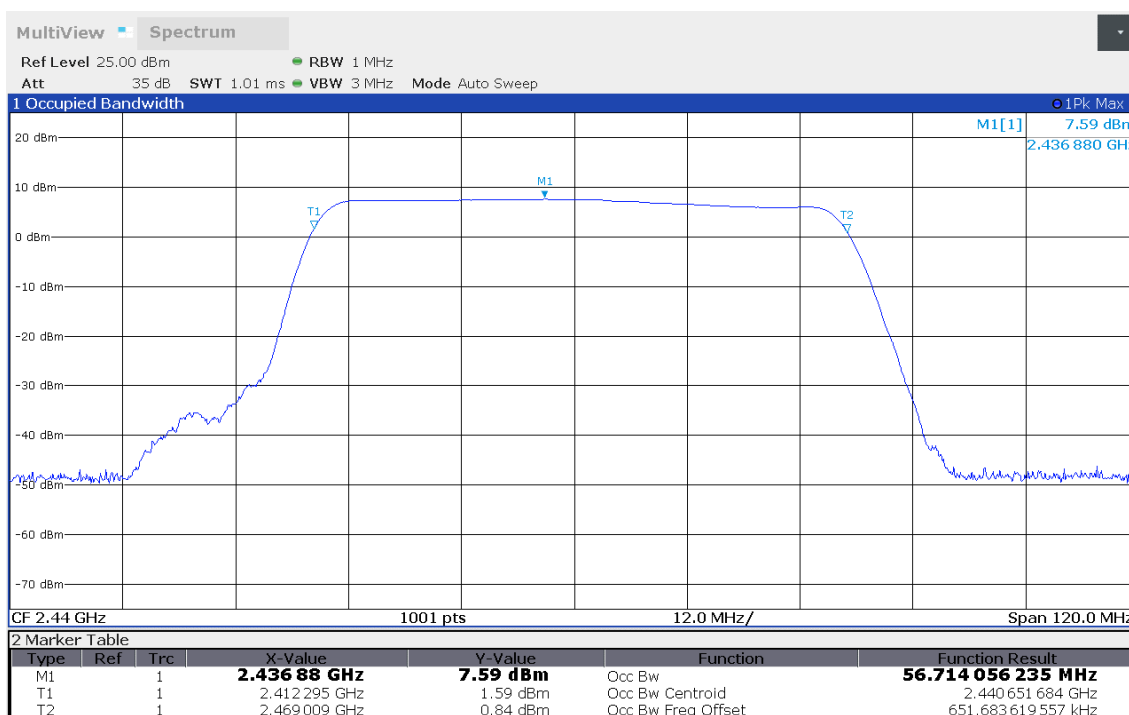
Test Procedure
1. EUT transmitter is activated in test mode under normal conditions 2. The spectrum analyzer is set to peak detection and maximum hold with a span twice the emission spectrum 3. The resolution bandwidth is set to the range of 1 % to 5 % of the occupied bandwidth 4. The occupied bandwidth is measured with the build-in analyzer function

3.1.6 Results

Test Results		
Mode	Frequency [MHz]	Bandwidth [MHz]
CSS 250k	2440	56.713
CSS 1M	2440	58.328

Occupied Bandwidth

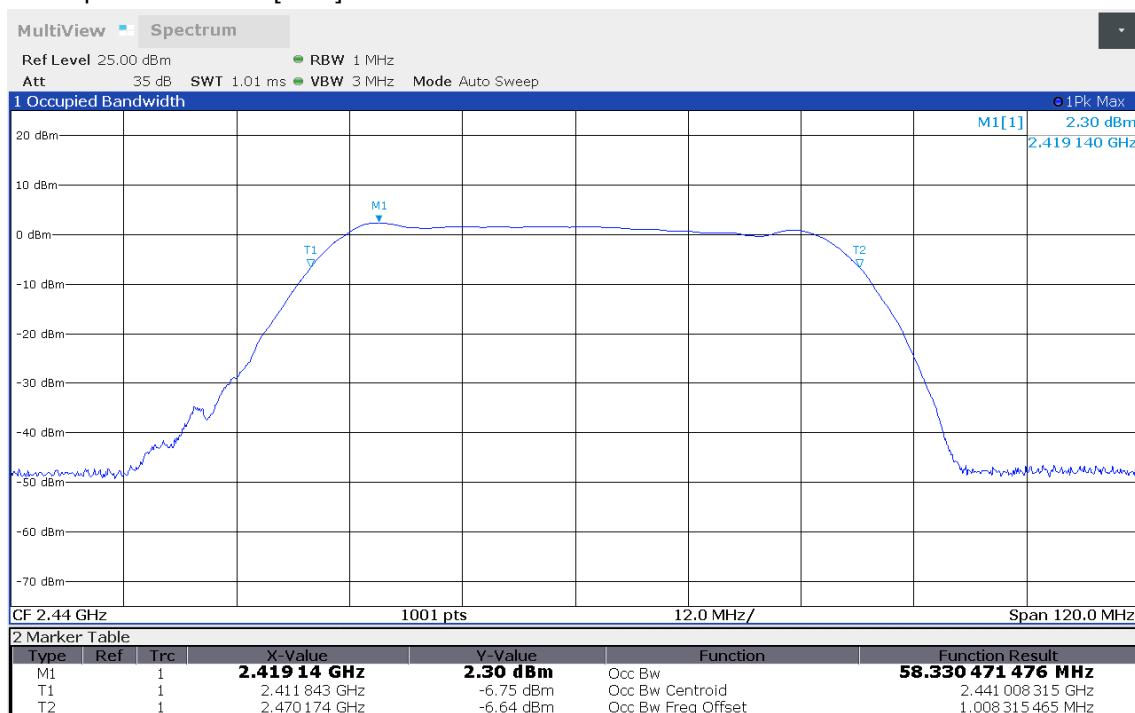
Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: CSS, Channel: 1, 2440 MHz, 250 kbps
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-01-31
 Occupied Bandwidth [MHz]: 56.713



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Occupied Bandwidth

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: CSS, Channel: 1, 2440 MHz, 1 Mbps
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-01-31
 Occupied Bandwidth [MHz]: 58.328



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3.2 Test Conditions and Results - 6 dB bandwidth

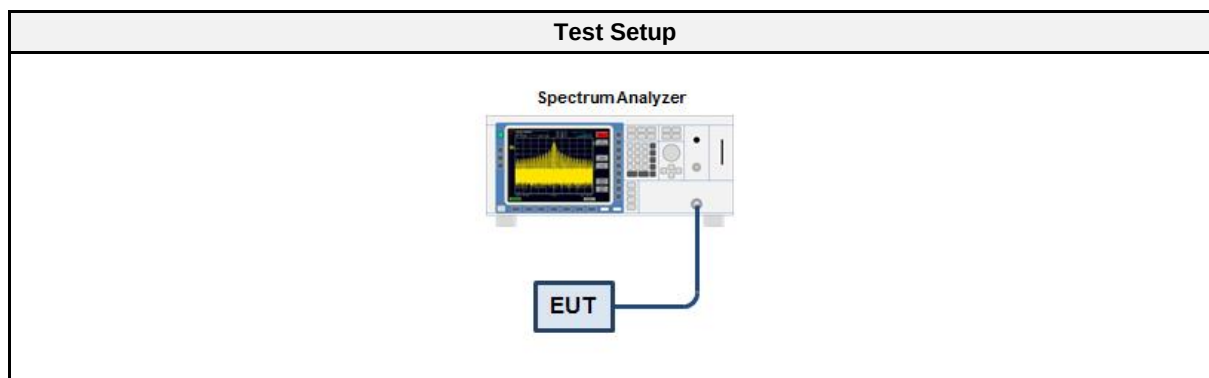
3.2.1 Information

Test Information	
Reference	FCC § 15.247(a)(2); ISED RSS-247, Issue 2 (section 5.2)
Measurement Method	ANSI C63.10 11.8
Measurement Uncertainty	$\pm 1.26 \%$
Operator	Wilfried Treffke
Date	2022-01-31

3.2.2 Limits

Limits
$\geq 500\text{kHz}$

3.2.3 Setup



3.2.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSW 43	EF00896	2021-07	2022-07
Cable (diverse)	– (diverse)	CAABE	EF00779	2022-01	2023-01

3.2.5 Procedure

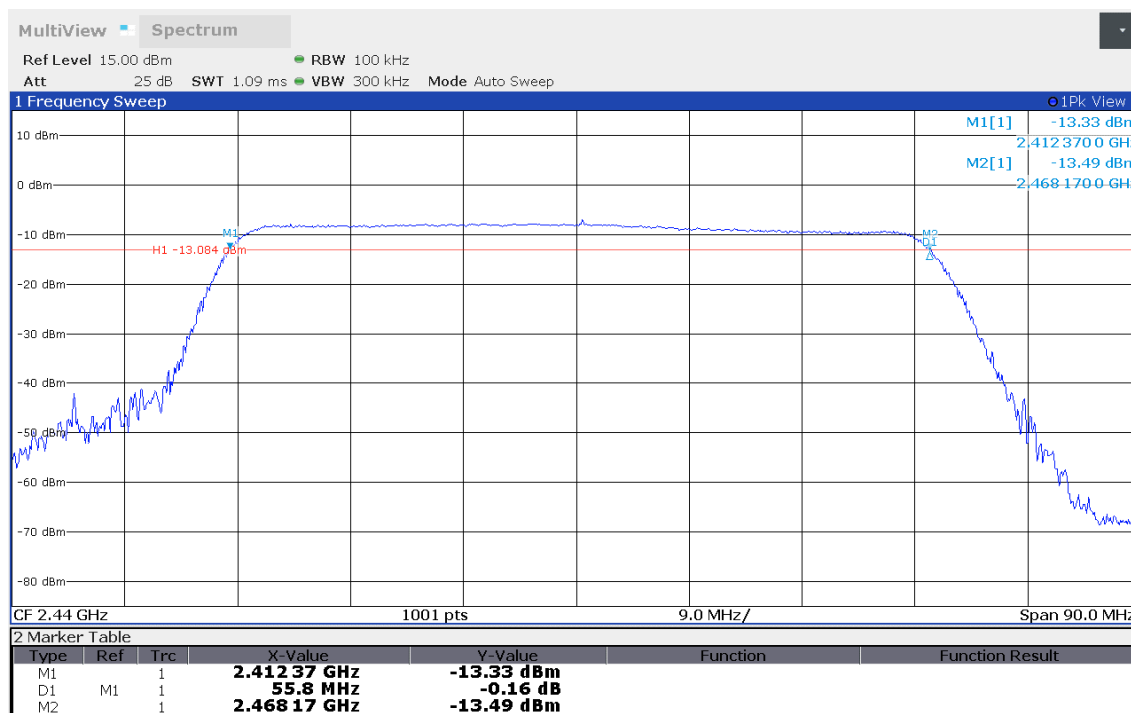
Test Procedure
1. EUT set to test mode 2. Span set to at least twice the emission spectrum 3. Detector set to peak and max hold and RBW is set to 100 kHz 4. Envelope peak value of emission spectrum is selected 5. Marker on envelope of spectrum is set to level of -6 dB to the left of the peak 6. Marker on envelope of spectrum is set to level of -6 dB to the right of the peak 7. 6 dB Bandwidth is determined by marker frequency separation

3.2.6 Results

Test Results				
Mode	Frequency [MHz]	Bandwidth [MHz]	Limit [kHz]	Verdict
CSS 250k	2440	55.800	500	PASS
CSS 1M	2440	54.630	500	PASS

DTS (6 dB) Bandwidth

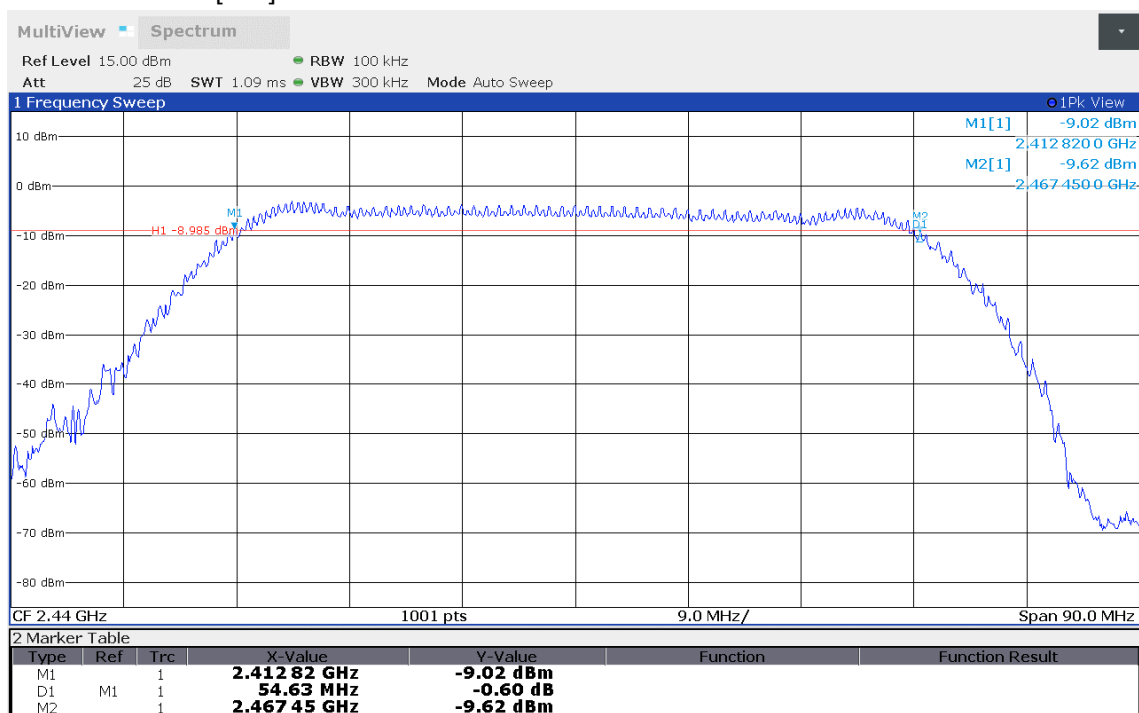
Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: CSS, Channel: 1, 2440 MHz, 250 kbps
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-01-31
 Lower Frequency [MHz]: 2412.370
 Upper Frequency [MHz]: 2468.170
 6 dB Bandwidth [kHz]: 55800



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DTS (6 dB) Bandwidth

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: CSS, Channel: 1, 2440 MHz, 1 Mbps
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-01-31
 Lower Frequency [MHz]: 2412.820
 Upper Frequency [MHz]: 2467.450
 6 dB Bandwidth [kHz]: 54630



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3.3 Test Conditions and Results - Maximum peak conducted output power

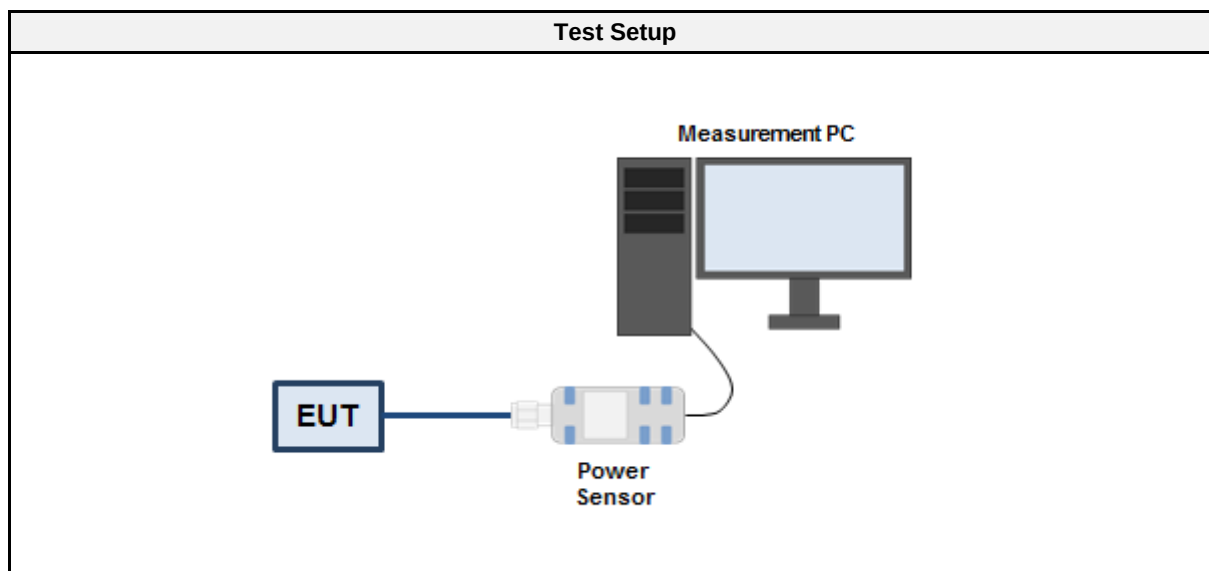
3.3.1 Information

Test Information	
Reference	FCC § 15.247(b); ISSED RSS-247, Issue 2 (section 5.4)
Measurement Method	ANSI C63.10 11.9.1
Measurement Uncertainty	± 2.86 dB
Operator	Wilfried Treffke
Date	2022-01-31

3.3.2 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.

3.3.3 Setup



3.3.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Power Meter	R&S	NRP Z-81	EF00830	2021-08	2022-08

3.3.5 Procedure

Test Procedure
1. EUT set to test mode 2. Power Meter is set to peak mode 3. Measurement is repeated for other test mode

3.3.6 Results

Test Results - CSS 250k				
Channel [MHz]	Power [dBm]	Power [mW]	Limit [W]	Verdict
2440	16.6	45.71	1.0	PASS
Test Results - CSS 1M				
Channel [MHz]	Power [dBm]	Power [mW]	Limit [W]	Verdict
2440	17.8	60.2	1.0	PASS

3.4 Test Conditions and Results - Power spectral density

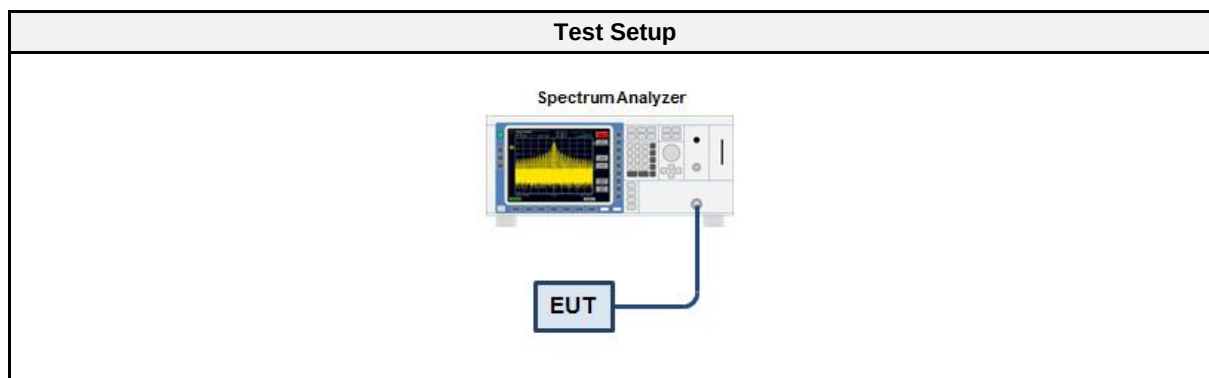
3.4.1 Information

Test Information	
Reference	FCC § 15.247(e); ISSED RSS-247, Issue 2 (section 5.2)
Measurement Method	ANSI C63.10 11.10.2, 14.3.2
Measurement Uncertainty	± 2.86 dB
Operator	Wilfried Treffke
Date	2022-01-31

3.4.2 Limits

Limits
8 dBm / 3 kHz

3.4.3 Setup



3.4.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSW 43	EF00896	2021-07	2022-07
Cable (diverse)	– (diverse)	CAABE	EF00779	2022-01	2023-01

3.4.5 Procedure

Test Procedure
1. EUT set to test mode 2. The analyzer is set to DTS channel center frequency with a span of 1.5 times the DTS bandwidth 3. The RBW is set to 100 kHz with VBW $\geq$ RBW and the detector is set to peak with max hold 4. After the trace has stabilized a marker is set to the envelope maximum 5. If the power spectral density is above the limit the RBW is reduced (not lower than 3 kHz) and the measurement is repeated 6. If the EUT has more than one transmit chain the procedure is repeated for each transmit chain

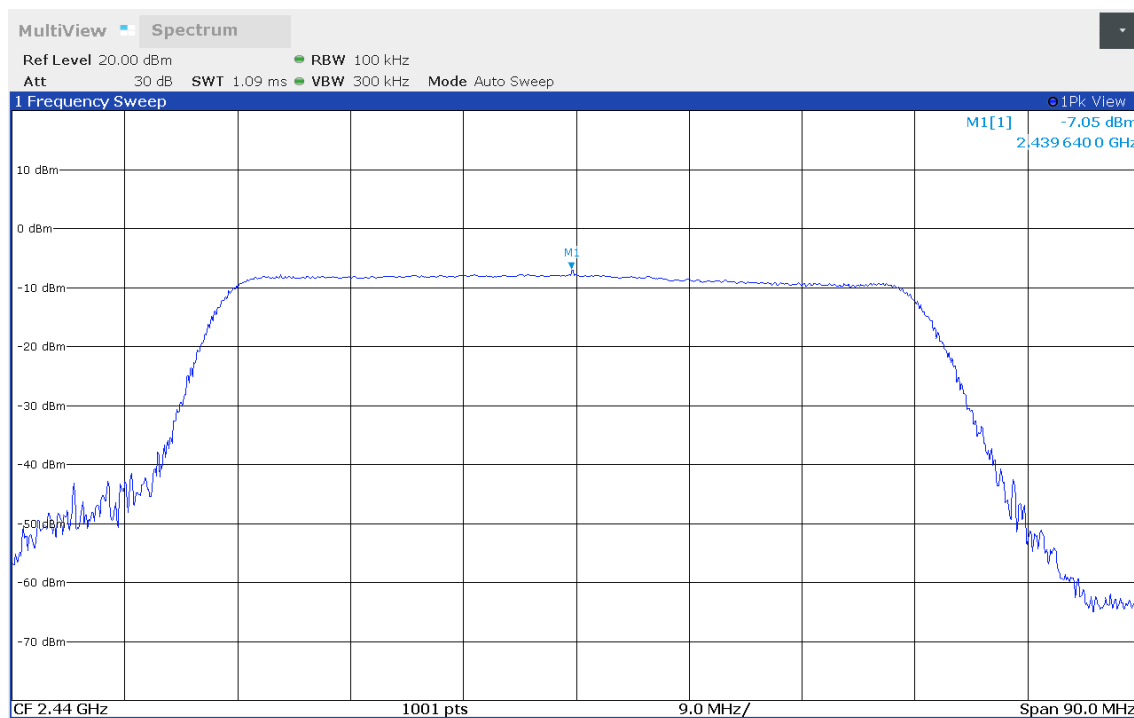
3.4.6 Results

Test Results - CSS 250k			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
2440	-7.049	8.0	PASS
RBW = 100 kHz			

Test Results - CSS 1M			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
2440	-2.890	8.0	PASS
RBW = 100 kHz			

Peak Power Spectral Density

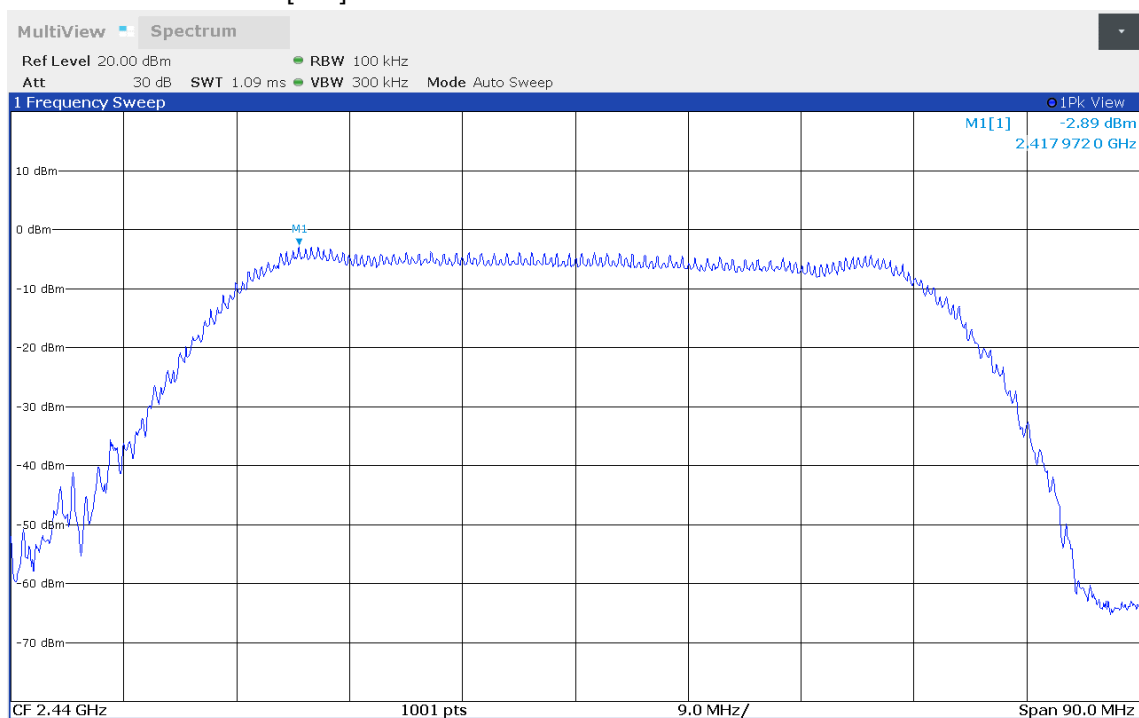
Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: CSS, Channel: 1, 2440 MHz, 250 kbps
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-01-31
 Peak Frequency [MHz]: 2439.640
 Spectral Density [dBm/RBW]: -7.049
 Resolution Bandwidth [kHz]: 100 kHz



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Peak Power Spectral Density

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: CSS, Channel: 1, 2440 MHz, 1 Mbps
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-01-31
 Peak Frequency [MHz]: 2417.972
 Spectral Density [dBm/RBW]: -2.890
 Resolution Bandwidth [kHz]: 100 kHz



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3.5 Test Conditions and Results - AC powerline conducted emissions

3.5.1 Information

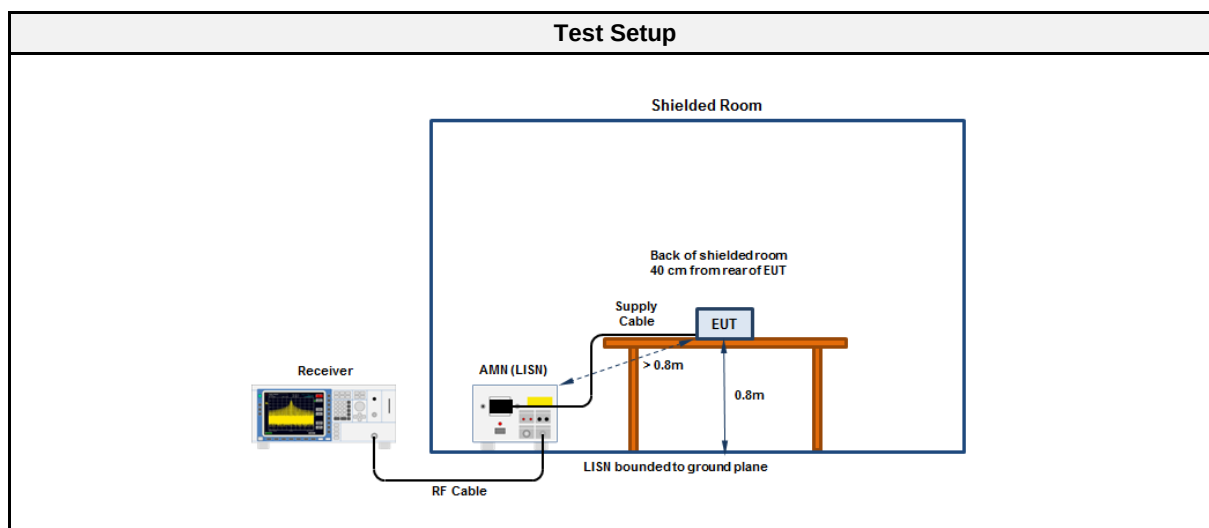
Test Information	
Reference	FCC § 15.207; ISED RSS-247, Issue 2 (section 3.1)
Measurement Method	ANSI C63.10 6.2
Measurement Uncertainty	± 3.82 dB
Operator	Wilfried Treffke
Date	2022-01-31

3.5.2 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

3.5.3 Setup



3.5.4 Equipment

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

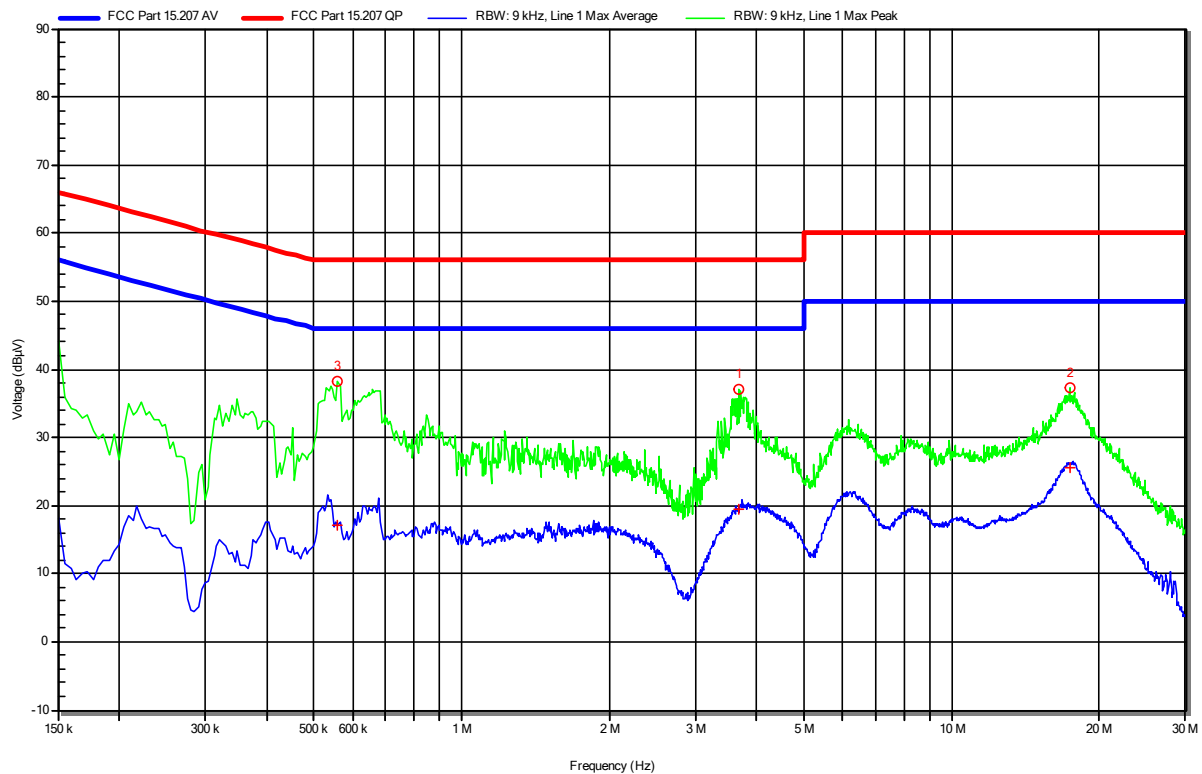
Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	R&S	ESR7	EF00943	2021-08	2022-08
Pulse Limiter	R&S	ESH3-Z2	EF01222	2021-07	2022-07
LISN	Schwarzbeck	NSLK 8127 RC	EF01592	2021-07	2022-07

Conducted emissions at the mains power port according to Part 15.207

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 36640
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Date: 2022-02-03
 Operating Conditions: ambient temperature: 22 °Celsius
 power input: 5V
 LISN: Schwarzbeck NSLK 8127 RC L
 Operational Mode: STXP=42, Datarate=250kbit/s
 Applied to Port: AC - Mains

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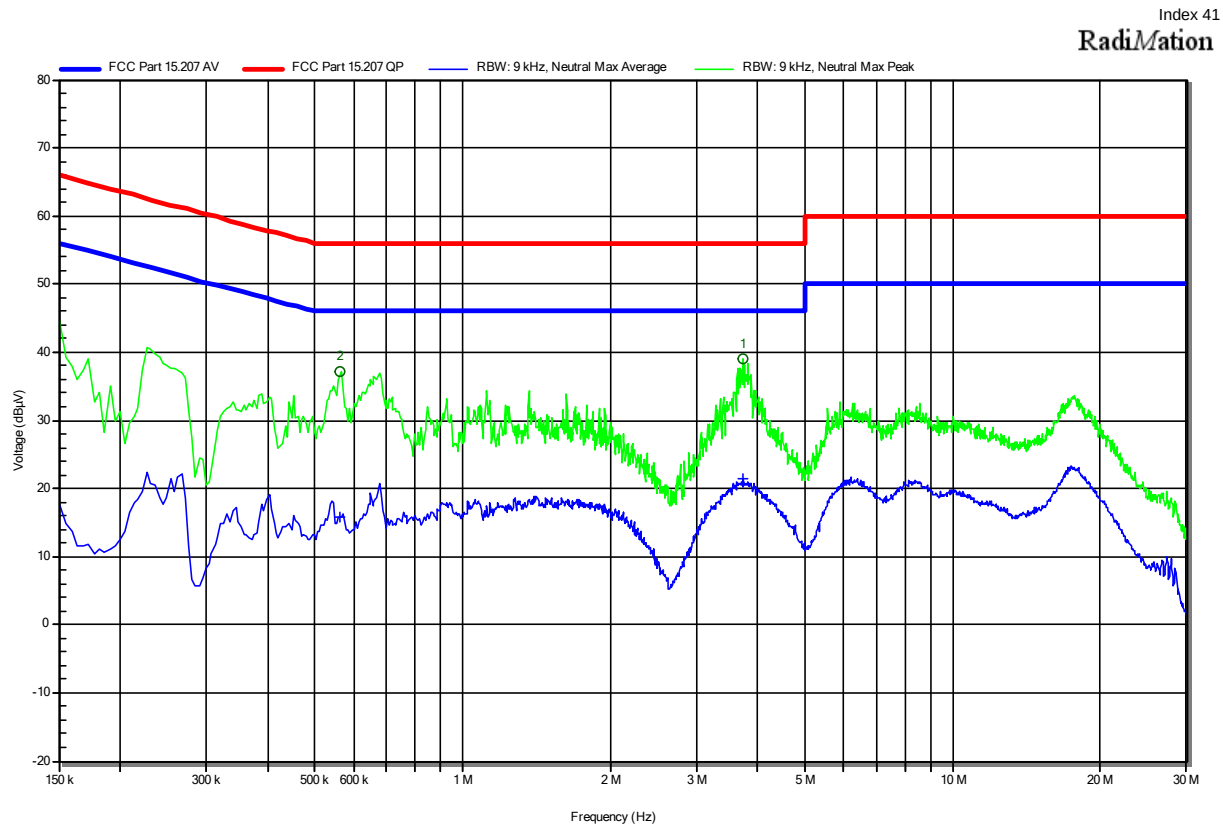
RadiMation



Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	3.687 MHz	19.53 dBµV	46 dBµV	-26.47 dB	Pass	Line 1
2	17.399 MHz	25.61 dBµV	50 dBµV	-24.39 dB	Pass	Line 1
3	559.5 kHz	17.04 dBµV	46 dBµV	-28.96 dB	Pass	Line 1

Conducted emissions at the mains power port according to Part 15.207

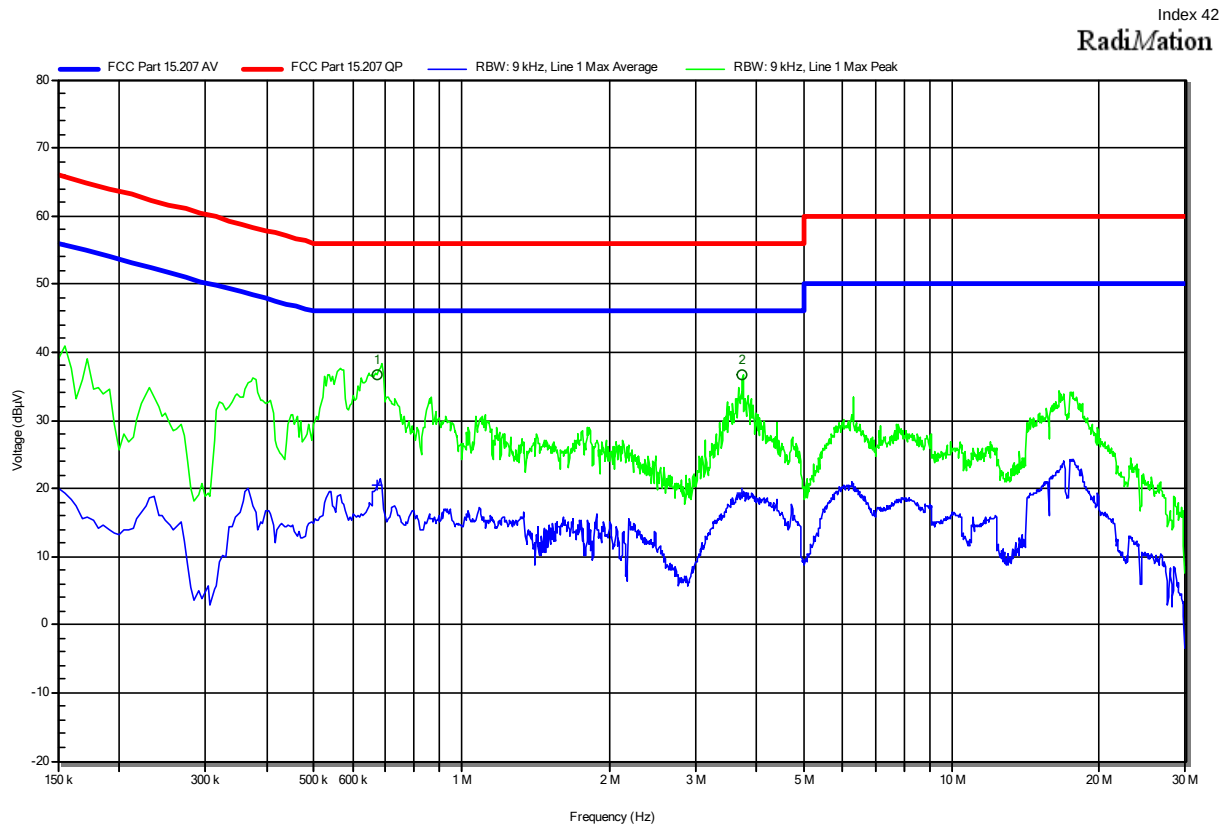
Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 36640
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Date: 2022-02-03
 Operating Conditions: ambient temperature: 22 °Celsius
 power input: 5V
 LISN: Schwarzbeck NSLK 8127 RC N
 Operational Mode: STXP=42, Datarate=250kbit/s
 Applied to Port: AC - Mains



Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	3.737 MHz	21.49 dBµV	46 dBµV	-24.51 dB	Pass	Neutral
2	564 kHz	15.78 dBµV	46 dBµV	-30.22 dB	Pass	Neutral

Conducted emissions at the mains power port according to Part 15.207

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 36640
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Date: 2022-02-03
 Operating Conditions: ambient temperature: 22 °Celsius
 power input: 5V
 LISN: Schwarzbeck NSLK 8127 RC L
 Operational Mode: STXP=42, Datarate= 1 Mbit/s
 Applied to Port: AC - Mains



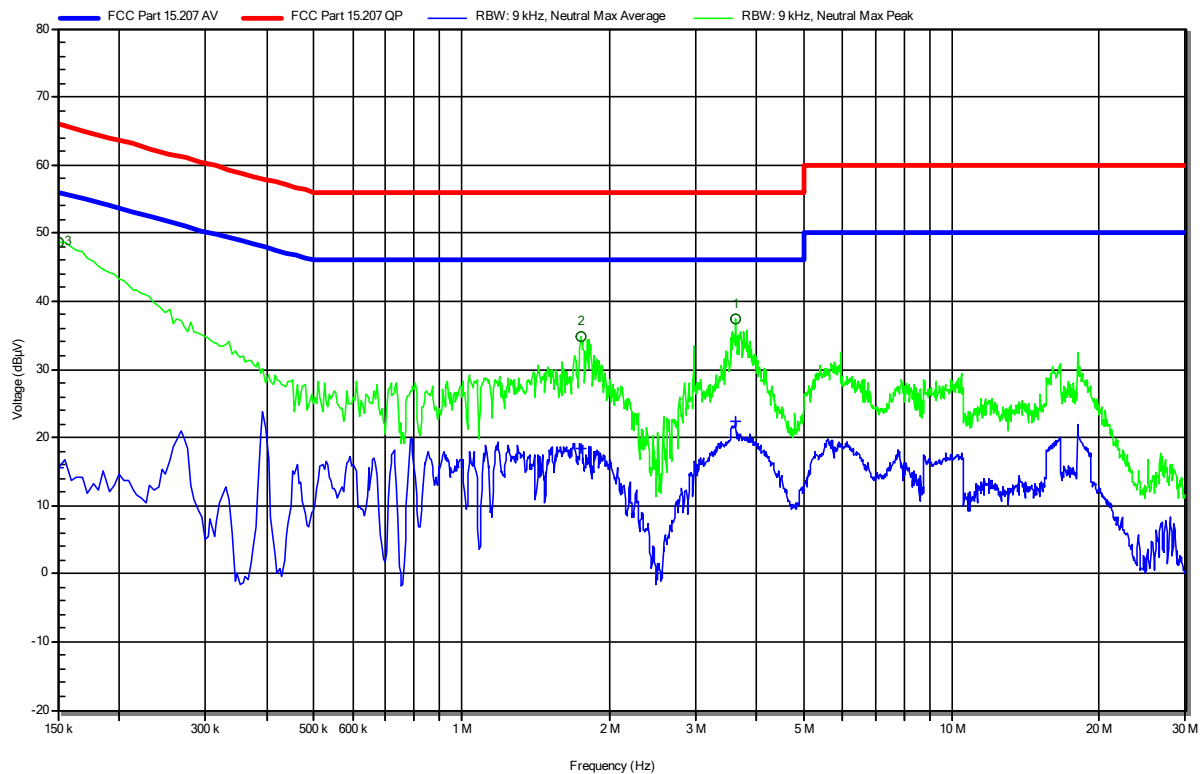
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	672 kHz	20.54 dBµV	46 dBµV	-25.46 dB	Pass	Line 1
2	3.746 MHz	19.3 dBµV	46 dBµV	-26.7 dB	Pass	Line 1

Conducted emissions at the mains power port according to Part 15.207

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 36640
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Date: 2022-02-03
 Operating Conditions: ambient temperature: 22 °Celsius
 power input: 5V
 LISN: Schwarzbeck NSLK 8127 RC N
 Operational Mode: STXP=42, Datarate= 1 Mbit/s
 Applied to Port: AC - Mains

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RadiMation



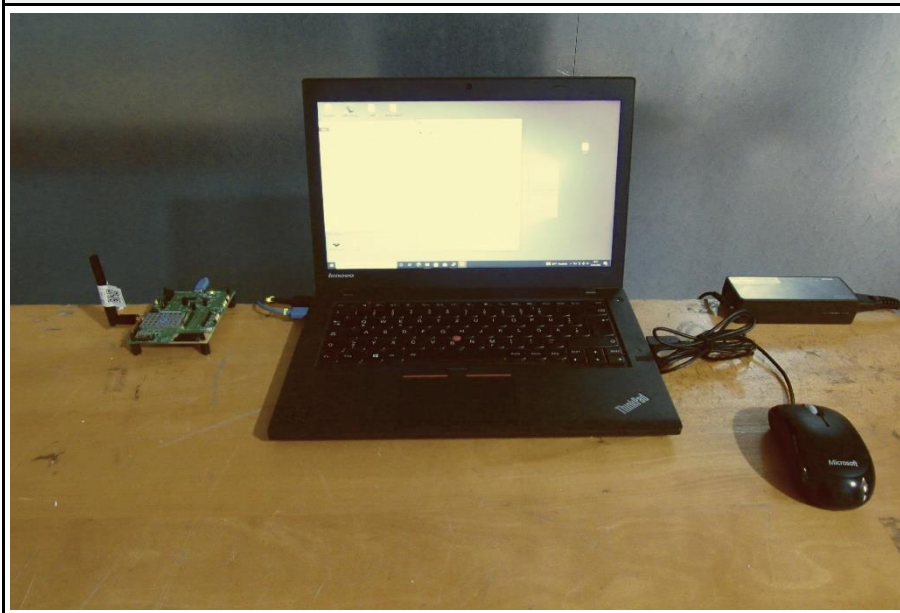
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	3.615 MHz	22.45 dBμV	46 dBμV	-23.55 dB	Pass	Neutral
2	1.747 MHz	18.49 dBμV	46 dBμV	-27.51 dB	Pass	Neutral
3	150 kHz	15.68 dBμV	56 dBμV	-40.32 dB	Pass	Neutral

3.5.5 Setup Photos

AC power line conducted emissions 1



AC powerline conducted emissions 2



3.6 Test Conditions and Results - Band-edge compliance

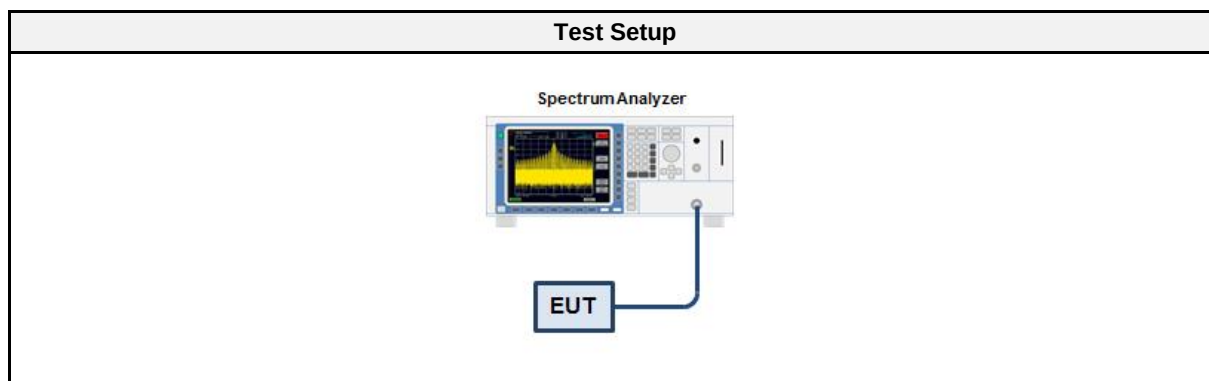
3.6.1 Information

Test Information	
Reference	FCC § 15.247(d); ISSED RSS-247, Issue 2 (section 5.5)
Measurement Uncertainty	± 3.64 dB
Measurement Method	ANSI C63.10 11.13
Operator	Wilfried Treffke
Date	2022-01-31

3.6.2 Limits

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

3.6.3 Setup



3.6.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSW 43	EF00896	2021-07	2022-07
Cable (diverse)	– (diverse)	CAABE	EF00779	2022-01	2023-01

3.6.5 Procedure

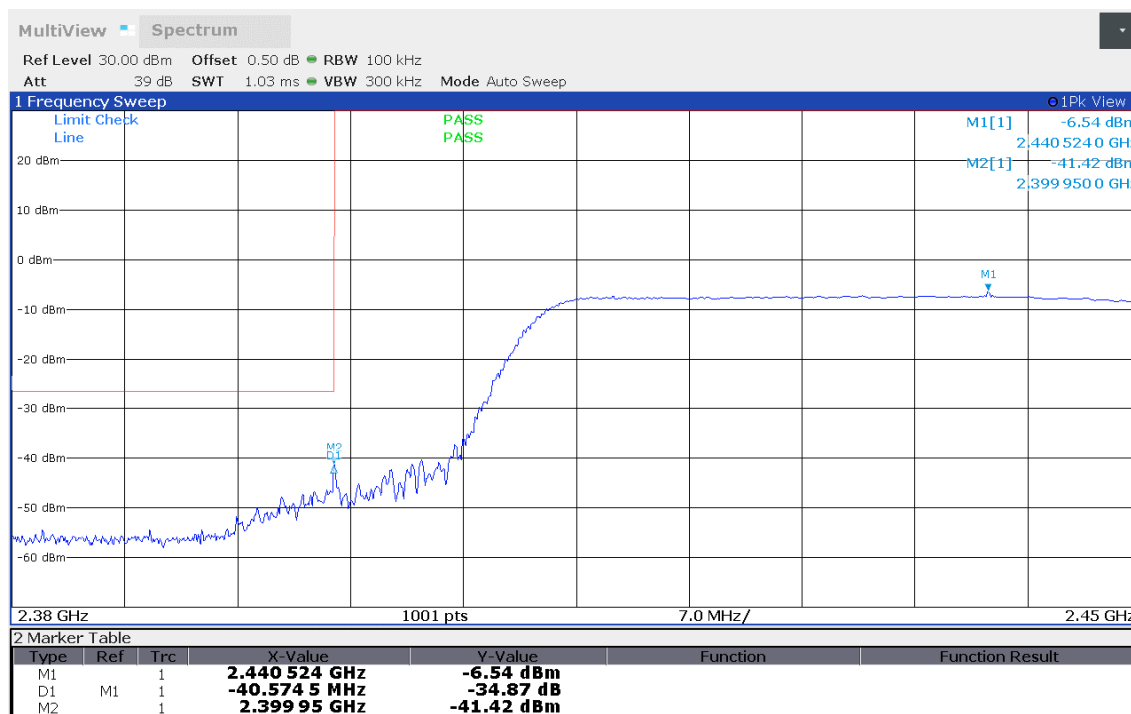
Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Span set around lower band edge and detector is set to peak and max hold 3. Resolution bandwidth is set to 100 kHz 4. Markers are set to peak emission levels within frequency band and outside frequency band 5. Band edge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

3.6.6 Results

Test Results				
Mode	Channel [MHz]	Out-of-band Attenuation [dB]	Limit [dB]	Verdict
CSS 250k, lower band-edge	2440	-34.88	-20	PASS
CSS 250k, upper band-edge	2440	-46.53	-20	PASS
CSS 1M, lower band-edge	2440	-39.98	-20	PASS
CSS 1M, upper band-edge	2440	-47.44	-20	PASS

Emissions in nonrestricted frequency bands at the Band-edge

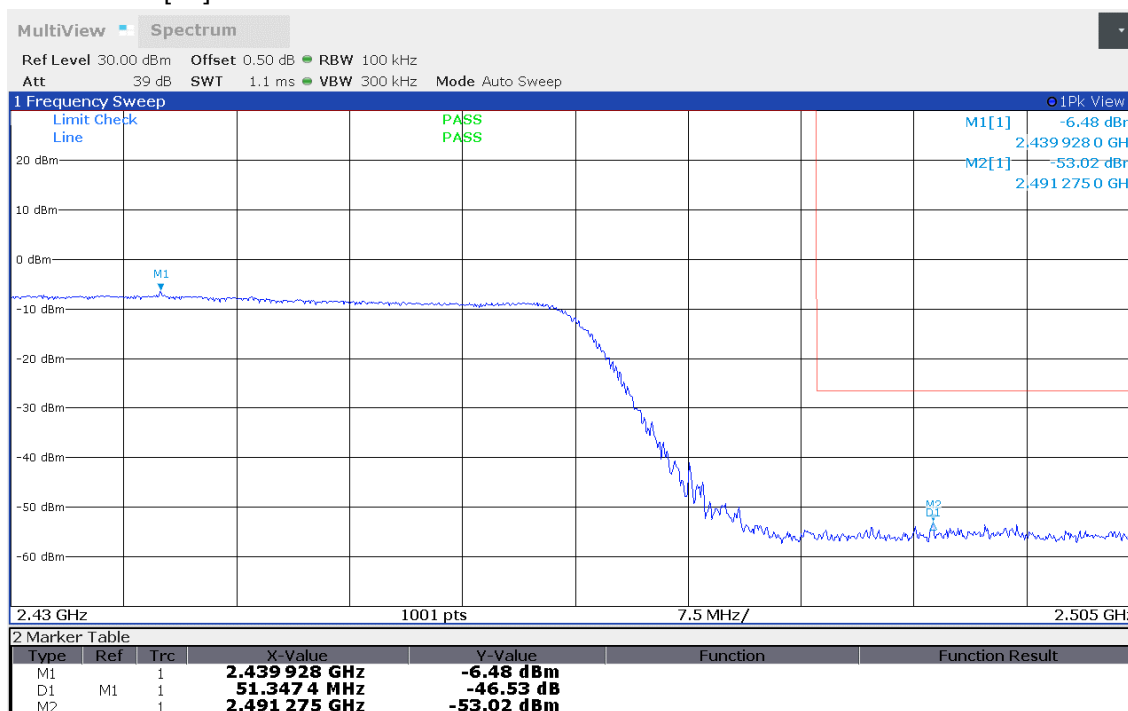
Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: CSS, Channel: 1, 2440 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-01-31
 Note: 250 kbps
 Band-edge: Lower
 In-band Frequency [MHz]: 2440.524
 Max. in-band Level [dBm/100 kHz]: -6.542
 Out-of-band Frequency [MHz]: 2399.95
 Max. out-of-band Level [dBm/100 kHz]: -41.417
 Attenuation [dBc]: -34.88



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Emissions in nonrestricted frequency bands at the Band-edge

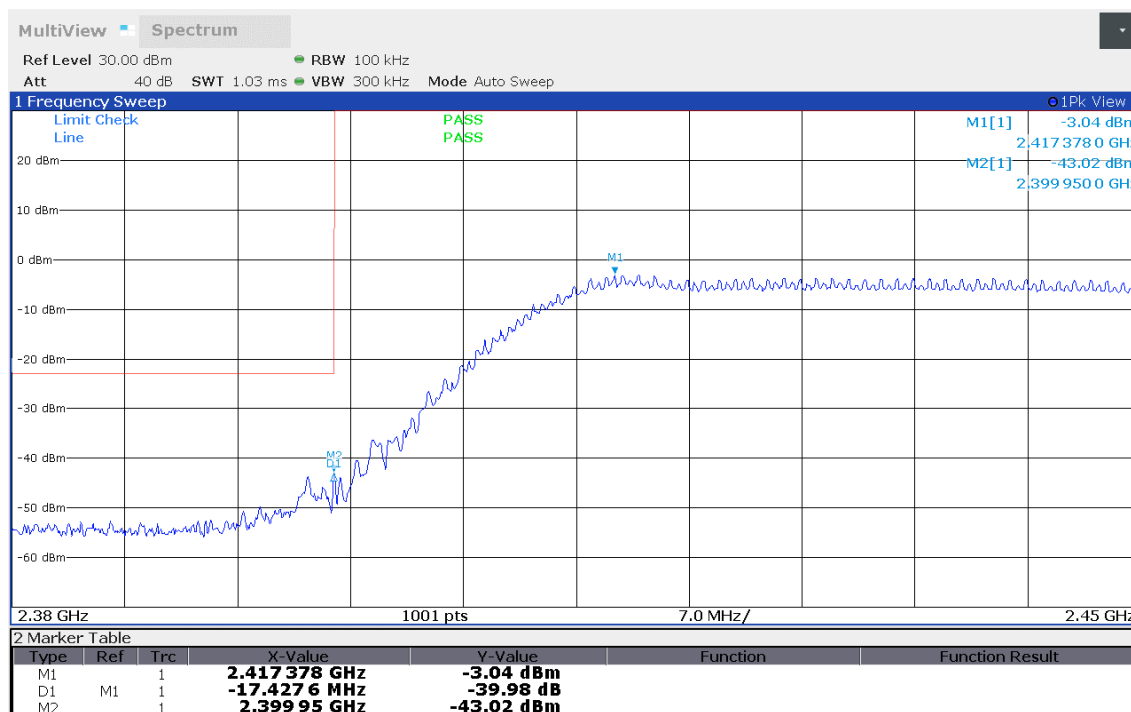
Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: CSS, Channel: 1, 2440 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-01-31
 Note: 250 kbps
 Band-edge: Upper
 In-band Frequency [MHz]: 2439.928
 Max. in-band Level [dBm/100 kHz]: -6.481
 Out-of-band Frequency [MHz]: 2491.275
 Max. out-of-band Level [dBm/100 kHz]: -53.016
 Attenuation [dB]: -46.53



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Emissions in nonrestricted frequency bands at the Band-edge

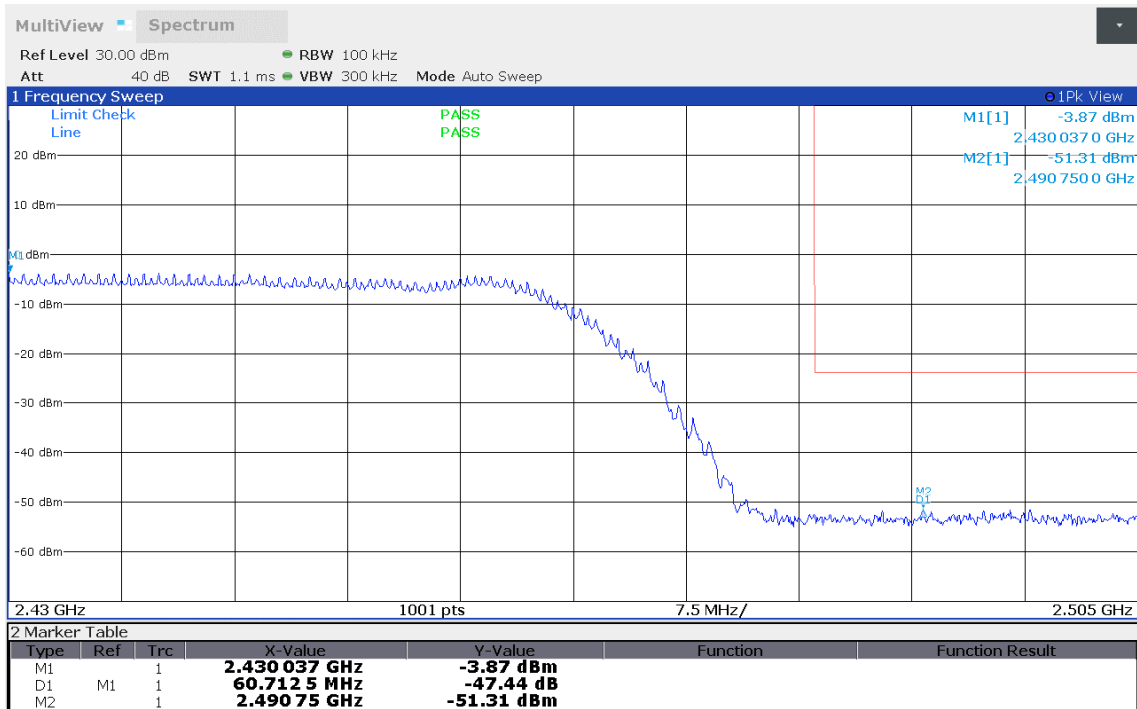
Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: CSS, Channel: 1, 2440 MHz, 1Mbps
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-01-31
 Band-edge: Lower
 In-band Frequency [MHz]: 2417.378
 Max. in-band Level [dBm/100 kHz]: -3.039
 Out-of-band Frequency [MHz]: 2399.95
 Max. out-of-band Level [dBm/100 kHz]: -43.017
 Attenuation [dB]: ?
 Attenuation [dBc]: -39.98



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Emissions in nonrestricted frequency bands at the Band-edge

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: CSS, Channel: 1, 2440 MHz, 1Mbps
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-01-31
 Band-edge: Upper
 In-band Frequency [MHz]: 2430.037
 Max. in-band Level [dBm/100 kHz]: -3.874
 Out-of-band Frequency [MHz]: 2490.75
 Max. out-of-band Level [dBm/100 kHz]: -51.31
 Attenuation [dB]: -47.44



11:18:20 31.01.2022

3.7 Test Conditions and Results - Conducted spurious emissions

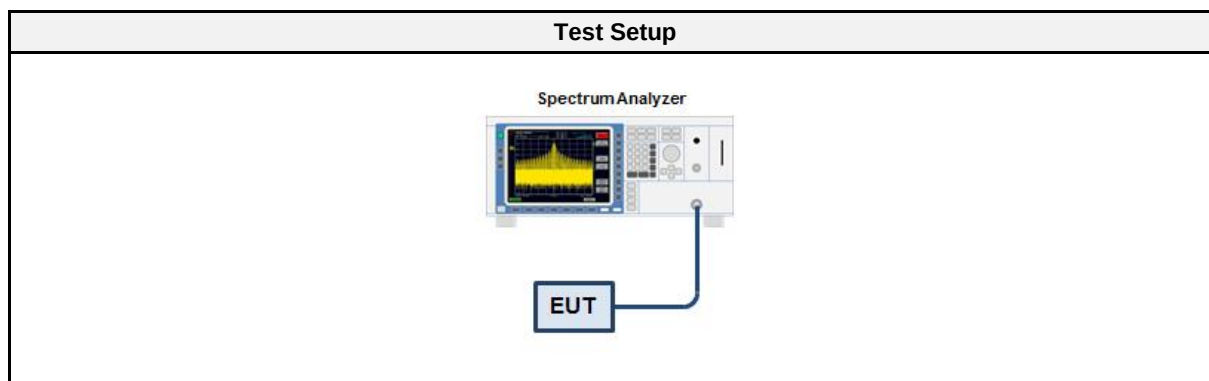
3.7.1 Information

Test Information	
Reference	FCC § 15.247(d); ISED RSS-247, Issue 2 (section 5.5)
Measurement Uncertainty	± 4.25 dB
Measurement Method	ANSI C63.10 11.11
Operator	Wilfried Treffke
Date	2022-01-31

3.7.2 Limits

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

3.7.3 Setup



3.7.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSW 43	EF00896	2021-07	2022-07
Cable (diverse)	– (diverse)	CAABE	EF00779	2022-01	2023-01

3.7.5 Procedure

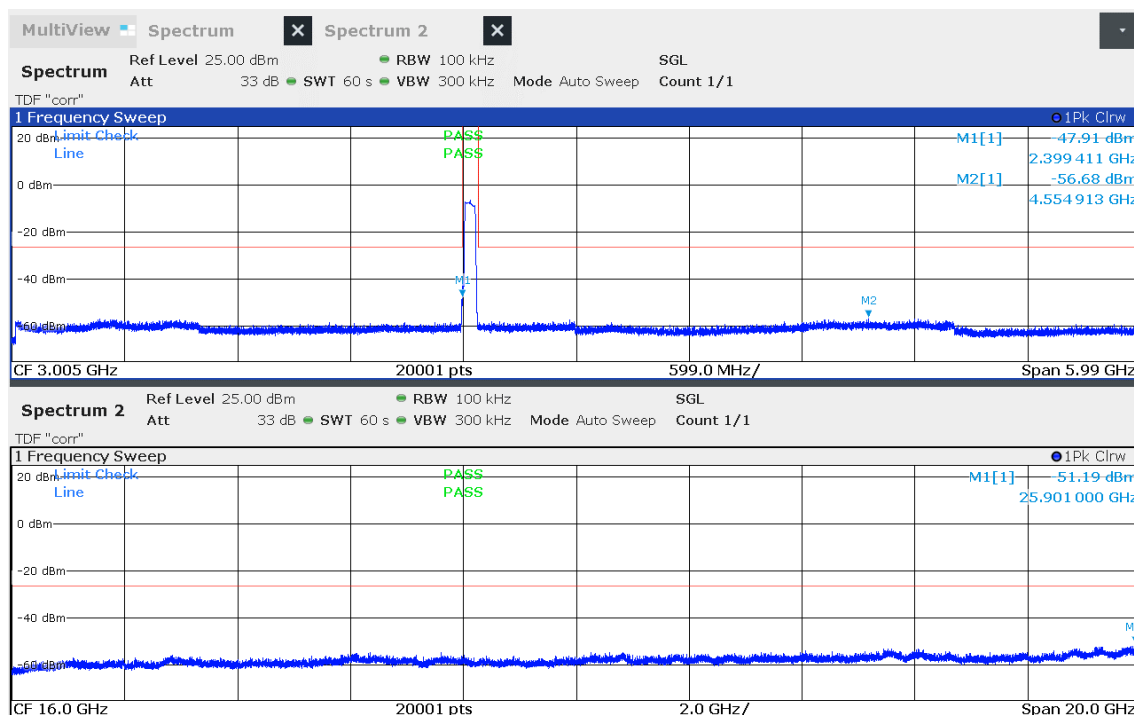
Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Span set around lower band edge and detector is set to peak and max hold 3. Resolution bandwidth is set to 100 kHz 4. Markers are set to peak emission levels outside frequency band

3.7.6 Results

Test Results		
Mode	Channel [MHz]	Verdict
CSS 250k	2440	PASS
CSS 1M	2440	PASS

Conducted Spurious Emissions

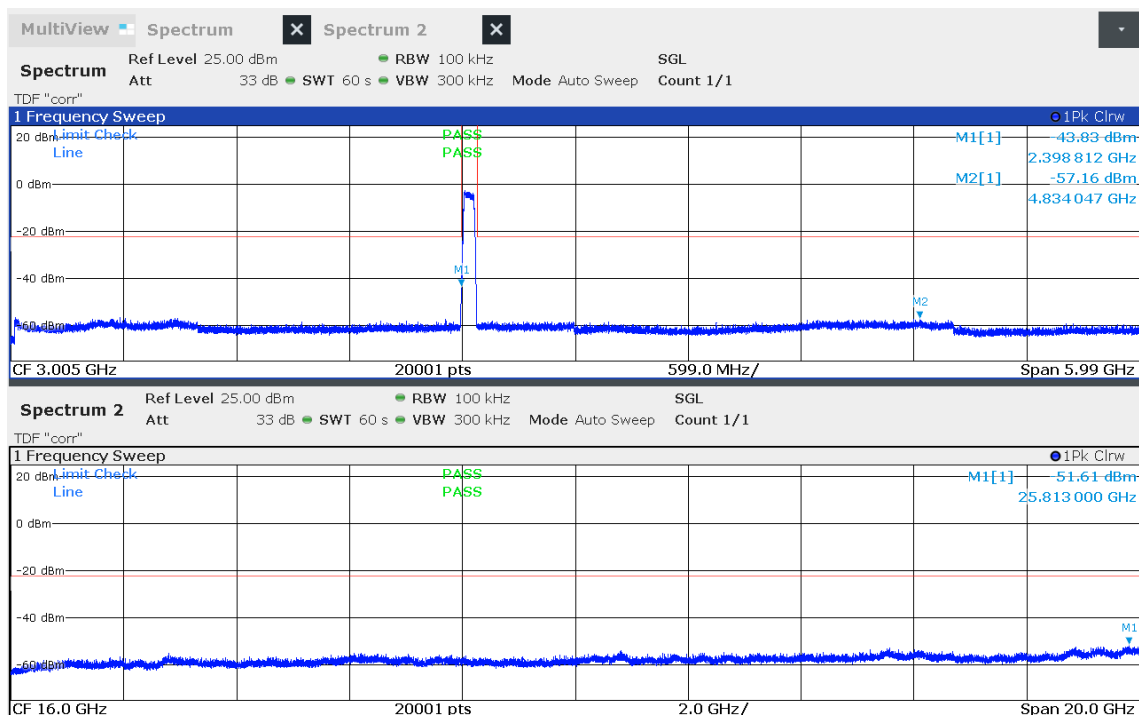
Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: CSS, Channel: 1, 2440 MHz, 250 kbps
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-01-31
 Max. in-band Frequency [MHz]: 2441.1
 Max. in-band Level [dBm/100 kHz]: -6.5
 Out-of-band Limit [dBm/100 kHz]: -26.5



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Conducted Spurious Emissions

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: CSS, Channel: 1, 2440 MHz, 1 Mbps
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-01-31
 Max. in-band Frequency [MHz]: 2417.9
 Max. in-band Level [dBm/100 kHz]: -2.2
 Out-of-band Limit [dBm/100 kHz]: -22.2



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3.8 Test Conditions and Results - Transmitter radiated emissions

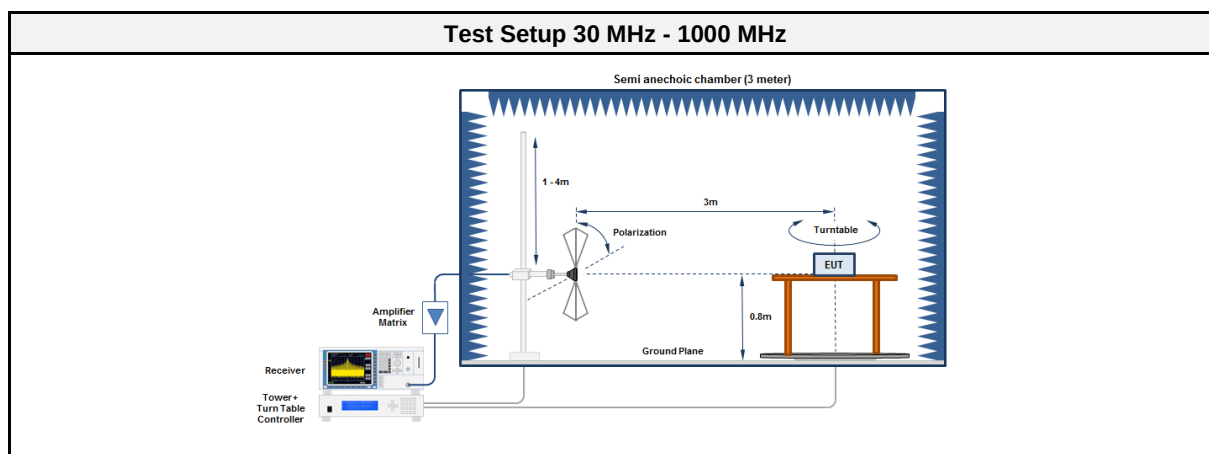
3.8.1 Information

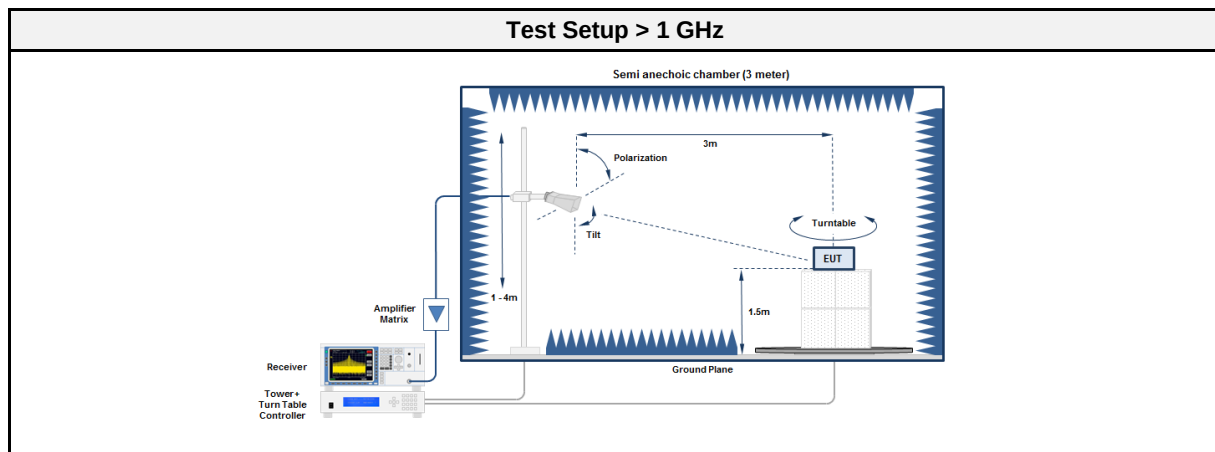
Test Information	
Reference	FCC § 15.247(d); FCC § 15.209; ISSED RSS-Gen, Issue 5 A2 (section 6.13)
Measurement Uncertainty	± 5.95 dB
Measurement Method	ANSI C63.10 6.4, 6.5, 6.6, 11.12
Operator	Wilfried Treffke
Date	2022-01-31

3.8.2 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

3.8.3 Setup





3.8.4 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	2021-02	2024-02
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2021-07	2022-07
Antenna	R&S	HK 116	EF00030	2021-05	2024-05
Antenna	R&S	HL 223	EF00187	2019-05	2022-05

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC2	EF01407	2021-08	2022-08
Measurement Receiver	R&S	FSU43	EF01631	2021-07	2022-07
Antenna	Schwarzbeck	BBHA 9120D	EF00018	2019-10	2022-10
Antenna	Amplifier Research	AT4560	EF00302	2021-06	2023-06

3.8.5 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	

3.8.6 Results

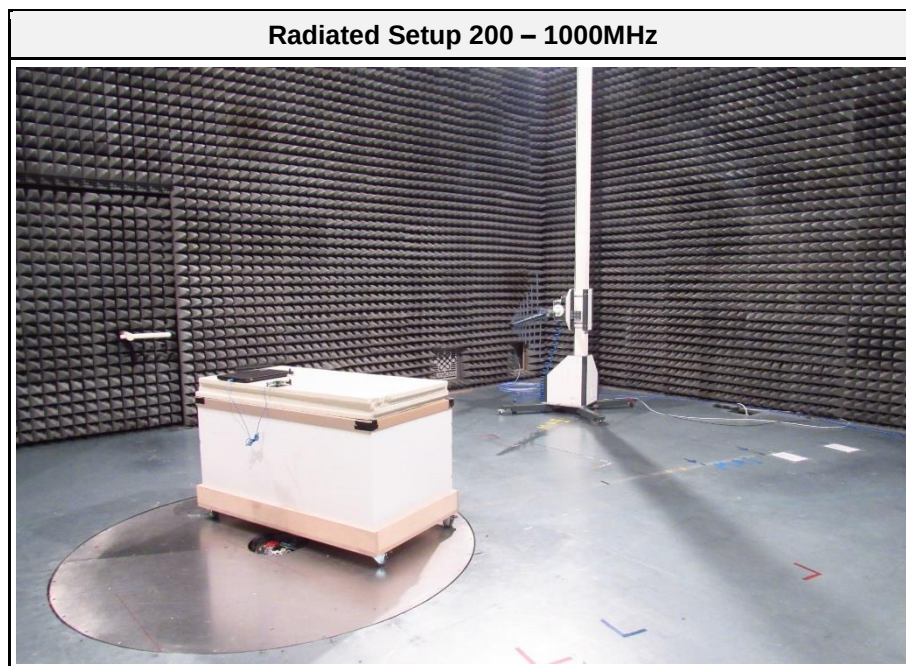
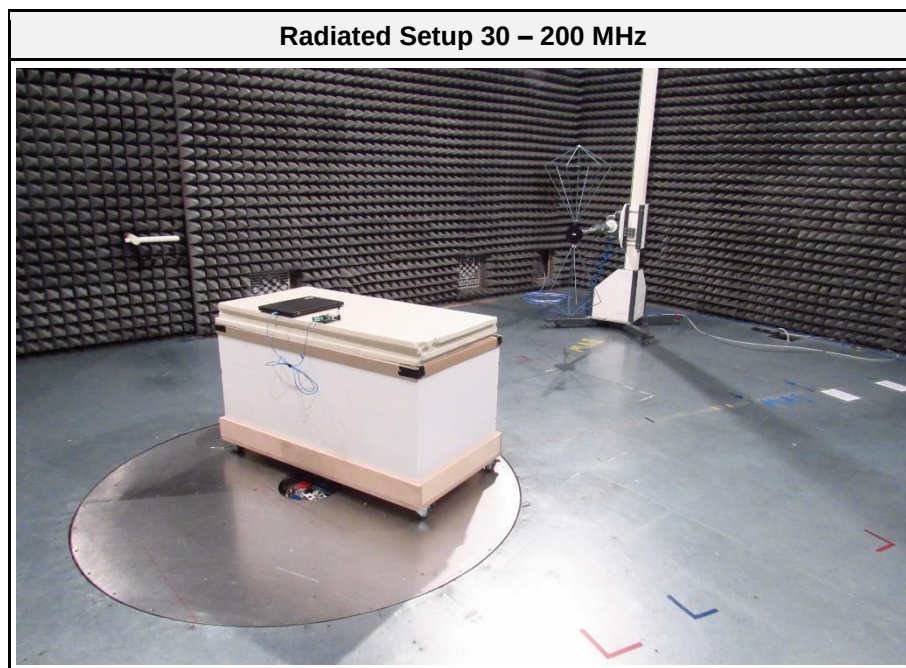
Test Report No.: G0M-2201-1246-TFC247DT-V01

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

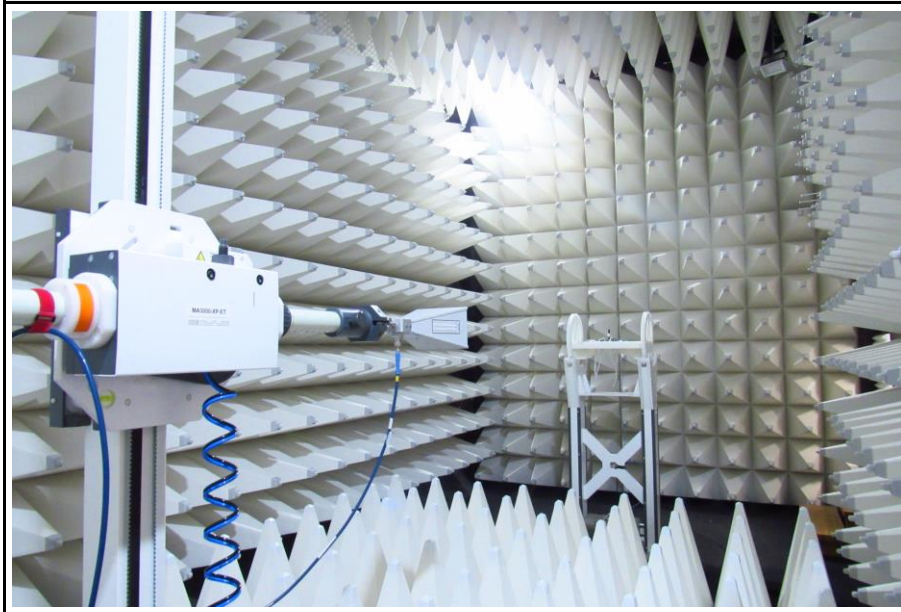
Test Results – 250 kbps						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2440	167.9933	32.90	qpk	ver	43.50	-10.65
2440	2389.6	57.52	pk	hor	74.00	-16.48
2440	2389.6	44.66	avg	hor	54.00	-09.34
2440	2484.1	57.79	pk	hor	74.00	-16.21
2440	2484.1	45.87	avg	hor	54.00	-08.13
2440	4887.2	43.34	pk	hor	74.00	-30.66
2440	4887.2	31.89	avg	hor	54.00	-22.11
2440	18513	47.92	pk	ver	74.00	-26.08
2440	18513	35.71	avg	ver	54.00	-18.29

Test Results – 1 Mbps						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2440	2385.6	57.97	pk	ver	74.00	-16.03
2440	2385.6	44.87	avg	ver	54.00	-09.13
2440	2484.3	58.80	pk	ver	74.00	-15.20
2440	2484.3	45.34	avg	ver	54.00	-08.66
2440	4882.4	39.94	pk	ver	74.00	-34.06
2440	4882.4	33.67	avg	ver	54.00	-20.33
2440	7688.7	44.47	pk	hor	74.00	-29.53
2440	7688.7	30.27	avg	hor	54.00	-23.73
2440	13383	42.51	pk	ver	74.00	-31.49
2440	13383	30.87	avg	ver	54.00	-23.13
2440	18555	48.23	pk	hor	74.00	-25.77
2440	18555	35.43	avg	hor	54.00	-18.57

3.8.7 Setup Photos



Radiated Setup above 1 GHz



3.9 Test Conditions and Results - Receiver radiated emissions

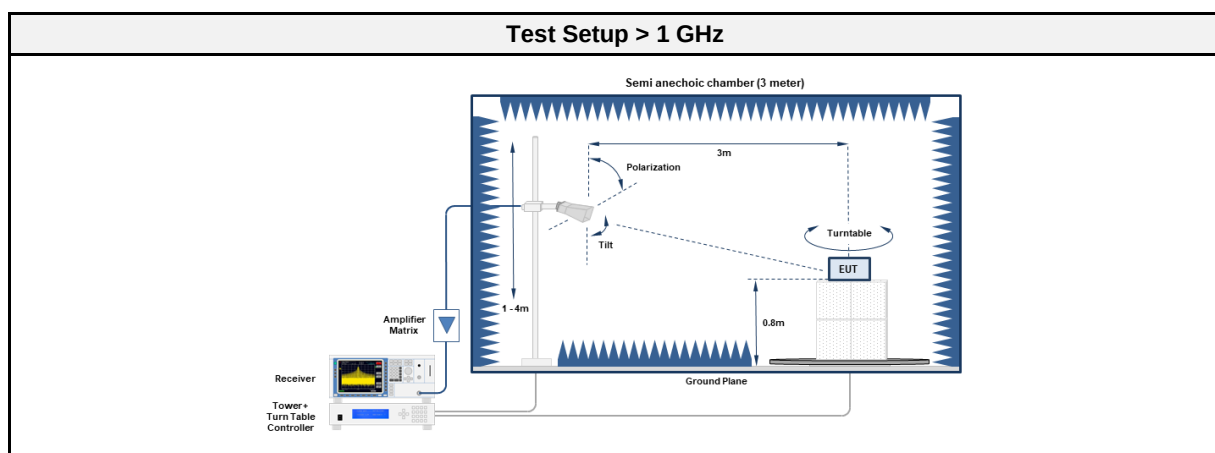
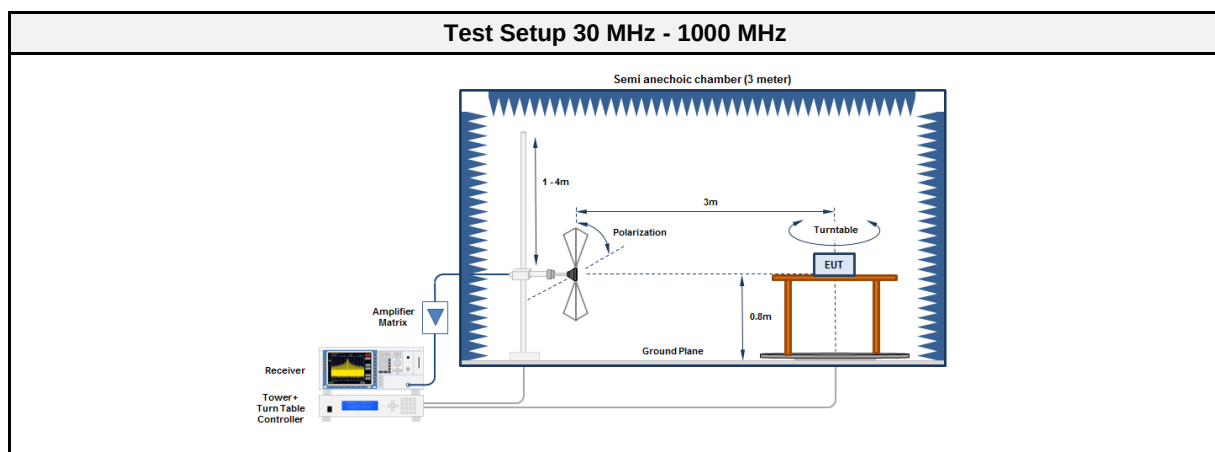
3.9.1 Information

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	Wilfried Treffke
Date	2022-01-31

3.9.2 Limits

Limits			
Frequency range [MHz]	Detector	Field strength [$\mu\text{V/m}$]	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

3.9.3 Setup



3.9.4 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	2021-02	2024-02
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2021-07	2022-07
Antenna	R&S	HK 116	EF00030	2021-05	2024-05
Antenna	R&S	HL 223	EF00187	2019-05	2022-05

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2021-02	2024-02
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2021-07	2022-07
Antenna	Schwarzbeck	BBHA 9120D	EF00018	2019-10	2022-10

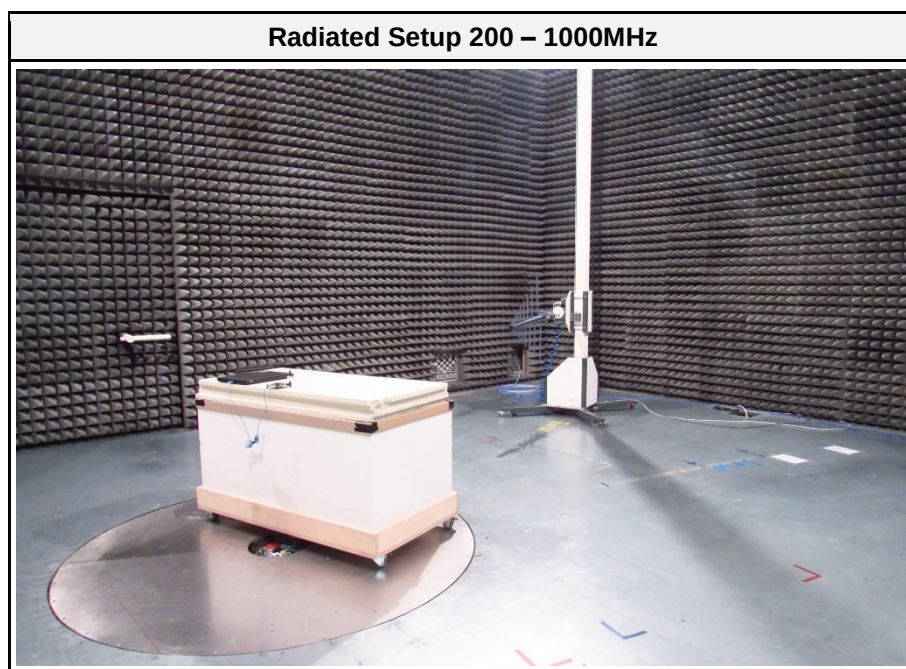
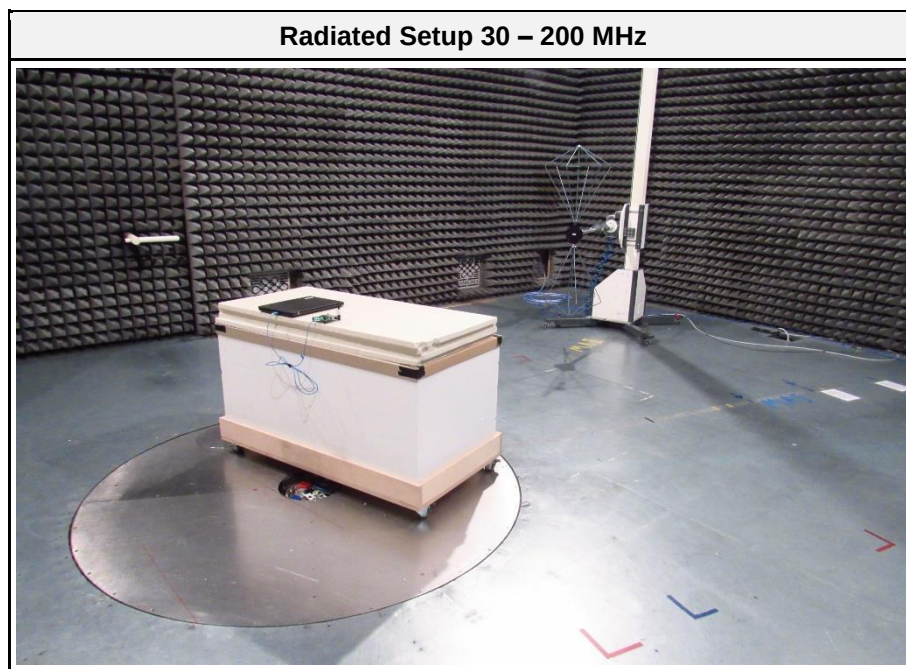
3.9.5 Procedure

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	

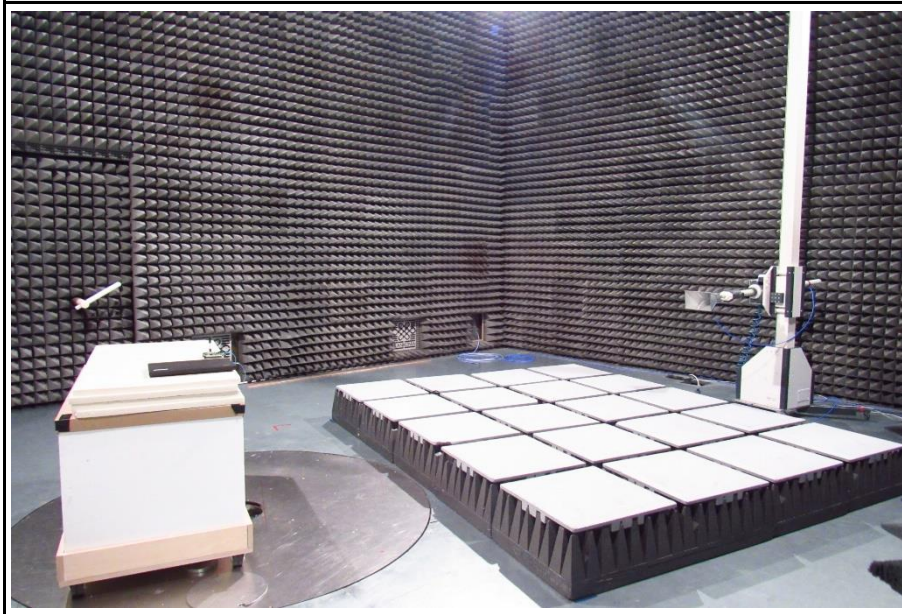
3.9.6 Results

Test Results						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2440	47.3442	30.50	qpk	ver	40.00	-09.46
2440	95.926	33.90	qpk	ver	43.50	-09.62
2440	168.0018	33.90	qpk	ver	43.50	-09.60

3.9.7 Setup Photos



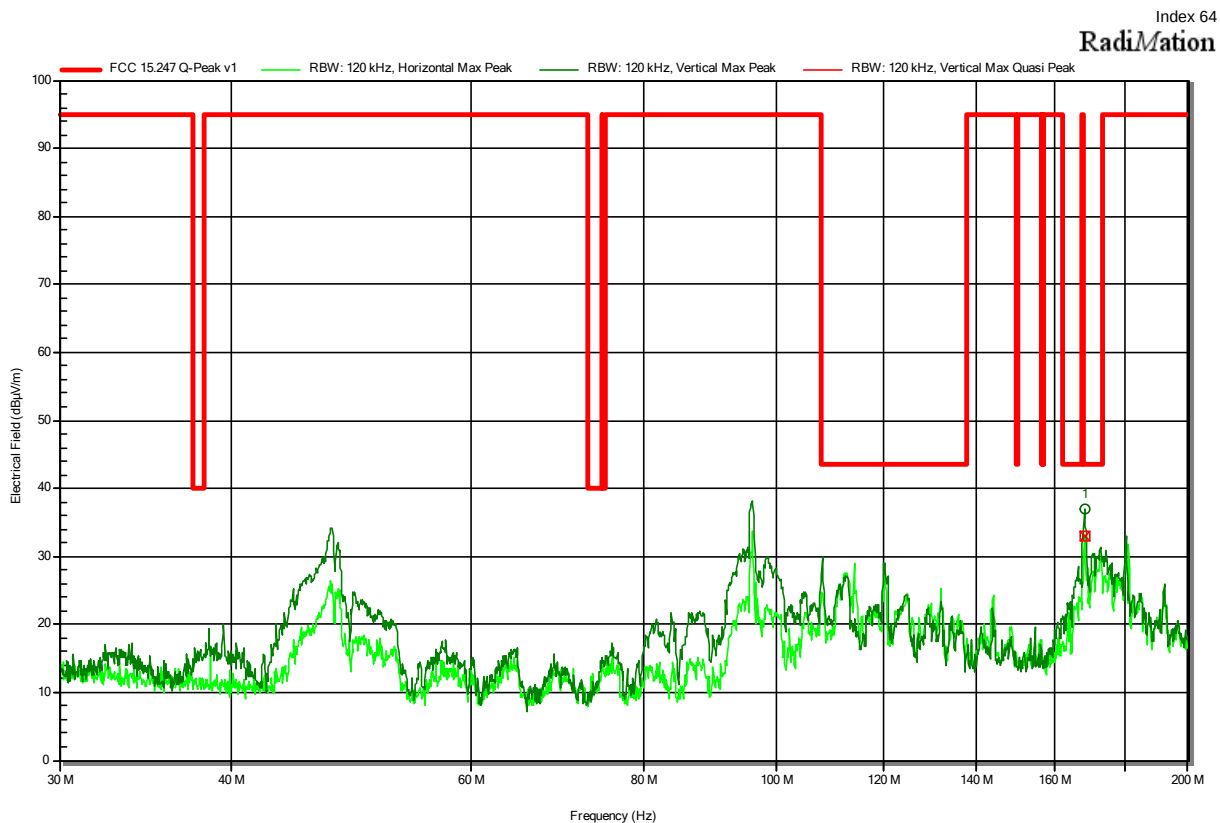
Radiated Setup above 1 GHz



ANNEX A Transmitter spurious emissions

Radiated Spurious Emissions according to FCC 15.247

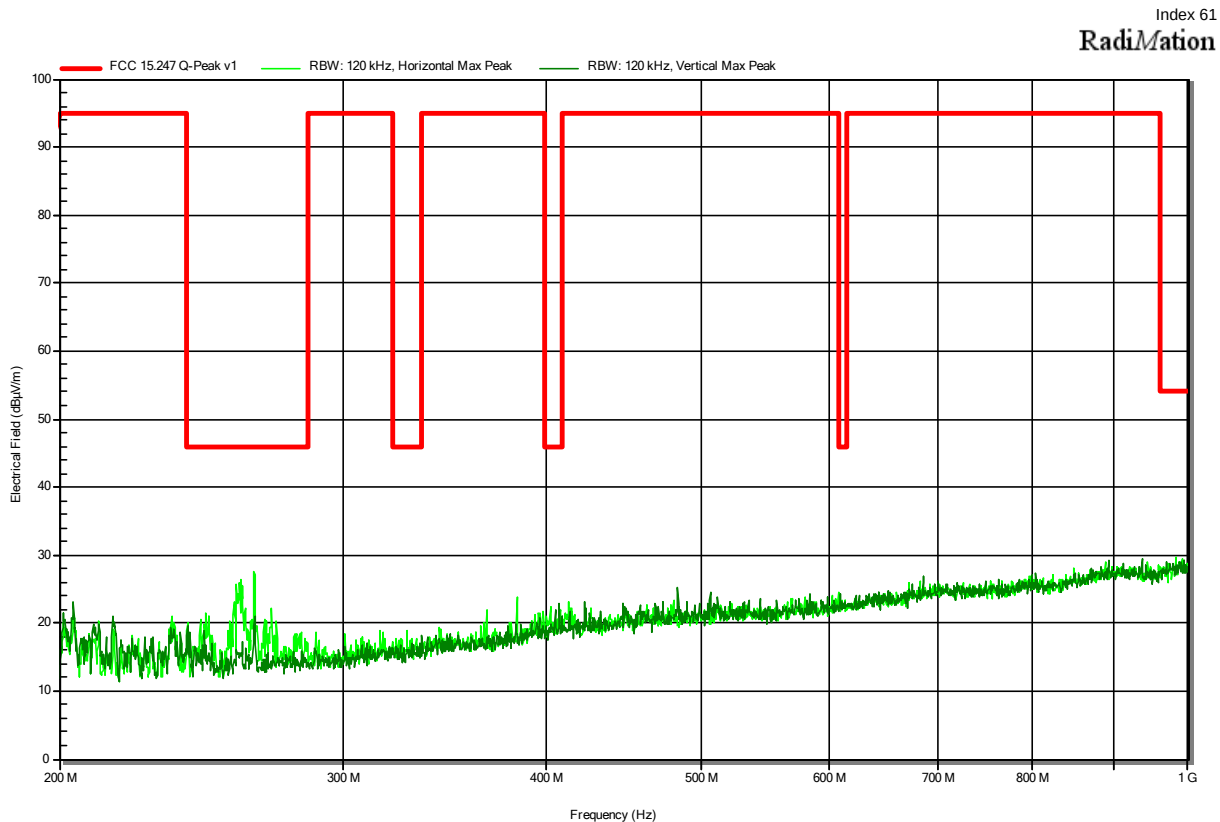
Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Qawasmeh
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5VDC (USB powered)
 Antenna: Rohde & Schwarz HK 116
 Measurement distance: 3 m
 Mode: Tx; CSS, 250 kbps, stxp=42
 Test Date: 2022-02-01



Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Polarization
167.9933 MHz	32.9 dBμV/m	43.5 dBμV/m	-10.65 dB	Pass	Vertical

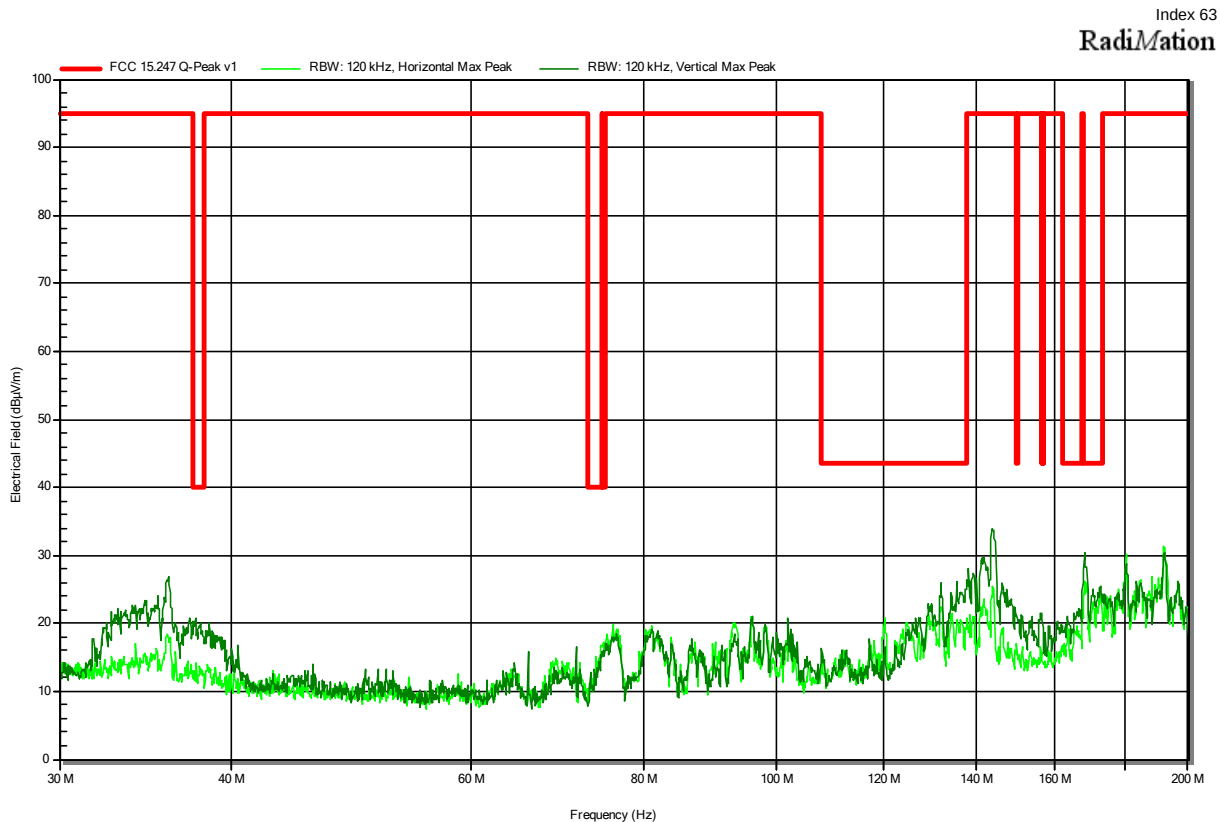
Radiated Spurious Emissions according to FCC 15.247

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Qawasmeh
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5VDC (USB powered)
 Antenna: Rohde & Schwarz HL 223
 Measurement distance: 3 m
 Mode: Tx; CSS, 250 kbps, stxp=42
 Test Date: 2022-02-01



Radiated Spurious Emissions according to FCC 15.247

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Qawasmeh
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5VDC (USB powered)
 Antenna: Rohde & Schwarz HK 116
 Measurement distance: 3 m
 Mode: Tx; CSS, 1 Mbps, stxp=42
 Test Date: 2022-02-01
 Note:

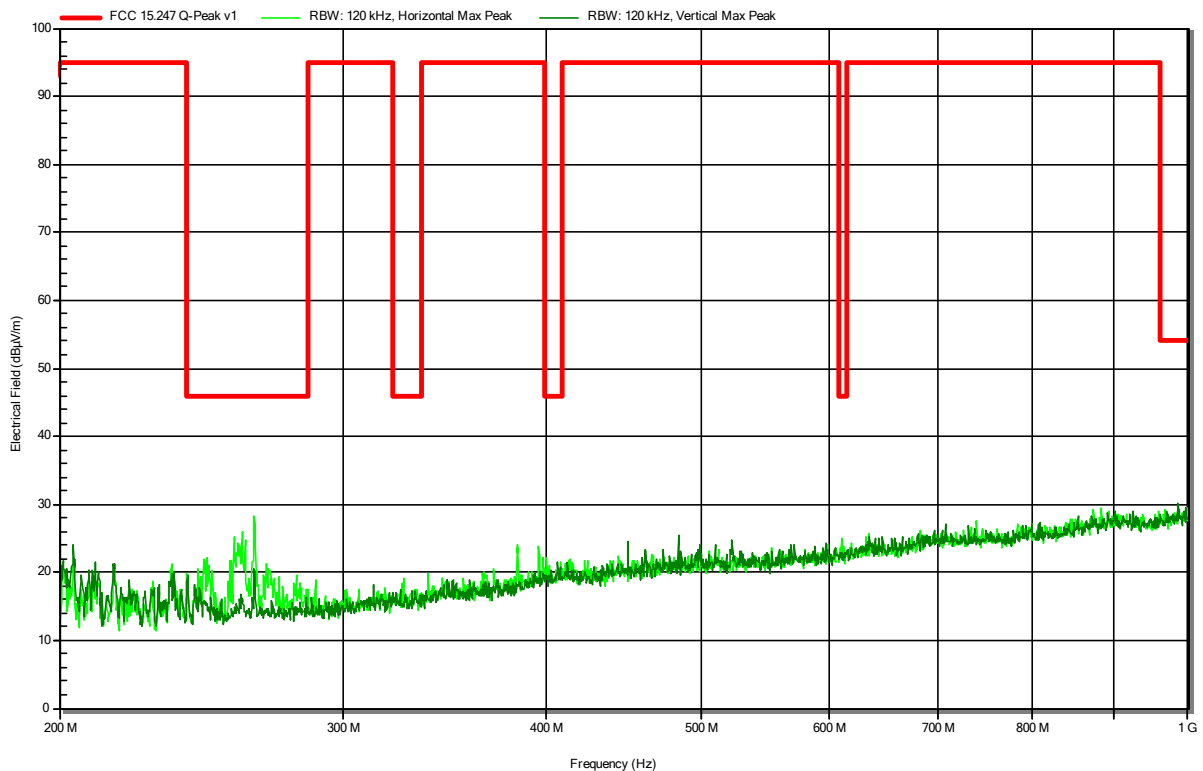


Radiated Spurious Emissions according to FCC 15.247

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Qawasmeh
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5VDC (USB powered)
 Antenna: Rohde & Schwarz HL 223
 Measurement distance: 3 m
 Mode: Tx; CSS, 1 Mbps, stxp=42
 Test Date: 2022-02-01
 Note:

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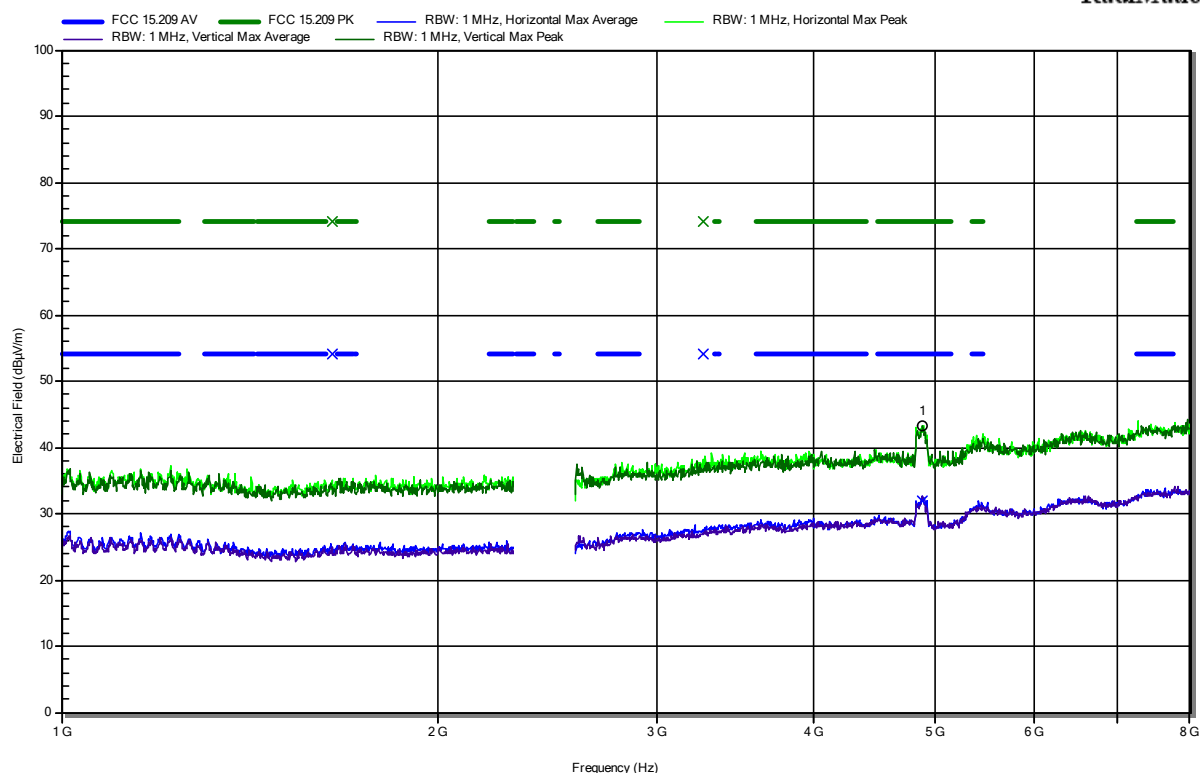


Radiated Spurious Emissions according to FCC 15.247

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Test Site: Eurofins Product Service GmbH
 Operator: R. Jaafar
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5VDC (USB powered)
 Antenna: Schwarzbeck BBHA 9120B
 Measurement distance: 3 m
 Mode: Tx; CSS, 250 Kbps, stxp=42
 Test Date: 2022-02-02
 Note:

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Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
4.8872 GHz	43.34 dBμV/m	74 dBμV/m	-30.66 dB	Pass	Horizontal
Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
4.8872 GHz	31.89 dBμV/m	54 dBμV/m	-22.11 dB	Pass	Horizontal

Test Report No.: G0M-2201-1246-TFC247DT-V01

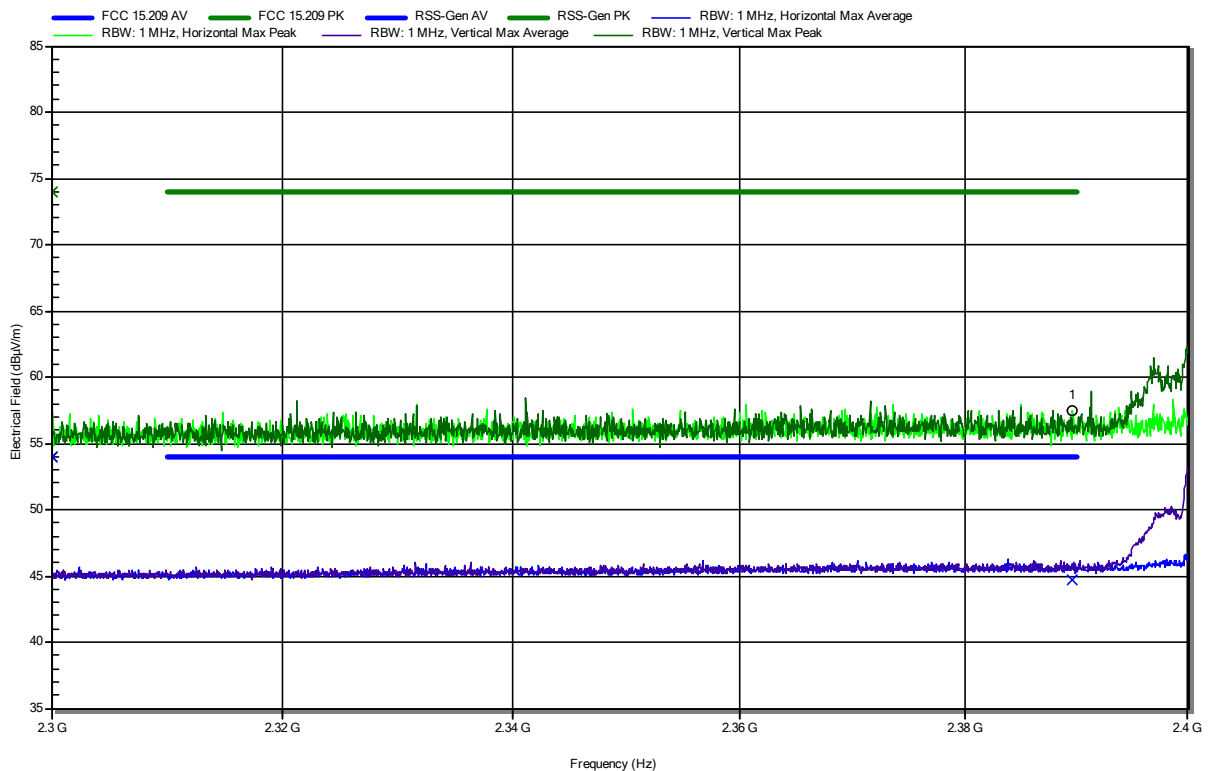
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Radiated Spurious Emissions according to FCC 15.247

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Test Site: Eurofins Product Service GmbH
 Operator: R. Jaafar
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5VDC (USB powered)
 Antenna: Schwarzbeck BBHA 9120B
 Measurement distance: 3 m
 Mode: Tx; CSS, 250 Kbps, stxp=42
 Test Date: 2022-02-02
 Note: lower bandedge

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RadiMation



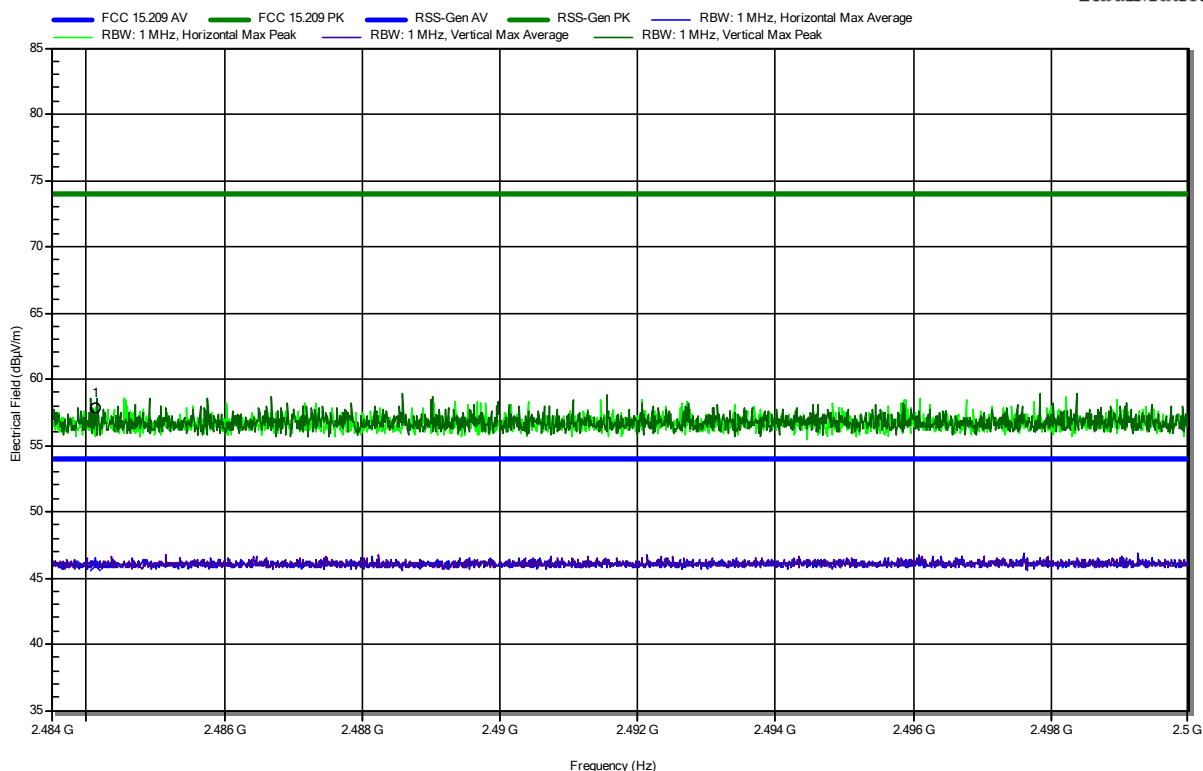
Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
2.3896 GHz	57.52 dBμV/m	74 dBμV/m	-16.48 dB	Pass	Horizontal
Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
2.3896 GHz	44.66 dBμV/m	54 dBμV/m	-9.34 dB	Pass	Horizontal

Radiated Spurious Emissions according to FCC 15.247

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Test Site: Eurofins Product Service GmbH
 Operator: R. Jaafar
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5VDC (USB powered)
 Antenna: Schwarzbeck BBHA 9120B
 Measurement distance: 3 m
 Mode: Tx; CSS, 250 Kbps, stxp=42
 Test Date: 2022-02-02
 Note: upper bandedge

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RadiMation



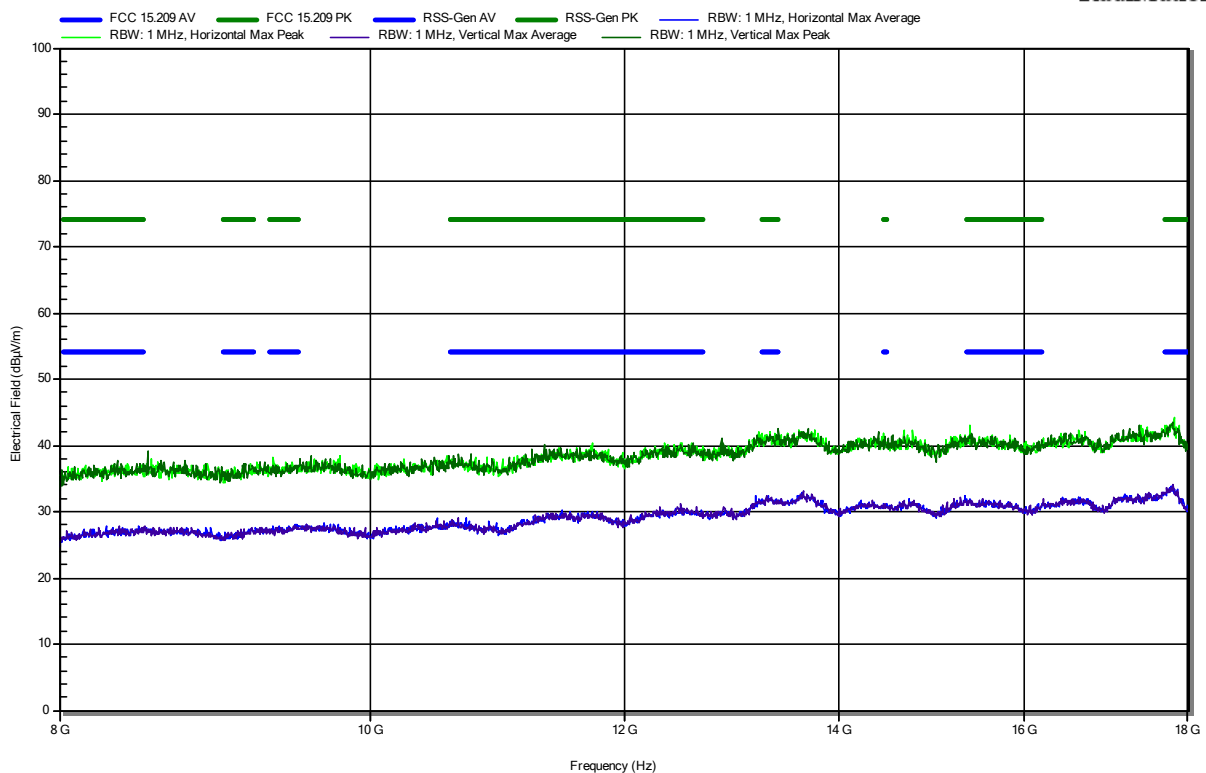
Frequency 2.4841 GHz	Peak 57.79 dBµV/m	Peak Limit 74 dBµV/m	Peak Difference -16.21 dB	Peak Status Pass	Polarization Horizontal
Frequency 2.4841 GHz	Average 45.87 dBµV/m	Average Limit 54 dBµV/m	Average Difference -8.13 dB	Average Status Pass	Polarization Horizontal

Radiated Spurious Emissions according to FCC 15.247

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Test Site: Eurofins Product Service GmbH
 Operator: R. Jaafar
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5VDC (USB powered)
 Antenna: Schwarzbeck HWRD 650
 Measurement distance: 3 m
 Mode: Tx; CSS, 250 Kbps, stxp=42
 Test Date: 2022-02-02
 Note:

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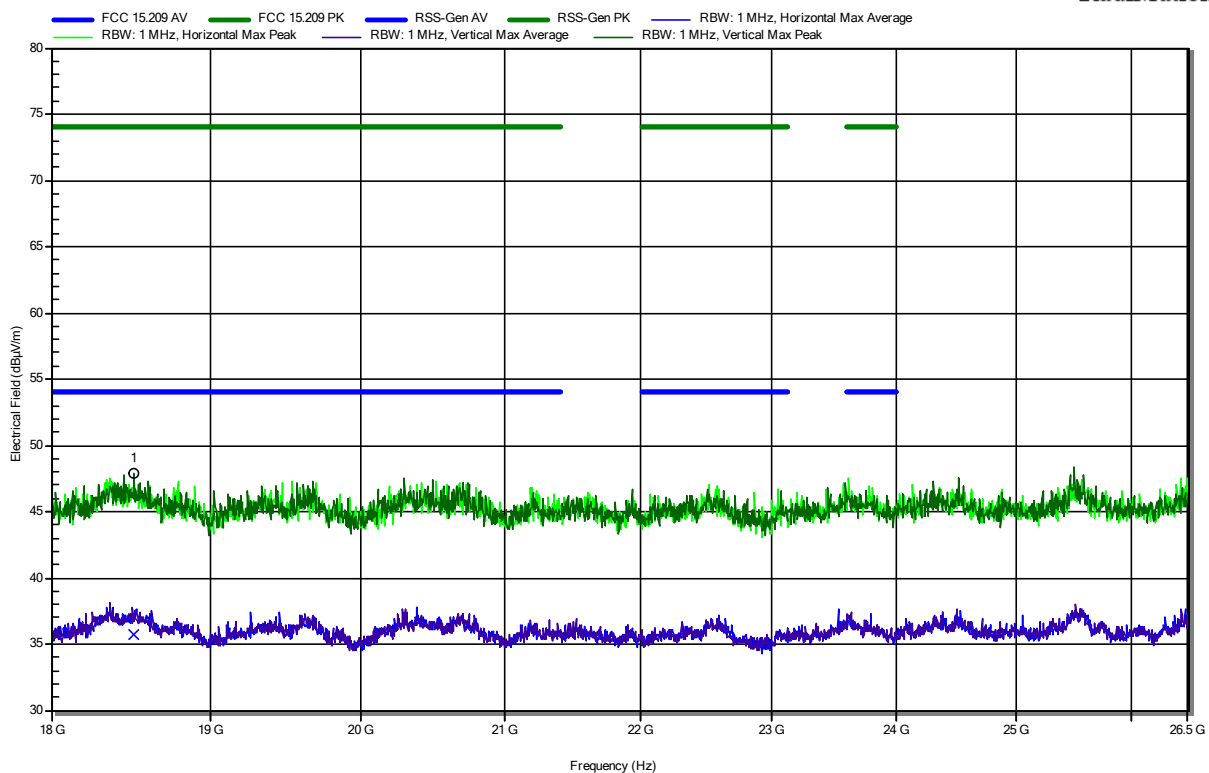


Radiated Spurious Emissions according to FCC 15.247

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Test Site: Eurofins Product Service GmbH
 Operator: R. Jaafar
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5VDC (USB powered)
 Antenna: Amplifier Research AT4560
 Measurement distance: 3 m
 Mode: Tx; CSS, 250 Kbps, stxp=42
 Test Date: 2022-02-02
 Note:

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RadiMation



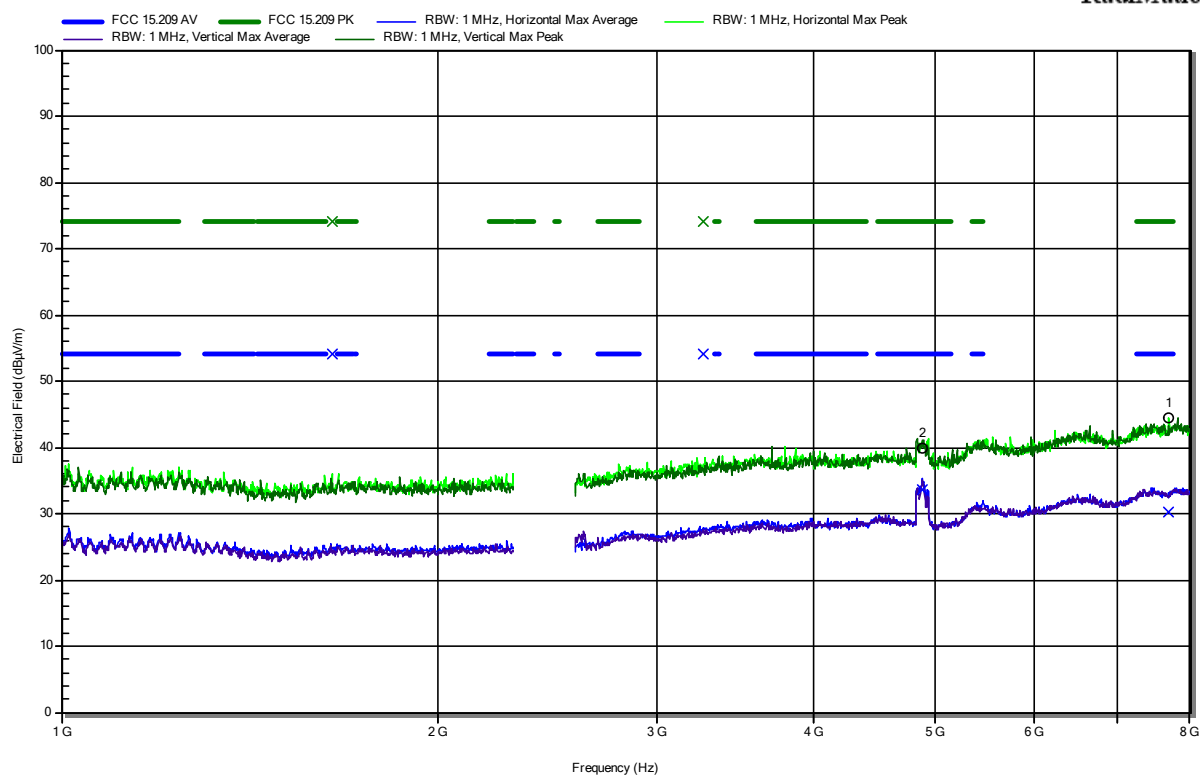
Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
18.513 GHz	47.92 dBμV/m	74 dBμV/m	-26.08 dB	Pass	Vertical
Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
18.513 GHz	35.71 dBμV/m	54 dBμV/m	-18.29 dB	Pass	Vertical

Radiated Spurious Emissions according to FCC 15.247

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Test Site: Eurofins Product Service GmbH
 Operator: R. Jaafar
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5VDC (USB powered)
 Antenna: Schwarzbeck BBHA 9120B
 Measurement distance: 3 m
 Mode: Tx; CSS, 1 Mbps, stxp=42
 Test Date: 2022-02-02
 Note:

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Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
4.8824 GHz	39.94 dBμV/m	74 dBμV/m	-34.06 dB	Pass	Vertical
7.6887 GHz	44.47 dBμV/m	74 dBμV/m	-29.53 dB	Pass	Horizontal

Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
4.8824 GHz	33.67 dBμV/m	54 dBμV/m	-20.33 dB	Pass	Vertical
7.6887 GHz	30.27 dBμV/m	54 dBμV/m	-23.73 dB	Pass	Horizontal

Test Report No.: G0M-2201-1246-TFC247DT-V01

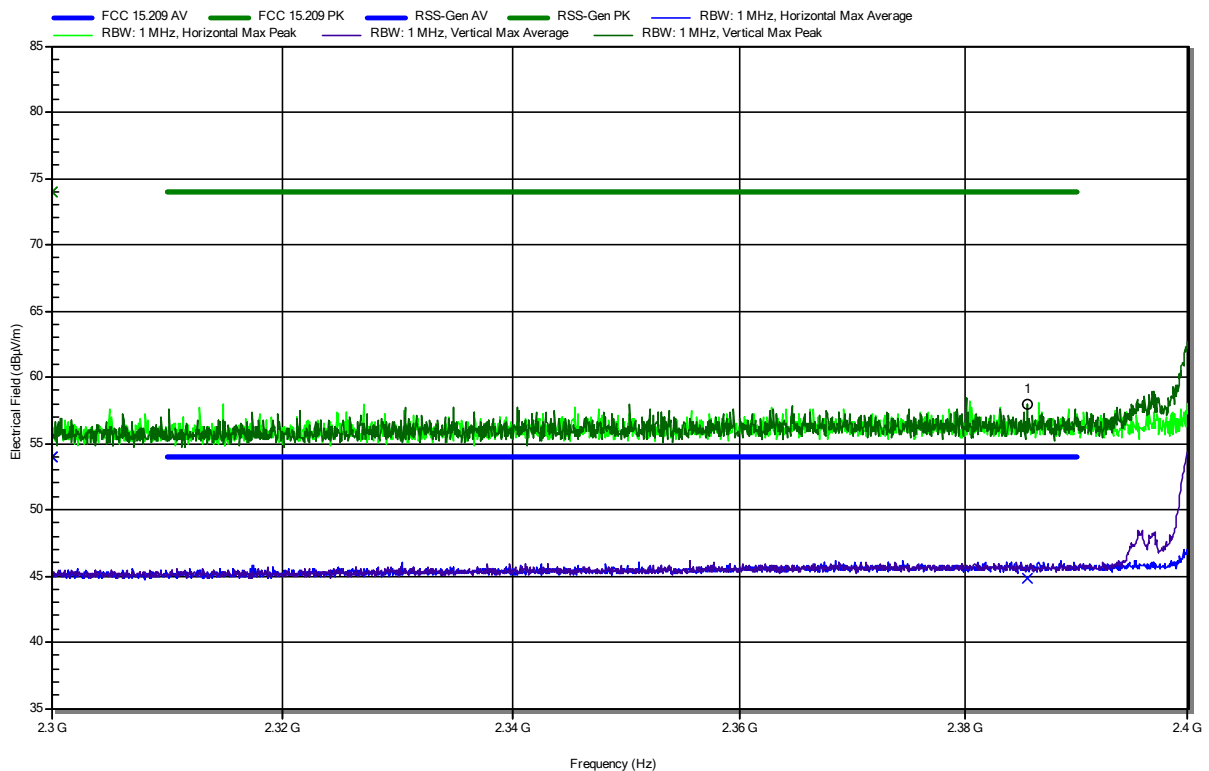
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Radiated Spurious Emissions according to FCC 15.247

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Test Site: Eurofins Product Service GmbH
 Operator: R. Jaafar
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5VDC (USB powered)
 Antenna: Schwarzbeck BBHA 9120B
 Measurement distance: 3 m
 Mode: Tx; CSS, 1 Mbps, stxp=42
 Test Date: 2022-02-02
 Note: lower bandedge

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Frequency 2.3856 GHz	Peak 57.97 dBµV/m	Peak Limit 74 dBµV/m	Peak Difference -16.03 dB	Peak Status Pass	Polarization Vertical
Frequency 2.3856 GHz	Average 44.87 dBµV/m	Average Limit 54 dBµV/m	Average Difference -9.13 dB	Average Status Pass	Polarization Vertical

Test Report No.: G0M-2201-1246-TFC247DT-V01

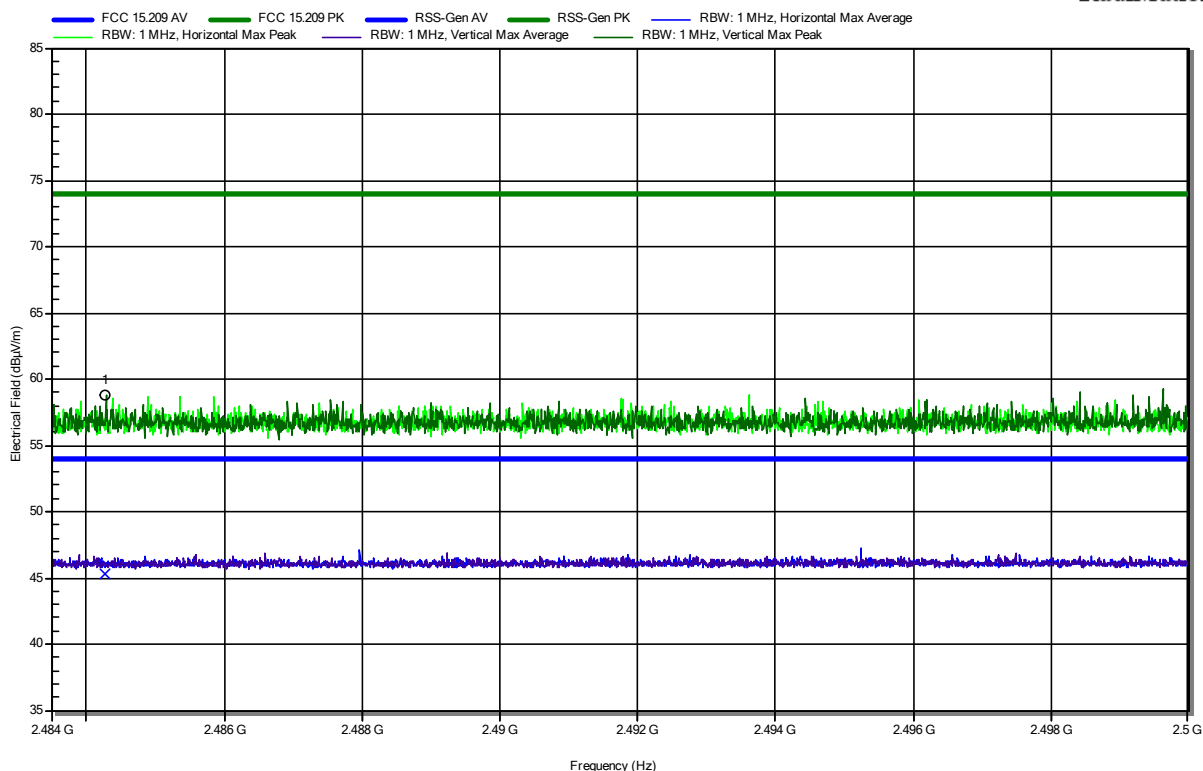
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Radiated Spurious Emissions according to FCC 15.247

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Test Site: Eurofins Product Service GmbH
 Operator: R. Jaafar
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5VDC (USB powered)
 Antenna: Schwarzbeck BBHA 9120B
 Measurement distance: 3 m
 Mode: Tx; CSS, 1 Mbps, stxp=42
 Test Date: 2022-02-02
 Note: upper bandedge

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Frequency 2.4843 GHz	Peak 58.8 dBμV/m	Peak Limit 74 dBμV/m	Peak Difference -15.2 dB	Peak Status Pass	Polarization Vertical
Frequency 2.4843 GHz	Average 45.34 dBμV/m	Average Limit 54 dBμV/m	Average Difference -8.66 dB	Average Status Pass	Polarization Vertical

Test Report No.: G0M-2201-1246-TFC247DT-V01

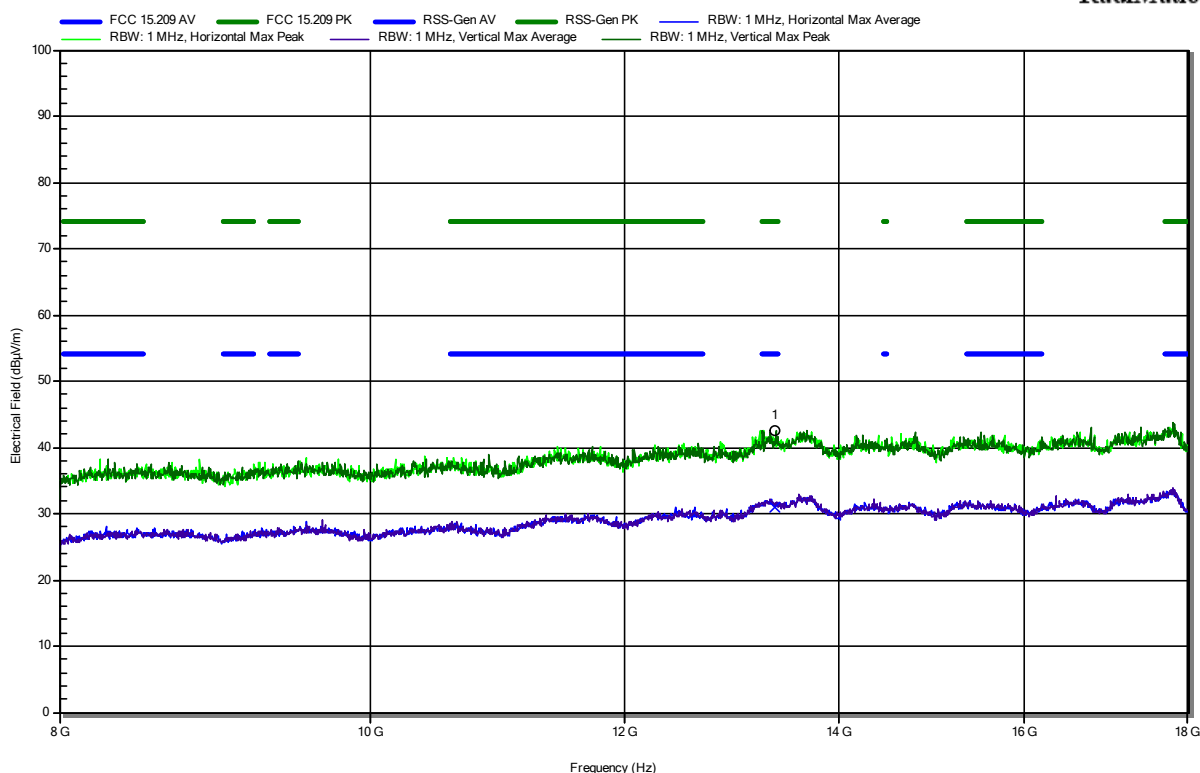
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Radiated Spurious Emissions according to FCC 15.247

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Test Site: Eurofins Product Service GmbH
 Operator: R. Jaafar
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5VDC (USB powered)
 Antenna: Schwarzbeck HWRD 650
 Measurement distance: 3 m
 Mode: Tx; CSS, 1 Mbps, stxp=42
 Test Date: 2022-02-02
 Note:

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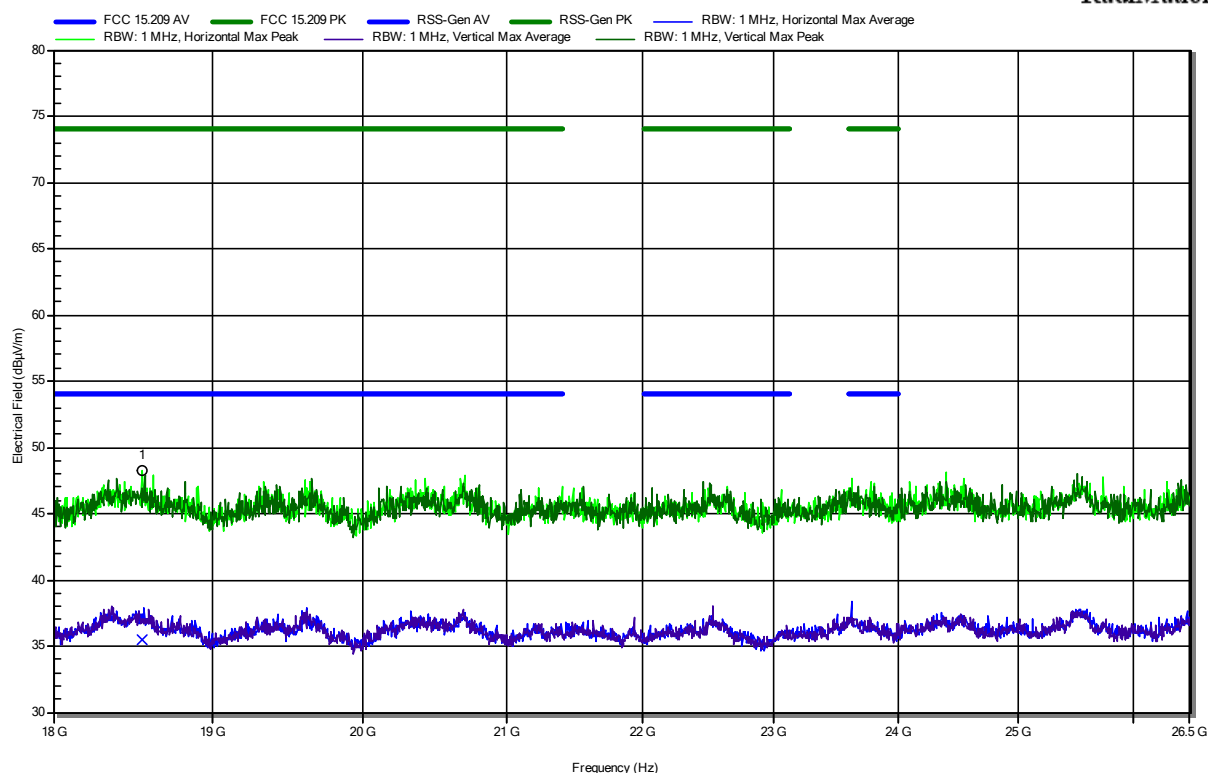
Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Polarization
13.383 GHz	42.51 dBμV/m	74 dBμV/m	-31.49 dB	Pass	Vertical
Frequency	Average	Average Limit	Average Difference	Average Status	Polarization
13.383 GHz	30.87 dBμV/m	54 dBμV/m	-23.13 dB	Pass	Vertical

Radiated Spurious Emissions according to FCC 15.247

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 38173
 Test Site: Eurofins Product Service GmbH
 Operator: R. Jaafar
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 23 °Celsius, Vnom: 5VDC (USB powered)
 Antenna: Amplifier Research AT4560
 Measurement distance: 3 m
 Mode: Tx; CSS, 1 Mbps, stxp=42
 Test Date: 2022-02-02
 Note:

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Frequency 18.555 GHz	Peak 48.23 dBμV/m	Peak Limit 74 dBμV/m	Peak Difference -25.77 dB	Peak Status Pass	Polarization Horizontal
Frequency 18.555 GHz	Average 35.43 dBμV/m	Average Limit 54 dBμV/m	Average Difference -18.57 dB	Average Status Pass	Polarization Horizontal

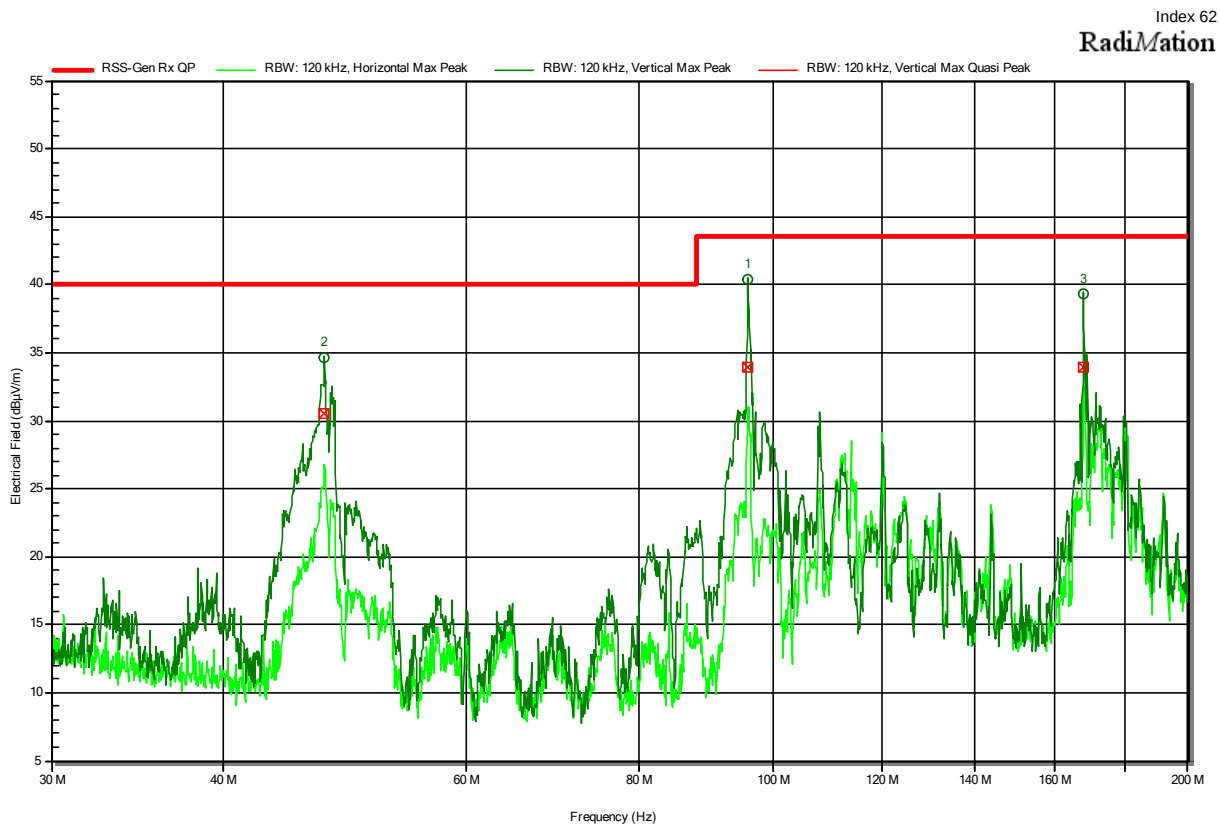
Test Report No.: G0M-2201-1246-TFC247DT-V01

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

ANNEX B Receiver spurious emissions

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

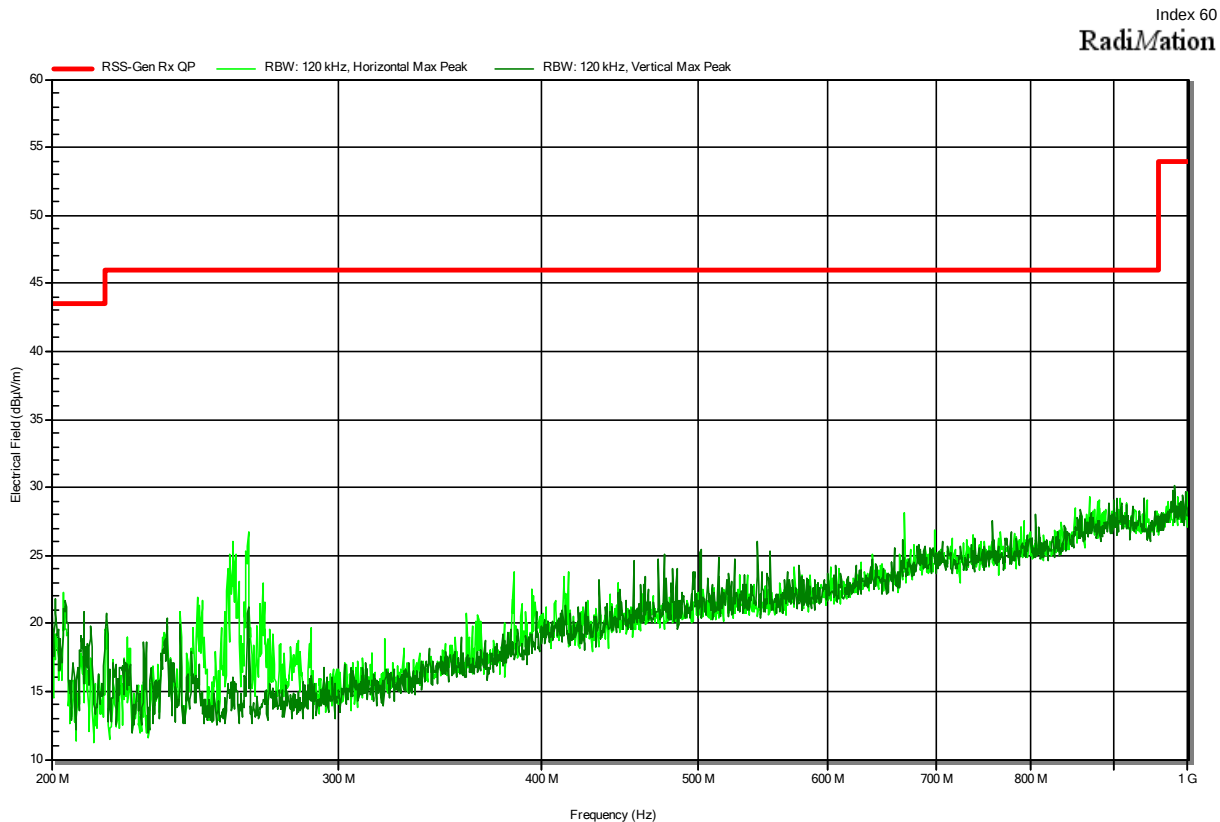
Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 36640
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Qawasmeh
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 22 °Celsius, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HK 116
 Measurement distance: 3 m
 Mode: Rx; Nanotron Rx
 Test Date: 2022-02-01



Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Polarization
47.3442 MHz	30.5 dBµV/m	40 dBµV/m	-9.46 dB	Pass	Vertical
95.926 MHz	33.9 dBµV/m	43.5 dBµV/m	-9.62 dB	Pass	Vertical
168.0018 MHz	33.9 dBµV/m	43.5 dBµV/m	-9.6 dB	Pass	Vertical

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

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 36640
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Qawasmeh
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 22 °Celsius, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 223
 Measurement distance: 3 m
 Mode: Rx; Nanotron Rx
 Test Date: 2022-02-01
 Note:

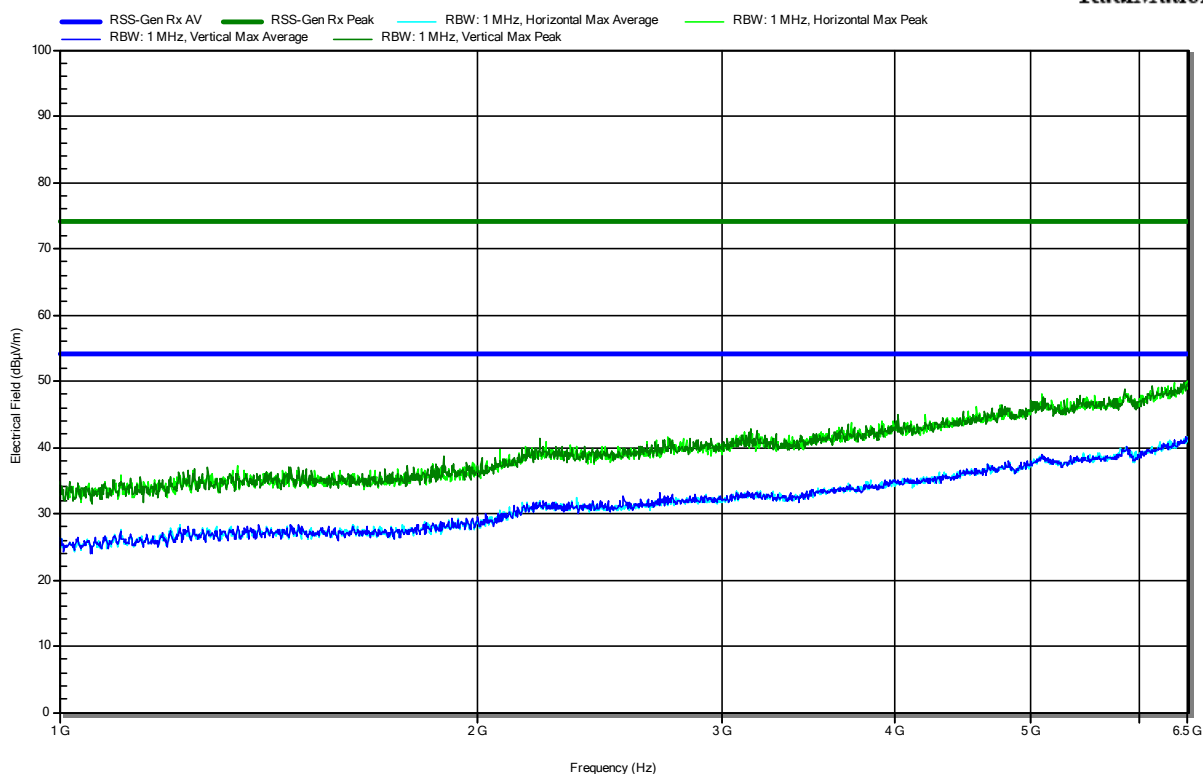


Radiated Spurious Emissions according to RSS-247, 47 CFR Part 15.247

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 36640
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Qawasmeh
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 22 °Celsius, Vnom: 5.0 VDC
 Antenna: Schwarzbeck BBHA 9120D
 Measurement distance: 3 m
 Mode: Rx; Nanotron Rx
 Test Date: 2022-02-01
 Note:

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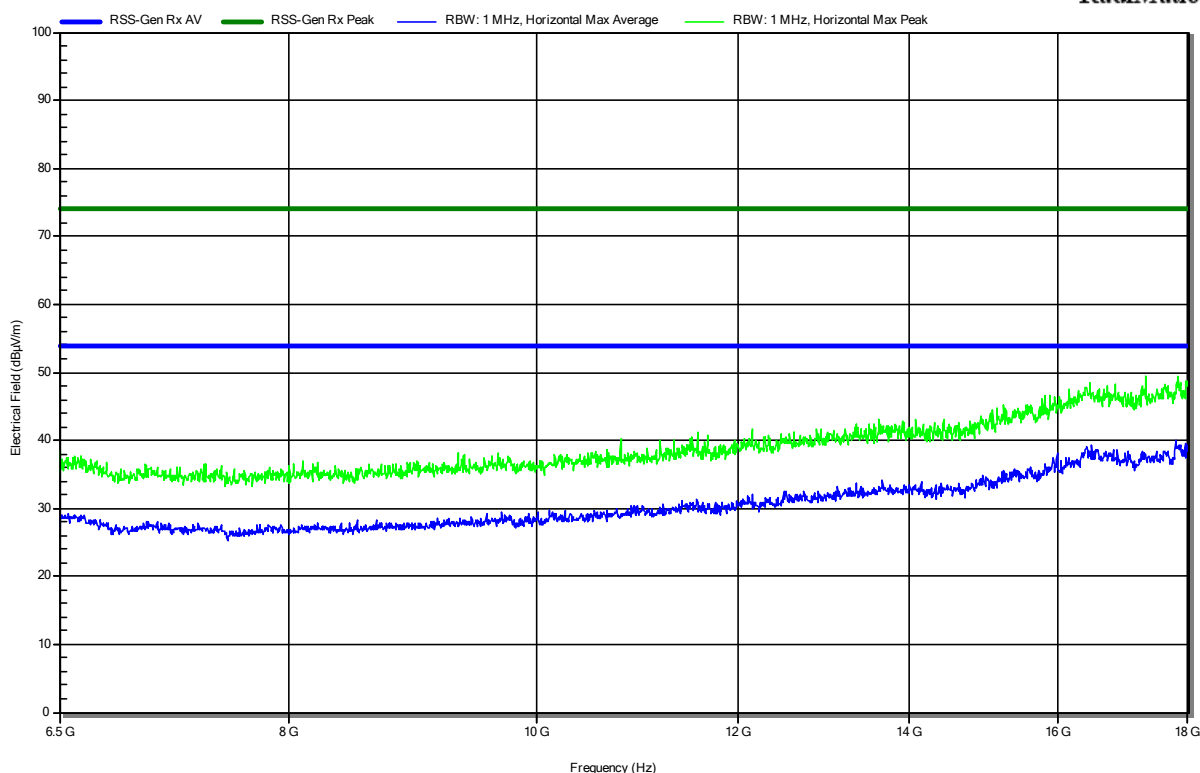


Radiated Spurious Emissions according to RSS-247, 47 CFR Part 15.247

Project Number: G0M-2201-1246
 Applicant: Nanotron Technologies GmbH
 Model Description: Swarm Bee LE V3 with Development Kit
 Model: Swarm Bee LE V3
 Test Sample ID: 36640
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Qawasmeh
 Measurement software: RadiMation, version 2020.1.8
 Test Conditions: Tnom: 22 °Celsius, Vnom: 5.0 VDC
 Antenna: Schwarzbeck HWRD 650
 Measurement distance: 3 m
 Mode: Rx; Nanotron Rx
 Test Date: 2022-02-01
 Note:

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== = END OF TEST REPORT == =

Test Report No.: G0M-2201-1246-TFC247DT-V01

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