

RADIO REPORT FCC 47 CFR Part 15C ISED Canada RSS-247 Digital transmission systems operating within the 2400 – 2483.5 MHz band	
Report Reference No	G0M-1909-8448-TFC247BL-V02
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-2 DAkkS - Registration number : D-PL-12092-01-04 (FCC) FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant	Onethinx
Address	Punterweg 2 8042 PB Zwolle NETHERLANDS
Test Specification	According to FCC/ISED rules
Standard	47 CFR Part 15C RSS-247, Issue 2, 2017-02 RSS-Gen, Issue 5, Amendment 1, 2019-03
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	Onethinx Core LoRaWAN module
Model(s)	OTX-18
Additional Model(s)	None
Brand Name(s)	None
Hardware Version(s)	V18.02
Software Version(s)	0x000000B4
FCC-ID	2AUBKOTX-18
IC	n/a
Test Result	PASSED

Possible test case verdicts:		
Required by standard but not tested	N/T	
Not required by standard	N/R	
Not applicable to EUT	N/A	
Test object does meet the requirement	P(PASS)	
Test object does not meet the requirement	F(FAIL)	
Testing:		
Test Lab Temperature	20 - 23 °C	
Test Lab Humidity	32 – 38 %	
Date of receipt of test item	2019-10-13	
Report:		
Compiled by	Wilfried Treffke	
Tested by (+ signature) (Responsible for Test)	Wilfried Treffke	
Approved by (+ signature) (Head of Lab)	Christian Weber	
Date of Issue	2020-10-19	
Total number of pages	106	
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	2020-07-28	Initial Release	
02	2020-10-19	Replaced document: G0M-1909-8448-TFC247FH-V01 Replaced by: G0M-1909-8448-TFC247FH-V02 Reason: Add. measurement uncertainty	W.Treffke

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

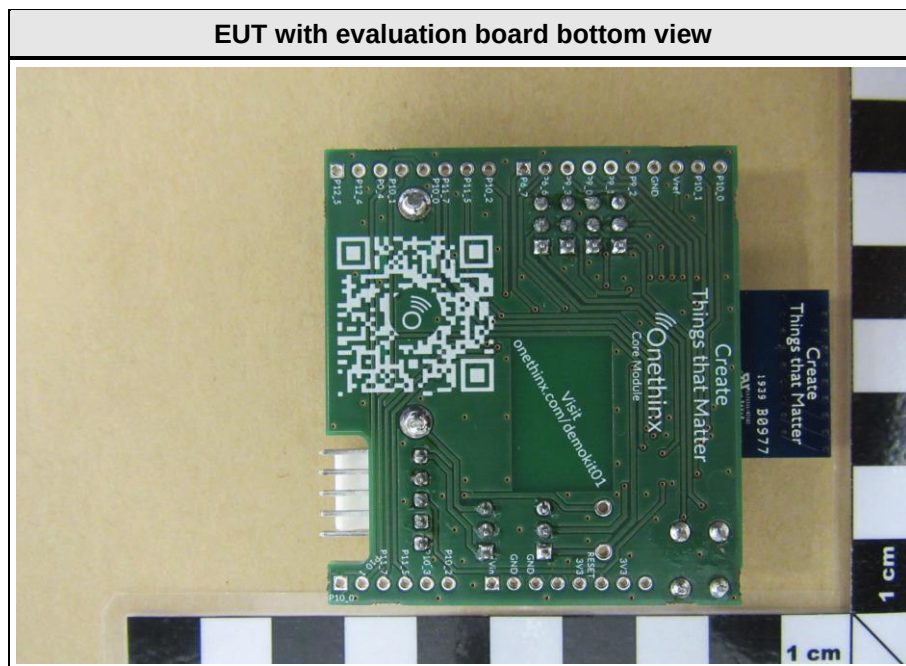
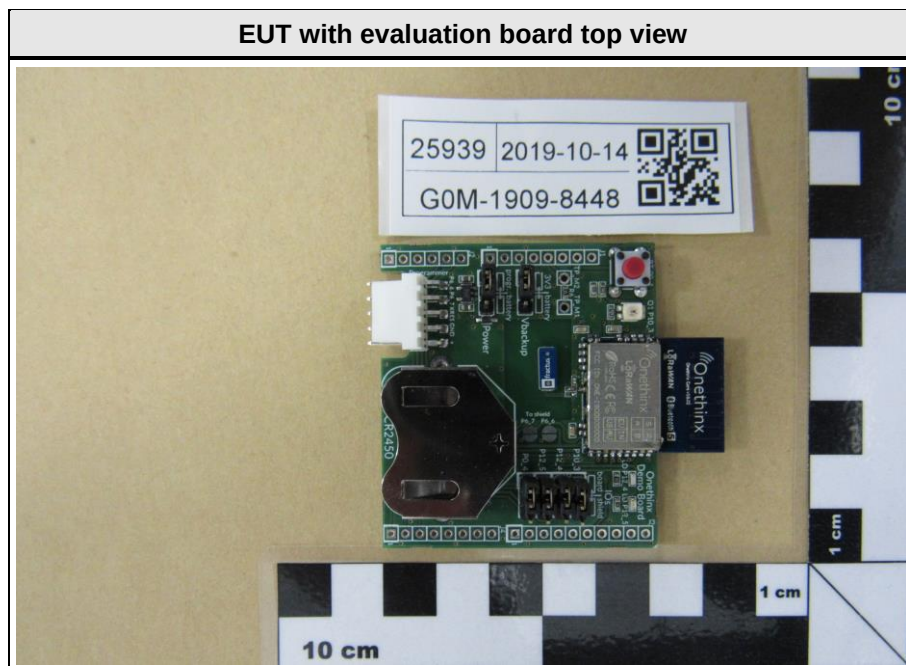
REPORT INDEX

1	Equipment (Test Item) Under Test.....	6
1.1	Photos – Equipment External	7
1.2	Photos – Equipment Internal	8
1.3	Photos – Test Setup.....	9
1.4	Support Equipment.....	11
1.5	Test Modes	12
1.6	Test Frequencies.....	13
1.7	Sample emission level calculation.....	14
2	Result Summary.....	15
3	Test Conditions and Results.....	16
3.1	Test Conditions and Results – Occupied bandwidth	16
3.2	Test Conditions and Results – 6 dB bandwidth	24
3.3	Test Conditions and Results – Maximum peak conducted output power	32
3.4	Test Conditions and Results – Power spectral density.....	34
3.5	Test Conditions and Results – AC power line conducted emissions	42
3.6	Test Conditions and Results – Band-edge compliance	45
3.7	Test Conditions and Results – Conducted spurious emissions.....	51
3.8	Test Conditions and Results – Transmitter radiated emissions.....	59
3.9	Test Conditions and Results - Receiver radiated emissions	62
ANNEX A	Transmitter spurious emissions	65
ANNEX B	Receiver spurious emissions	97

1 Equipment (Test Item) Under Test

Description	Onethinx Core LoRaWAN module	
Model	OTX-18	
Additional Model(s)	None	
Brand Name(s)	None	
Serial Number(s)	None	
Hardware Version(s)	V18.02	
Software Version(s)	0x000000B4	
PMN	n/a	
HVIN	n/a	
FVIN	n/a	
HMN	n/a	
FCC-ID	2AUBKOTX-18	
IC	n/a	
Equipment type	Radio Module	
Radio type	Transceiver	
Assigned frequency bands	2400 - 2483.5 MHz	
Radio technology	Bluetooth LE 5.0	
Bluetooth Specification	LE 1M PHY	Yes
	LE 2M PHY	Yes
	LE Coded PHY S=2 (125 kbit)	No
	LE Coded PHY S=8 (500 kbit)	No
	Stable Modulation Index - Transmitter	No
	Stable Modulation Index - Receiver	No
Modulation	GFSK	
Number of antenna ports	1	
Antenna	Type	Integrated chip-antenna
	Model	FR05-S1-N-0-102
	Manufacturer	Fractus Antennas
	Gain	1.7 dBi
Supply Voltage	V _{NOM}	3.6 VDC
Operating Temperature	T _{NOM}	25 °C
AC/DC-Adaptor	Model	None
Manufacturer	Onethinx Punterweg 2 8042 PB Zwolle NETHERLANDS	

1.1 Photos – Equipment External

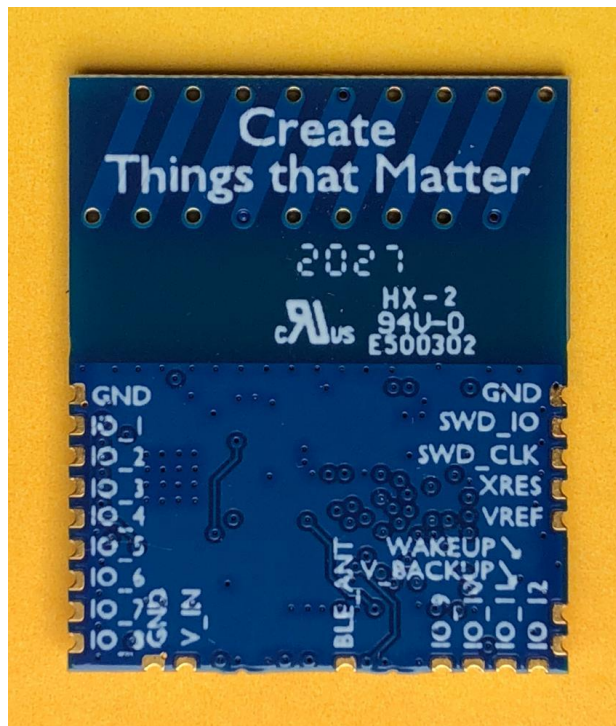


1.2 Photos – Equipment Internal

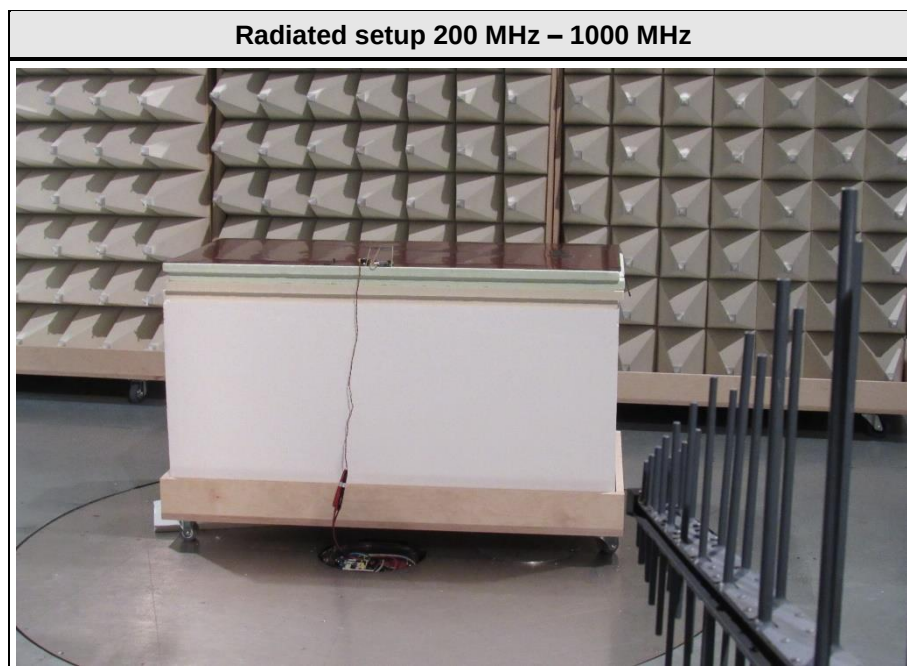
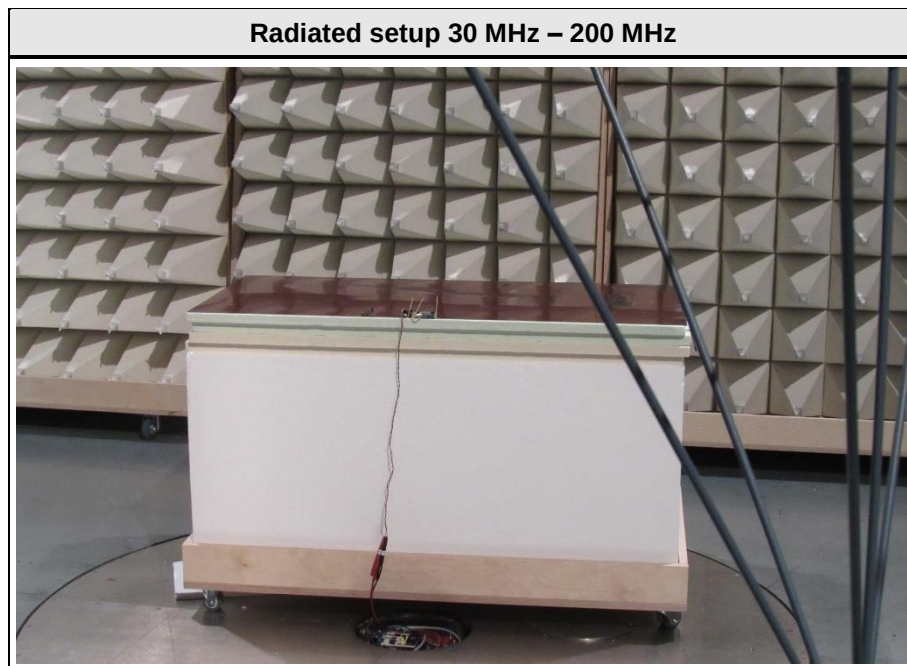
LoRaWAN Module without Shielding Top View



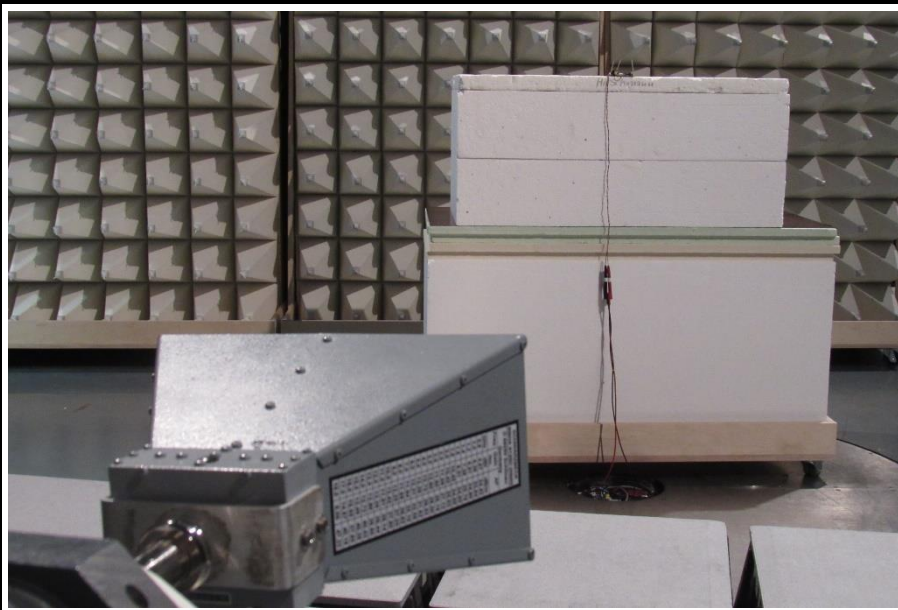
LoRaWAN Module without Shielding Bottom View



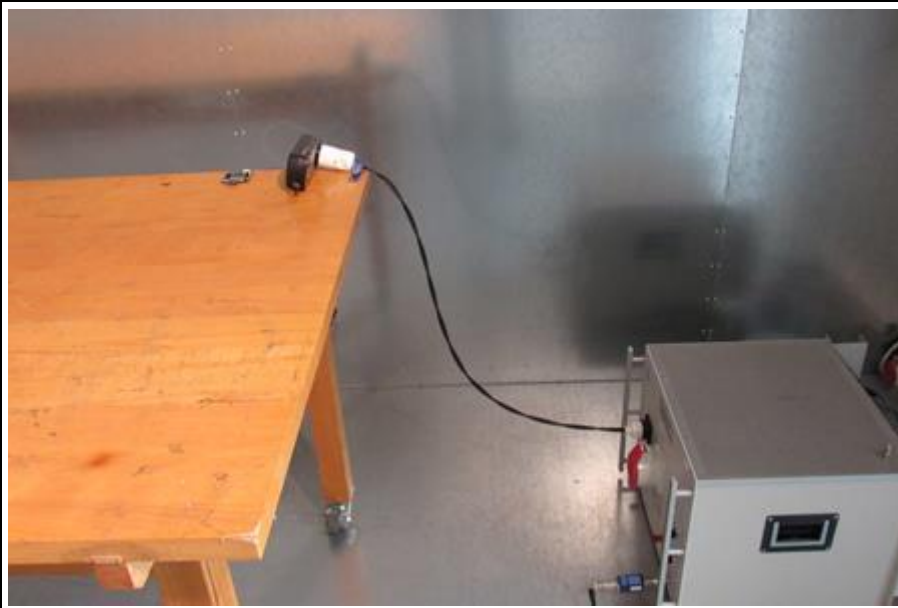
1.3 Photos – Test Setup



Radiated setup 1 GHz – 10 GHz



Conducted Setup



1.4 Support Equipment.

Product Type	Device	Manufacturer	Model	Comment
AE	Cypress Kitprogrammer	Cypress	Kitprog2	Set in test mode
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
Comment:				

1.5 Test Modes

Mode	Description
LE 1M PHY	Mode = Transmit Modulation = GFSK Spreading = None Duty cycle = 64%
LE 2M PHY	Mode = Transmit Modulation = GFSK Spreading = None Duty cycle = 59%
Transmit	Mode = Transmit Modulation = GFSK Spreading = None Duty cycle = 100%
Receive	Mode = Receive
Comment:	

1.6 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Tx / Rx	0	2402
F2	Tx / Rx	19	2440
F3	Tx / Rx	39	2480

1.7 Sample emission level calculation

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

Reading:

This is the reading obtained on the spectrum analyzer in dB μ V. 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 dB μ V/m). The FCC limits are given in units of μ V/m. The following formula is used to convert the units of μ V/m to dB μ V/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 dB μ V + 26 dB/m	= 47.5 dB μ V/m	:	47.5 dB μ V/m – 57.0 dB μ V/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 (section 6.6)	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)(1) ISED RSS-247, Issue 2 (section 5.4)	Maximum peak conducted power	ANSI C63.10-2013	PASS	
FCC § 15.247(c) 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 (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 C63.10-2013	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

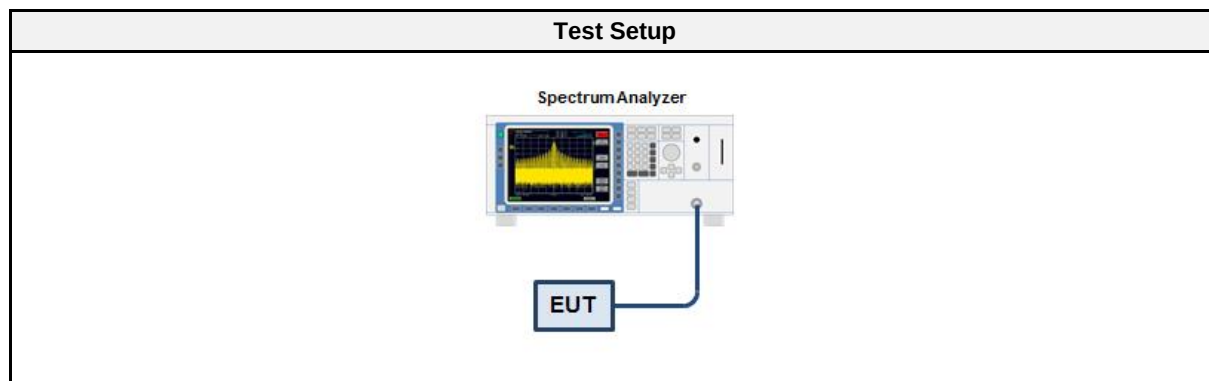
3.1.1 Information

Test Information	
Reference	ISED RSS-Gen, Issue 5 (section 6.6)
Measurement Method	ANSI C63.10 6.9.3
Measurement Uncertainty	$\pm 1.26 \%$
Operator	Wilfried Treffke
Date	2020-07-27

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 Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07

3.1.5 Procedure

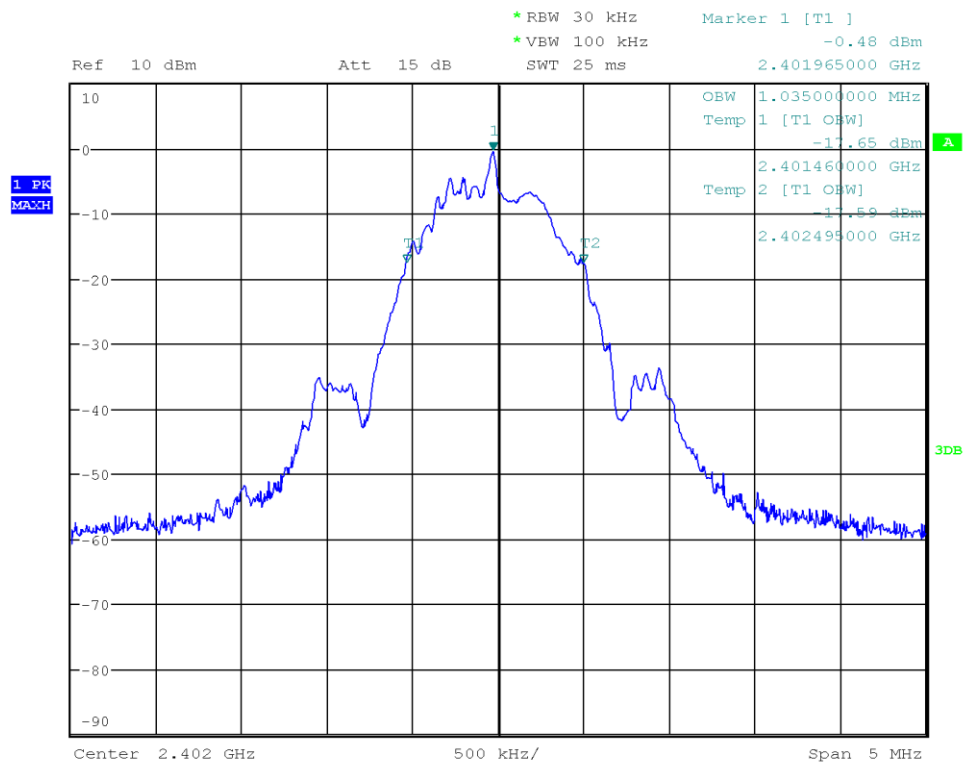
Test Procedure
1. EUT transmitter is activated in test mode under normal conditions 2. The spectrum analyzer is set to peak detection and maximum hold with a span twice the emission spectrum 3. The resolution bandwidth is set to the range of 1 % to 5 % of the occupied bandwidth 4. The occupied bandwidth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

3.1.6 Results

Test Results		
Mode	Frequency [MHz]	Bandwidth [MHz]
LE 1M PHY	2402	1.035
LE 1M PHY	2440	1.035
LE 1M PHY	2480	1.045
LE 2M PHY	2402	2.055
LE 2M PHY	2440	2.065
LE 2M PHY	2480	2.070

Occupied Bandwidth

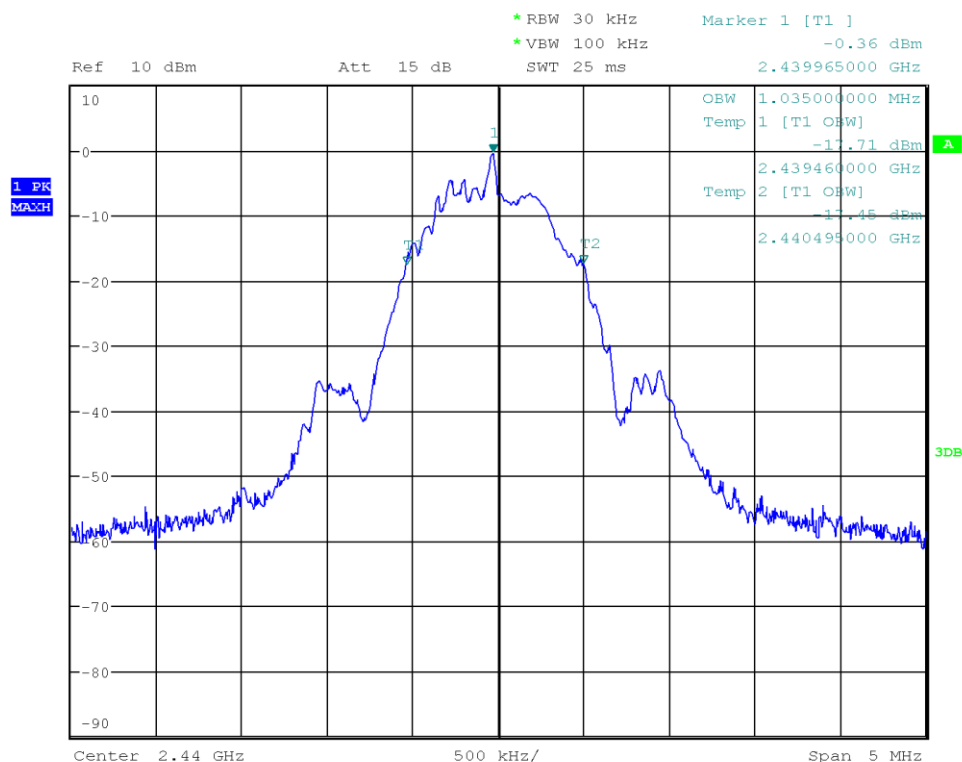
Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: GFSK, Channel: 0, 2402 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 1M PHY
 Occupied Bandwidth [MHz]: 1.035



Date: 27.JUL.2020 08:07:42

Occupied Bandwidth

Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: GFSK, Channel: 19, 2440 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 1M PHY
 Occupied Bandwidth [MHz]: 1.035



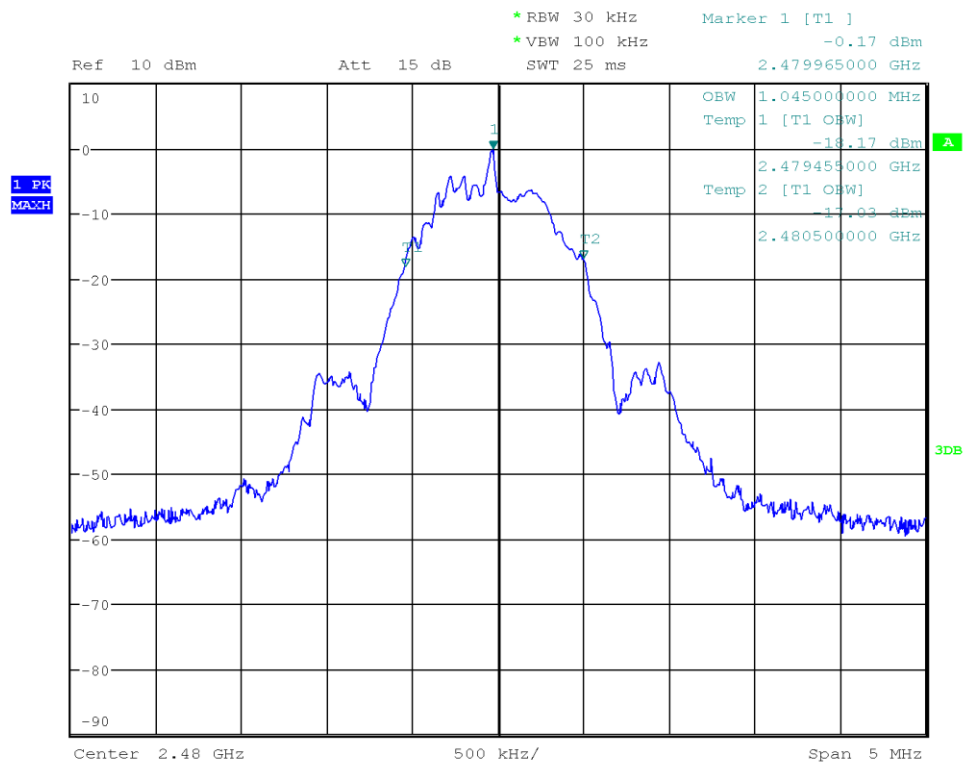
Date: 27.JUL.2020 08:09:07

Test Report No.: G0M-1909-8448-TFC247BL-V02

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

Occupied Bandwidth

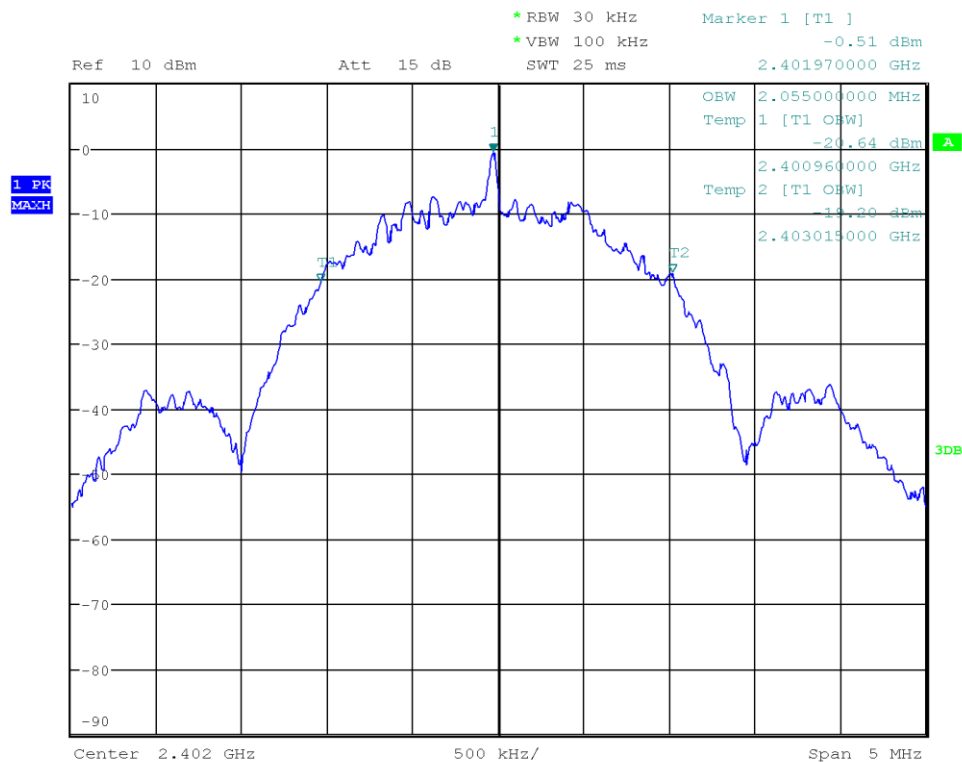
Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: GFSK, Channel: 39, 2480 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 1M PHY
 Occupied Bandwidth [MHz]: 1.045



Date: 27.JUL.2020 08:10:36

Occupied Bandwidth

Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: GFSK, Channel: 0, 2402 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 2M PHY
 Occupied Bandwidth [MHz]: 2.055



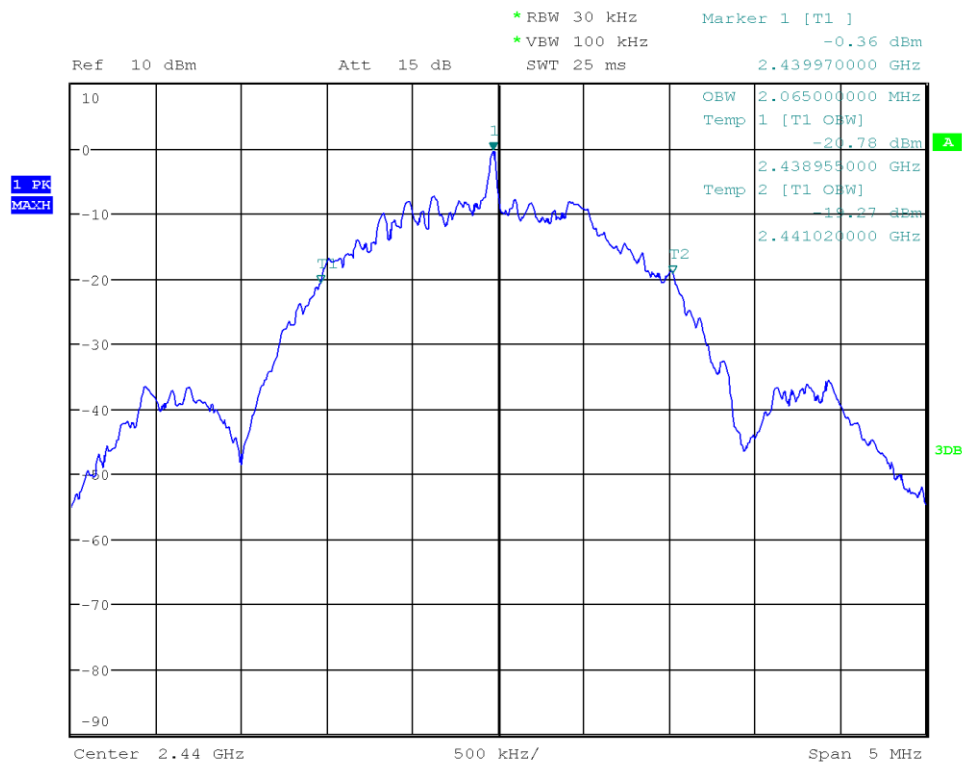
Date: 27.JUL.2020 08:12:20

Test Report No.: G0M-1909-8448-TFC247BL-V02

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

Occupied Bandwidth

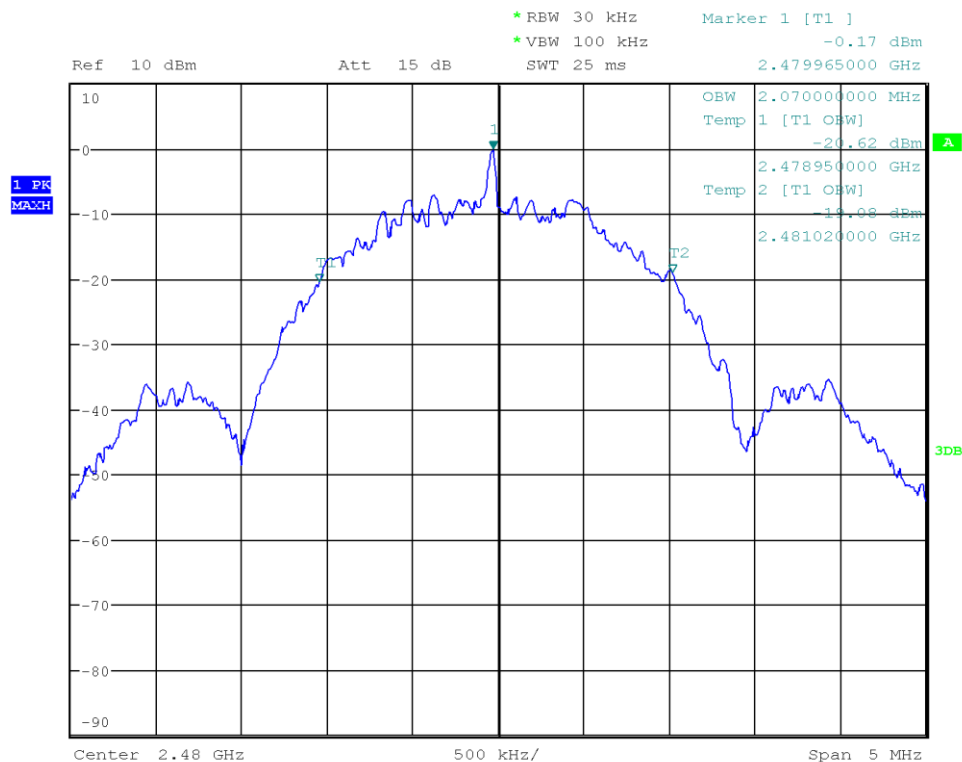
Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: GFSK, Channel: 19, 2440 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 2M PHY
 Occupied Bandwidth [MHz]: 2.065



Date: 27.JUL.2020 08:13:44

Occupied Bandwidth

Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: GFSK, Channel: 39, 2480 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 2M PHY
 Occupied Bandwidth [MHz]: 2.070



Date: 27.JUL.2020 08:19:32

3.2 Test Conditions and Results – 6 dB bandwidth

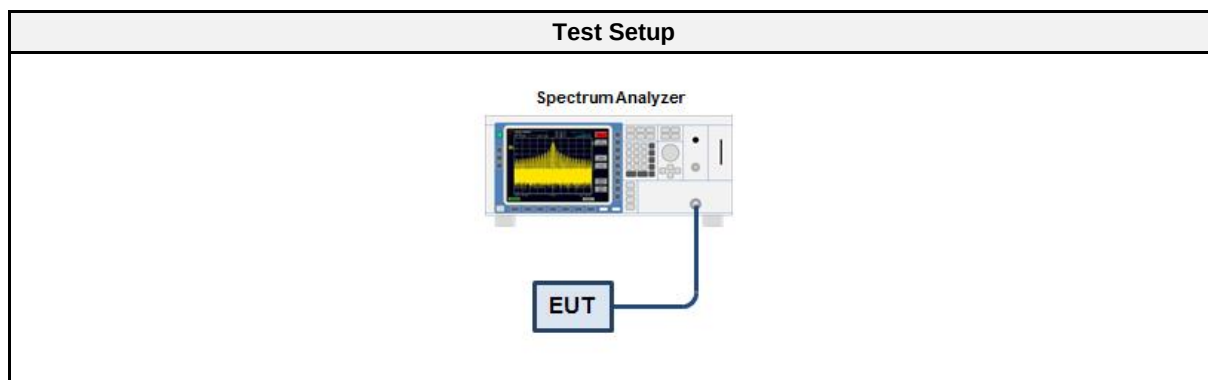
3.2.1 Information

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	± 1.26 %
Operator	Wilfried Treffke
Date	2020-07-27

3.2.2 Limits

Limits
≥ 500kHz

3.2.3 Setup



3.2.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07

3.2.5 Procedure

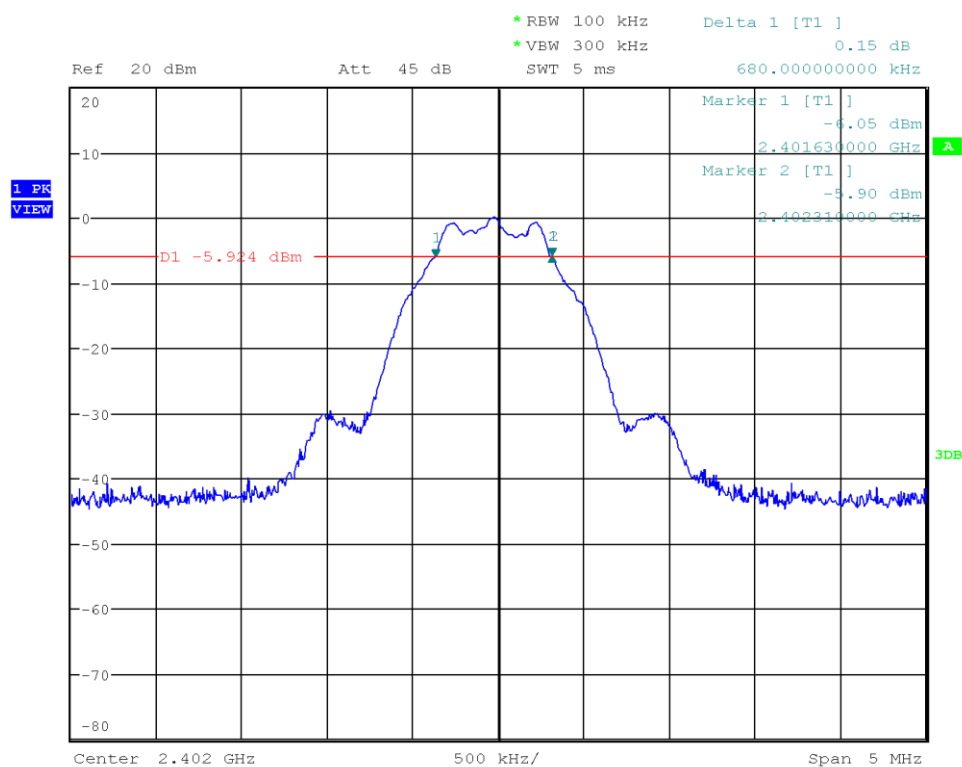
Test Procedure
1. EUT set to test mode 2. Span set to at least twice the emission spectrum 3. Detector set to peak and max hold and RBW is set to 100 kHz 4. Envelope peak value of emission spectrum is selected 5. Marker on envelope of spectrum is set to level of -6 dB to the left of the peak 6. Marker 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 [kHz]	Limit [kHz]	Verdict
LE 1M PHY	2402	680	500	PASS
LE 1M PHY	2440	680	500	PASS
LE 1M PHY	2480	705	500	PASS
LE 2M PHY	2402	1160	500	PASS
LE 2M PHY	2440	1155	500	PASS
LE 2M PHY	2480	1175	500	PASS

DTS (6 dB) Bandwidth

Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: GFSK, Channel: 0, 2402 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 1M PHY
 Lower Frequency [MHz]: 2401.630
 Upper Frequency [MHz]: 2402.310
 6 dB Bandwidth [kHz]: 680



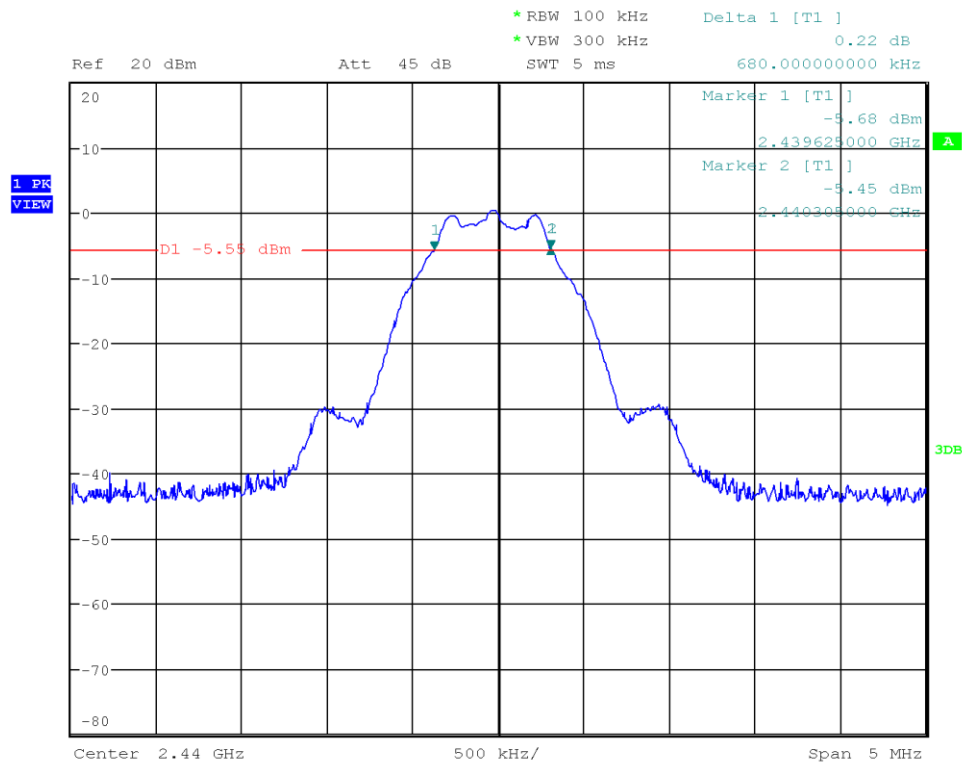
Date: 27.JUL.2020 08:26:10

Test Report No.: G0M-1909-8448-TFC247BL-V02

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

DTS (6 dB) Bandwidth

Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: GFSK, Channel: 19, 2440 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 1M PHY
 Lower Frequency [MHz]: 2439.625
 Upper Frequency [MHz]: 2440.305
 6 dB Bandwidth [kHz]: 680



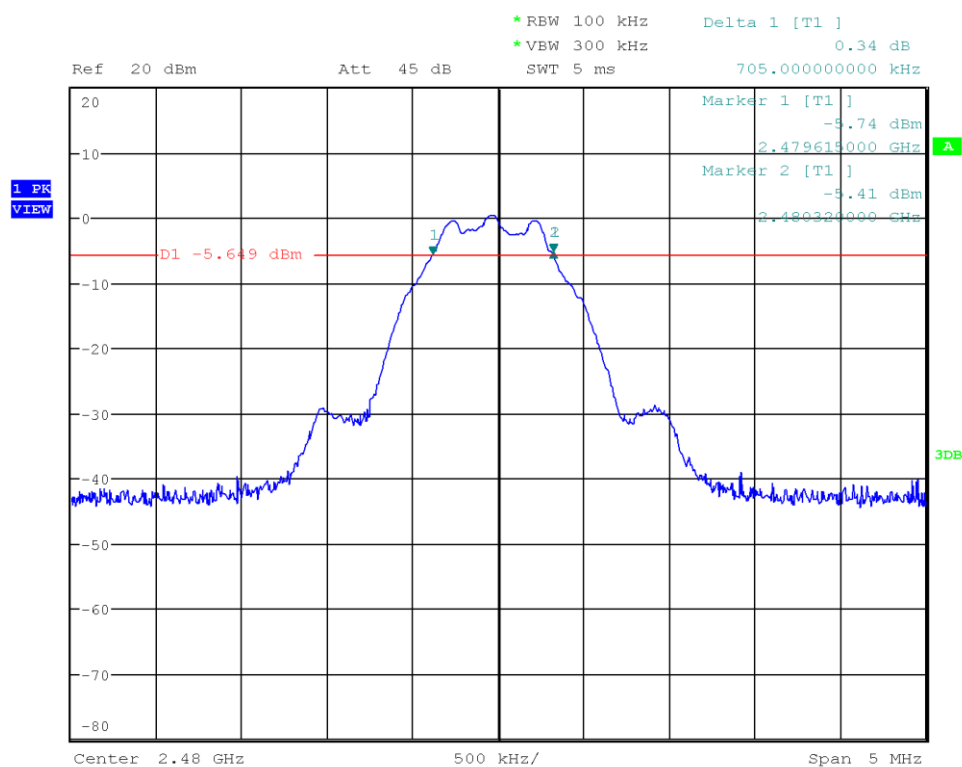
Date: 27.JUL.2020 08:27:52

Test Report No.: G0M-1909-8448-TFC247BL-V02

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

DTS (6 dB) Bandwidth

Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: GFSK, Channel: 39, 2480 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 1M PHY
 Lower Frequency [MHz]: 2479.615
 Upper Frequency [MHz]: 2480.320
 6 dB Bandwidth [kHz]: 705



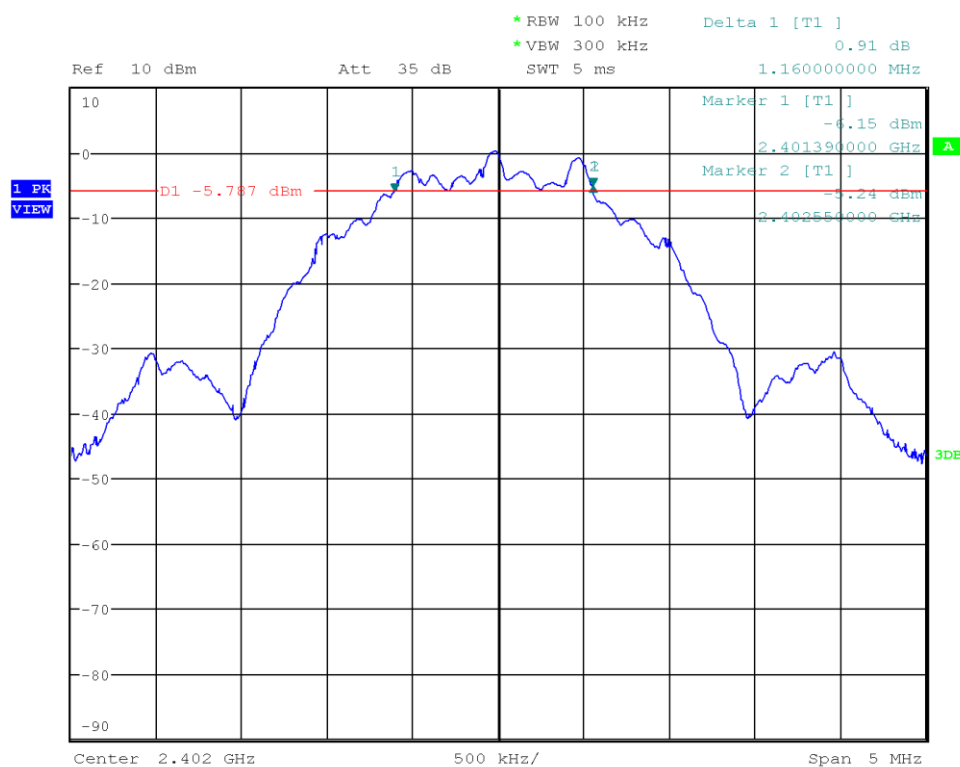
Date: 27.JUL.2020 08:28:51

Test Report No.: G0M-1909-8448-TFC247BL-V02

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

DTS (6 dB) Bandwidth

Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: GFSK, Channel: 0, 2402 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 2M PHY
 Lower Frequency [MHz]: 2401.390
 Upper Frequency [MHz]: 2402.550
 6 dB Bandwidth [kHz]: 1160



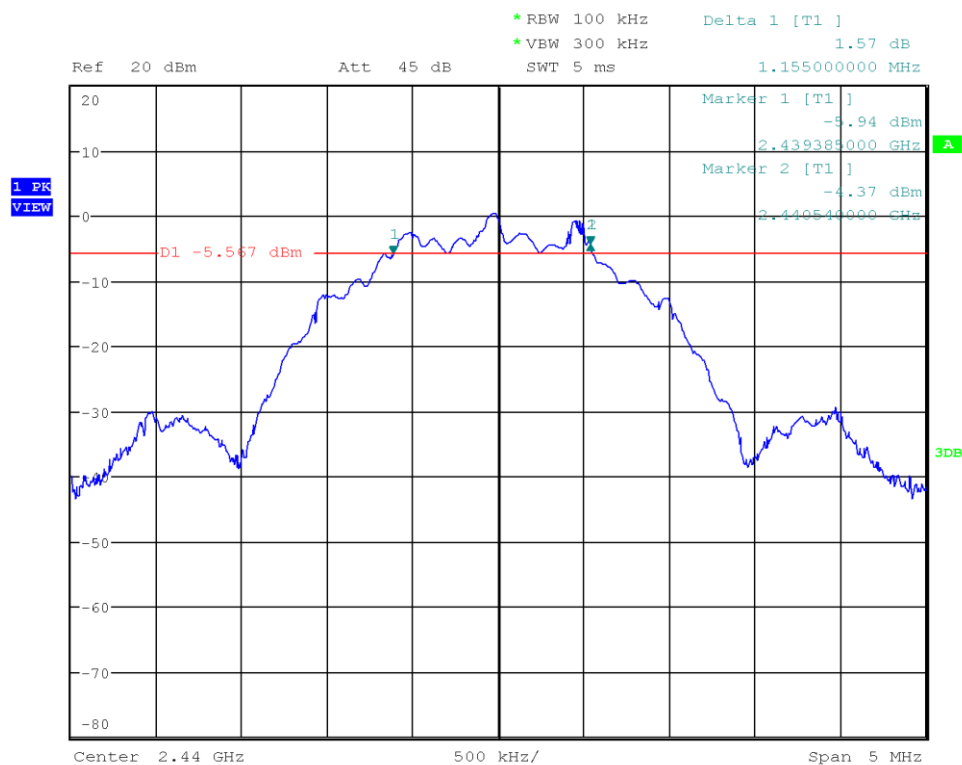
Date: 27.JUL.2020 08:30:05

Test Report No.: G0M-1909-8448-TFC247BL-V02

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

DTS (6 dB) Bandwidth

Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: GFSK, Channel: 19, 2440 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 2M PHY
 Lower Frequency [MHz]: 2439.385
 Upper Frequency [MHz]: 2440.540
 6 dB Bandwidth [kHz]: 1155



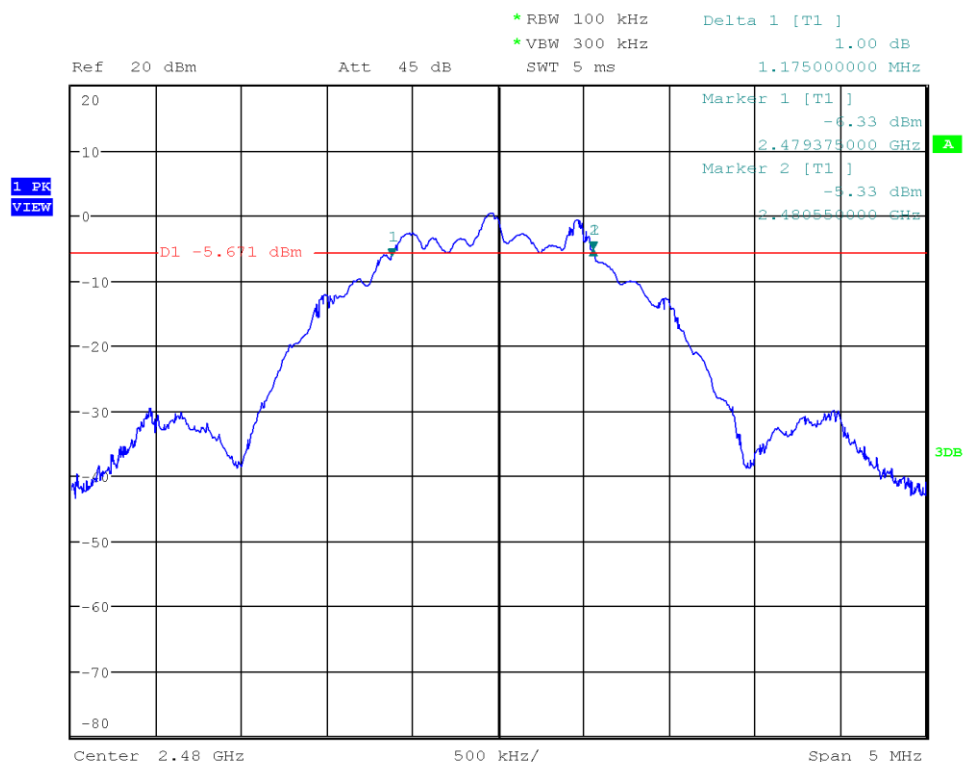
Date: 27.JUL.2020 08:31:28

Test Report No.: G0M-1909-8448-TFC247BL-V02

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

DTS (6 dB) Bandwidth

Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: GFSK, Channel: 39, 2480 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 2M PHY
 Lower Frequency [MHz]: 2479.375
 Upper Frequency [MHz]: 2480.550
 6 dB Bandwidth [kHz]: 1175



Date: 27.JUL.2020 08:32:30

Test Report No.: G0M-1909-8448-TFC247BL-V02

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

3.3 Test Conditions and Results – Maximum peak conducted output power

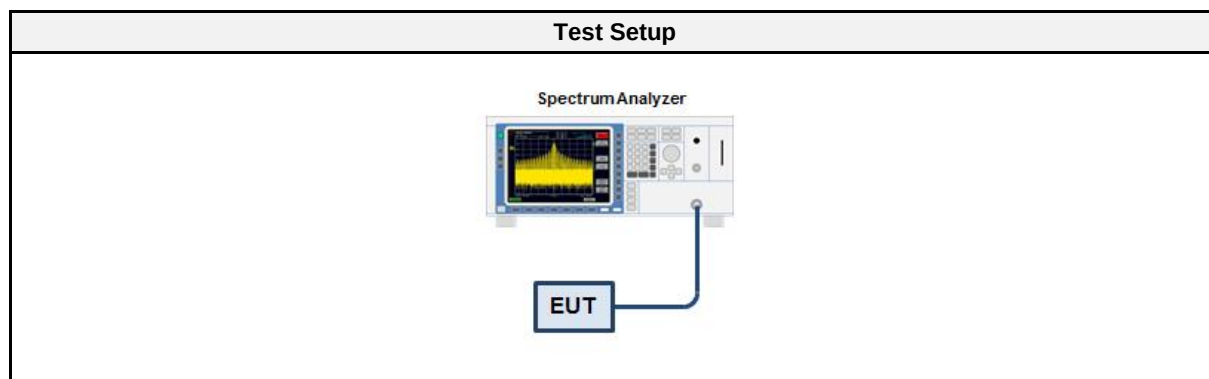
3.3.1 Information

Test Information	
Reference	FCC § 15.247(b)(1); ISED RSS-247, Issue 2 (section 5.4)
Measurement Method	ANSI C63.10 11.9.1
Measurement Uncertainty	± 1.77 dB
Operator	Wilfried Treffke
Date	2020-07-27

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
Spectrum Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07

3.3.5 Procedure

Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Analyzer resolution bandwidth is set $\geq$ DTS bandwidth 3. Detector set to peak and max hold 4. Sweep time is set to auto 5. After the trace has stabilized a marker is set to peak of envelope

3.3.6 Results

Test Results- BLE 1M PHY				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2402	0.989	0.0013	1.0	PASS
2440	1.327	0.0014	1.0	PASS
2480	1.323	0.0014	1.0	PASS

Test Results- BLE 2M PHY				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2402	1.007	0.0013	1.0	PASS
2440	1.357	0.0014	1.0	PASS
2480	1.319	0.0014	1.0	PASS

3.4 Test Conditions and Results – Power spectral density

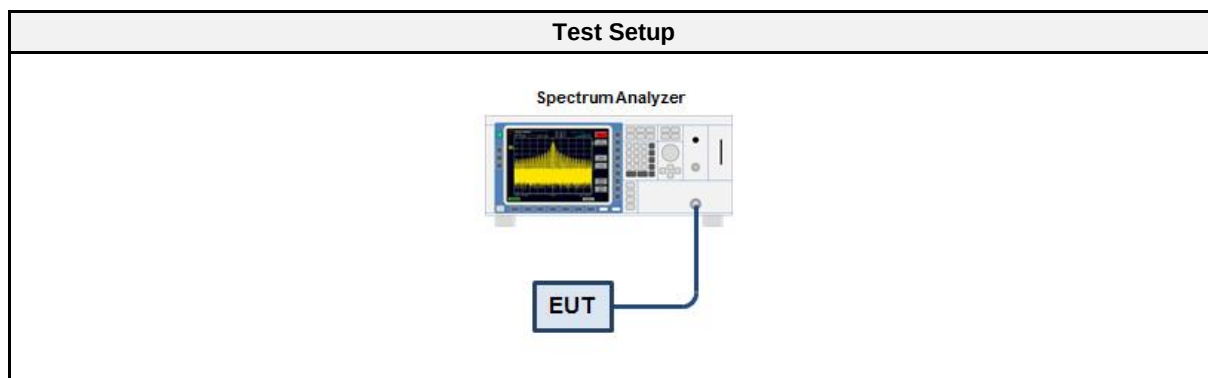
3.4.1 Information

Test Information	
Reference	FCC § 15.247€; ISSED RSS-247, Issue 2 (section 5.2)
Measurement Method	ANSI C63.10 11.10.2, 14.3.2
Measurement Uncertainty	± 1.73 dB
Operator	Wilfried Treffke
Date	2020-07-27

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 Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07

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 ≥ 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

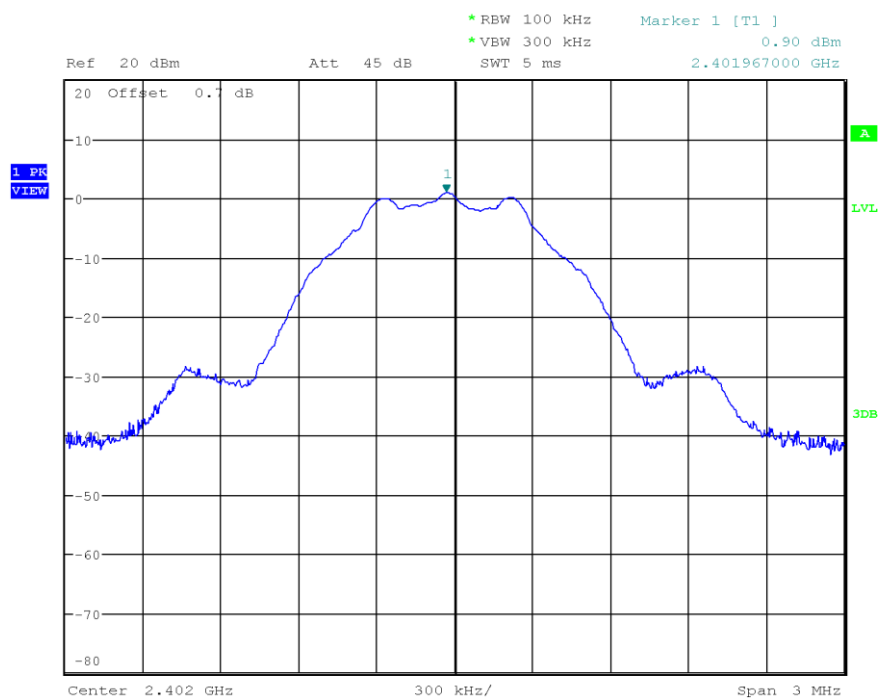
3.4.6 Results

Test Results- BLE 1M PHY			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
2402	0.902	8.0	PASS
2440	1.221	8.0	PASS
2480	1.099	8.0	PASS
RBW = 100 kHz			

Test Results- BLE 2M PHY			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
2402	0.833	8.0	PASS
2440	1.202	8.0	PASS
2480	1.064	8.0	PASS
RBW = 100 kHz			

Peak Power Spectral Density

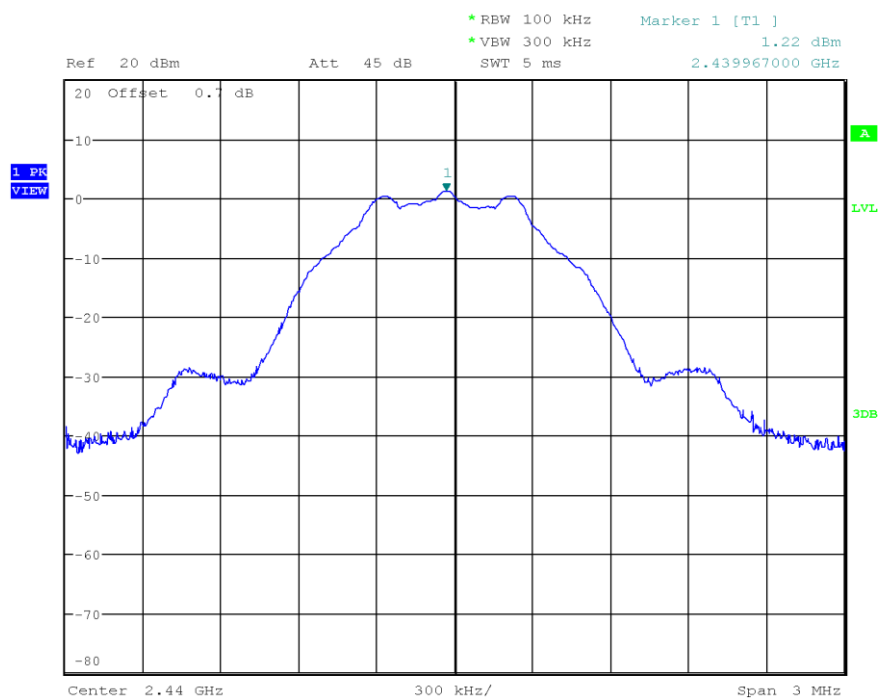
Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: GFSK, Channel: 0, 2402 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: BLE 1M PHY
 Peak Frequency [MHz]: 2401.967
 Spectral Density [dBm/RBW]: 0.902
 Resolution Bandwidth [kHz]: 100 kHz



Date: 27.JUL.2020 09:46:12

Peak Power Spectral Density

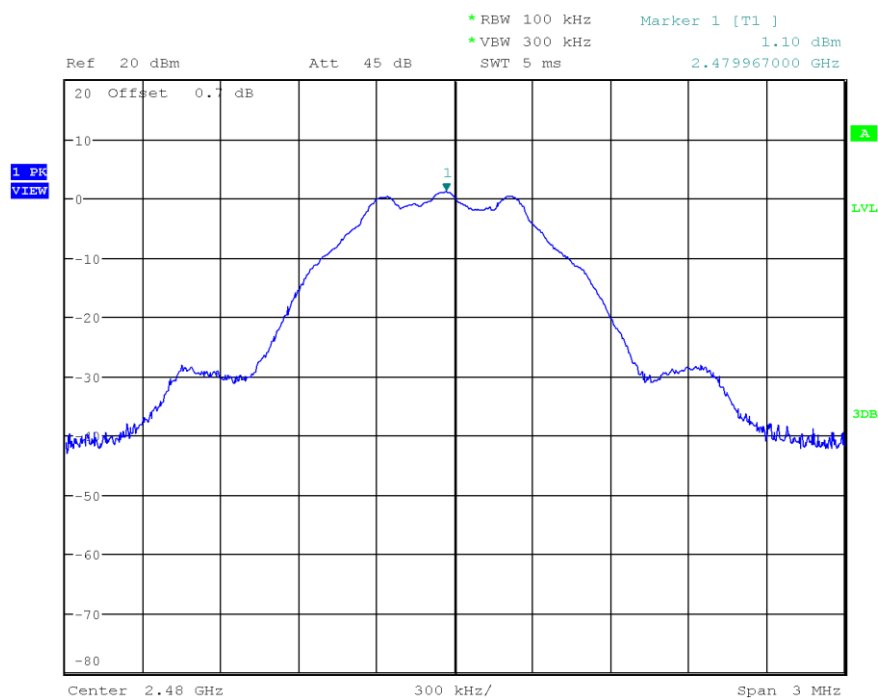
Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: GFSK, Channel: 19, 2440 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: BLE 1M PHY
 Peak Frequency [MHz]: 2439.967
 Spectral Density [dBm/RBW]: 1.221
 Resolution Bandwidth [kHz]: 100 kHz



Date: 27.JUL.2020 09:48:32

Peak Power Spectral Density

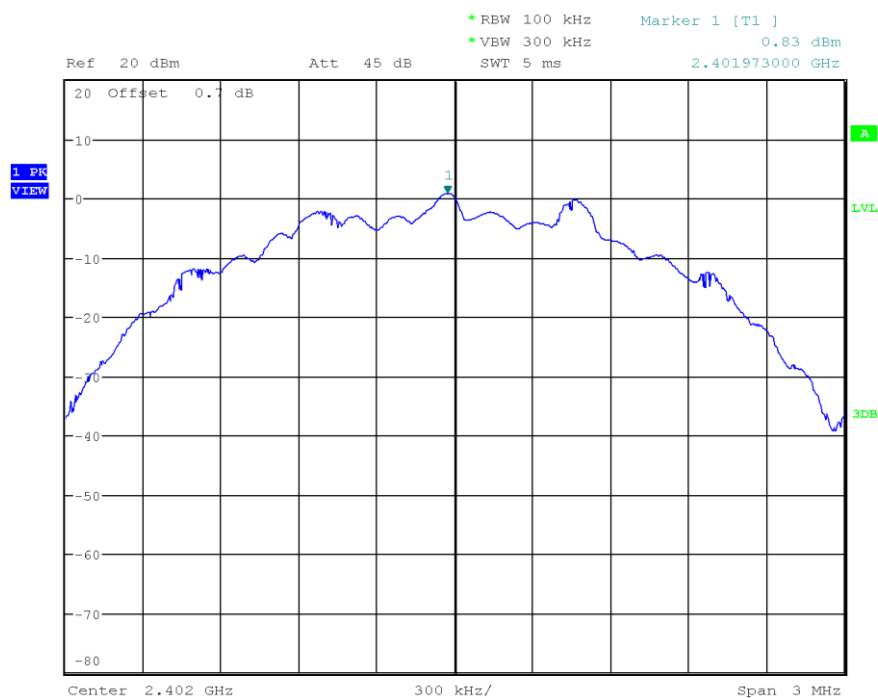
Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: GFSK, Channel: 39, 2480 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: BLE 1M PHY
 Peak Frequency [MHz]: 2479.967
 Spectral Density [dBm/RBW]: 1.099
 Resolution Bandwidth [kHz]: 100 kHz



Date: 27.JUL.2020 09:50:49

Peak Power Spectral Density

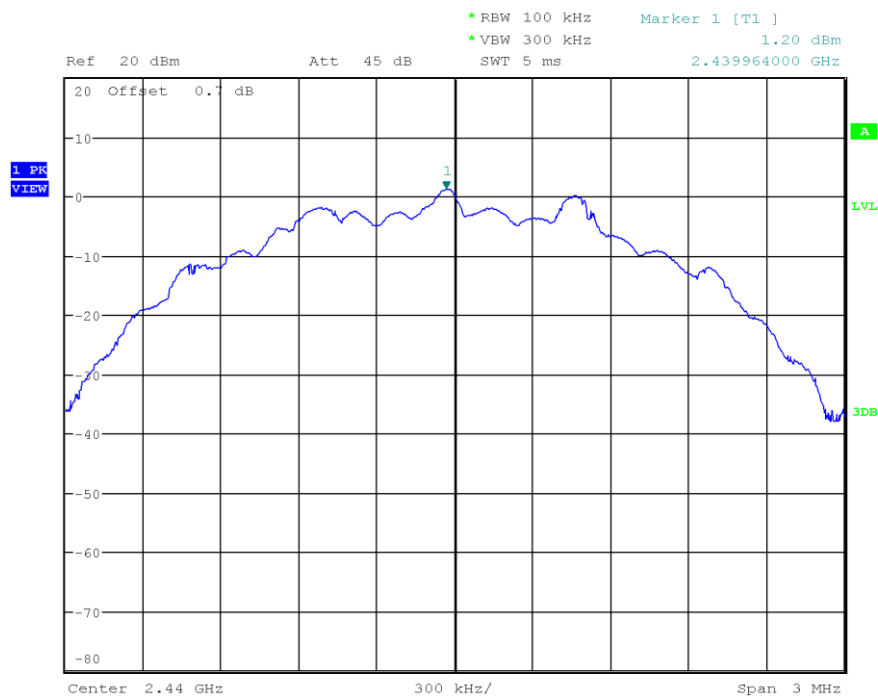
Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: GFSK, Channel: 0, 2402 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: BLE 2M PHY
 Peak Frequency [MHz]: 2401.973
 Spectral Density [dBm/RBW]: 0.833
 Resolution Bandwidth [kHz]: 100 kHz



Date: 27.JUL.2020 09:57:17

Peak Power Spectral Density

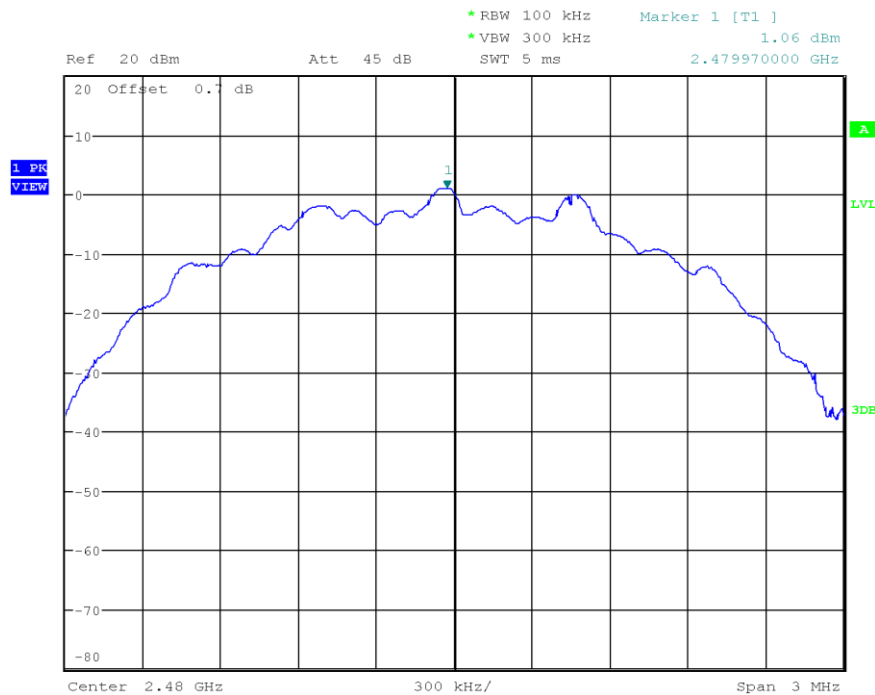
Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: GFSK, Channel: 19, 2440 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: BLE 2M PHY
 Peak Frequency [MHz]: 2439.964
 Spectral Density [dBm/RBW]: 1.202
 Resolution Bandwidth [kHz]: 100 kHz



Date: 27.JUL.2020 09:58:11

Peak Power Spectral Density

Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: GFSK, Channel: 39, 2480 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: BLE 2M PHY
 Peak Frequency [MHz]: 2479.970
 Spectral Density [dBm/RBW]: 1.064
 Resolution Bandwidth [kHz]: 100 kHz



Date: 27.JUL.2020 09:59:16

3.5 Test Conditions and Results – AC power line conducted emissions

3.5.1 Information

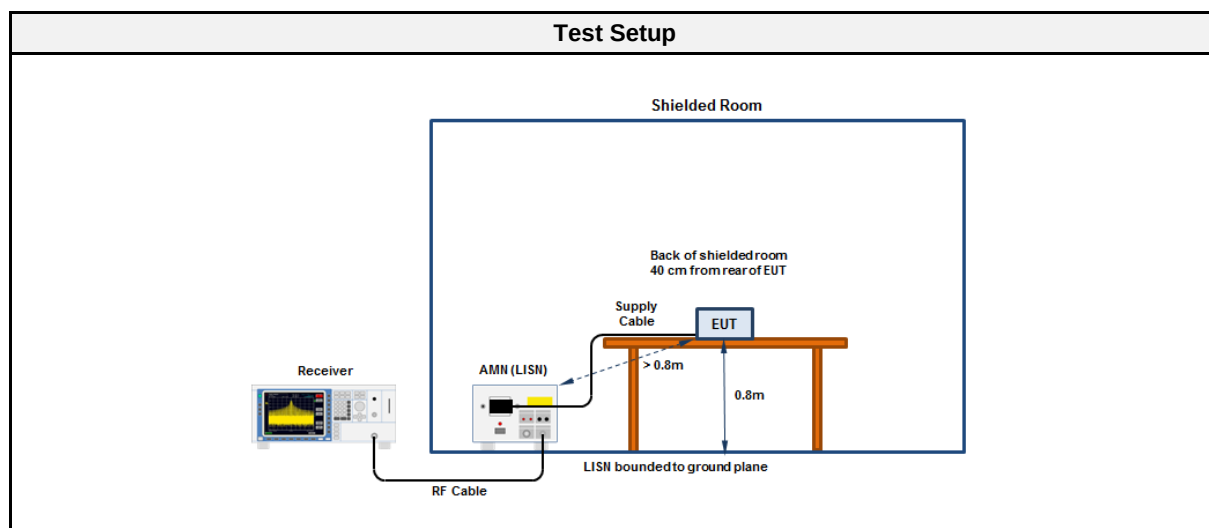
Test Information	
Reference	FCC § 15.207; ISED RSS-247, Issue 2 (section 3.1)
Measurement Method	ANSI C63.10 6.2
Measurement Uncertainty	± 3.82 dB
Operator	Wilfried Treffke
Date	2019-10-15

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	2016.1.10

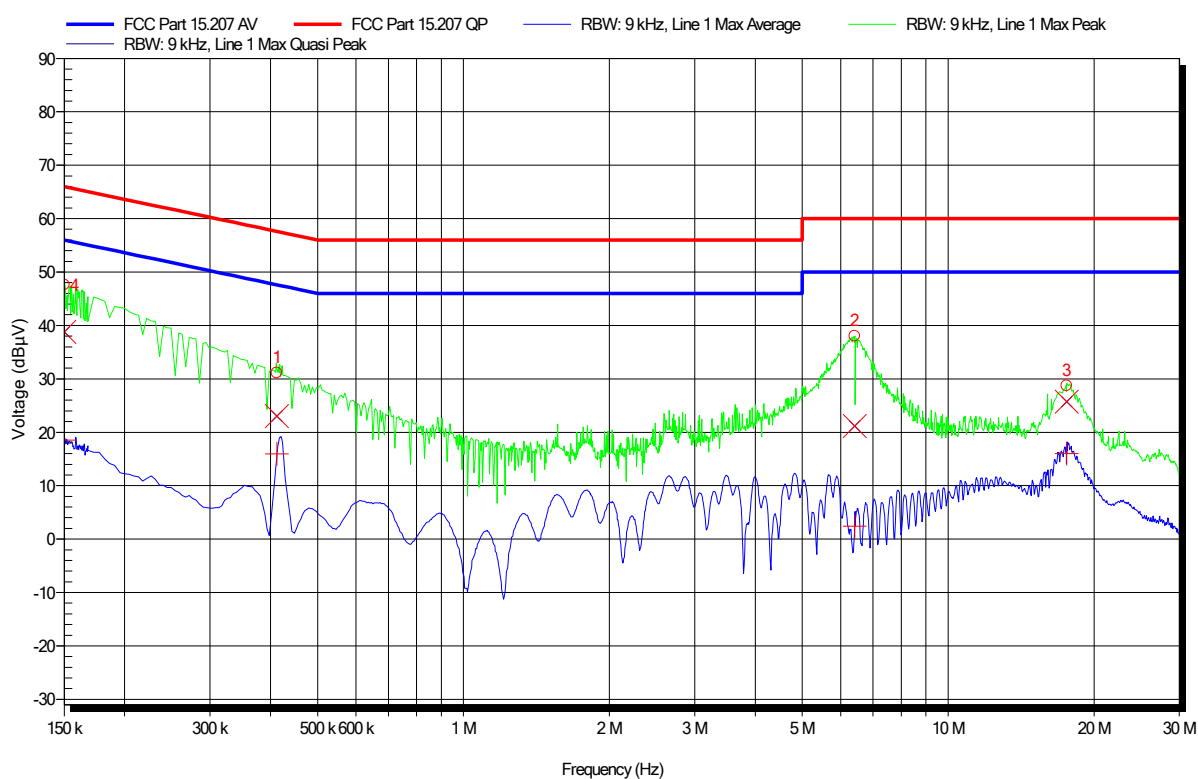
Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
LISN	Schwarzbeck	NSLK 8128	EF00975	2019-07	2021-07
EMI Test Receiver	R&S	ESCS 30	EF00295	2019-07	2020-07

EMI voltage test in the ac-mains according to FCC part 15 C

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 24°C, Vnom: 120 VAC
 LISN: NSLK 8128 N
 Mode: BLE; Tx; 2440 MHz
 Test Date: 2019-10-15
 Note:

Index 45



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	412.35 kHz	23.05 dBμV	57.6 dBμV	-34.55 dB	Pass
2	6.418 MHz	21.2 dBμV	60 dBμV	-38.8 dB	Pass
3	17.556 MHz	25.72 dBμV	60 dBμV	-34.28 dB	Pass
4	150 kHz	38.78 dBμV	66 dBμV	-27.22 dB	Pass

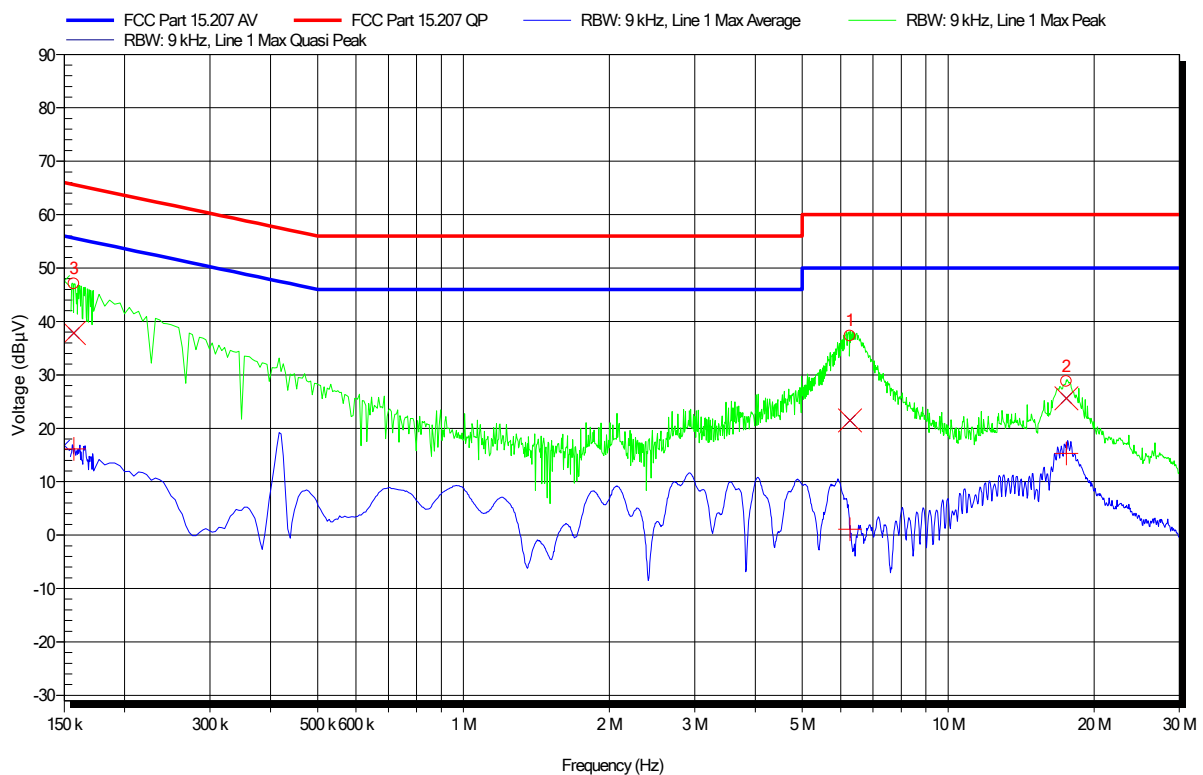
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	412.35 kHz	15.95 dBμV	47.6 dBμV	-31.65 dB	Pass
2	6.418 MHz	2.42 dBμV	50 dBμV	-47.58 dB	Pass
3	17.556 MHz	16.02 dBμV	50 dBμV	-33.98 dB	Pass
4	150 kHz	18.55 dBμV	56 dBμV	-37.45 dB	Pass

EMI voltage test in the ac-mains according to FCC part 15 C

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Mr. Treffke
Test Conditions: Tnom: 24°C, Vnom: 120 VAC
LISN: NSLK 8128 N
Mode: BLE; Tx; 2440 MHz
Test Date: 2019-10-15
Note:

Index 46



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	6.27 MHz	21.48 dBμV	60 dBμV	-38.52 dB	Pass
2	17.548 MHz	25.58 dBμV	60 dBμV	-34.42 dB	Pass
3	157.2 kHz	37.81 dBμV	65.61 dBμV	-27.8 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	6.27 MHz	1.08 dBμV	50 dBμV	-48.92 dB	Pass
2	17.548 MHz	15.3 dBμV	50 dBμV	-34.7 dB	Pass
3	157.2 kHz	16.13 dBμV	55.61 dBμV	-39.48 dB	Pass

3.6 Test Conditions and Results – Band-edge compliance

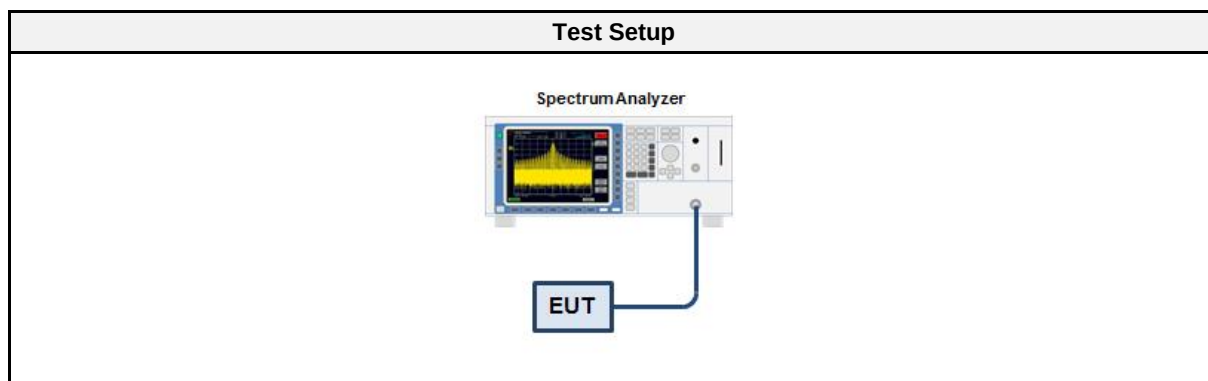
3.6.1 Information

Test Information	
Reference	FCC § 15.247(d); ISSED RSS-247, Issue 2 (section 5.5)
Measurement Method	ANSI C63.10 11.13
Measurement Uncertainty	± 1.80 dB
Operator	Wilfried Treffke
Date	2020-07-27

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 Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07

3.6.5 Procedure

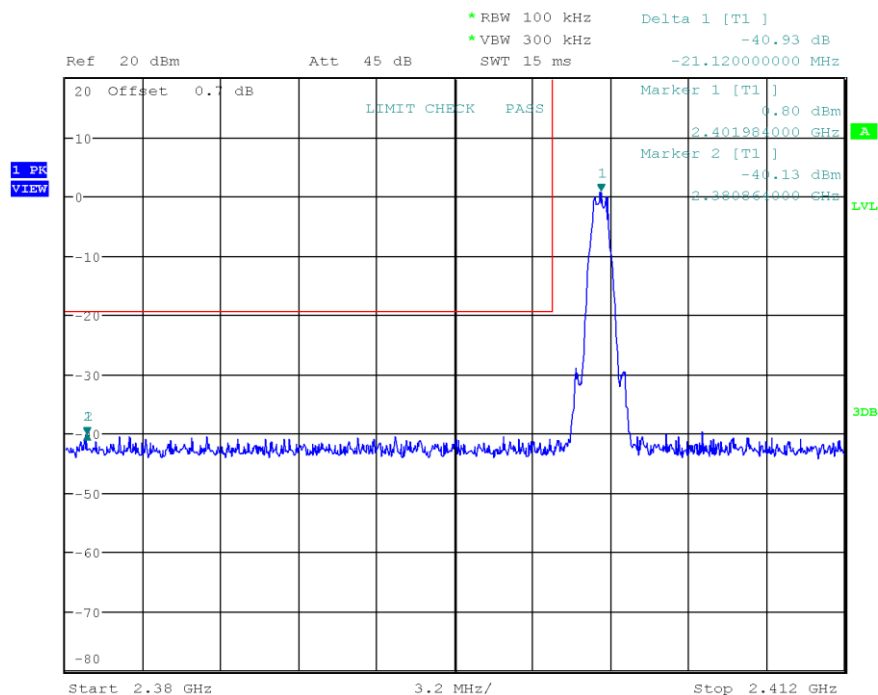
Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Span set around lower band edge and detector is set to peak and max hold 3. Resolution bandwidth is set to 100 kHz 4. Markers are set to peak emission levels within frequency band and outside frequency band 5. Band edge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

3.6.6 Results

Test Results				
Mode	Channel [MHz]	Out-of-band Attenuation [dB]	Limit [dB]	Verdict
LE 1M PHY	2402	-40.93	-20	PASS
LE 1M PHY	2480	-40.63	-20	PASS
LE 2M PHY	2402	-30.83	-20	PASS
LE 2M PHY	2480	-40.59	-20	PASS

Emissions in nonrestricted frequency bands at the Band-edge

Project Number: GOM-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 7.8.6, 6.10.4
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 1M PHY
 Band-edge: Lower
 In-band Frequency [MHz]: 2401.984
 Max. in-band Level [dBm/100 kHz]: 0.804
 Out-of-band Frequency [MHz]: 2380.864
 Max. out-of-band Level [dBm/100 kHz]: -40.125
 Attenuation [dB]: -40.93



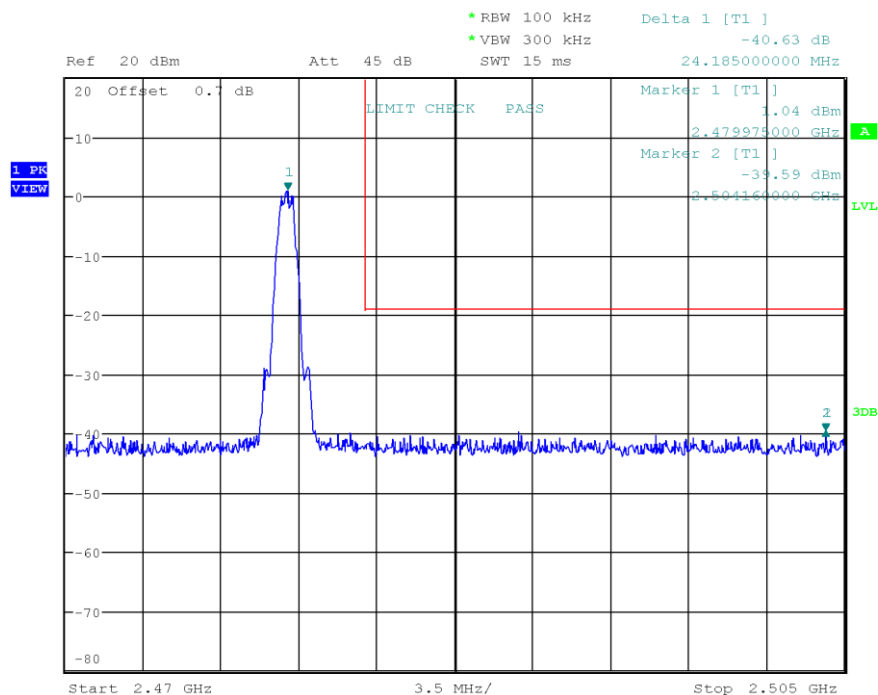
Date: 27.JUL.2020 10:07:01

Test Report No.: GOM-1909-8448-TFC247BL-V02

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

Emissions in nonrestricted frequency bands at the Band-edge

Project Number: GOM-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 7.8.6, 6.10.4
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 1M PHY
 Band-edge: Upper
 In-band Frequency [MHz]: 2479.975
 Max. in-band Level [dBm/100 kHz]: 1.04
 Out-of-band Frequency [MHz]: 2504.16
 Max. out-of-band Level [dBm/100 kHz]: -39.587
 Attenuation [dB]: -40.63



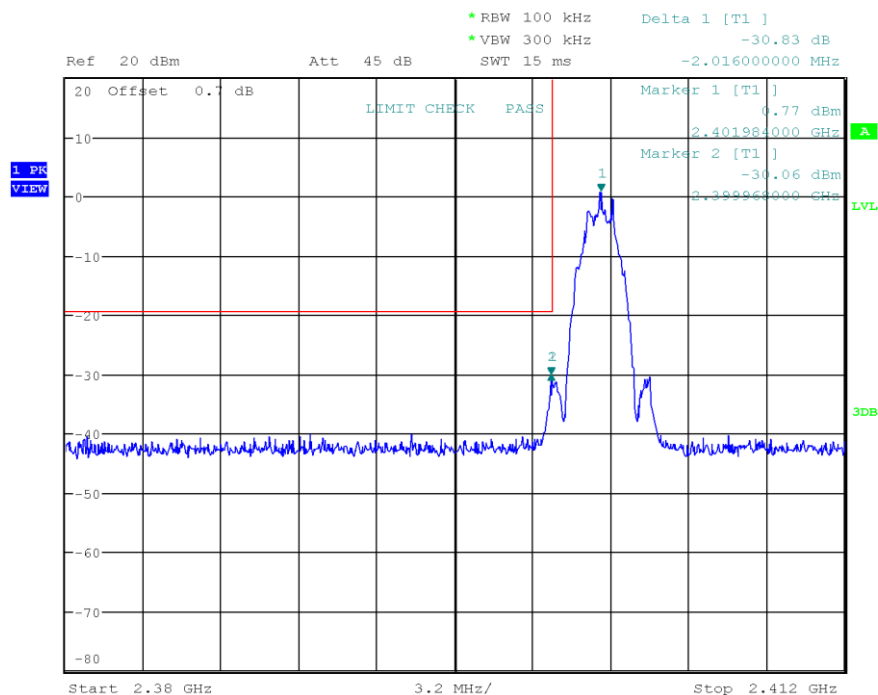
Date: 27.JUL.2020 10:08:22

Test Report No.: GOM-1909-8448-TFC247BL-V02

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

Emissions in nonrestricted frequency bands at the Band-edge

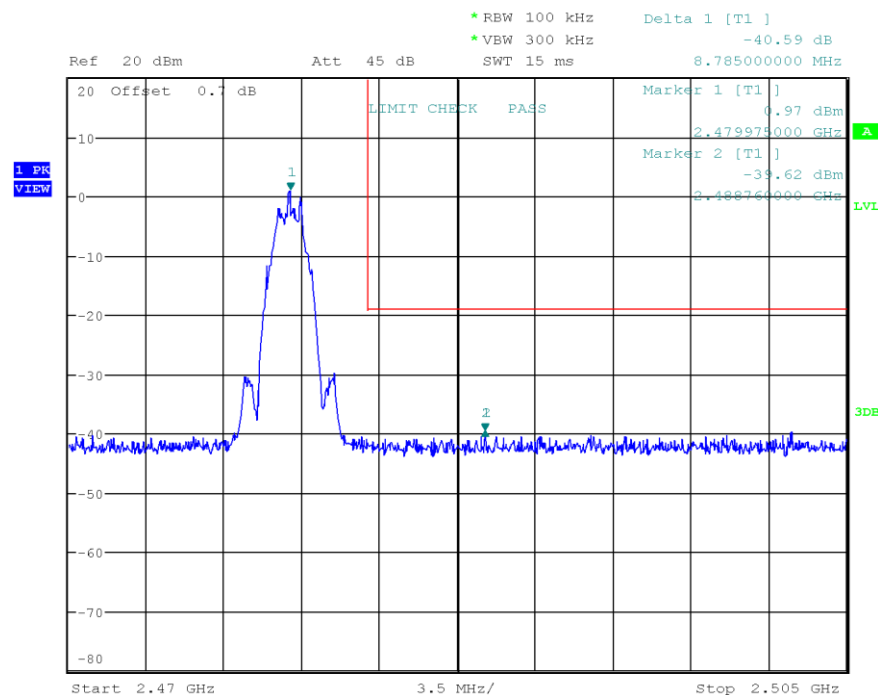
Project Number: GOM-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 7.8.6, 6.10.4
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 2M PHY
 Band-edge: Lower
 In-band Frequency [MHz]: 2401.984
 Max. in-band Level [dBm/100 kHz]: 0.769
 Out-of-band Frequency [MHz]: 2399.968
 Max. out-of-band Level [dBm/100 kHz]: -30.057
 Attenuation [dB]: -30.83



Date: 27.JUL.2020 10:09:48

Emissions in nonrestricted frequency bands at the Band-edge

Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 7.8.6, 6.10.4
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 2M PHY
 Band-edge: Upper
 In-band Frequency [MHz]: 2479.975
 Max. in-band Level [dBm/100 kHz]: 0.966
 Out-of-band Frequency [MHz]: 2488.76
 Max. out-of-band Level [dBm/100 kHz]: -39.621
 Attenuation [dB]: -40.59



Date: 27.JUL.2020 10:11:04

3.7 Test Conditions and Results – Conducted spurious emissions

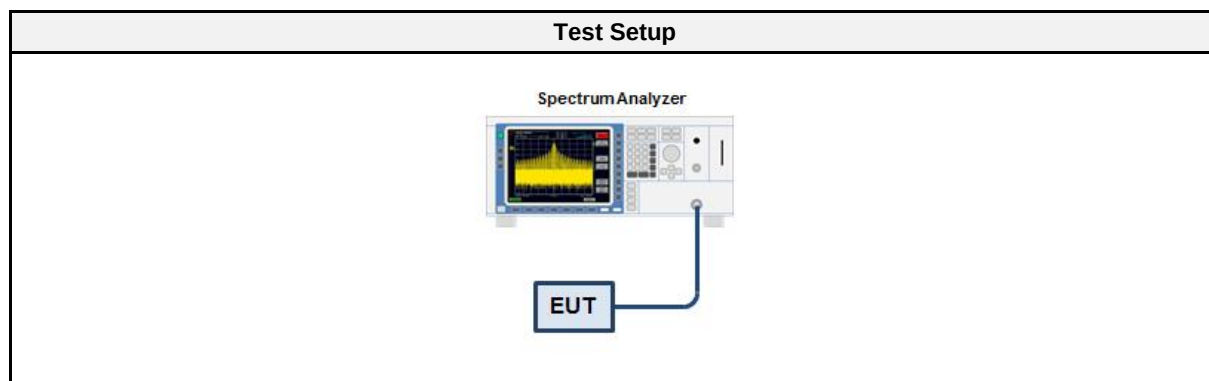
3.7.1 Information

Test Information	
Reference	FCC § 15.247(d); ISSED RSS-247, Issue 2 (section 5.5)
Measurement Method	ANSI C63.10 11.11
Measurement Uncertainty	± 4.25 dB
Operator	Wilfried Treffke
Date	2020-07-27

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 Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07

3.7.5 Procedure

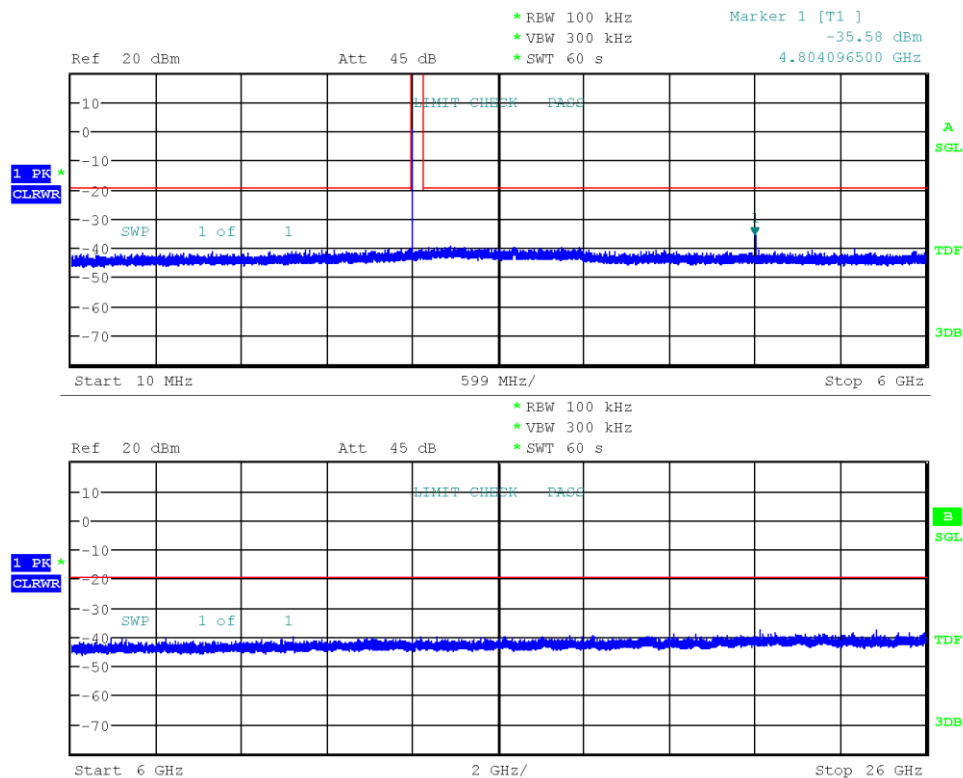
Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Span set around lower band edge and detector is set to peak and max hold 3. Resolution bandwidth is set to 100 kHz 4. Markers are set to peak emission levels within frequency band and outside frequency band 5. Band edge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

3.7.6 Results

Test Results		
Mode	Channel [MHz]	Verdict
LE 1M PHY	2402	PASS
LE 1M PHY	2440	PASS
LE 1M PHY	2480	PASS
LE 2M PHY	2402	PASS
LE 2M PHY	2440	PASS
LE 2M PHY	2480	PASS

Conducted Spurious Emissions

Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: GFSK, Channel: 0, 2402 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 1M PHY
 Max. in-band Frequency [MHz]: 2402.0
 Max. in-band Level [dBm/100 kHz]: 0.7
 Out-of-band Limit [dBm/100 kHz]: -19.3



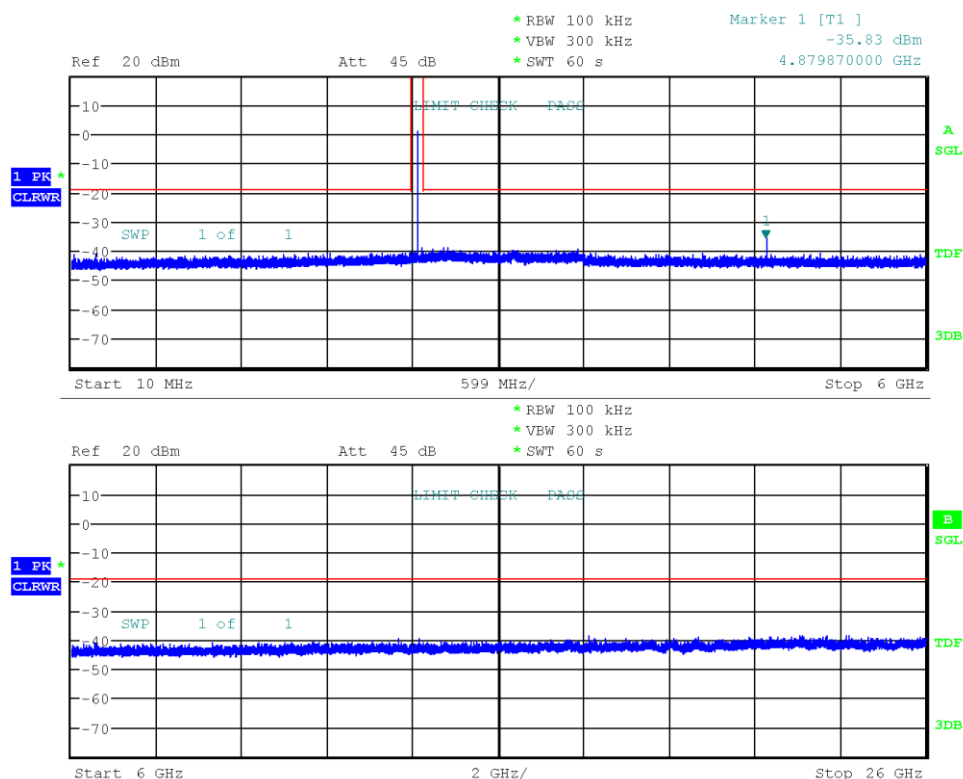
Date: 27.JUL.2020 10:32:02

Test Report No.: G0M-1909-8448-TFC247BL-V02

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

Conducted Spurious Emissions

Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: GFSK, Channel: 19, 2440 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 1M PHY
 Max. in-band Frequency [MHz]: 2440.0
 Max. in-band Level [dBm/100 kHz]: 1.0
 Out-of-band Limit [dBm/100 kHz]: -19.0



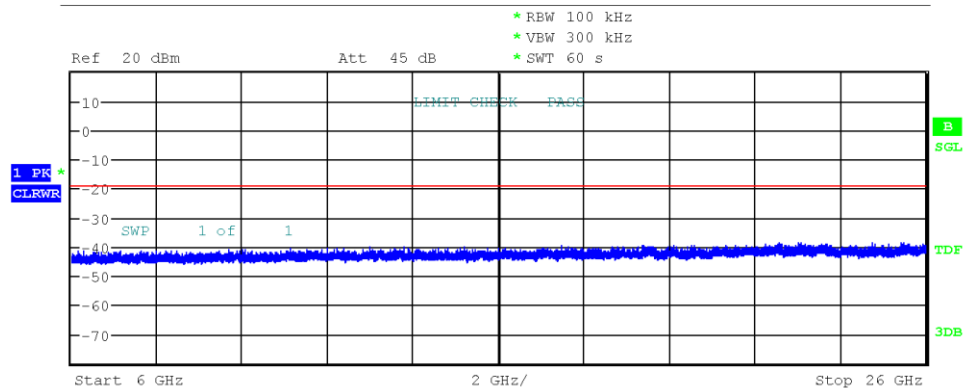
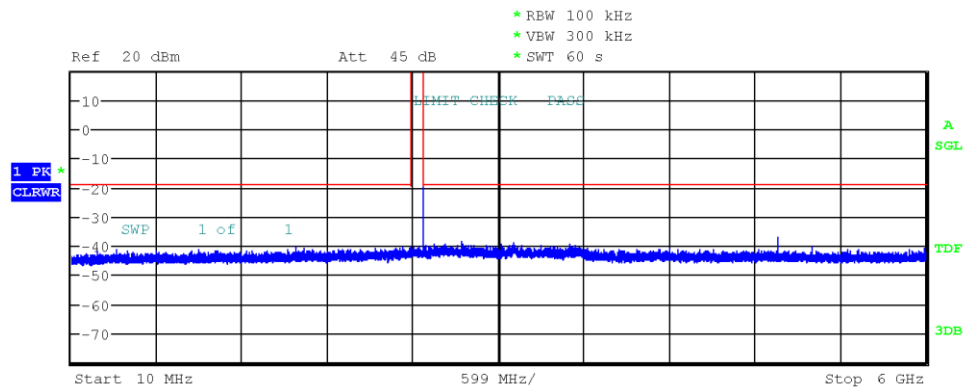
Date: 27.JUL.2020 10:37:03

Test Report No.: G0M-1909-8448-TFC247BL-V02

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

Conducted Spurious Emissions

Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: GFSK, Channel: 39, 2480 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 1M PHY
 Max. in-band Frequency [MHz]: 2480.0
 Max. in-band Level [dBm/100 kHz]: 0.9
 Out-of-band Limit [dBm/100 kHz]: -19.1



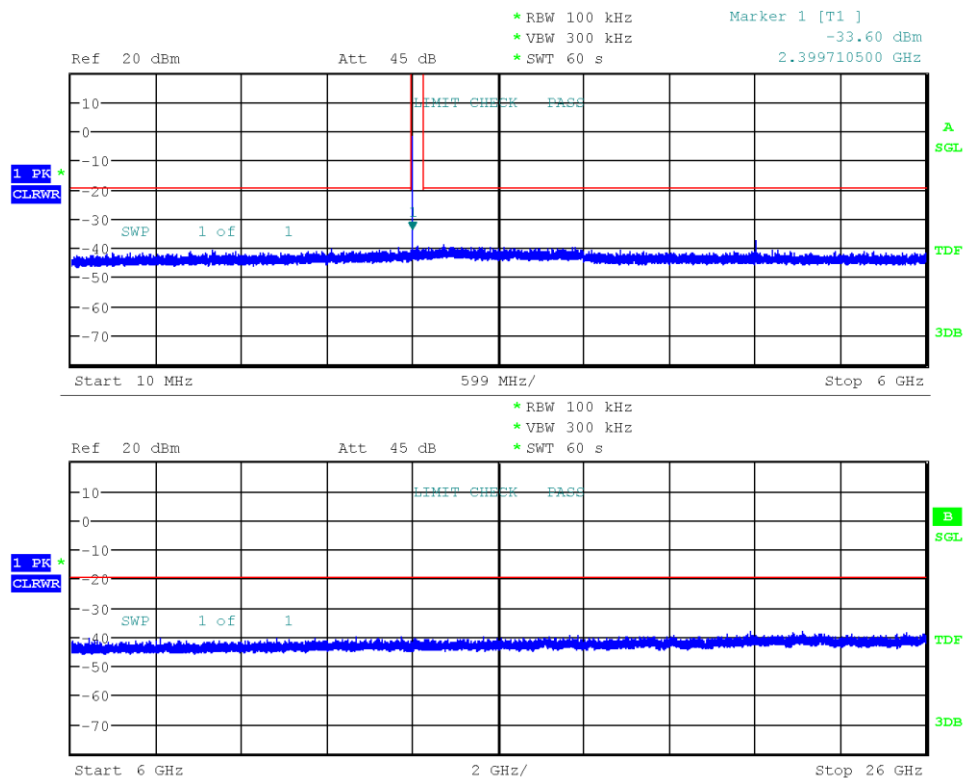
Date: 27.JUL.2020 10:39:55

Test Report No.: G0M-1909-8448-TFC247BL-V02

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

Conducted Spurious Emissions

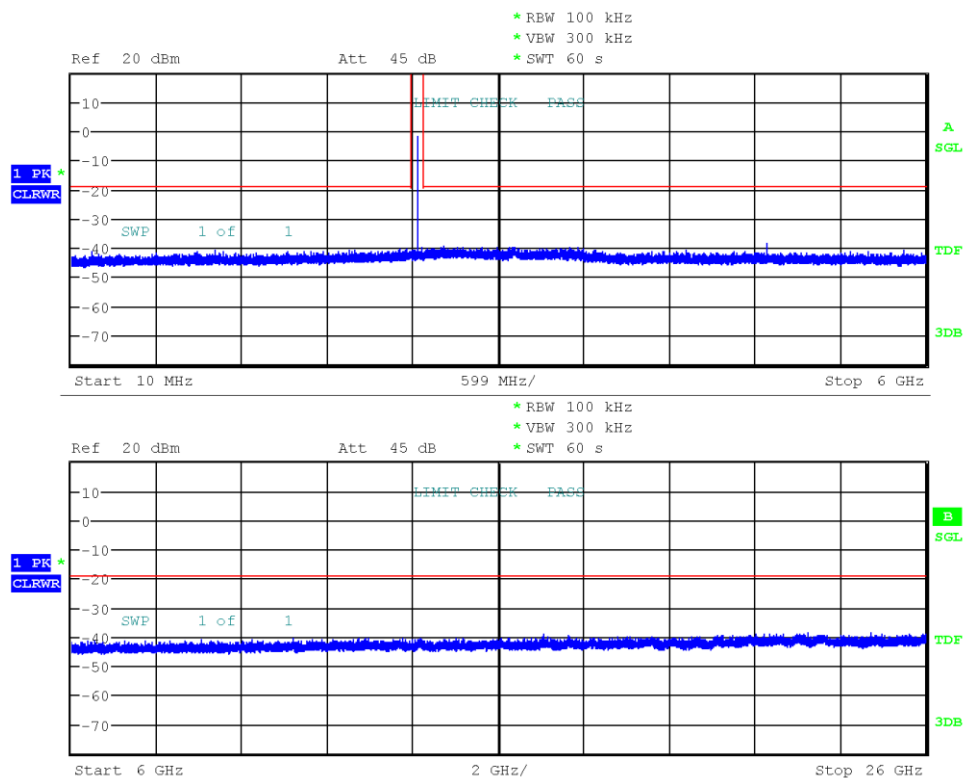
Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: GFSK, Channel: 0, 2402 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 2M PHY
 Max. in-band Frequency [MHz]: 2402.0
 Max. in-band Level [dBm/100 kHz]: 0.7
 Out-of-band Limit [dBm/100 kHz]: -19.3



Date: 27.JUL.2020 10:49:09

Conducted Spurious Emissions

Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: GFSK, Channel: 19, 2440 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 2M PHY
 Max. in-band Frequency [MHz]: 2440.0
 Max. in-band Level [dBm/100 kHz]: 1.0
 Out-of-band Limit [dBm/100 kHz]: -19.0



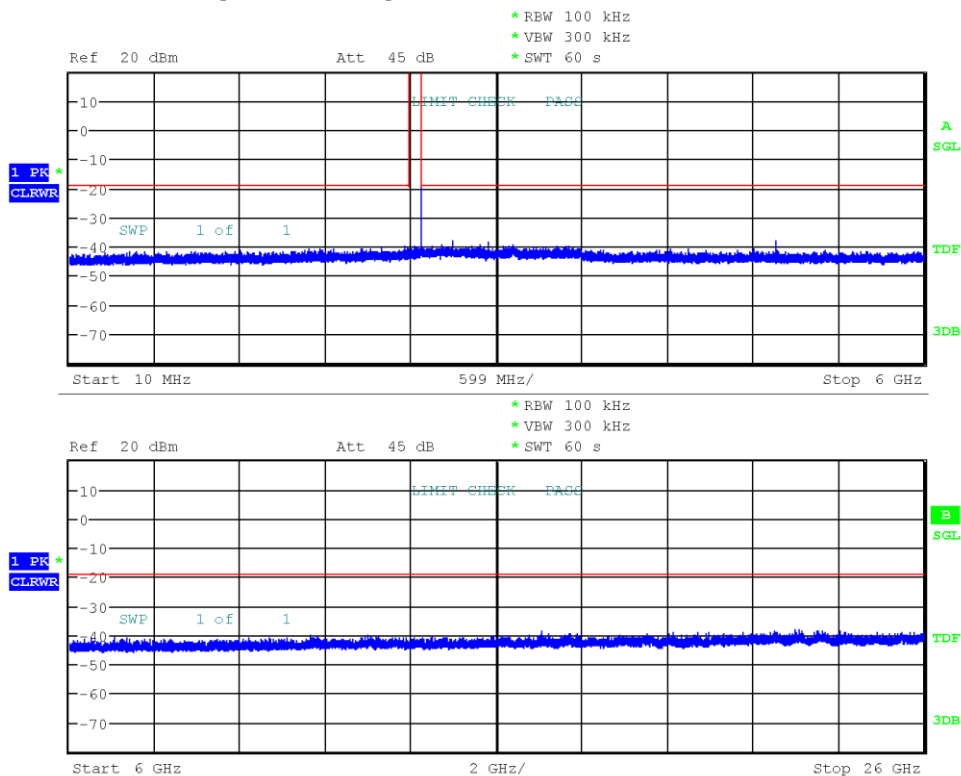
Date: 27.JUL.2020 10:52:41

Test Report No.: G0M-1909-8448-TFC247BL-V02

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

Conducted Spurious Emissions

Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: GFSK, Channel: 39, 2480 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-27
 Note: LE 2M PHY
 Max. in-band Frequency [MHz]: 2480.0
 Max. in-band Level [dBm/100 kHz]: 1.0
 Out-of-band Limit [dBm/100 kHz]: -19.0



Date: 27.JUL.2020 10:56:13

3.8 Test Conditions and Results – Transmitter radiated emissions

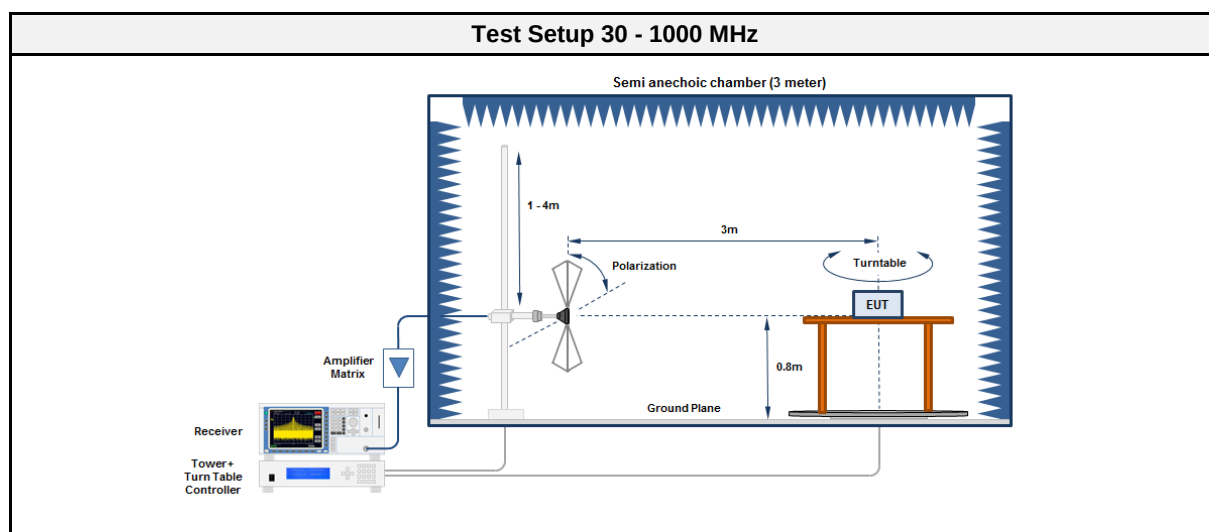
3.8.1 Information

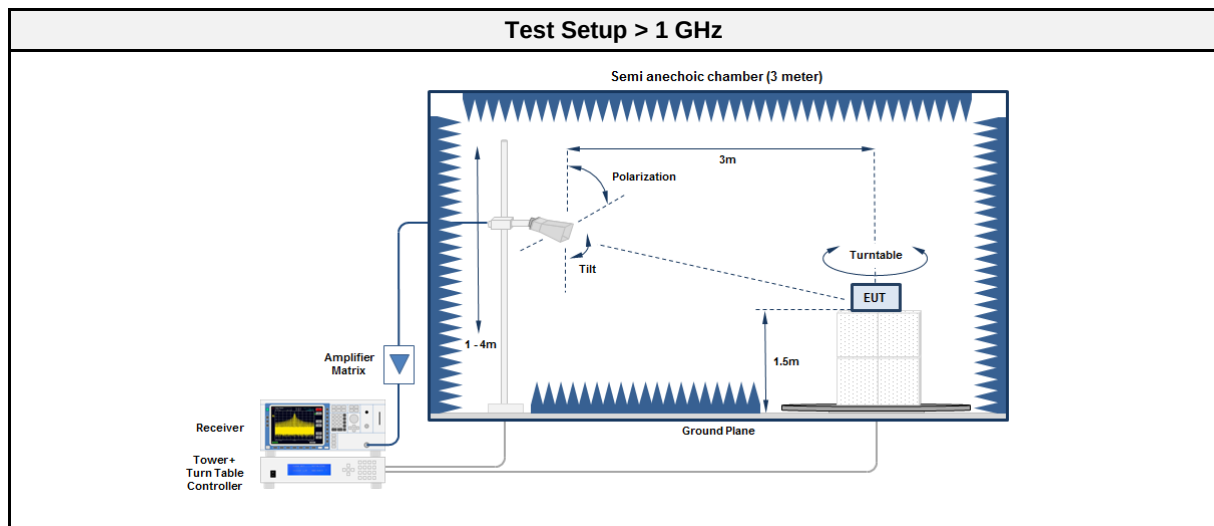
Test Information	
Reference	FCC § 15.247(d); FCC § 15.209; ISSED RSS-Gen, Issue 5 (section 6.13)
Measurement Method	ANSI C63.10 6.4, 6.5, 6.6, 11.12
Operator	Wilfried Treffke
Measurement Uncertainty	± 5.67 dB
Measured mode: Transmit	The mode was determined as worst-case Tx scenario (radiated measurements).
Additional information	Measurement plots not listed in this test report (related to the frequency range to be measured) contain noise floor only. No significant emissions measured in these measurement ranges. An evaluation was performed manually with the spectrum analyser.
Date	2019-10-15

3.8.2 Limits

Limits			
Frequency [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	2016.1.10

Test Equipment 30 - 1000 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2018-07	2021-07
Spectrum Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07
Antenna	R&S	HK 116	EF00030	2019-04	2022-04
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	2018-07	2021-07
Spectrum Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07
Antenna	Schwarzbeck	BBHA 9120D	EF01153	2019-09	2020-09
Antenna	Amplifier Research	AT4560	EF00302	2019-05	2020-05

3.8.5 Procedure

Test Procedure < 30 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 EUT is rotated through 360°
4.	The emissions are measured with peak detector and max hold
5.	All significant emissions are measured again using the corresponding final detector

Test Procedure 30 - 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 Results

Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2402	2385.3	50.71	pk	ver	74.00	-23.29
2402	2385.3	37.48	avg	ver	54.00	-16.52
2402	2389.6	50.30	pk	hor	74.00	-23.70
2402	2389.6	37.48	avg	hor	54.00	-16.52
2402	4801	48.81	pk	hor	74.00	-25.19
2440	4879	50.59	pk	hor	74.00	-23.41
2440	4879	43.28	avg	hor	54.00	-10.72
2440	7318	54.52	pk	hor	74.00	-19.48
2440	7318	45.85	avg	hor	54.00	-08.15
2440	7318	53.01	pk	ver	74.00	-20.99
2440	7318	44.72	avg	ver	54.00	-09.28
2480	4961	56.12	pk	hor	74.00	-17.88
2480	4961	50.63	RMS	hor	54.00	-03.37
2480	4961	50.79	pk	ver	74.00	-23.21
2480	4961	43.88	avg	ver	54.00	-10.12
2480	7441	50.53	pk	hor	74.00	-23.47
2480	7441	43.03	RMS	hor	54.00	-10.97

3.9 Test Conditions and Results - Receiver radiated emissions

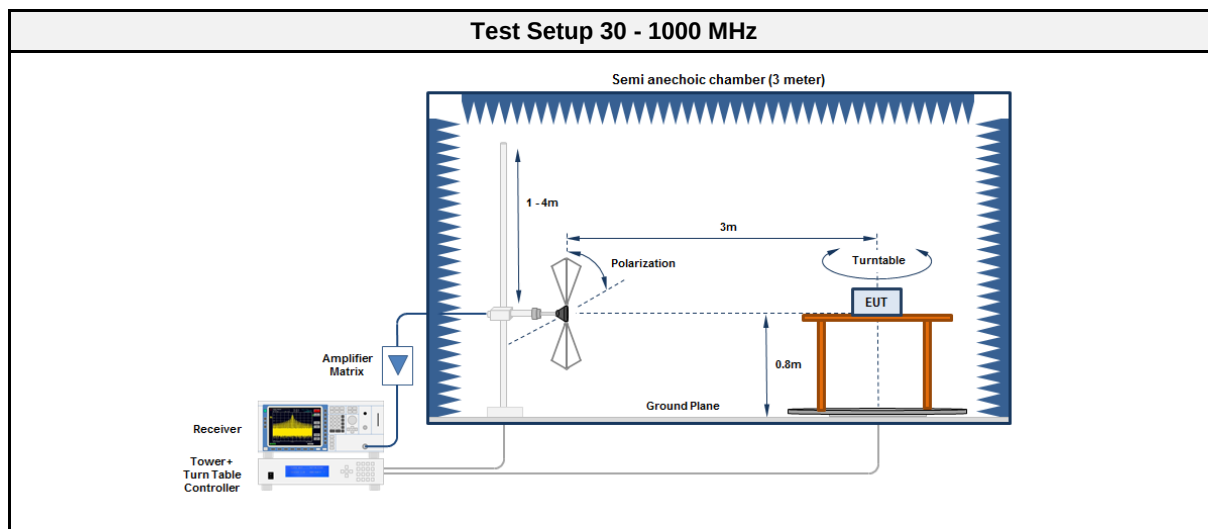
3.9.1 Information

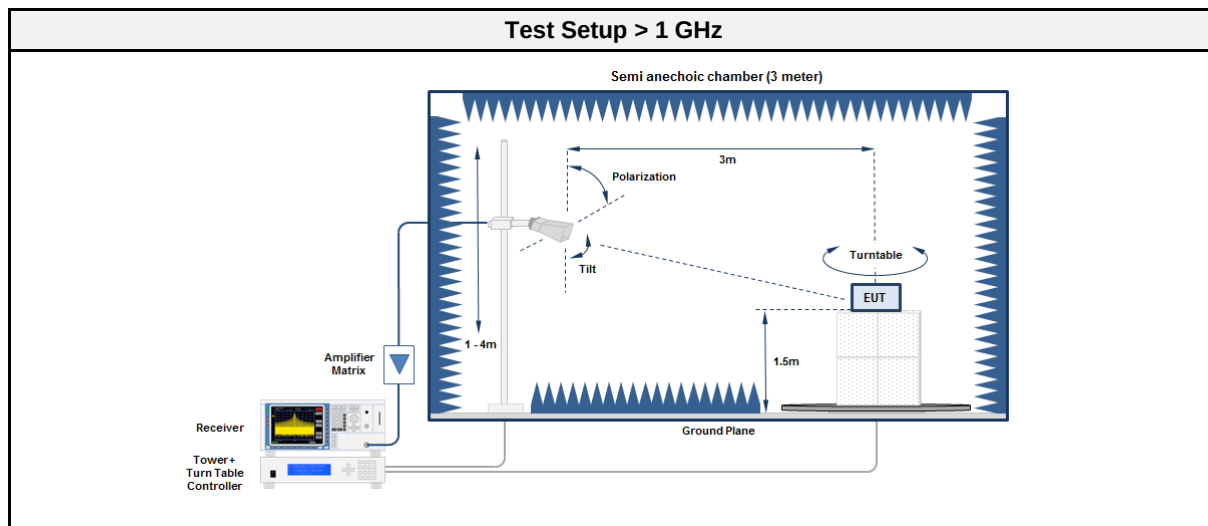
Test Information	
Reference	ISED RSS-247, Issue 2 (section 3.1)
Measurement Method	ANSI C63.10 6.5, 6.6, 11.12
Measurement Uncertainty	± 5.67 dB
Operator	Wilfried Treffke
Date	2019-10-15

3.9.2 Limits

Limits			
Frequency [MHz]	Detector	Field strength [dB μ 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	2016.1.10

Test Equipment 30 - 1000 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2018-07	2021-07
Spectrum Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07
Antenna	R&S	HK 116	EF00030	2019-04	2022-04
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	2018-07	2021-07
Spectrum Analyzer	R&S	FSU 26	EF01407	2019-07	2020-07
Antenna	Schwarzbeck	BBHA 9120D	EF01153	2019-09	2020-09
Antenna	Amplifier Research	AT4560	EF00302	2019-05	2020-05

3.9.5 Procedure

Test Procedure 30 - 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	

3.9.6 Results

Test Results						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2440	885.897	30.38	pk	hor	46.00	-15.62
2440	3918	29.40	pk	ver	53.98	-24.58
2440	3947	29.33	pk	hor	53.98	-24.65
2440	7955	39.41	pk	ver	53.98	-14.57
2440	11361	43.55	pk	hor	53.98	-10.43

ANNEX A Transmitter spurious emissions

Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx

EUT Name: Onethinx Core LoRaWAN module

Model: OTX-18

Test Site: Eurofins Product Service GmbH

Operator: Wilfried Treffke

Test Conditions: Tnom: 24°C, Vnom: 3.6V DC

Antenna: Rohde & Schwarz HK 116, Horizontal

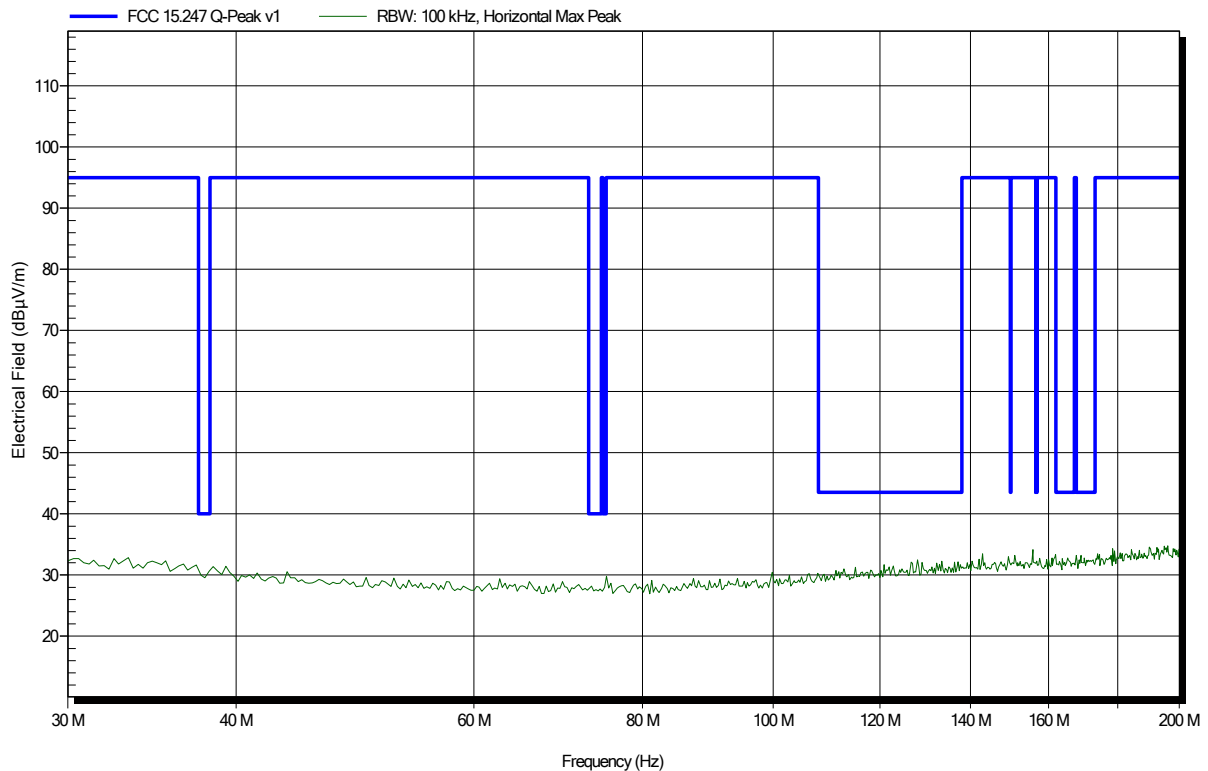
Measurement distance: 3 m

Mode: TX; BLE; 2402 MHz

Test Date: 2019-10-15

Note:

Index 32

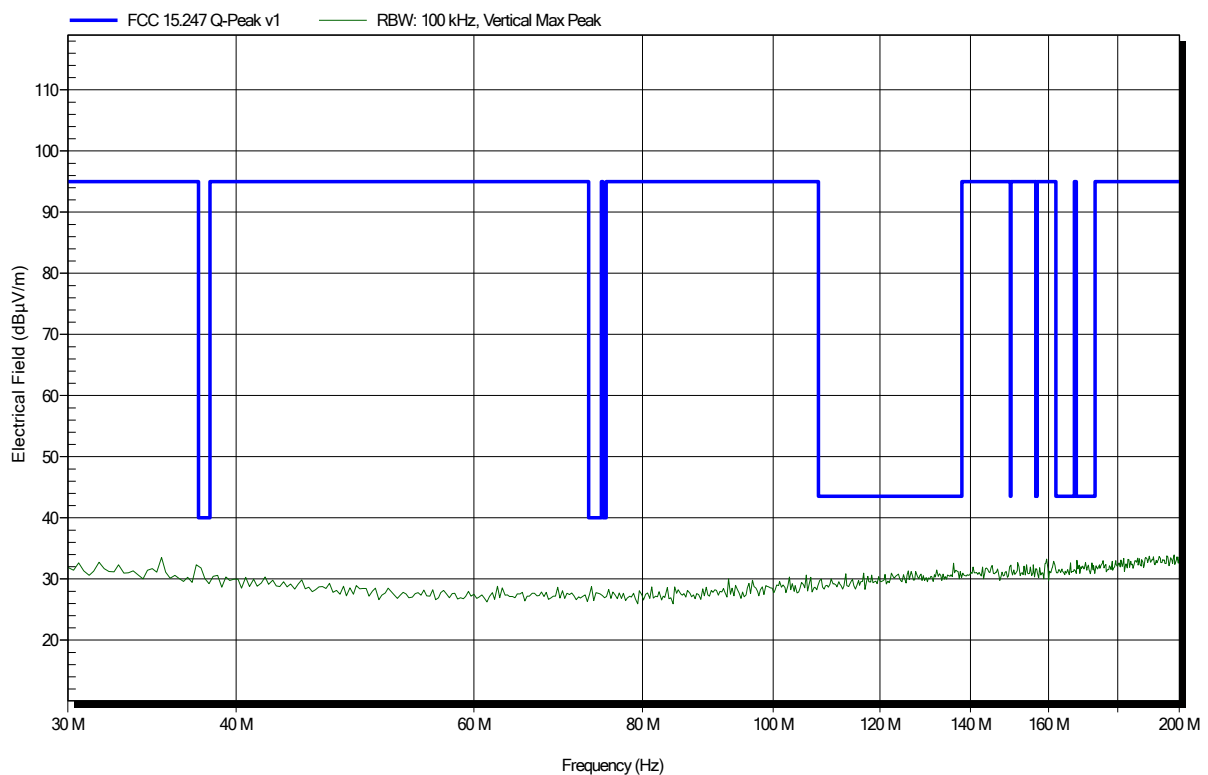


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Rohde & Schwarz HK 116, Vertical
Measurement distance: 3 m
Mode: TX; BLE; 2402 MHz
Test Date: 2019-10-15
Note:

Index 33

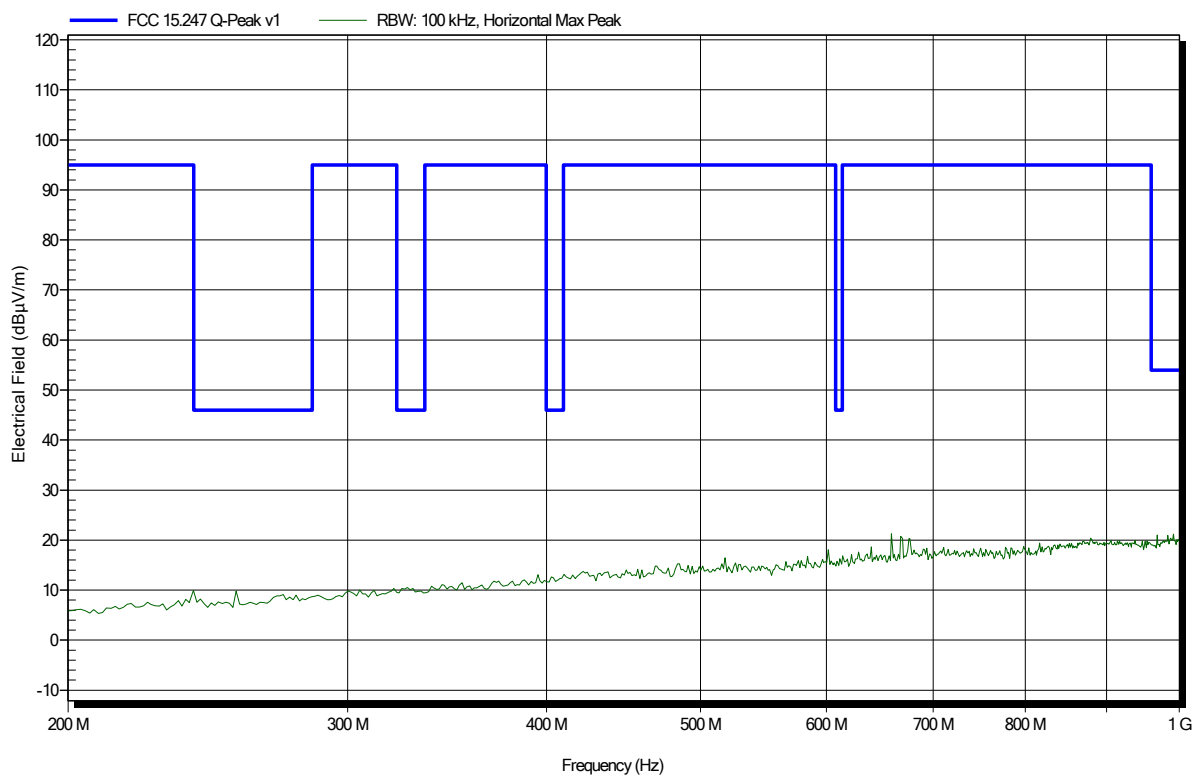


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
 Antenna: Rohde & Schwarz HL 223, Horizontal
 Measurement distance: 3 m
 Mode: TX; BLE; 2402 MHz
 Test Date: 2019-10-15
 Note:

Index 30

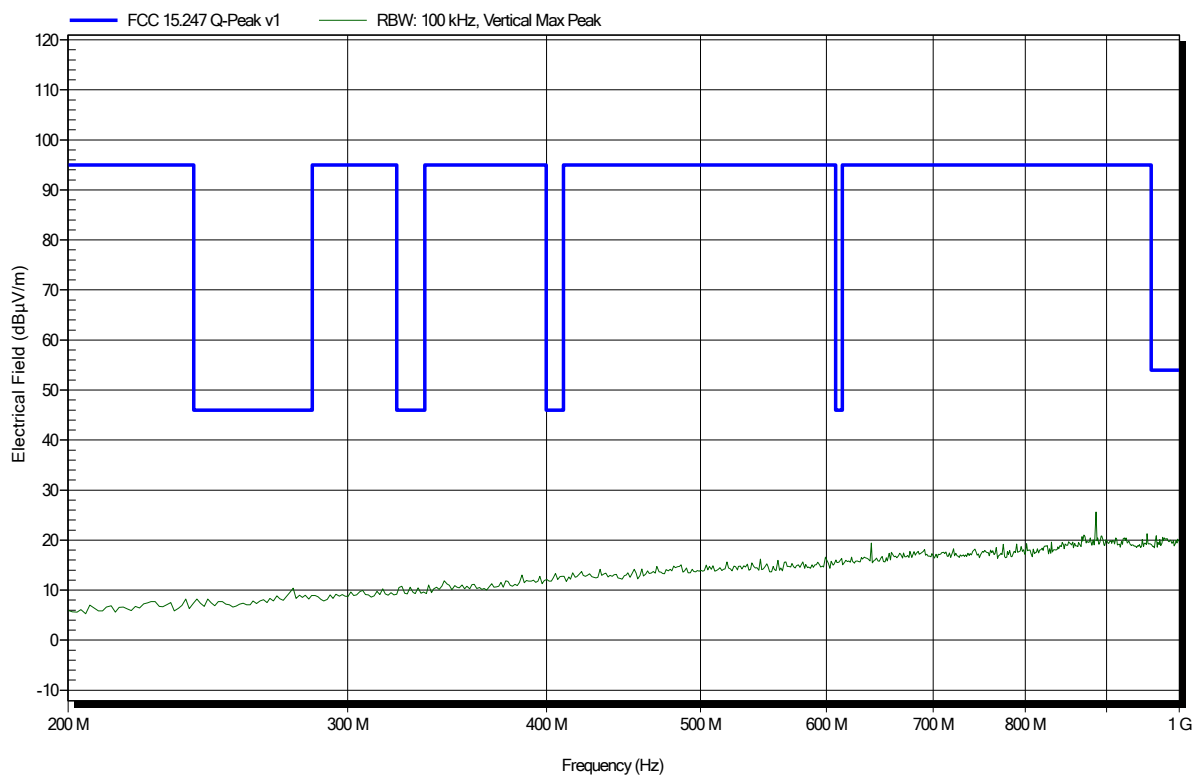


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Rohde & Schwarz HL 223, Vertical
Measurement distance: 3 m
Mode: TX; BLE; 2402 MHz
Test Date: 2019-10-15
Note:

Index 31

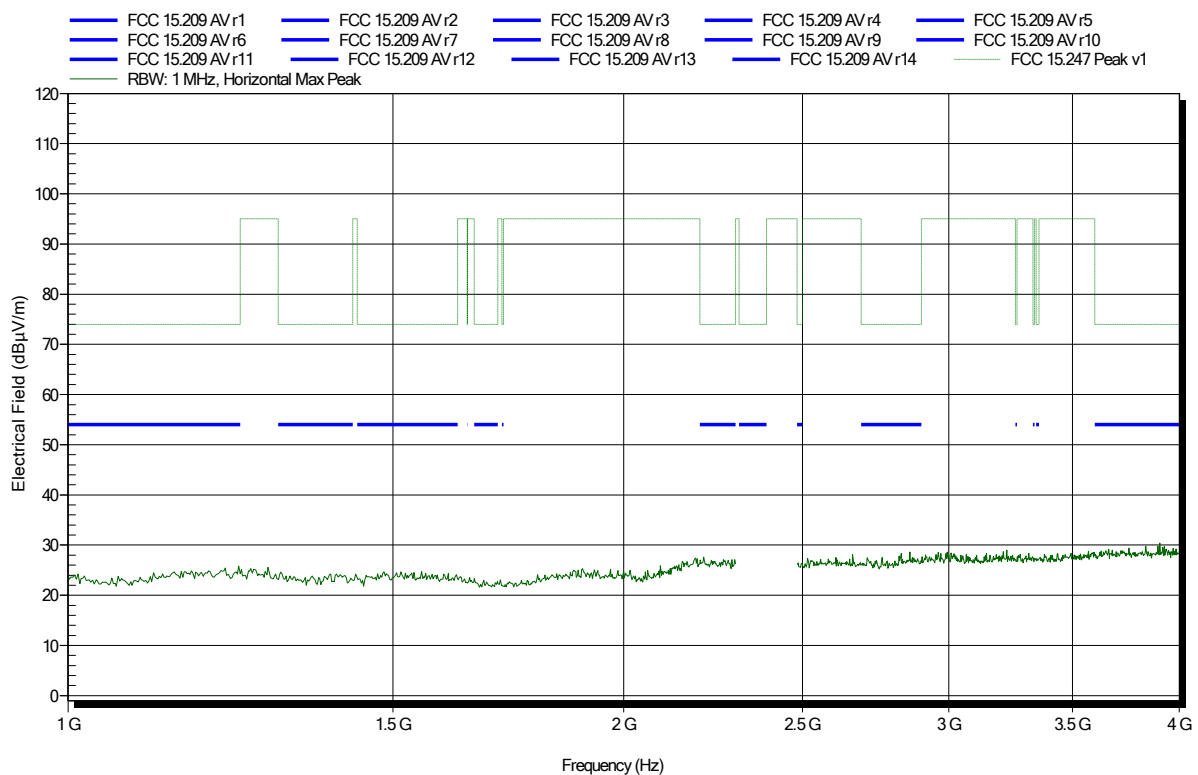


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; BLE; 2402 MHz
 Test Date: 2019-10-14
 Note:

Index 1

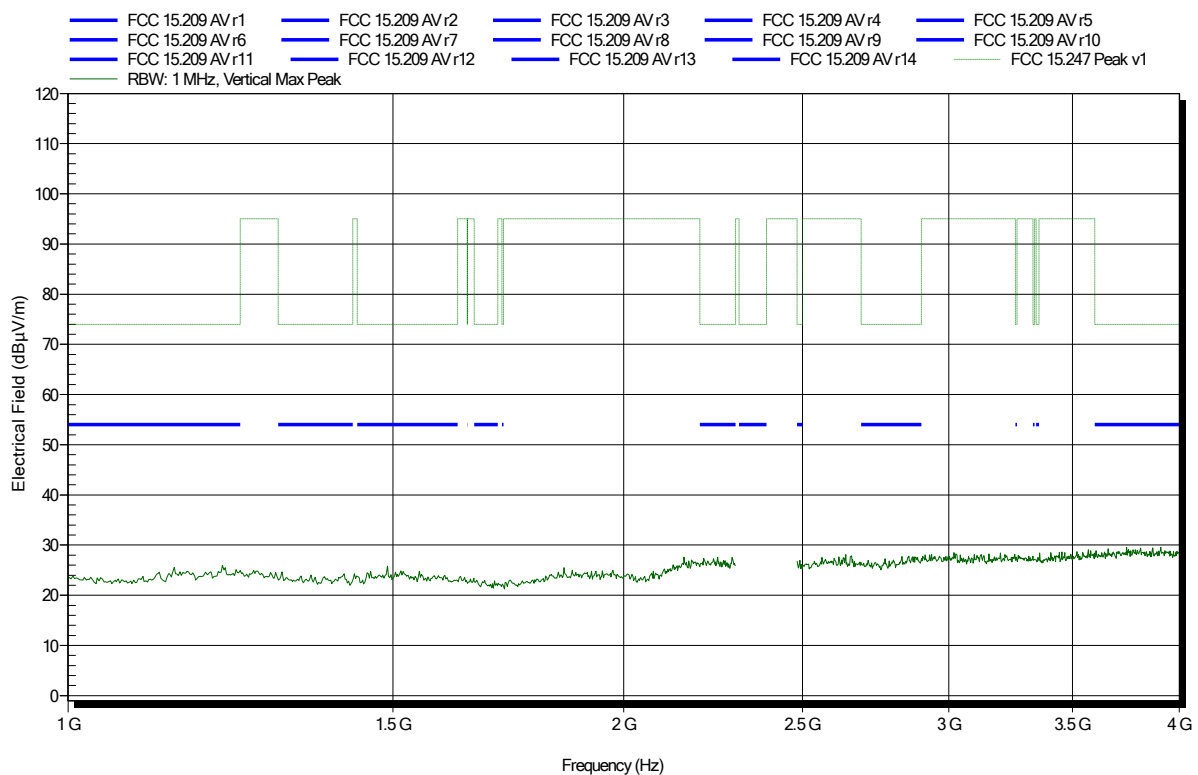


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Schwarzbeck BBHA 9120D, Vertical
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2402 MHz
Test Date: 2019-10-14
Note:

Index 5

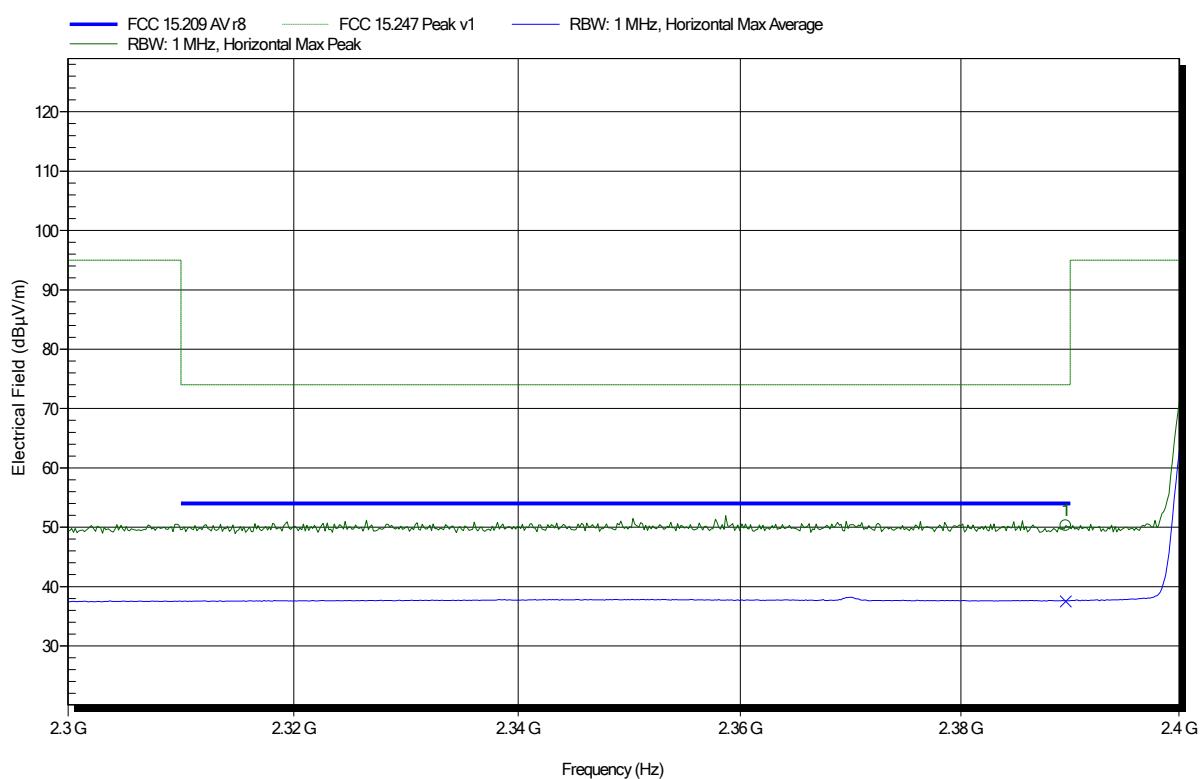


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Schwarzbeck BBHA 9120D, Horizontal
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2402 MHz
Test Date: 2019-10-14
Note: lower bandedge

Index 2



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.3896 GHz	50.3 dBµV/m	74 dBµV/m	-23.7 dB	Pass

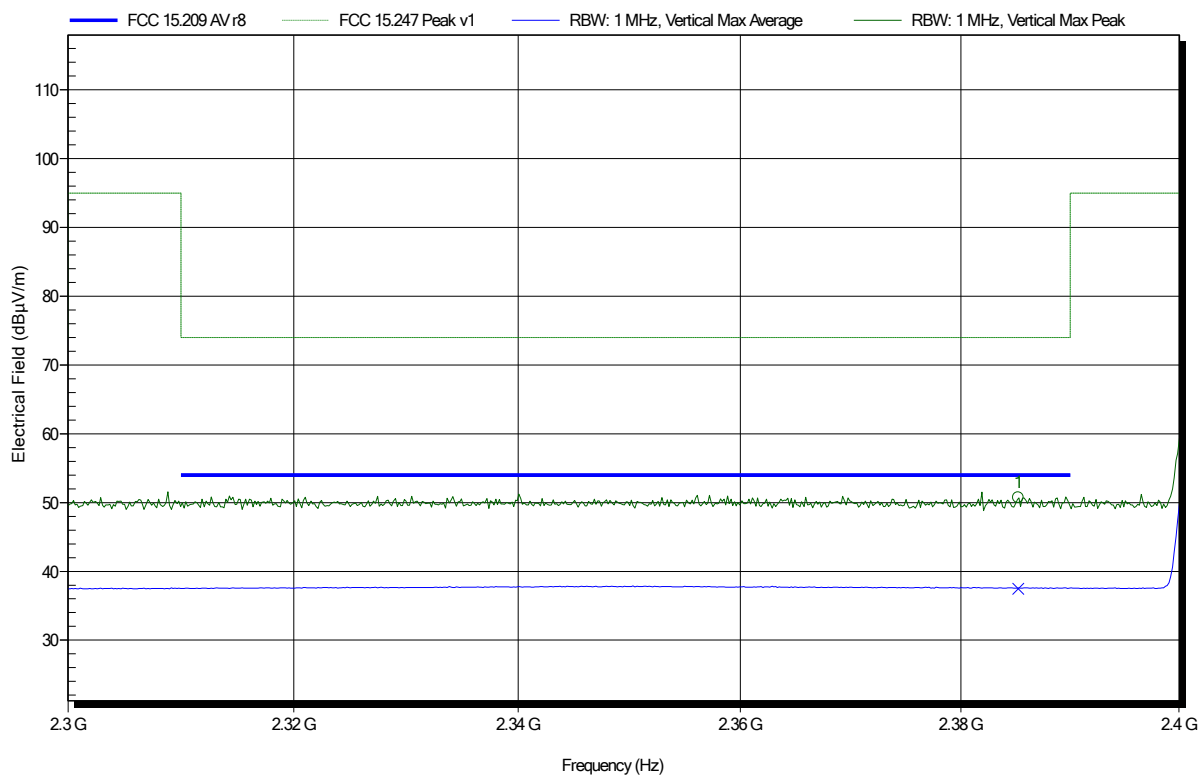
Frequency	Average	Average Limit	Average Difference	Average Status
2.3896 GHz	37.48 dBµV/m	54 dBµV/m	-16.52 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Schwarzbeck BBHA 9120D, Vertical
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2402 MHz
Test Date: 2019-10-14
Note: lower bandedge

Index 6



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.3853 GHz	50.71 dBµV/m	74 dBµV/m	-23.29 dB	Pass

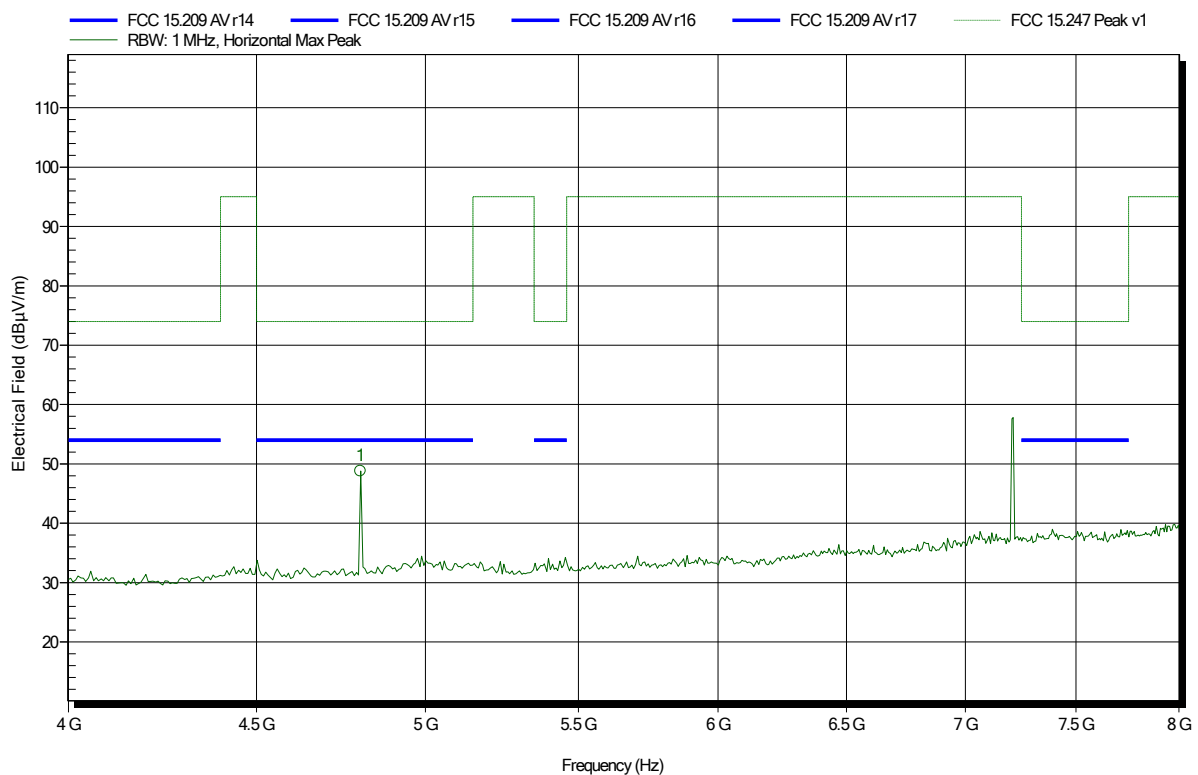
Frequency	Average	Average Limit	Average Difference	Average Status
2.3853 GHz	37.48 dBµV/m	54 dBµV/m	-16.52 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Schwarzbeck BBHA 9120D, Horizontal
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2402 MHz
Test Date: 2019-10-14
Note:

Index 3



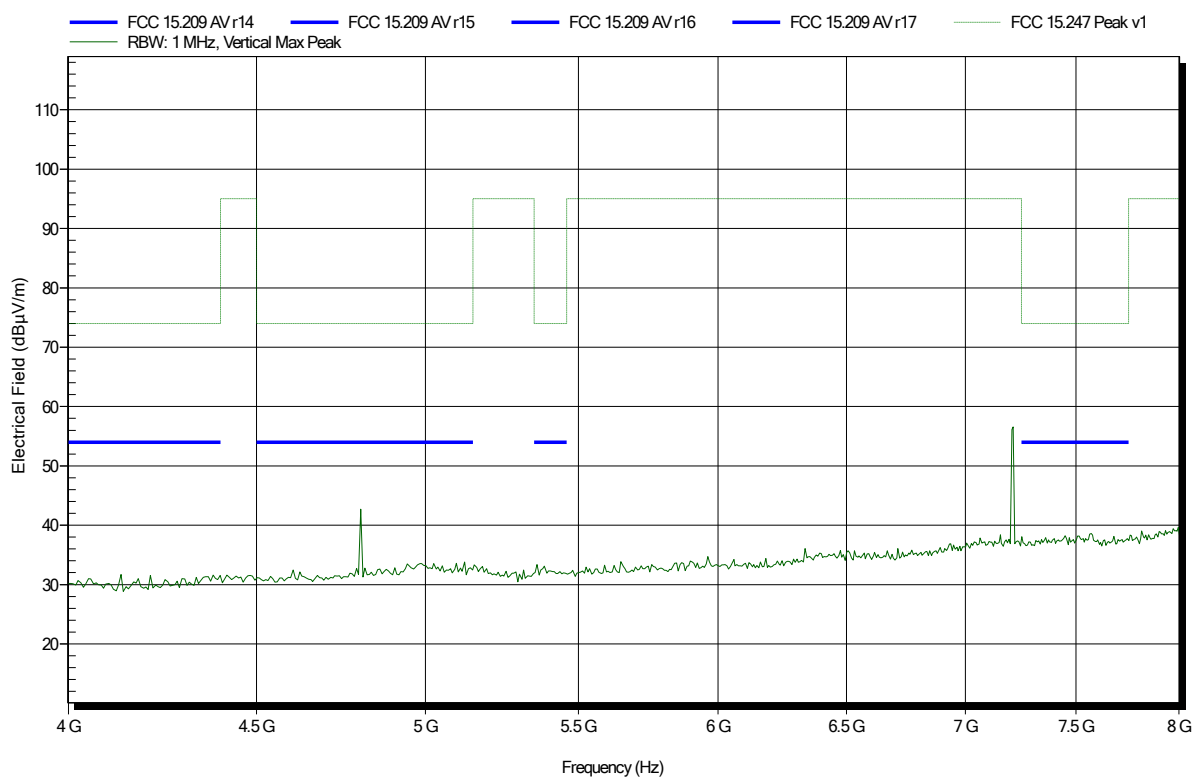
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.801 GHz	48.81 dBµV/m	74 dBµV/m	-25.19 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Schwarzbeck BBHA 9120D, Vertical
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2402 MHz
Test Date: 2019-10-14
Note:

Index 7

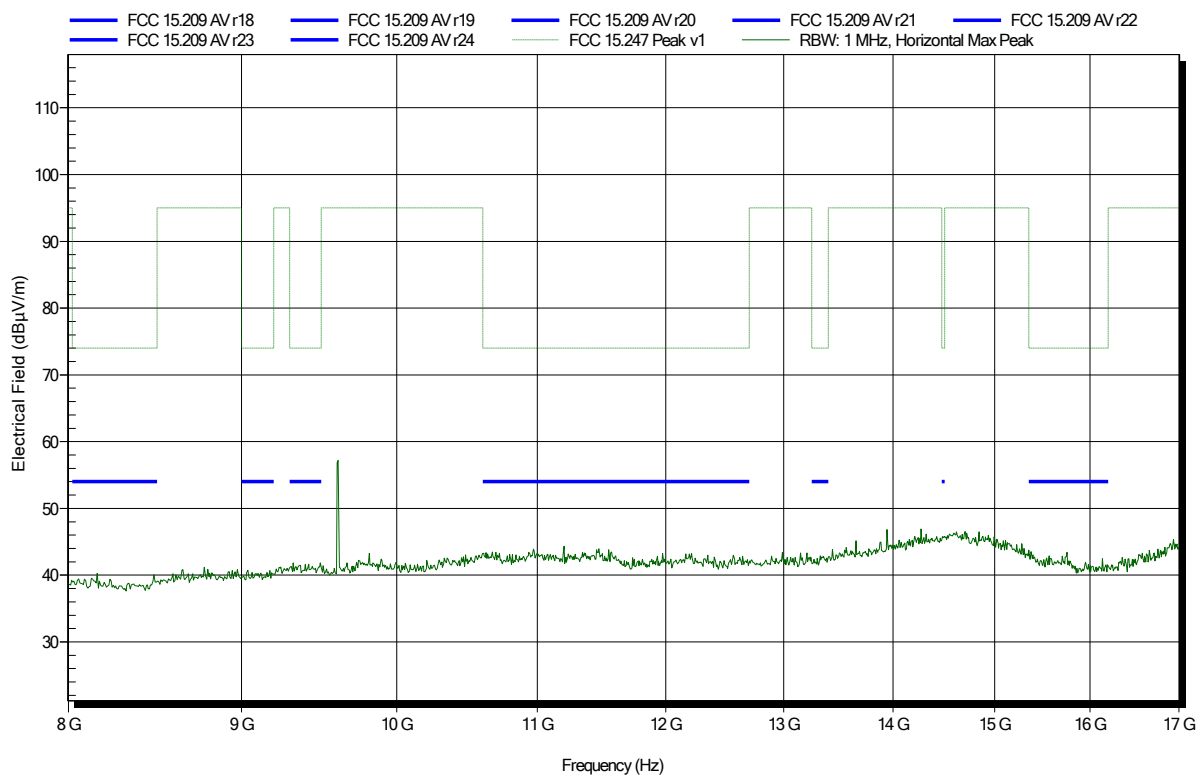


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Schwarzbeck BBHA 9120D, Horizontal
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2402 MHz
Test Date: 2019-10-14
Note:

Index 4

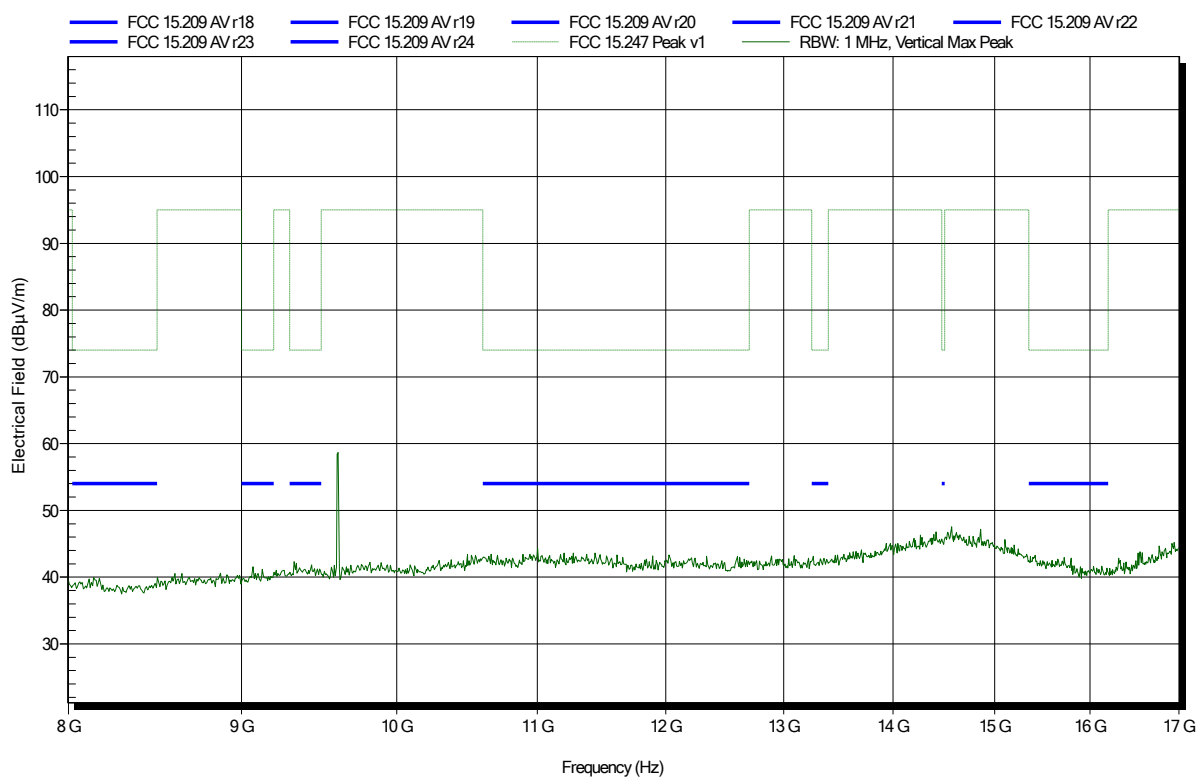


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Schwarzbeck BBHA 9120D, Vertical
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2402 MHz
Test Date: 2019-10-14
Note:

Index 8

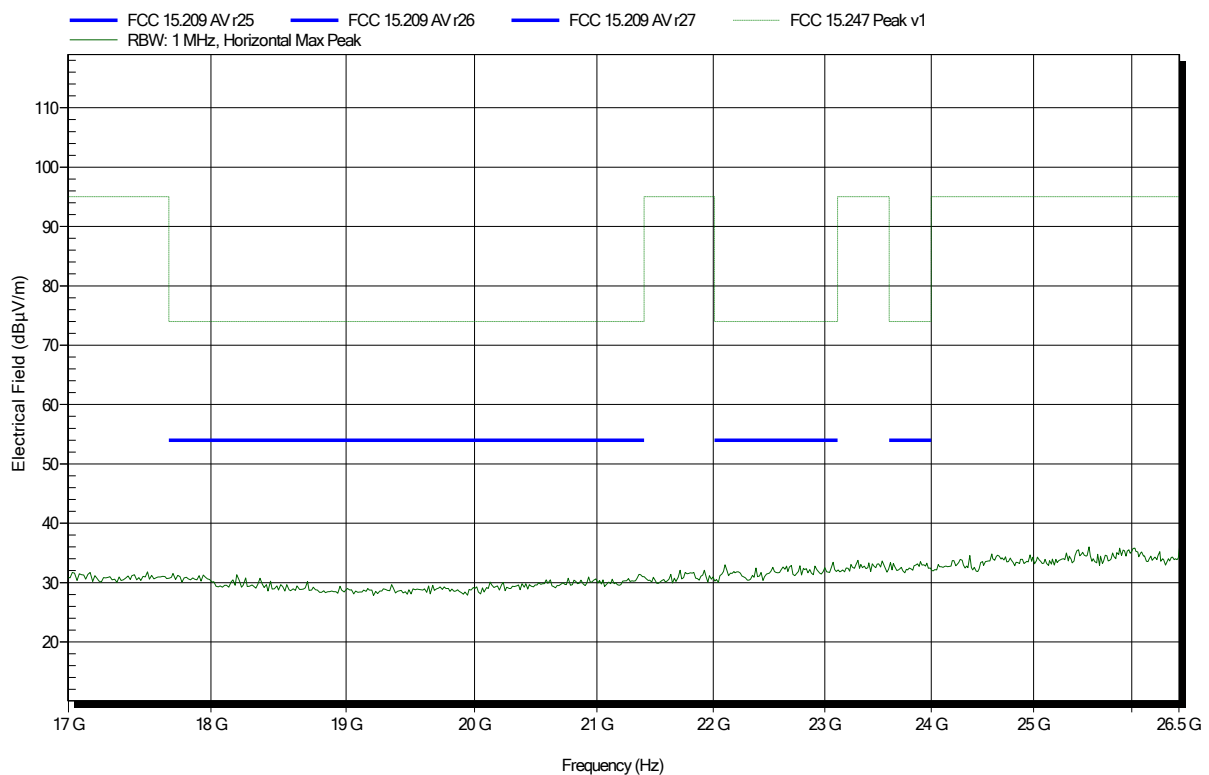


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Amplifier Research AT4560, Horizontal
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2402 MHz
Test Date: 2019-10-14
Note:

Index 10

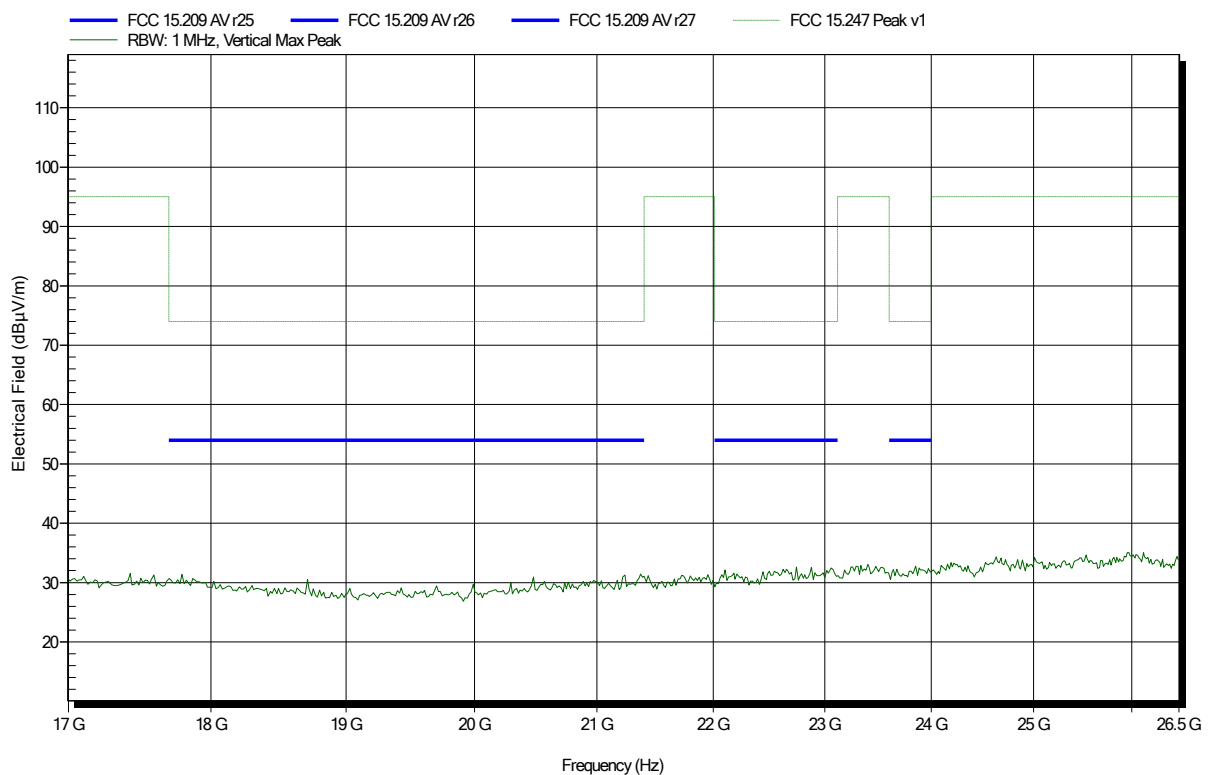


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Amplifier Research AT4560, Vertical
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2402 MHz
Test Date: 2019-10-14
Note:

Index 11



Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx

EUT Name: Onethinx Core LoRaWAN module

Model: OTX-18

Test Site: Eurofins Product Service GmbH

Operator: Wilfried Treffke

Test Conditions: Tnom: 24°C, Vnom: 3.6V DC

Antenna: Schwarzbeck BBHA 9120D, Horizontal

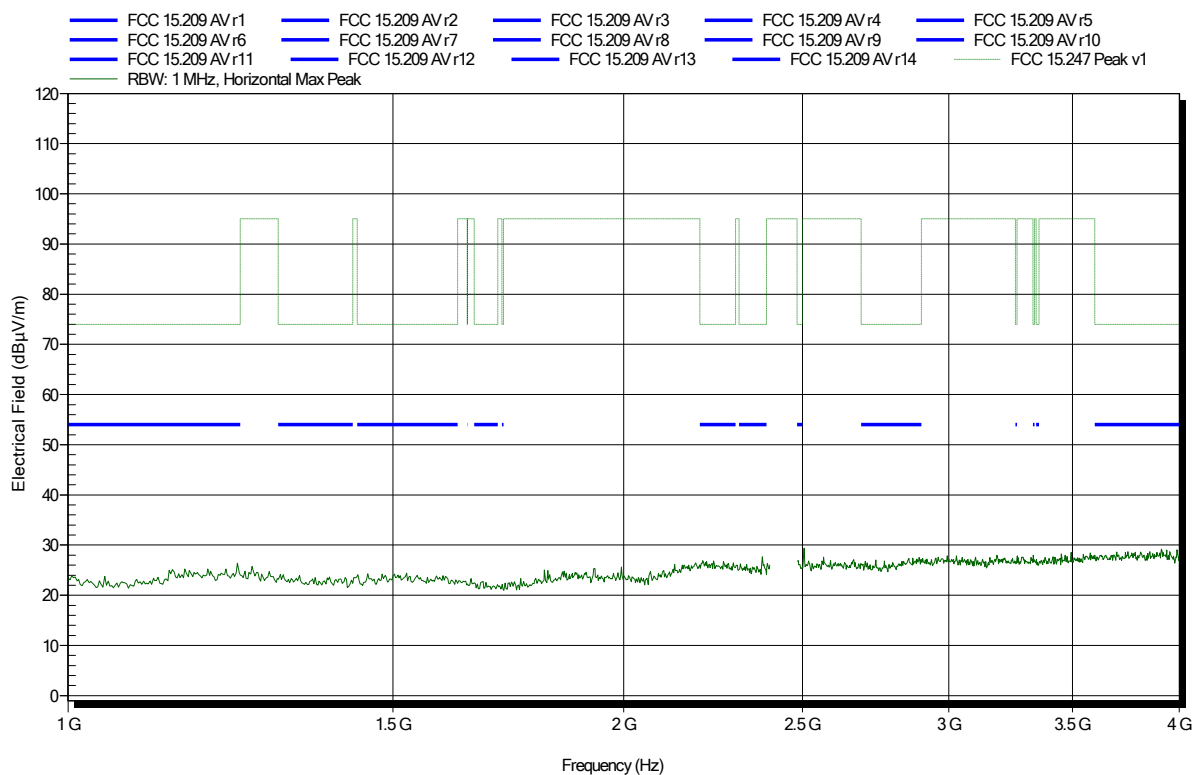
Measurement distance: 1 m converted to 3m

Mode: TX; BLE; 2440 MHz

Test Date: 2019-10-14

Note:

Index 12

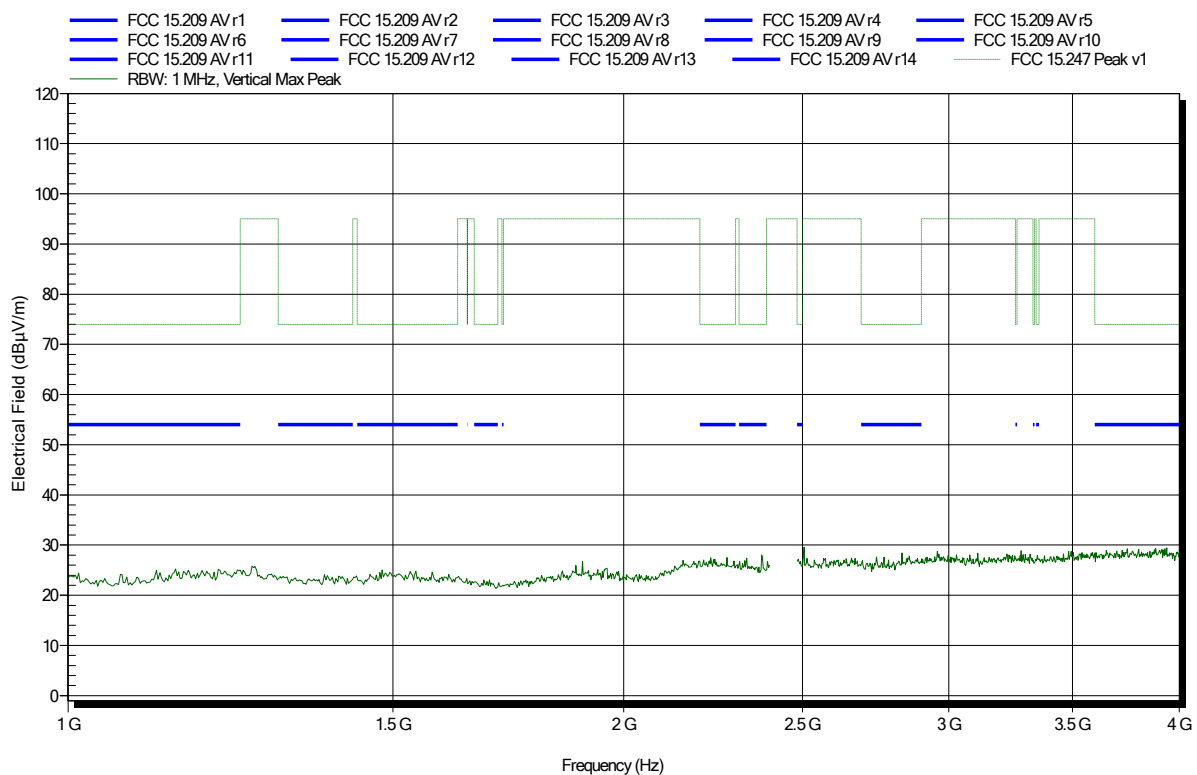


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Schwarzbeck BBHA 9120D, Vertical
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2440 MHz
Test Date: 2019-10-14
Note:

Index 16

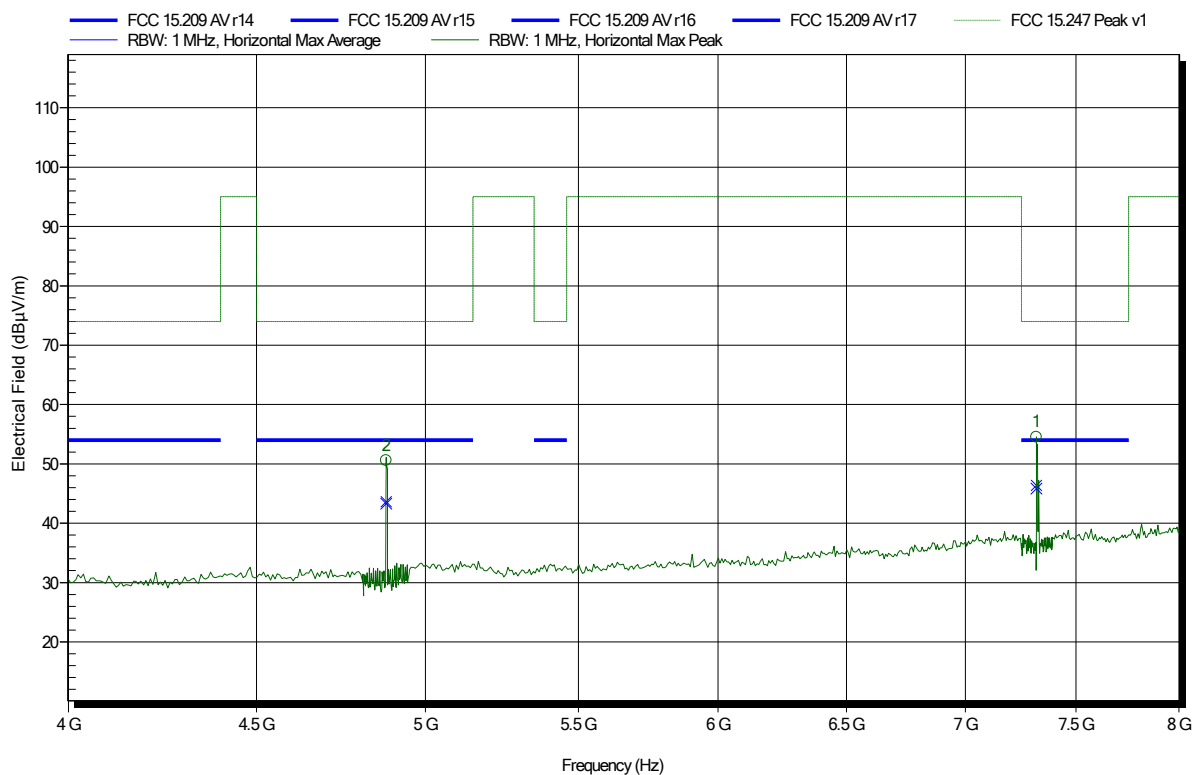


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; BLE; 2440 MHz
 Test Date: 2019-10-14
 Note:

Index 13



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.879 GHz	50.59 dBµV/m	74 dBµV/m	-23.41 dB	Pass
7.318 GHz	54.52 dBµV/m	74 dBµV/m	-19.48 dB	Pass

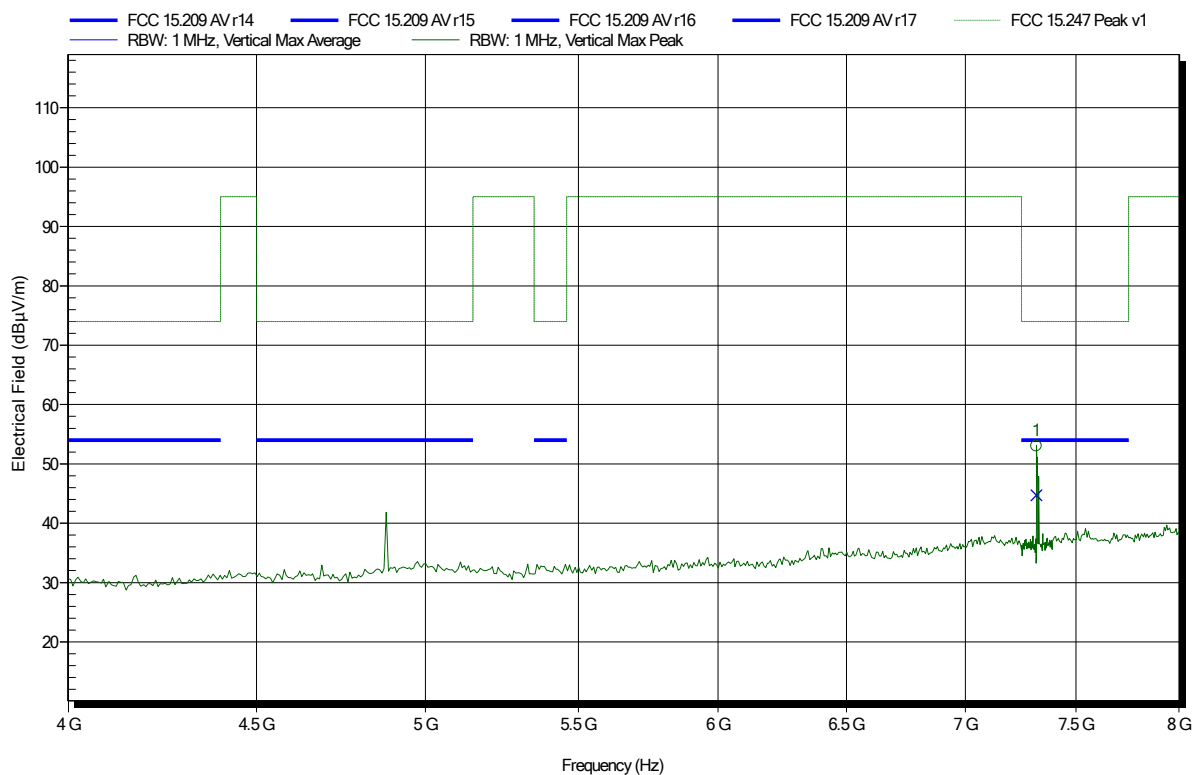
Frequency	Average	Average Limit	Average Difference	Average Status
4.879 GHz	43.28 dBµV/m	54 dBµV/m	-10.72 dB	Pass
7.318 GHz	45.85 dBµV/m	54 dBµV/m	-8.15 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; BLE; 2440 MHz
 Test Date: 2019-10-14
 Note:

Index 17



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
7.318 GHz	53.01 dBµV/m	74 dBµV/m	-20.99 dB	Pass

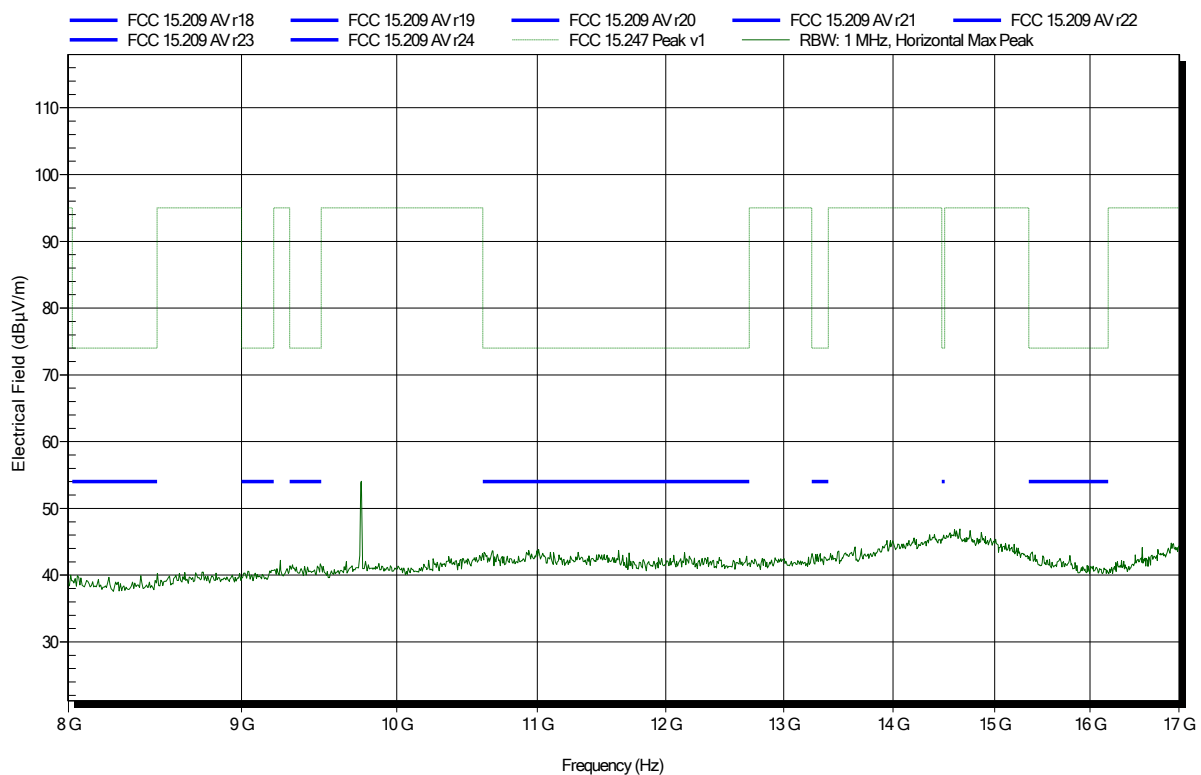
Frequency	Average	Average Limit	Average Difference	Average Status
7.318 GHz	44.72 dBµV/m	54 dBµV/m	-9.28 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Schwarzbeck BBHA 9120D, Horizontal
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2440 MHz
Test Date: 2019-10-14
Note:

Index 14

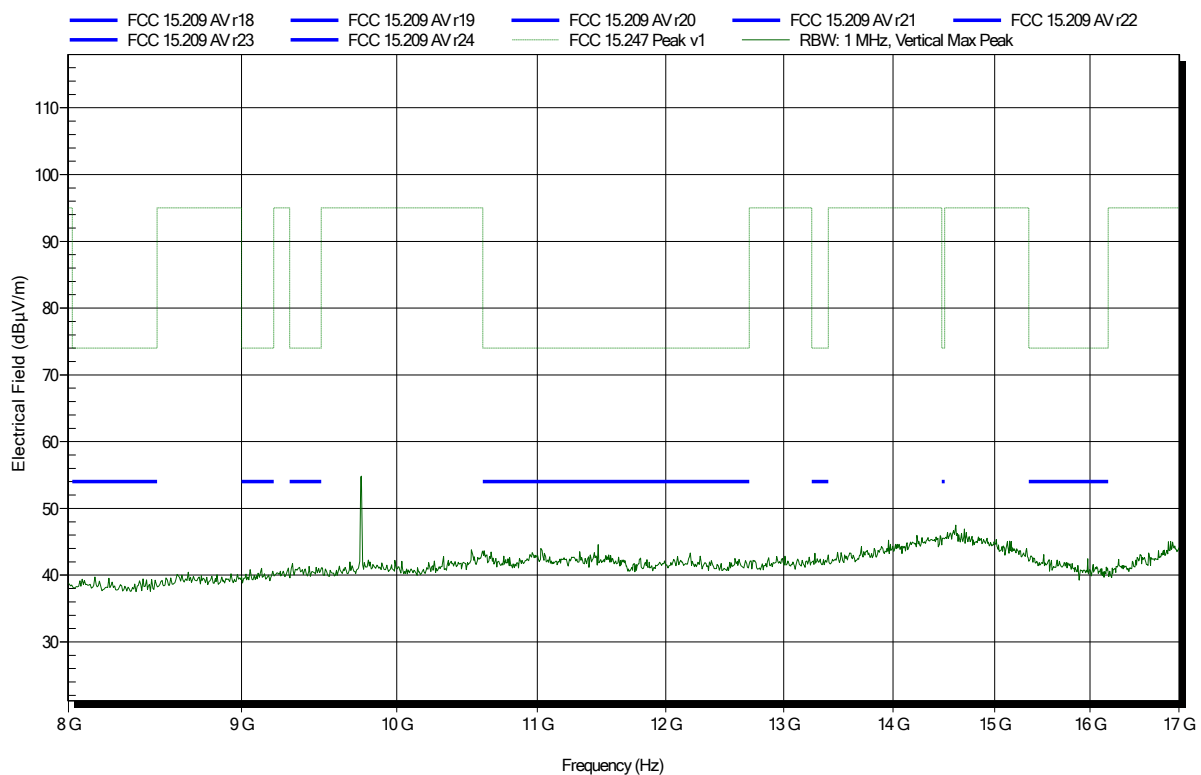


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Schwarzbeck BBHA 9120D, Vertical
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2440 MHz
Test Date: 2019-10-14
Note:

Index 18

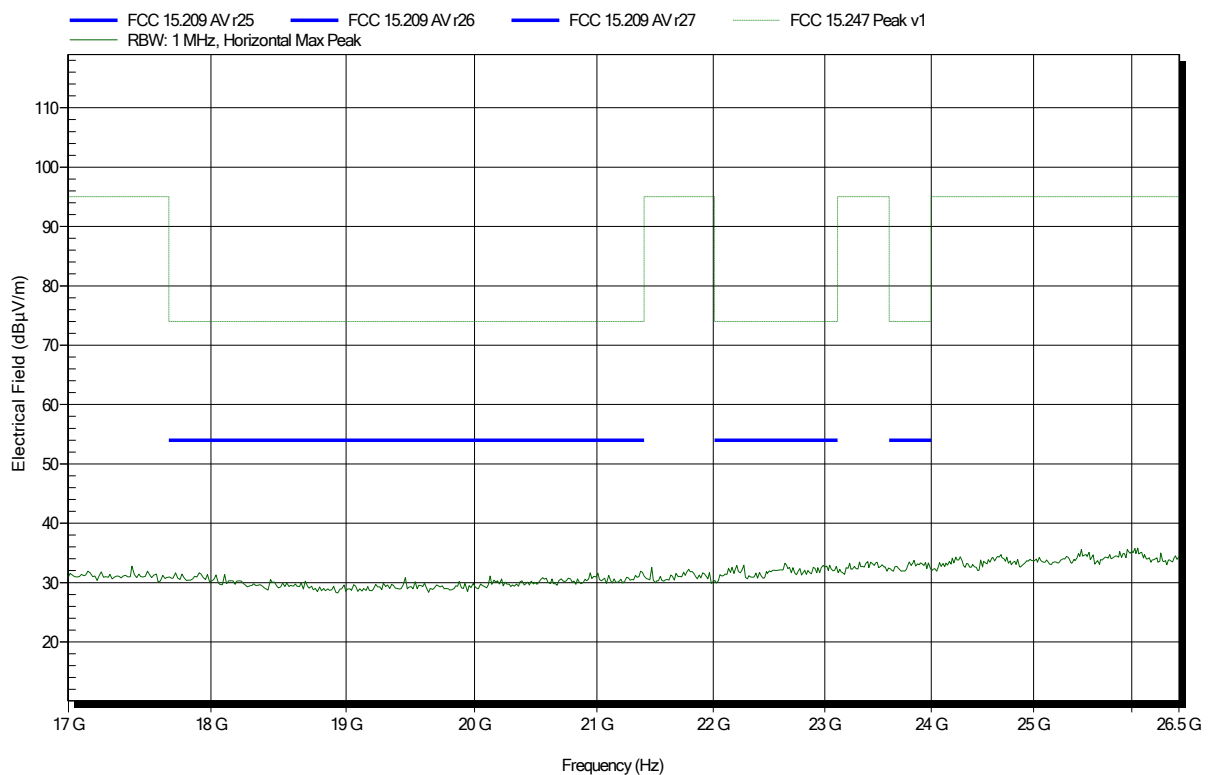


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Amplifier Research AT4560, Horizontal
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2440 MHz
Test Date: 2019-10-14
Note:

Index 15

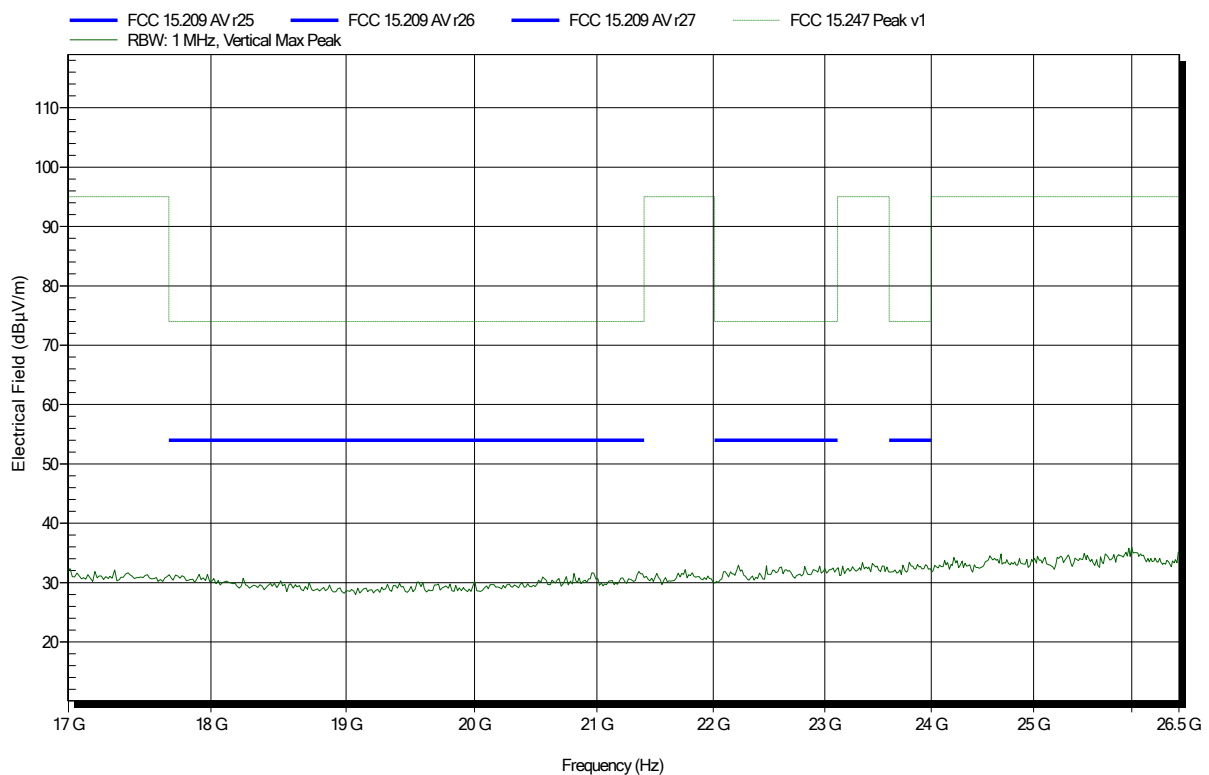


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Amplifier Research AT4560, Vertical
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2440 MHz
Test Date: 2019-10-14
Note:

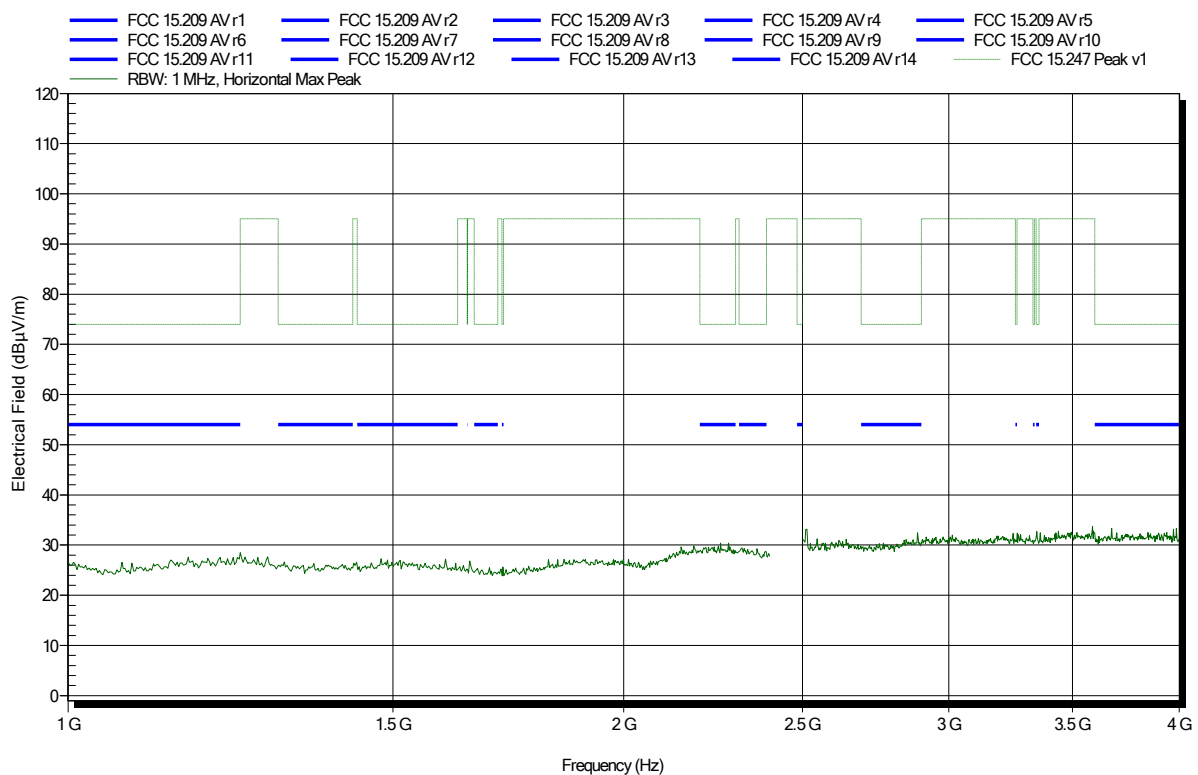
Index 19



Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448
 Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; BLE; 2480 MHz
 Test Date: 2019-10-15
 Note:

Index 20

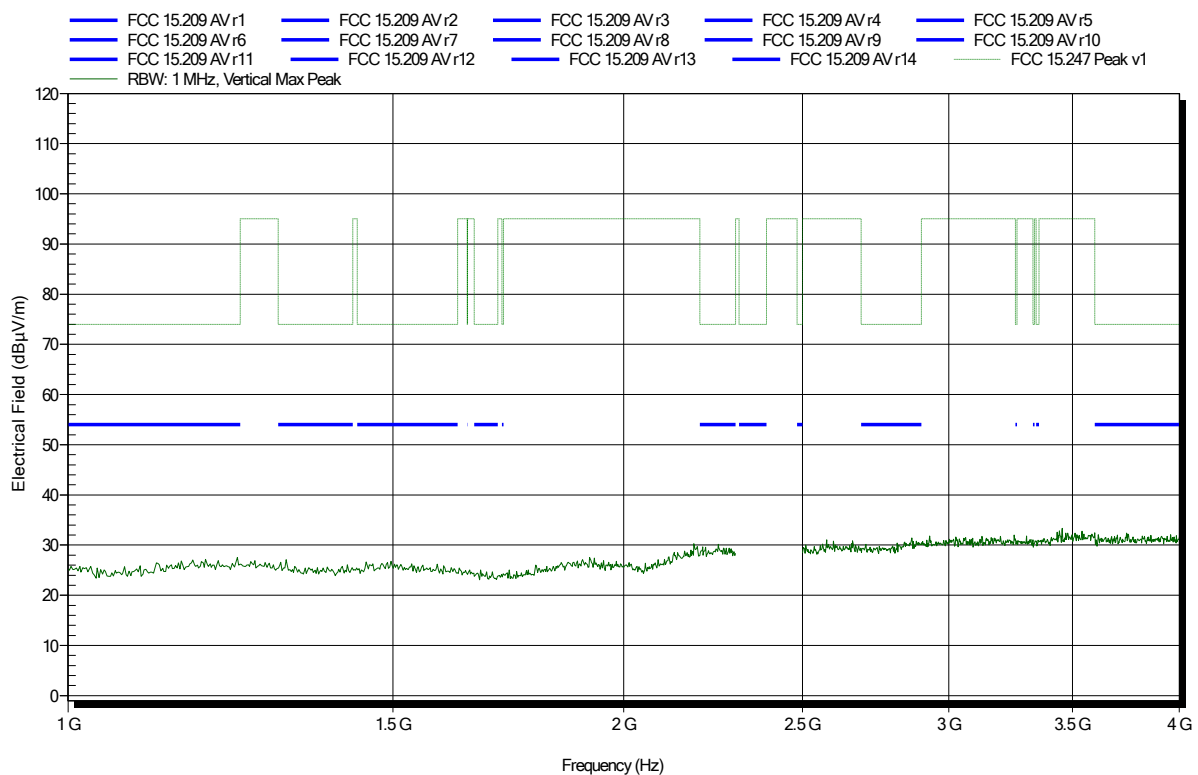


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Schwarzbeck BBHA 9120D, Vertical
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2480 MHz
Test Date: 2019-10-15
Note:

Index 25

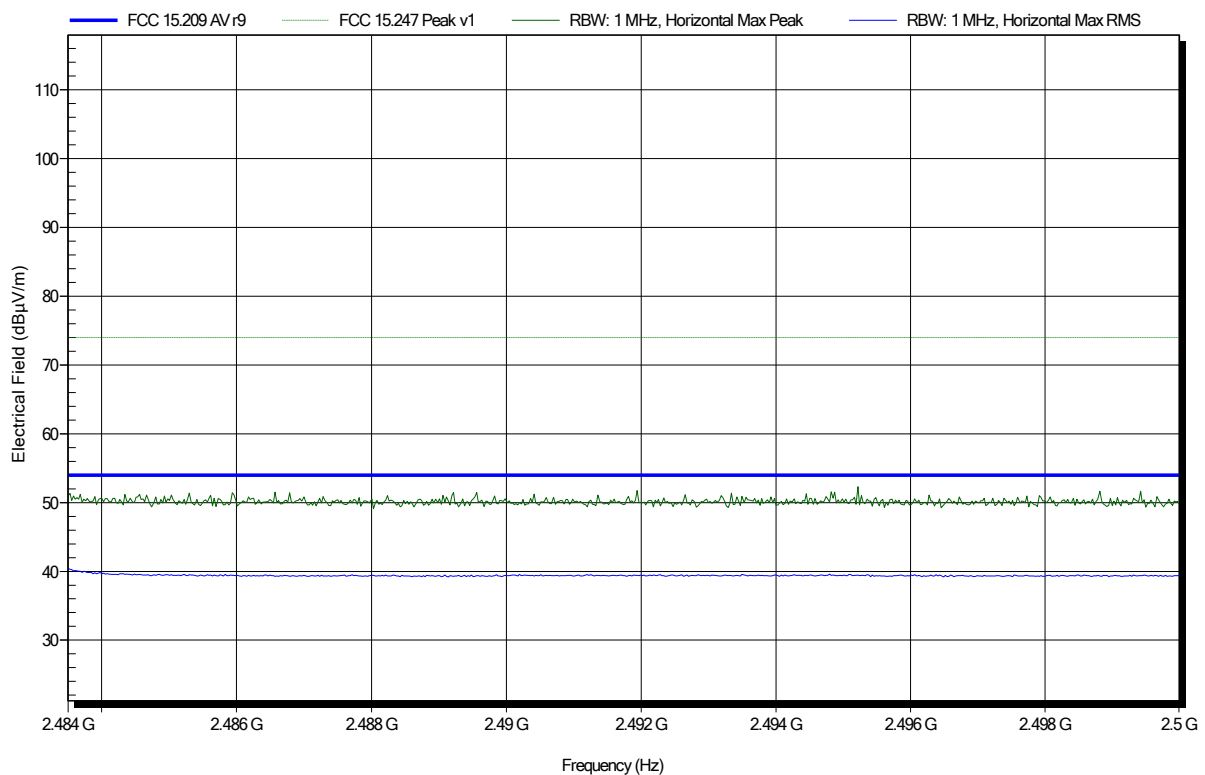


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Schwarzbeck BBHA 9120D, Horizontal
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2480 MHz
Test Date: 2019-10-15
Note: upper bandedge

Index 21

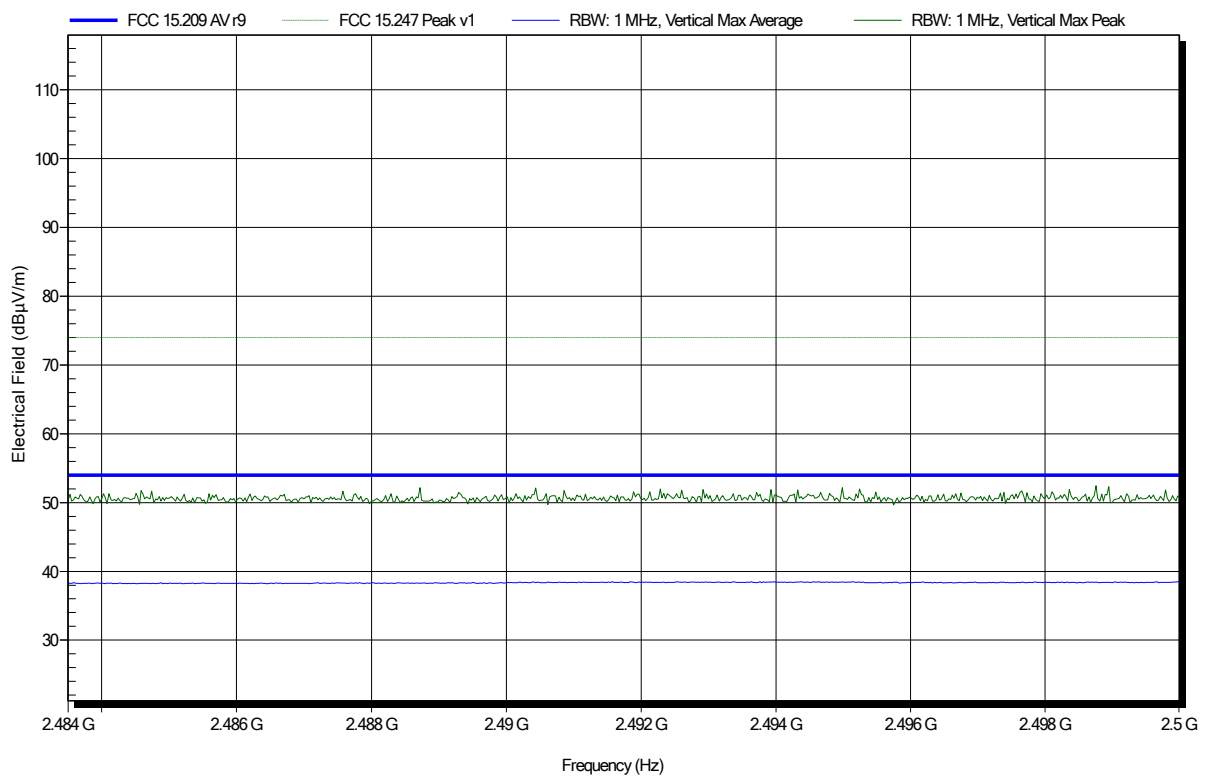


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; BLE; 2480 MHz
 Test Date: 2019-10-15
 Note: upper bandedge

Index 26

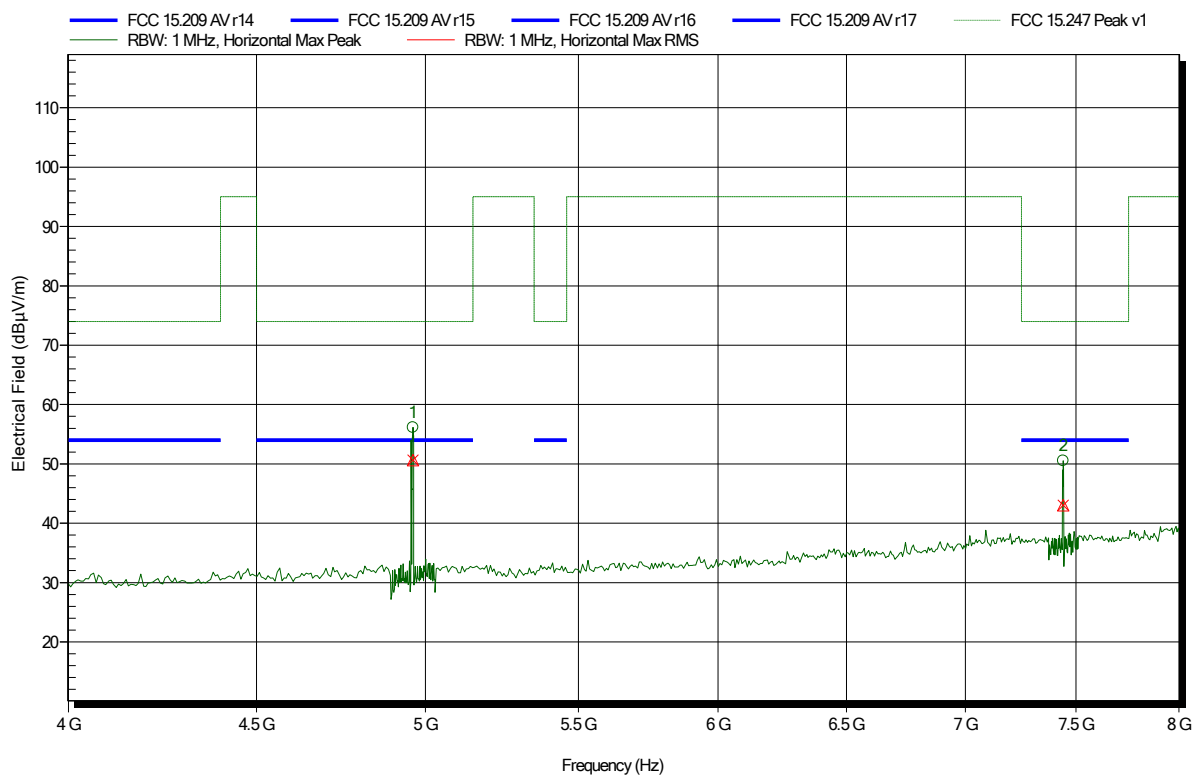


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Schwarzbeck BBHA 9120D, Horizontal
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2480 MHz
Test Date: 2019-10-15
Note:

Index 22



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.961 GHz	56.12 dBµV/m	74 dBµV/m	-17.88 dB	Pass
7.441 GHz	50.53 dBµV/m	74 dBµV/m	-23.47 dB	Pass

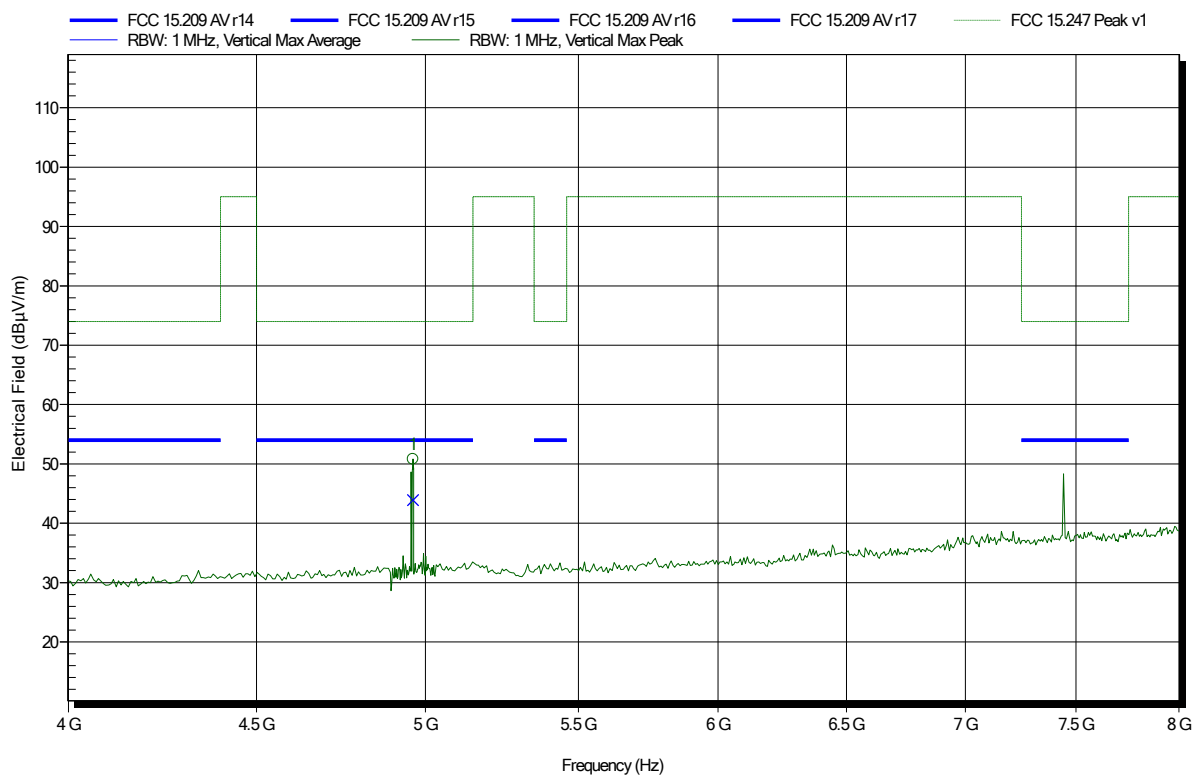
Frequency	RMS	RMS Limit	RMS Difference	RMS Status
4.961 GHz	50.63 dBµV/m	54 dBµV/m	-3.37 dB	Pass
7.441 GHz	43.03 dBµV/m	54 dBµV/m	-10.97 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Schwarzbeck BBHA 9120D, Vertical
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2480 MHz
Test Date: 2019-10-15
Note:

Index 27



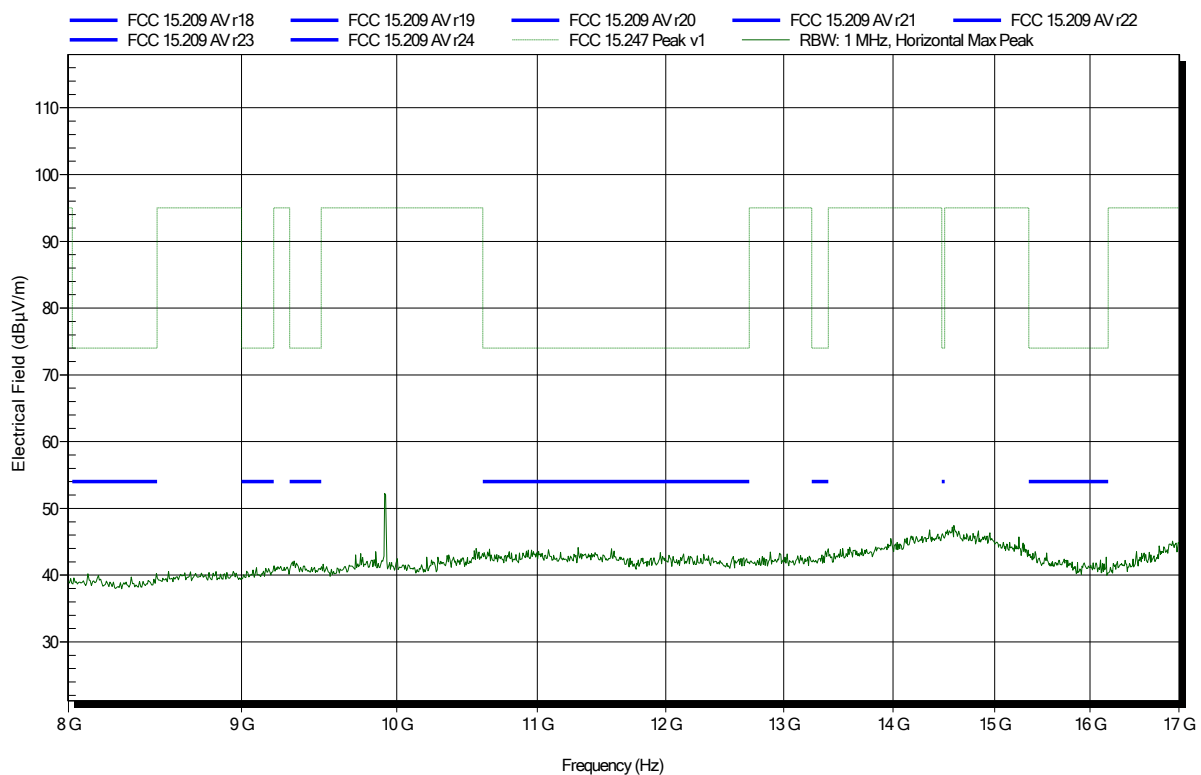
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.961 GHz	50.79 dBµV/m	74 dBµV/m	-23.21 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
4.961 GHz	43.88 dBµV/m	54 dBµV/m	-10.12 dB	Pass

Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448
 Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; BLE; 2480 MHz
 Test Date: 2019-10-15
 Note:

Index 23

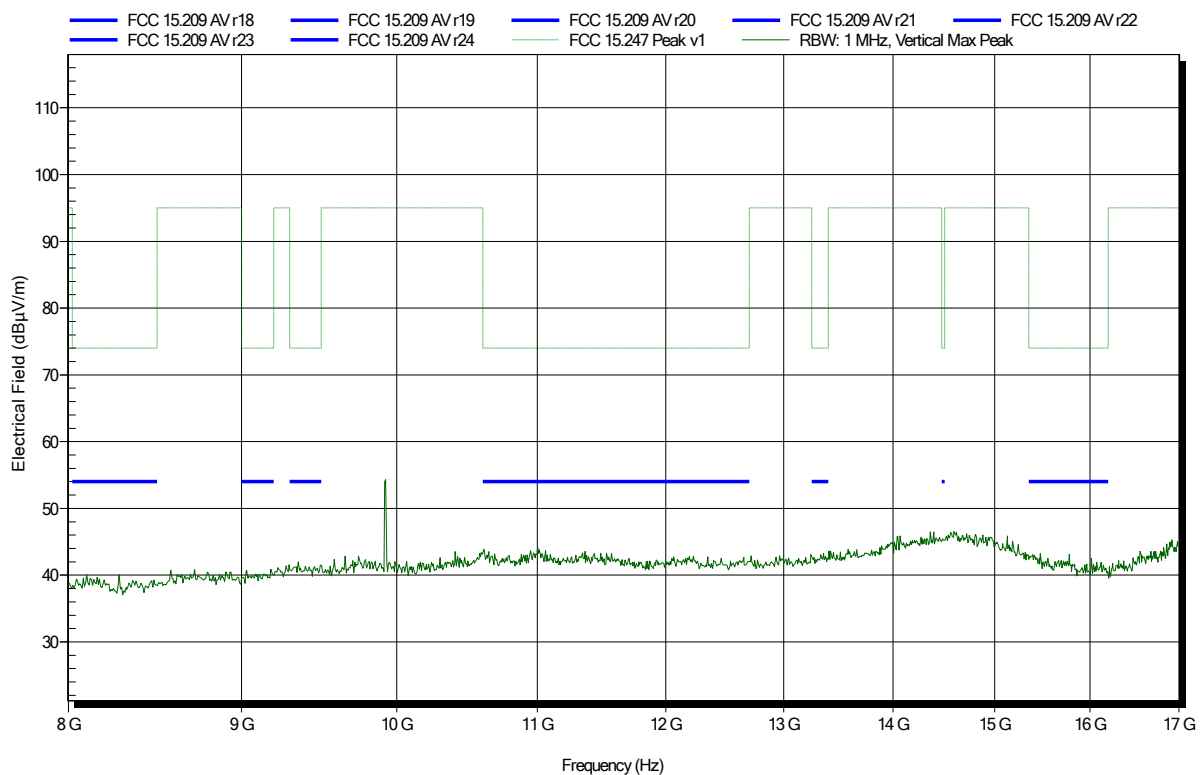


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Schwarzbeck BBHA 9120D, Vertical
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2480 MHz
Test Date: 2019-10-15
Note:

Index 28

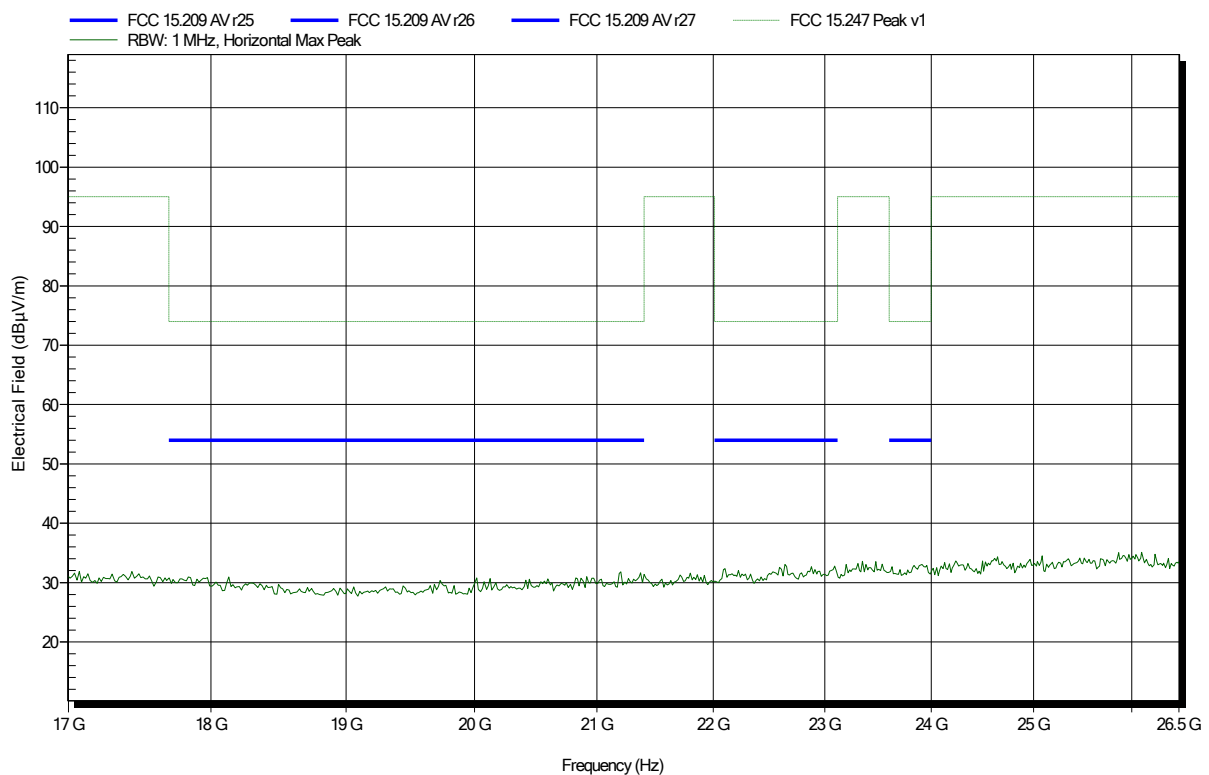


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
 Antenna: Amplifier Research AT4560, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; BLE; 2480 MHz
 Test Date: 2019-10-15
 Note:

Index 24

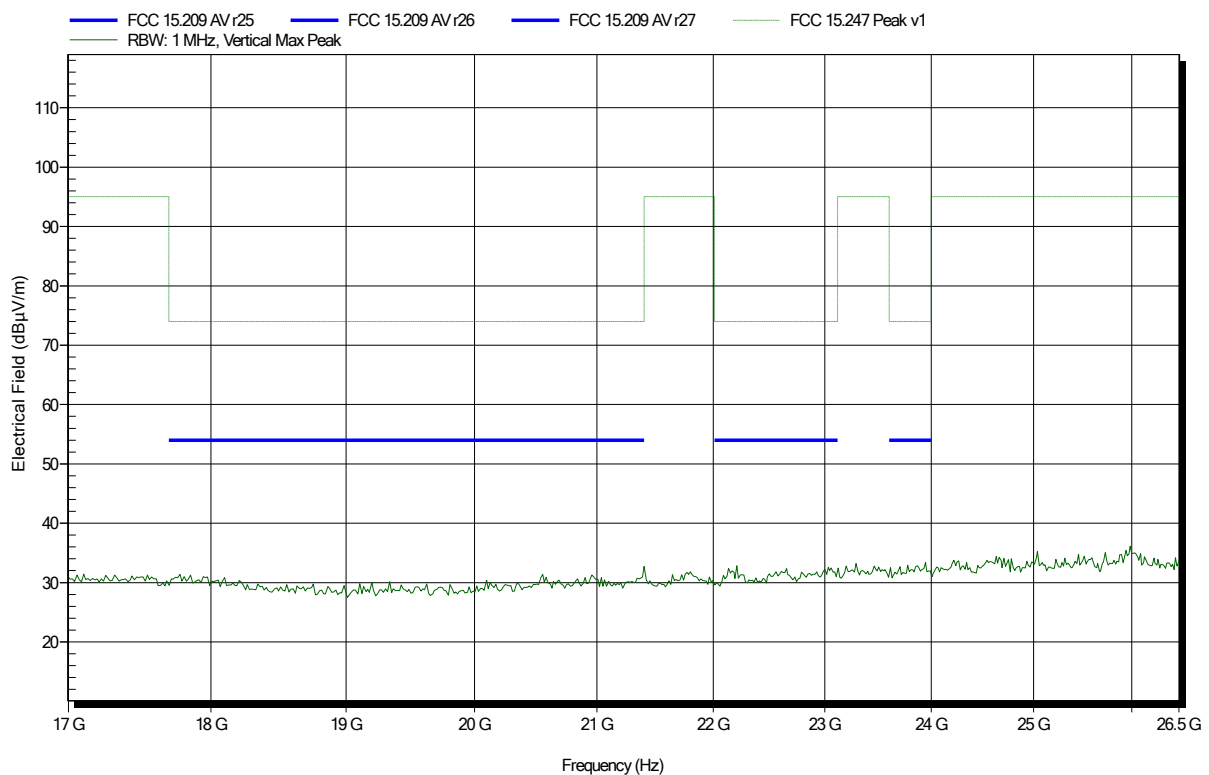


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Amplifier Research AT4560, Vertical
Measurement distance: 1 m converted to 3m
Mode: TX; BLE; 2480 MHz
Test Date: 2019-10-15
Note:

Index 29



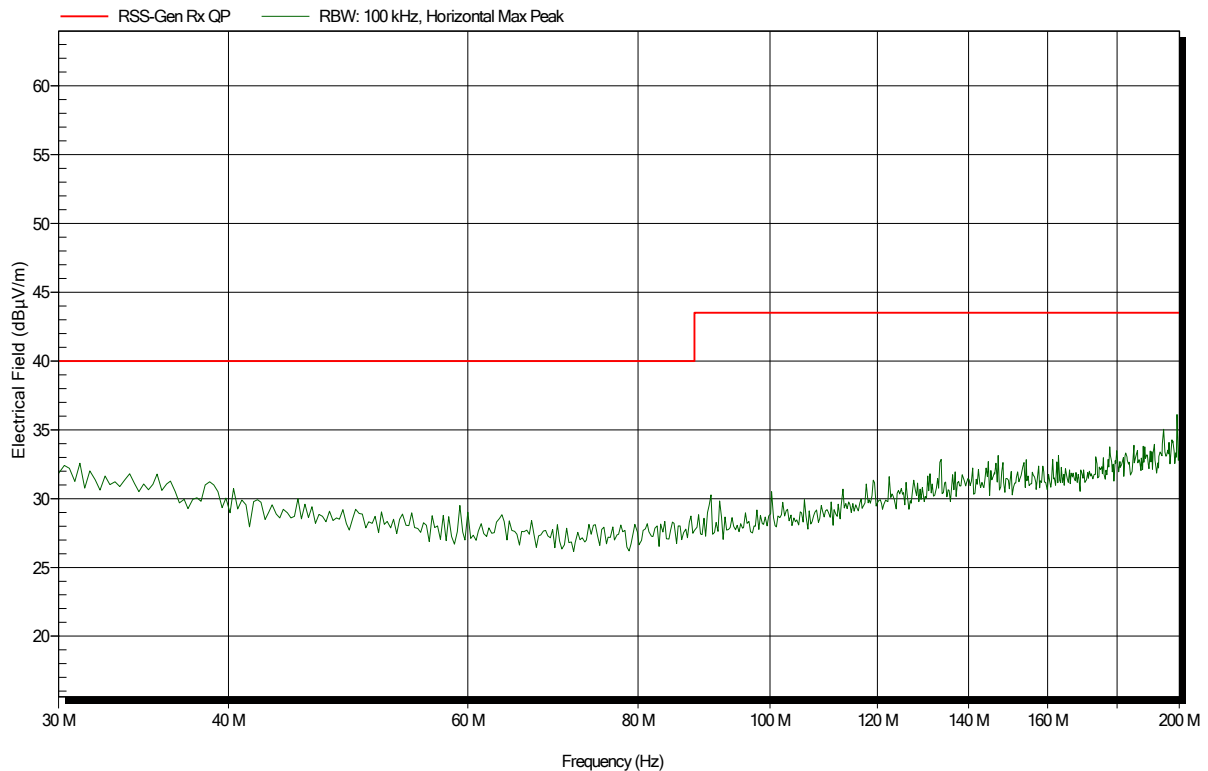
ANNEX B Receiver spurious emissions

Spurious emissions according to ISSED RSS-247 Issue 2 (February 2017)

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
 Antenna: Rohde & Schwarz HK 116, Horizontal
 Measurement distance: 3 m
 Mode: RX; BLE; 2440 MHz
 Test Date: 2019-10-15
 Note:

Index 34

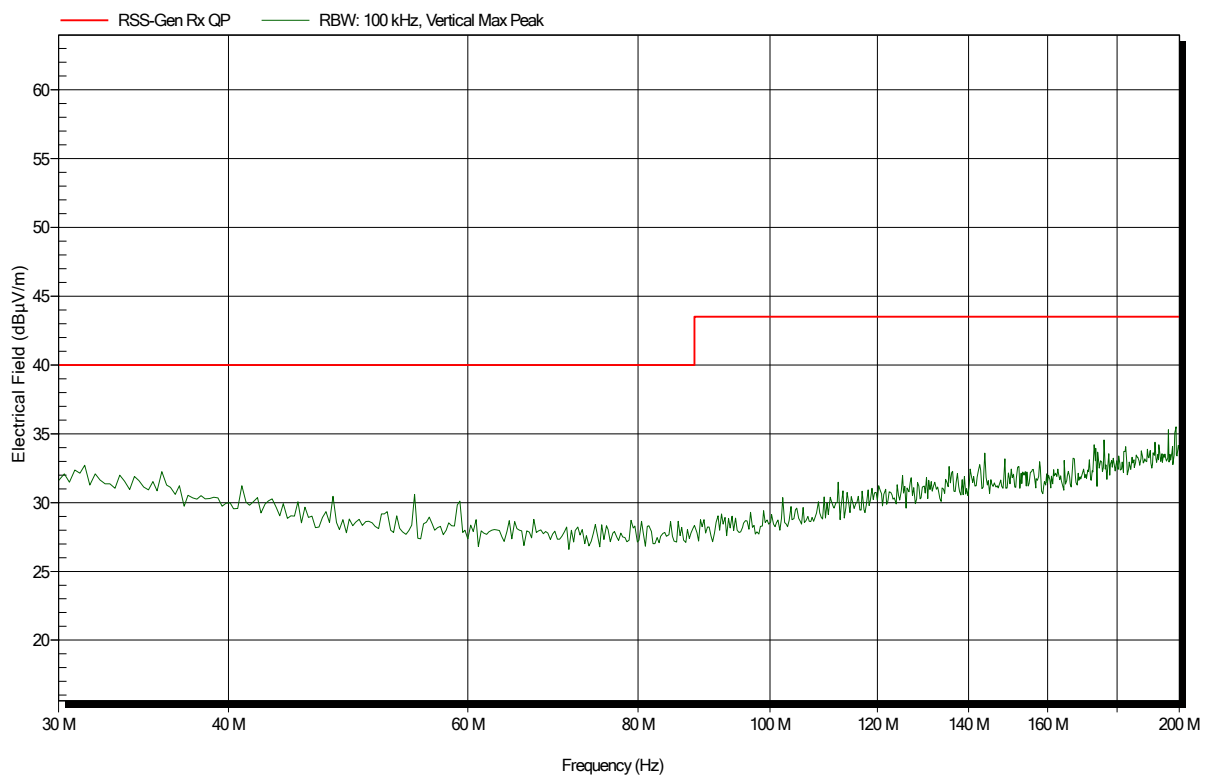


Spurious emissions according to ISSED RSS-247 Issue 2 (February 2017)

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
 Antenna: Rohde & Schwarz HK 116, Vertical
 Measurement distance: 3 m
 Mode: RX; BLE; 2440 MHz
 Test Date: 2019-10-15
 Note:

Index 35

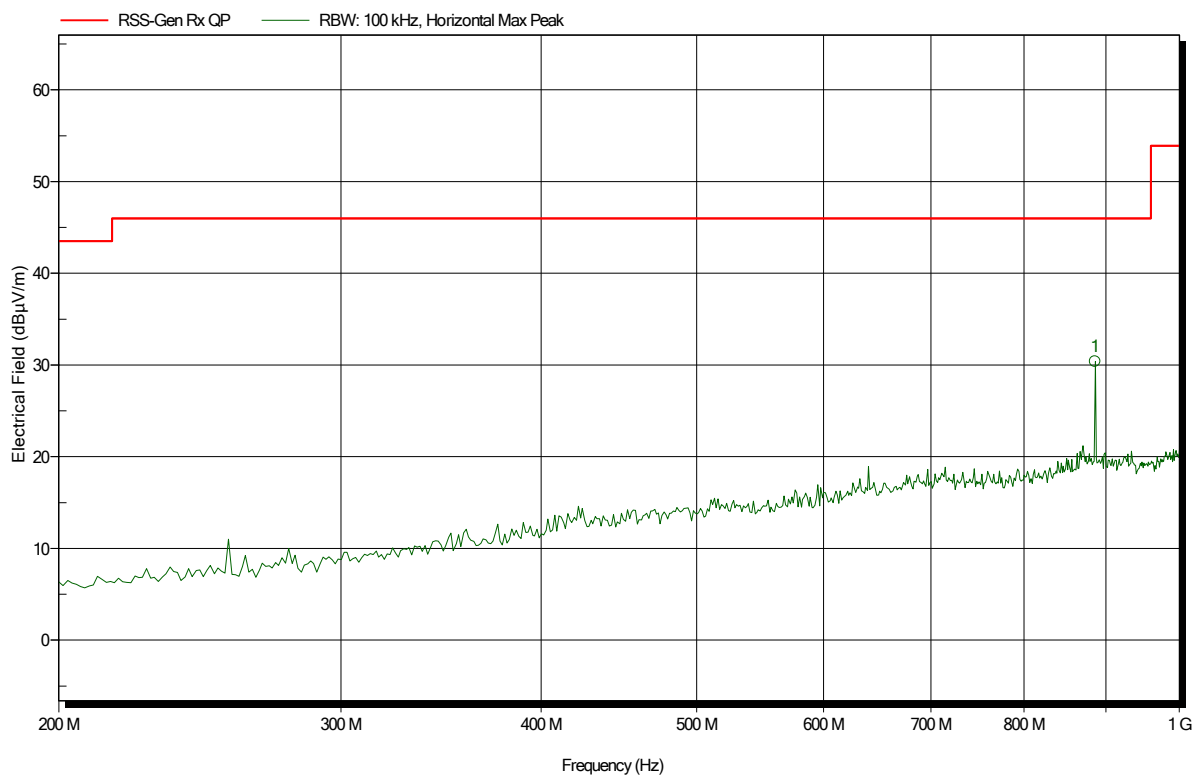


Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
 Antenna: Rohde & Schwarz HL 223, Horizontal
 Measurement distance: 3 m
 Mode: RX; BLE; 2440 MHz
 Test Date: 2019-10-15
 Note:

Index 36



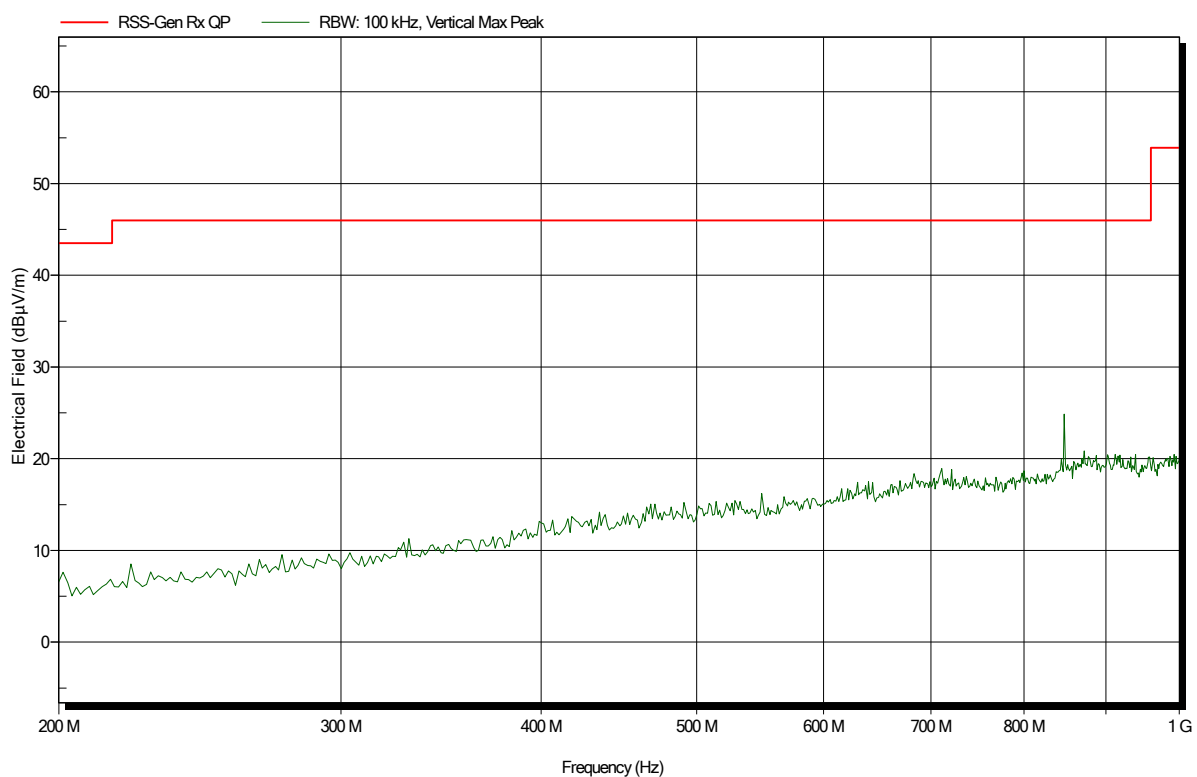
Frequency	Peak	Peak Limit	Peak Difference	Status	Angle	Height
885.897 MHz	30.38 dBµV/m	46 dBµV/m	-15.62 dB	Pass	225 Degree	1.2 m

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Rohde & Schwarz HL 223, Vertical
Measurement distance: 3 m
Mode: RX; BLE; 2440 MHz
Test Date: 2019-10-15
Note:

Index 37

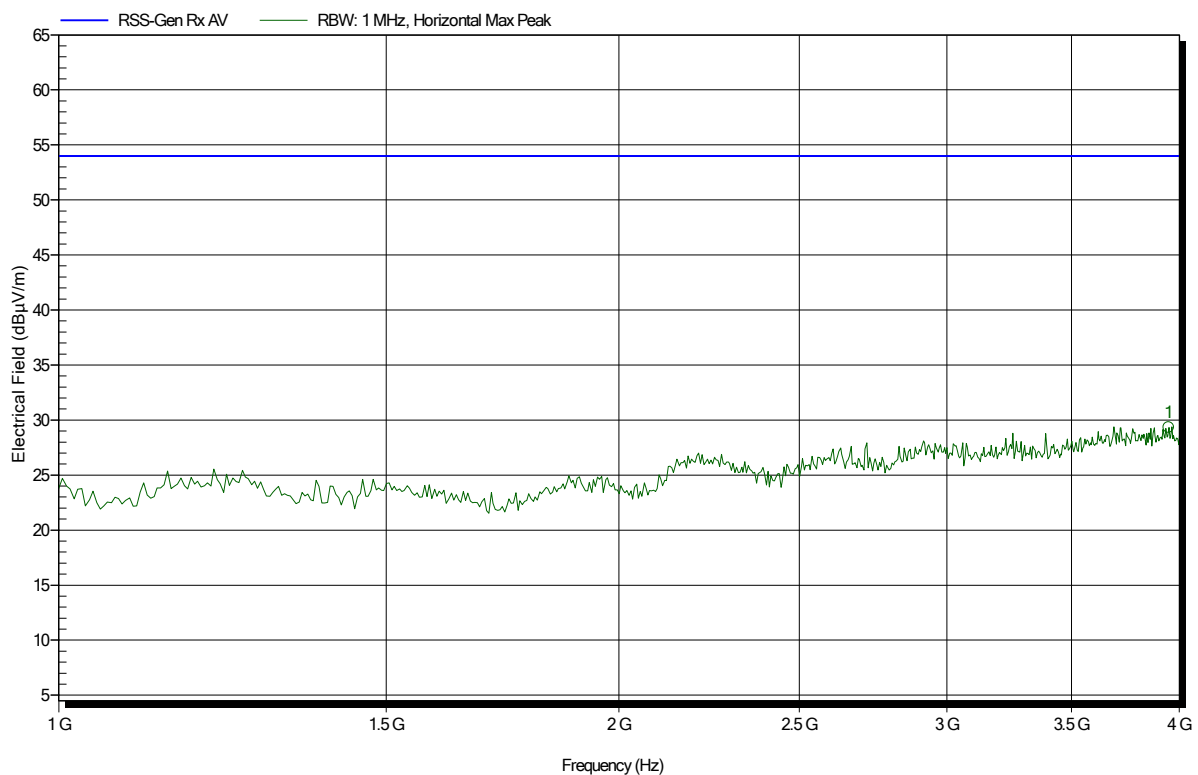


Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 1 m
 Mode: RX; BLE; 2440 MHz
 Test Date: 2019-10-15
 Note:

Index 38



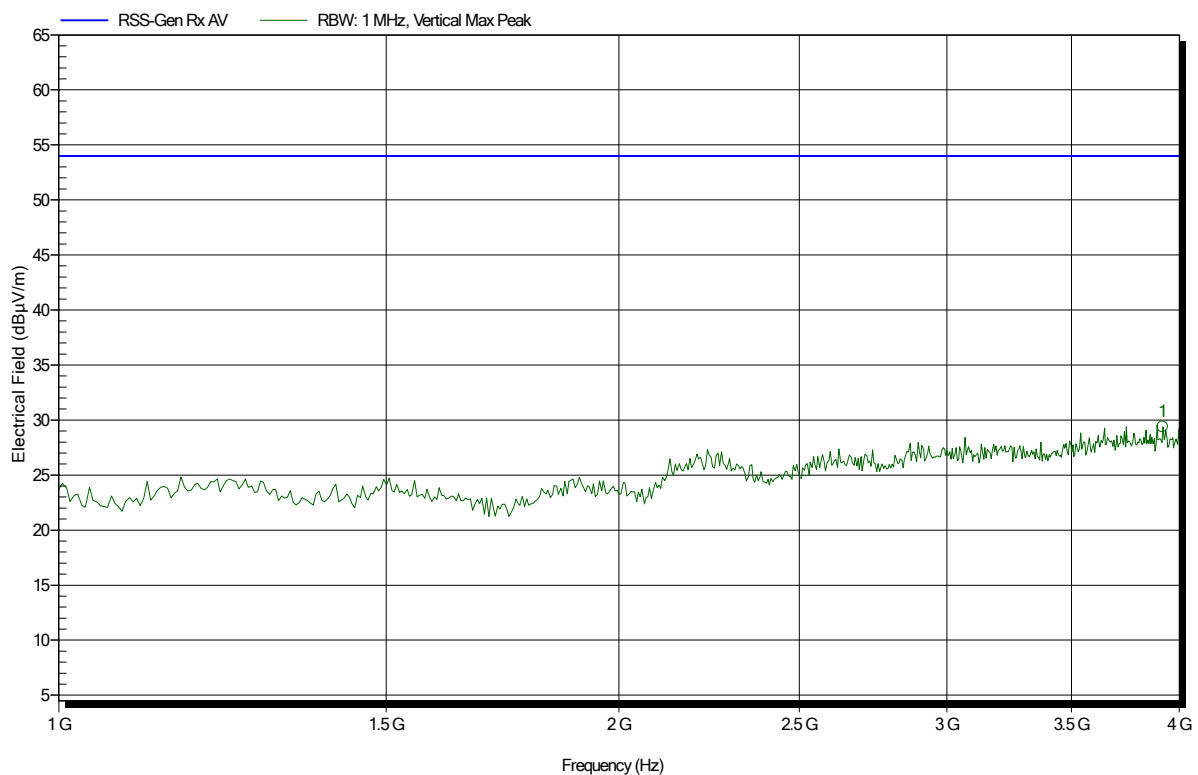
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
3.947 GHz	29.33 dBµV/m	53.98 dBµV/m	-24.65 dB	Pass

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Schwarzbeck BBHA 9120D, Vertical
Measurement distance: 1 m
Mode: RX; BLE; 2440 MHz
Test Date: 2019-10-15
Note:

Index 41



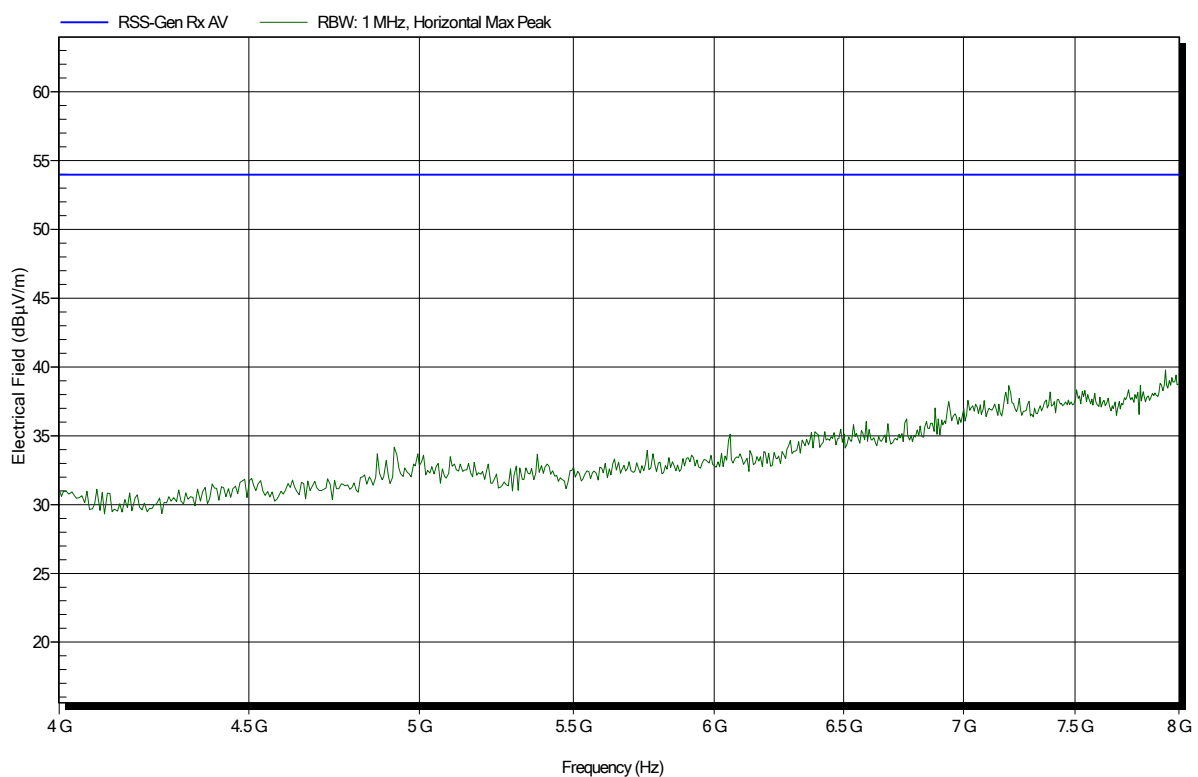
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
3.918 GHz	29.4 dBμV/m	53.98 dBμV/m	-24.58 dB	Pass

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 1 m
 Mode: RX; BLE; 2440 MHz
 Test Date: 2019-10-15
 Note:

Index 39

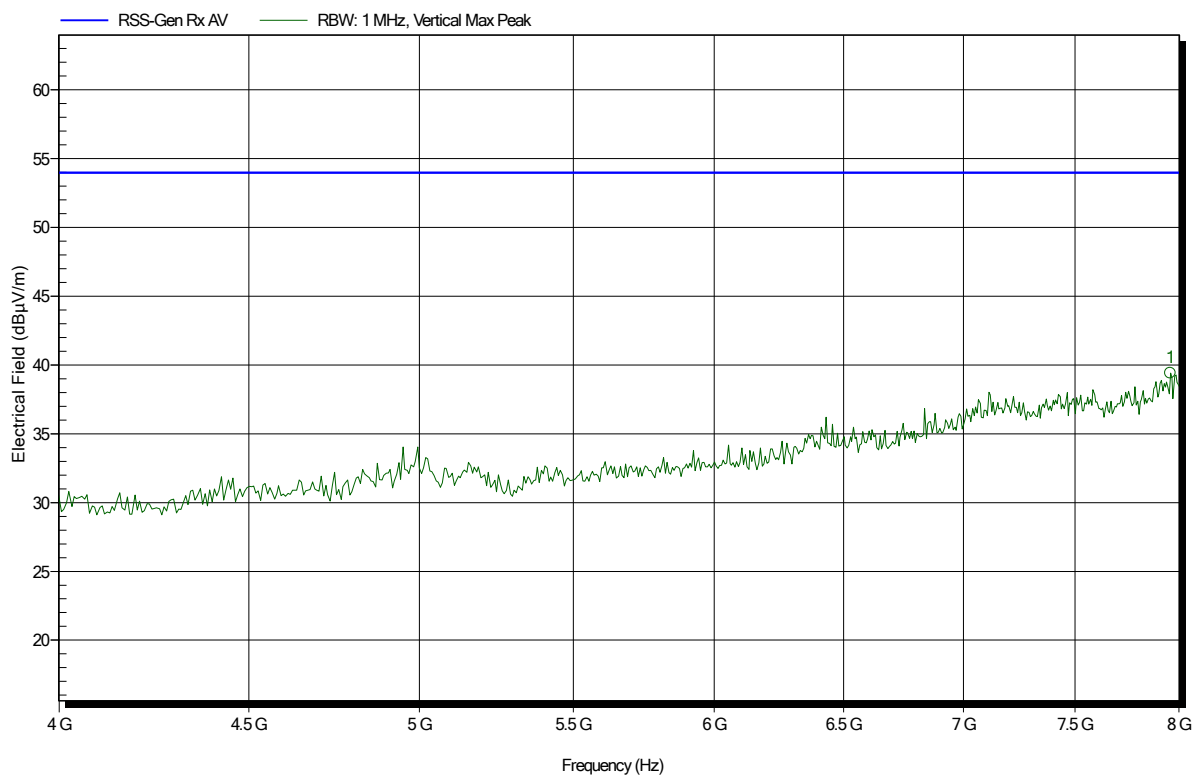


Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Schwarzbeck BBHA 9120D, Vertical
Measurement distance: 1 m
Mode: RX; BLE; 2440 MHz
Test Date: 2019-10-15
Note:

Index 42



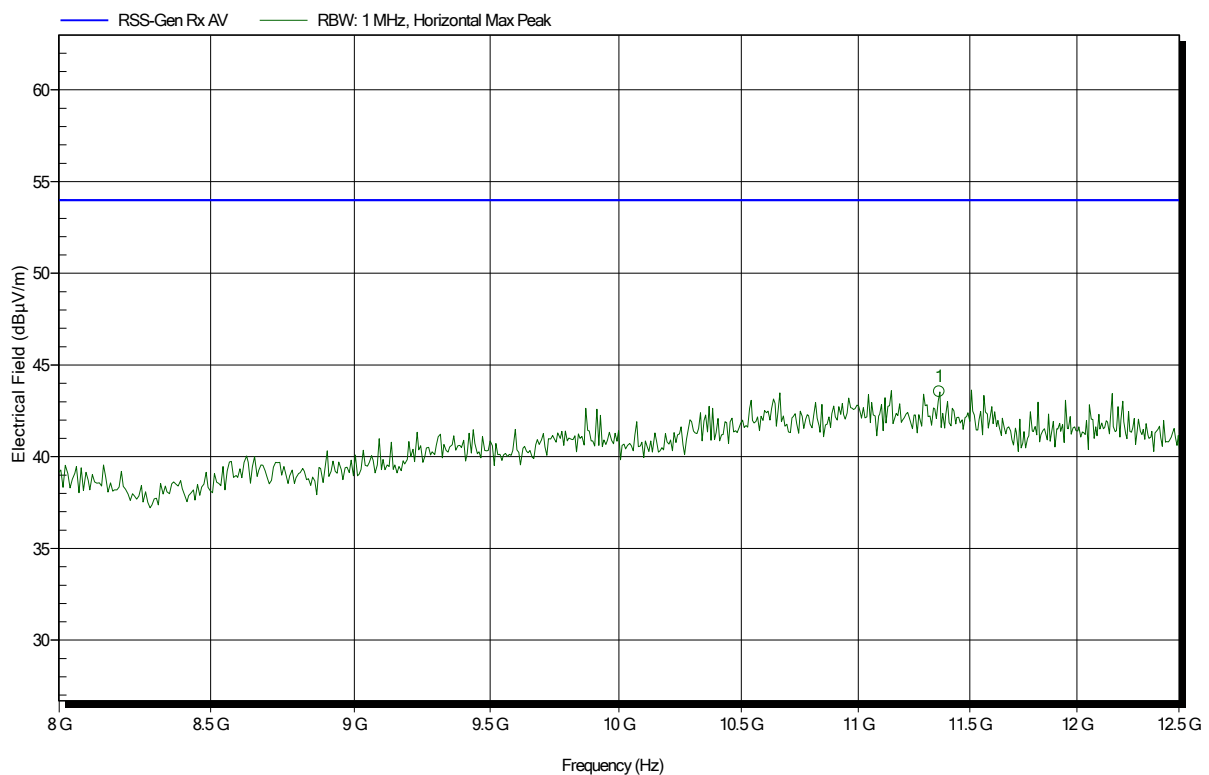
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
7.955 GHz	39.41 dBµV/m	53.98 dBµV/m	-14.57 dB	Pass

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Wilfried Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
Antenna: Schwarzbeck BBHA 9120D, Horizontal
Measurement distance: 1 m converted to 3m
Mode: RX; BLE; 2440 MHz
Test Date: 2019-10-15
Note:

Index 40



Frequency	Peak	Peak Limit	Peak Difference	Status
11.361 GHz	43.55 dBµV/m	53.98 dBµV/m	-10.43 dB	Pass

Spurious emissions according to ISED RSS-247 Issue 2 (February 2017)

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Wilfried Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.6V DC
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: RX; BLE; 2440 MHz
 Test Date: 2019-10-15
 Note:

Index 44

