

RADIO REPORT FCC 47 CFR Part 15C ISED Canada RSS-247 Digital transmission systems operating within the 902 – 928 MHz band	
Report Reference No	G0M-1909-8448-TFC247FH-V03
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	    DAkkS - Registration number : D-PL-12092-01-03 (ISED) ISED Testing Laboratory site: 3470A-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	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	2019-10-14	
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	78	
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	2020-07-24	Initial Release	
02	2020-09-07	Replaced document: G0M-1909-8448-TFC247FH-V01 Replaced by: G0M-1909-8448-TFC247FH-V02 Reason: Typo because of operating band frequency	W. Treffke
03	2020-10-19	Replaced document: G0M-1909-8448-TFC247FH-V02 Replaced by: G0M-1909-8448-TFC247FH-V03 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

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1 Equipment (Test Item) Under Test

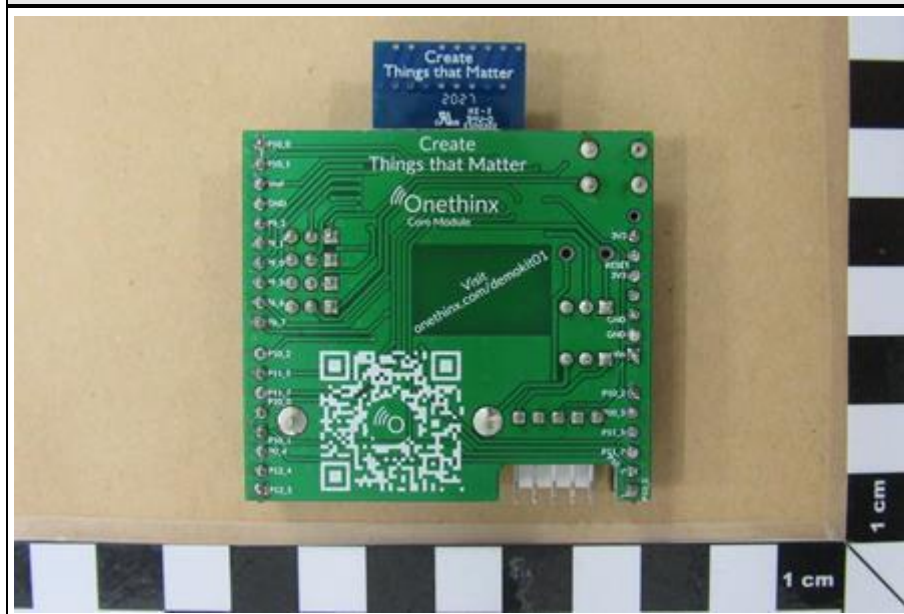
Description	Onethinx Core LoRaWAN module	
Model	OTX-18	
Additional Model(s)	None	
Brand Name(s)	None	
Serial Number(s)	None	
Hardware Version(s)	V18.02	
Software Version(s)	0x000000B4	
PMN	n/a	
HVIN	n/a	
FVIN	n/a	
HMN	n/a	
FCC-ID	2AUBKOTX-18	
IC	n/a	
Equipment type	Radio Module	
Radio type	Transceiver	
Assigned frequency bands	902.0 - 928.0 MHz	
Radio technology	LoRa Frequency Hopping	
Modulation	LoRa (Chirp)	
Number of antenna ports	1	
Antenna	Type	Integrated
	Model	PCB antenna
	Manufacturer	Onethinx
	Gain	0 dBi (declared by applicant)
Supply Voltage	V _{NOM}	3.3 VDC
Operating Temperature	T _{NOM}	23 °C
AC/DC-Adaptor	Model	None
Manufacturer	Onethinx Punterweg 2 8042 PB Zwolle NETHERLANDS	

1.1 Photos – Equipment External

Evaluation board with LoRa module Top View



Evaluation board with LoRa module Bottom View



EUT LoRa module Top View



EUT LoRa module Top View

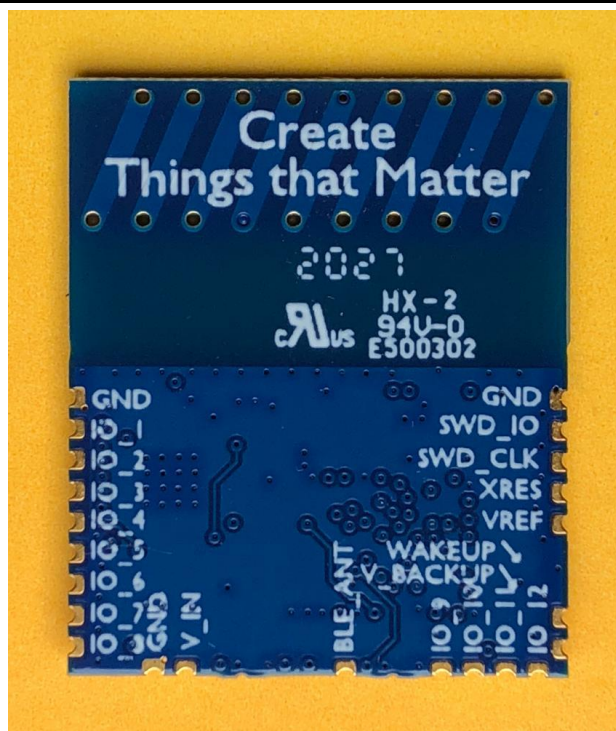


1.2 Photos – Equipment Internal

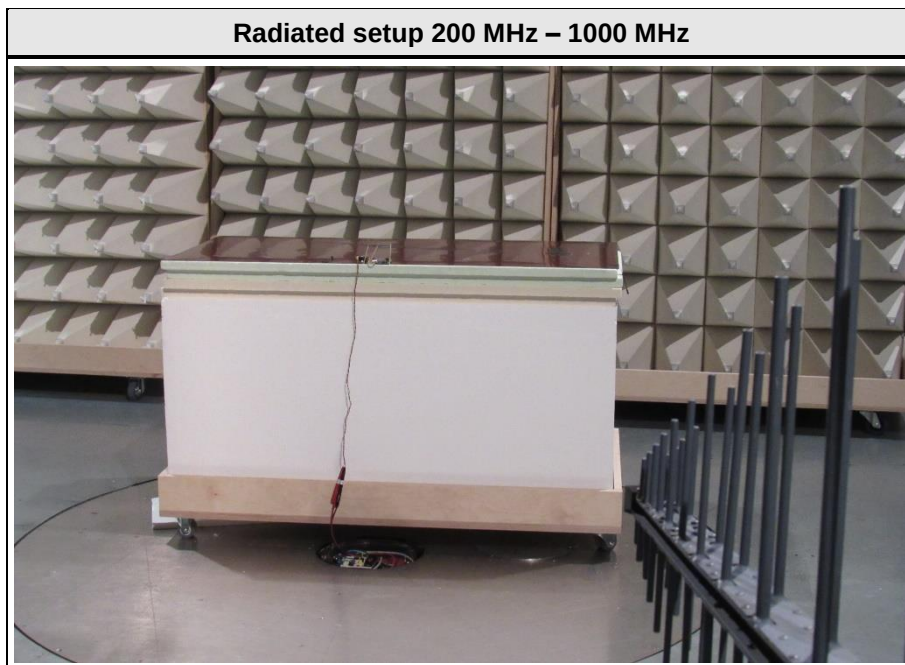
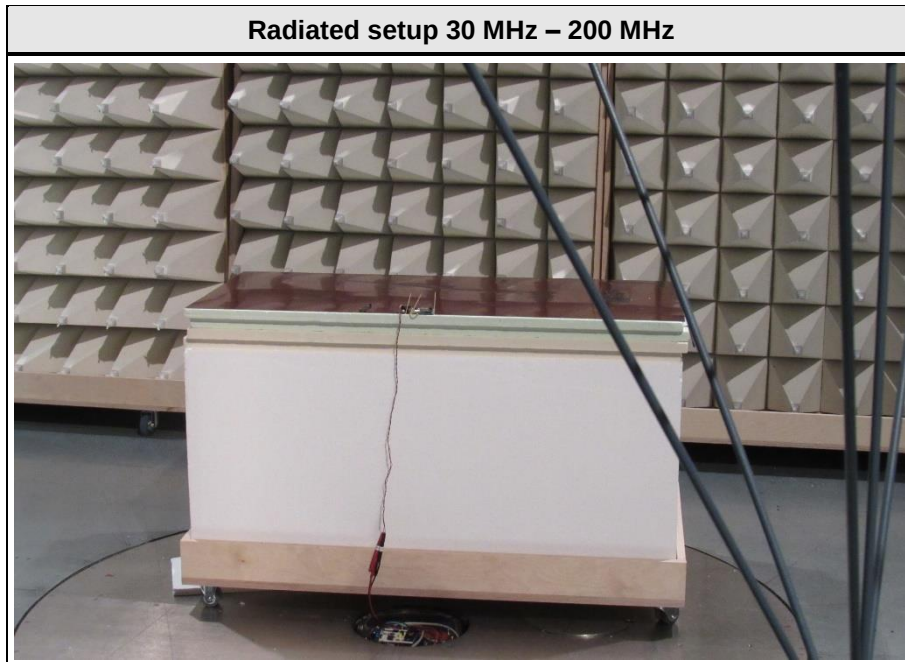
LoRaWAN Module without Shielding Top View



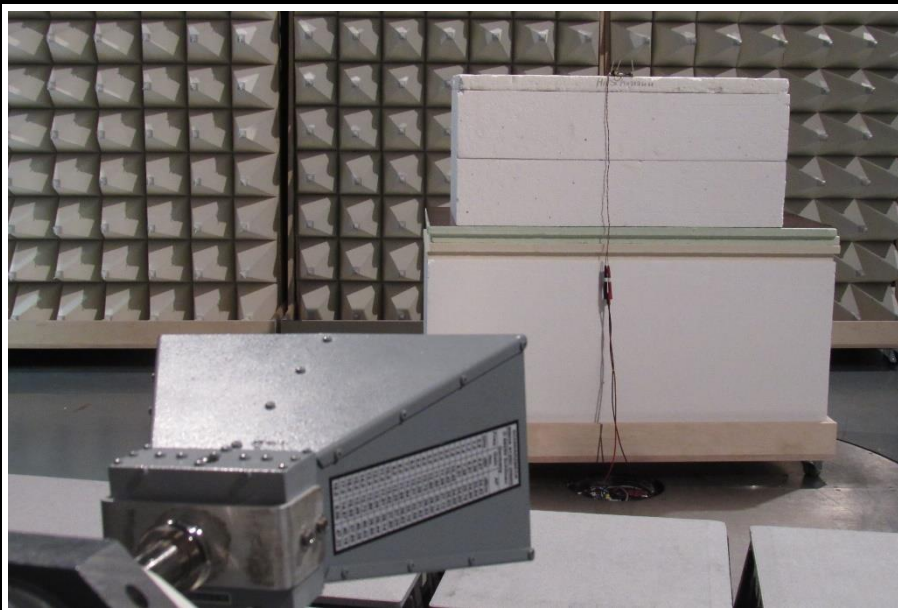
LoRaWAN Module without Shielding Bottom View



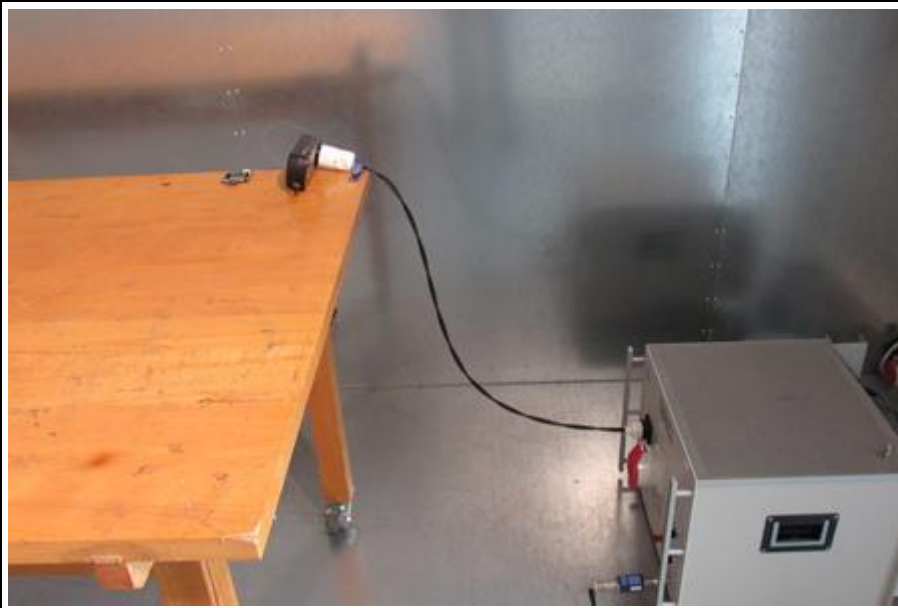
1.3 Photos – Test Setup



Radiated setup 1 GHz – 10 GHz



Conducted Setup



1.4 Support Equipment

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

1.5 Test mode duty cycle

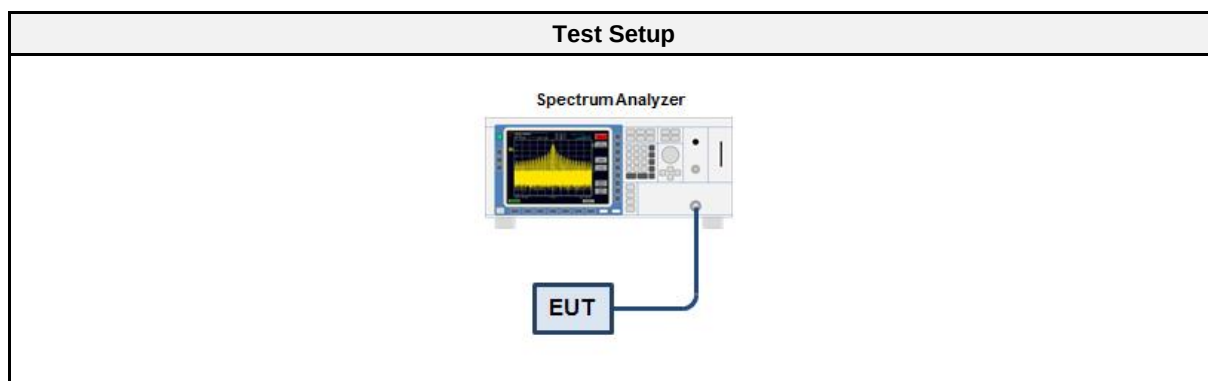
1.5.1 Information

Test Information	
Measurement Method	ANSI C63.10 11.6

1.5.2 Requirements

Requirements	
Duty cycle	Duty cycle correction
$\geq 98 \%$	No correction required
$< 98 \%$	Correction required ($10 \times \log_{10}(1/DC)$)

1.5.3 Setup



1.5.4 Equipment

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

1.5.5 Procedure

Test Procedure
1. EUT set to test mode 2. Span is set to zero span 3. Detector set to peak 4. Sweep time is set long enough to capture at least 5 bursts 5. Envelope peak value of emission spectrum is selected 6. The maximum burst duration T_{ON} is measured using two markers set to the start and the end of the longest burst 7. The minimum idle duration T_{OFF} is measured using two markers set to the start and the end of the shortest idle period 8. The duty cycle is calculated by $DC = T_{ON} / (T_{ON} + T_{OFF})$ 9. The duty cycle correction is calculated by $DC = 10 \times \log_{10}(T_{ON} / (T_{ON} + T_{OFF}))$

1.5.6 Results

Duty Cycle Results		
Mode	Duty Cycle	Correction Factor [dB]
Single	100%	0

1.6 Test Modes

Mode	Description
Transmit	Mode = Transmit single frequency Modulation = LoRa Duty cycle = 100 %
Hopping	Mode = Transmit hopping mode Modulation = LoRa Duty cycle = 8.3 %
Comment:	

1.7 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Tx / Rx	0	902.3
F2	Tx / Rx	31	908.5
F3	Tx / Rx	63	914.9

1.8 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)(1) ISED RSS-247 § 5.1 Issue 2	20 dB Bandwidth	ANSI C63.10-2013	PASS	
FCC § 15.247(a)(1)(iii) ISED RSS-247, Issue 2 (section 5.1)	Number of hopping frequencies	ANSI C63.10-2013	PASS	
FCC § 15.247(a)(1) ISED RSS-247, Issue 2 (section 5.1)	Frequency hopping channel separation	ANSI C63.10-2013	PASS	
FCC § 15.247(a)(1)(iii) ISED RSS-247, Issue 2 (section 5.1)	Time of occupancy (Dwell time)	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 § 15.207 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	N/T	
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

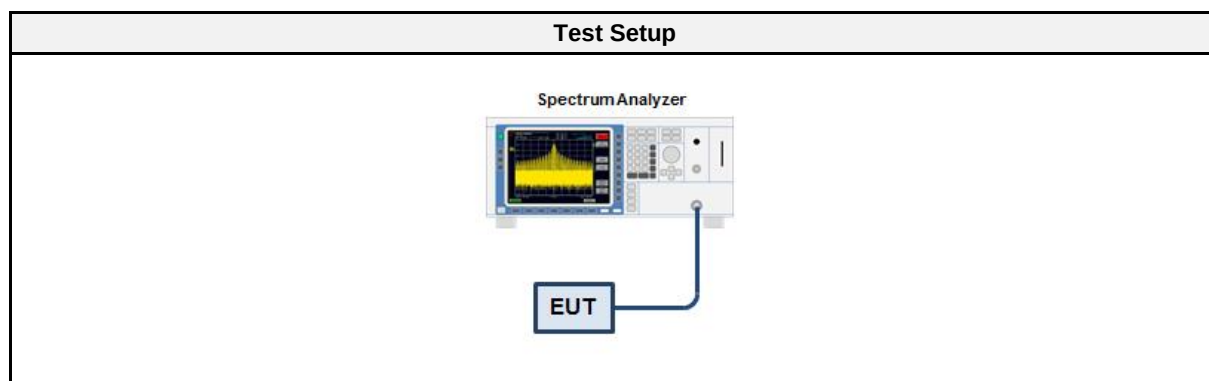
3.1.1 Information

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	2020-07-17

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

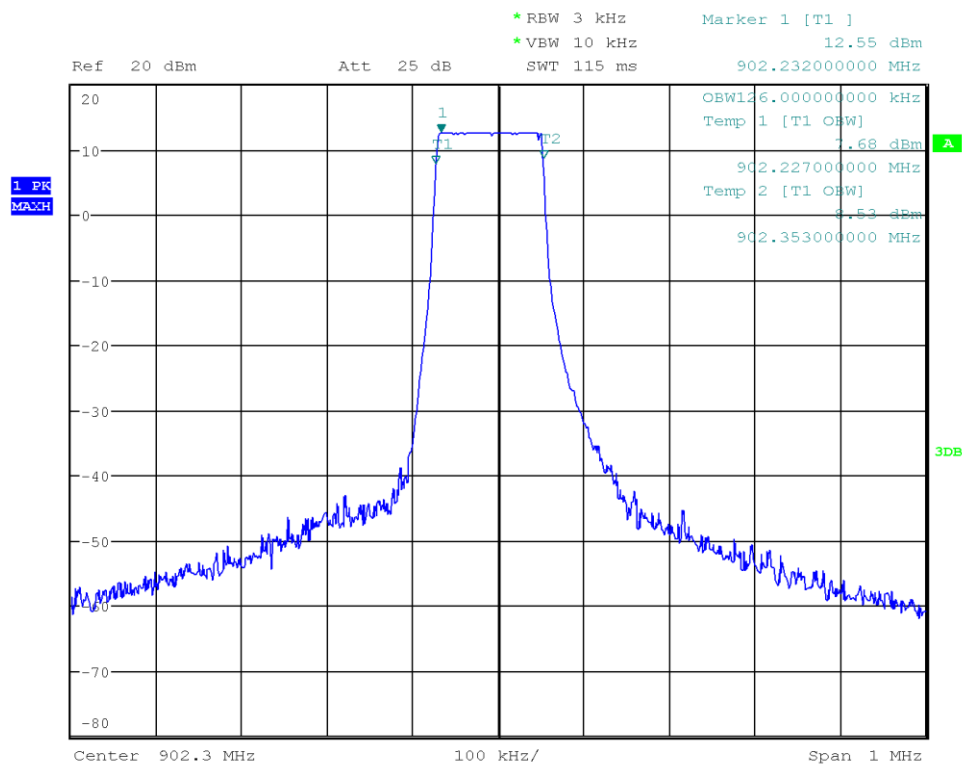
Test Procedure
1. EUT transmitter is activated in test mode under normal conditions 2. The spectrum analyzer is set to peak detection and maximum hold with a span twice the emission spectrum 3. The resolution bandwidth is set to the range of 1 % to 5 % of the occupied bandwidth 4. The occupied bandwidth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

3.1.6 Results

Test Results		
Mode	Frequency [MHz]	Bandwidth [MHz]
Transmit	902.3	0.126
Transmit	908.5	0.126
Transmit	914.9	0.126

Occupied Bandwidth

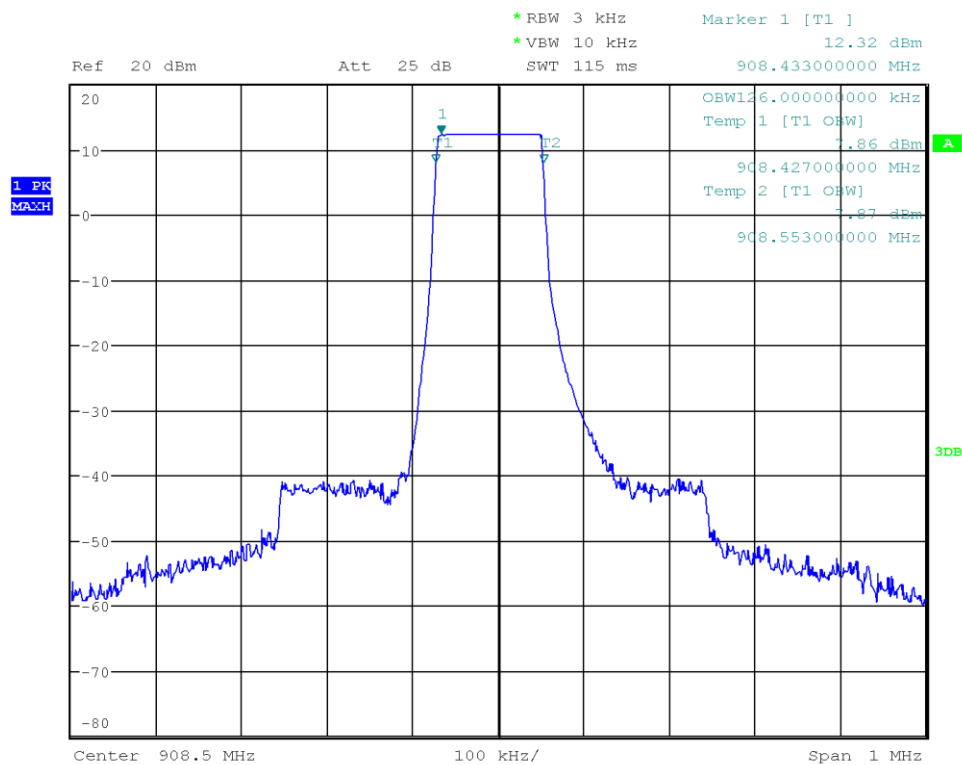
Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: LoRa, Channel: 902.3 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-17
 Occupied Bandwidth [MHz]: 0.126



Date: 17.JUL.2020 10:38:28

Occupied Bandwidth

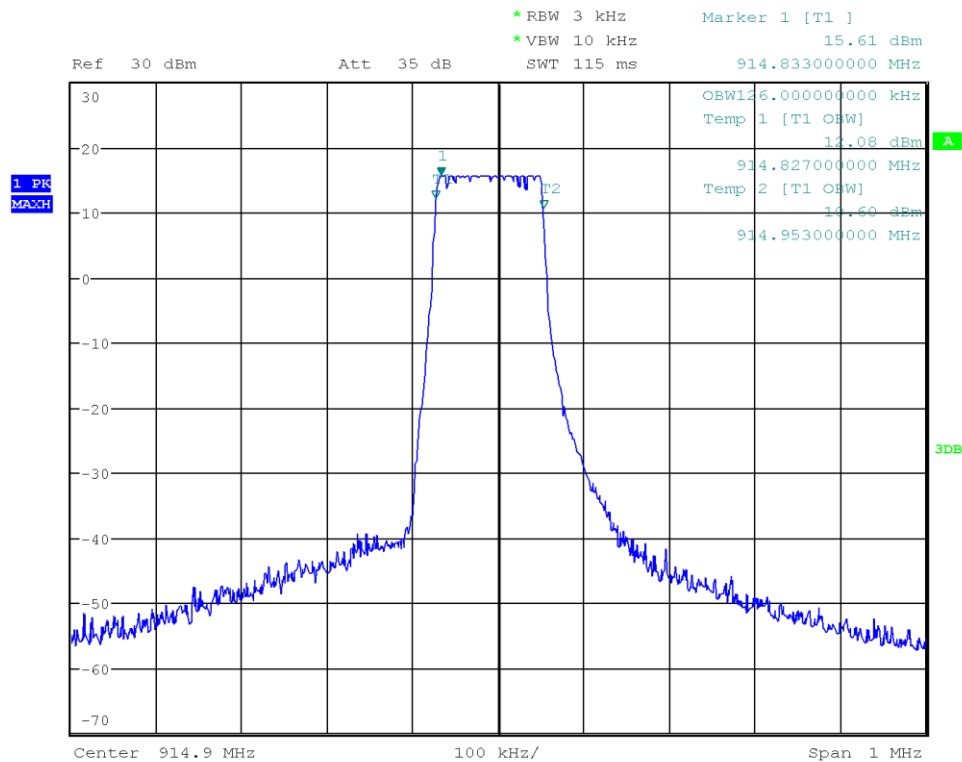
Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: LoRa, Channel: 908.5 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-17
 Occupied Bandwidth [MHz]: 0.126



Date: 17.JUL.2020 10:40:01

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: LoRa, Channel: 914.9 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-17
 Occupied Bandwidth [MHz]: 0.126



Date: 17.JUL.2020 10:41:43

3.2 Test Conditions and Results - 20 dB bandwidth

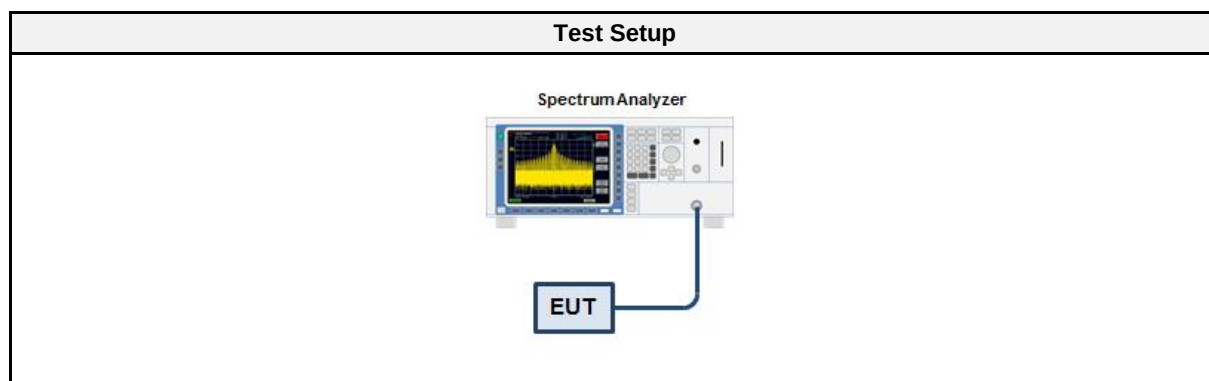
3.2.1 Information

Test Information	
Reference	FCC 15.247(a)(1) / ISSED RSS-247 5.1
Measurement Method	ANSI C63.10 6.9.2
Measurement Uncertainty	$\pm 1.26 \%$
Operator	Wilfried Treffke
Date	2020-07-17

3.2.2 Limits

Limits	
Condition	Limit
Number of hopping channels ≥ 50 , Time of occupancy ≤ 0.4 s within 20 s	20 dB BW < 250 kHz
Number of hopping channels ≥ 25 , Time of occupancy ≤ 0.4 s within 10 s	250 kHz $\leq$ 20 dB BW < 500 kHz

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

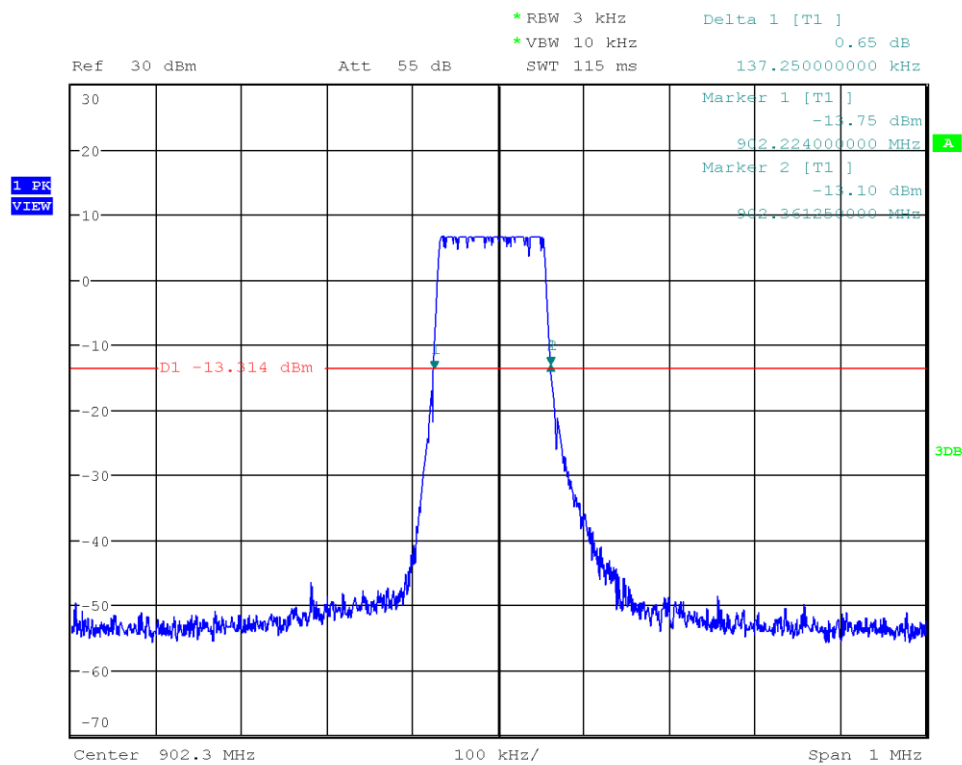
Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Span set to at least twice the emission spectrum 3. Detector set to peak and max hold 4. Envelope peak value of emission spectrum is selected 5. Marker on envelope of spectrum is set to level of -20 dB to the left of the peak 6. Marker on envelope of spectrum is set to level of -20 dB to the right of the peak 7. 20dB Bandwidth is determined by marker frequency separation

3.2.6 Results

Test Results		
Mode	Frequency [MHz]	Bandwidth [MHz]
Transmit	902.3	0.137
Transmit	908.5	0.137
Transmit	914.9	0.136

20 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 6.9.2
 Operational Mode: LoRa, single, Channel: 902.3 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-17
 Lower Frequency [MHz]: 902.224
 Upper Frequency [MHz]: 902.361
 20 dB Bandwidth [kHz]: 137



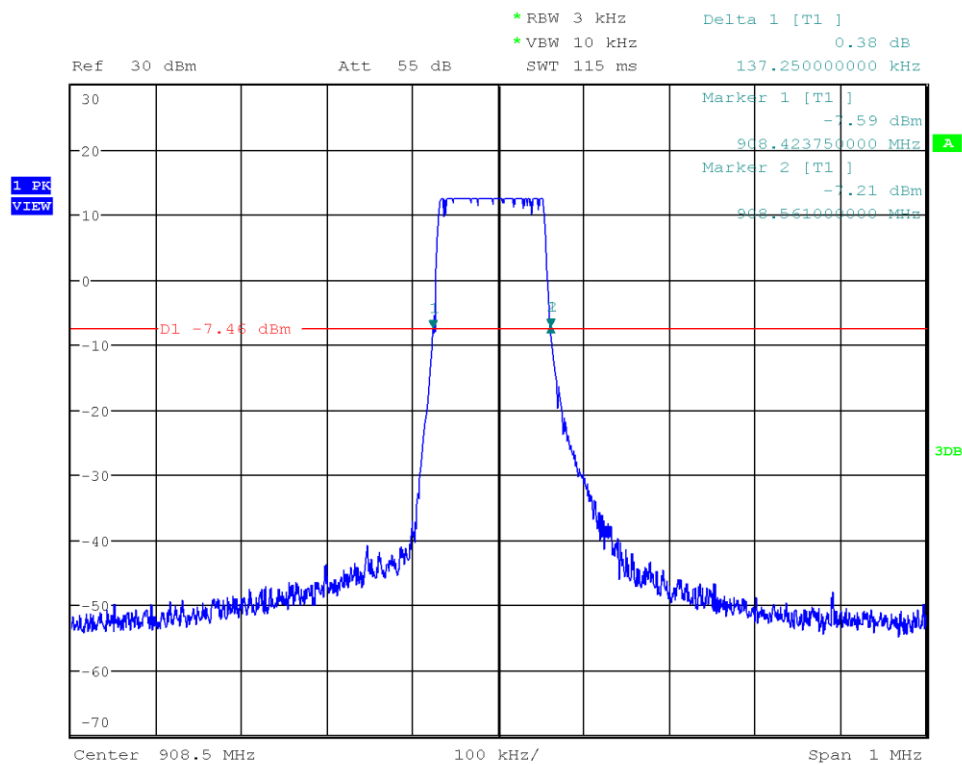
Date: 17.JUL.2020 11:48:27

Test Report No.: G0M-1909-8448-TFC247FH-V03

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

20 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 6.9.2
 Operational Mode: LoRa, single, Channel: 908.5 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-17
 Lower Frequency [MHz]: 908.424
 Upper Frequency [MHz]: 908.561
 20 dB Bandwidth [kHz]: 137



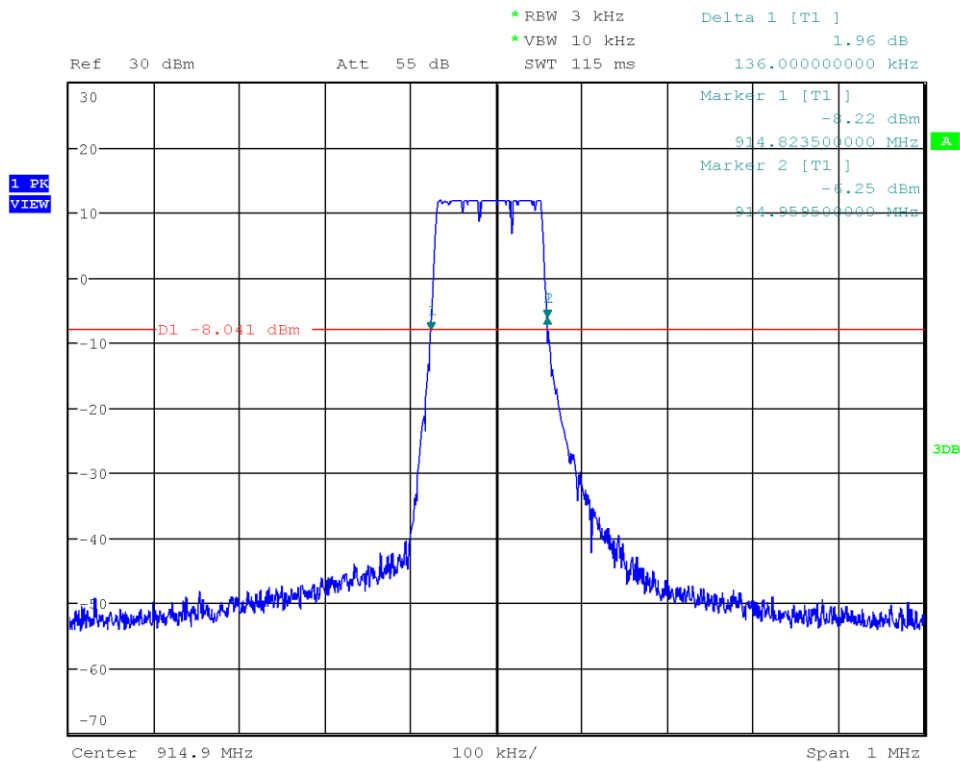
Date: 17.JUL.2020 11:51:54

Test Report No.: G0M-1909-8448-TFC247FH-V03

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

20 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 6.9.2
 Operational Mode: LoRa, single, Channel: 914.9 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-17
 Lower Frequency [MHz]: 914.823
 Upper Frequency [MHz]: 914.960
 20 dB Bandwidth [kHz]: 136



Date: 17.JUL.2020 11:53:24

Test Report No.: G0M-1909-8448-TFC247FH-V03

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

3.3 Test Conditions and Results - Number of hopping frequencies

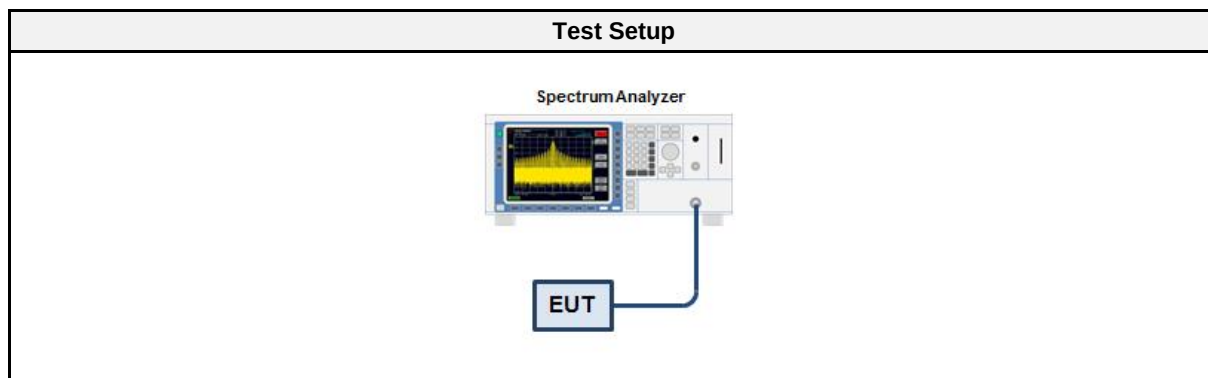
3.3.1 Information

Test Information	
Reference	FCC § 15.247(a)(1)(iii); ISED RSS-247, Issue 2 (section 5.1)
Measurement Method	ANSI C63.10 7.8.3
Operator	Wilfried Treffke
Date	2020-07-17

3.3.2 Limits

Limits	
Condition	Number of hopping channels
20 dB BW < 250 kHz Time of occupancy ≤ 0.4 s within 20 s	Number of hopping channels ≥ 50
250 kHz ≤ 20 dB BW < 500 kHz Time of occupancy ≤ 0.4 s within 10 s	Number of hopping channels ≥ 25

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

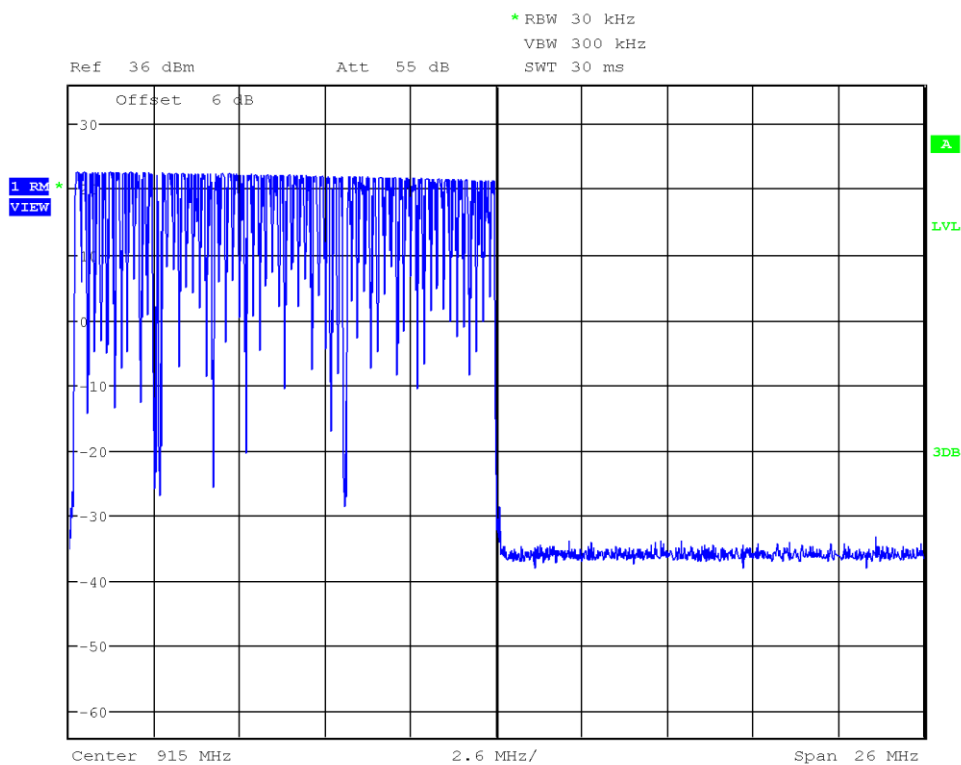
Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Span set to measurement frequency range 3. Detector set to peak and max hold 4. Resolution bandwidth is set small enough to resolve hopping channel emission spectra 5. The number of peaks is counted to determine number of hopping frequencies

3.3.6 Results

Test Results		
Number of hopping frequencies	Limit	Verdict
64	≥ 50	PASS

Number of hopping frequencies

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 (a)(1)(i)
 Reference Method: ANSI C63.10:2013 7.8.3
 Operational Mode: LoRa, Hopping Mode
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-17
 Number of Hopping Channels: 64
 Limit: at least 50
 Verdict: Pass



Date: 17.JUL.2020 12:51:27

Test Report No.: G0M-1909-8448-TFC247FH-V03

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

3.4 Test Conditions and Results - Frequency hopping channel separation

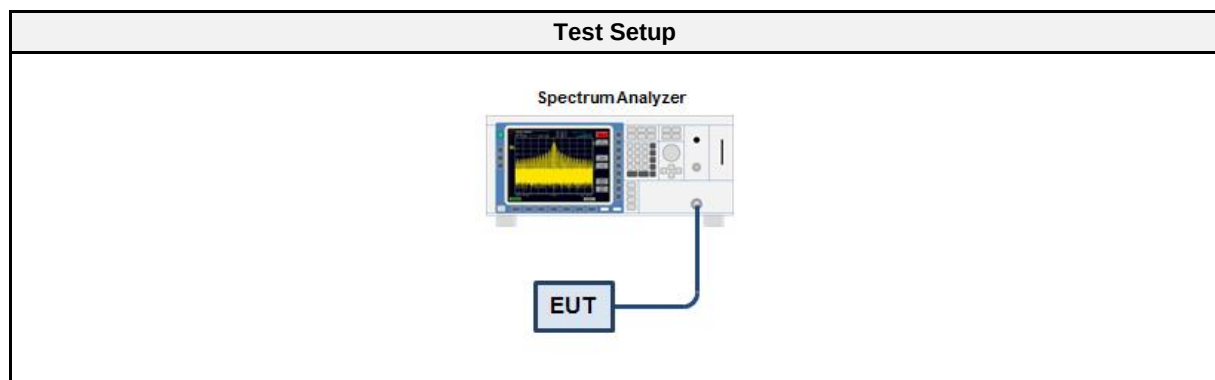
3.4.1 Information

Test Information	
Reference	FCC § 15.247(a)(1); ISSED RSS-247, Issue 2 (section 5.1)
Measurement Method	ANSI C63.10 7.8.4
Measurement Uncertainty	± 3.14 %
Operator	Wilfried Treffke
Date	2020-07-17

3.4.2 Limits

Limit
≥ 25 kHz or 20 dB bandwidth, whichever is greater

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 (Communication tester is used if needed) 2. Span set to measurement frequency range 3. Detector set to peak and max hold 4. Resolution bandwidth is set small enough to resolve hopping channel emission spectra 5. The two adjacent channel peaks are marked 6. Channel separation is determined from frequency separation of markers

3.4.6 Results

Test Results		
Channel separation [kHz]	Limit [kHz]	Verdict
199	≥137	PASS

3.5 Test Conditions and Results - Time of occupancy (Dwell time)

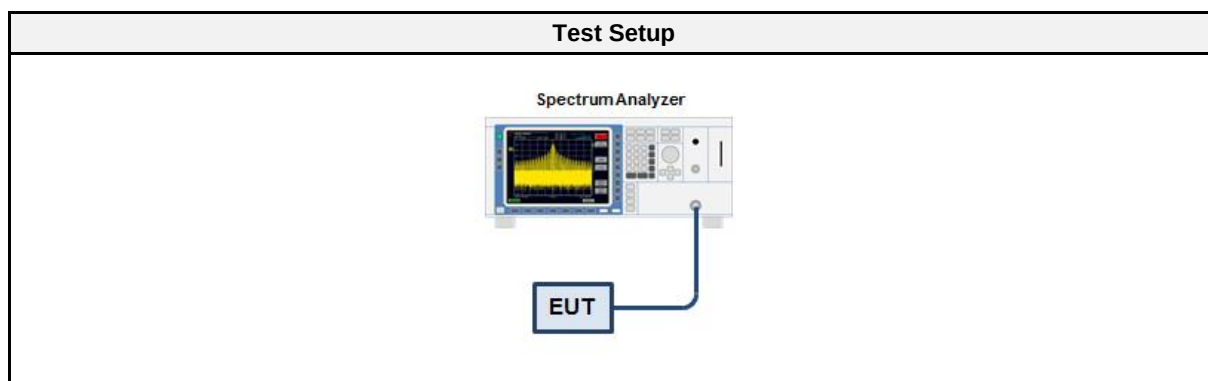
3.5.1 Information

Test Information	
Reference	FCC § 15.247(a)(1)(iii); ISED RSS-247, Issue 2 (section 5.1)
Measurement Method	ANSI C63.10 7.8.2
Measurement Uncertainty	$\pm 78.53 \%$
Operator	Wilfried Treffke
Date	2020-07-17

3.5.2 Limits

Limits	
Condition	Limit
20 dB BW < 250 kHz Number of hopping channels ≥ 50	Time of occupancy ≤ 0.4 s within 20 s
250 kHz $\leq$ 20 dB BW < 500 kHz Number of hopping channels ≥ 25	Time of occupancy ≤ 0.4 s within 10 s

3.5.3 Setup



3.5.4 Equipment

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

3.5.5 Procedure

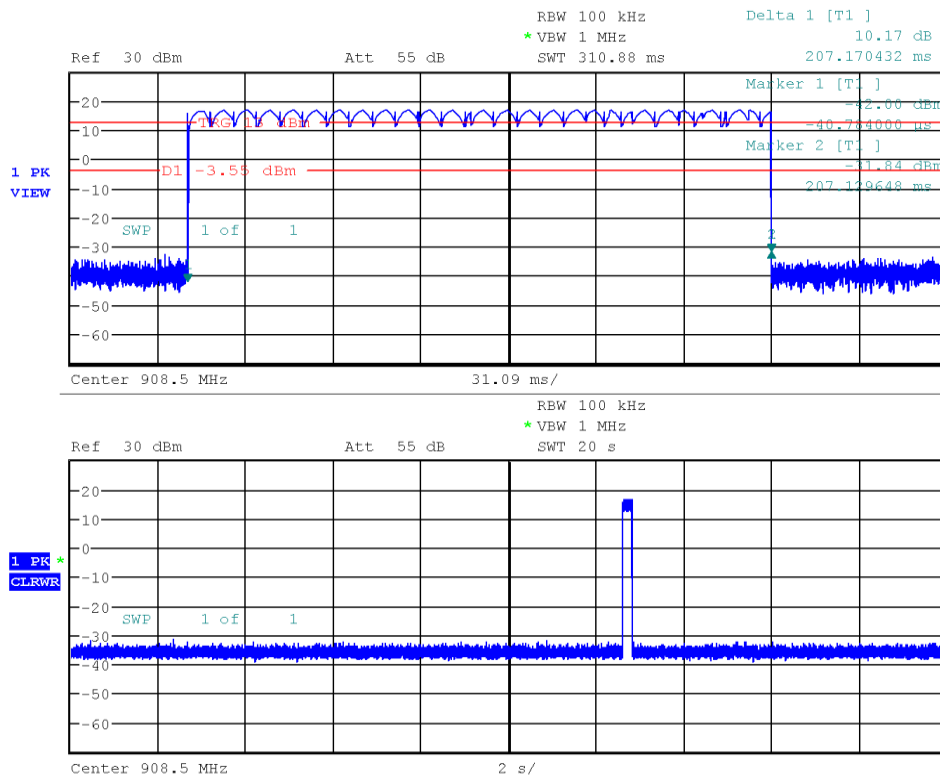
Test Procedure
1. EUT set to test hopping mode (Communication tester is used if needed) 2. Analyzer span is set to zero span 3. Detector set to peak and max hold 4. RBW is set to 100 kHz and VBW to 300 kHz 5. The sweep time is set to capture one single dwell time 6. Trigger is set to video trigger 7. A marker is set to the start and end positions of the burst 8. The dwell time is determined from the marker difference 9. Another sweep is initiated without trigger and sweep time set to the observation time 10. The number of hops is counted 11. The total time of occupancy is calculated from the dwell time per hop multiplied by the number of hops

3.5.6 Results

Test Results					
Observation Period [s]	Number of Hops	Dwell time per Hop [s]	Time of occupancy [s]	Limit [s]	Margin [s]
20	1	0.207	0.207	0.4	-0.19

Time of occupancy

Project Number: G0M-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Method: ANSI C63.10:2013 7.8.4
 Operational Mode: Hopping mode
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-17
 Dwell Time per Hop [ms]: 207.170
 Number of Hops: 1
 Time of occupancy [s]: 0.207
 Limit [s]: 0.4
 Verdict: Pass



Date: 17.JUL.2020 14:31:14

3.6 Test Conditions and Results - Maximum peak conducted output power

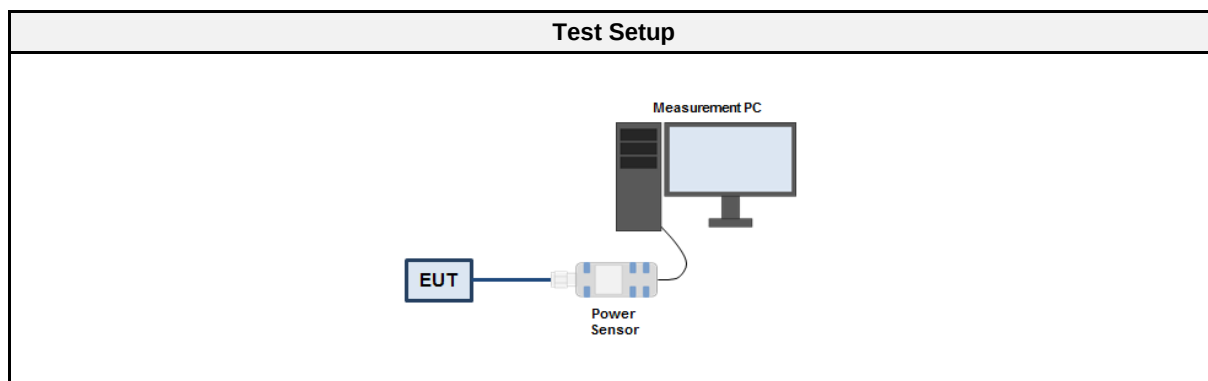
3.6.1 Information

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 %
Operator	Wilfried Treffke
Date	2020-07-17

3.6.2 Limits

Limits	
Condition	Limit
Number of hopping channels ≥ 50	1 W (30 dBm)
50 > Number of hopping channels ≥ 25	0.25 W (24 dBm)

3.6.3 Setup



3.6.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Power Sensor	R&S	NRP-Z81	EF00830	2018-07	2019-07

3.6.5 Procedure

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

3.6.6 Results

Test Results				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
902.3	21.5	0.141	1.0	PASS
908.5	21.6	0.144	1.0	PASS
914.9	21.5	0.141	1.0	PASS

3.7 Test Conditions and Results - AC powerline conducted emissions

3.7.1 Information

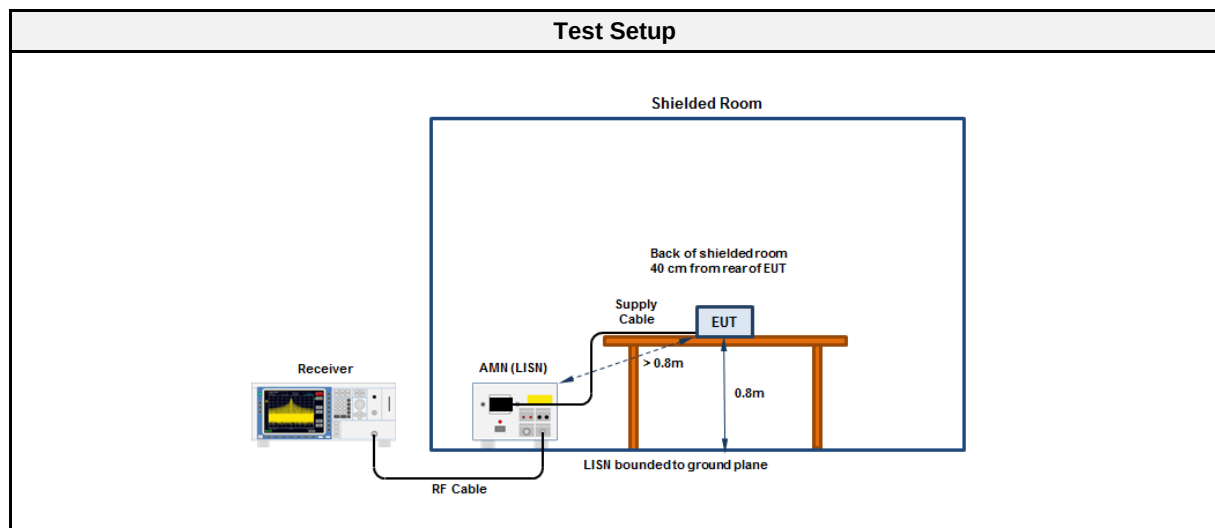
Test Information	
Reference	FCC § 15.207; ISED RSS-247, Issue 2 (section 3.1)
Measurement Method	ANSI C63.10 6.2
Measurement Uncertainty	± 3.82 %
Operator	Wilfried Treffke
Date	2020-07-16

3.7.2 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

3.7.3 Setup



3.7.4 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2016.1.10

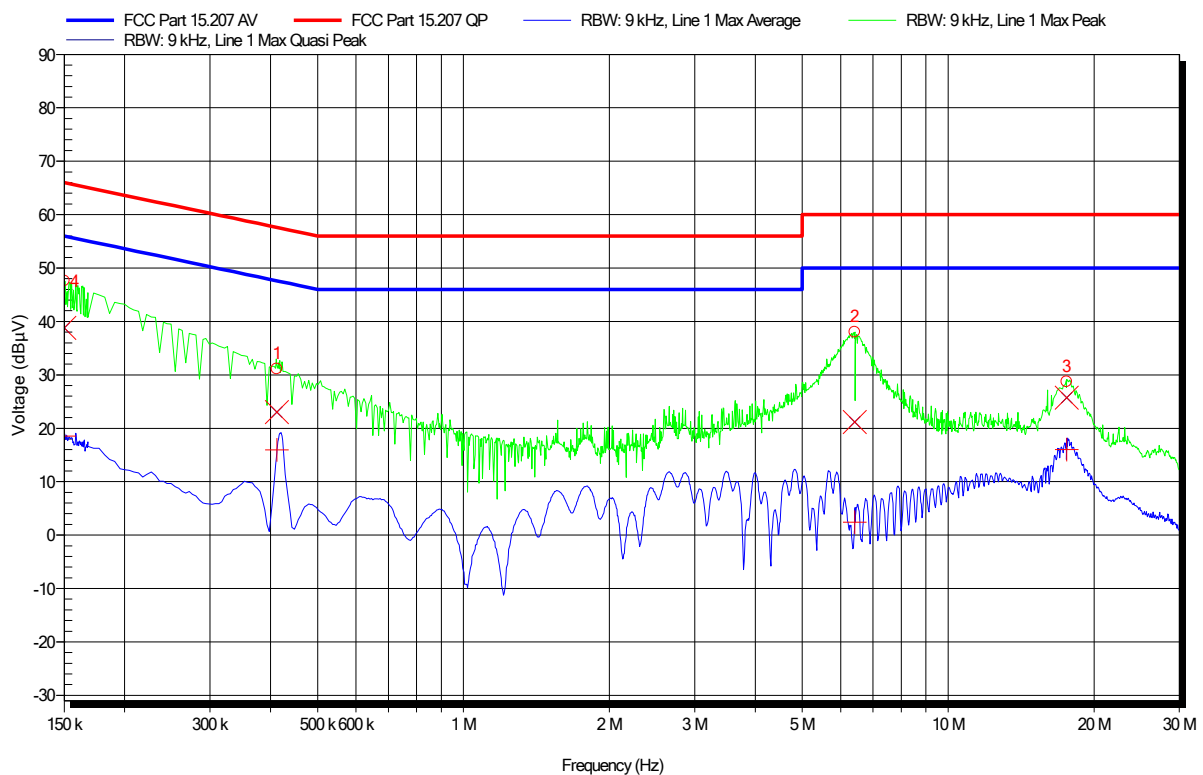
Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
LISN	Schwarzbeck	NSLK 8128	EF00975	2019-07	2021-07
EMI Test Receiver	R&S	ESCS 30	EF00295	2019-07	2020-07

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, Unom: 120 VAC
LISN: NSLK 8128 N
Mode: LoRa, hopping mode
Test Date: 2020-07-16
Note:

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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

3.8 Test Conditions and Results - Band-edge compliance

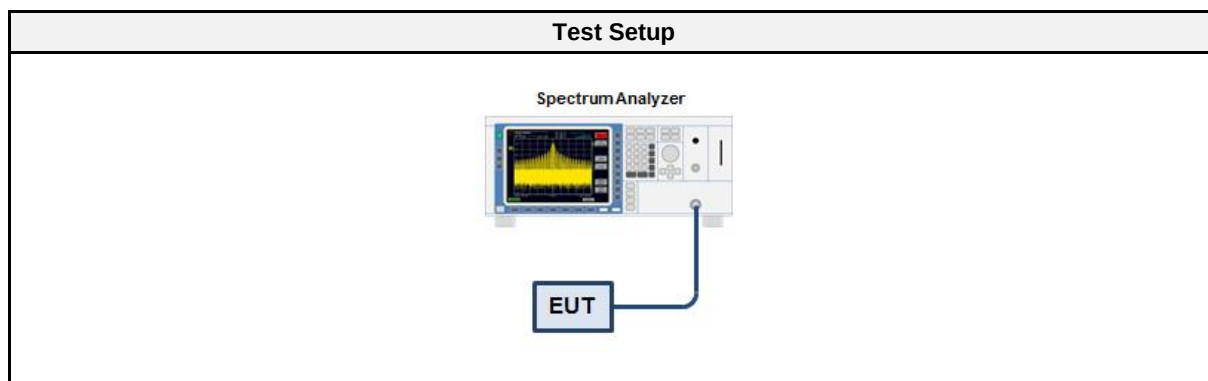
3.8.1 Information

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	2020-07-17

3.8.2 Limits

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

3.8.3 Setup



3.8.4 Equipment

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

3.8.5 Procedure

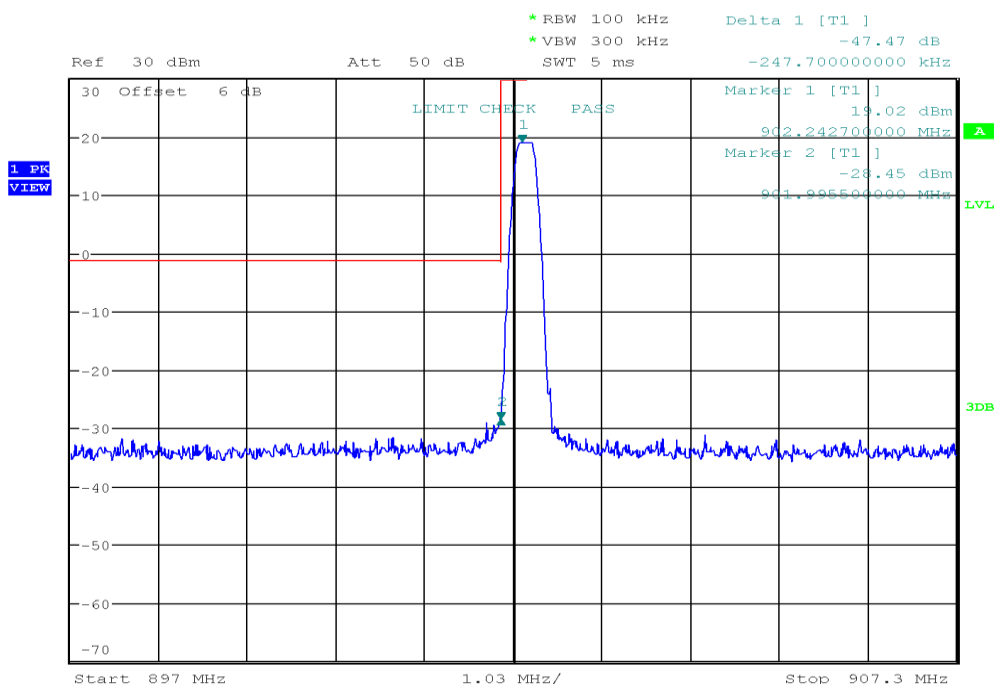
Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Span set around lower band edge and detector is set to peak and max hold 3. Resolution bandwidth is set to 100 kHz 4. Markers are set to peak emission levels within frequency band and outside frequency band 5. Band edge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

3.8.6 Results

Test Results				
Mode	Channel [MHz]	Out-of-band Attenuation [dB]	Limit [dB]	Verdict
Single	902.3	-47.47	-20	PASS
Single	914.9	-53.84	-20	PASS
Hopping	902.3	-59.56	-20	PASS
Hopping	914.9	-53.37	-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 6.10
 Operational Mode: single frequency, Channel: 902.3 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-17
 Band-edge: Lower
 In-band Frequency [MHz]: 902.243
 Max. in-band Level [dBm/100 kHz]: 19.016
 Out-of-band Frequency [MHz]: 901.995
 Max. out-of-band Level [dBm/100 kHz]: -28.451
 Attenuation [dB]: -47.47



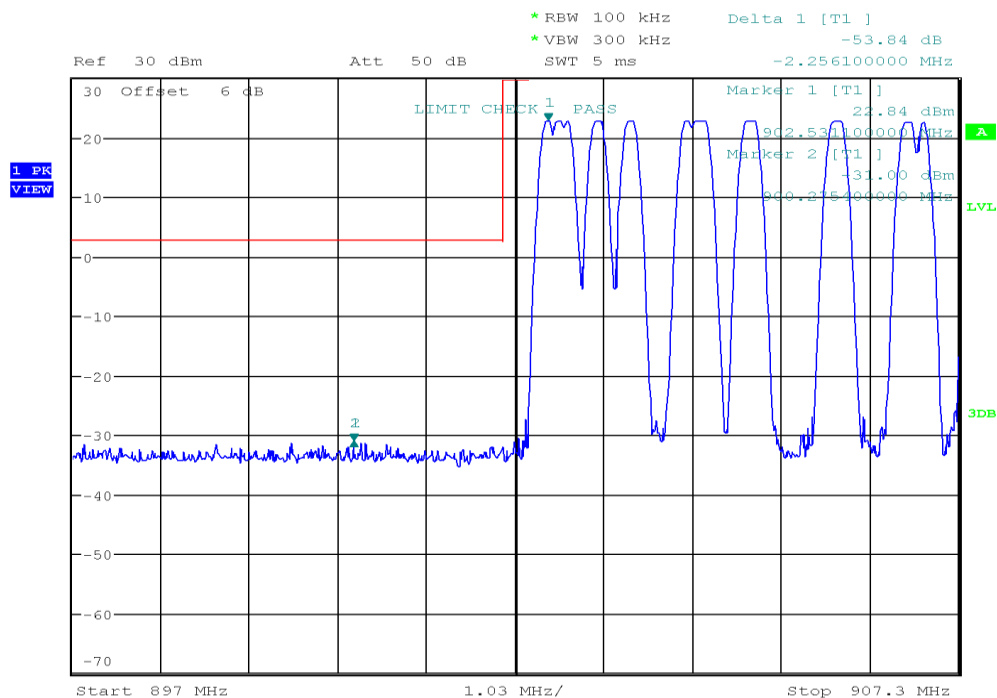
Date: 17.JUL.2020 15:19:07

Test Report No.: GOM-1909-8448-TFC247FH-V03

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

Emissions in nonrestricted frequency bands at the Band-edge

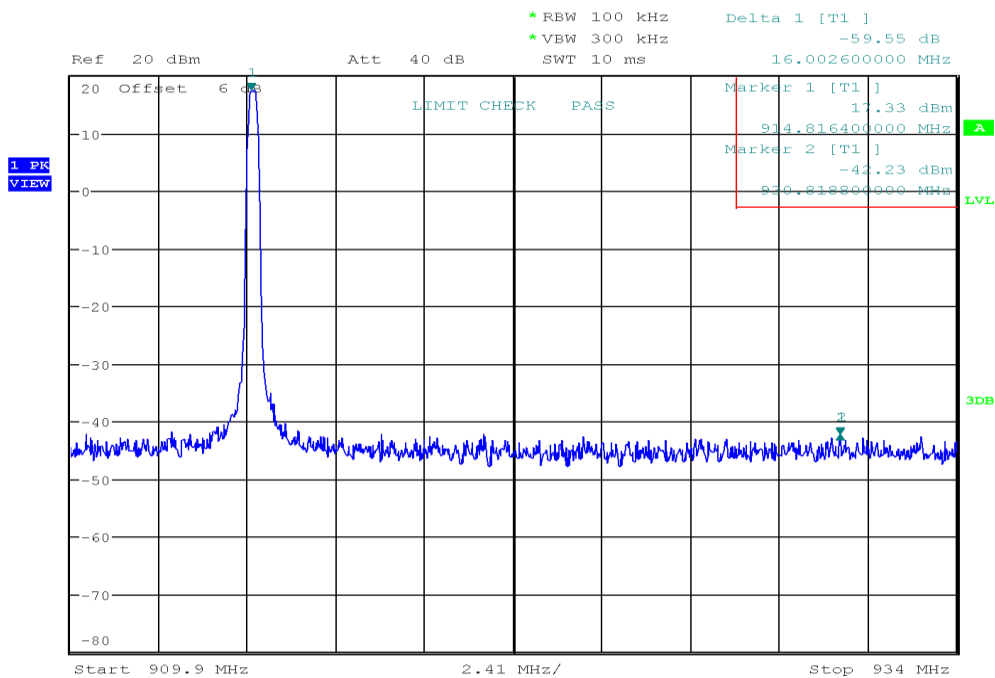
Project Number: GOM-1909-8448
 Applicant: Onethinx
 Model Description: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Sample ID: 25940
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.10
 Operational Mode: hopping mode, Channel: 902.3 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-17
 Band-edge: Lower
 In-band Frequency [MHz]: 902.531
 Max. in-band Level [dBm/100 kHz]: 22.844
 Out-of-band Frequency [MHz]: 900.275
 Max. out-of-band Level [dBm/100 kHz]: -31.0
 Attenuation [dB]: -53.84



Date: 17.JUL.2020 15:24:14

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 6.10
 Operational Mode: single frequency, Channel: 914.9 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-17
 Band-edge: Upper
 In-band Frequency [MHz]: 914.816
 Max. in-band Level [dBm/100 kHz]: 17.327
 Out-of-band Frequency [MHz]: 930.819
 Max. out-of-band Level [dBm/100 kHz]: -42.228
 Attenuation [dB]: -59.56



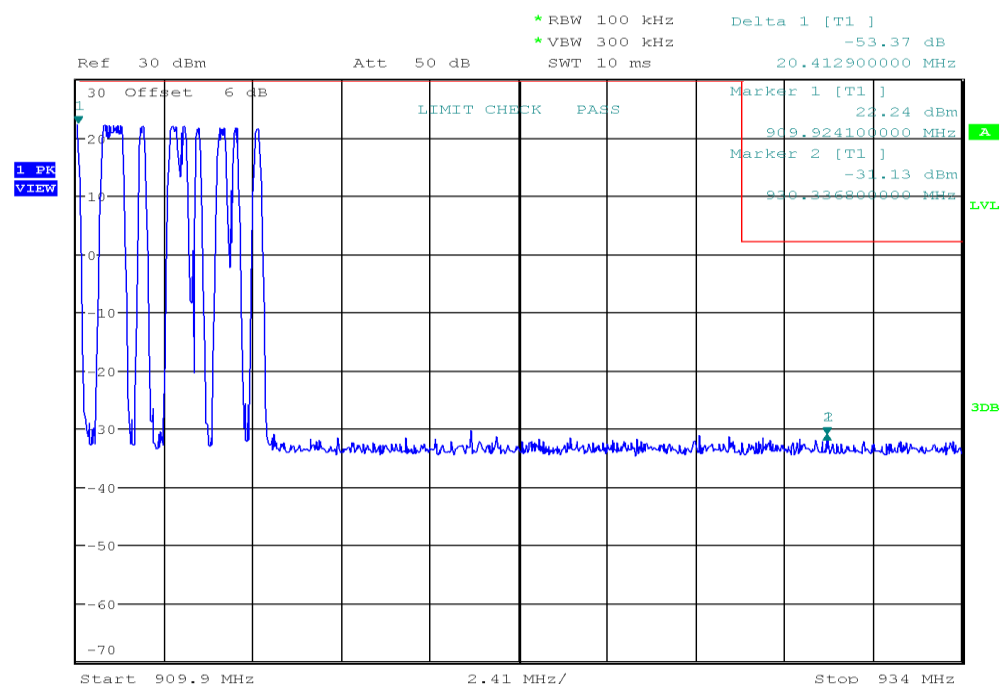
Date: 17.JUL.2020 15:26:16

Test Report No.: GOM-1909-8448-TFC247FH-V03

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 6.10
 Operational Mode: hopping mode, Channel: 914.9 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-17
 Band-edge: Upper
 In-band Frequency [MHz]: 909.924
 Max. in-band Level [dBm/100 kHz]: 22.235
 Out-of-band Frequency [MHz]: 930.337
 Max. out-of-band Level [dBm/100 kHz]: -31.131
 Attenuation [dB]: -53.37



Date: 17.JUL.2020 15:28:13

Test Report No.: GOM-1909-8448-TFC247FH-V03

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

3.9 Test Conditions and Results - Conducted spurious emissions

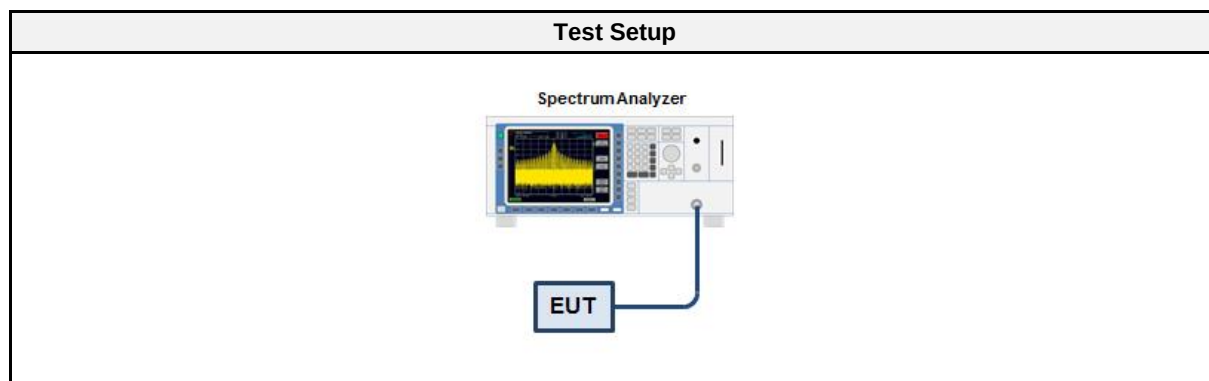
3.9.1 Information

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	2020-07-17

3.9.2 Limits

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

3.9.3 Setup



3.9.4 Equipment

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

3.9.5 Procedure

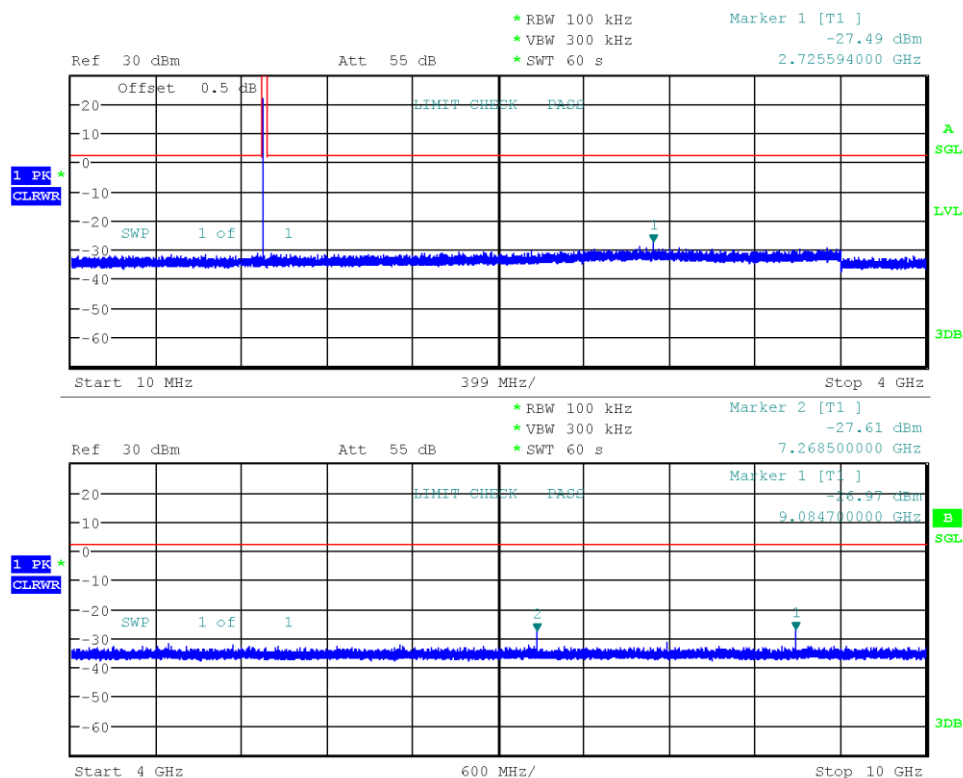
Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Span set around lower band edge and detector is set to peak and max hold 3. Resolution bandwidth is set to 100 kHz 4. Markers are set to peak emission levels within frequency band and outside frequency band 5. Band edge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

3.9.6 Results

Test Results		
Mode	Channel [MHz]	Verdict
Single	902.3	PASS
Single	908.5	PASS
Single	914.9	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: LoRa, Channel: 908.5 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-17
 Max. in-band Frequency [MHz]: 908.5
 Max. in-band Level [dBm/100 kHz]: 22.0
 Out-of-band Limit [dBm/100 kHz]: 2.0



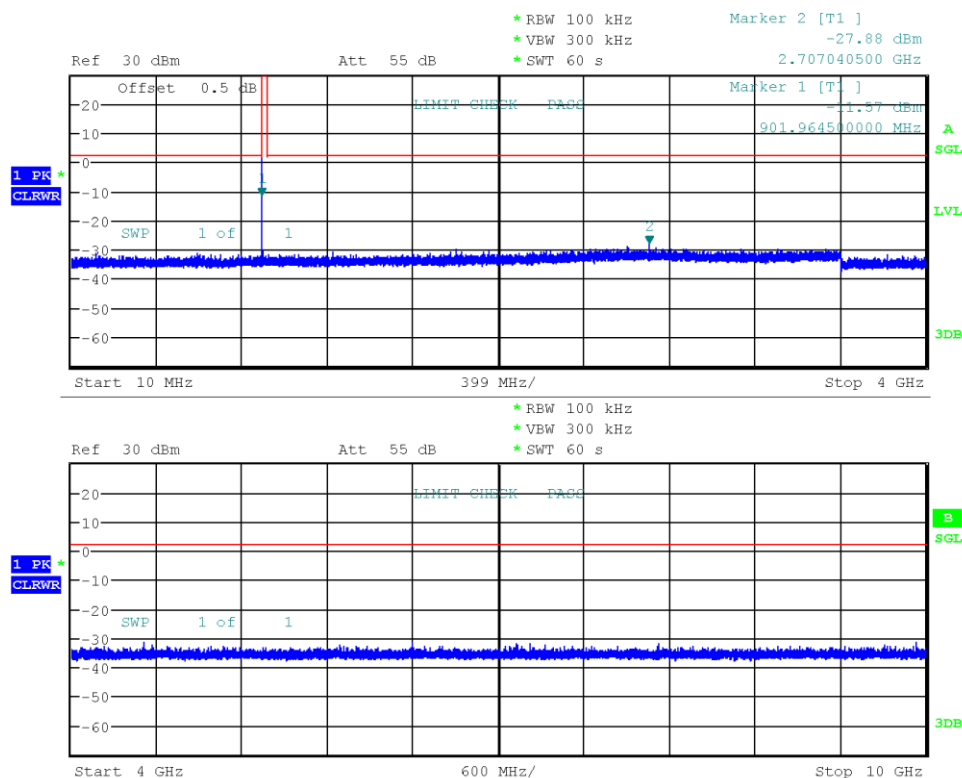
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Test Report No.: G0M-1909-8448-TFC247FH-V03

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: LoRa, Channel: 902.3 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-17
 Max. in-band Frequency [MHz]: 902.3
 Max. in-band Level [dBm/100 kHz]: 22.0
 Out-of-band Limit [dBm/100 kHz]: 2.0



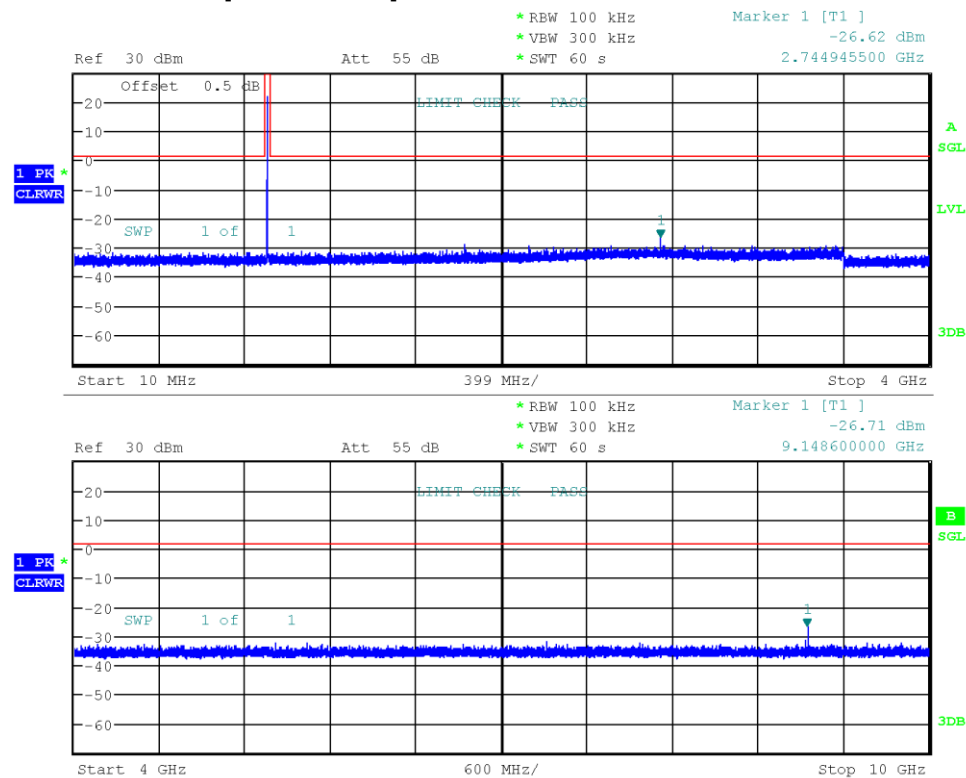
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Test Report No.: G0M-1909-8448-TFC247FH-V03

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: LoRa, Channel: 914.9 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Wilfried Treffke
 Test Site: Eurofins Product Service GmbH
 Test Date: 2020-07-17
 Max. in-band Frequency [MHz]: 914.9
 Max. in-band Level [dBm/100 kHz]: 21.9
 Out-of-band Limit [dBm/100 kHz]: 1.9



Date: 17.JUL.2020 15:11:22

3.10 Test Conditions and Results - Transmitter radiated emissions

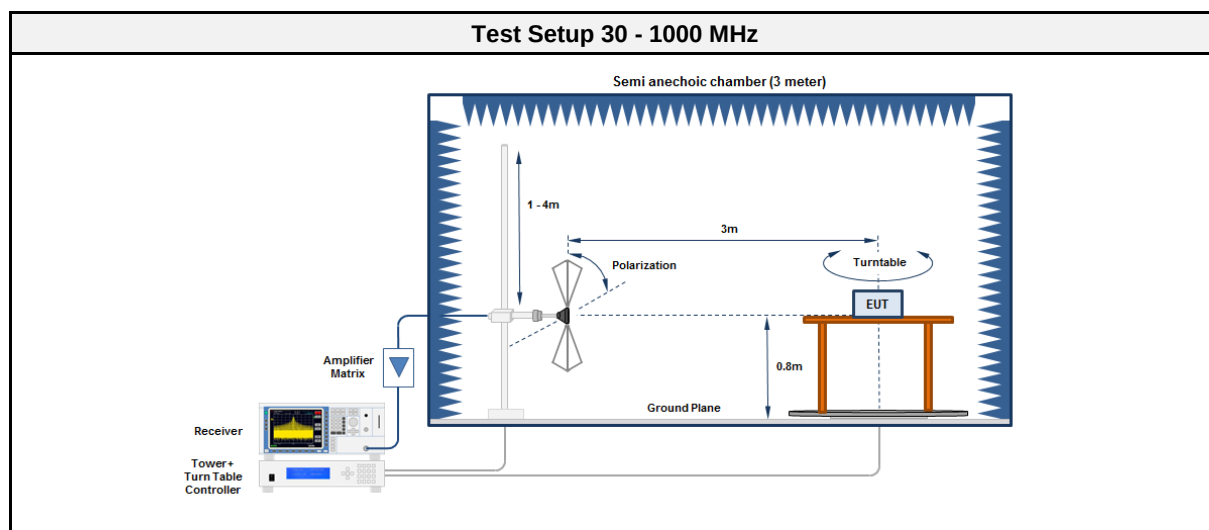
3.10.1 Information

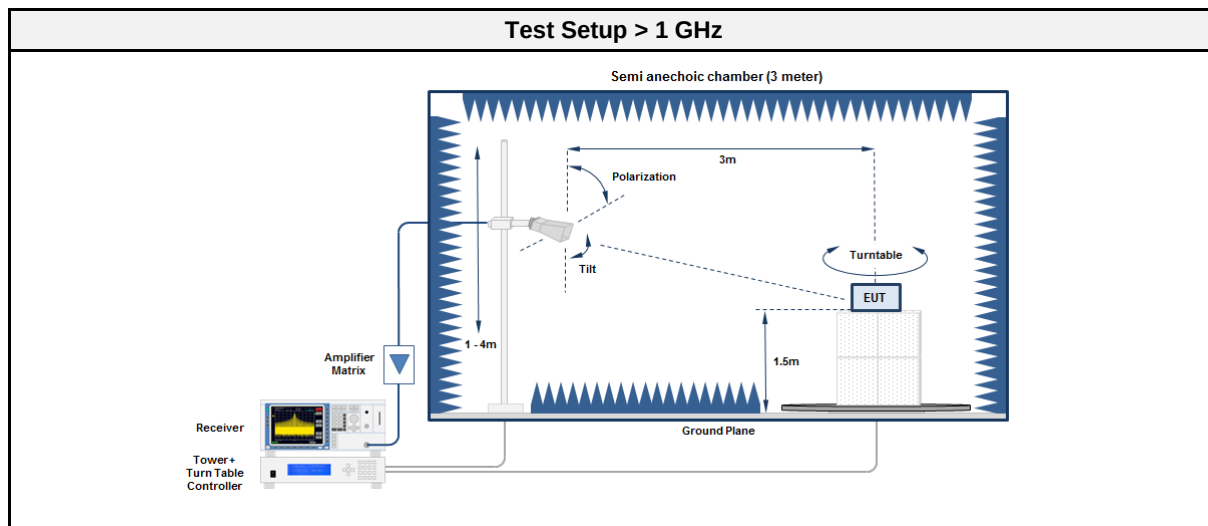
Test Information	
Reference	FCC § 15.247(d); FCC § 15.209; ISED RSS-Gen, Issue 5 (section 6.13)
Measurement Method	ANSI C63.10 6.4, 6.5, 6.6, 11.12
Measurement Uncertainty	± 5.67 dB
Operator	Wilfried Treffke
Date	2020-07-16

3.10.2 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

3.10.3 Setup





3.10.4 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
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2020-06	2021-06
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
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2020-06	2021-06
Antenna	Schwarzbeck	BBHA 9120D	EF00018	2019-10	2022-10

3.10.5 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	

3.10.6 Results

Test Results						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
902.3	3609	47.51	pk	hor	74.00	-26.49
902.3	4512	49.82	pk	hor	74.00	-24.18
902.3	4512	47.66	avg	hor	54.00	-06.34
902.3	4512	46.86	pk	ver	74.00	-27.14
902.3	4512	44.41	avg	ver	54.00	-09.59
902.3	8121	49.17	pk	hor	74.00	-24.83
902.3	8121	45.81	avg	hor	54.00	-08.19
902.3	8121	52.41	pk	ver	74.00	-21.59
902.3	8121	49.49	avg	ver	54.00	-04.51
902.3	9023	46.02	pk	hor	74.00	-27.98
902.3	9023	37.68	avg	hor	54.00	-16.32
902.3	9023	54.46	pk	ver	74.00	-19.54
902.3	9023	52.30	avg	ver	54.00	-01.70
908.5	2725	48.83	pk	hor	74.00	-25.17
908.5	2725	47.17	avg	hor	54.00	-06.83
908.5	3634	53.64	pk	hor	74.00	-20.36
908.5	3634	52.24	avg	hor	54.00	-01.76
908.5	3634	49.48	pk	ver	74.00	-24.52
908.5	3634	47.63	avg	ver	54.00	-06.37
908.5	7268	52.51	pk	ver	74.00	-21.49
908.5	7268	48.66	avg	ver	54.00	-05.34
908.5	9085	48.48	pk	hor	74.00	-25.52
908.5	9085	43.92	avg	hor	54.00	-10.08
908.5	9085	55.24	pk	ver	74.00	-18.76
914.9	3659	52.27	pk	hor	74.00	-21.73
914.9	3659	50.55	avg	hor	54.00	-03.45
914.9	3660	54.57	pk	ver	74.00	-19.43
914.9	3660	53.36	avg	ver	54.00	-00.64
914.9	8234	50.96	pk	ver	74.00	-23.04
914.9	8234	48.68	avg	ver	54.00	-05.32
914.9	9149	48.55	pk	ver	74.00	-25.45
914.9	9149	43.81	avg	ver	54.00	-10.19

ANNEX A Transmitter spurious emissions

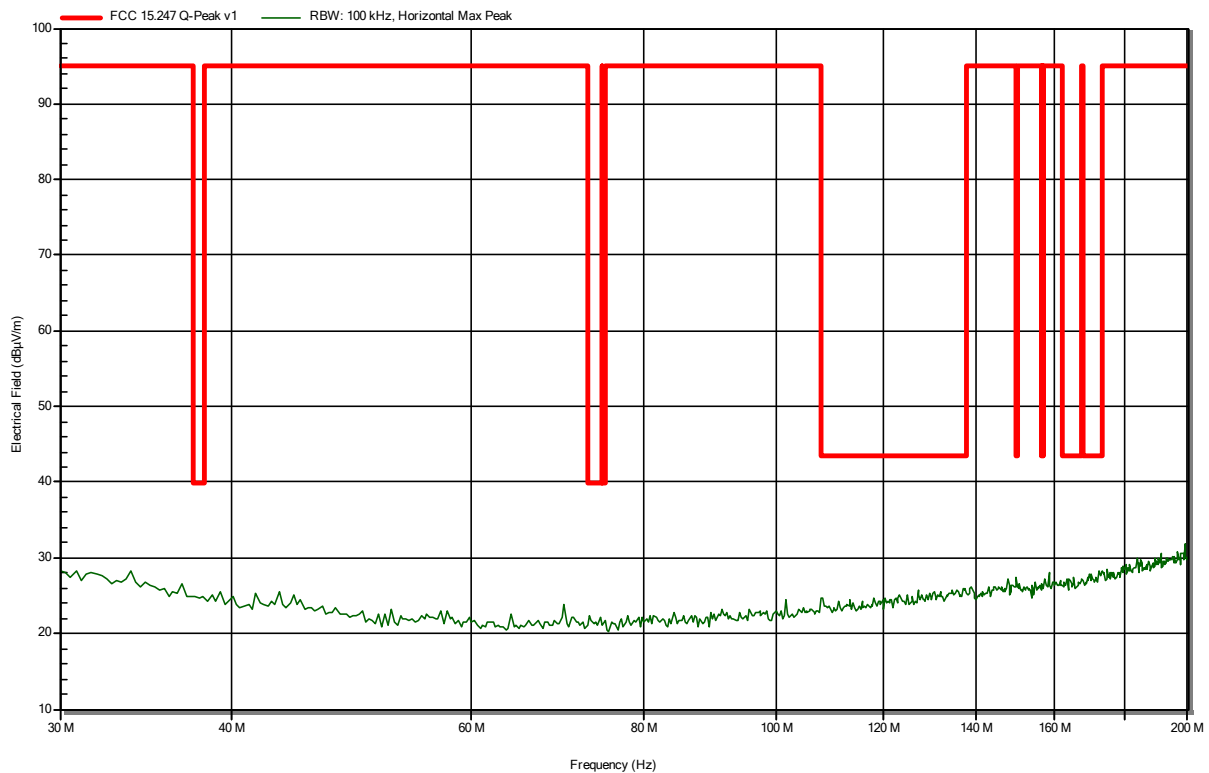
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Mr. Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
Antenna: Rohde & Schwarz HK 116, Horizontal
Measurement distance: 3 m
Mode: TX; Lora; 902.3 MHz
Test Date: 2020-07-16
Note:

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RadiMation



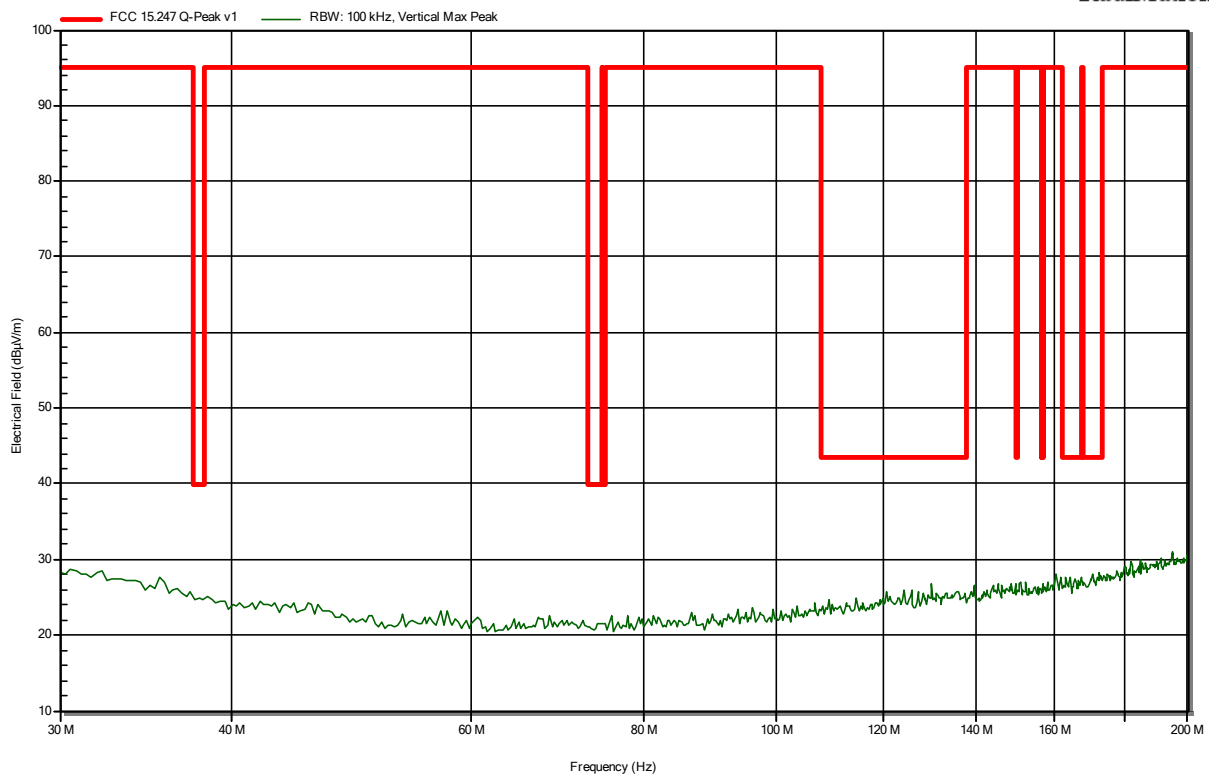
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Mr. Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
Antenna: Rohde & Schwarz HK 116, Vertical
Measurement distance: 3 m
Mode: TX; Lora; 902.3 MHz
Test Date: 2020-07-16
Note:

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RadiMation



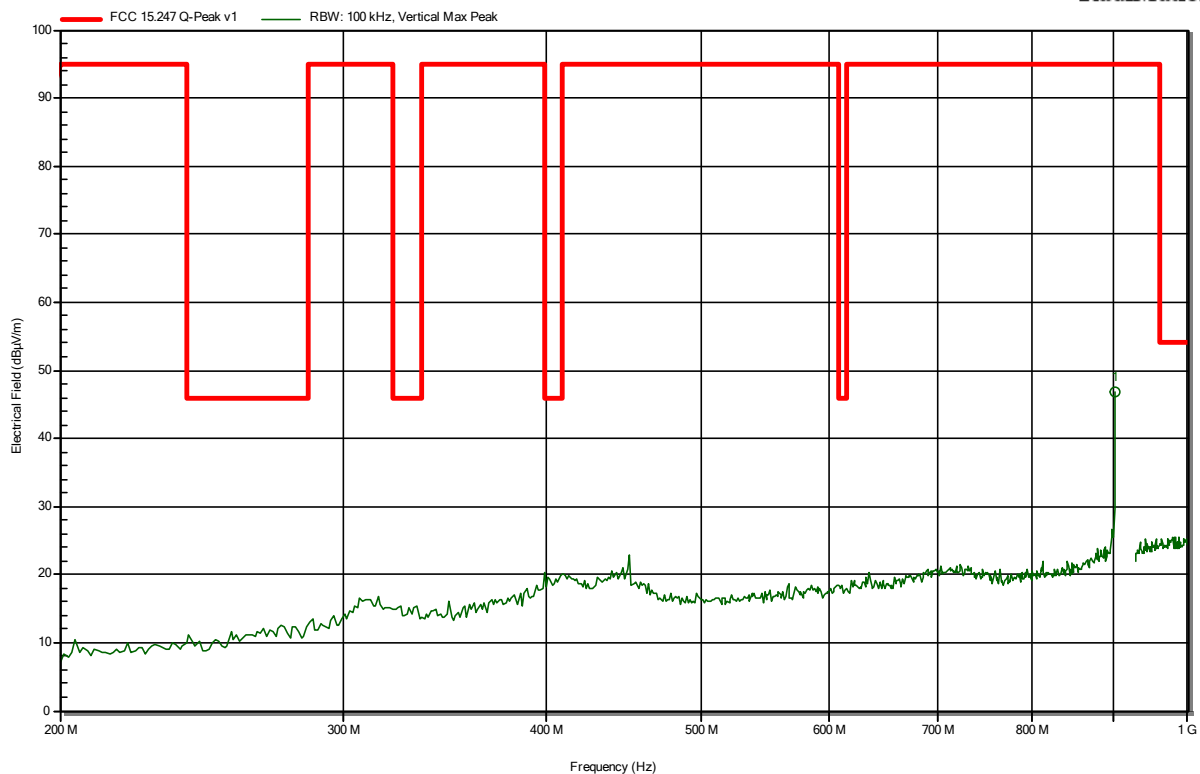
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
 Antenna: Rohde & Schwarz HL 223, Vertical
 Measurement distance: 3 m
 Mode: TX; Lora; 902.3 MHz
 Test Date: 2020-07-16
 Note:

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RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
902 MHz	46.81 dBμV/m	95 dBμV/m	-48.19 dB	Pass

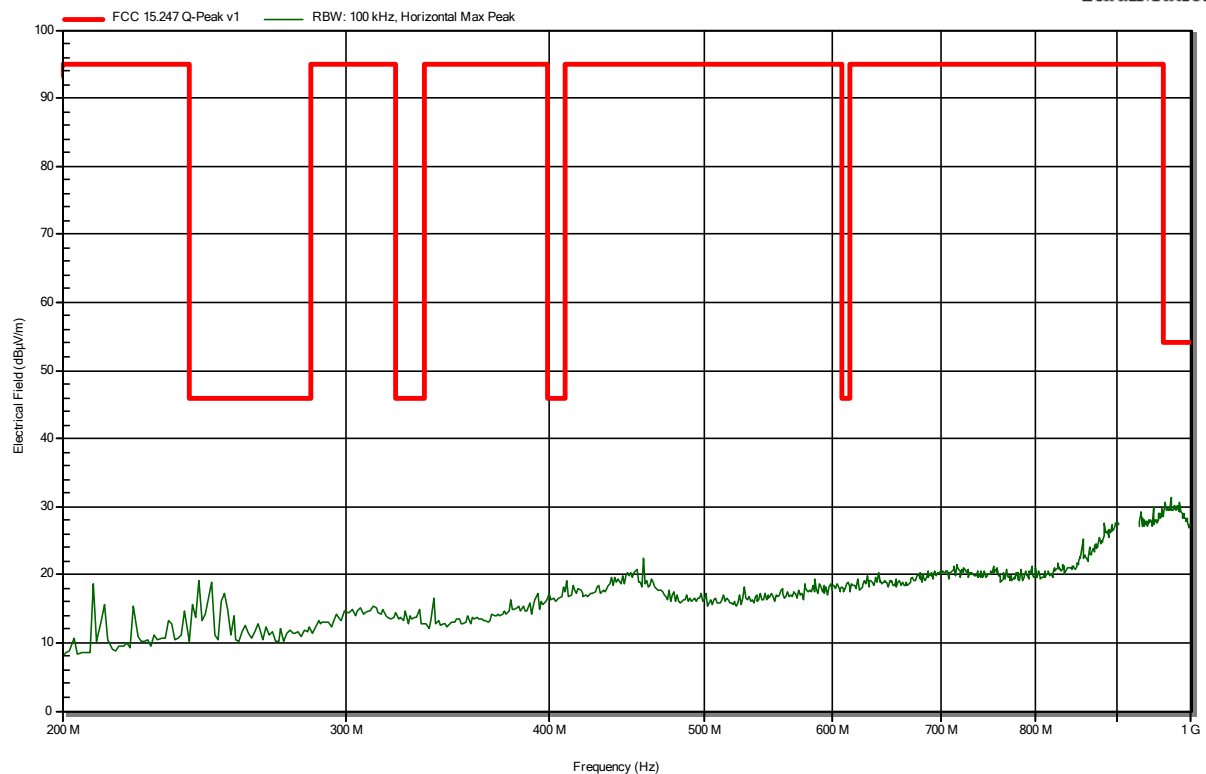
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Mr. Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
Antenna: Rohde & Schwarz HL 223, Horizontal
Measurement distance: 3 m
Mode: TX; Lora; 902.3 MHz
Test Date: 2020-07-16
Note:

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Radiation



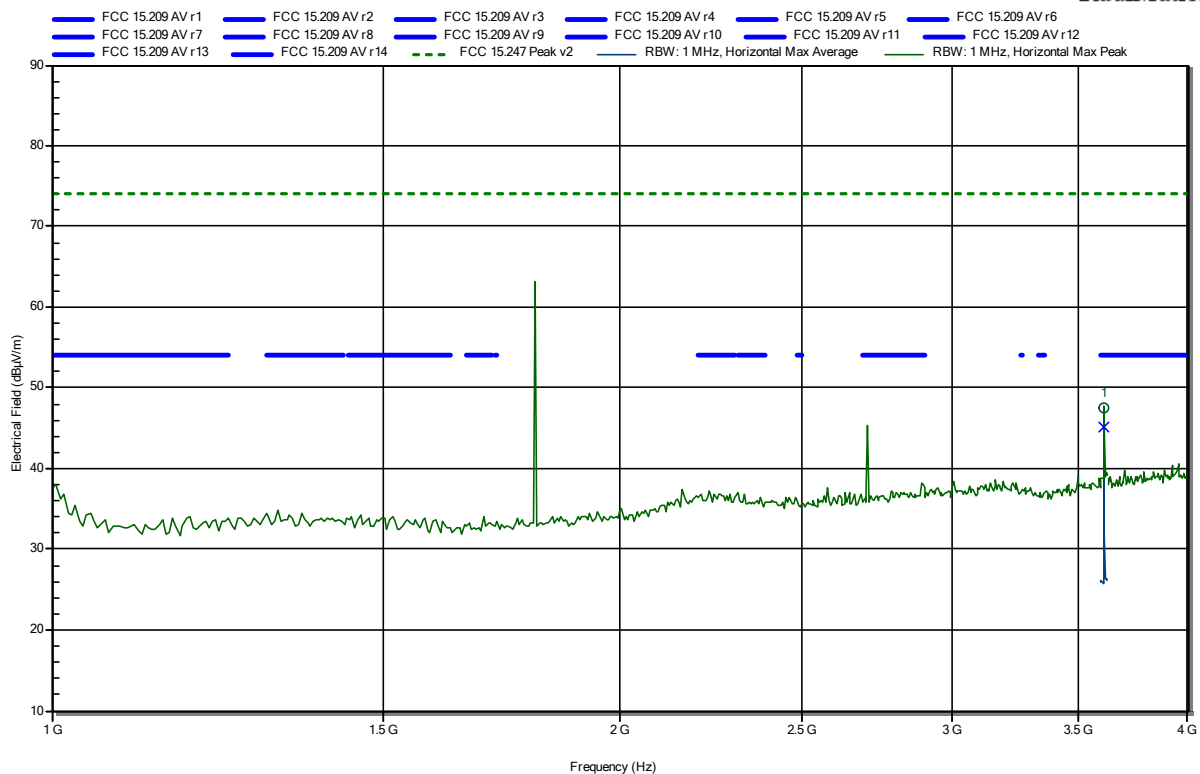
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
 Antenna: BBHA 9120D, Horizontal
 Measurement distance: 3 m converted to 3m
 Mode: TX; Lora; 902.3 MHz
 Test Date: 2020-07-16
 Note:

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Radiation



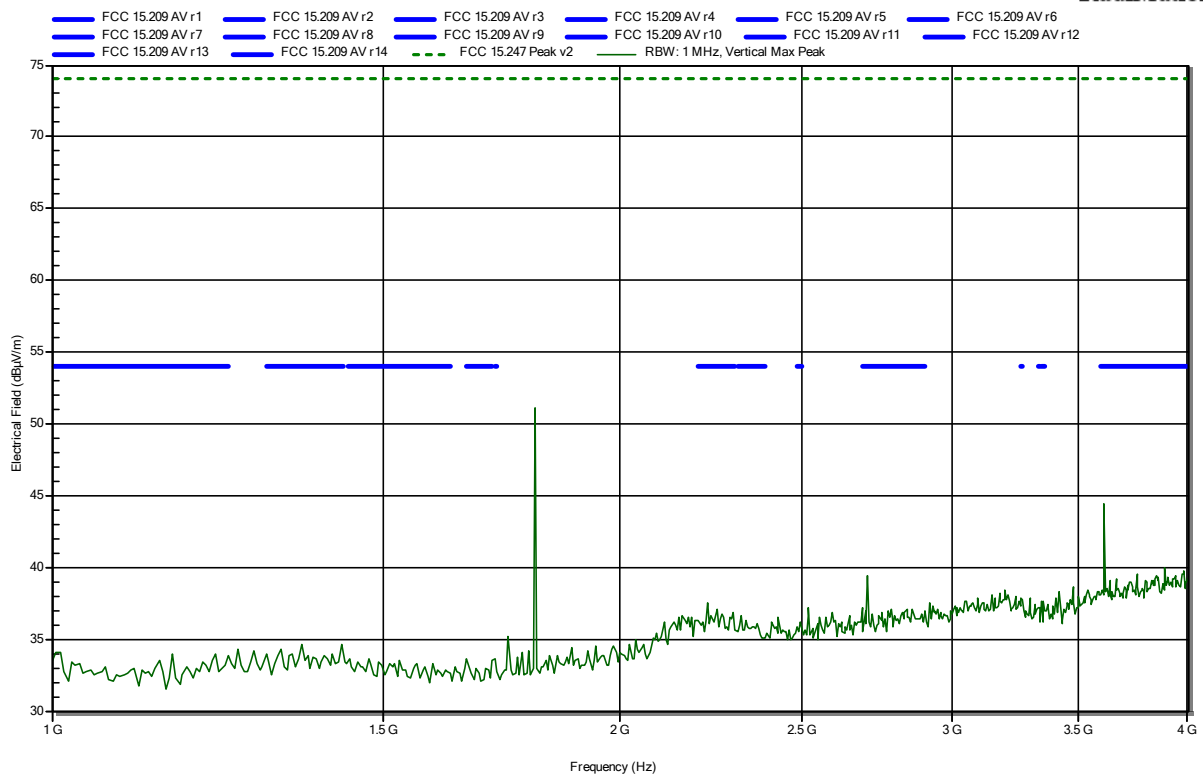
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
3.609 GHz	47.51 dBμV/m	74 dBμV/m	-26.49 dB	Pass

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: Mr. Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
 Antenna: BBHA 9120D, Vertical
 Measurement distance: 3 m converted to 3m
 Mode: TX; Lora; 902.3 MHz
 Test Date: 2020-07-16
 Note:

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Radiation



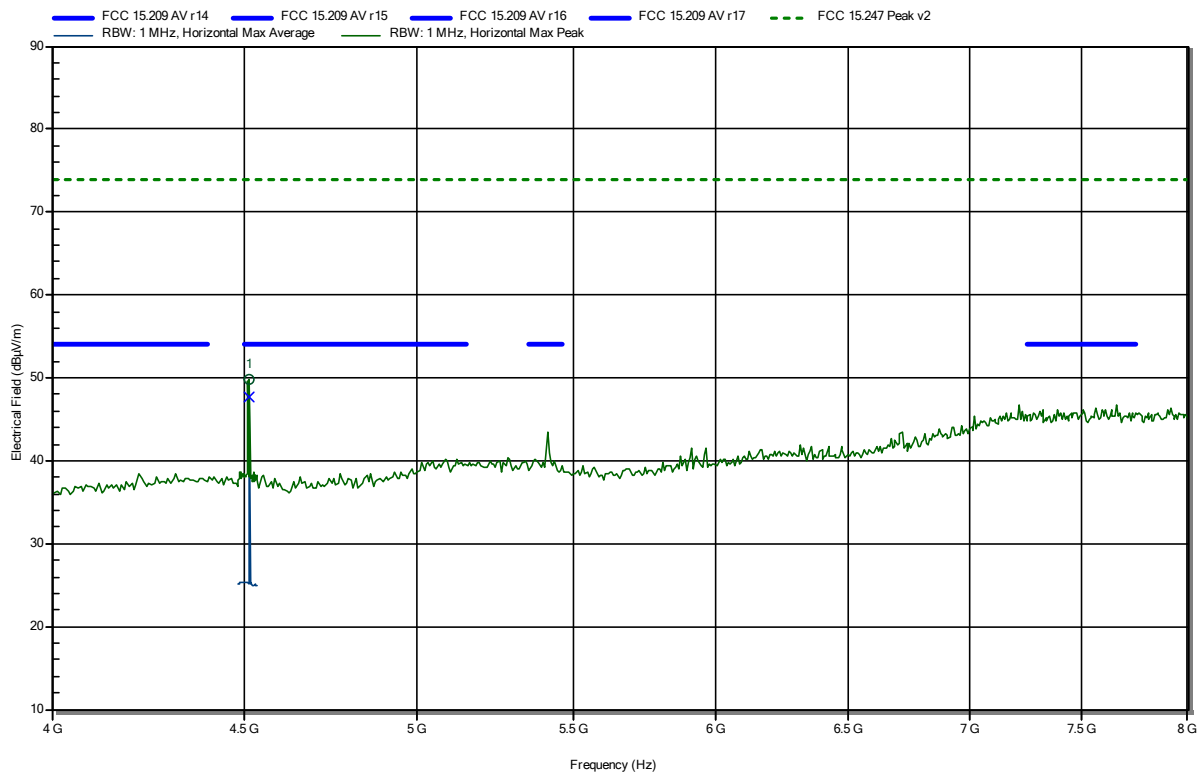
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Measurement software: RadiMation, version 2016.1.10
 Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
 Antenna: BBHA 9120D, Horizontal
 Measurement distance: 3 m
 Mode: TX; Lora; 902.3 MHz
 Test Date: 2020-07-16
 Note:

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Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
4.512 GHz	49.82 dBµV/m	74 dBµV/m	-24.18 dB	Pass	1.2 m
Frequency	Average	Average Limit	Average Difference	Average Status	Height
4.512 GHz	47.66 dBµV/m	54 dBµV/m	-6.34 dB	Pass	1.2 m

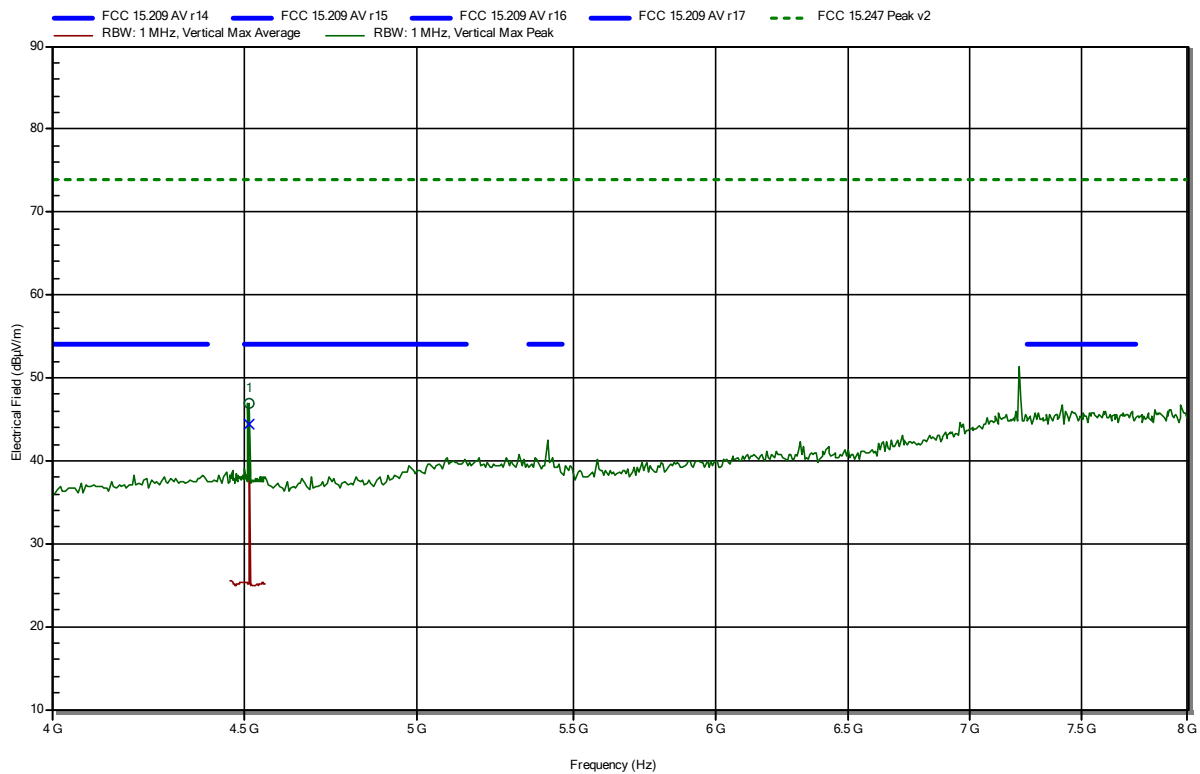
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Measurement software: RadiMation, version 2016.1.10
 Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
 Antenna: BBHA 9120D, Vertical
 Measurement distance: 3 m
 Mode: TX; Lora; 902.3 MHz
 Test Date: 2020-07-16
 Note:

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Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
4.512 GHz	46.86 dBµV/m	74 dBµV/m	-27.14 dB	Pass	1.2 m
Frequency	Average	Average Limit	Average Difference	Average Status	Height
4.512 GHz	44.41 dBµV/m	54 dBµV/m	-9.59 dB	Pass	1.2 m

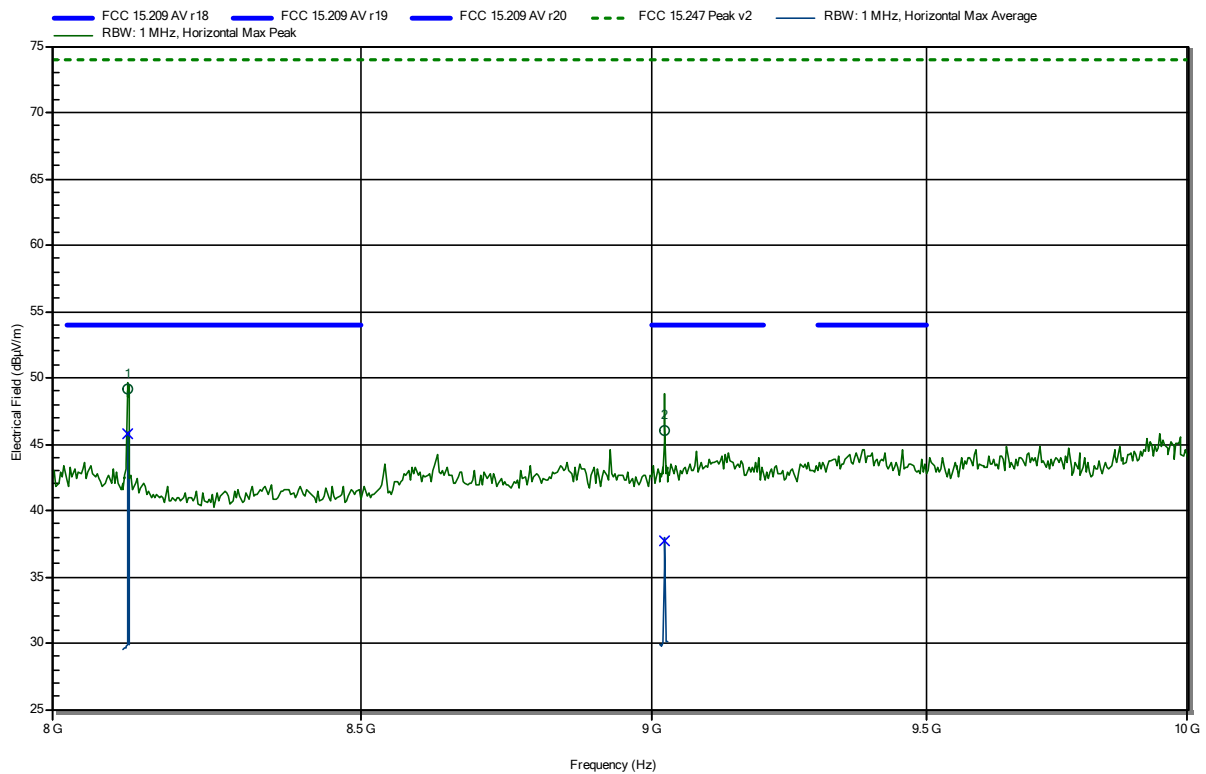
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Mr. Treffke
Measurement software: RadiMation, version 2016.1.10
Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
Antenna: BBHA 9120D, Horizontal
Measurement distance: 1 m
Mode: TX; Lora; 902.3 MHz
Test Date: 2020-07-16
Note:

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RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
8.121 GHz	49.17 dBµV/m	74 dBµV/m	-24.83 dB	Pass	1.2 m
9.023 GHz	46.02 dBµV/m	74 dBµV/m	-27.98 dB	Pass	1.2 m

Frequency	Average	Average Limit	Average Difference	Average Status	Height
8.121 GHz	45.81 dBµV/m	54 dBµV/m	-8.19 dB	Pass	1.2 m
9.023 GHz	37.68 dBµV/m	54 dBµV/m	-16.32 dB	Pass	1.2 m

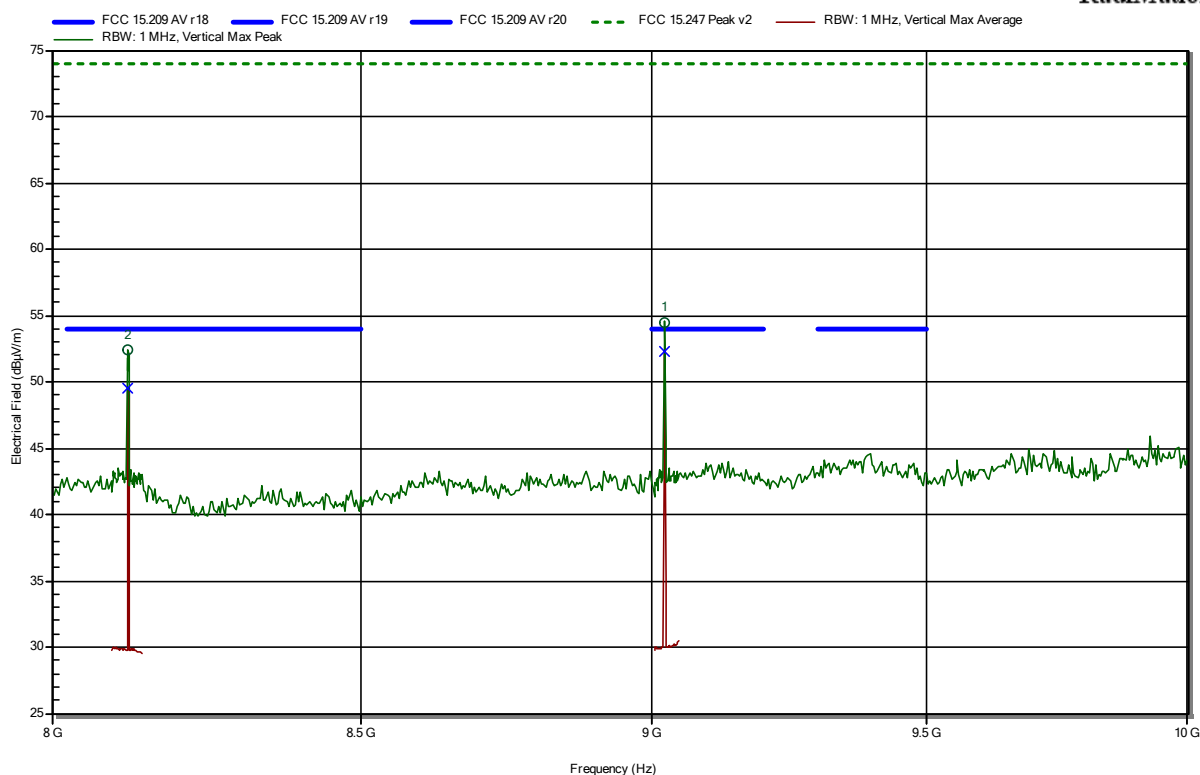
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Mr. Treffke
Measurement software: RadiMation, version 2016.1.10
Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
Antenna: BBHA 9120D, Vertical
Measurement distance: 1 m
Mode: TX; Lora; 902.3 MHz
Test Date: 2020-07-16
Note:

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Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
8.121 GHz	52.41 dBμV/m	74 dBμV/m	-21.59 dB	Pass	1.2 m
9.023 GHz	54.46 dBμV/m	74 dBμV/m	-19.54 dB	Pass	1.2 m

Frequency	Average	Average Limit	Average Difference	Average Status	Height
8.121 GHz	49.49 dBμV/m	54 dBμV/m	-4.51 dB	Pass	1.2 m
9.023 GHz	52.3 dBμV/m	54 dBμV/m	-1.7 dB	Pass	1.2 m

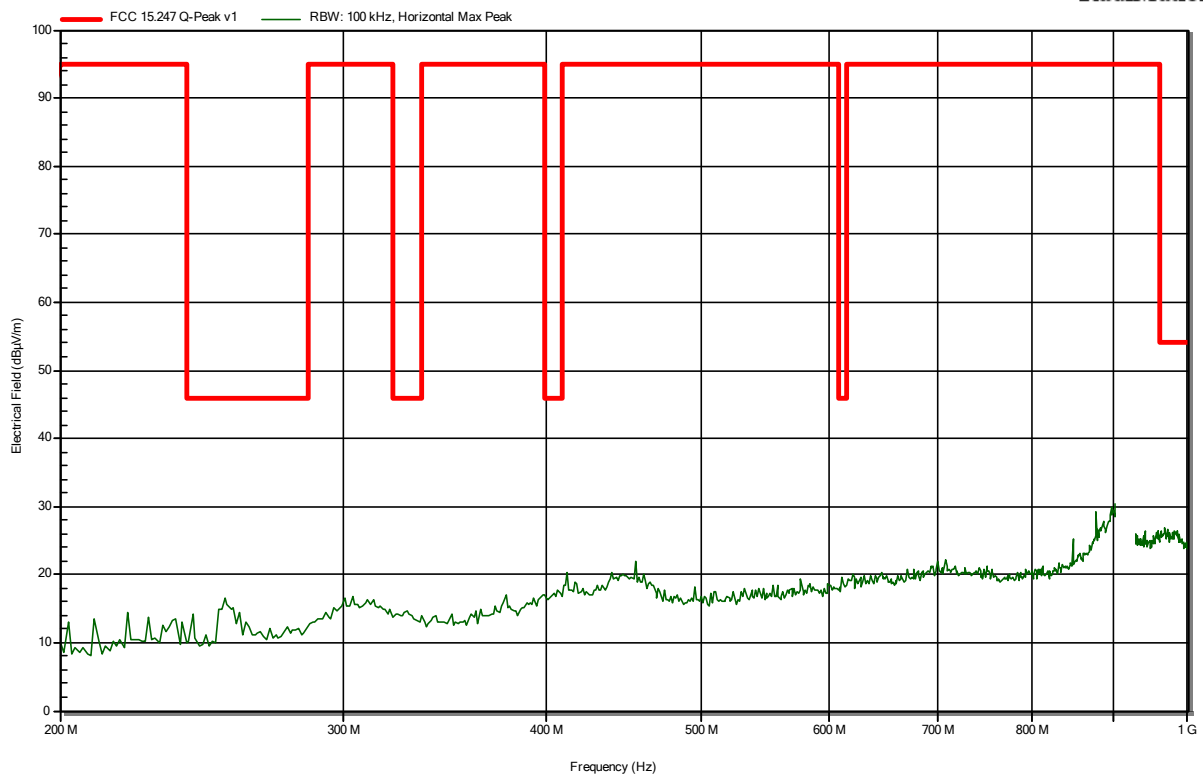
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Mr. Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
Antenna: Rohde & Schwarz HL 223, Horizontal
Measurement distance: 3 m
Mode: TX; Lora; 908.5 MHz
Test Date: 2020-07-16
Note:

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Radiation



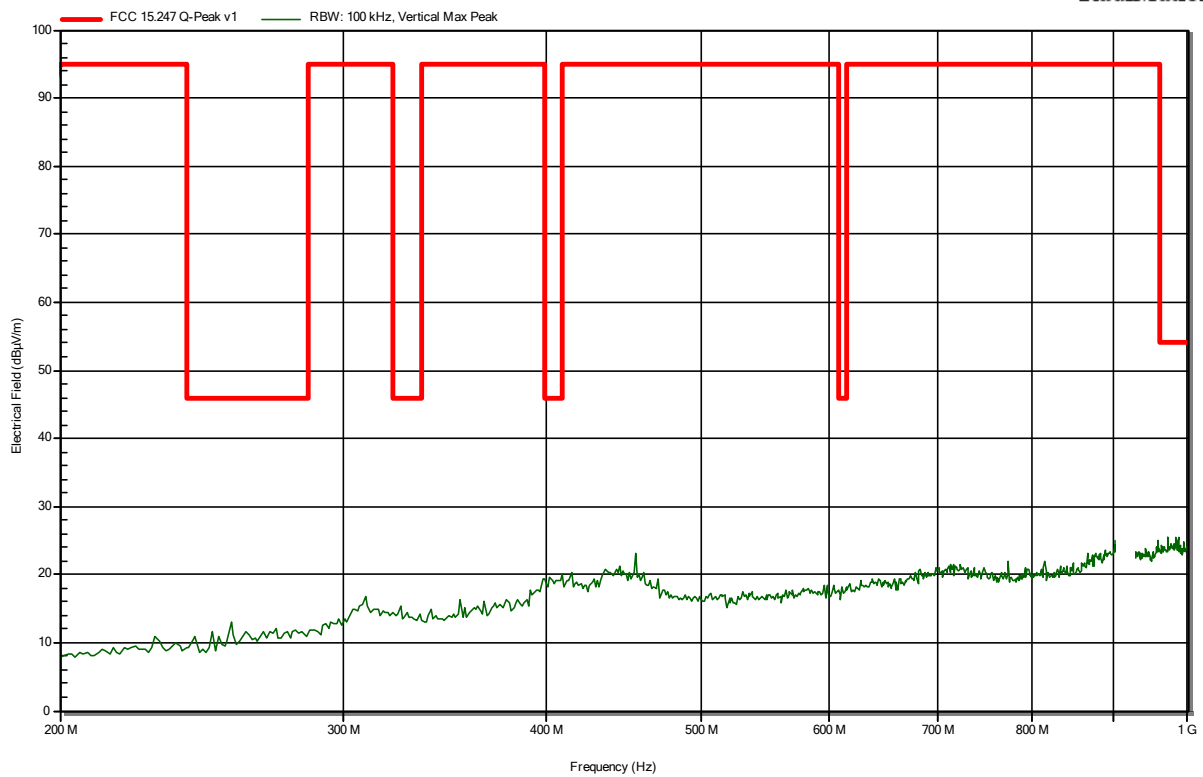
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Mr. Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
Antenna: Rohde & Schwarz HL 223, Vertical
Measurement distance: 3 m
Mode: TX; Lora; 908.5 MHz
Test Date: 2020-07-16
Note:

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Radiation



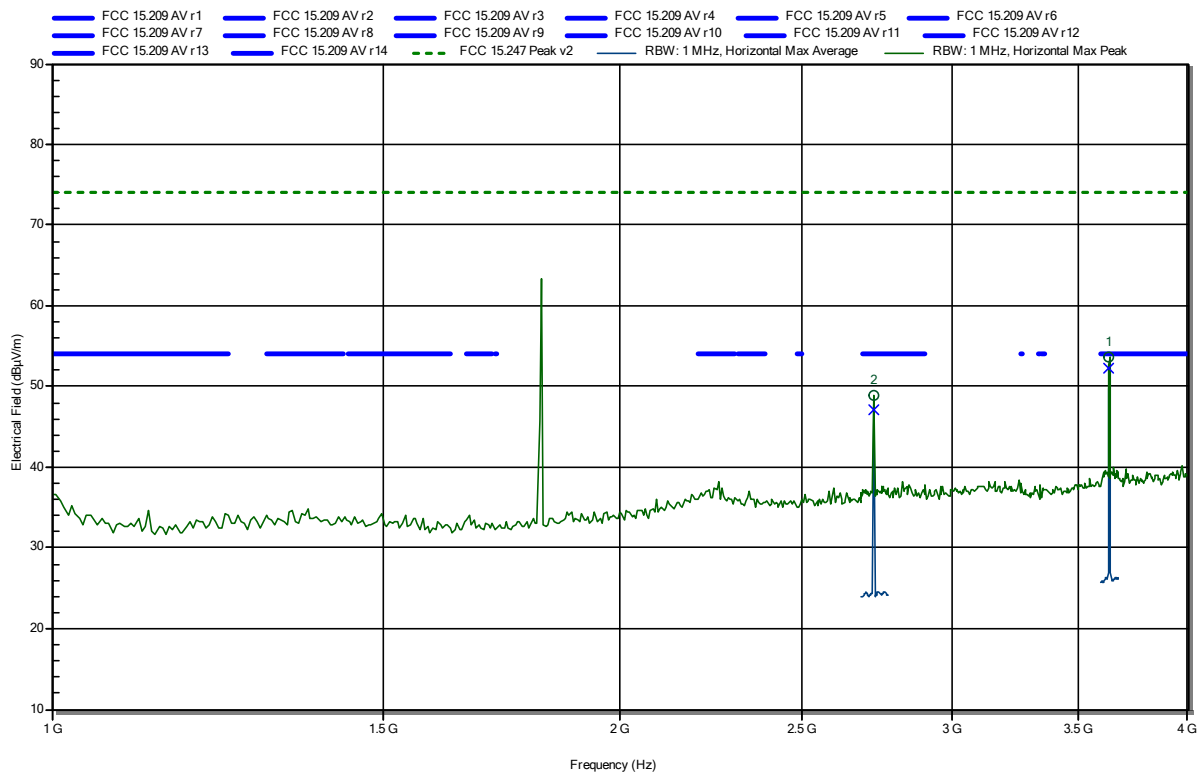
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Measurement software: RadiMation, version 2016.1.10
 Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
 Antenna: BBHA 9120D, Horizontal
 Measurement distance: 3 m
 Mode: TX; Lora; 908.5 MHz
 Test Date: 2020-07-16
 Note:

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Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
2.725 GHz	48.83 dBμV/m	74 dBμV/m	-25.17 dB	Pass	1.2 m
3.634 GHz	53.64 dBμV/m	74 dBμV/m	-20.36 dB	Pass	1.2 m

Frequency	Average	Average Limit	Average Difference	Average Status	Height
2.725 GHz	47.17 dBμV/m	54 dBμV/m	-6.83 dB	Pass	1.2 m
3.634 GHz	52.24 dBμV/m	54 dBμV/m	-1.76 dB	Pass	1.2 m

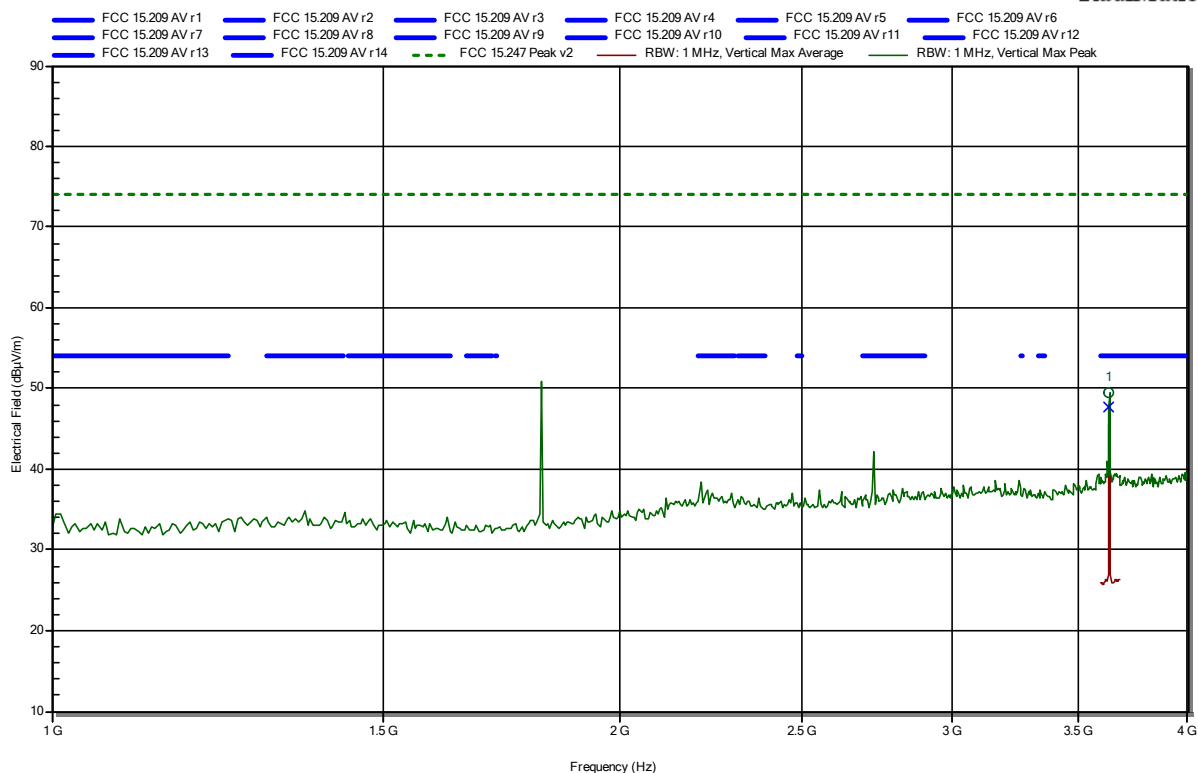
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Measurement software: RadiMation, version 2016.1.10
 Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
 Antenna: BBHA 9120D, Vertical
 Measurement distance: 3 m
 Mode: TX; Lora; 908.5 MHz
 Test Date: 2020-07-16
 Note:

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Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
3.634 GHz	49.48 dBµV/m	74 dBµV/m	-24.52 dB	Pass	1.2 m
Frequency	Average	Average Limit	Average Difference	Average Status	Height
3.634 GHz	47.63 dBµV/m	54 dBµV/m	-6.37 dB	Pass	1.2 m

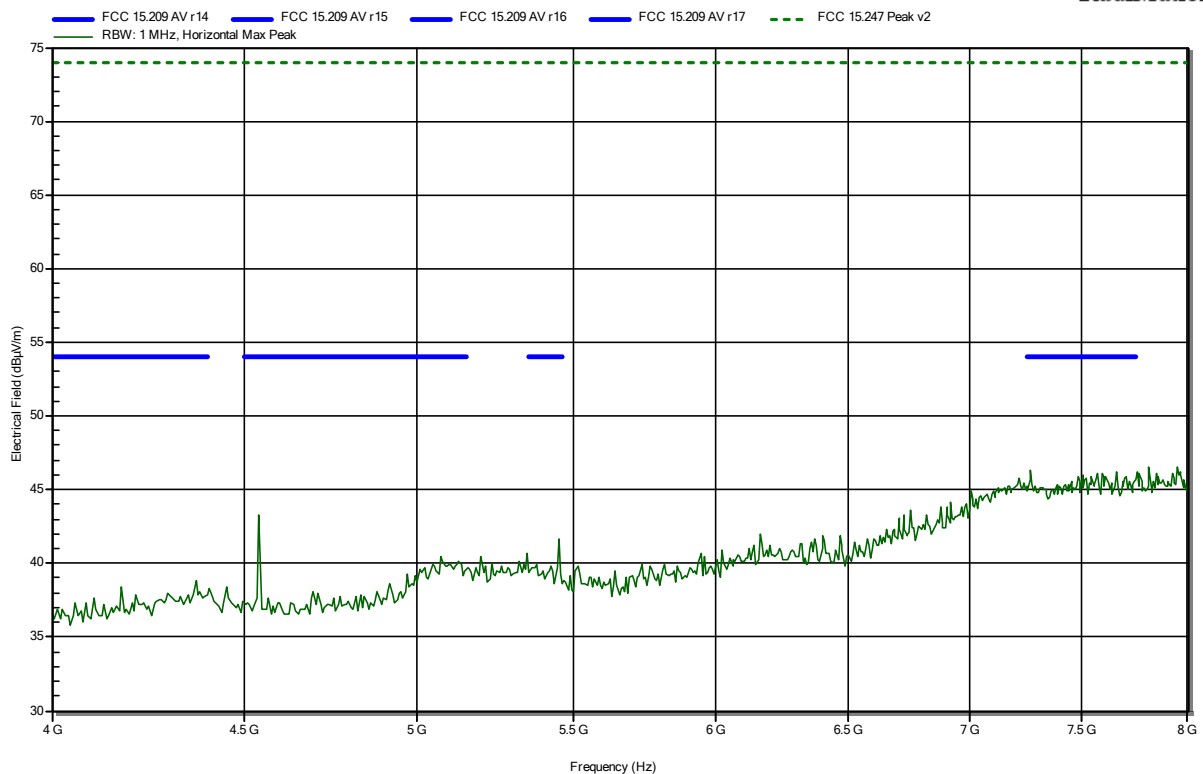
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Mr. Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
Antenna: BBHA 9120D, Horizontal
Measurement distance: 3 m converted to 3m
Mode: TX; Lora; 908.5 MHz
Test Date: 2020-07-16
Note:

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Radiation

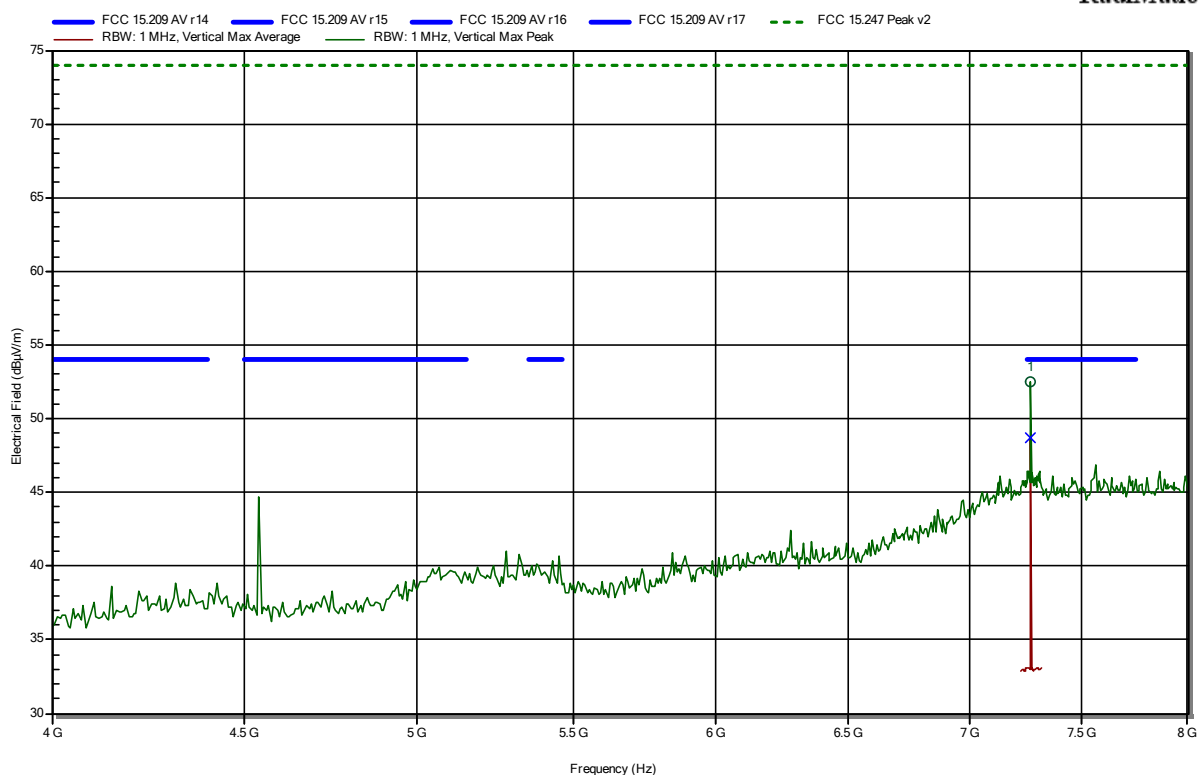


Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448
 Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Measurement software: RadiMation, version 2016.1.10
 Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
 Antenna: BBHA 9120D, Vertical
 Measurement distance: 3 m
 Mode: TX; Lora; 908.5 MHz
 Test Date: 2020-07-16
 Note:

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Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
7.268 GHz	52.51 dBµV/m	74 dBµV/m	-21.49 dB	Pass	1.2 m
Frequency	Average	Average Limit	Average Difference	Average Status	Height
7.268 GHz	48.66 dBµV/m	54 dBµV/m	-5.34 dB	Pass	1.2 m

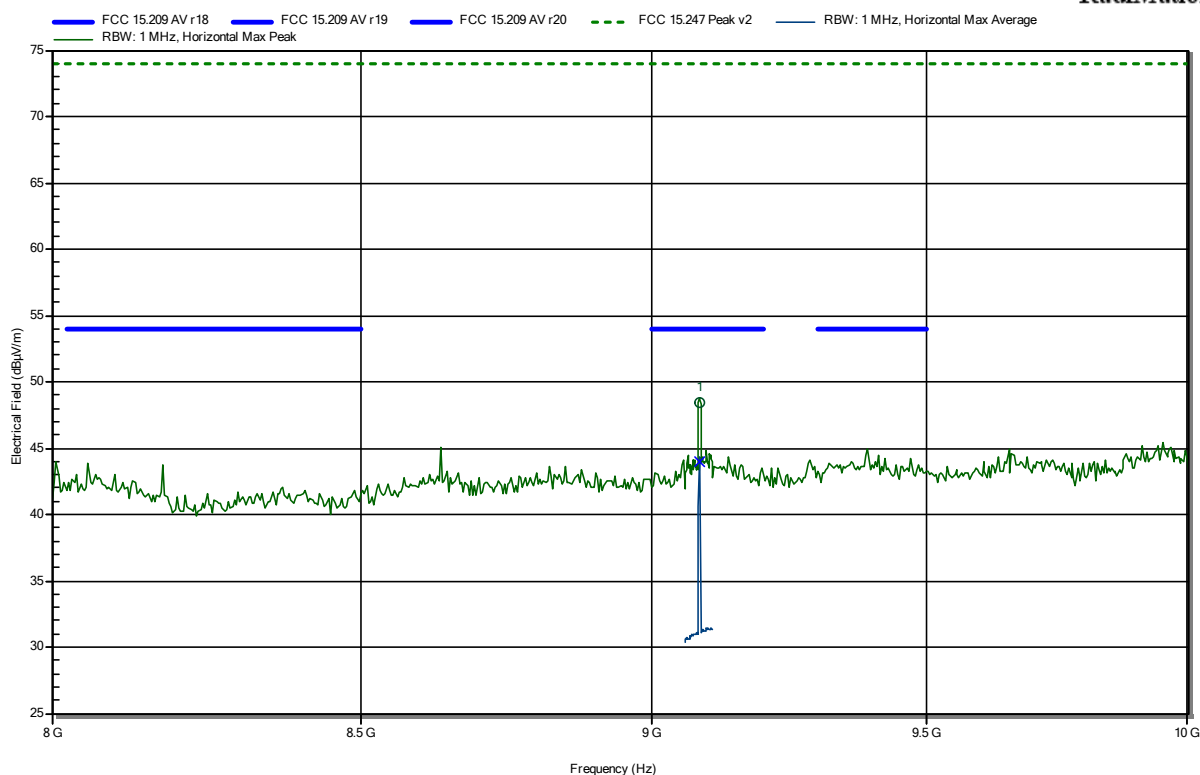
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Mr. Treffke
Measurement software: RadiMation, version 2016.1.10
Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
Antenna: BBHA 9120D, Horizontal
Measurement distance: 1 m
Mode: TX; Lora; 908.5 MHz
Test Date: 2020-07-16
Note:

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Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
9.085 GHz	48.48 dBµV/m	74 dBµV/m	-25.52 dB	Pass	1.2 m
Frequency	Average	Average Limit	Average Difference	Average Status	Height
9.085 GHz	43.92 dBµV/m	54 dBµV/m	-10.08 dB	Pass	1.2 m

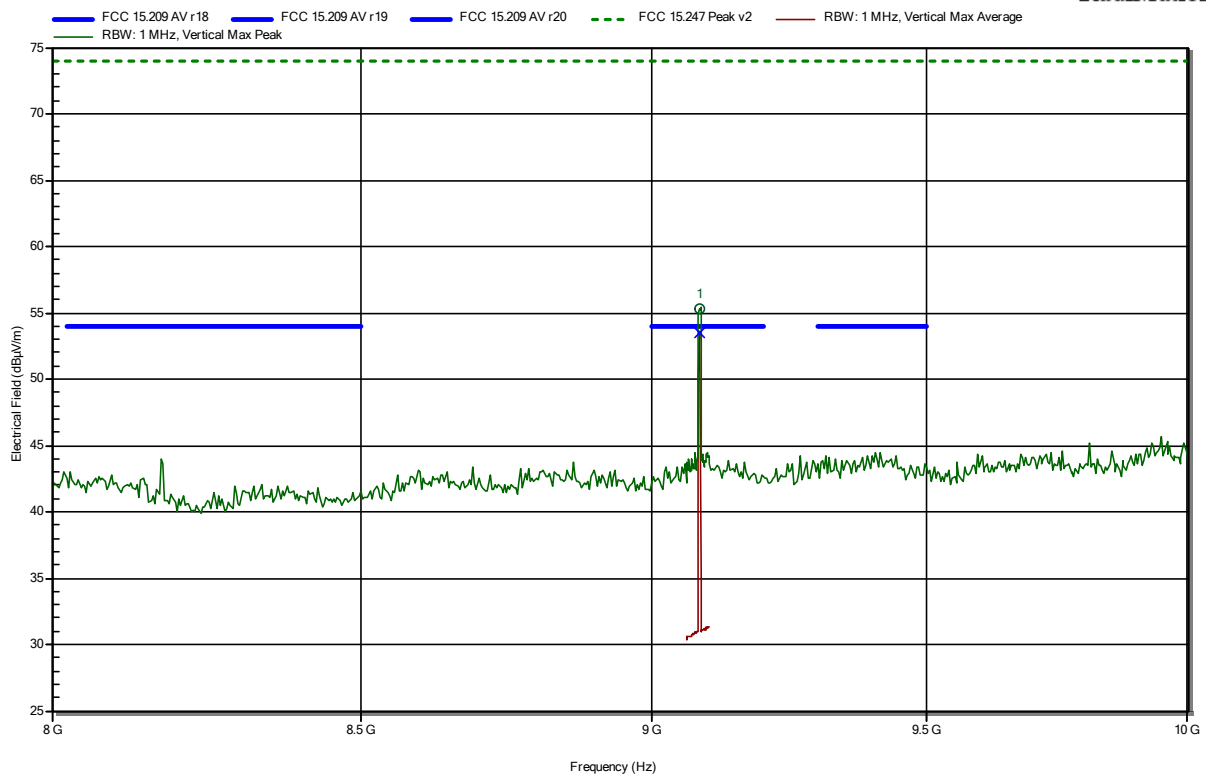
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
 Antenna: BBHA 9120D, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; Lora; 908.5 MHz
 Test Date: 2020-07-16
 Note:

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Frequency	Peak	Peak Limit	Peak Difference	Peak Status
9.085 GHz	55.24 dBμV/m	74 dBμV/m	-18.76 dB	Pass

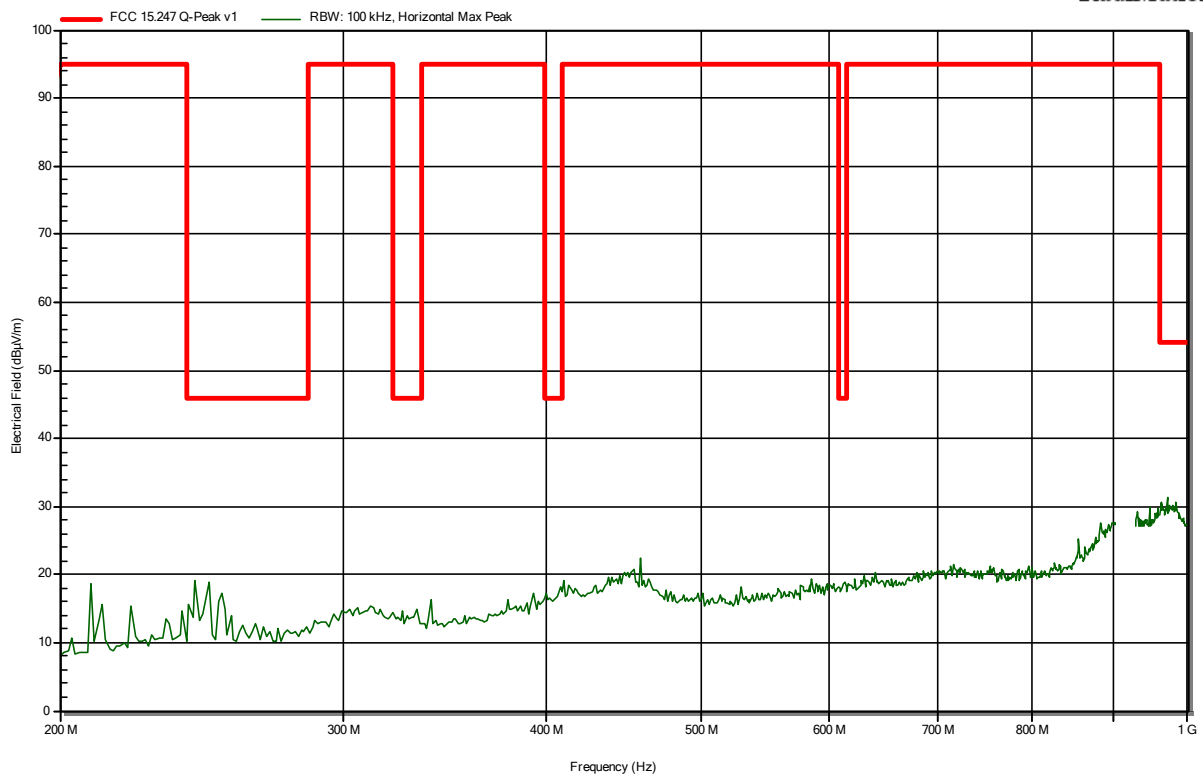
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Mr. Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
Antenna: Rohde & Schwarz HL 223, Horizontal
Measurement distance: 3 m
Mode: TX; Lora; 914.9 MHz
Test Date: 2020-07-16
Note:

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Radiation



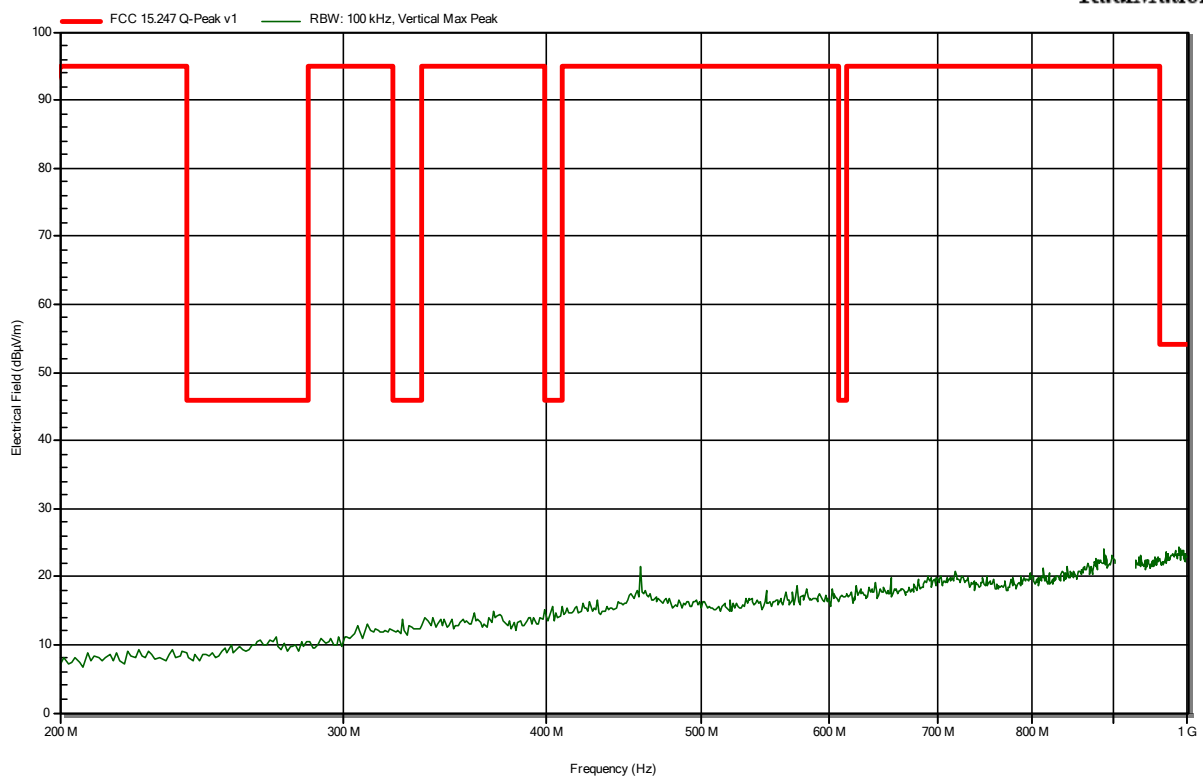
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Mr. Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
Antenna: Rohde & Schwarz HL 223, Vertical
Measurement distance: 3 m
Mode: TX; Lora; 914.9 MHz
Test Date: 2020-07-16
Note:

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Radiation



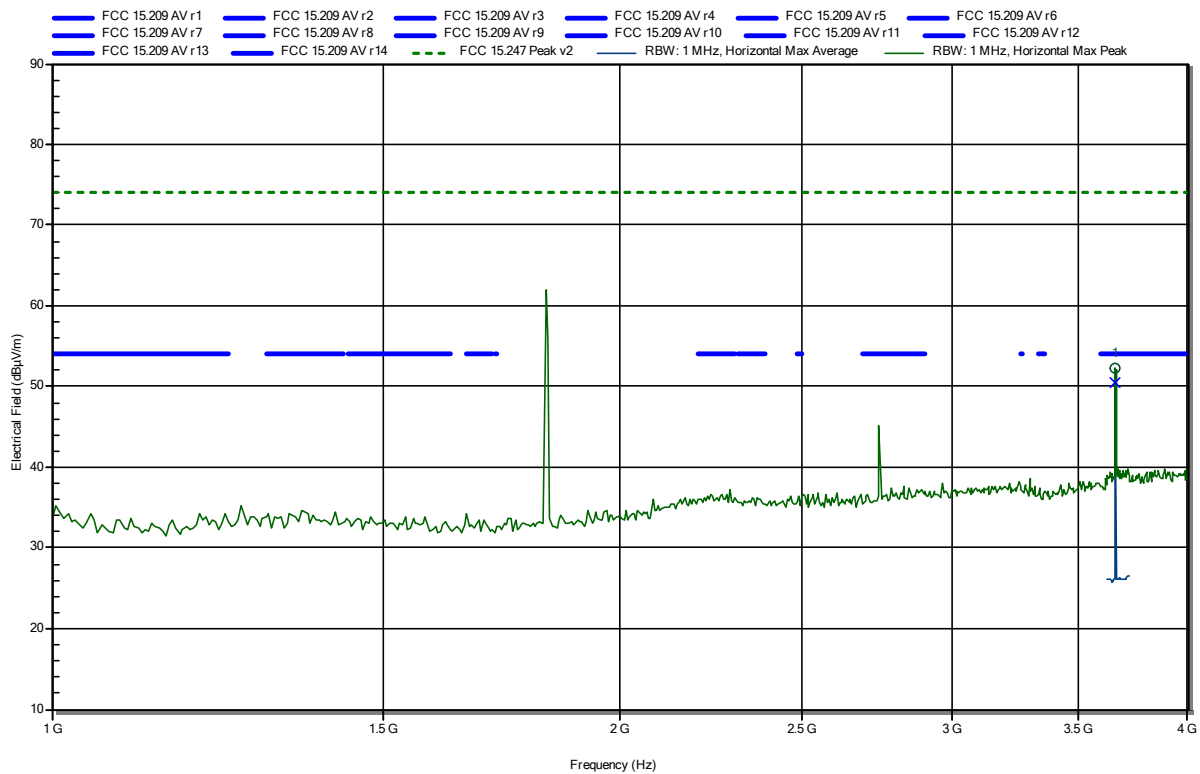
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Measurement software: RadiMation, version 2016.1.10
 Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
 Antenna: BBHA 9120D, Horizontal
 Measurement distance: 3 m
 Mode: TX; Lora; 914.9 MHz
 Test Date: 2020-07-16
 Note:

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Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
3.659 GHz	52.27 dBµV/m	74 dBµV/m	-21.73 dB	Pass	1.2 m
Frequency	Average	Average Limit	Average Difference	Average Status	Height
3.659 GHz	50.55 dBµV/m	54 dBµV/m	-3.45 dB	Pass	1.2 m

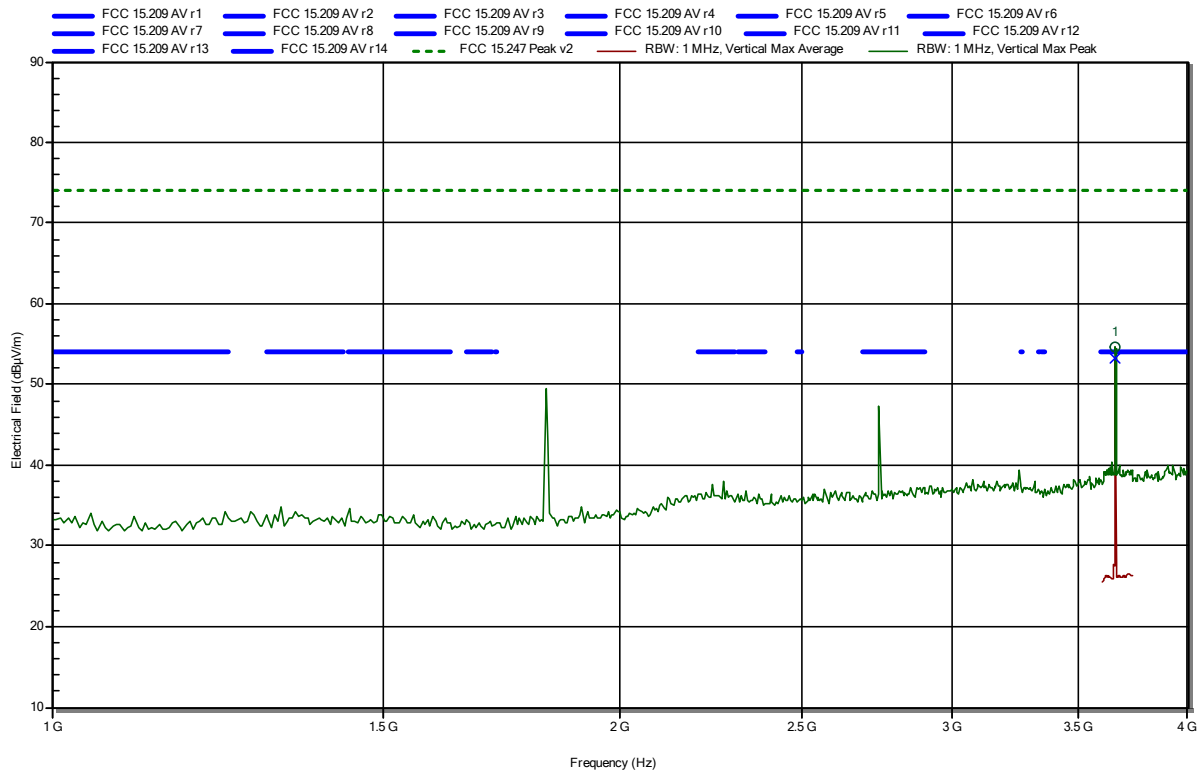
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Measurement software: RadiMation, version 2016.1.10
 Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
 Antenna: BBHA 9120D, Vertical
 Measurement distance: 3 m
 Mode: TX; Lora; 914.9 MHz
 Test Date: 2020-07-16
 Note:

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RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
3.66 GHz	54.57 dBµV/m	74 dBµV/m	-19.43 dB	Pass	1.2 m
Frequency	Average	Average Limit	Average Difference	Average Status	Height
3.66 GHz	53.36 dBµV/m	54 dBµV/m	-0.64 dB	Pass	1.2 m

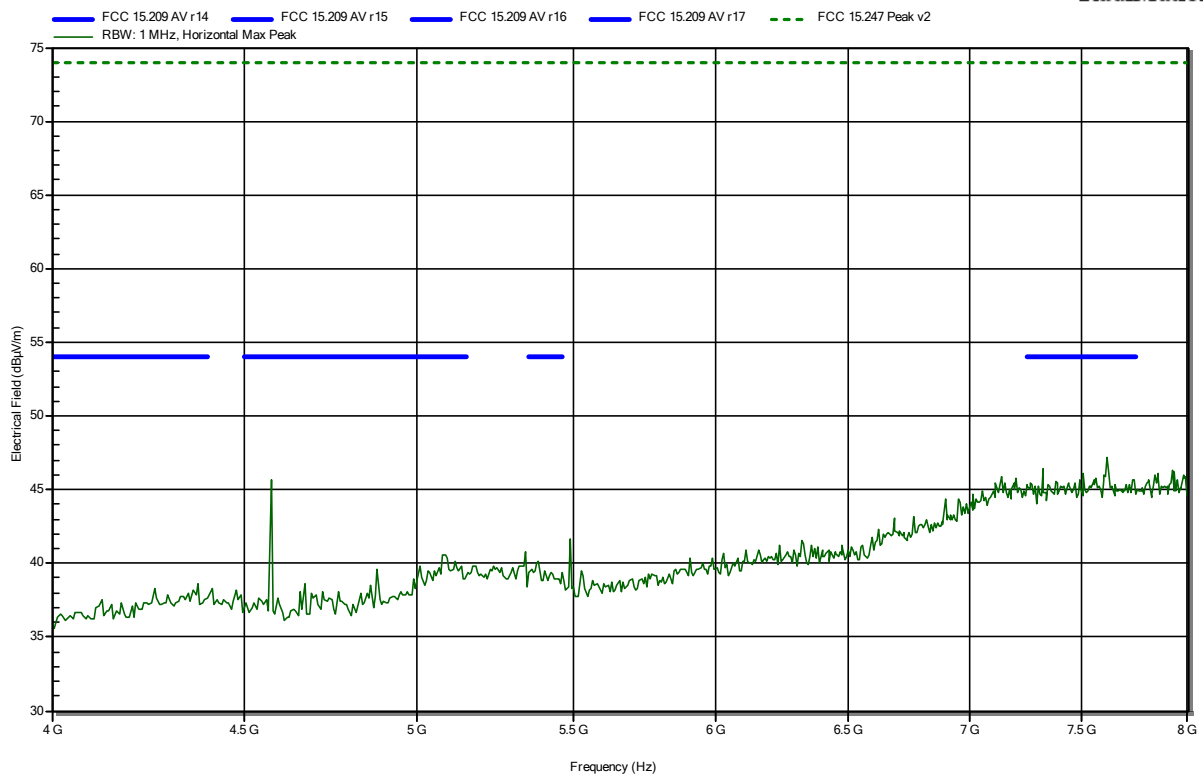
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Mr. Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
Antenna: BBHA 9120D, Horizontal
Measurement distance: 3 m converted to 3m
Mode: TX; Lora; 914.9 MHz
Test Date: 2020-07-16
Note:

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Radiation



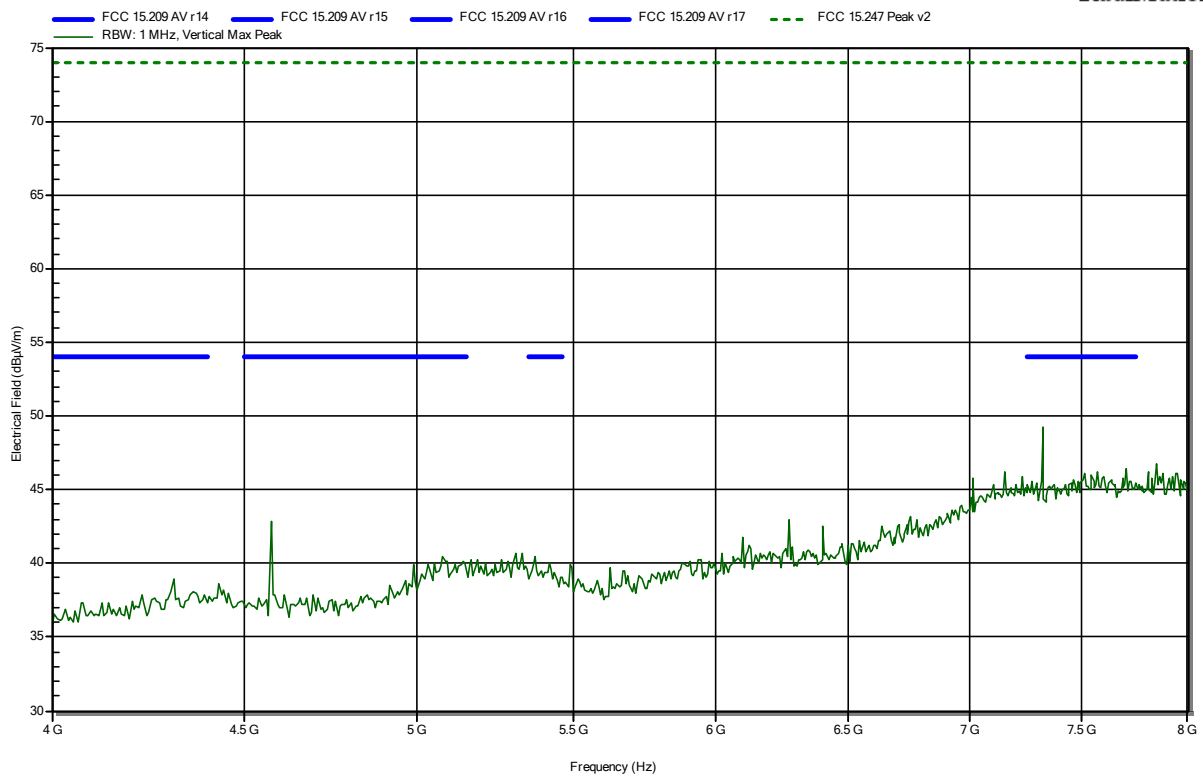
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
EUT Name: Onethinx Core LoRaWAN module
Model: OTX-18
Test Site: Eurofins Product Service GmbH
Operator: Mr. Treffke
Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
Antenna: BBHA 9120D, Vertical
Measurement distance: 3 m converted to 3m
Mode: TX; Lora; 914.9 MHz
Test Date: 2020-07-16
Note:

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Radiation



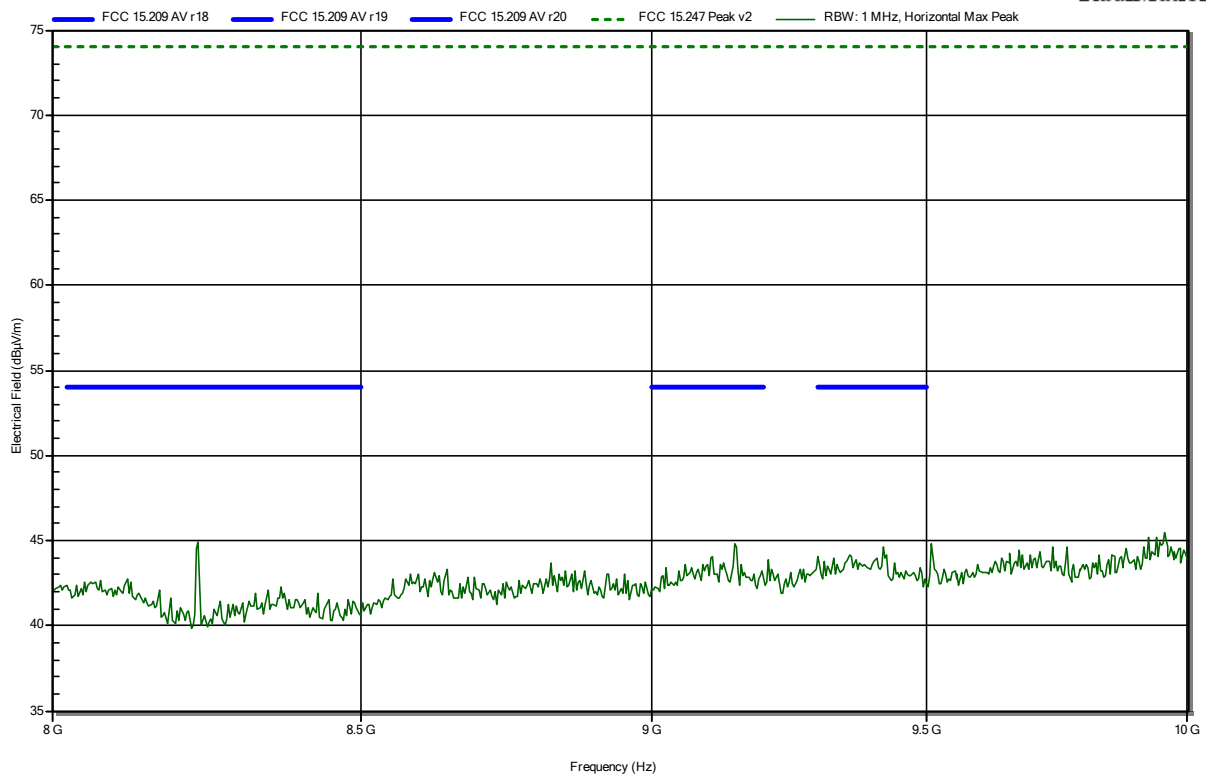
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
 Antenna: BBHA 9120D, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; Lora; 914.9 MHz
 Test Date: 2020-07-16
 Note:

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RadiMation



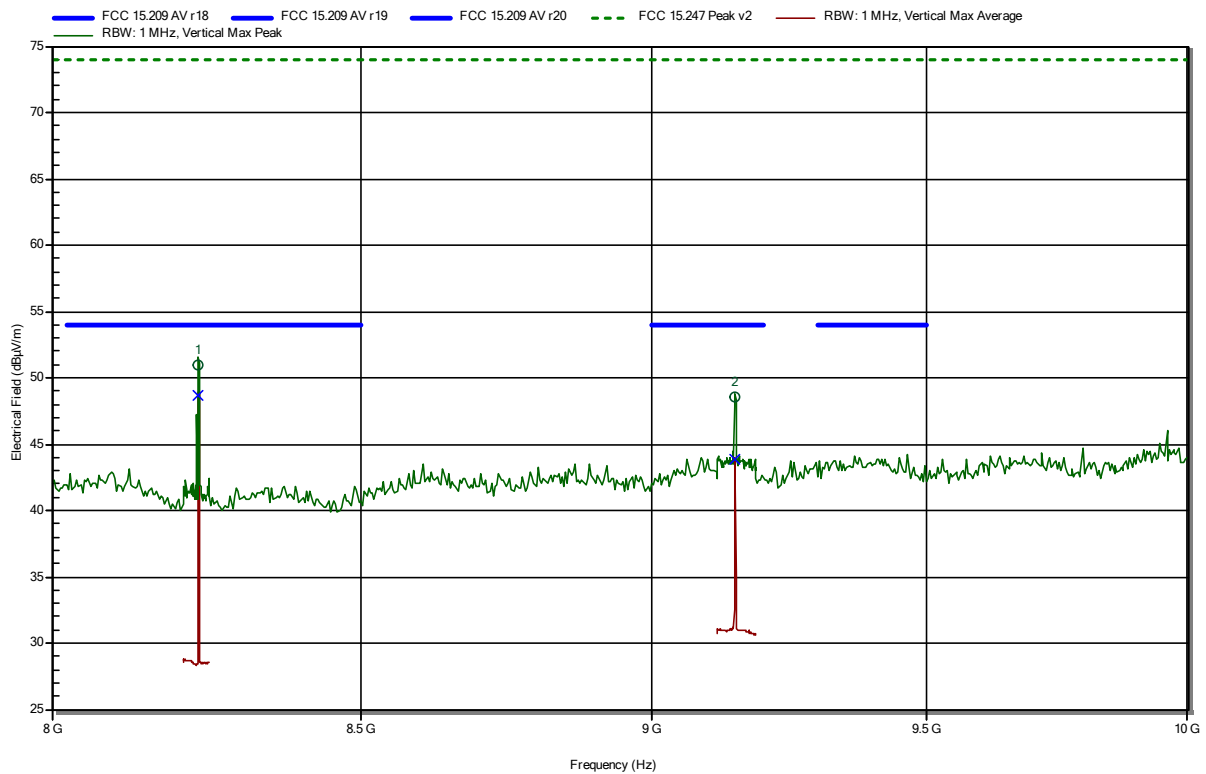
Spurious emissions according to FCC 47 e-CFR §15.247

Project number: G0M-1909-8448

Applicant: Onethinx
 EUT Name: Onethinx Core LoRaWAN module
 Model: OTX-18
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Measurement software: RadiMation, version 2016.1.10
 Test Conditions: Tnom: 24°C, Vnom: 3.3 VDC
 Antenna: BBHA 9120D, Vertical
 Measurement distance: 1 m
 Mode: TX; Lora; 914.9 MHz
 Test Date: 2020-07-16
 Note:

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RadiMation



Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Height
8.234 GHz	50.96 dBμV/m	74 dBμV/m	-23.04 dB	Pass	1.2 m
9.149 GHz	48.55 dBμV/m	74 dBμV/m	-25.45 dB	Pass	1.2 m

Frequency	Average	Average Limit	Average Difference	Average Status	Height
8.234 GHz	48.68 dBμV/m	54 dBμV/m	-5.32 dB	Pass	1.2 m
9.149 GHz	43.81 dBμV/m	54 dBμV/m	-10.19 dB	Pass	1.2 m