

FCC TEST REPORT	
FCC 47 CFR Part 15C Industry Canada RSS-247 Frequency hopping systems operating within the 2400 – 2483.5 MHz band	
Report Reference No.	G0M-1510-5172-TFC247BT-133-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	  A2LA Accredited Testing Laboratory, Certificate No.: 1983.01 FCC Filed Test Laboratory, Reg.-No.: 96970 IC OATS Filing assigned code: 3470A
Applicant's name	u-blox Berlin GmbH
Address	Rudower Chaussee 9 12489 Berlin GERMANY
Test specification:	
Standard.....	47 CFR Part 15C RSS-247, Issue 1, 2015-05 RSS-Gen, Issue 4, 2014-11 ANSI C63.10:2013 ANSI C63.4:2014
Test scope.....	partial radio compliance test according to customer request
Equipment under test (EUT):	
Product description	WLAN/Bluetooth multi-radio host-based module
Model No.	ELLA-W1
Additional Model(s)	None
Brand Name(s)	None
Hardware version	G8, mounted on eval board version 1.01
Firmware / Software version	MFG firmware
	FCC-ID: none IC: none
Test result	Passed

Possible test case verdicts:

- neither assessed nor tested : N/N
- required by standard but not appl. to test object : N/A
- required by standard but not tested : N/T
- not required by standard for the test object : N/R
- test object does meet the requirement : P (Pass)
- test object does not meet the requirement : F (Fail)

Testing:

Test Lab Temperature : 20 – 23 °C

Test Lab Humidity : 32 – 38 %

Date of receipt of test item : 2015-11-02

Date (s) of performance of tests : 2015-11-02 - 2015-11-16

Compiled by : Toralf Jahn

Tested by (+ signature) : Toralf Jahn

(Responsible for Test)

Approved by (+ signature) : Christian Weber

(Head of Lab)

Date of issue : 2015-12-23

Total number of pages : 70



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:

This test report is for the versions ELLA-W133-A and ELLA-W133.

Version History

Version	Issue Date	Remarks	Revised by
01	2015-12-23	Initial Release	

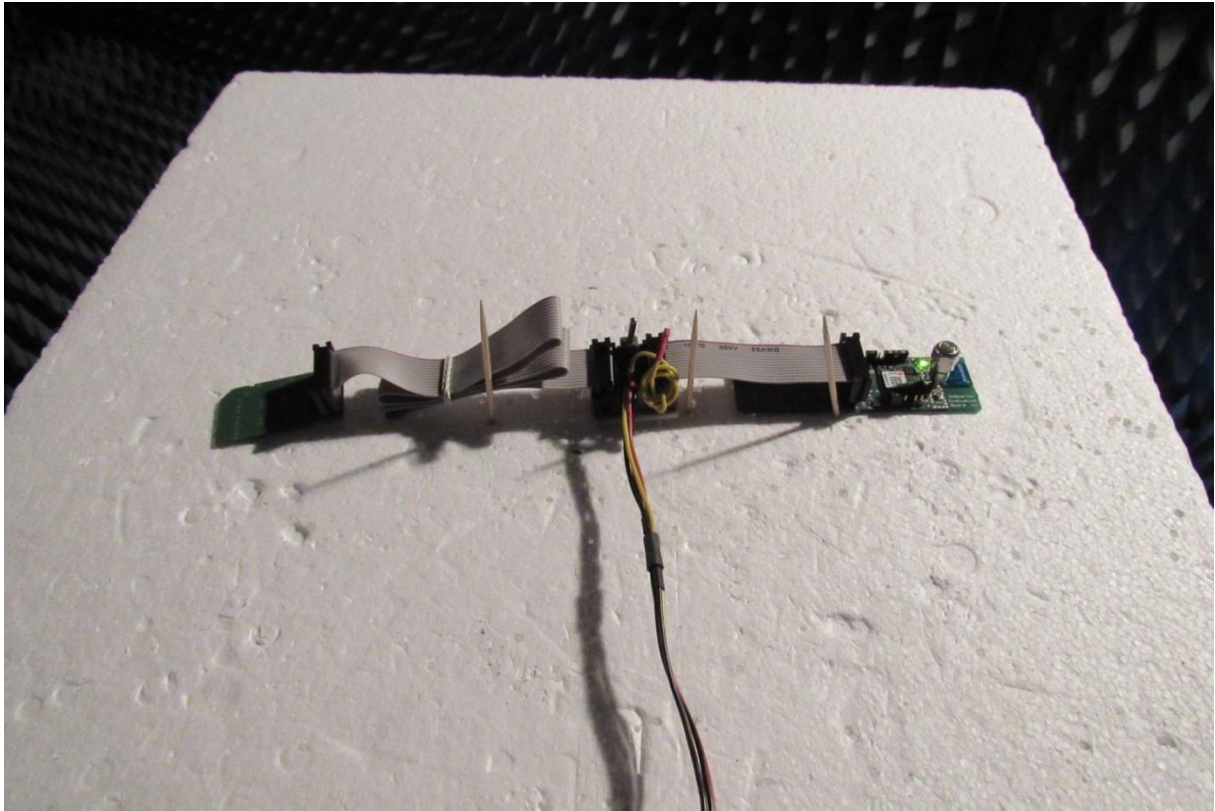
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1 Equipment (Test item) Description

Description	WLAN/Bluetooth multi-radio host-based module	
Model	ELLA-W1	
Additional Model(s)	None	
Brand Name(s)	None	
Serial number	None	
Hardware version	G8, mounted on eval board version 1.01	
Software / Firmware version	MFG firmware	
FCC-ID	none	
IC	none	
Equipment type	Radio module	
Radio type	Transceiver	
Radio technology	Bluetooth	
Operating frequency range	2402 - 2480 MHz	
Assigned frequency band	2400 - 2483.5 MHz	
Main test frequencies	F _{LOW}	2402 MHz
	F _{MID}	2441 MHz
	F _{HIGH}	2480 MHz
Spreading	FHSS	
Modulations	GFSK, PI/4-DQPSK, 8-PSK	
Number of channels	79 hopping channels at all	
Channel spacing	1 MHz	
Number of antennas	none	
Antenna	Type	N/A
	Model	N/A
	Manufacturer	N/A
	Gain	N/A
Manufacturer	u-blox Berlin GmbH Rudower Chaussee 9 12489 Berlin GERMANY	
Power supply	V _{NOM}	3.3 VDC
	V _{MIN}	3.0 VDC
	V _{MIN}	3.6 VDC
AC/DC-Adaptor	Model	N/A
	Vendor	N/A
	Input	N/A
	Output	N/A

1.1 Photos – Test setup



1.2 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
AE	Development board	lesswire AG	WiBear11n-SF1-EK	Mounting of EUT
CABL	Flat ribbon cable	unspecific	unspecific	SDIO connection to control PC
AE	Interface card	DeLock	91481	SDIO interface on PC
AE	power supply	Statron	2224.7	
*Note: Use the following abbreviations: AE : Auxiliary/Associated Equipment, or SIM : Simulator (Not Subjected to Test) CABL : Connecting cables				

1.3 Test Modes

Mode #	Description	
DH5-Sngl	General conditions:	EUT powered by laboratory power supply.
	Radio conditions:	Mode = standalone transmit Spreading = Hopping stopped (single hopping channel) Modulation = GFSK Packet type = DH5 Data rate = 1 Mbps Duty cycle = 77 % Power level = Maximum
3DH5-Sngl	General conditions:	EUT powered by laboratory power supply.
	Radio conditions:	Mode = standalone transmit Spreading = Hopping stopped (single hopping channel) Modulation = 8-DPSK Packet type = 3DH5 Data rate = 3 Mbps Duty cycle = 77 % Power level = Maximum

1.4 Test Equipment Used During Testing

Measurement Software			
Description	Manufacturer	Name	Version
EMC Test Software	Dare Instruments	Radimation	2014.1.15

Conducted spurious emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum analyzer	R&S	FSW43	EF00896	2015-03	2016-03

Radiated spurious emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Semi-anechoic chamber	Frankonia	AC 1	EF00062	-	-
Spectrum Analyzer	R&S	FSIQ26	EF00242	2015-04	2016-04
Biconical Antenna	R&S	HK 116	EF00012	2013-02	2016-02
LPD Antenna	R&S	HL 223	EF00187	2014-03	2017-03
LPD Antenna	R&S	HL 025	EF00327	2015-10	2018-10

1.5 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyzer in dBμV. Any external preamplifiers used are taken into account through internal analyzer settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyzer. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

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

Net:

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

Limit:

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

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

Margin:

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

Example only:

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

2 Result Summary

FCC 47 CFR Part 15C, IC RSS-247				
Product Specific Standard Section	Requirement – Test	Reference Method	Result	Remarks
RSS-Gen 6.6	Occupied Bandwidth	ANSI C63.10	N/R	Informational only
FCC § 15.247(a)(1) IC RSS-247 § 5.1	20 dB Bandwidth	ANSI C63.10	N/T	Customer specific test plan
FCC § 15.247(a)(1)(iii) IC RSS-247 § 5.1	Number of hopping frequencies	ANSI C63.10	N/T	Customer specific test plan
FCC § 15.247(a)(1) IC RSS-247 § 5.1	Frequency hopping channel separation	ANSI C63.10	N/T	Customer specific test plan
FCC § 15.247(a)(1)(iii) IC RSS-247 § 5.1	Time of occupancy (Dwell time)	ANSI C63.10	N/T	Customer specific test plan
FCC § 15.247(b)(1) IC RSS-247 § 5.4	Maximum peak conducted power	ANSI C63.10	N/T	Customer specific test plan
47 CFR 15.207 IC RSS-247 § 3.1	AC power line conducted emissions	ANSI C63.4	N/T	Customer specific test plan
FCC § 15.247(d) IC RSS-247 § 5.5	Band edge compliance	ANSI C63.10	N/T	Customer specific test plan
FCC § 15.247(d) IC RSS-247 § 5.5	Conducted spurious emissions	ANSI C63.10	PASS	
FCC § 15.247(d) FCC § 15.209 IC RSS-247 § 5.5	Transmitter radiated spurious emissions	ANSI C63.10	PASS	Customer specific test plan. Antenna port terminated with 50 Ohms.
IC RSS-247 § 3.1	Receiver radiated spurious emissions	ANSI C63.10	N/T	Customer specific test plan
Remarks:				

3 Test Conditions and Results

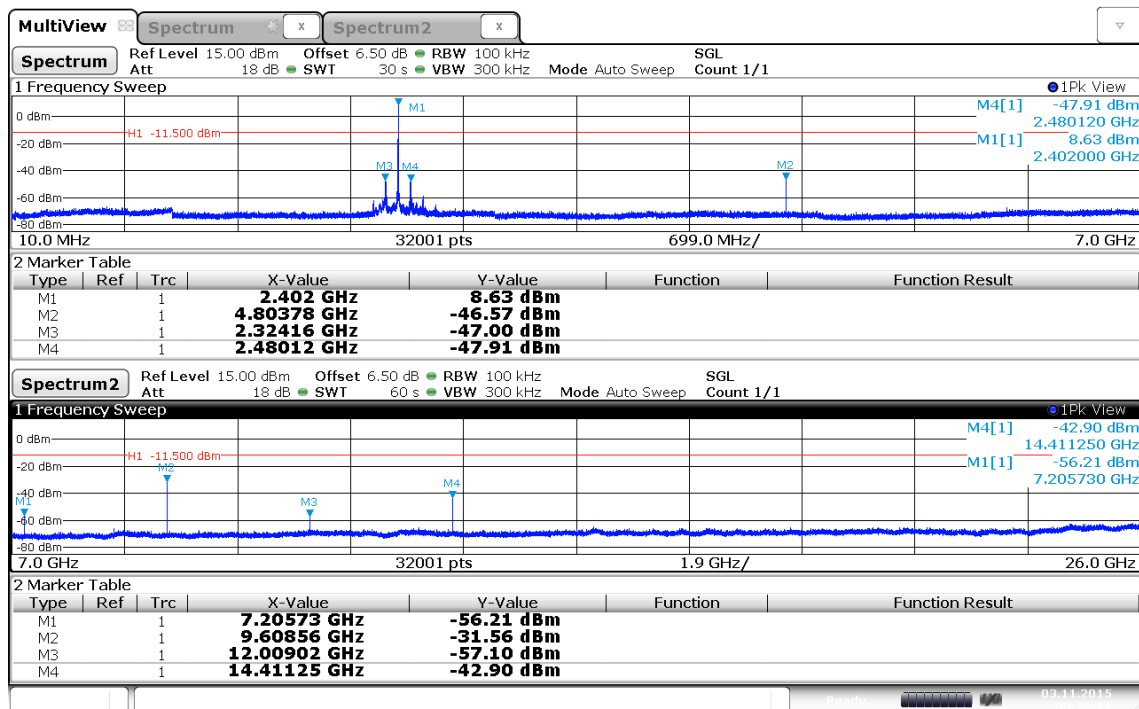
3.1 Test Conditions and Results – Conducted spurious emissions

Conducted spurious emissions acc. to FCC 15.247 / IC RSS-247				Verdict: PASS
EUT requirement rule parts and clause		Reference		
		FCC 15.247(d) / IC RSS-247 5.5		
Test according to measurement reference		Reference Method		
		ANSI C63.10		
Test frequency range		Tested frequencies		
		10 MHz – 10 th Harmonic		
Measurement mode		Peak		
Limits				
Limit			Condition	
≤ -20 dB/100 kHz			Peak power measurement detector = Peak	
≤ -30 dB/100 kHz			Peak power measurement detector = RMS	
Test setup				
Spectrum Analyzer EUT				
Test procedure				
1. EUT set to test mode (Communication tester is used if needed) 2. Span it set according to measurement range 3. Resolution bandwidth is set to 100 kHz and detector to peak and max hold 4. Markers are set to peak emission levels within frequency band 5. Emission level is determined by second marker on emission peak 6. Attenuation is determined from level difference				
Test overview				
Channel	Frequency [MHz]	Mode	Model	Result
F _{LOW}	2402	DH5-Sngl	ELLA-W133-A	Pass
F _{LOW}	2402	3DH5-Sngl	ELLA-W133-A	Pass
F _{HIGH}	2480	DH5-Sngl	ELLA-W133-A	Pass
F _{LOW}	2402	DH5-Sngl	ELLA-W133	Pass
F _{HIGH}	2480	DH5-Sngl	ELLA-W133	Pass
Comments: The Low Channel was measured for ELLA-W133-A with DH5-Sngl and 3DH5-Sngl. DH5-Sngl was determined as the worst case. Subsequent measurements were only performed with DH5-Sngl.				

ELLA-W133-A Conducted spurious emissions – DH5-Sngl F_{Low}
Spurious Emissions acc. to FCC 15.247

Project Number: G0M-1510-5172

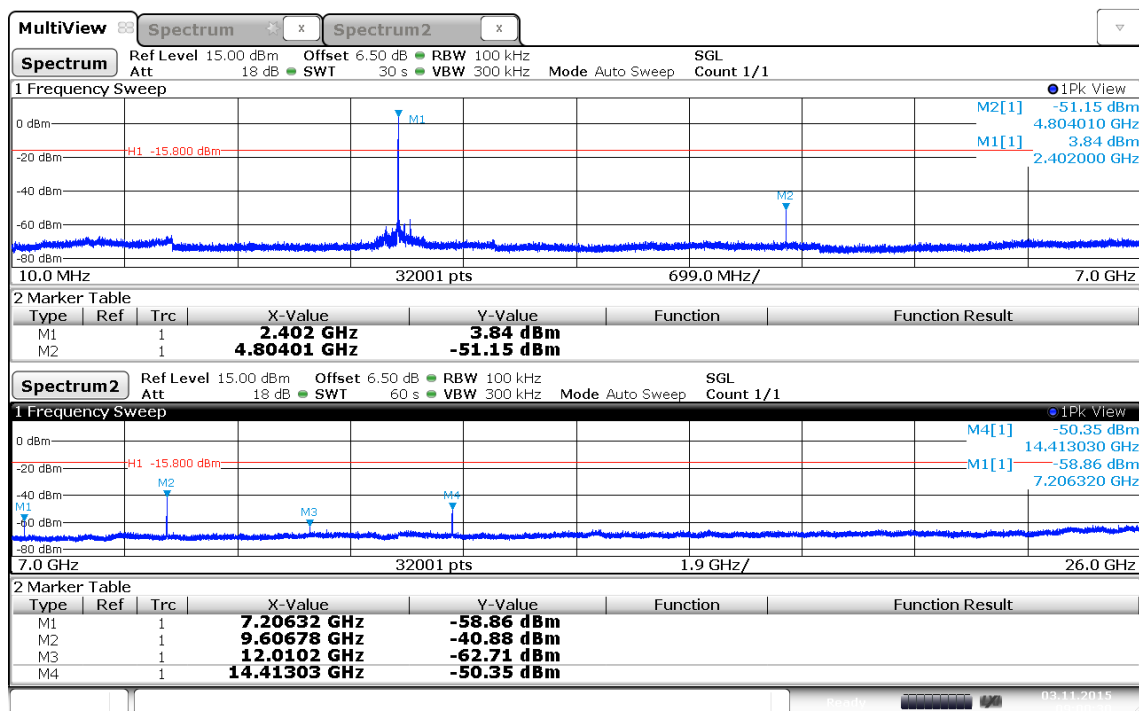
Applicant: u-blox Berlin GmbH
 EUT Name: ELLA-W133-A
 Model: Test Sample #3
 Test Site: Eurofins Product Service GmbH
 Operator: Christian Weber
 Test Conditions: Tnom / Vnom
 Mode: Tx, Bluetooth, 2402 MHz, DH5, Power max.
 Test Date: 2015-11-03
 Verdict: PASS
 Note 1: Spurious in non-restricted frequency bands (ANSI C63.10)
 Note 2: conducted measurement



ELLA-W133-A Conducted spurious emissions – 3DH5-Sngl F_{LOW}
Spurious Emissions acc. to FCC 15.247

Project Number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: ELLA-W133-A
 Model: Test Sample #3
 Test Site: Eurofins Product Service GmbH
 Operator: Christian Weber
 Test Conditions: Tnom / Vnom
 Mode: Tx, Bluetooth, 2402 MHz, 3-DH5, Power max.
 Test Date: 2015-11-03
 Verdict: PASS
 Note 1: Spurious in non-restricted frequency bands (ANSI C63.10)
 Note 2: conducted measurement



Date: 3.NOV.2015 09:00:30

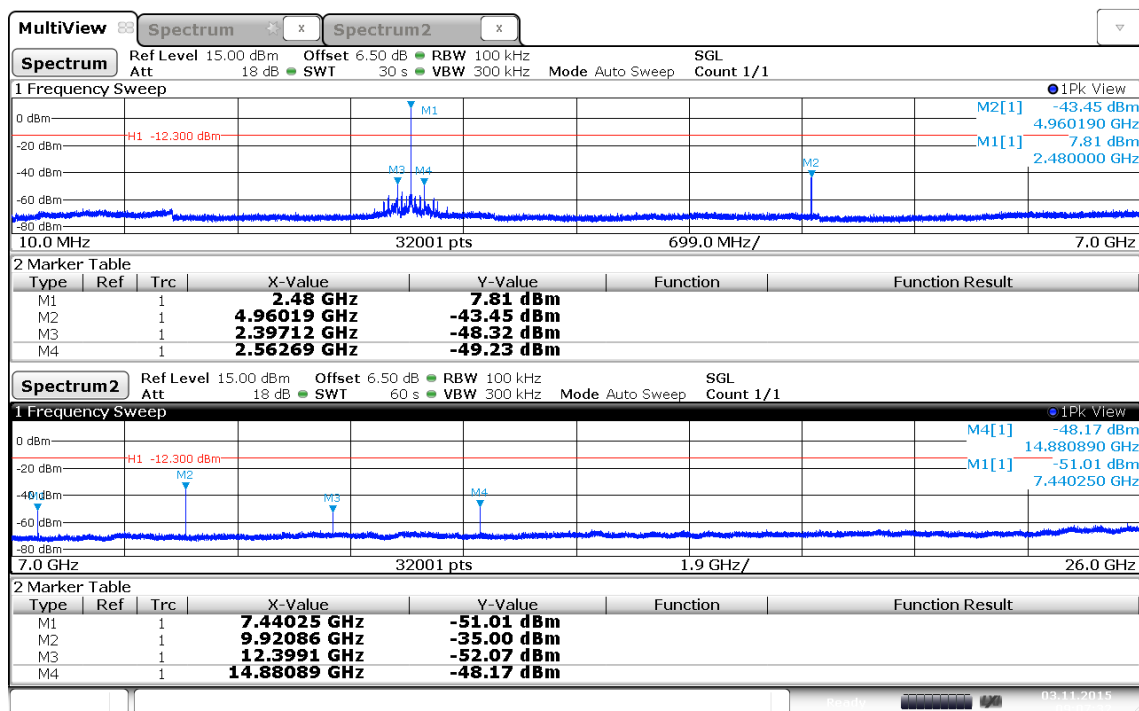
Test Report No.: G0M-1510-5172-TFC247BT-133-V01

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

ELLA-W133-A Conducted spurious emissions – DH5-Sngl F_{HIGH}
Spurious Emissions acc. to FCC 15.247

Project Number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: ELLA-W133-A
 Model: Test Sample #3
 Test Site: Eurofins Product Service GmbH
 Operator: Christian Weber
 Test Conditions: Tnom / Vnom
 Mode: Tx, Bluetooth, 2480 MHz, DH5, Power max.
 Test Date: 2015-11-03
 Verdict: PASS
 Note 1: Spurious in non-restricted frequency bands (ANSI C63.10)
 Note 2: conducted measurement



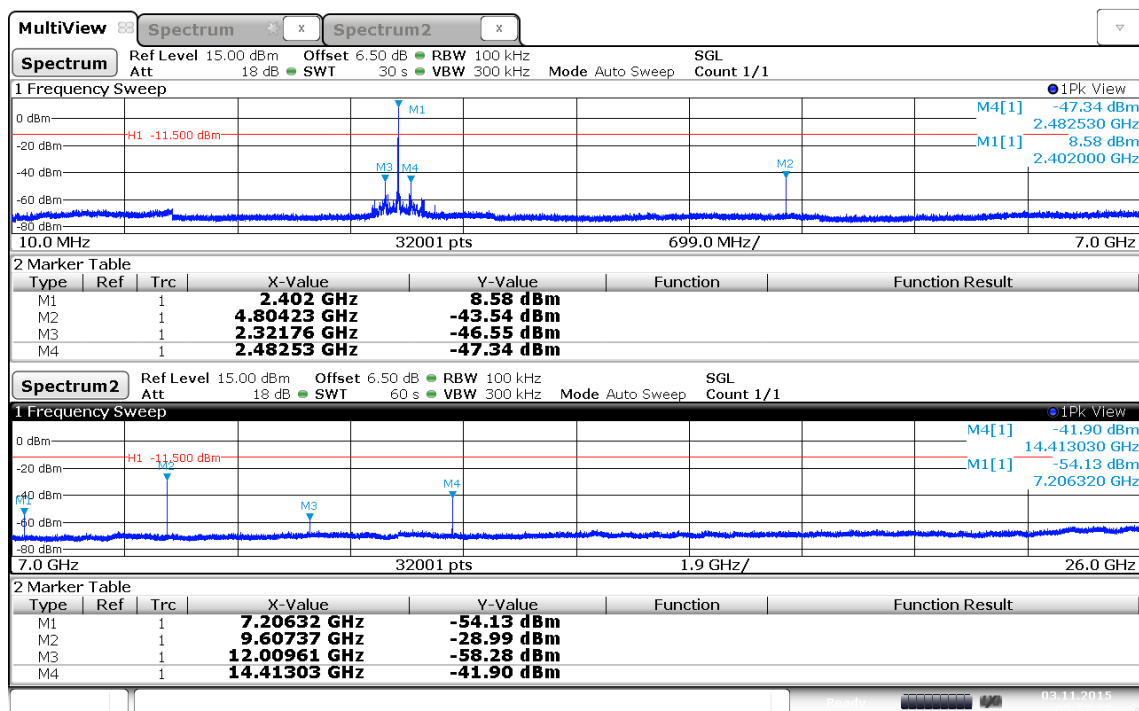
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ELLA-W133 Conducted spurious emissions – DH5-Sngl F_{Low}

Spurious Emissions acc. to FCC 15.247

Project Number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: ELLA-W133
 Model: Test Sample #4
 Test Site: Eurofins Product Service GmbH
 Operator: Christian Weber
 Test Conditions: Tnom / Vnom
 Mode: Tx, Bluetooth, 2402 MHz, DH5, Power max.
 Test Date: 2015-11-03
 Verdict: PASS
 Note 1: Spurious in non-restricted frequency bands (ANSI C63.10)
 Note 2: conducted measurement



Date: 3.NOV.2015 09:52:27

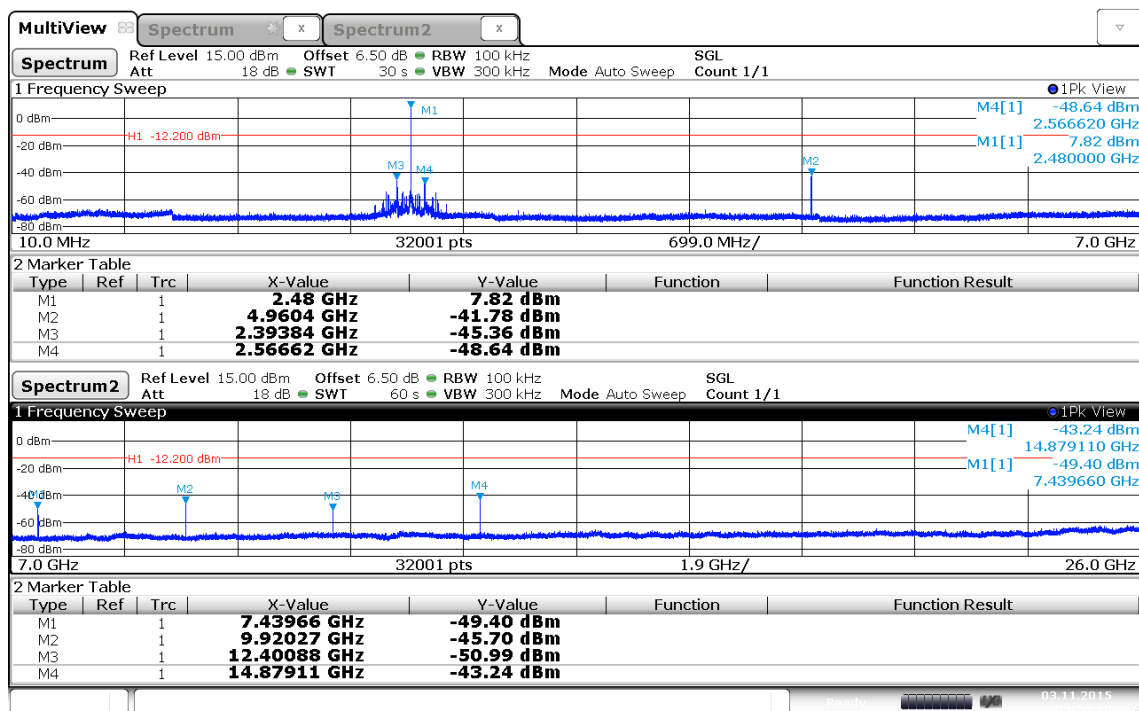
Test Report No.: G0M-1510-5172-TFC247BT-133-V01

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

ELLA-W133 Conducted spurious emissions – DH5-Sngl F_{HIGH}
Spurious Emissions acc. to FCC 15.247

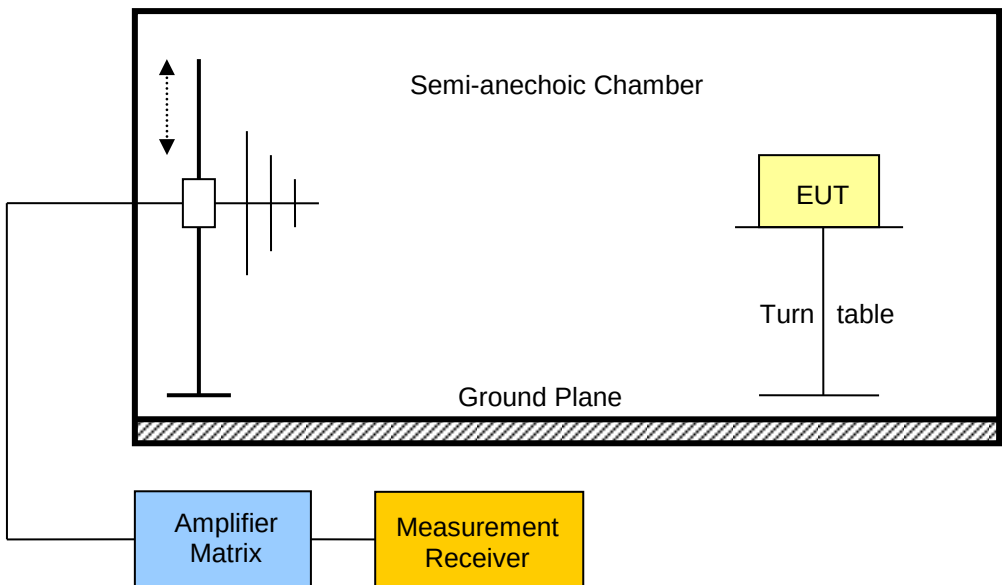
Project Number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: ELLA-W133
 Model: Test Sample #4
 Test Site: Eurofins Product Service GmbH
 Operator: Christian Weber
 Test Conditions: Tnom / Vnom
 Mode: Tx, Bluetooth, 2480 MHz, DH5, Power max.
 Test Date: 2015-11-03
 Verdict: PASS
 Note 1: Spurious in non-restricted frequency bands (ANSI C63.10)
 Note 2: conducted measurement



Date: 3.NOV.2015 09:56:50

3.2 Test Conditions and Results – Transmitter radiated emissions

Transmitter radiated emissions acc. to FCC 47 CFR 15.247 / IC RSS-247				Verdict: PASS
Test according referenced standards	Reference Method			
	FCC 15.247(d) / IC RSS-247 5.5			
Test according to measurement reference	Reference Method			
	ANSI C63.10			
Test frequency range	Tested frequencies			
	30 MHz – 10 th Harmonic			
Limits				
Frequency range [MHz]	Detector	Limit [µV/m]	Limit [dBµV/m]	Limit Distance [m]
30 – 88	Quasi-Peak	100	40	3
88 – 216	Quasi-Peak	150	43.5	3
216 – 960	Quasi-Peak	200	46	3
960 – 1000	Quasi-Peak	500	54	3
> 1000	Average	500	54	3
Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)). When average radiated emission measurements are specified, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.				
Test setup				
				

Test procedure								
1. EUT set to test mode (Communication tester is used if needed) 2. Span it set according to measurement range 3. Resolution bandwidth below 1 GHz is set according to CISPR 16 with peak/quasi-peak detector and RBW of 1 MHz with peak/average detector is used above 1 GHz 4. Markers are set to peak emission levels within restricted bands								
Test results – ELLA-W133-A								
Channel	Frequency [MHz]	Mode	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
F _{LOW}	2402	DH5-Sngl	4800	48.43	pk	ver	74.00	-25.57
F _{LOW}	2402	DH5-Sngl	4800	47.21	pk	hor	74.00	-26.79
F _{LOW}	2402	DH5-Sngl	7200	52.45	pk	ver	95.00	-42.55
F _{LOW}	2402	DH5-Sngl	7200	48.42	pk	hor	95.00	-46.58
F _{LOW}	2402	DH5-Sngl	9603	64.30	pk	ver	95.00	-30.70
F _{LOW}	2402	DH5-Sngl	9603	59.70	pk	hor	95.00	-35.30
F _{LOW}	2402	DH5-Sngl	12009	56.06	pk	ver	74.00	-17.94
F _{LOW}	2402	DH5-Sngl	12009	46.57	avg	ver	54.00	-07.43
F _{LOW}	2402	DH5-Sngl	12011	57.04	pk	hor	74.00	-16.96
F _{LOW}	2402	DH5-Sngl	12011	48.26	avg	hor	54.00	-05.74
F _{LOW}	2402	3DH5-Sngl	9608	55.05	pk	hor	95.00	-39.95
F _{LOW}	2402	3DH5-Sngl	12009	56.11	pk	ver	74.00	-17.89
F _{LOW}	2402	3DH5-Sngl	12009	45.31	avg	ver	54.00	-08.69
F _{LOW}	2402	3DH5-Sngl	12011	55.13	pk	hor	74.00	-18.87
F _{LOW}	2402	3DH5-Sngl	12011	44.07	avg	hor	54.00	-09.93
F _{HIGH}	2480	DH5-Sngl	4956	50.66	pk	hor	74.00	-23.34
F _{HIGH}	2480	DH5-Sngl	4960	51.65	pk	ver	74.00	-22.35
F _{HIGH}	2480	DH5-Sngl	7438	48.22	pk	hor	74.00	-25.78
F _{HIGH}	2480	DH5-Sngl	7440	51.91	pk	ver	74.00	-22.09
F _{HIGH}	2480	DH5-Sngl	7440	44.65	avg	ver	54.00	-09.35
F _{HIGH}	2480	DH5-Sngl	9917	62.94	pk	ver	95.00	-32.06
F _{HIGH}	2480	DH5-Sngl	9922	60.33	pk	hor	95.00	-34.67
F _{HIGH}	2480	DH5-Sngl	12399	54.15	pk	hor	74.00	-19.85
F _{HIGH}	2480	DH5-Sngl	12399	44.16	avg	hor	54.00	-09.84
F _{HIGH}	2480	DH5-Sngl	12401	57.30	pk	ver	74.00	-16.70
F _{HIGH}	2480	DH5-Sngl	12401	47.75	avg	ver	54.00	-06.25

Test results – ELLA-W133								
Channel	Frequency [MHz]	Mode	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
F _{LOW}	2402	DH5-Sngl	4800	46.61	pk	ver	74.00	-27.39
F _{LOW}	2402	DH5-Sngl	4800	45.45	pk	hor	74.00	-28.55
F _{LOW}	2402	DH5-Sngl	7200	57.87	pk	ver	95.00	-37.13
F _{LOW}	2402	DH5-Sngl	7200	52.10	pk	hor	95.00	-42.90
F _{LOW}	2402	DH5-Sngl	9602	58.84	pk	hor	95.00	-36.16
F _{LOW}	2402	DH5-Sngl	9603	62.66	pk	ver	95.00	-32.34
F _{LOW}	2402	DH5-Sngl	12009	58.80	pk	ver	74.00	-15.20
F _{LOW}	2402	DH5-Sngl	12009	50.23	avg	ver	54.00	-03.77
F _{LOW}	2402	DH5-Sngl	12009	52.81	pk	hor	74.00	-21.19
F _{LOW}	2402	DH5-Sngl	12009	43.17	avg	hor	54.00	-10.83
F _{HIGH}	2480	DH5-Sngl	4960	52.36	pk	hor	74.00	-21.64
F _{HIGH}	2480	DH5-Sngl	4961	49.68	pk	ver	74.00	-24.32
F _{HIGH}	2480	DH5-Sngl	7440	53.22	pk	ver	74.00	-20.78
F _{HIGH}	2480	DH5-Sngl	7440	46.74	avg	ver	54.00	-07.26
F _{HIGH}	2480	DH5-Sngl	7440	52.59	pk	hor	74.00	-21.41
F _{HIGH}	2480	DH5-Sngl	9917	61.11	pk	ver	95.00	-33.89
F _{HIGH}	2480	DH5-Sngl	9917	61.57	pk	hor	95.00	-33.43
F _{HIGH}	2480	DH5-Sngl	12401	54.10	pk	ver	74.00	-19.90
F _{HIGH}	2480	DH5-Sngl	12401	44.81	avg	ver	54.00	-09.19
F _{HIGH}	2480	DH5-Sngl	12401	52.26	pk	hor	74.00	-21.74
F _{HIGH}	2480	DH5-Sngl	12401	41.68	avg	hor	54.00	-12.32
Comments: The Low Channel was measured for ELLA-W133-A with DH5-Sngl and 3DH5-Sngl. DH5-Sngl was determined as the worst case. Subsequent measurements were only performed with DH5-Sngl.								

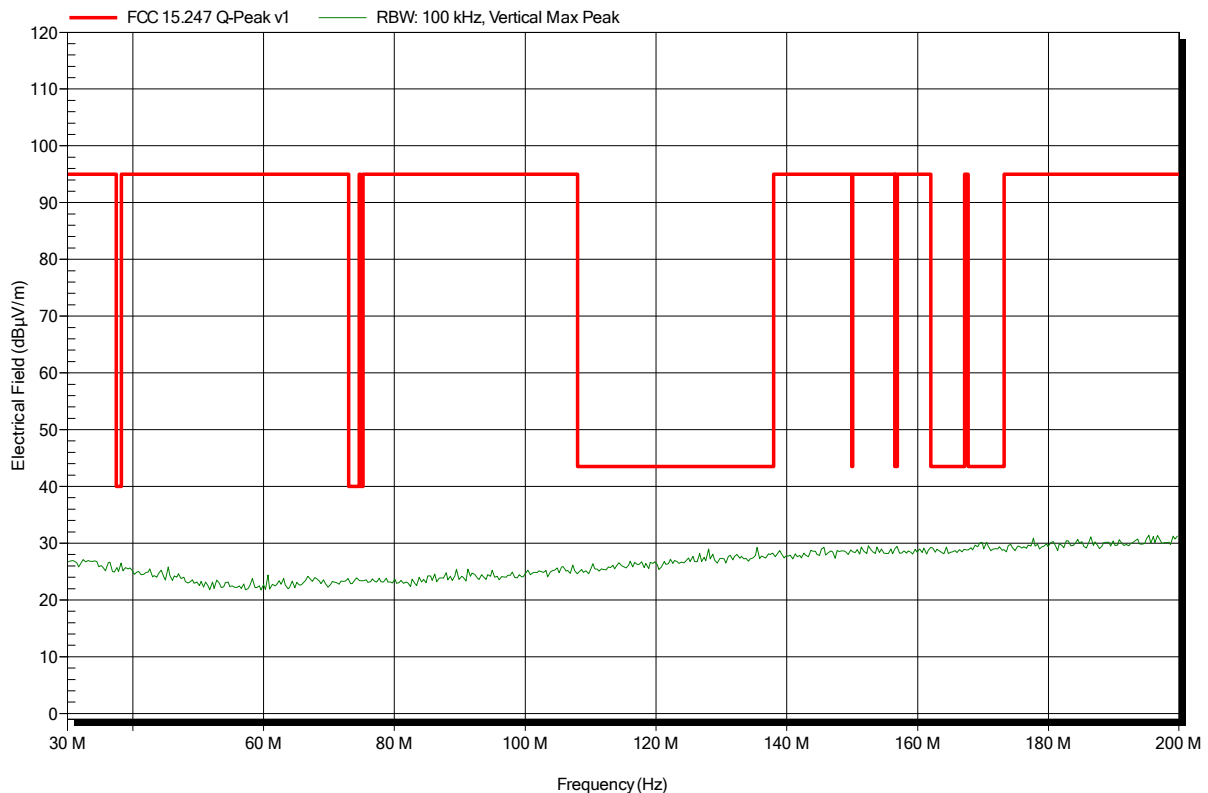
ANNEX A Transmitter radiated spurious emissions

Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant:	u-blox Berlin GmbH
EUT Name:	Kombi-Module Sample 3
Model:	ELLA-W133-A (WiBear11n-SF2)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Test Conditions:	Tnom: 24°C, Vnom: 3.3 V DC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
Test Date:	2015-11-04
Note:	EUT horizontal; 50 Ohm loaded

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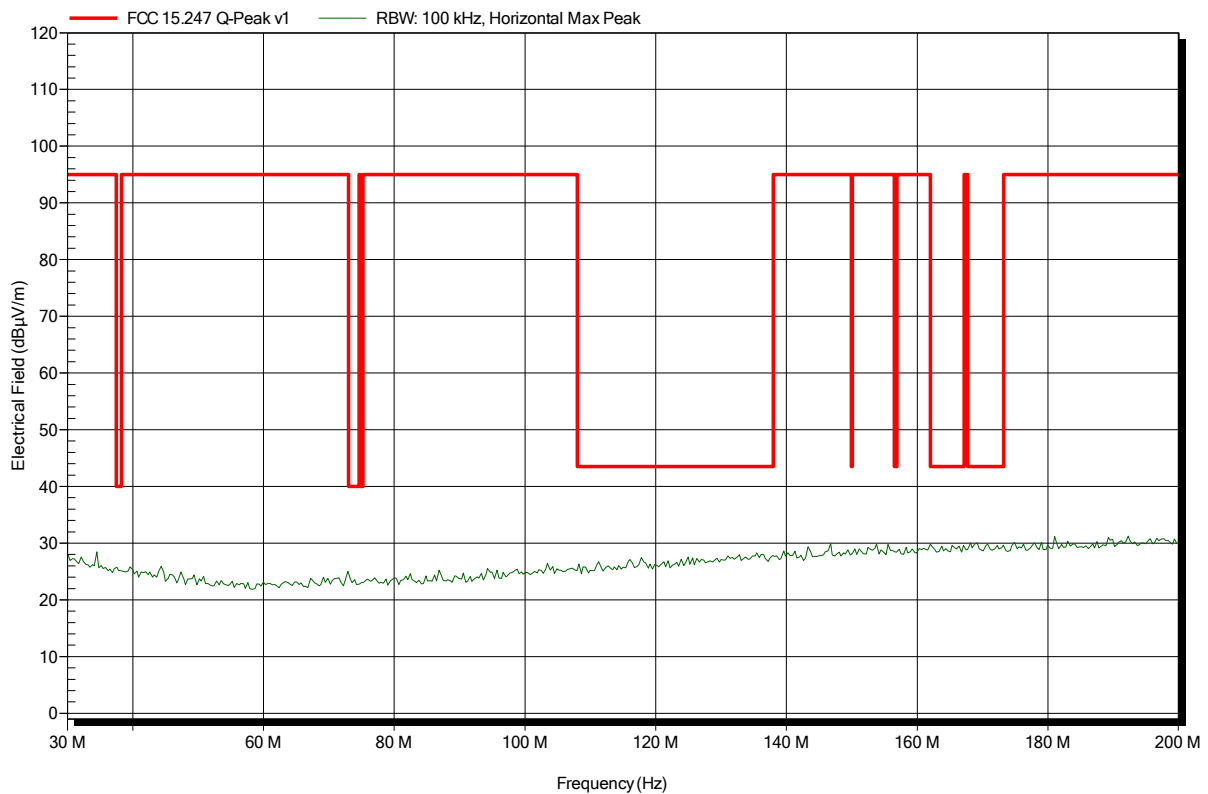


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant:	u-blox Berlin GmbH
EUT Name:	Kombi-Module Sample 3
Model:	ELLA-W133-A (WiBear11n-SF2)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Test Conditions:	Tnom: 24°C, Vnom: 3.3 V DC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
Test Date:	2015-11-04
Note:	EUT horizontal; 50 Ohm loaded

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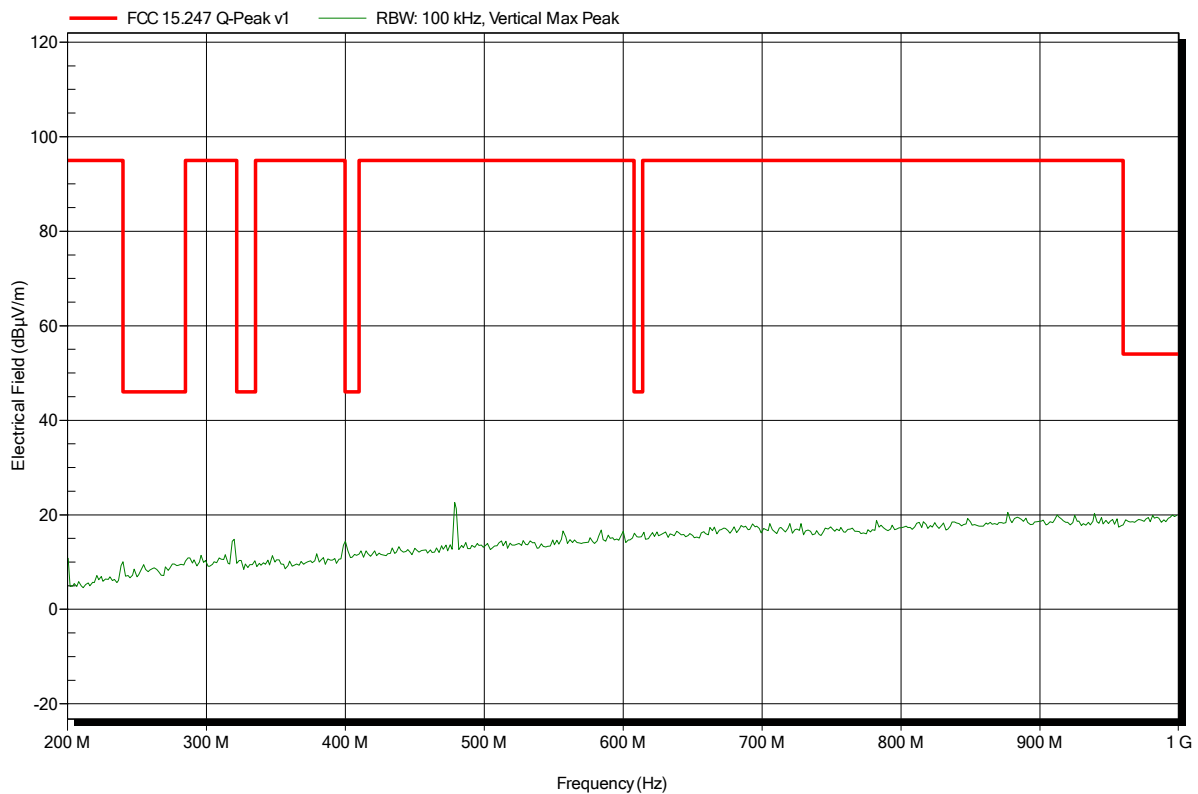


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 223, Vertical
 Measurement distance: 3 m
 Mode: TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
 Test Date: 2015-11-04
 Note: EUT horizontal; 50 Ohm loaded

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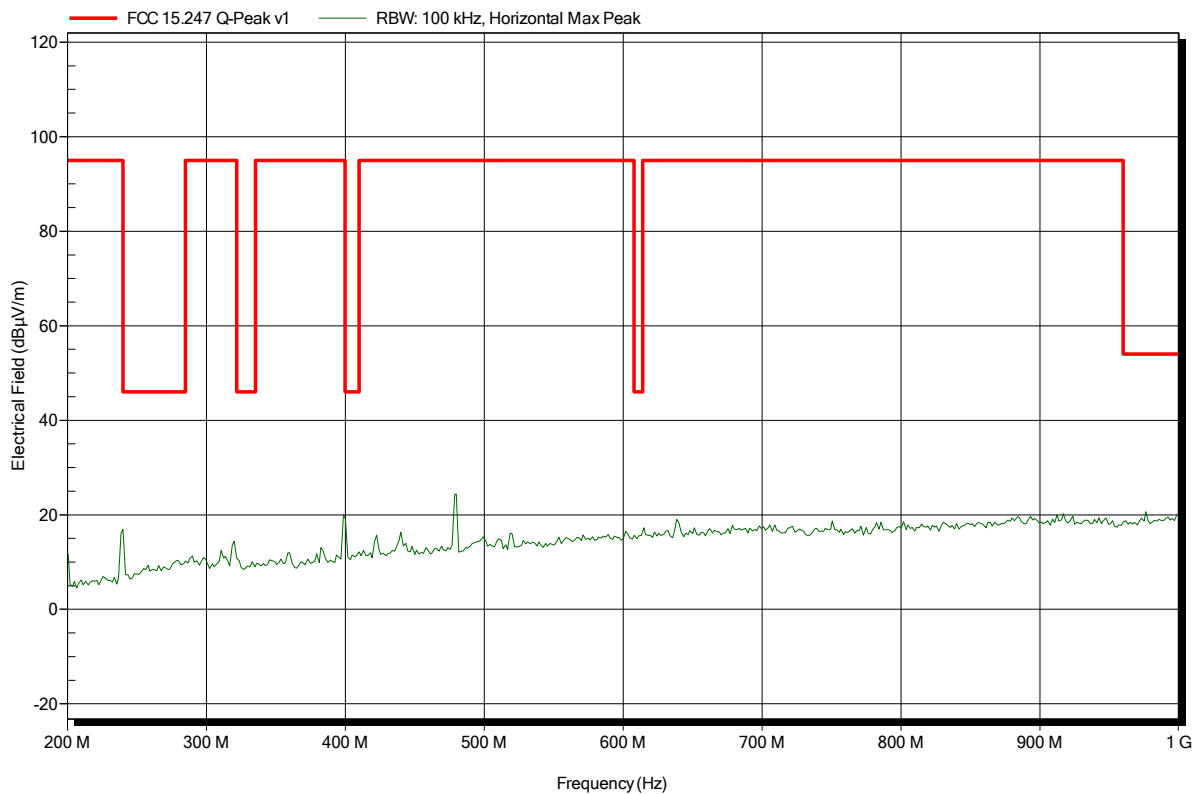


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 223, Horizontal
 Measurement distance: 3 m
 Mode: TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
 Test Date: 2015-11-04
 Note: EUT horizontal; 50 Ohm loaded

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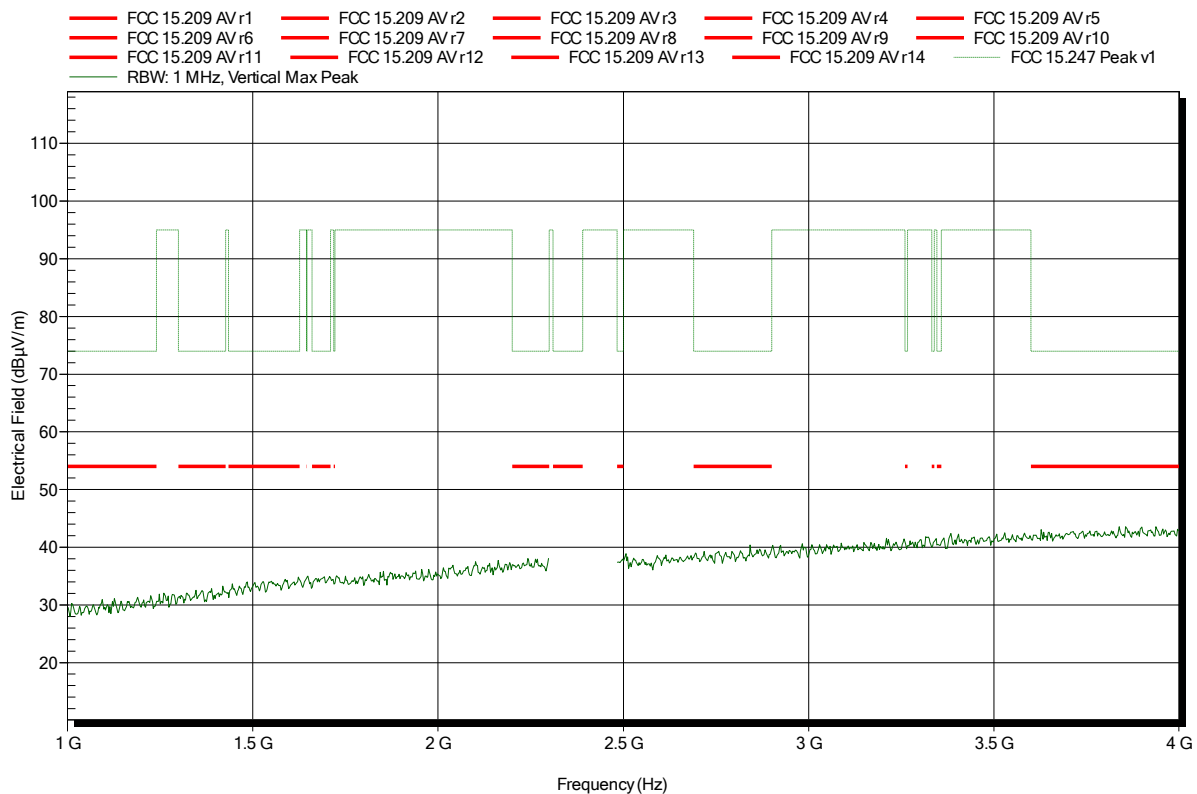


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 3 m
 Mode: TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
 Test Date: 2015-11-04
 Note: EUT horizontal; 50 Ohm loaded

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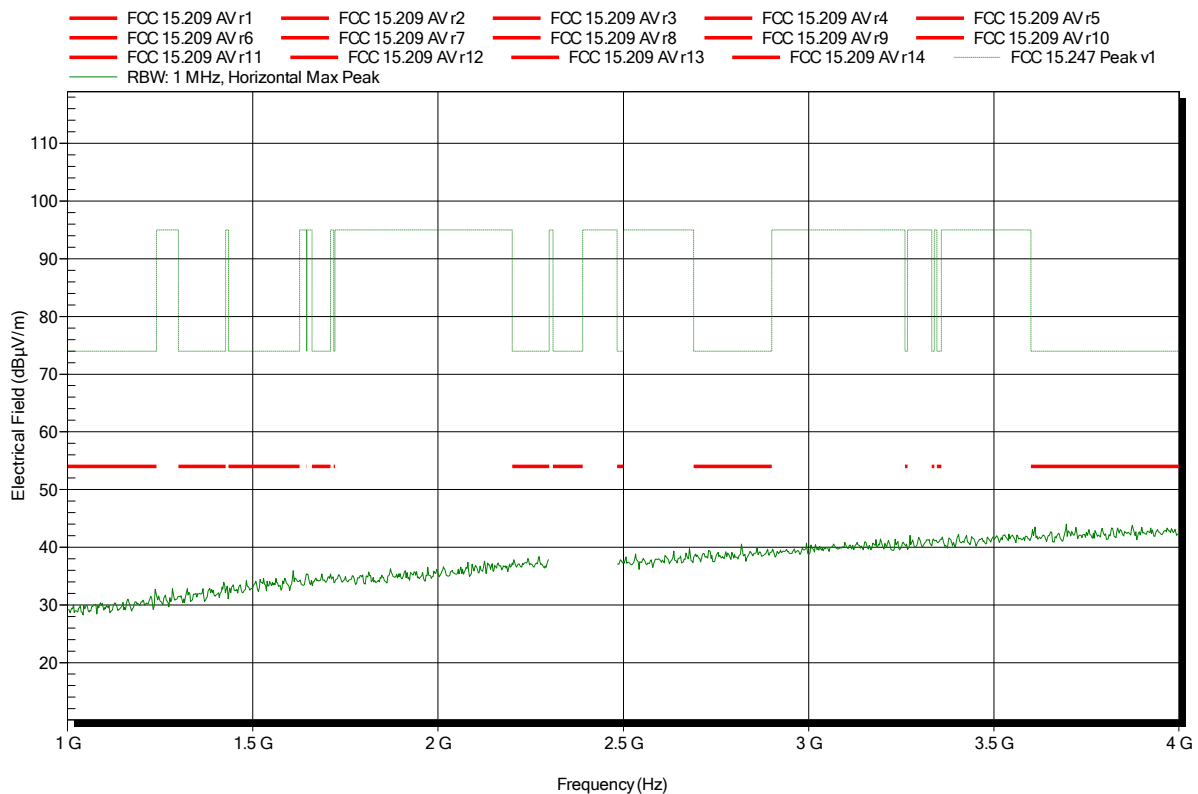


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 3 m
 Mode: TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
 Test Date: 2015-11-04
 Note: EUT horizontal; 50 Ohm loaded

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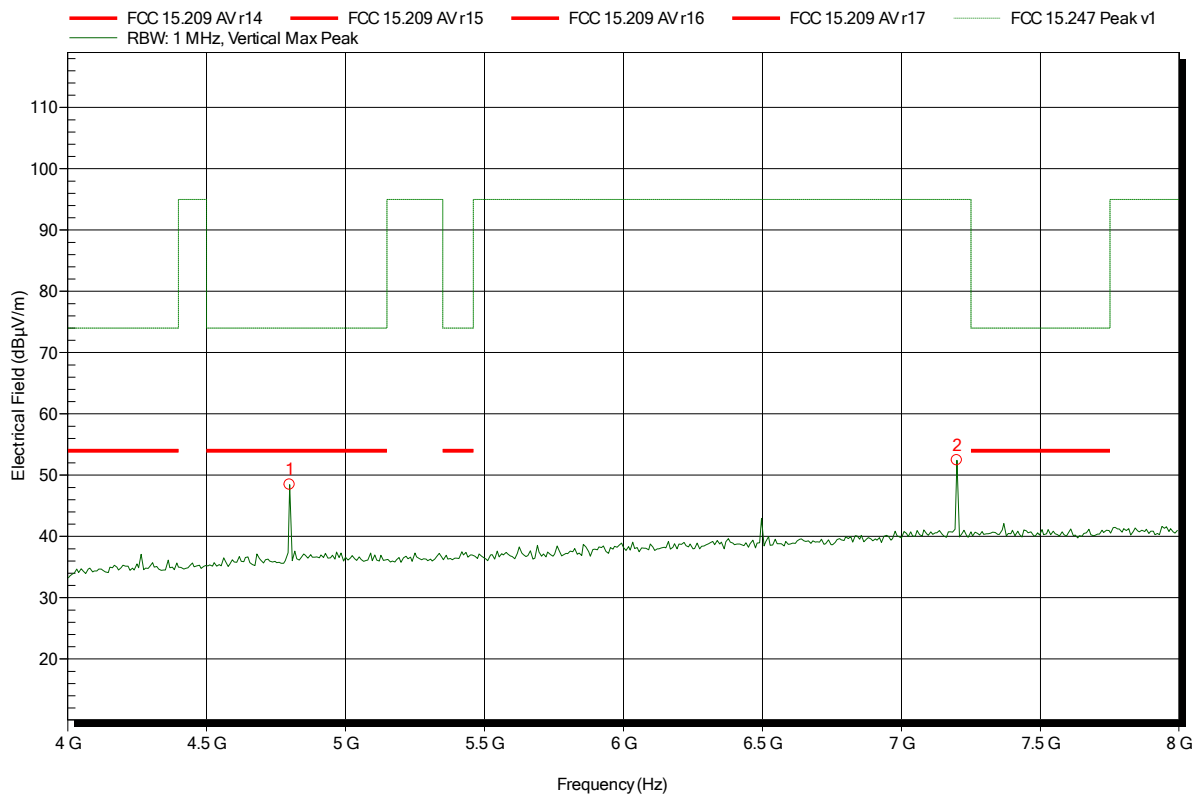


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
 Test Date: 2015-11-04
 Note: EUT horizontal; 50 Ohm loaded

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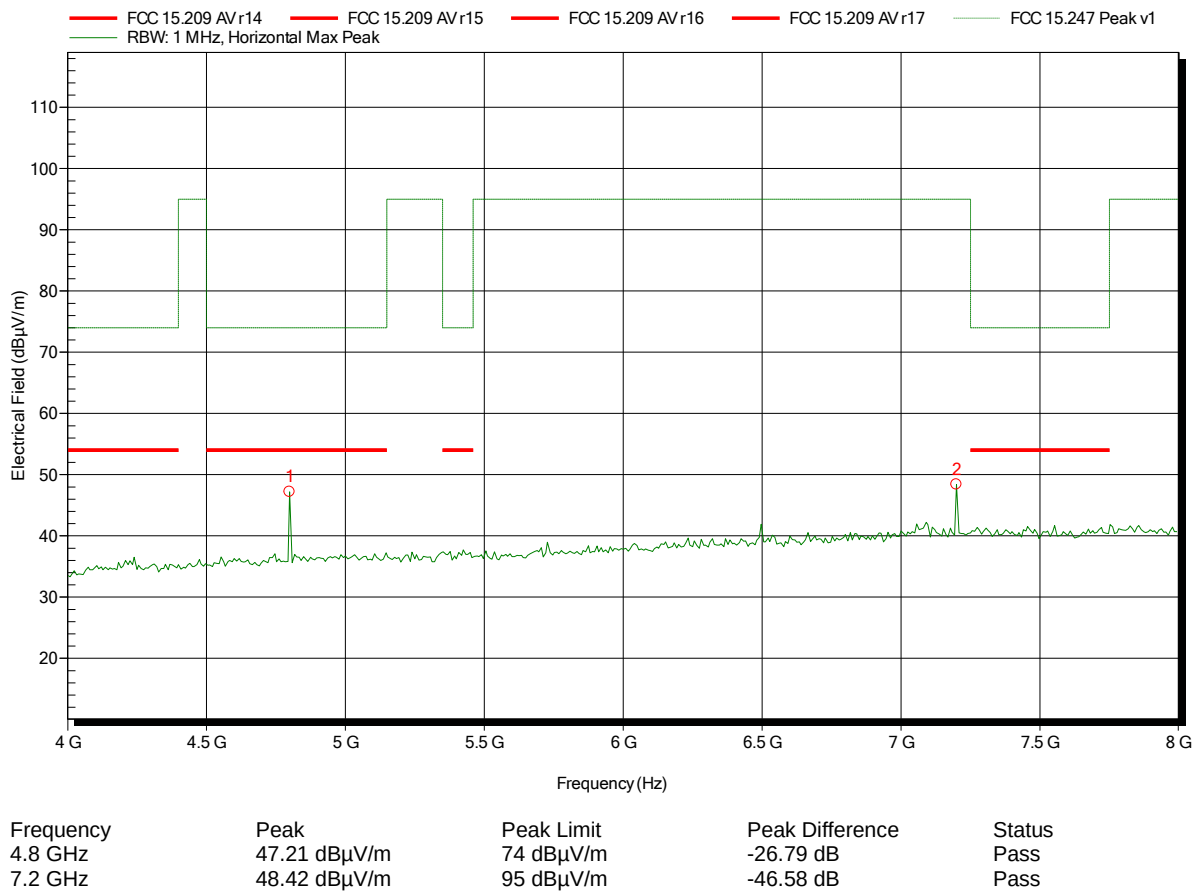
Frequency	Peak	Peak Limit	Peak Difference	Status
4.8 GHz	48.43 dBµV/m	74 dBµV/m	-25.57 dB	Pass
7.2 GHz	52.45 dBµV/m	95 dBµV/m	-42.55 dB	Pass

Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
 Test Date: 2015-11-04
 Note: EUT horizontal; 50 Ohm loaded

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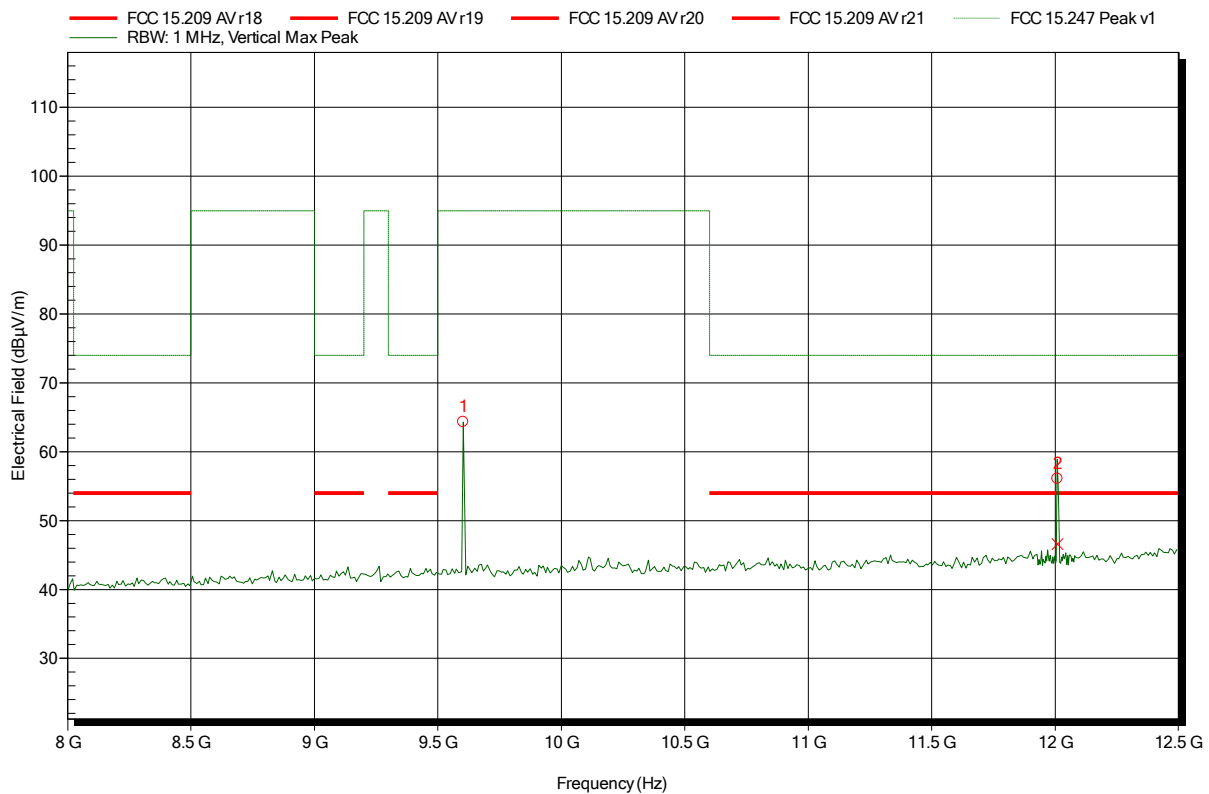


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
 Test Date: 2015-11-04
 Note: EUT horizontal; 50 Ohm loaded

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Frequency	Peak	Peak Limit	Peak Difference	Status
9.603 GHz	64.3 dBµV/m	95 dBµV/m	-30.7 dB	Pass
12.009 GHz	56.06 dBµV/m	74 dBµV/m	-17.94 dB	Pass

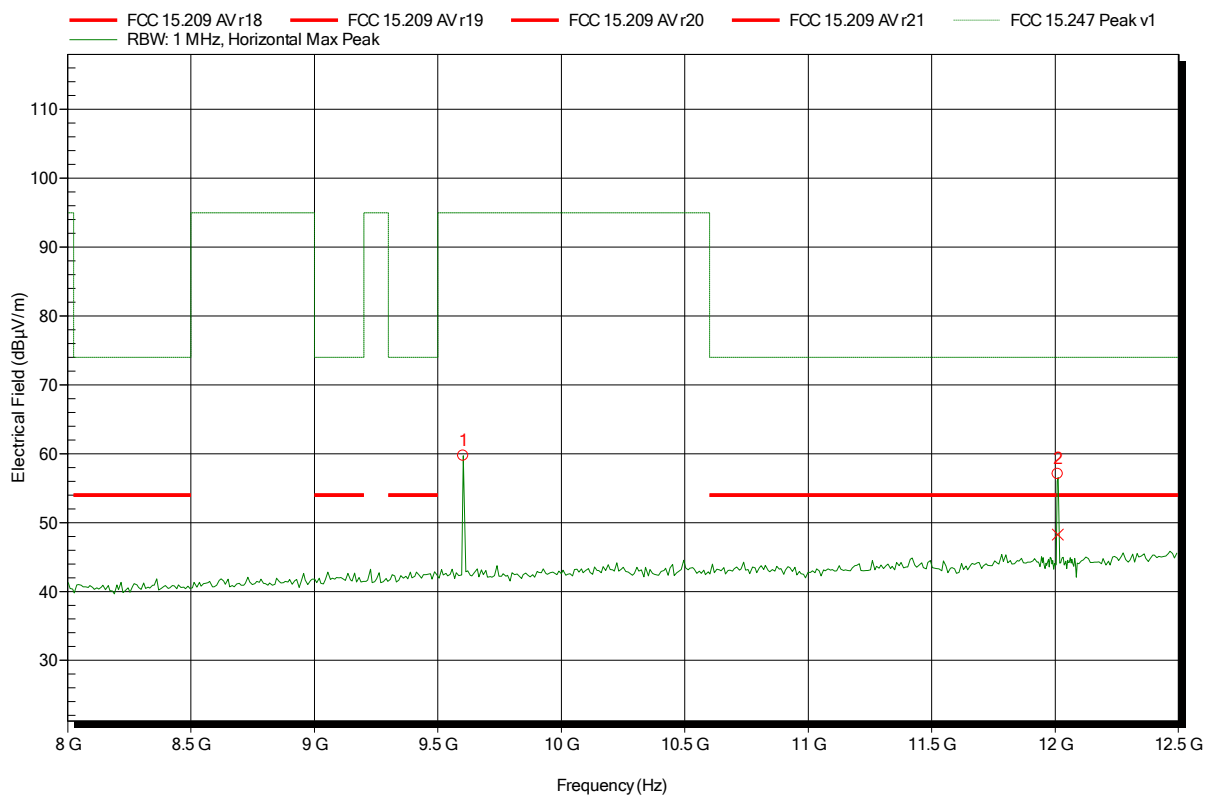
Frequency	Average	Average Limit	Average Difference	Average Status
12.009 GHz	46.57 dBµV/m	54 dBµV/m	-7.43 dB	Pass

Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
 Test Date: 2015-11-04
 Note: EUT horizontal; 50 Ohm loaded

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Frequency	Peak	Peak Limit	Peak Difference	Status
9.603 GHz	59.7 dBµV/m	95 dBµV/m	-35.3 dB	Pass
12.011 GHz	57.04 dBµV/m	74 dBµV/m	-16.96 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
12.011 GHz	48.26 dBµV/m	54 dBµV/m	-5.74 dB	Pass

Test Report No.: G0M-1510-5172-TFC247BT-133-V01

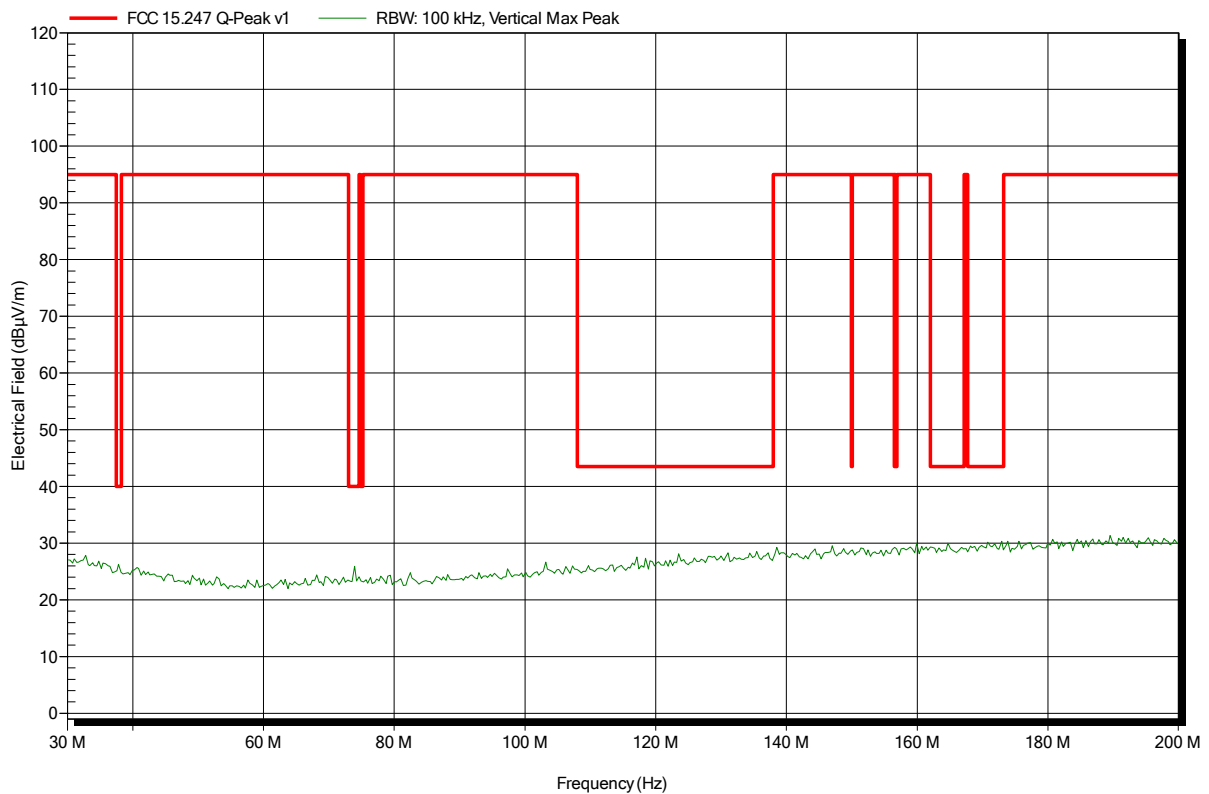
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant:	u-blox Berlin GmbH
EUT Name:	Kombi-Module Sample 3
Model:	ELLA-W133-A (WiBear11n-SF2)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Test Conditions:	Tnom: 24°C, Vnom: 3.3 V DC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; BT-EDR; CH.: 0; 2402 MHz; 3-DH5; Pmax
Test Date:	2015-11-04
Note:	EUT horizontal; 50 Ohm loaded

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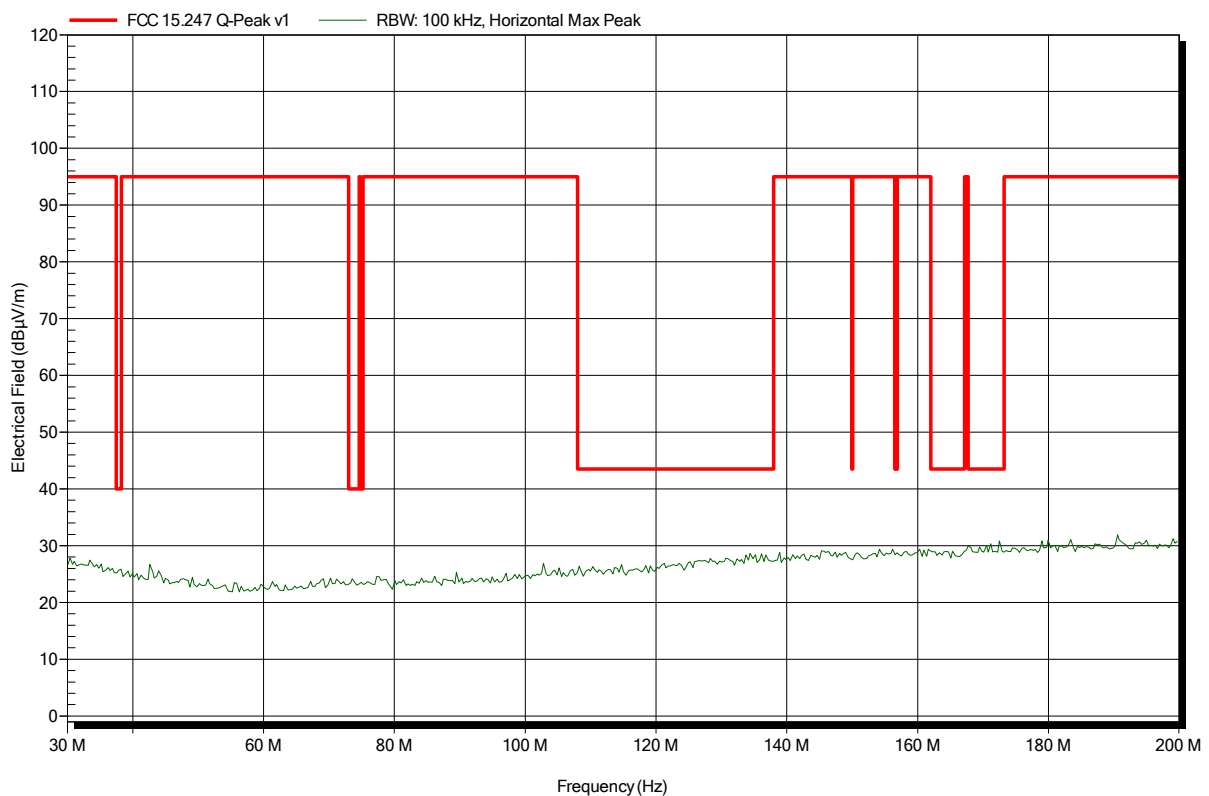


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant:	u-blox Berlin GmbH
EUT Name:	Kombi-Module Sample 3
Model:	ELLA-W133-A (WiBear11n-SF2)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Test Conditions:	Tnom: 24°C, Vnom: 3.3 V DC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; BT-EDR; CH.: 0; 2402 MHz; 3-DH5; Pmax
Test Date:	2015-11-04
Note:	EUT horizontal; 50 Ohm loaded

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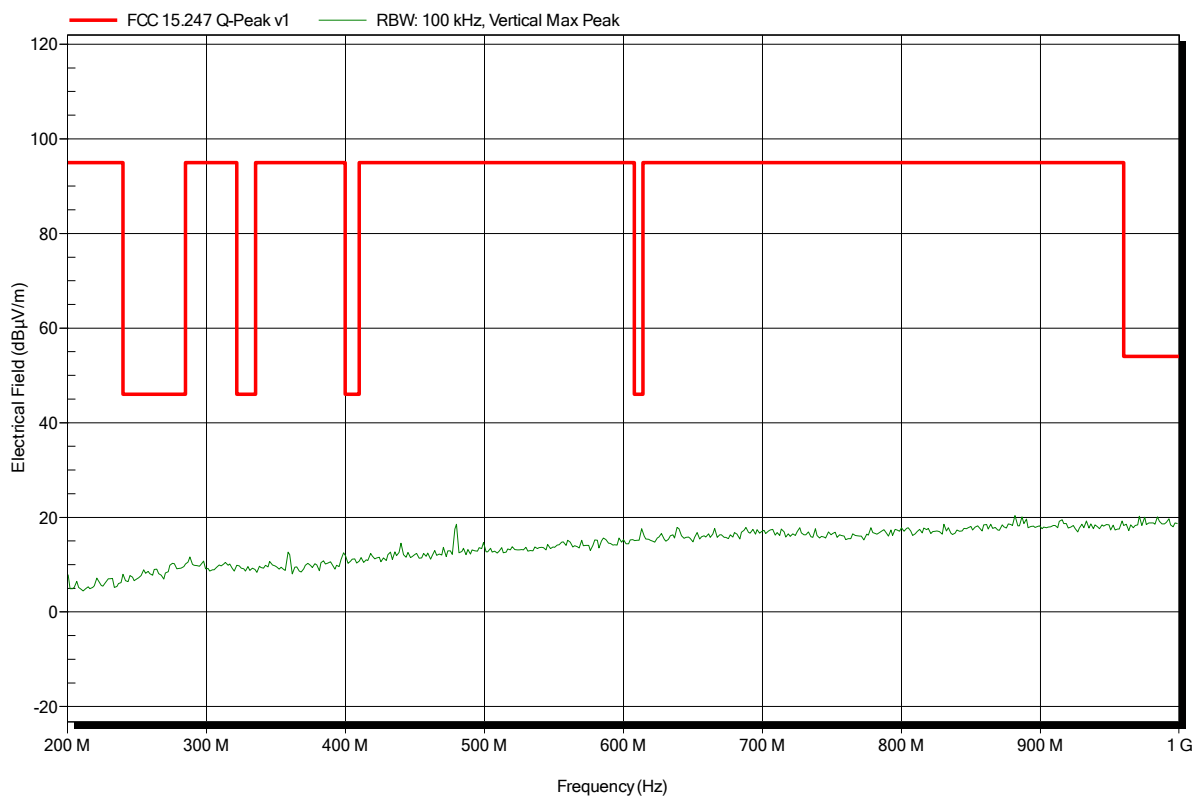


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant:	u-blox Berlin GmbH
EUT Name:	Kombi-Module Sample 3
Model:	ELLA-W133-A (WiBear11n-SF2)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Test Conditions:	Tnom: 24°C, Vnom: 3.3 V DC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; BT-EDR; CH.: 0; 2402 MHz; 3-DH5; Pmax
Test Date:	2015-11-04
Note:	EUT horizontal; 50 Ohm loaded

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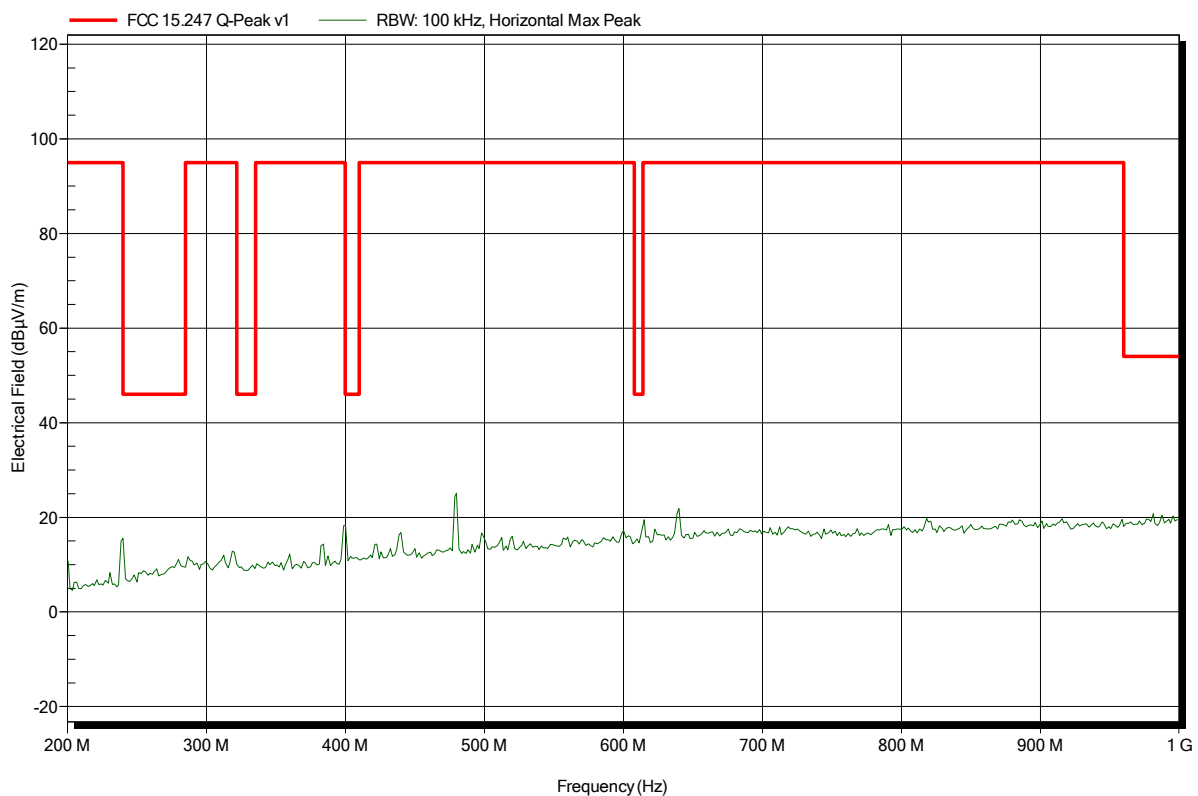


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant:	u-blox Berlin GmbH
EUT Name:	Kombi-Module Sample 3
Model:	ELLA-W133-A (WiBear11n-SF2)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Test Conditions:	Tnom: 24°C, Vnom: 3.3 V DC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; BT-EDR; CH.: 0; 2402 MHz; 3-DH5; Pmax
Test Date:	2015-11-04
Note:	EUT horizontal; 50 Ohm loaded

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Test Report No.: G0M-1510-5172-TFC247BT-133-V01

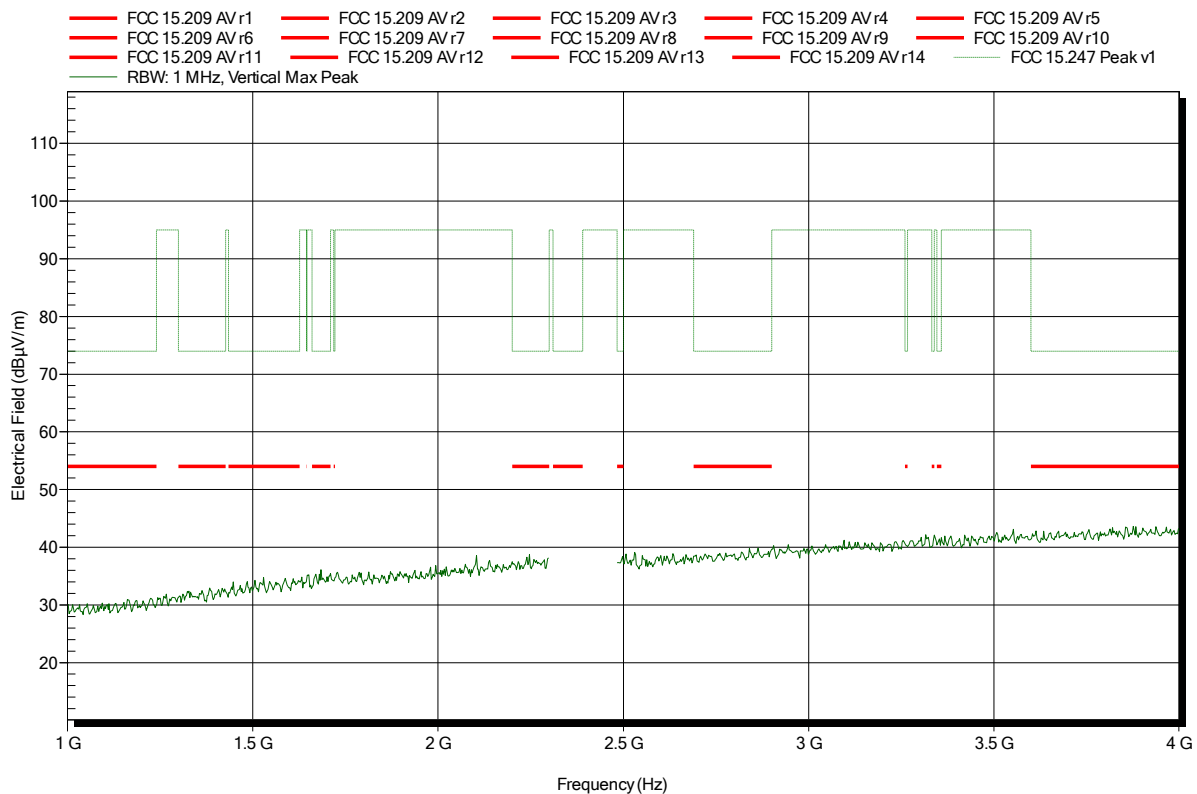
Eurofins Product Service GmbH
Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 3 m
 Mode: TX; BT-EDR; CH.: 0; 2402 MHz; 3-DH5; Pmax
 Test Date: 2015-11-04
 Note: EUT horizontal; 50 Ohm loaded

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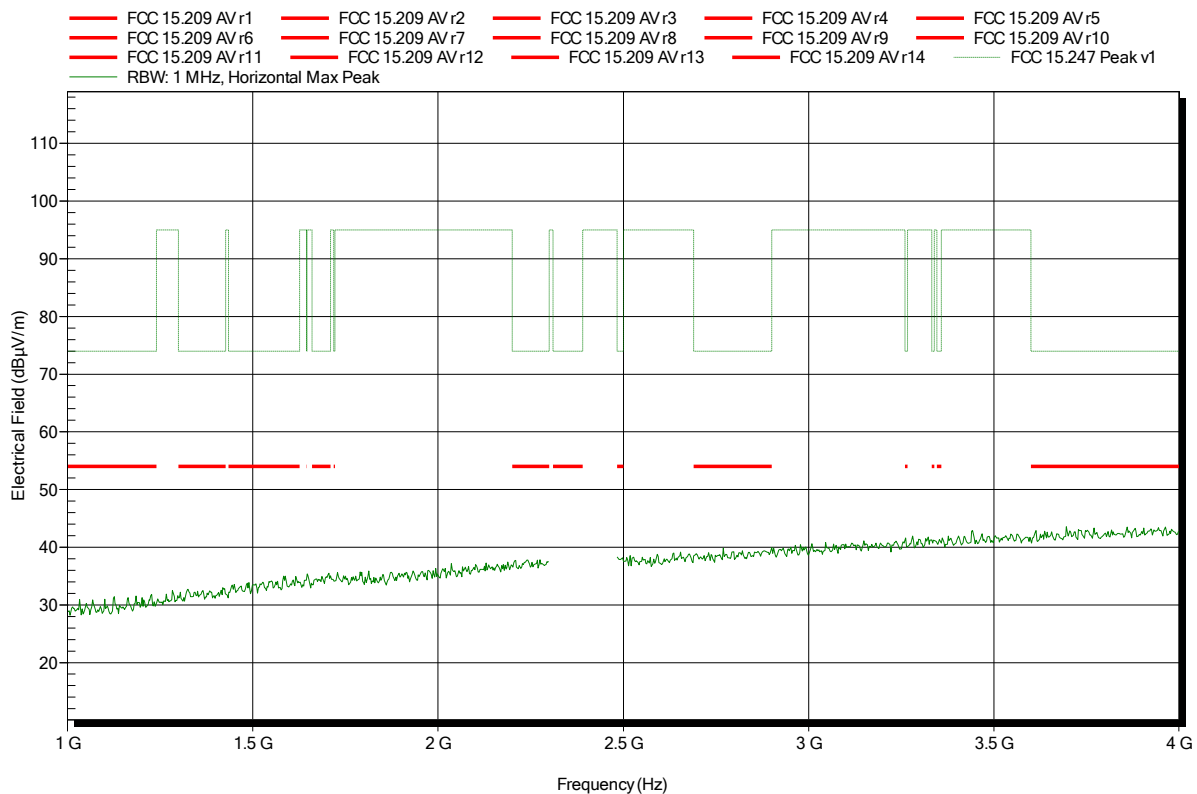


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 3 m
 Mode: TX; BT-EDR; CH.: 0; 2402 MHz; 3-DH5; Pmax
 Test Date: 2015-11-04
 Note: EUT horizontal; 50 Ohm loaded

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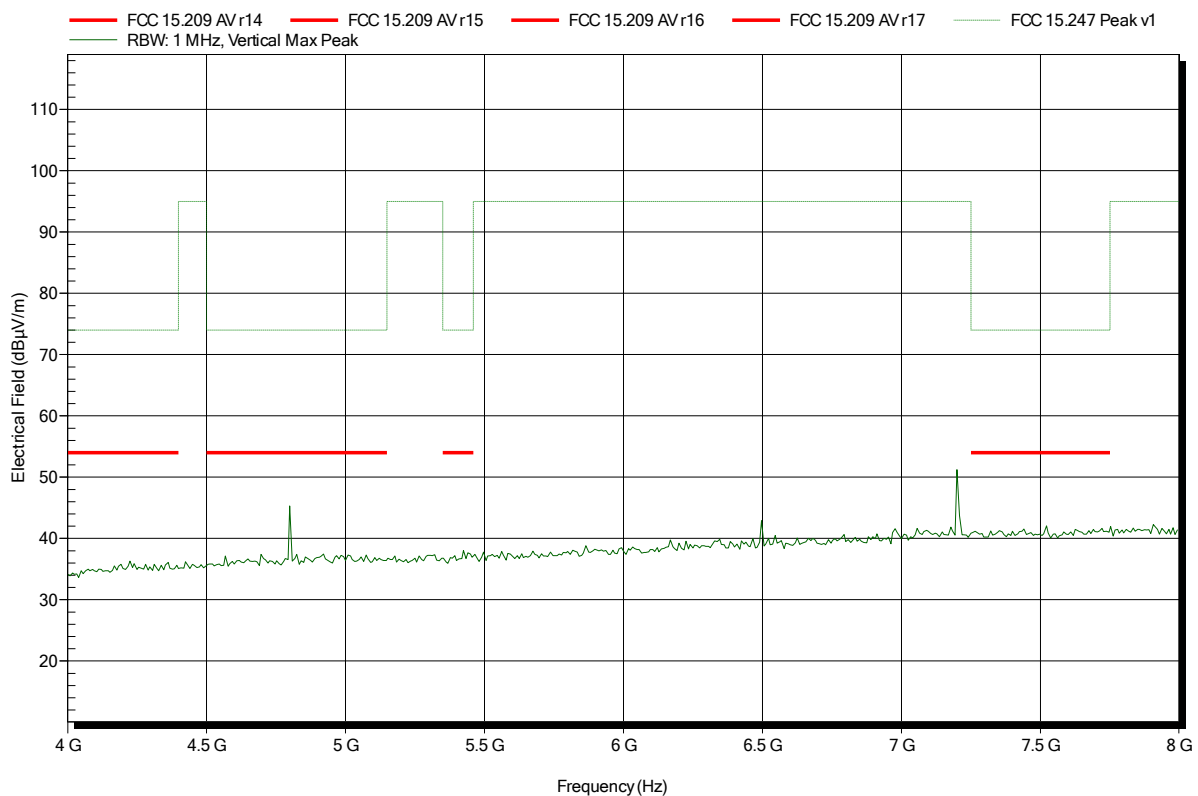


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-EDR; CH.: 0; 2402 MHz; 3-DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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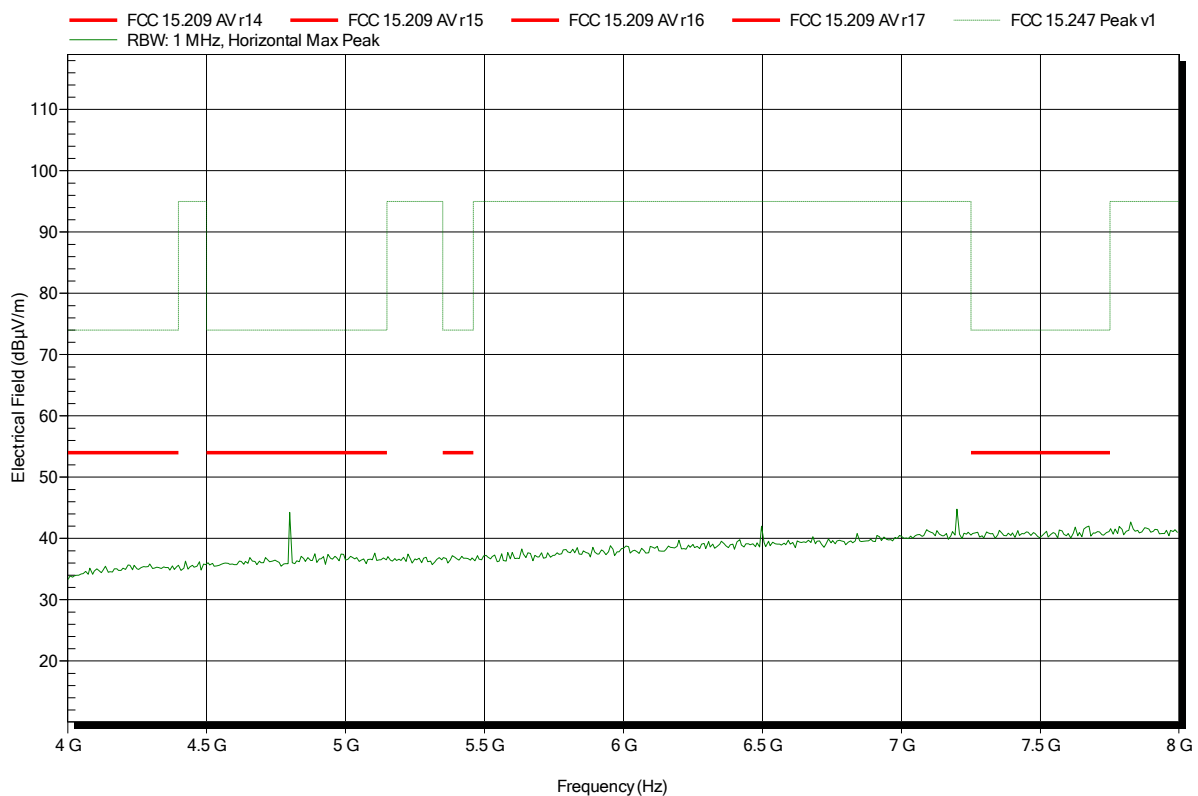


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-EDR; CH.: 0; 2402 MHz; 3-DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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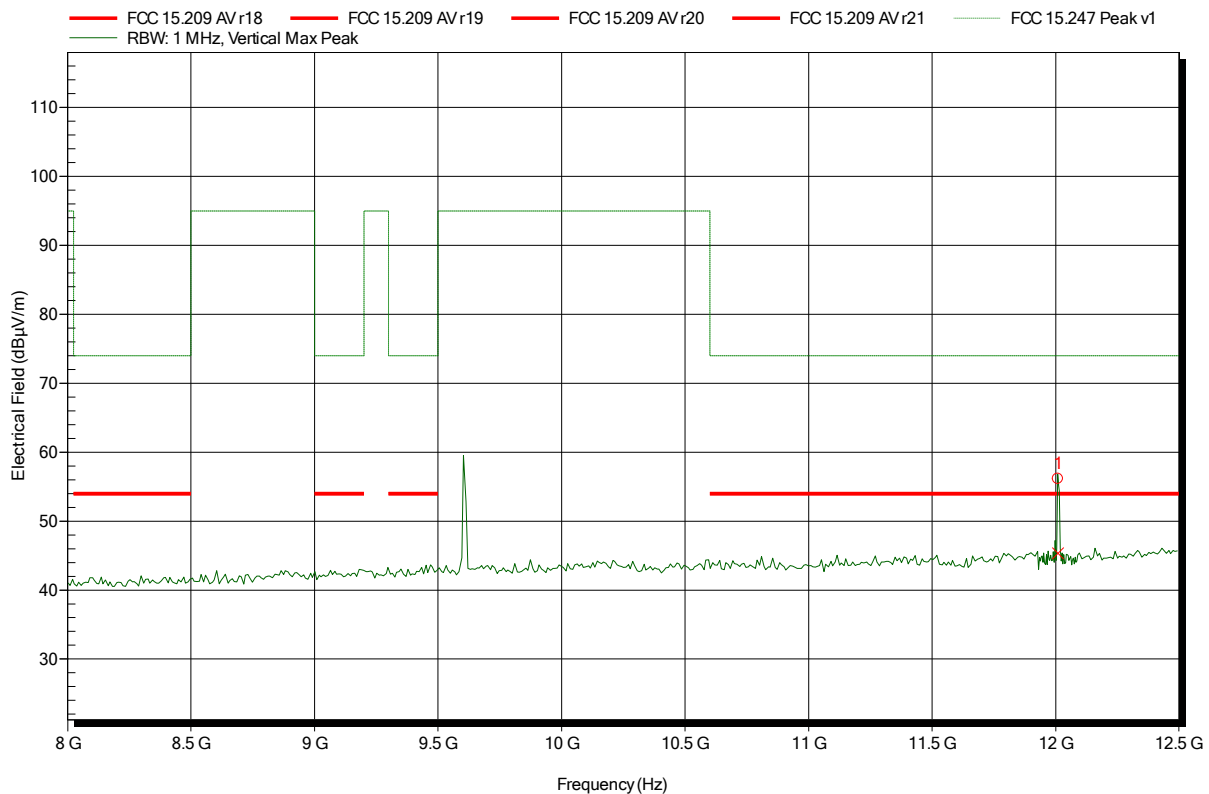


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-EDR; CH.: 0; 2402 MHz; 3-DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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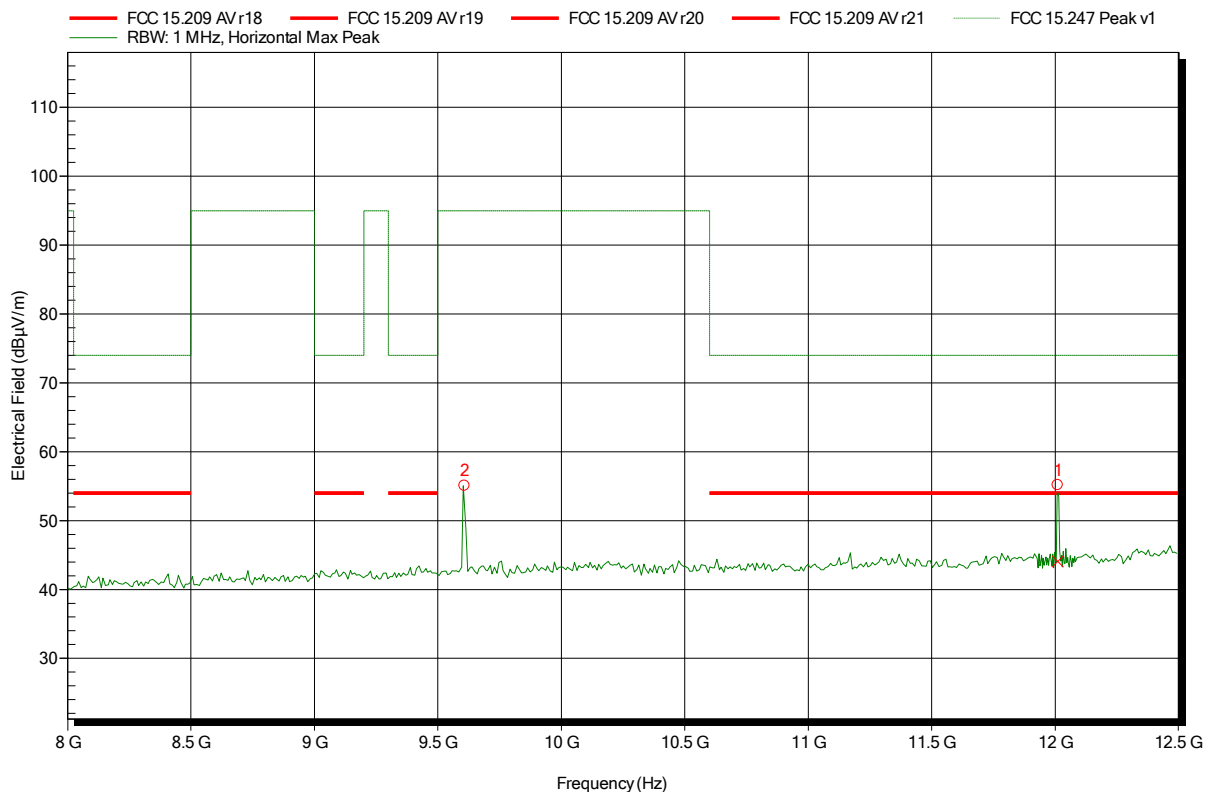
Frequency 12.009 GHz	Peak 56.11 dBµV/m	Peak Limit 74 dBµV/m	Peak Difference -17.89 dB	Status Pass
Frequency 12.009 GHz	Average 45.31 dBµV/m	Average Limit 54 dBµV/m	Average Difference -8.69 dB	Average Status Pass

Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-EDR; CH.: 0; 2402 MHz; 3-DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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Frequency	Peak	Peak Limit	Peak Difference	Status
9.608 GHz	55.05 dBµV/m	95 dBµV/m	-39.95 dB	Pass
12.011 GHz	55.13 dBµV/m	74 dBµV/m	-18.87 dB	Pass

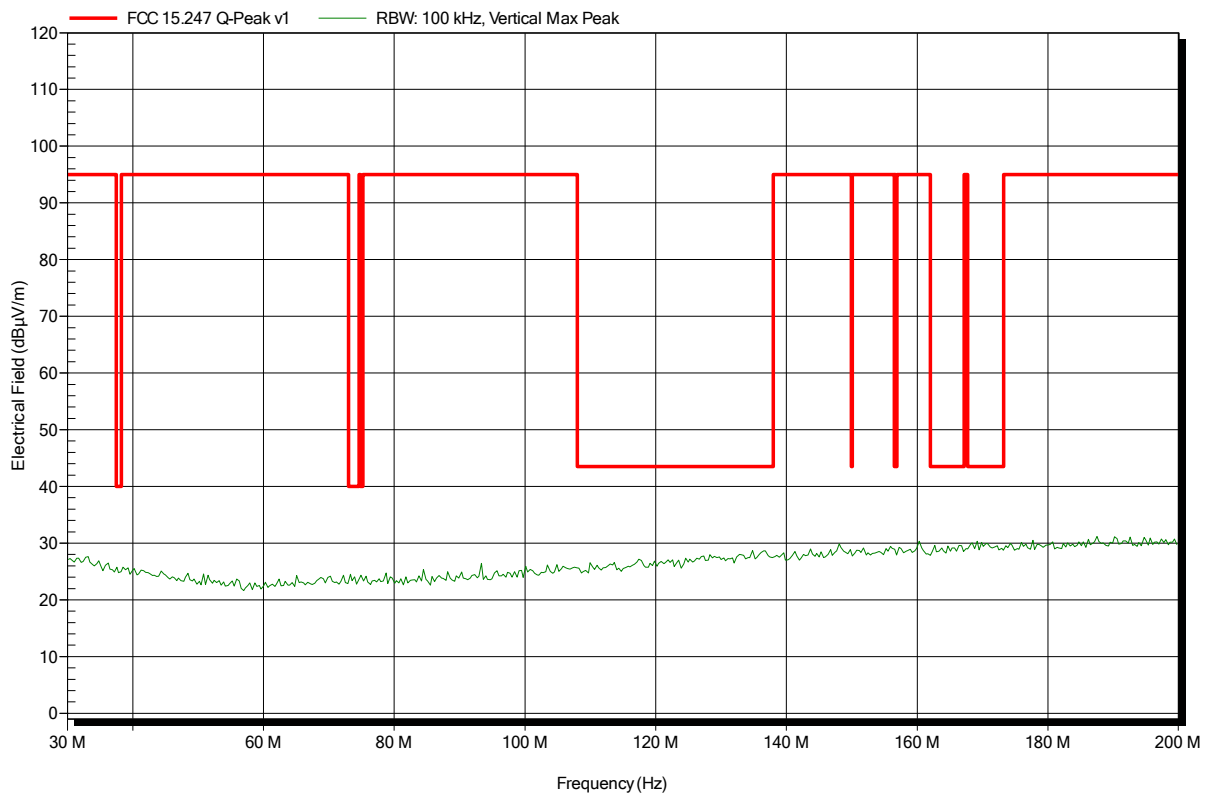
Frequency	Average	Average Limit	Average Difference	Average Status
12.011 GHz	44.07 dBµV/m	54 dBµV/m	-9.93 dB	Pass

Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HK 116, Vertical
 Measurement distance: 3 m
 Mode: TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
 Test Date: 2015-11-04
 Note: EUT horizontal; 50 Ohm loaded

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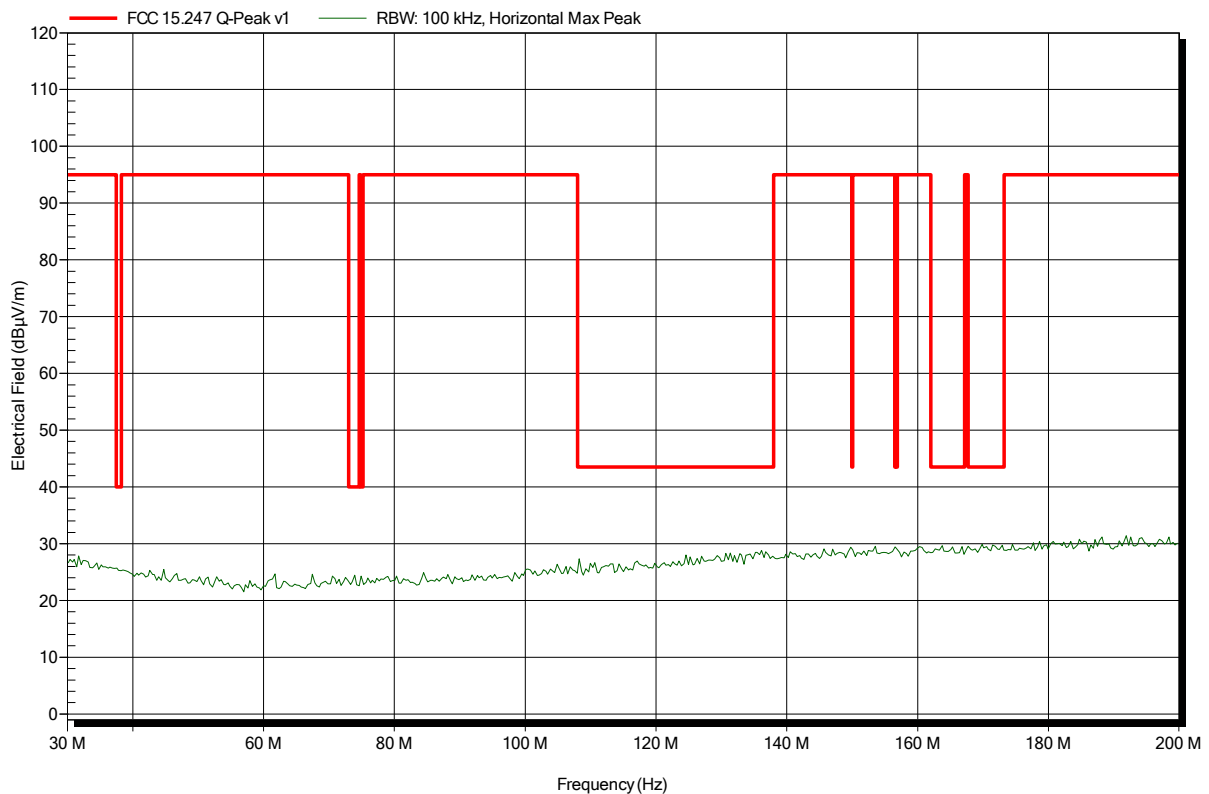


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HK 116, Horizontal
 Measurement distance: 3 m
 Mode: TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
 Test Date: 2015-11-04
 Note: EUT horizontal; 50 Ohm loaded

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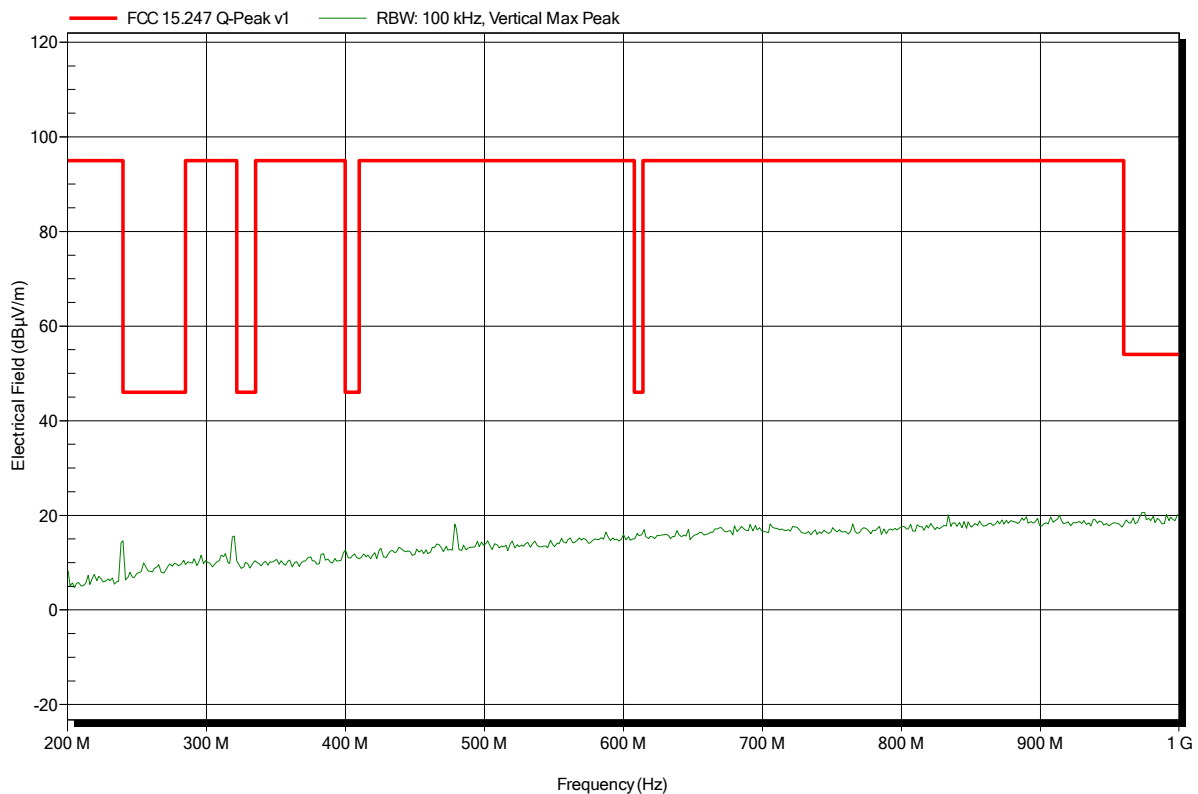


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant:	u-blox Berlin GmbH
EUT Name:	Kombi-Module Sample 3
Model:	ELLA-W133-A (WiBear11n-SF2)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Test Conditions:	Tnom: 24°C, Vnom: 3.3 V DC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
Test Date:	2015-11-04
Note:	EUT horizontal; 50 Ohm loaded

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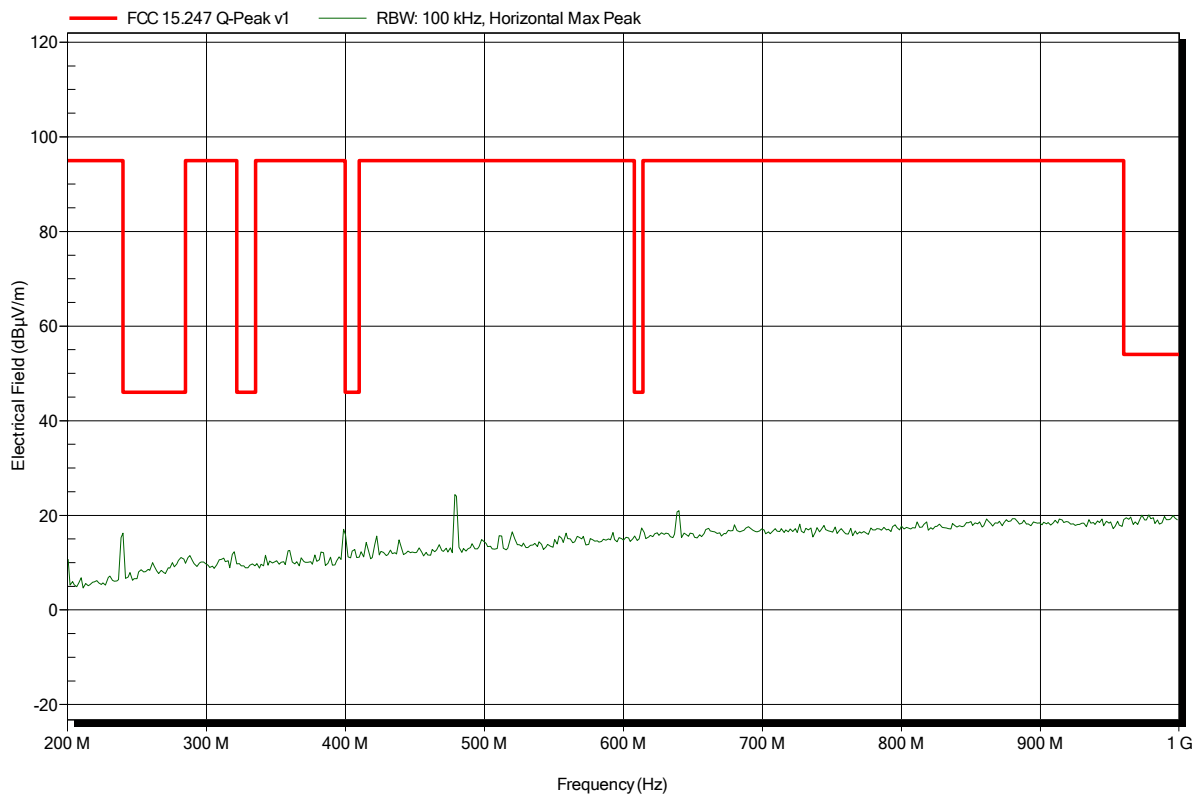


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant:	u-blox Berlin GmbH
EUT Name:	Kombi-Module Sample 3
Model:	ELLA-W133-A (WiBear11n-SF2)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Test Conditions:	Tnom: 24°C, Vnom: 3.3 V DC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
Test Date:	2015-11-04
Note:	EUT horizontal; 50 Ohm loaded

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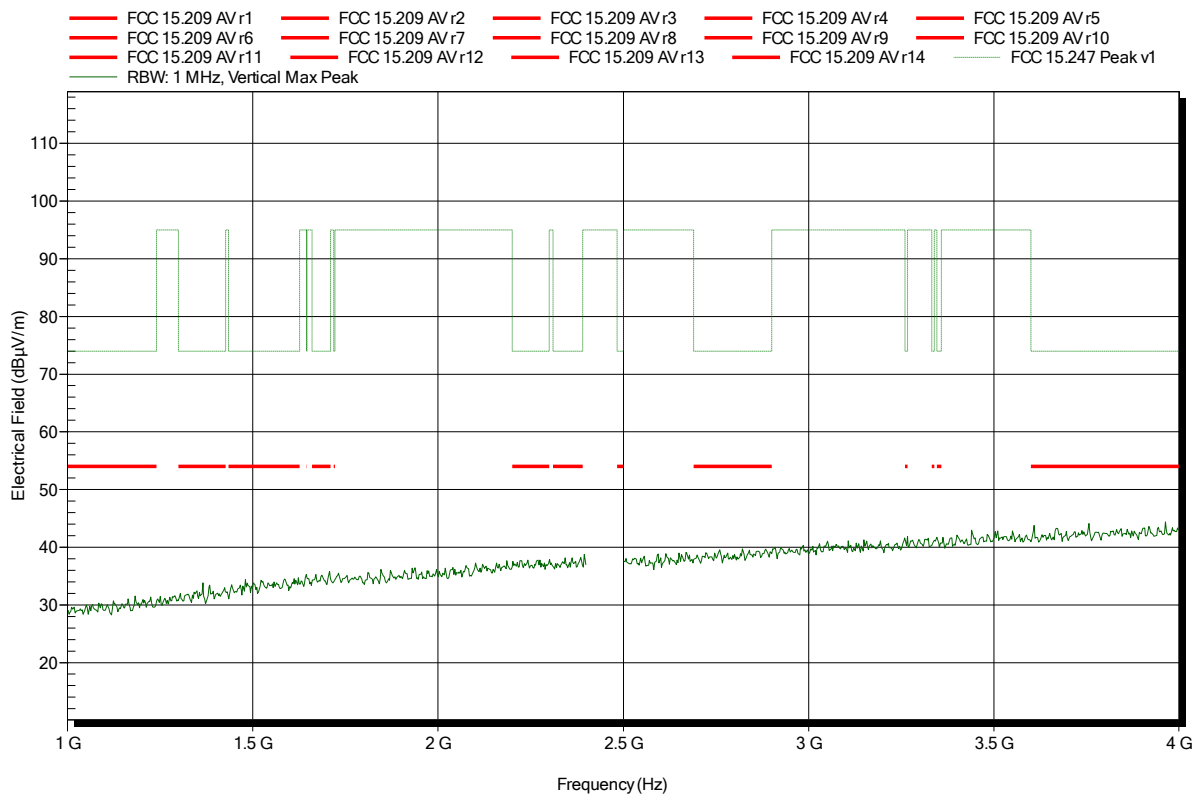


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 3 m
 Mode: TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
 Test Date: 2015-11-04
 Note: EUT horizontal; 50 Ohm loaded

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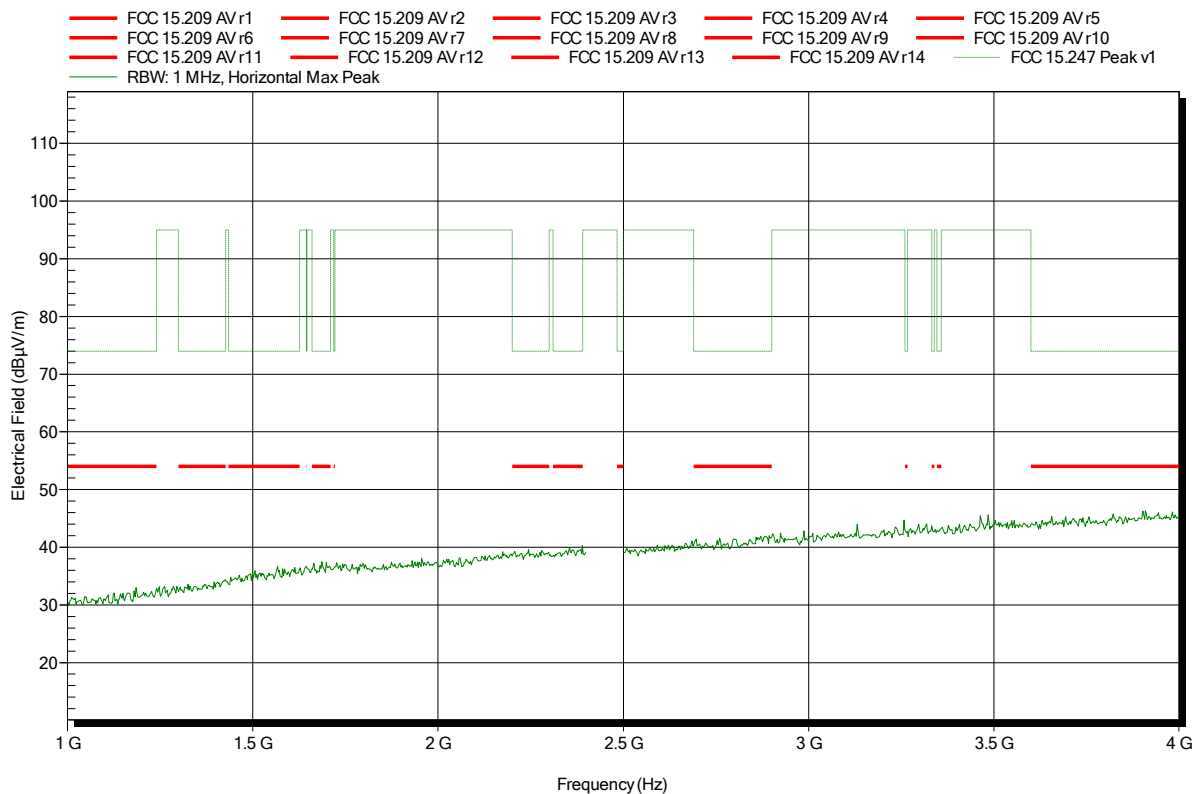


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 3 m
 Mode: TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
 Test Date: 2015-11-04
 Note: EUT horizontal; 50 Ohm loaded

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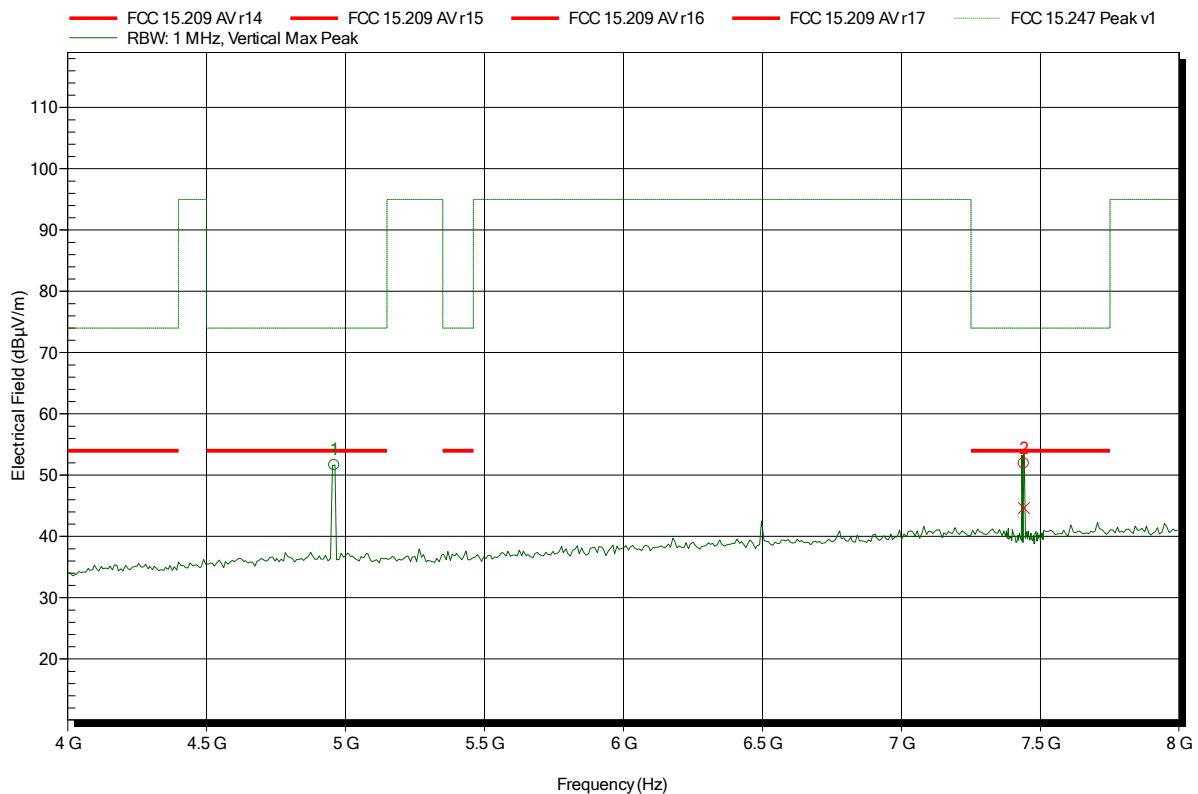


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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Frequency	Peak	Peak Limit	Peak Difference	Status
4.96 GHz	51.65 dBµV/m	74 dBµV/m	-22.35 dB	Pass
7.44 GHz	51.91 dBµV/m	74 dBµV/m	-22.09 dB	Pass

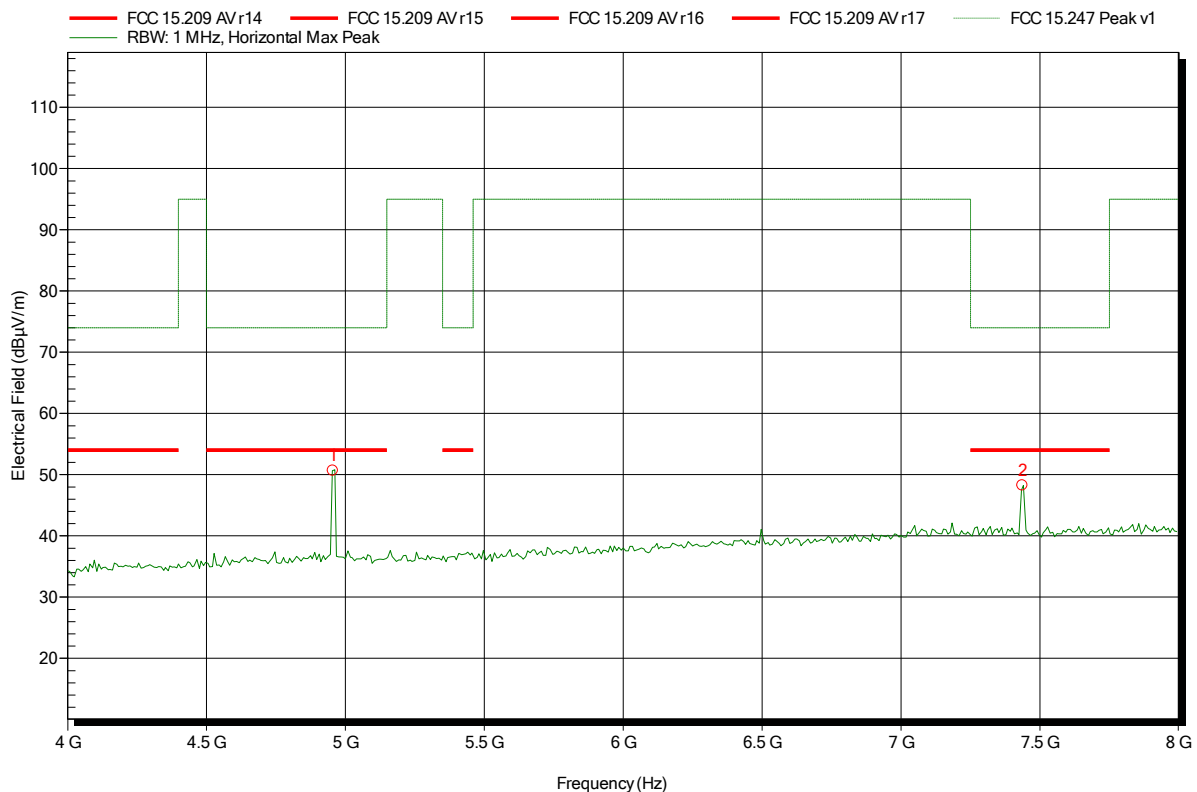
Frequency	Average	Average Limit	Average Difference	Average Status
7.44 GHz	44.65 dBµV/m	54 dBµV/m	-9.35 dB	Pass

Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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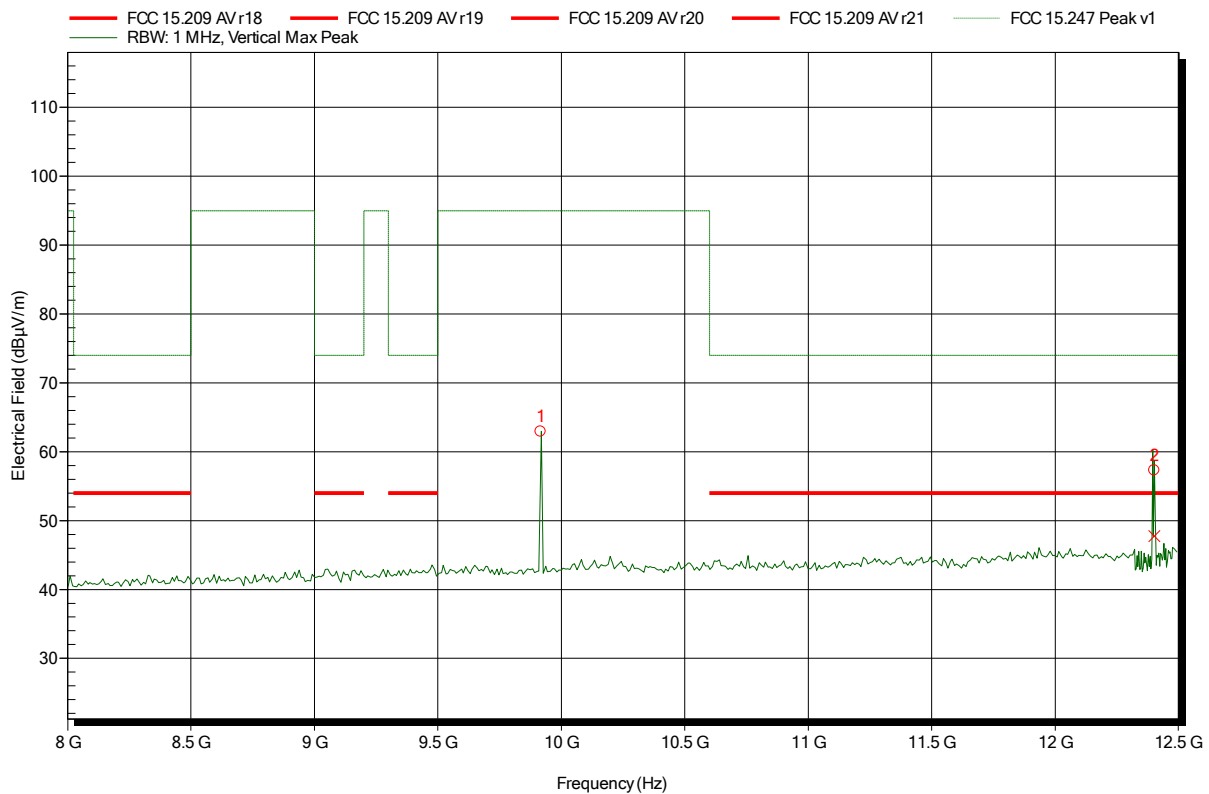
Frequency	Peak	Peak Limit	Peak Difference	Status
4.956 GHz	50.66 dBµV/m	74 dBµV/m	-23.34 dB	Pass
7.438 GHz	48.22 dBµV/m	74 dBµV/m	-25.78 dB	Pass

Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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Frequency	Peak	Peak Limit	Peak Difference	Status
9.917 GHz	62.94 dBµV/m	95 dBµV/m	-32.06 dB	Pass
12.401 GHz	57.3 dBµV/m	74 dBµV/m	-16.7 dB	Pass

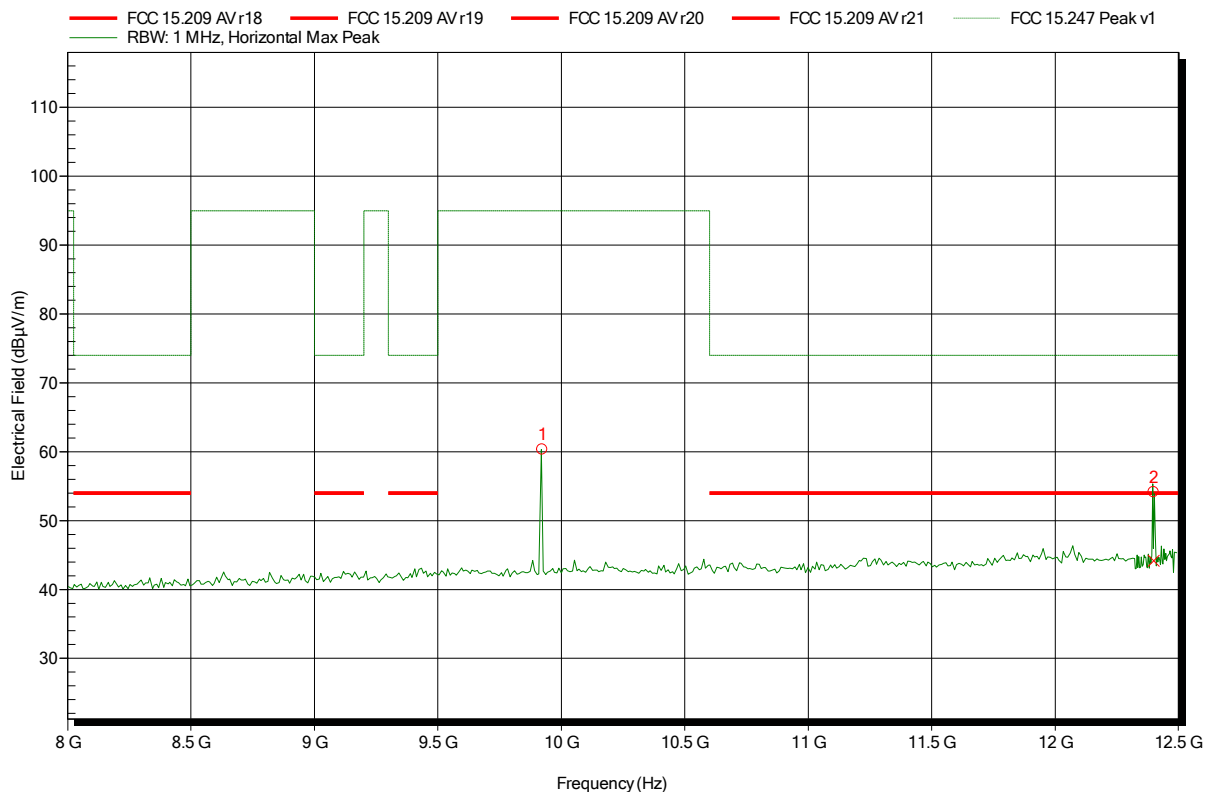
Frequency	Average	Average Limit	Average Difference	Average Status
12.401 GHz	47.75 dBµV/m	54 dBµV/m	-6.25 dB	Pass

Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 3
 Model: ELLA-W133-A (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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Frequency	Peak	Peak Limit	Peak Difference	Status
9.922 GHz	60.33 dBμV/m	95 dBμV/m	-34.67 dB	Pass
12.399 GHz	54.15 dBμV/m	74 dBμV/m	-19.85 dB	Pass

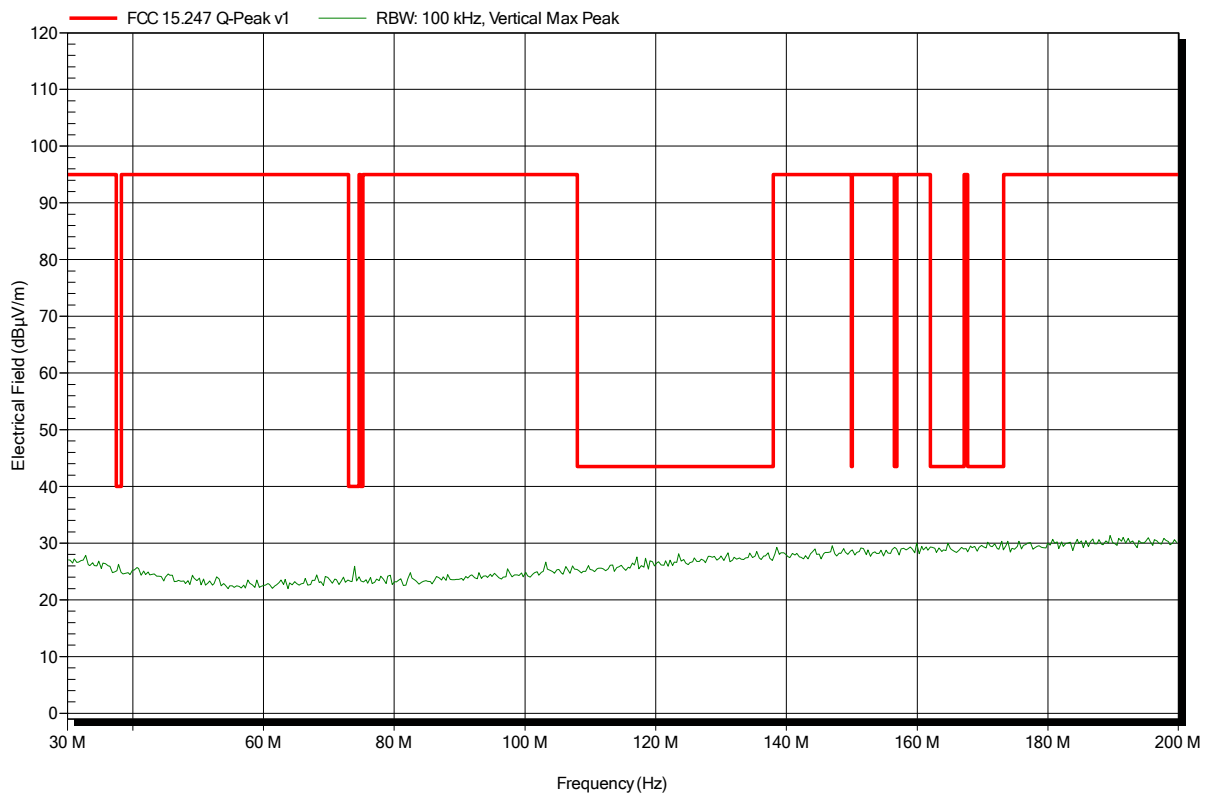
Frequency	Average	Average Limit	Average Difference	Average Status
12.399 GHz	44.16 dBμV/m	54 dBμV/m	-9.84 dB	Pass

Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant:	u-blox Berlin GmbH
EUT Name:	Kombi-Module Sample 4
Model:	ELLA-W133 (WiBear11n-SF2)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Test Conditions:	Tnom: 24°C, Vnom: 3.3 V DC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
Test Date:	2015-11-04
Note:	EUT horizontal; 50 Ohm loaded

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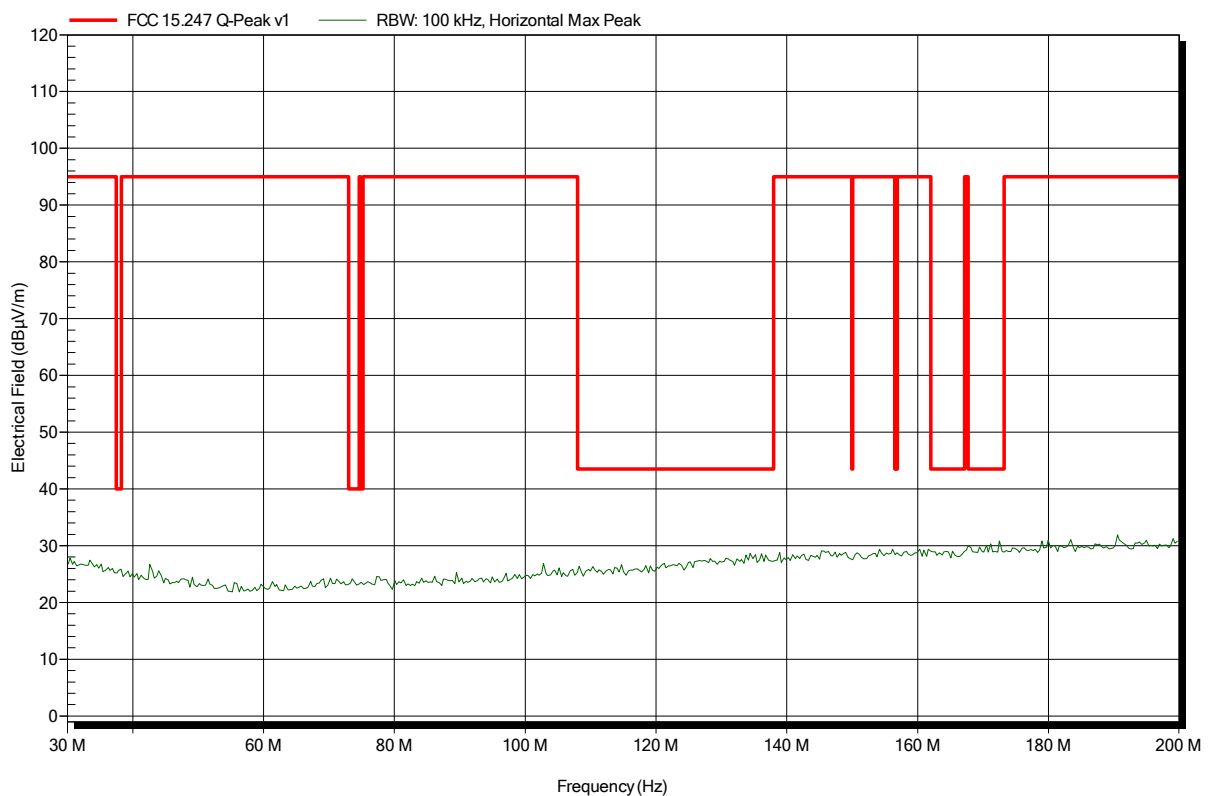


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 4
 Model: ELLA-W133 (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HK 116, Horizontal
 Measurement distance: 3 m
 Mode: TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
 Test Date: 2015-11-04
 Note: EUT horizontal; 50 Ohm loaded

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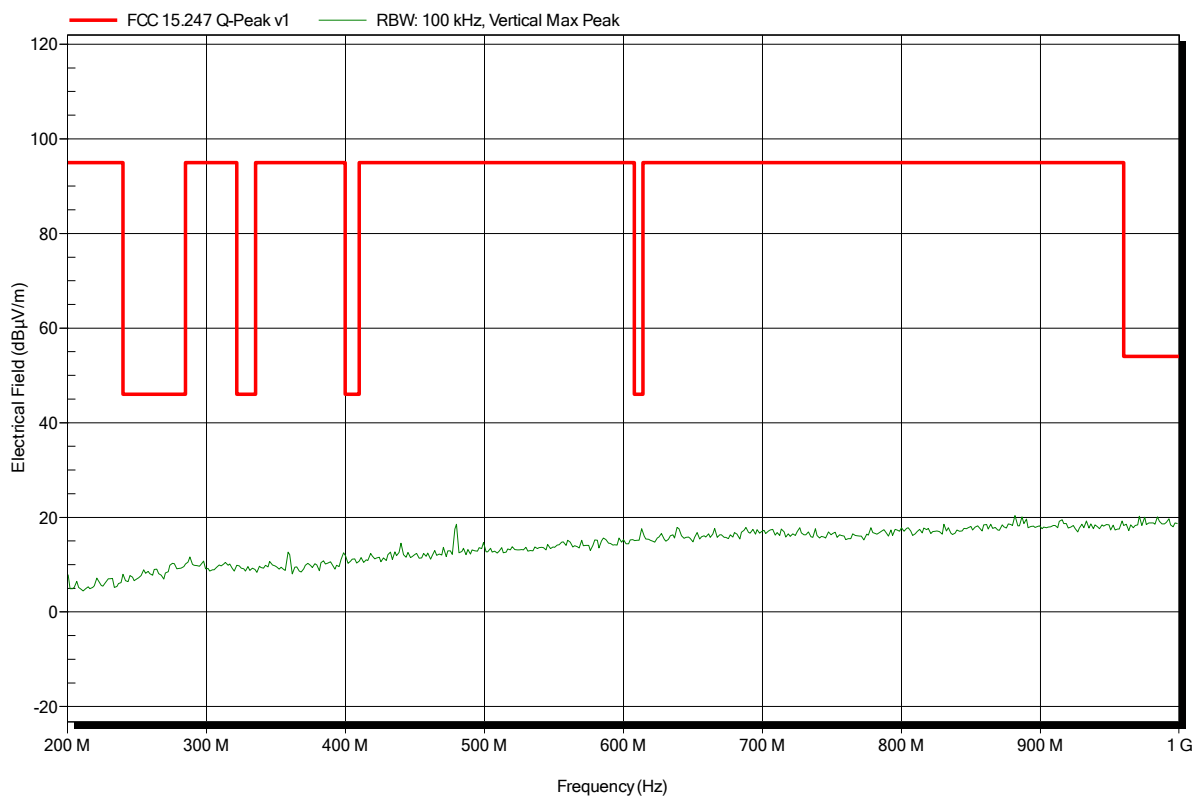


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant:	u-blox Berlin GmbH
EUT Name:	Kombi-Module Sample 4
Model:	ELLA-W133 (WiBear11n-SF2)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Test Conditions:	Tnom: 24°C, Vnom: 3.3 V DC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
Test Date:	2015-11-04
Note:	EUT horizontal; 50 Ohm loaded

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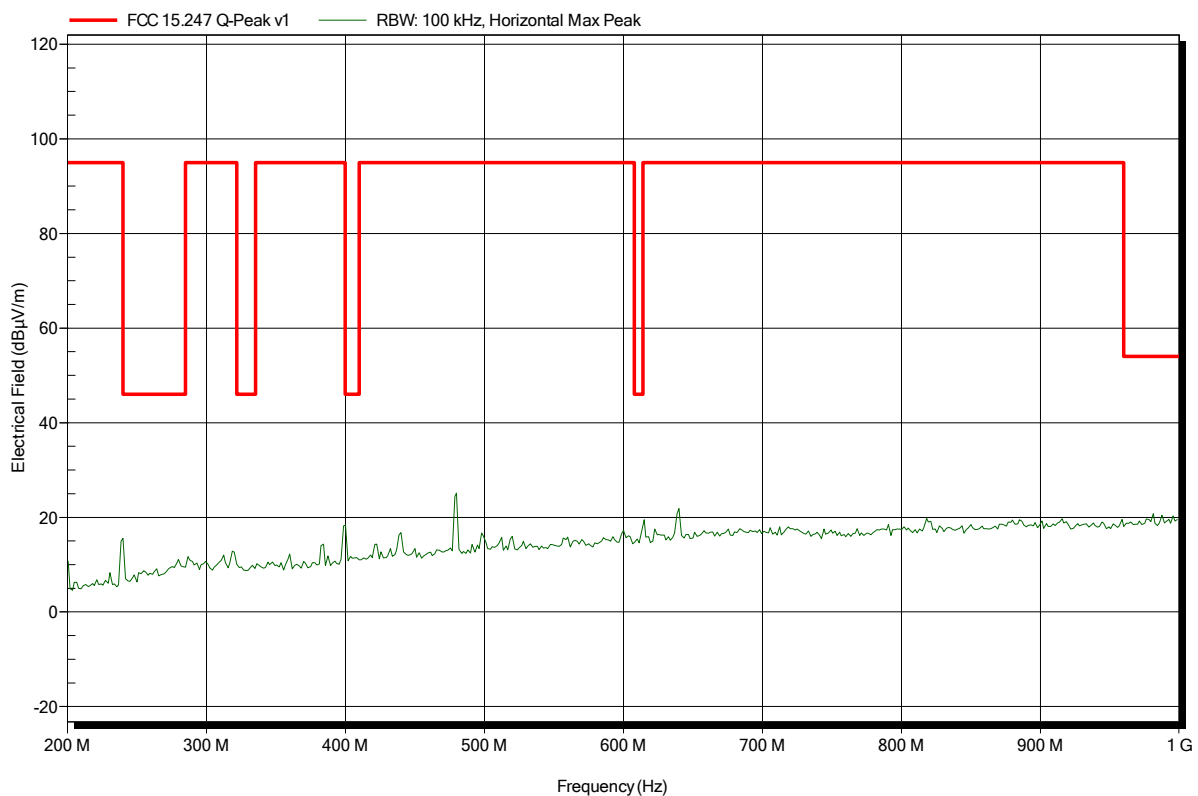


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant:	u-blox Berlin GmbH
EUT Name:	Kombi-Module Sample 4
Model:	ELLA-W133 (WiBear11n-SF2)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Test Conditions:	Tnom: 24°C, Vnom: 3.3 V DC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
Test Date:	2015-11-04
Note:	EUT horizontal; 50 Ohm loaded

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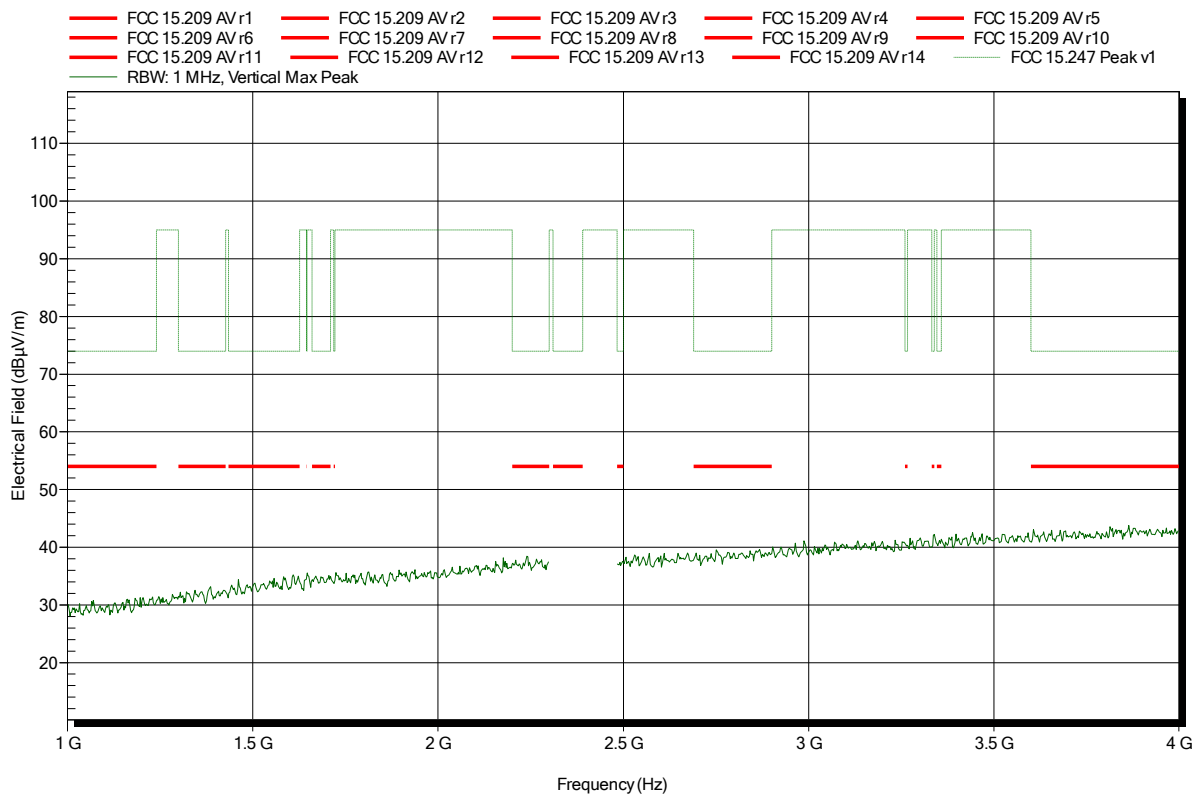


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 4
 Model: ELLA-W133 (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 3 m
 Mode: TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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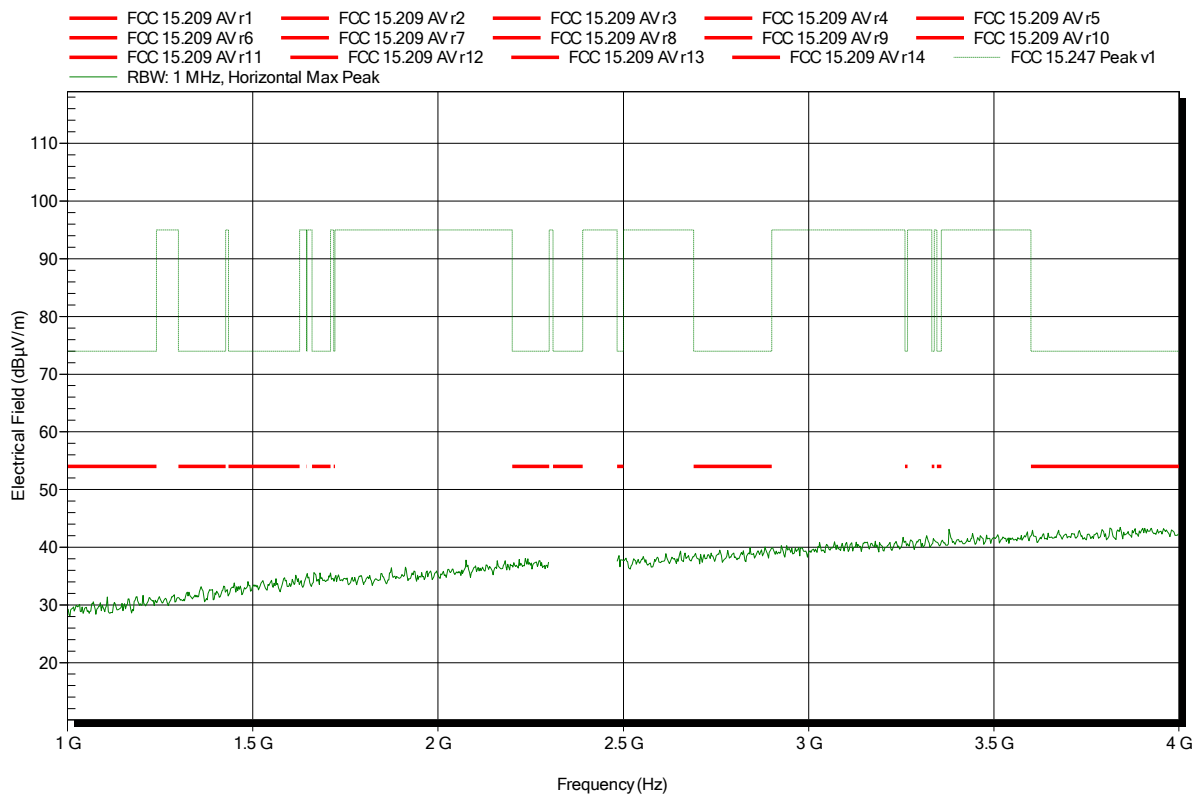


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 4
 Model: ELLA-W133 (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 3 m
 Mode: TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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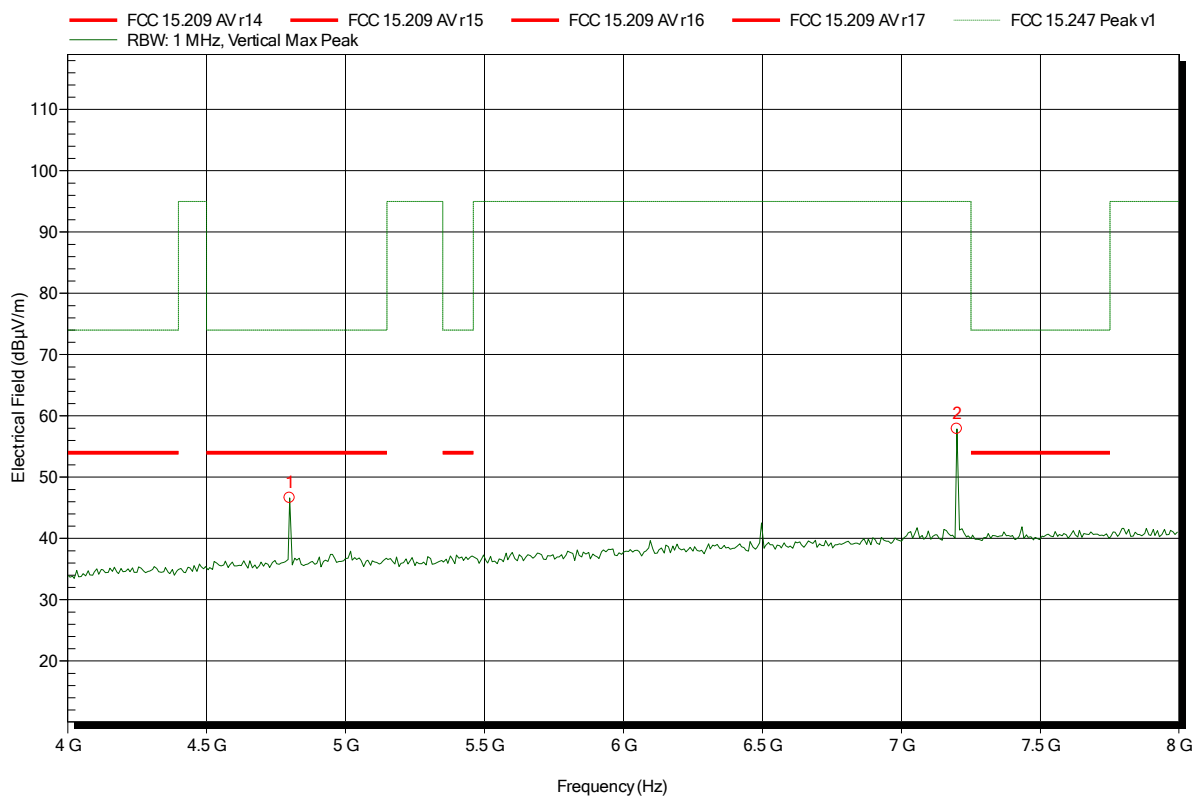


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 4
 Model: ELLA-W133 (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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Frequency	Peak	Peak Limit	Peak Difference	Status
4.8 GHz	46.61 dBµV/m	74 dBµV/m	-27.39 dB	Pass
7.2 GHz	57.87 dBµV/m	95 dBµV/m	-37.13 dB	Pass

Test Report No.: G0M-1510-5172-TFC247BT-133-V01

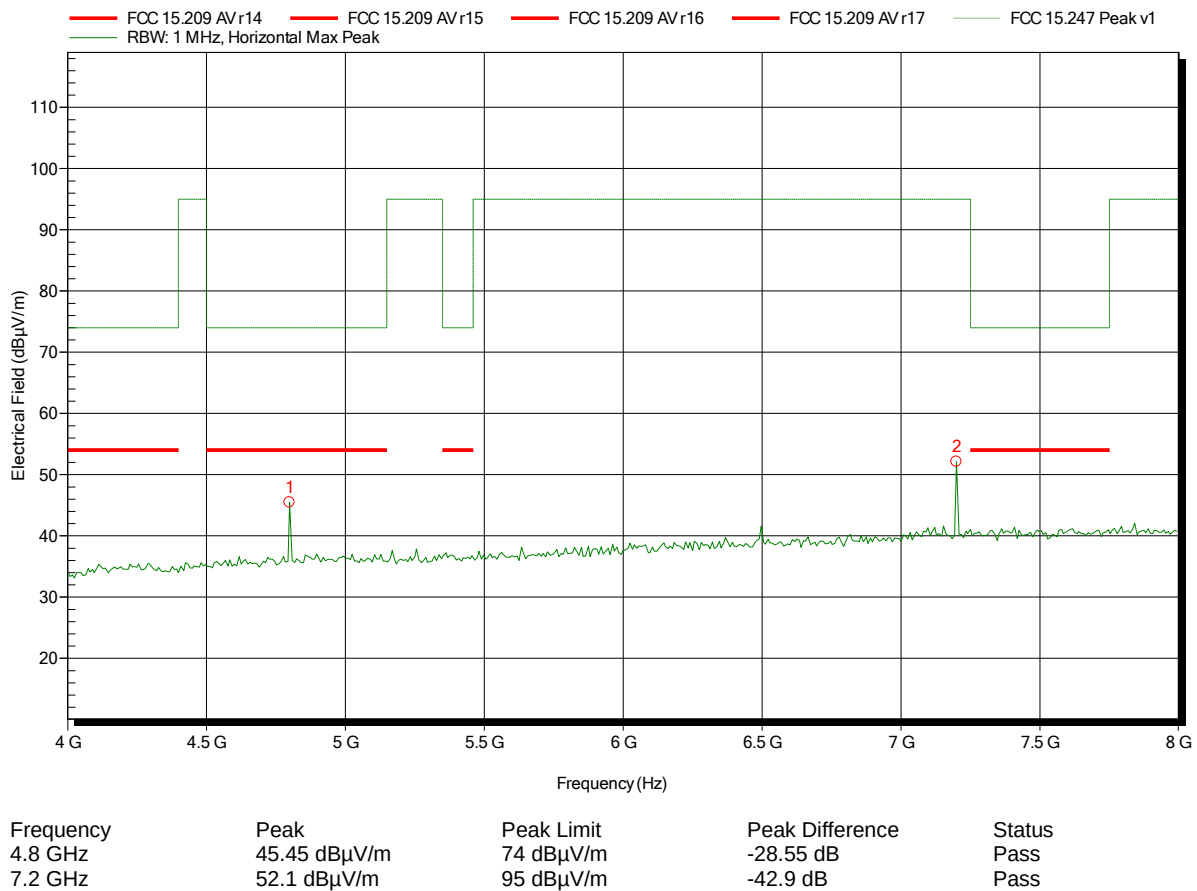
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 4
 Model: ELLA-W133 (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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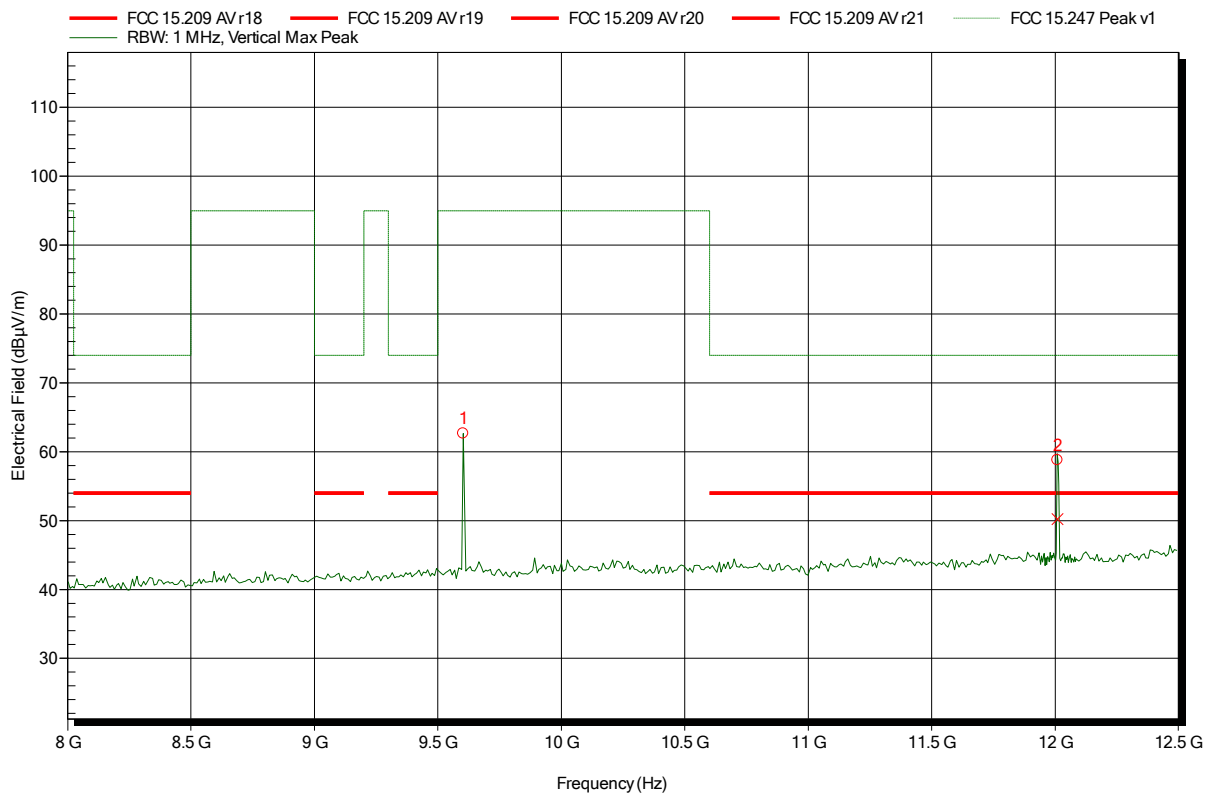


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 4
 Model: ELLA-W133 (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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Frequency	Peak	Peak Limit	Peak Difference	Status
9.603 GHz	62.66 dBµV/m	95 dBµV/m	-32.34 dB	Pass
12.009 GHz	58.8 dBµV/m	74 dBµV/m	-15.2 dB	Pass

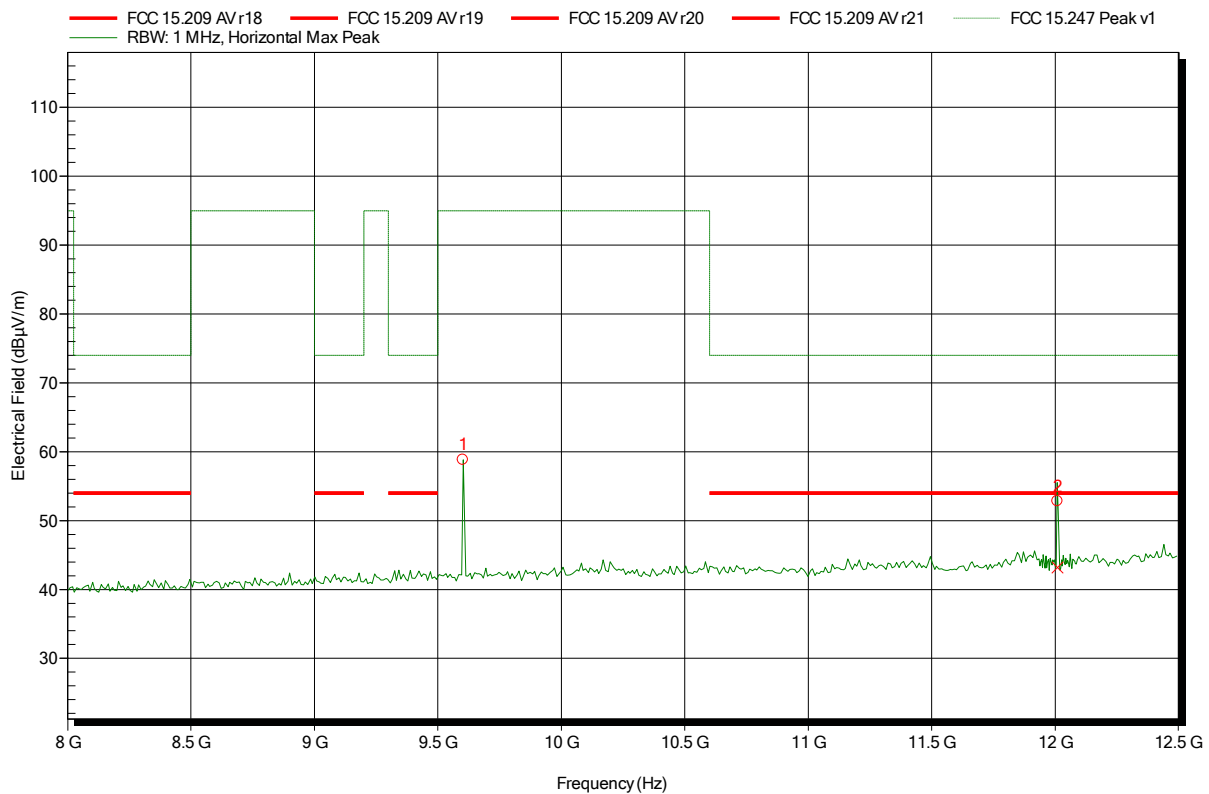
Frequency	Average	Average Limit	Average Difference	Average Status
12.009 GHz	50.23 dBµV/m	54 dBµV/m	-3.77 dB	Pass

Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 4
 Model: ELLA-W133 (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-BR; CH.: 0; 2402 MHz; DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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Frequency	Peak	Peak Limit	Peak Difference	Status
9.602 GHz	58.84 dBµV/m	95 dBµV/m	-36.16 dB	Pass
12.009 GHz	52.81 dBµV/m	74 dBµV/m	-21.19 dB	Pass

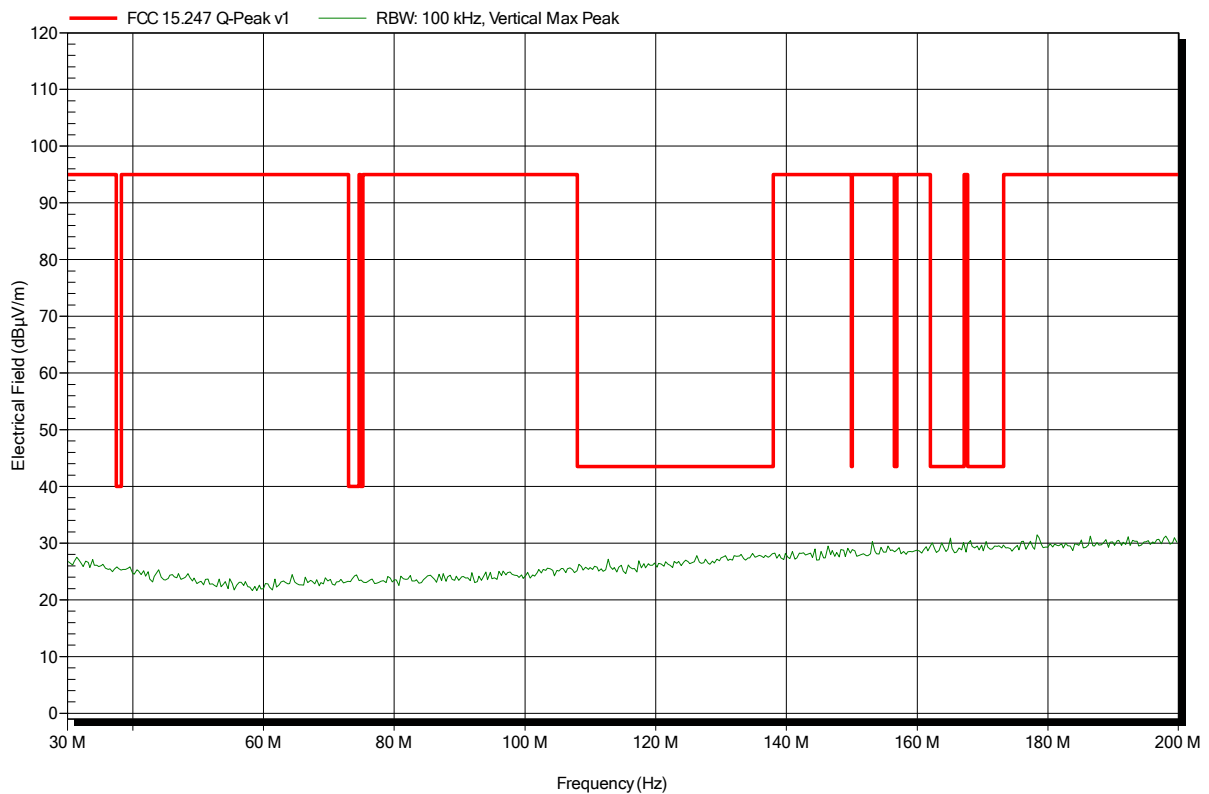
Frequency	Average	Average Limit	Average Difference	Average Status
12.009 GHz	43.17 dBµV/m	54 dBµV/m	-10.83 dB	Pass

Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant:	u-blox Berlin GmbH
EUT Name:	Kombi-Module Sample 4
Model:	ELLA-W133 (WiBear11n-SF2)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Test Conditions:	Tnom: 24°C, Vnom: 3.3 V DC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
Test Date:	2015-11-04
Note:	EUT horizontal; 50 Ohm loaded

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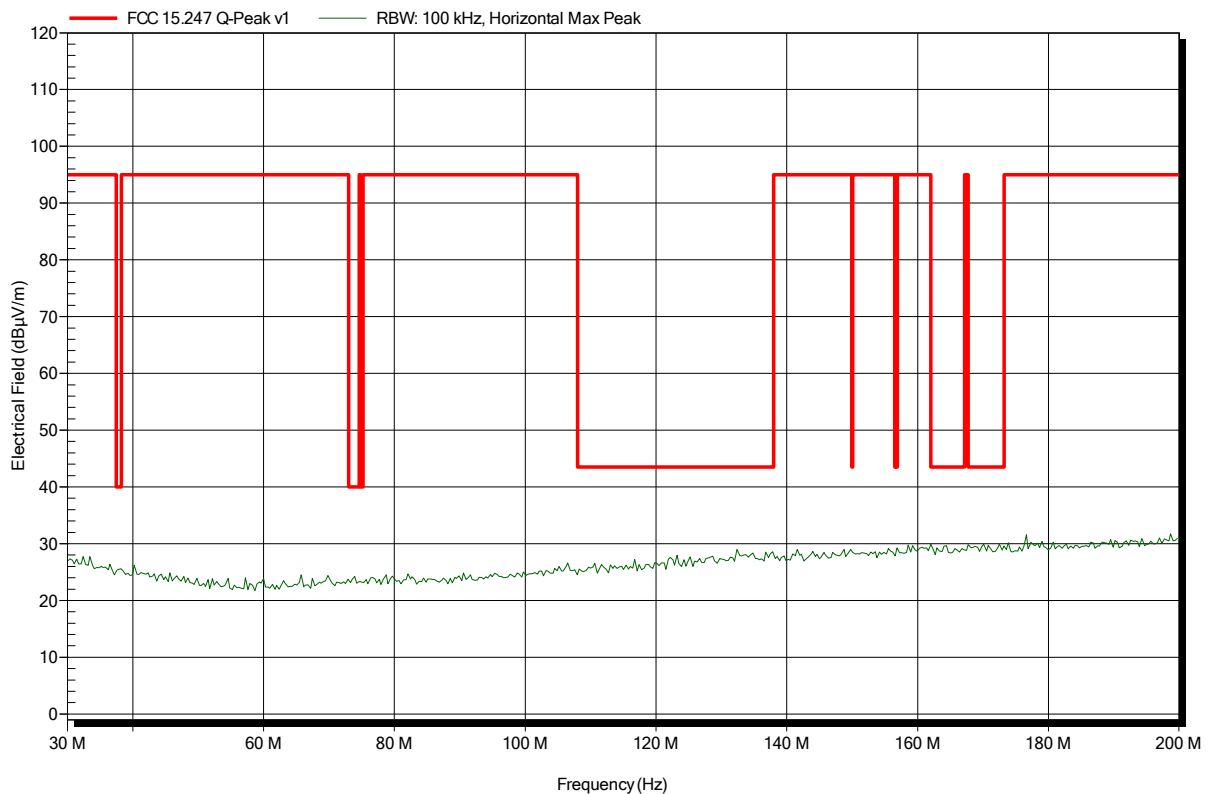


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant:	u-blox Berlin GmbH
EUT Name:	Kombi-Module Sample 4
Model:	ELLA-W133 (WiBear11n-SF2)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Test Conditions:	Tnom: 24°C, Vnom: 3.3 V DC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
Test Date:	2015-11-04
Note:	EUT horizontal; 50 Ohm loaded

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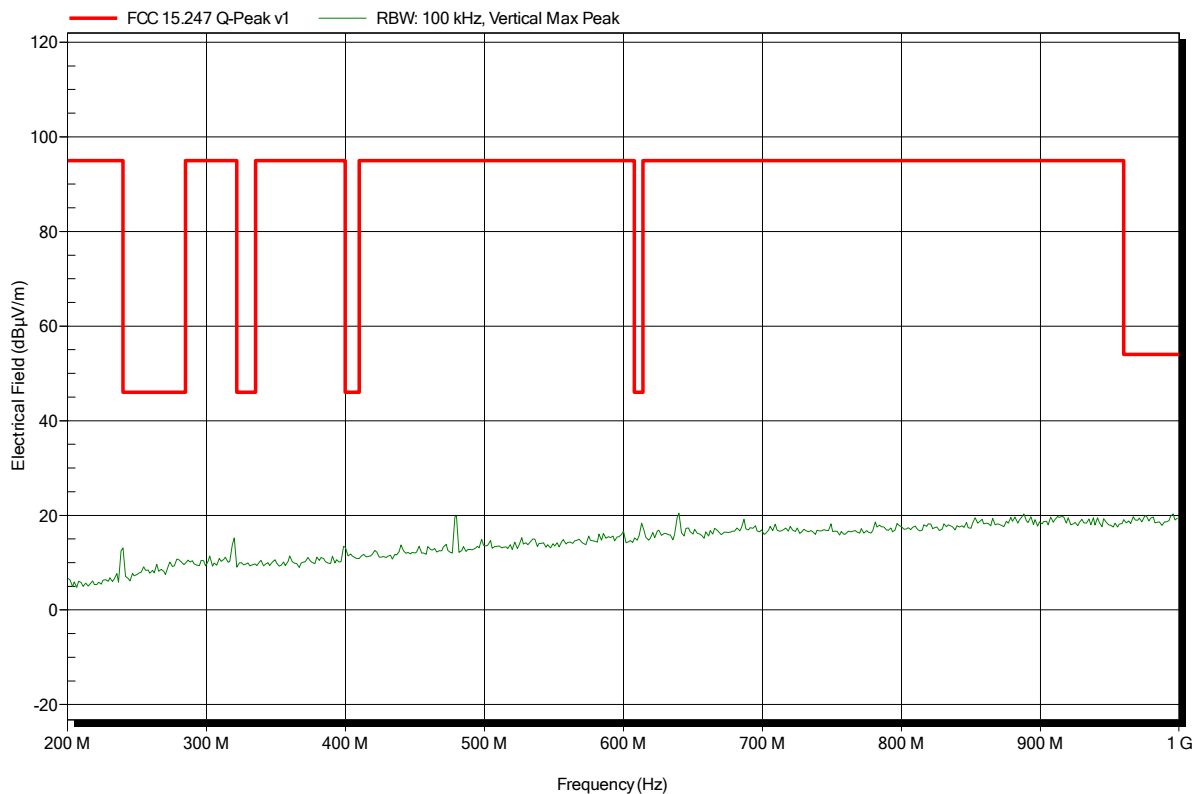


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant:	u-blox Berlin GmbH
EUT Name:	Kombi-Module Sample 4
Model:	ELLA-W133 (WiBear11n-SF2)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Test Conditions:	Tnom: 24°C, Vnom: 3.3 V DC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
Test Date:	2015-11-04
Note:	EUT horizontal; 50 Ohm loaded

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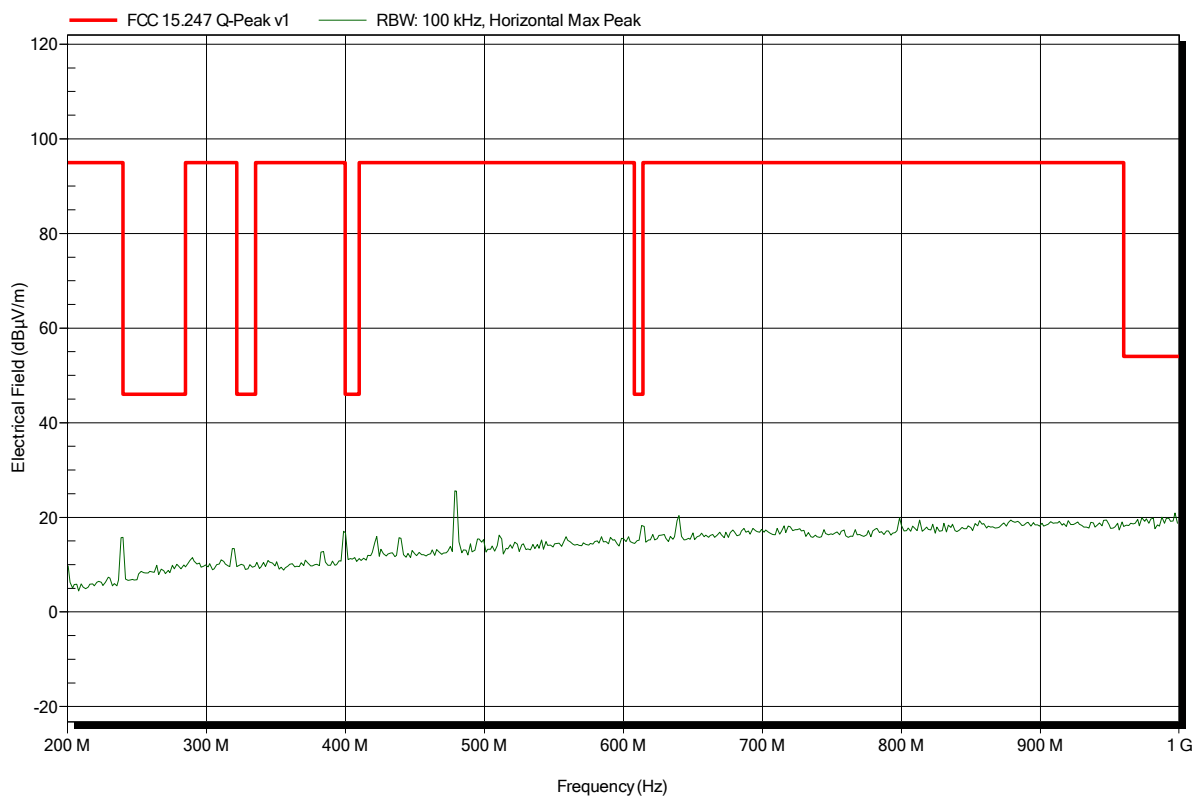


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant:	u-blox Berlin GmbH
EUT Name:	Kombi-Module Sample 4
Model:	ELLA-W133 (WiBear11n-SF2)
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Test Conditions:	Tnom: 24°C, Vnom: 3.3 V DC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
Test Date:	2015-11-04
Note:	EUT horizontal; 50 Ohm loaded

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Test Report No.: G0M-1510-5172-TFC247BT-133-V01

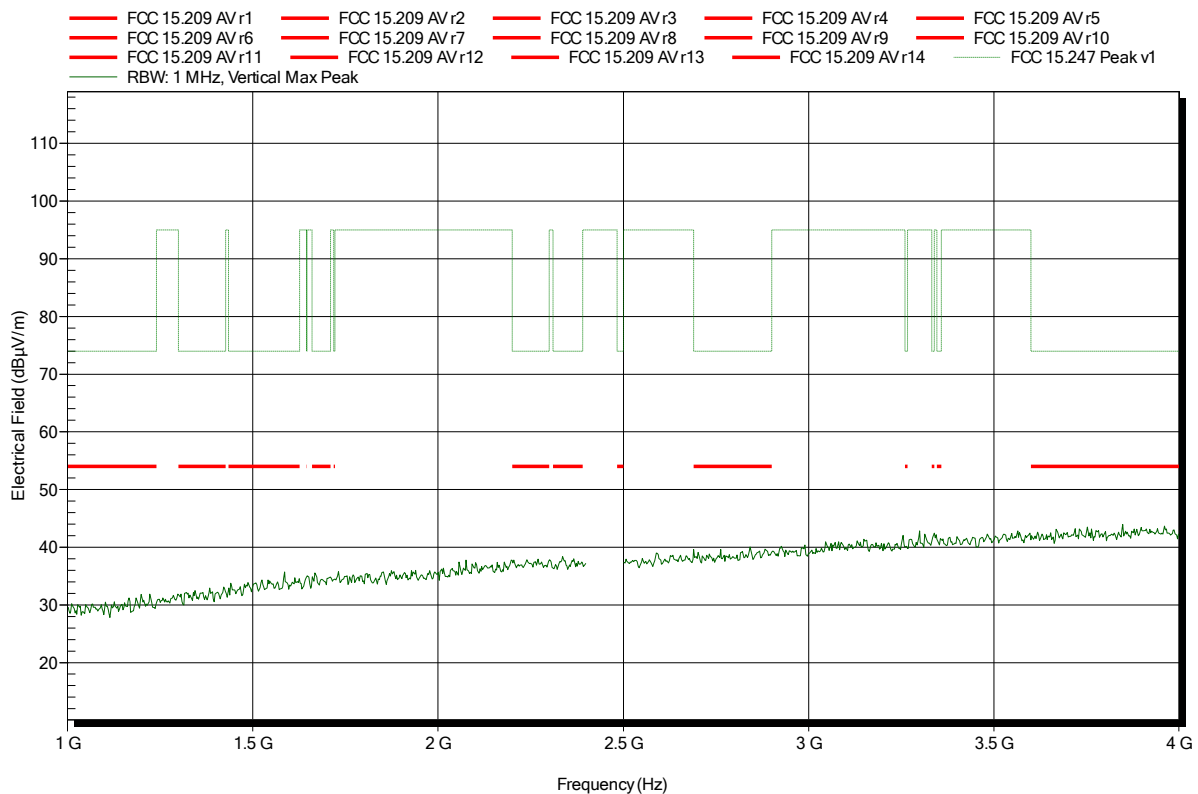
Eurofins Product Service GmbH
Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 4
 Model: ELLA-W133 (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 3 m
 Mode: TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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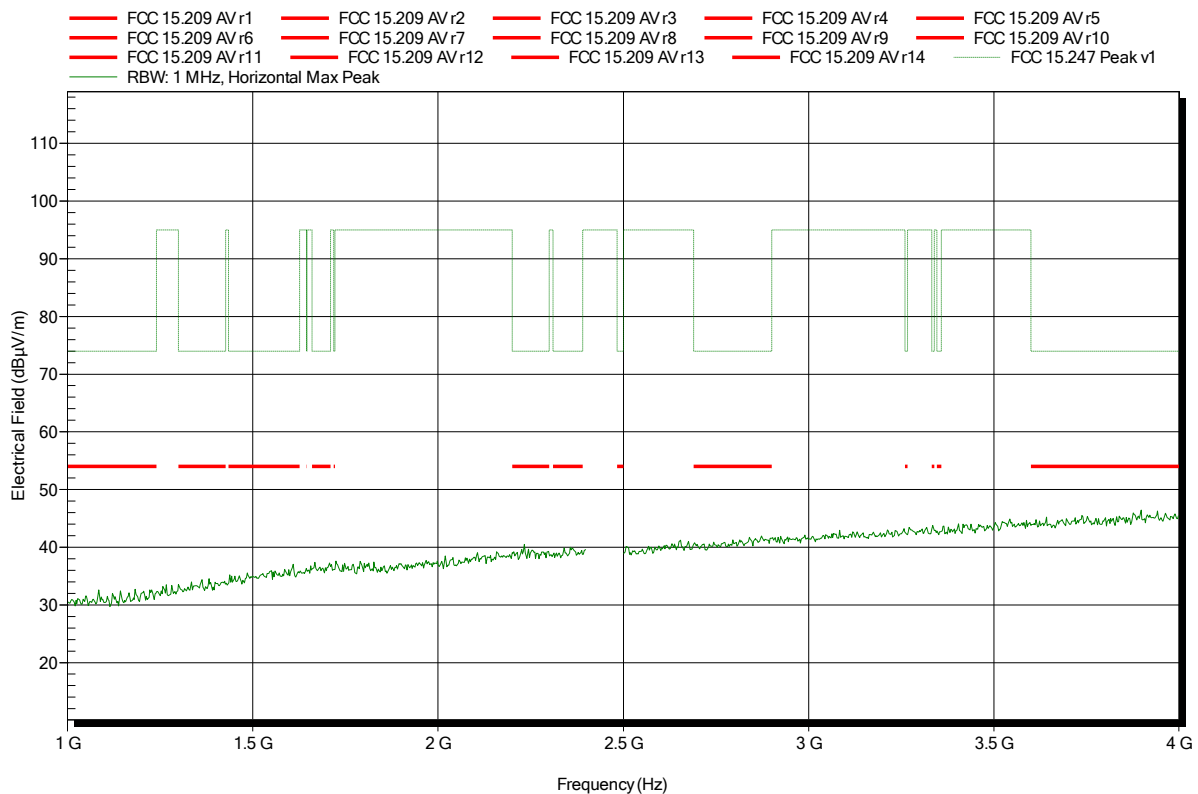


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 4
 Model: ELLA-W133 (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 3 m
 Mode: TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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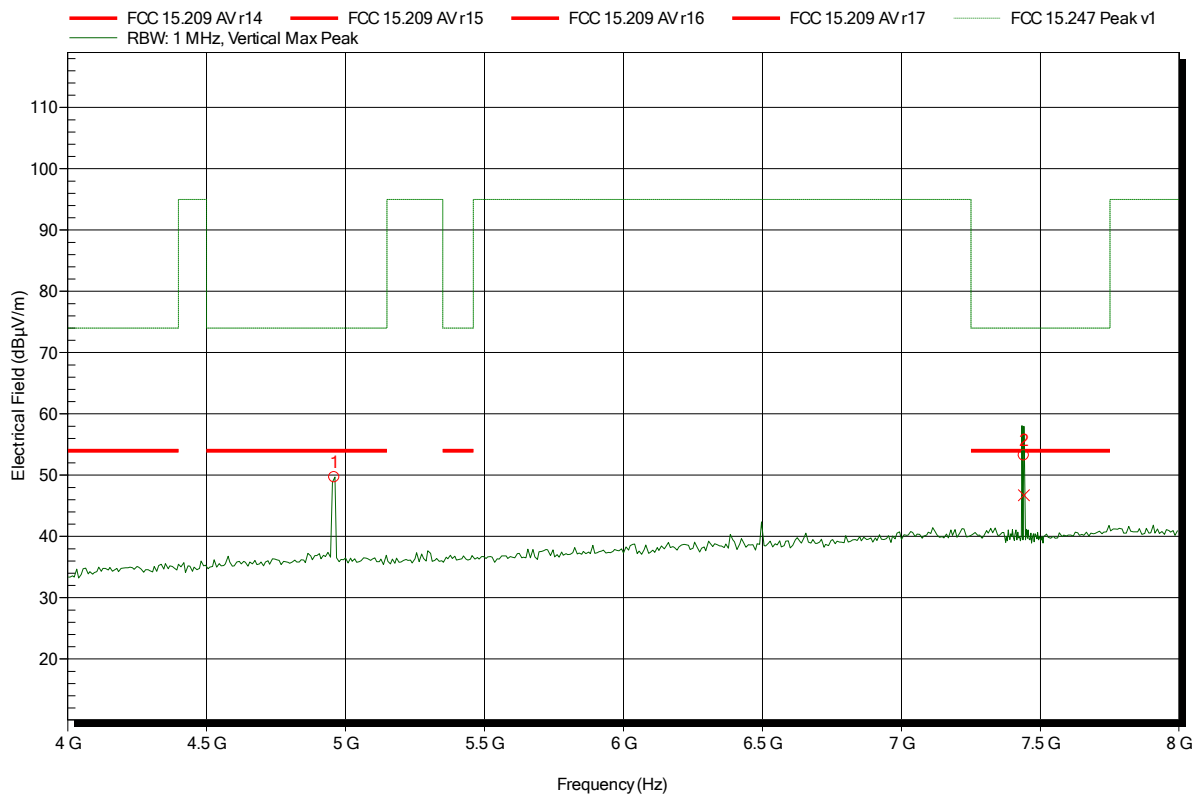


Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 4
 Model: ELLA-W133 (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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Frequency	Peak	Peak Limit	Peak Difference	Status
4.961 GHz	49.68 dBµV/m	74 dBµV/m	-24.32 dB	Pass
7.44 GHz	53.22 dBµV/m	74 dBµV/m	-20.78 dB	Pass

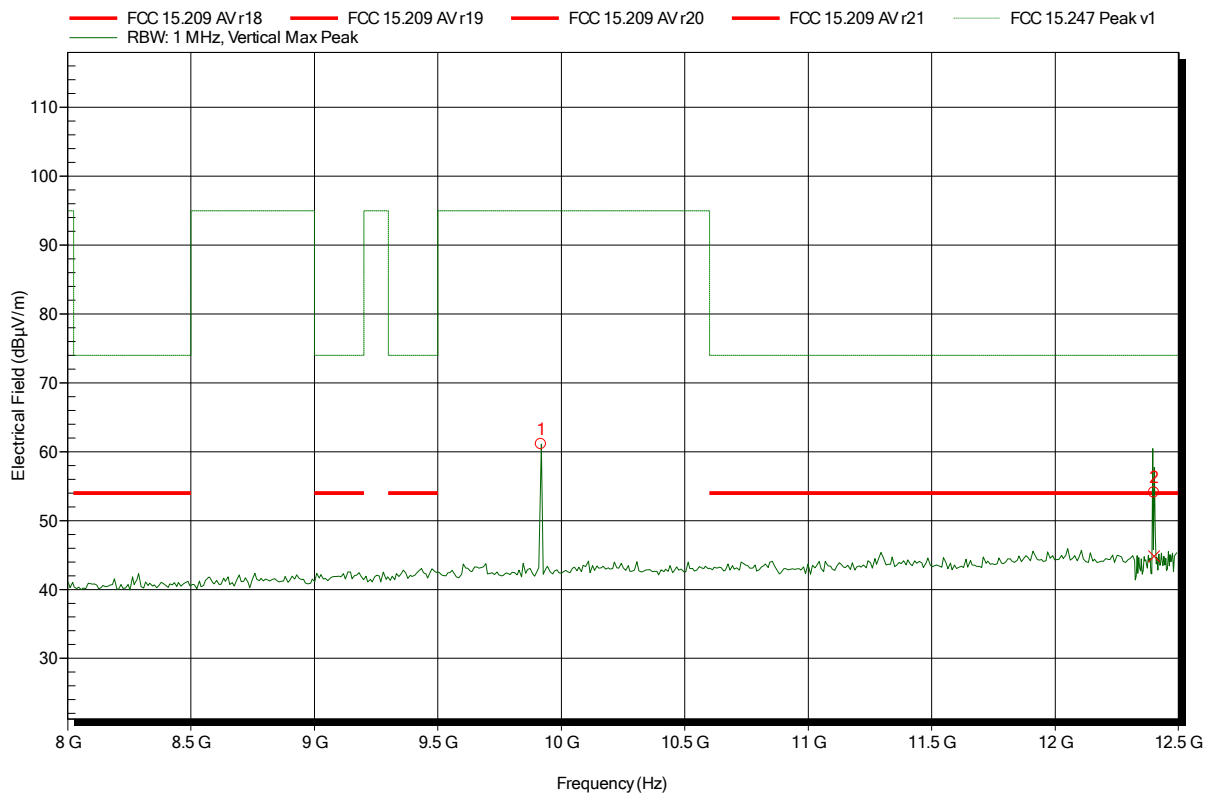
Frequency	Average	Average Limit	Average Difference	Average Status
7.44 GHz	46.74 dBµV/m	54 dBµV/m	-7.26 dB	Pass

Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 4
 Model: ELLA-W133 (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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Frequency	Peak	Peak Limit	Peak Difference	Status
9.917 GHz	61.11 dBµV/m	95 dBµV/m	-33.89 dB	Pass
12.401 GHz	54.1 dBµV/m	74 dBµV/m	-19.9 dB	Pass

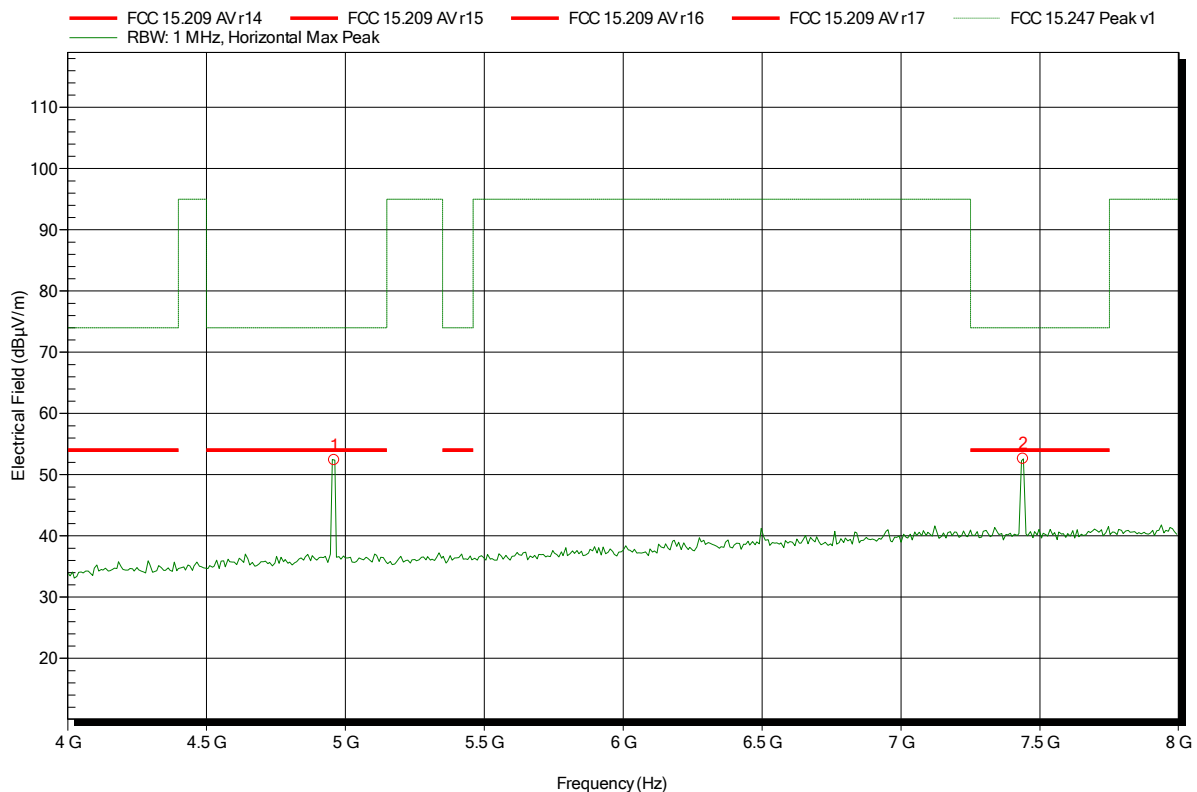
Frequency	Average	Average Limit	Average Difference	Average Status
12.401 GHz	44.81 dBµV/m	54 dBµV/m	-9.19 dB	Pass

Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 4
 Model: ELLA-W133 (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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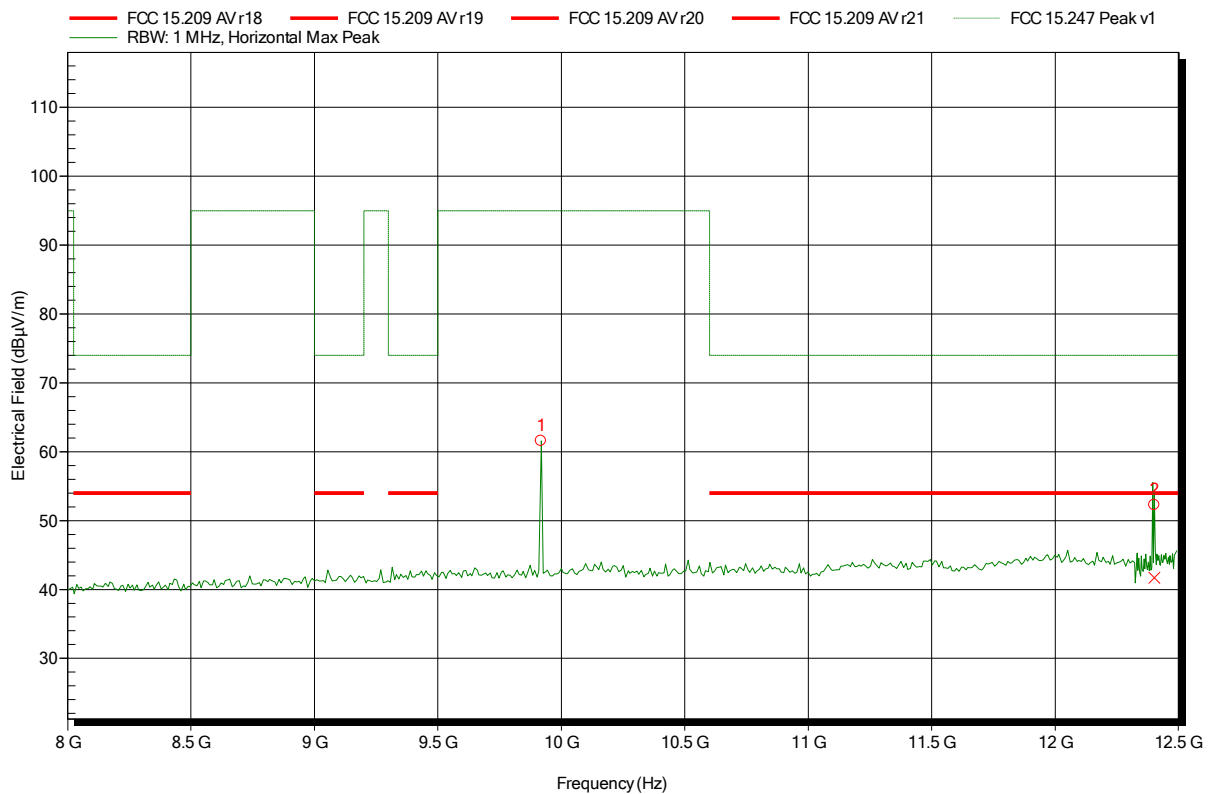
Frequency	Peak	Peak Limit	Peak Difference	Status
4.96 GHz	52.36 dBµV/m	74 dBµV/m	-21.64 dB	Pass
7.44 GHz	52.59 dBµV/m	74 dBµV/m	-21.41 dB	Pass

Spurious emissions according to FCC part 15 Subpart C § 15.247

Project number: G0M-1510-5172

Applicant: u-blox Berlin GmbH
 EUT Name: Kombi-Module Sample 4
 Model: ELLA-W133 (WiBear11n-SF2)
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 3.3 V DC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; BT-BR; CH.: 78; 2480 MHz; DH5; Pmax
 Test Date: 2015-11-05
 Note: EUT horizontal; 50 Ohm loaded

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Frequency	Peak	Peak Limit	Peak Difference	Status
9.917 GHz	61.57 dBµV/m	95 dBµV/m	-33.43 dB	Pass
12.401 GHz	52.26 dBµV/m	74 dBµV/m	-21.74 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
12.401 GHz	41.68 dBµV/m	54 dBµV/m	-12.32 dB	Pass