

RADIO REPORT FCC 47 CFR Part 15C ISED Canada RSS-247 Digital transmission systems operating within the 2400.0 MHz - 2483.5 MHz band	
Report Reference No	G0M-2205-1454-TFC247WF-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 DAkkS - Registration number : D-PL-12092-01-04 (FCC) FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant	u-blox AG
Address	Zürcherstrasse 68 8800 Thalwil Switzerland
Test Specification	47 CFR Part 15C RSS-247, Issue 2, 2017-02 RSS-Gen, Issue 5, Amendment 2, 2021-02
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	Stand-alone multiradio module
Model(s)	NORA-W101
Additional Model(s)	NORA-W106
Brand Name(s)	u-blox
Hardware Version(s)	04
Software Version(s)	V1.08
FCC ID	XPYNORAW1W2
IC	8595A-NORAW1W2
Test Result	PASSED

Possible test case verdicts:		
Required by standard but not tested	N/T	
Not required by standard	N/R	
Not applicable to EUT	N/A	
Test object does meet the requirement	P(PASS)	
Test object does not meet the requirement	F(FAIL)	
Testing:		
Test Lab Temperature	20 °C - 30 °C	
Test Lab Humidity	25 % - 55 %	
Date of receipt of test item	2022-07-18	
Report:		
Compiled by	Odai Qawasmeh	
Tested by (+ signature) (Responsible for Test)	Odai Qawasmeh	
Approved by (+ signature) (Test Lab Engineer)	Wilfried Treffke	
Date of Issue	2023-02-24	
Total number of pages	230	
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:		
According to customer declaration, the additional model NORA-W106 and the fully tested model NORA-W101 are identical, the only hardware difference is that NORA-W106 has an internal integrated antenna. Therefore only radiated emission tests have been conducted on the additional model.		

ADDITIONAL VARIANTS

Additional Variants (partially tested)		
Tested Variant	Description	
1	Product Type Description	Stand-alone multiradio module
	Model name	NORA-W106 (with integrated PCB antenna type: AT1608-A2R4NAA)
	Brand name	u-blox
	Hardware Version	04
	Software Version	V1.08
2	Product Type Description	Stand-alone multiradio module
	Model name	NORA-W101 (with external antenna type: PN PRO-IS-237)
	Brand name	u-blox
	Hardware Version	04
	Software Version	V1.08
Comment: The additional variant mentioned above were spot-checked.		

Additional Variants (not tested and not evaluated variants)		
Not-tested Variant	Description	
1	Product Type Description	Stand-alone multiradio module
	Model name	NORA-W251AWS
	Brand name	u-blox
	Hardware Version	04
	Software Version	V1.08
2	Product Type Description	Stand-alone multiradio module
	Model name	NORA-W256AWS
	Brand name	u-blox
	Hardware Version	04
	Software Version	V1.08
Comment: Those named additional variants above have not been tested. Those additional variants of the series have been declared by the manufacturer. The test report explicitly states that those variants were neither tested nor assessed nor evaluated.		

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2022-12-21	Initial Release	O. Qawasmeh
02	2023-02-24	Replaced document: G0M-2205-1454-TFC247WF-V01 Replaced by: G0M-2205-1454-TFC247WF-V02 Reason: Correction of calibration dates in section 3.8 and 3.9	R. Jaafar

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
BPSK	Binary Phase Shift Keying
DSSS	Direct Sequence Spread Spectrum
EUT	Equipment Under Test
FCC	Federal Communications Commission
HT	High Throughput
IEEE 802.11	MAC and PHY Layer for WiFi
ISED	Innovation, Science and Economic Development Canada
OFDM	Orthogonal Frequency Division Multiplexing
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RBW	Resolution bandwidth
RMS	Root mean square
VBW	Video bandwidth
V _{NOM}	Nominal supply voltage

REPORT INDEX

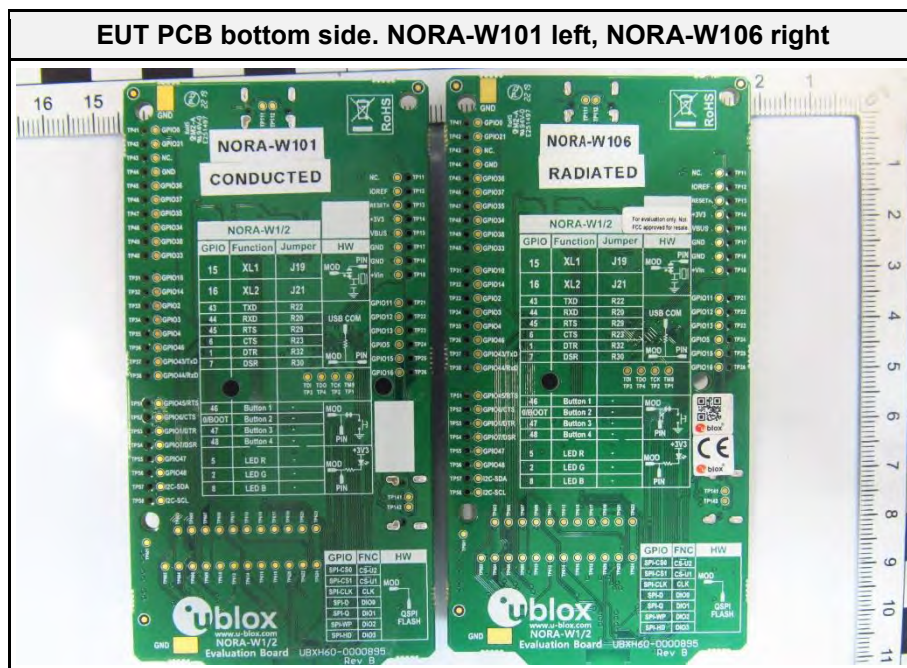
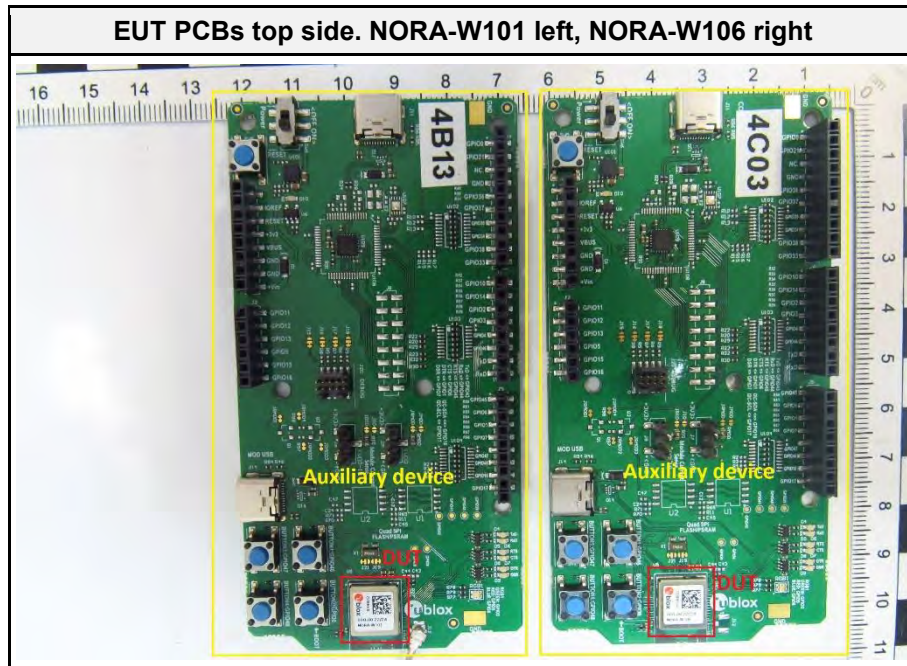
1	Equipment (Test Item) Under Test.....	7
1.1	Photos – Equipment External	9
1.2	Photos – Equipment Internal	14
1.3	Support Equipment.....	18
1.4	Test mode output power	19
1.5	Test mode duty cycle	21
1.6	Test Modes	23
1.7	Test Frequencies.....	24
1.8	Sample emission level calculation	25
2	Result Summary.....	26
3	Test Conditions and Results.....	27
3.1	Test Conditions and Results - Occupied bandwidth.....	27
3.2	Test Conditions and Results - 6 dB bandwidth.....	41
3.3	Test Conditions and Results - Maximum peak conducted output power	55
3.4	Test Conditions and Results - Power spectral density	57
3.5	Test Conditions and Results - AC powerline conducted emissions.....	71
3.6	Test Conditions and Results - Band-edge compliance.....	79
3.7	Test Conditions and Results - Conducted spurious emissions.....	89
3.8	Test Conditions and Results - Transmitter radiated emissions	103
3.9	Test Conditions and Results - Receiver radiated emissions	114
ANNEX A	Transmitter spurious emissions	123
ANNEX B	Transmitter spurious emissions (Tested variant 1).....	155
ANNEX C	Transmitter spurious emissions (Tested variant 2).....	187
ANNEX D	Receiver spurious emissions	219
ANNEX E	Receiver spurious emissions (Tested variant 1)	223
ANNEX F	Receiver spurious emissions (Tested variant 2)	227

1 Equipment (Test Item) Under Test

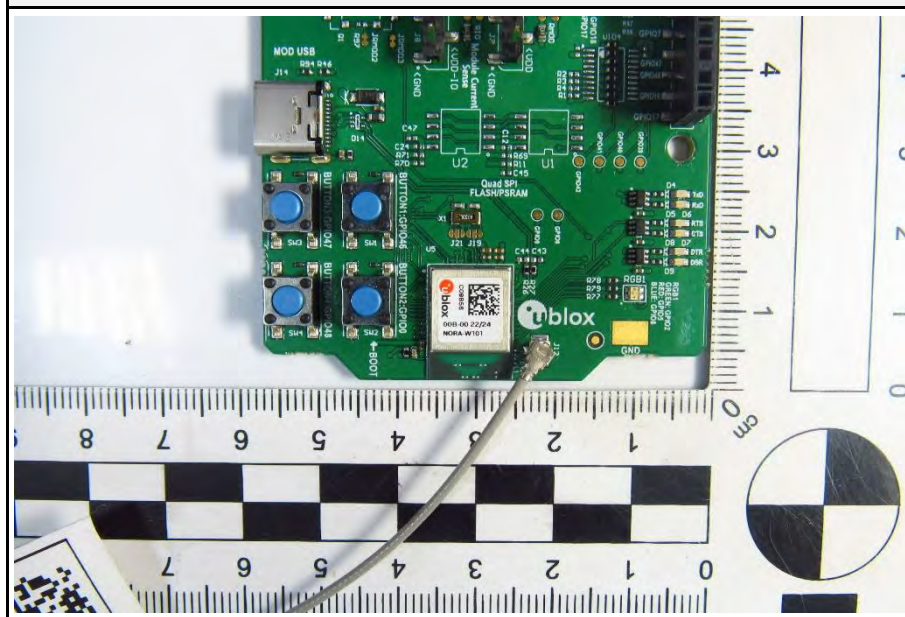
Description	Stand-alone multiradio module	
Model	NORA-W101	
Additional Model(s)	NORA-W106	
Brand Name(s)	u-blox	
Serial Number(s)	NORA-W101: 919100.0400.000 NORA-W106: 919200.0400.000	
Test Sample Id(s)	40682 (4B16, Radiated) 40677 (4B13, Conducted) 40680 (4C03)	
Hardware Version(s)	04	
Software Version(s)	V1.08	
PMN	NORA-W101, NORA-W106, NORA-W251AWS, NORA-W256AWS	
HVIN	NORA-W101, NORA-W106, NORA-W251AWS, NORA-W256AWS	
FVIN	n/a	
HMN	n/a	
FCC ID	XPYNORAW1W2	
IC	8595A-NORAW1W2	
Equipment type	Radio Module	
Radio type	Transceiver	
Assigned frequency bands	2400.0 MHz - 2483.5 MHz	
Radio technology	IEEE 802.11 b/g/n (HT20 + HT40)	
Modulation	BPSK, QPSK, 16-QAM, 64-QAM	
Number of antenna ports	1	
Antenna-1 NORA-W101	Type	External (Monopole)
	Model	PRO-EX-333
	Manufacturer	Abracon
	Gain	3.07 dBi (measured)
Antenna-2 NORA-W101	Type	External (Patch)
	Model	PN PRO-IS-237
	Manufacturer	Abracon
	Gain	1.61 dBi (measured)
Antenna NORA-W106	Type	Integrated (PCB antenna)
	Model	AT1608-A2R4NAA
	Manufacturer	Abracon
	Gain	1.12 dBi (measured)
Antenna NORA-W101 (Antenna is of same kind as PRO-EX-333 but is not tested or evaluated by lab)	Type	External
	Model	GW.26.0111
	Manufacturer	Taoglas
	Gain	2.0 dBi
Antenna NORA-W101 (Antenna is of same kind as PRO-EX-333 but is not tested or evaluated by lab)	Type	External
	Model	ANT-2.4-CW-RH-RPS
	Manufacturer	Linx
	Gain	-1.0 dBi
Antenna NORA-W101 (Antenna is of same kind as PRO-EX-333 but is not tested or evaluated by lab)	Type	External
	Model	PRO-EX-348
	Manufacturer	Abracon
	Gain	3.0 dBi

Antenna NORA-W101 (Antenna is of same kind as PRO-EX-333 but is not tested or evaluated by lab)	Type	External
	Model	PRO-EX-296
	Manufacturer	Abracon
	Gain	2.0 dBi
Antenna NORA-W101 (Antenna is of same kind as PRO-EX-333 but is not tested or evaluated by lab)	Type	External
	Model	PRO-EX-327
	Manufacturer	Abracon
	Gain	3.0 dBi
Antenna NORA-W101 (Antenna is of same kind as PRO-EX-333 but is not tested or evaluated by lab)	Type	External
	Model	PRO-EX-286
	Manufacturer	Abracon
	Gain	3.0 dBi
Supply Voltage	V _{NOM}	3.3 VDC
Operating Temperature	T _{NOM}	20 °C
AC/DC-Adaptor	N/A	
Manufacturer	u-blox AG Zürcherstrasse 68 8800 Thalwil Switzerland	

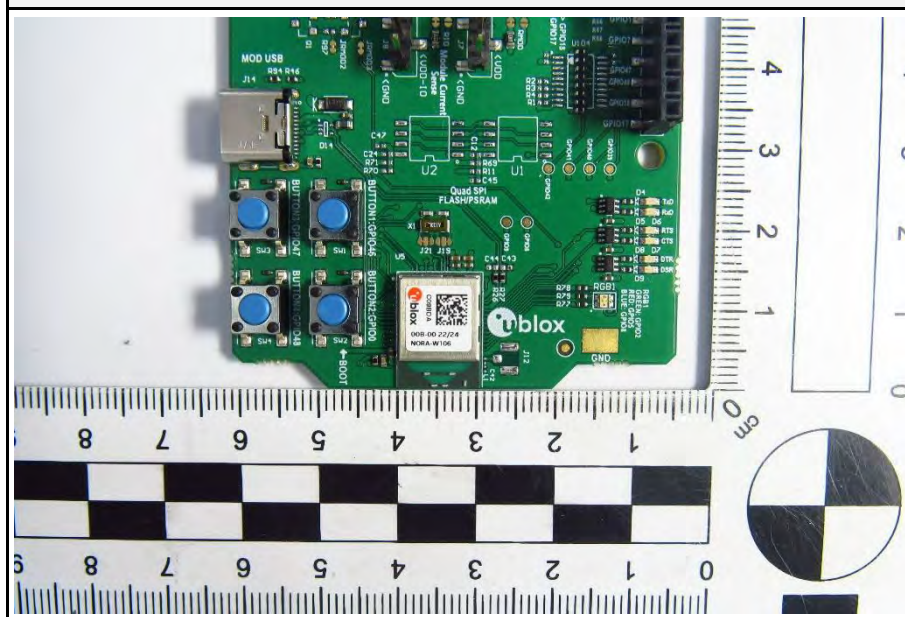
1.1 Photos – Equipment External



EUT radio module NORA-W101 view



EUT radio module NORA-W106 view



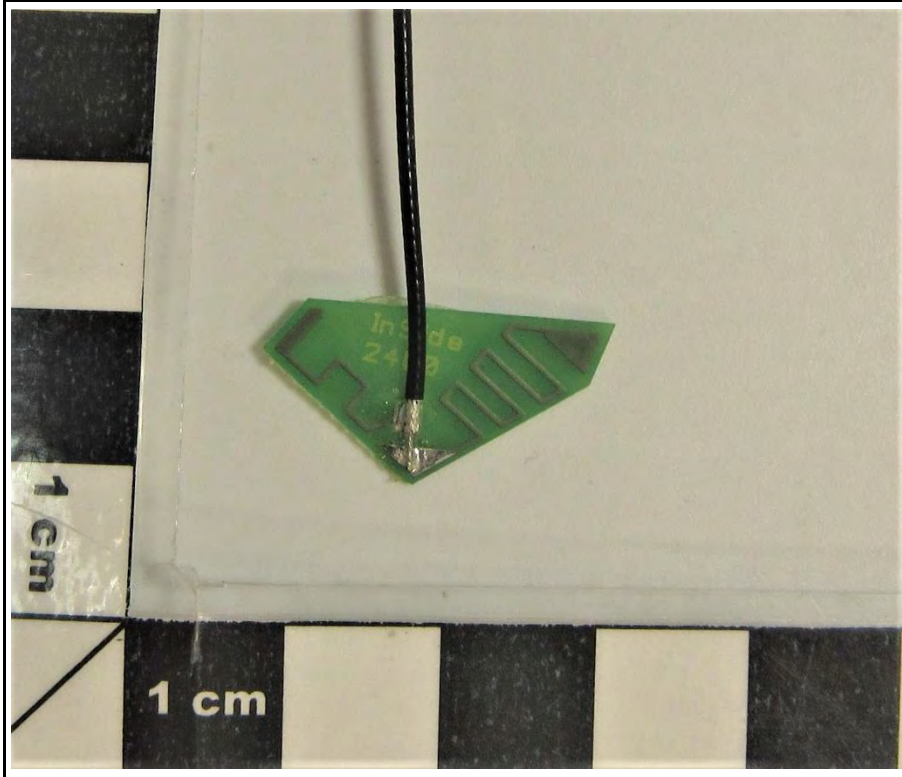
External antenna PRO-EX-333



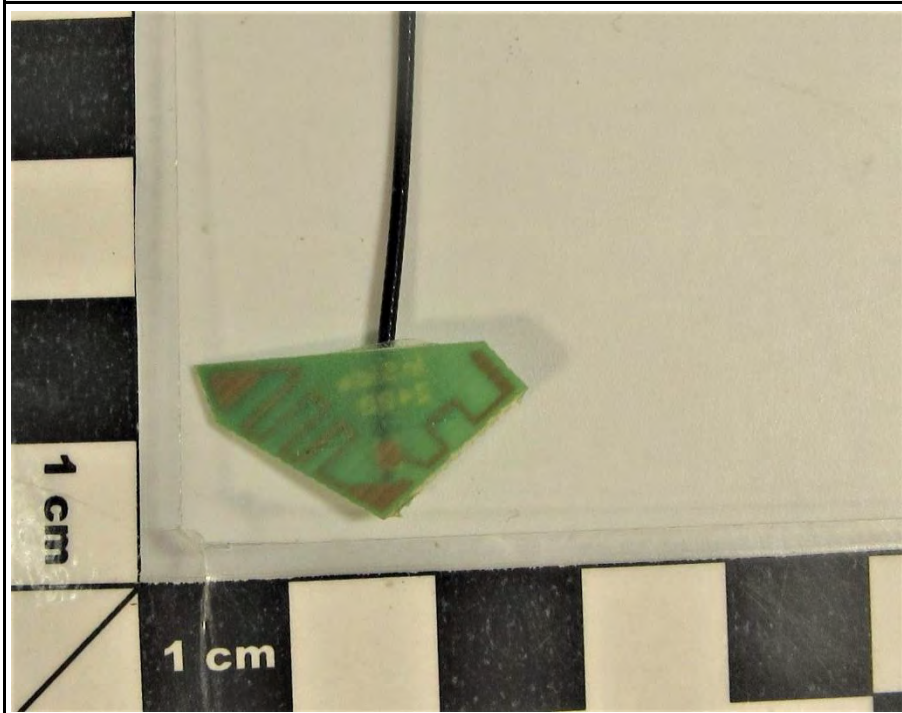
External antenna PRO-EX-333 connector



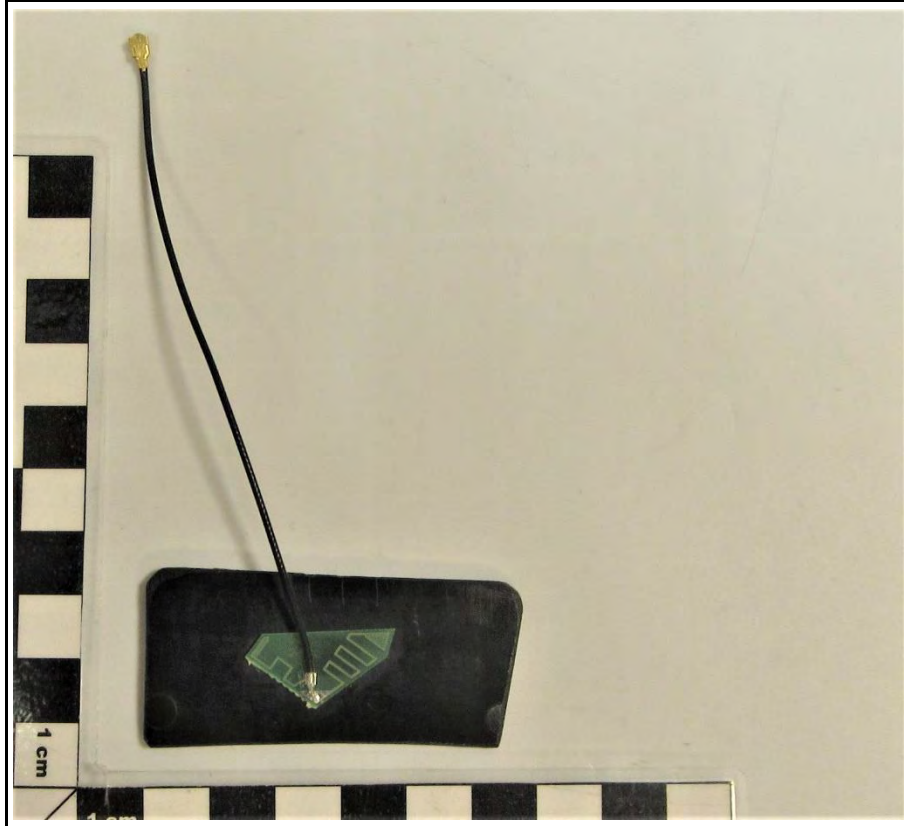
external antenna (PN PRO-IS-237)-front



External antenna (PN PRO-IS-237)-Back

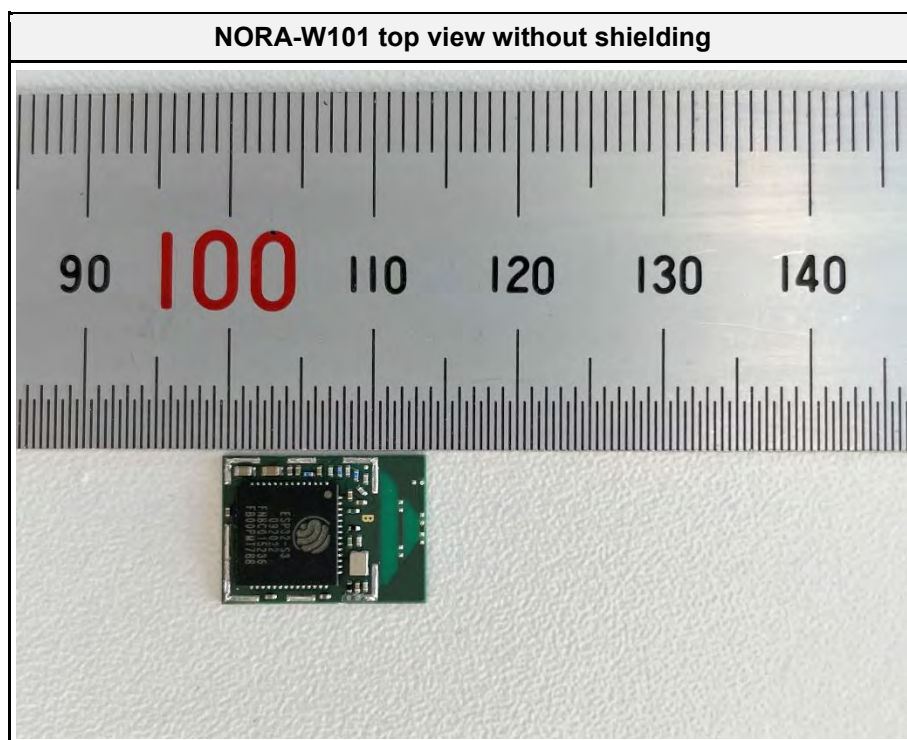
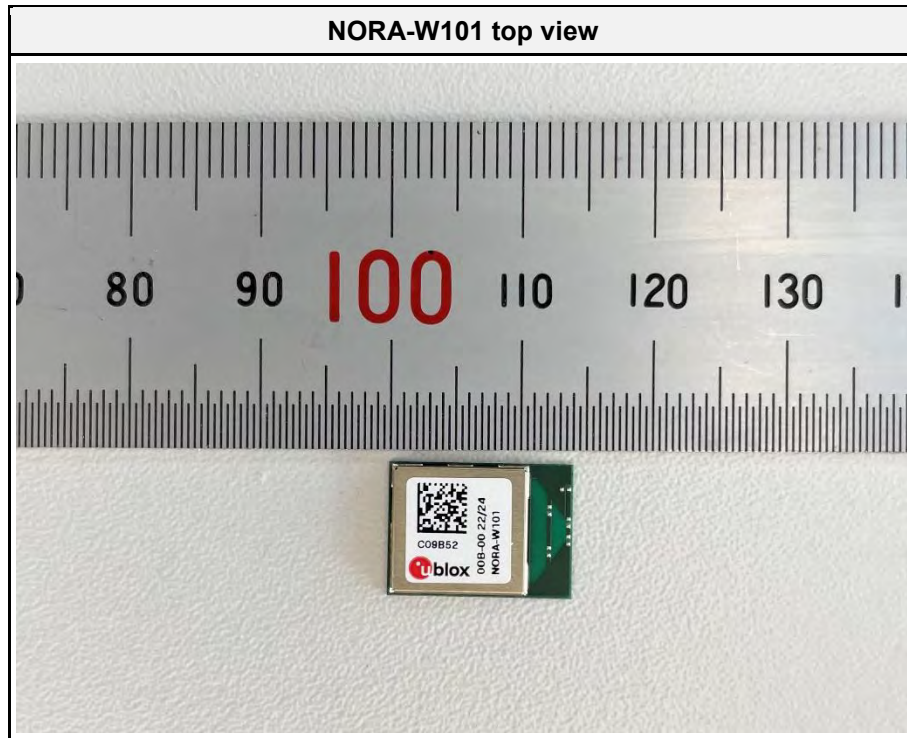


External antenna (PN PRO-IS-237)-with plastic background

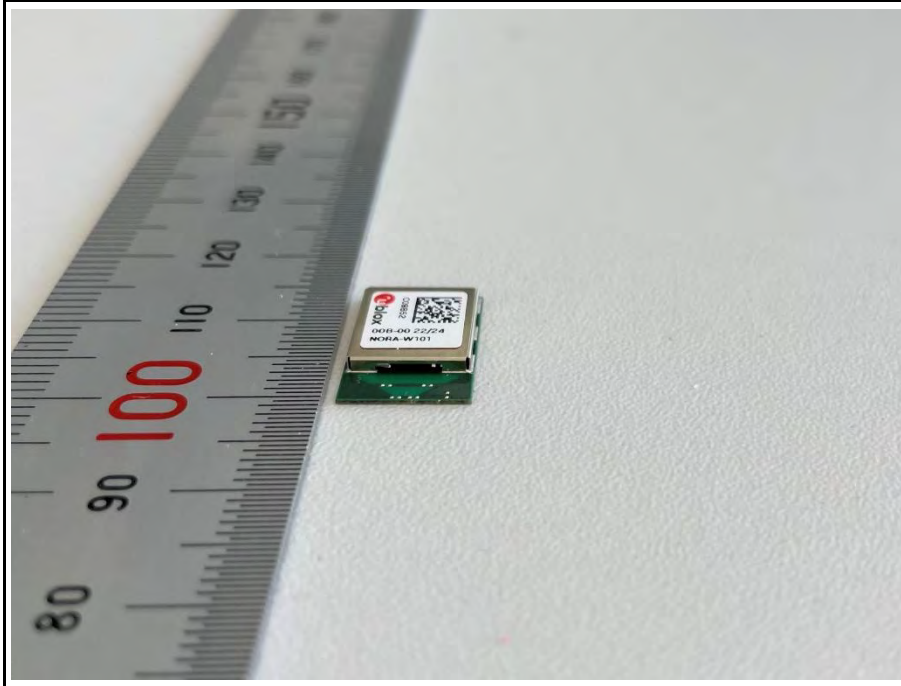


1.2 Photos – Equipment Internal

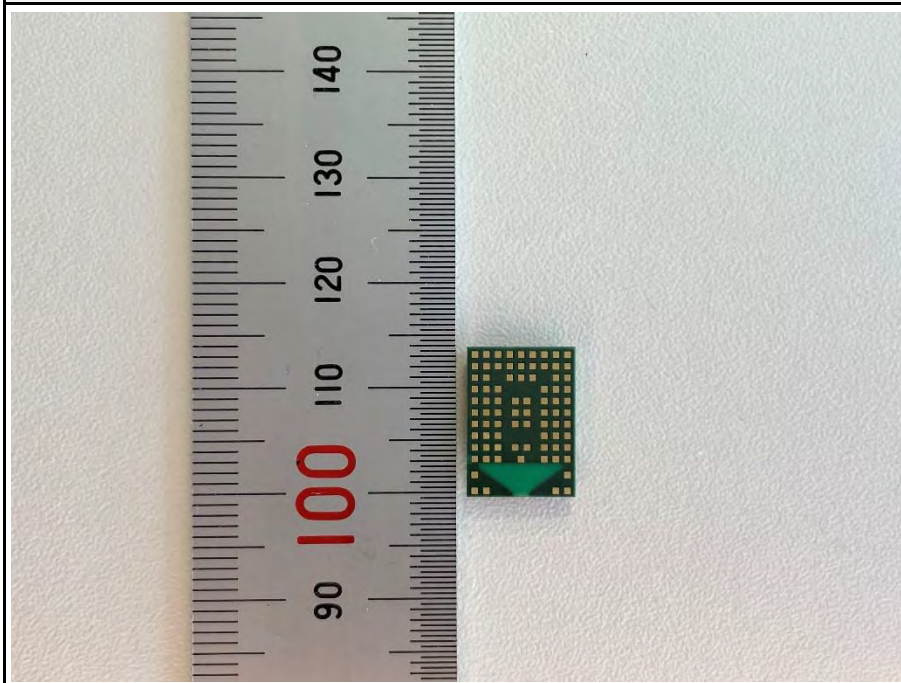
Comment: All internal photos are provided by customer.

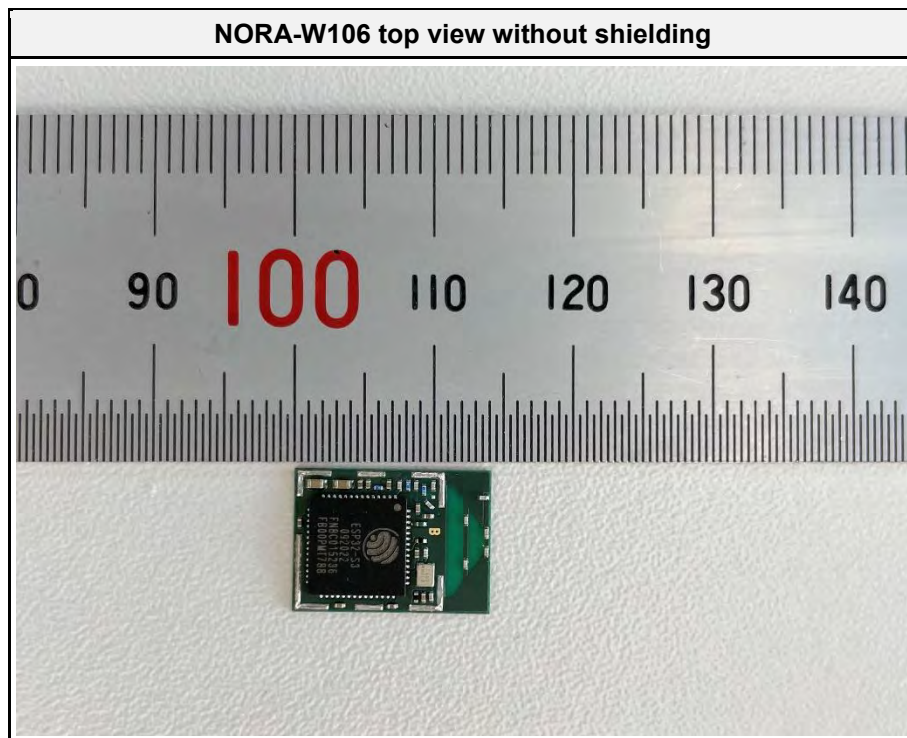
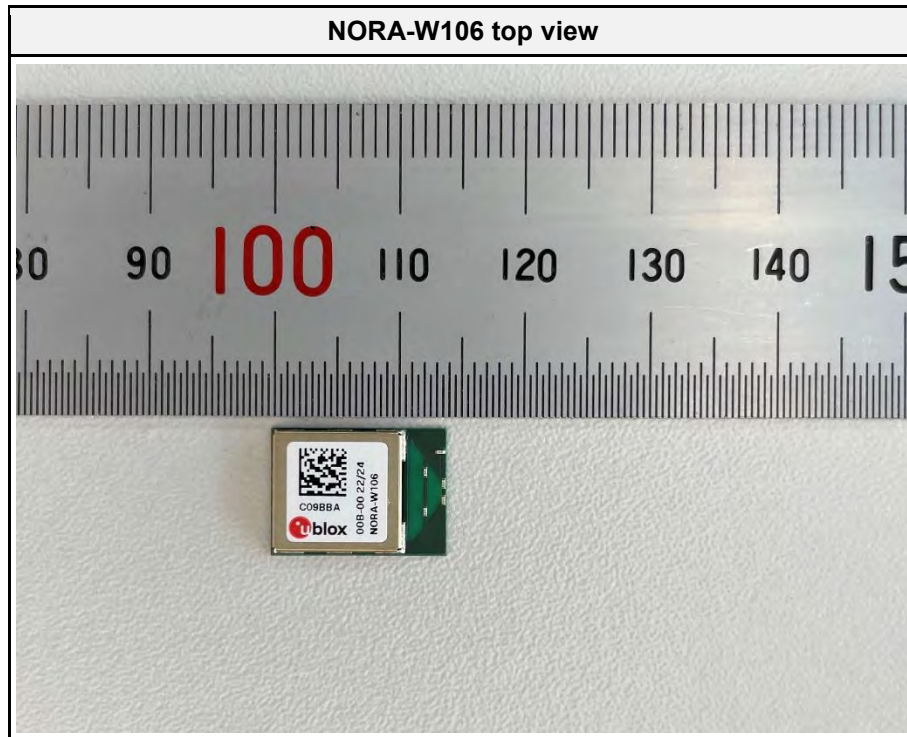


NORA-W101 perspective view

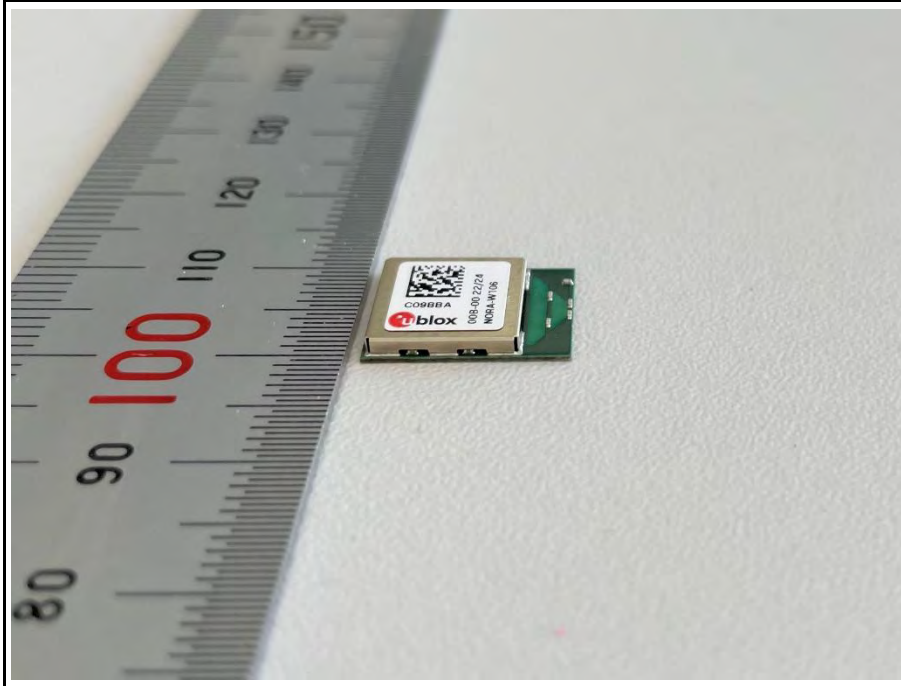


NORA-W101 bottom view

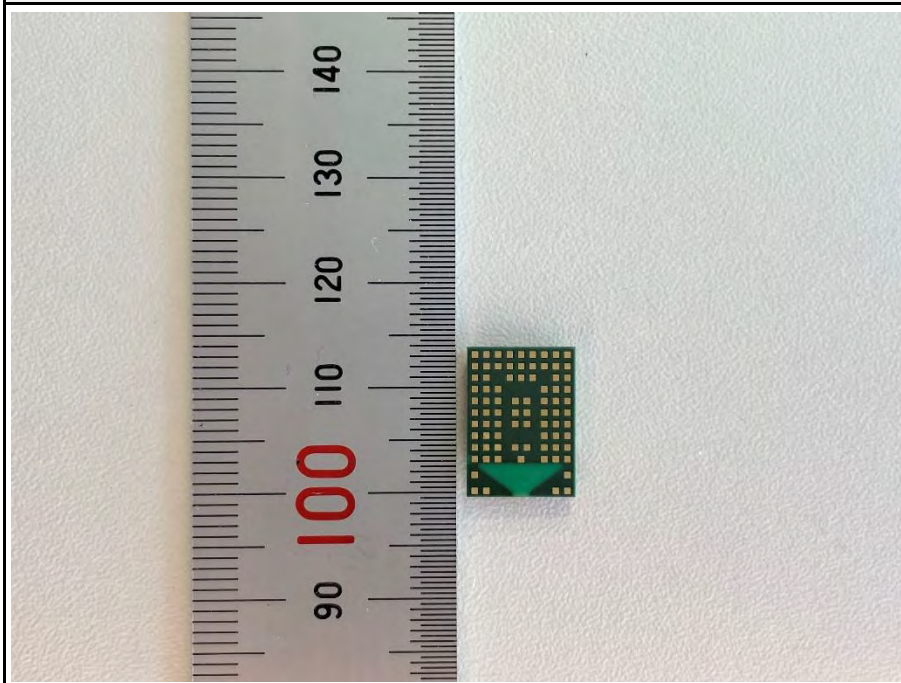




NORA-W106 perspective view



NORA-W106 bottom view



1.3 Support Equipment

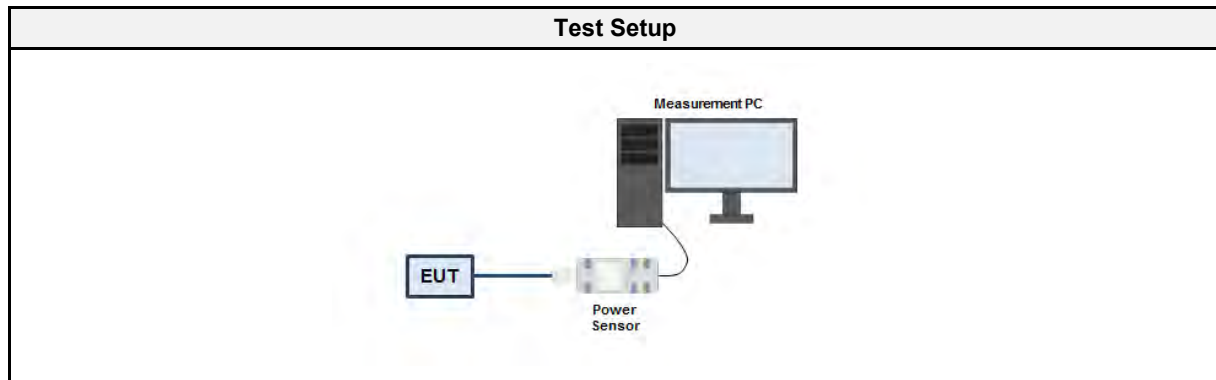
Product Type	Device	Manufacturer	Model	Comment
AE	Laptop	Lenovo	T450	
AE	Laptop	Lenovo	T440	
AE	Laptop power supply	Lenovo	ADLX45NDC3A	
SFT	EspoRFTTestTool		v2.9	
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
Comment:				

1.4 Test mode output power

1.4.1 Information

Test Information	
Measurement Method	ANSI C63.10 11.9, 14.3

1.4.2 Setup



1.4.3 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Power Sensor	R&S	NRP-Z81	EF00830	2021-08	2022-08

1.4.4 Procedure

Test Procedure
1. EUT set to test mode 2. The peak power is measured with the wideband power sensor 3. The power is measured for the lowest data rate on all three channels 4. For the channel with the highest power the power is also measured for all data rates 5. The data rate with the highest output power is selected for test mode

1.4.5 Results

Results - DSSS			
Data Rate [Mbps]	Power [dBm] Channel 2412 [MHz]	Power [dBm] Channel 2437 [MHz]	Power [dBm] Channel 2462 [MHz]
1	20.9	19.32	19.2
2	20.52	19.90	19.17
5.5	20.03	19.43	19.78
11	20.63	19.75	19.01

Results - OFDM			
Data Rate [Mbps]	Power [dBm] Channel 2412 [MHz]	Power [dBm] Channel 2437 [MHz]	Power [dBm] Channel 2462 [MHz]
6	23.2	23.42	23.36
9	23.19	23.12	23.04
12	22.88	22.98	22.96
18	22.91	22.95	22.95
24	22.72	23.09	22.96
36	22.98	22.85	22.93
48	22.7	22.87	22.87
54	22.77	22.72	22.84

Results - HT20			
MCS	Power [dBm] Channel 2412 [MHz]	Power [dBm] Channel 2437 [MHz]	Power [dBm] Channel 2462 [MHz]
0	23.08	23.21	23.03
1	23.07	23.13	23.3
2	22.75	22.90	22.84
3	22.64	22.37	22.80
4	22.60	22.68	22.64
5	22.84	22.55	23.08
6	22.52	22.47	22.48
7	22.44	22.42	22.81

Results - HT40			
MCS	Power [dBm] Channel 2422 [MHz]	Power [dBm] Channel 2437 [MHz]	Power [dBm] Channel 2452 [MHz]
0	23.01	23.15	22.95
1	22.61	22.44	22.83
2	22.10	22.11	22.85
3	22.11	22.27	22.21
4	22.33	22.17	22.13
5	22.71	22.74	22.55
6	22.13	22.41	22.31
7	22.24	22.68	22.49

1.5 Test mode duty cycle

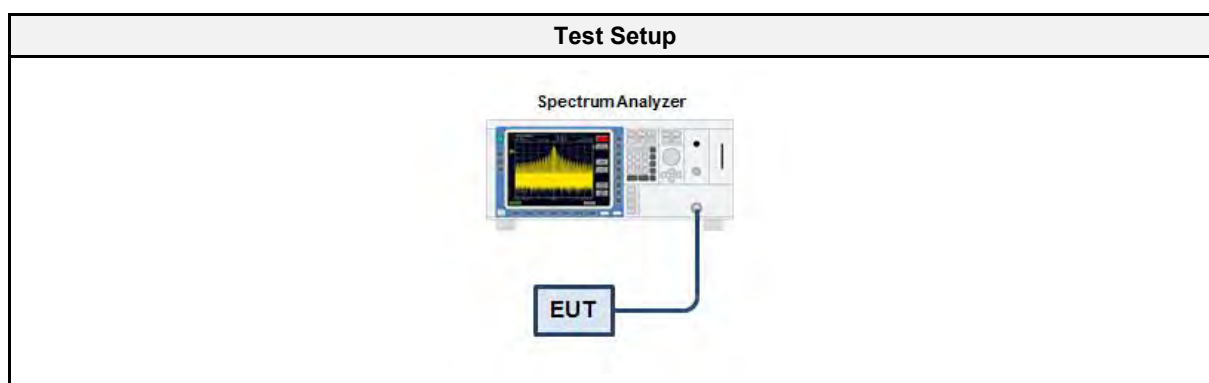
1.5.1 Information

Test Information	
Measurement Method	ANSI C63.10 11.6

1.5.2 Requirements

Requirements	
Duty cycle	Duty cycle correction
≥ 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 Analyser	R&S	FSU 26	EF01003	2022-07	2023-07

1.5.5 Procedure

Test Procedure
- EUT set to test mode - Span is set to zero span - Detector set to peak - Sweep time is set long enough to capture at least 5 bursts - Envelope peak value of emission spectrum is selected - The maximum burst duration T_{ON} is measured using two markers set to the start and the end of the longest burst - The minimum idle duration T_{OFF} is measured using two markers set to the start and the end of the shortest idle period - The duty cycle is calculated by $DC = T_{ON} / (T_{ON} + T_{OFF})$ - 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]
DSSS	96%	-0.18
OFDM	92%	-0.36
HT20	93%	-0.32
HT40	100%	0

1.6 Test Modes

Mode	Description
DSSS (IEEE 802.11b)	Mode = Transmit Modulation = BPSK Spreading = DSSS Bandwidth = 20 MHz Duty cycle = 96% Power setting = Pmax backed-off by 4 dB* Data rate = 1 Mbps (2412) Data rate = 11 Mbps (2437) Data rate = 5.5 Mbps (2462)
OFDM (IEEE 802.11g)	Mode = Transmit Modulation = OFDM Bandwidth = 20 MHz Duty cycle = 92% Power setting = Pmax backed-off by 4 dB* Data rate = 6 Mbps (2412) Data rate = 6 Mbps (2437) Data rate = 6 Mbps (2462)
HT20 (IEEE 802.11n)	Mode = Transmit Modulation = OFDM Bandwidth = 20 MHz Duty cycle = 93% Power setting (1 Simultaneous Tx) = Pmax backed-off by 4 dB* Data rate = 6.5 Mbps & 13 Mbps MCS (1 Simultaneous Tx) = 0 (2412) MCS (1 Simultaneous Tx) = 0 (2437) MCS (1 Simultaneous Tx) = 1 (2462)
HT40 (IEEE 802.11n)	Mode = Transmit Modulation = OFDM Bandwidth = 40 MHz Duty cycle = 100% Power setting (1 Simultaneous Tx) = Pmax backed-off by 4 dB* Data rate (1 Simultaneous Tx) = 13.5 Mbps & 27 Mbps MCS (1 Simultaneous Tx) = 0 (2422) MCS (1 Simultaneous Tx) = 0 (2437) MCS (1 Simultaneous Tx) = 0 (2452)
Receive	Mode = Receive
Comment: The above settings were found as worst case during pre-tests. *The EUT power was attenuated by 4 dB using a control software provided by the customer.	

1.7 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Tx / Rx	1	2412
F2	Tx / Rx	3	2422
F3	Tx / Rx	6	2437
F4	Tx / Rx	9	2452
F5	Tx / Rx	11	2462

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 dBμV. Any external preamplifiers used are taken into account through internal analyzer settings.

A.F.:

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

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

Net:

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

Limit:

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

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

Margin:

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

Example only:

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

2 Result Summary

FCC 47 CFR Part 15C, ISED RSS-247				
Product Standard Reference	Requirement	Reference Method	Result	Remarks
ISED RSS-Gen, Issue 5 A2 (section 6.7)	Occupied Bandwidth	ANSI C63.10-2013	N/R	Informational only
FCC § 15.247(a)(2) ISED RSS-247, Issue 2 (section 5.2)	6 dB Bandwidth	ANSI C63.10-2013	PASS	Note 1
FCC § 15.247(b) ISED RSS-247, Issue 2 (section 5.4)	Maximum peak conducted power	ANSI C63.10-2013	PASS	Note 1
FCC § 15.247(e) ISED RSS-247, Issue 2 (section 5.2)	Power spectral density	ANSI C63.10-2013	PASS	Note 1
FCC § 15.207 ISED RSS-247, Issue 2 (section 3.1)	AC power line conducted emissions	ANSI C63.10-2013	PASS	Note 1
FCC § 15.247(d) ISED RSS-247, Issue 2 (section 5.5)	Band edge compliance	ANSI C63.10-2013	PASS	Note 1
FCC § 15.247(d) ISED RSS-247, Issue 2 (section 5.5)	Conducted spurious emissions	ANSI C63.10-2013	PASS	Note 1
FCC § 15.247(d) FCC § 15.209 ISED RSS-Gen, Issue 5 A2 (section 6.13)	Transmitter radiated spurious emissions	ANSI C63.10-2013	PASS	Note 2
ISED RSS-247, Issue 2 (section 3.1)	Receiver radiated spurious emissions	ANSI C63.4-2014	PASS	Note 2
Note 1: This test was only performed for the main tested module NORA-W101. It is not required for the tested variants.				
Note 2: This test was performed in full for the main tested module NORA-W101 and partially (Spot-check) for the tested variants.				
Comment: The Decision Rule is applied on the basis of ETSI TR 102 273 and ETSI TR 100 028. These standards provide guidance on how to calculate and apply measurement uncertainty whilst providing maximum uncertainties allowance. In all cases due consideration will be given to ILAC-G8:09/2019. Where a result is considered conditional in respect of its proximity to the limit line, the customer would be made aware of situation so that they can make an informed decision on how to proceed.				

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

3 Test Conditions and Results

3.1 Test Conditions and Results - Occupied bandwidth

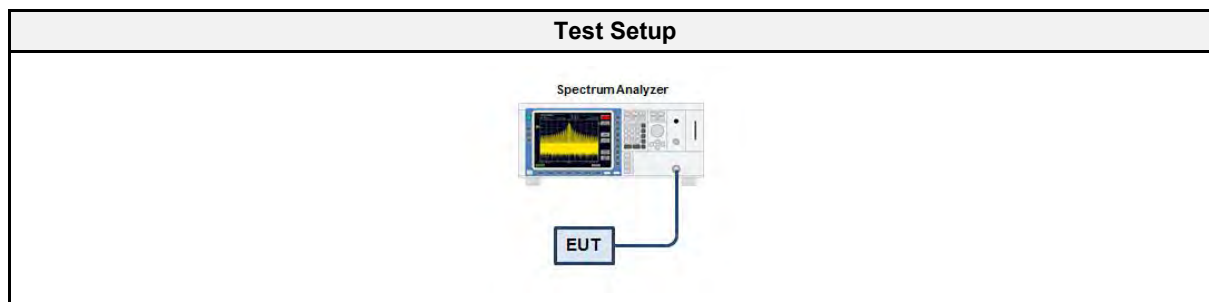
3.1.1 Information

Test Information	
Reference	ISED RSS-Gen, Issue 5 A2 (section 6.7)
Measurement Method	ANSI C63.10 6.9.3
Measurement Uncertainty	$\pm 1.26 \%$
Test Sample ID	40677
Operator	Dr.-Ing. Dhamia Almozani
Date	2022-08-18
Comment	Measurements were performed with attenuation level = 0 (corresponds to 0 dB)

3.1.2 Limits

Limits
None (Informational only)

3.1.3 Setup



3.1.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSU 26	EF01003	2022-07	2023-07
Cable (diverse)	– (diverse)	– (diverse)	EF00779 CAABZ	2022-02	2023-02

3.1.5 Procedure

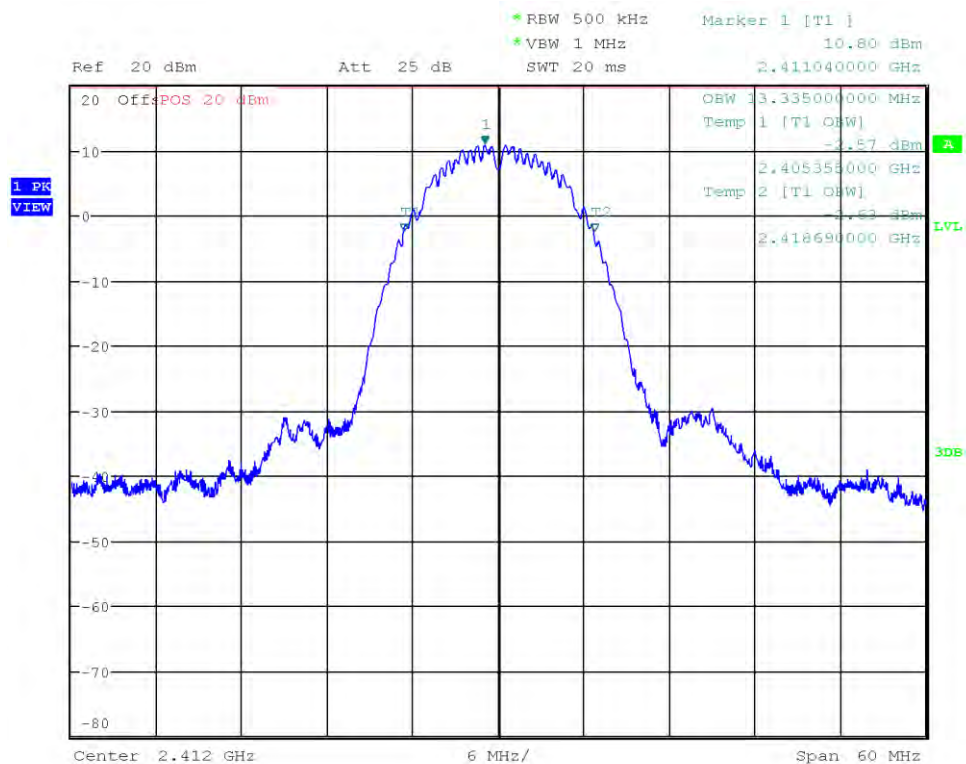
Test Procedure
- EUT transmitter is activated in test mode under normal conditions - The spectrum analyzer is set to peak detection and maximum hold with a span twice the emission spectrum - The resolution bandwidth is set to the range of 1 % to 5 % of the occupied bandwidth - The occupied bandwidth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

3.1.6 Results

Test Results		
Mode	Frequency [MHz]	Bandwidth [MHz]
DSSS	2412	13.335
DSSS	2437	13.185
DSSS	2462	13.050
OFDM	2412	18.405
OFDM	2437	18.345
OFDM	2462	18.495
HT20	2412	18.675
HT20	2437	18.675
HT20	2462	18.510
HT40	2422	34.92
HT40	2437	34.950
HT40	2452	36.000

Occupied Bandwidth

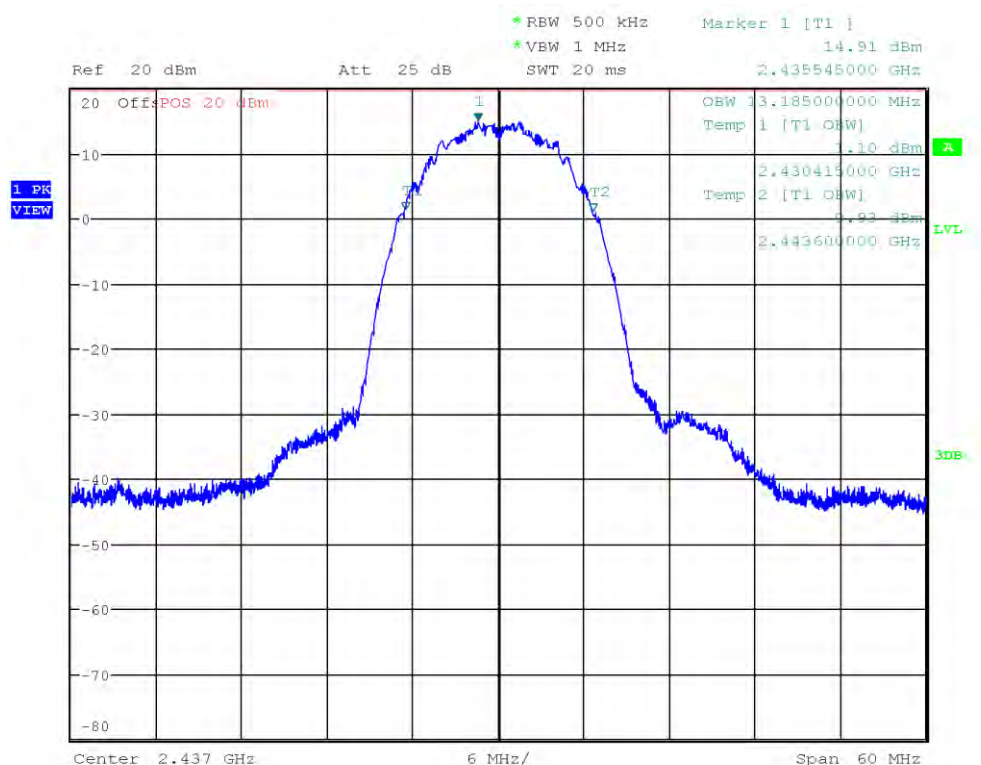
Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.11 b, Channel: 1, 2412
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=1 Mbps (worse case)
 Occupied Bandwidth [MHz]: 13.335



Date: 22.AUG.2022 10:44:54

Occupied Bandwidth

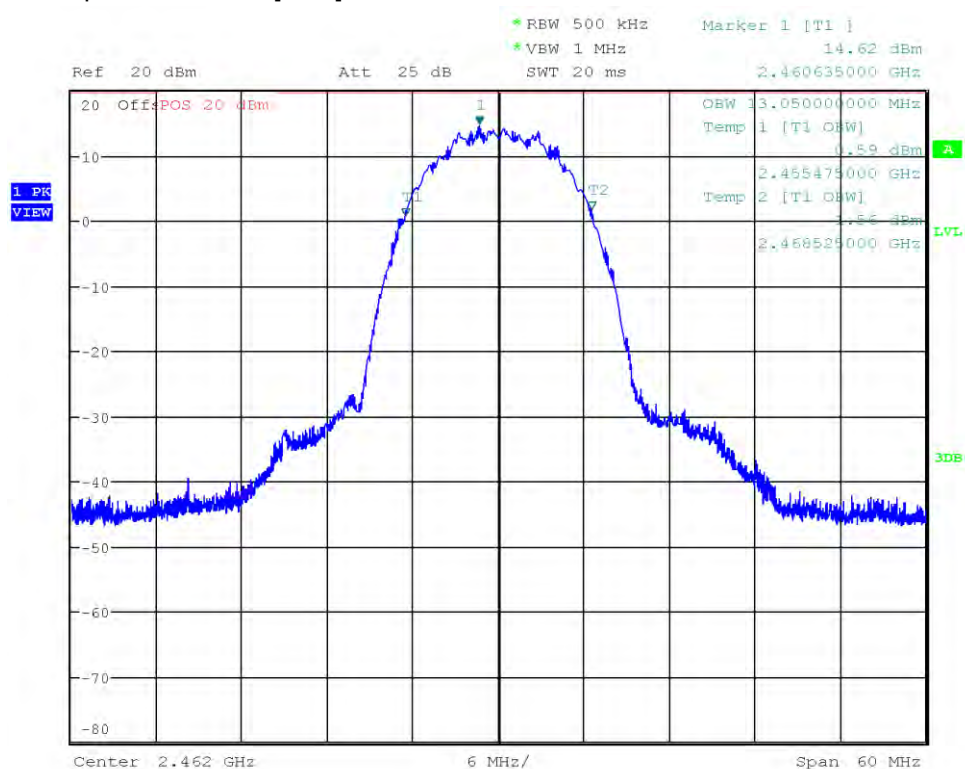
Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.11 b, Channel: 6, 2437
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=2 Mbps (worse case)
 Occupied Bandwidth [MHz]: 13.185



Date: 22.AUG.2022 10:53:56

Occupied Bandwidth

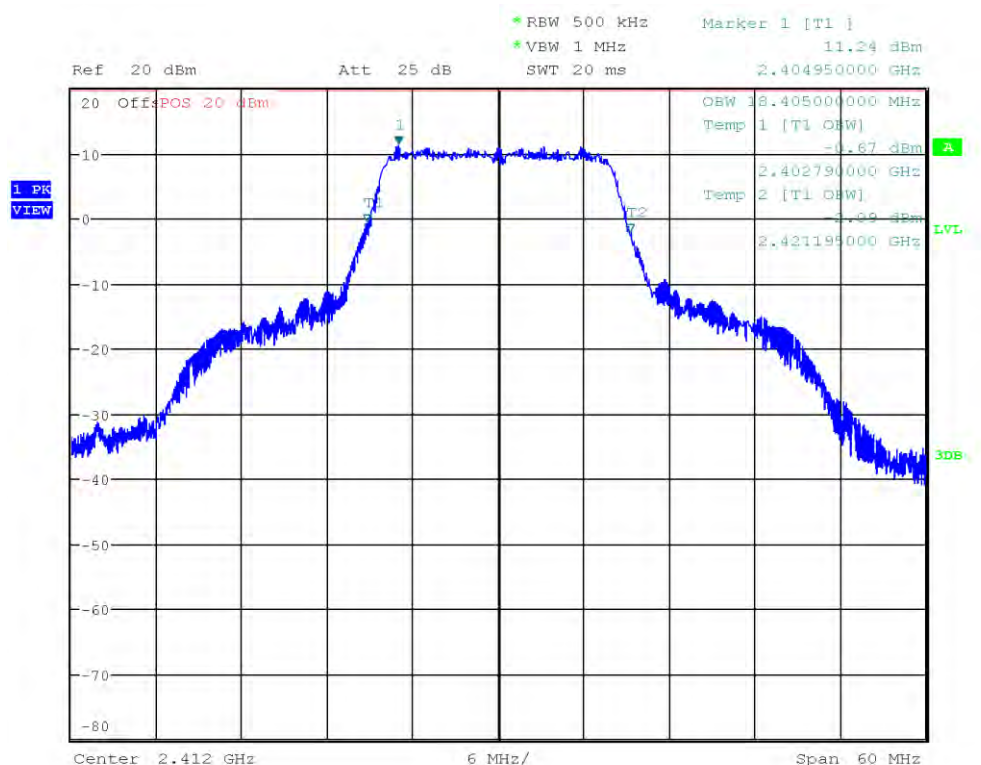
Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.11 b, Channel: 11, 2462
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=5.5 Mbps (worse case)
 Occupied Bandwidth [MHz]: 13.050



Date: 22.AUG.2022 10:55:25

Occupied Bandwidth

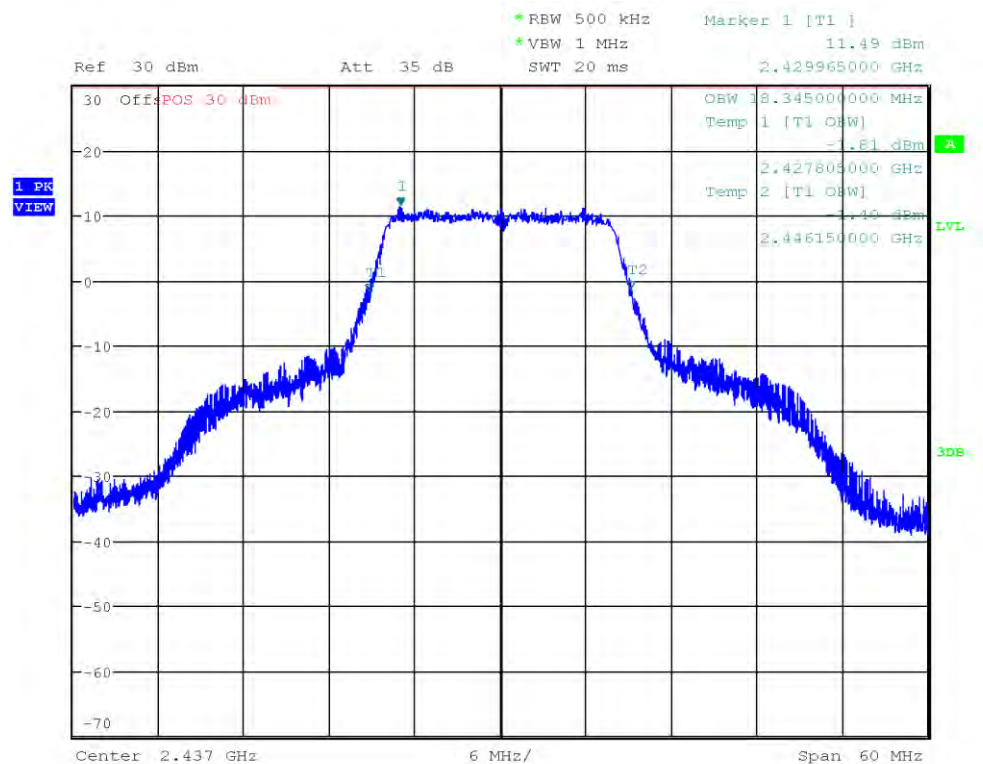
Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.11 g, Channel: 1, 2412
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=6 Mbps (worse case)
 Occupied Bandwidth [MHz]: 18.405



Date: 22.AUG.2022 10:58:44

Occupied Bandwidth

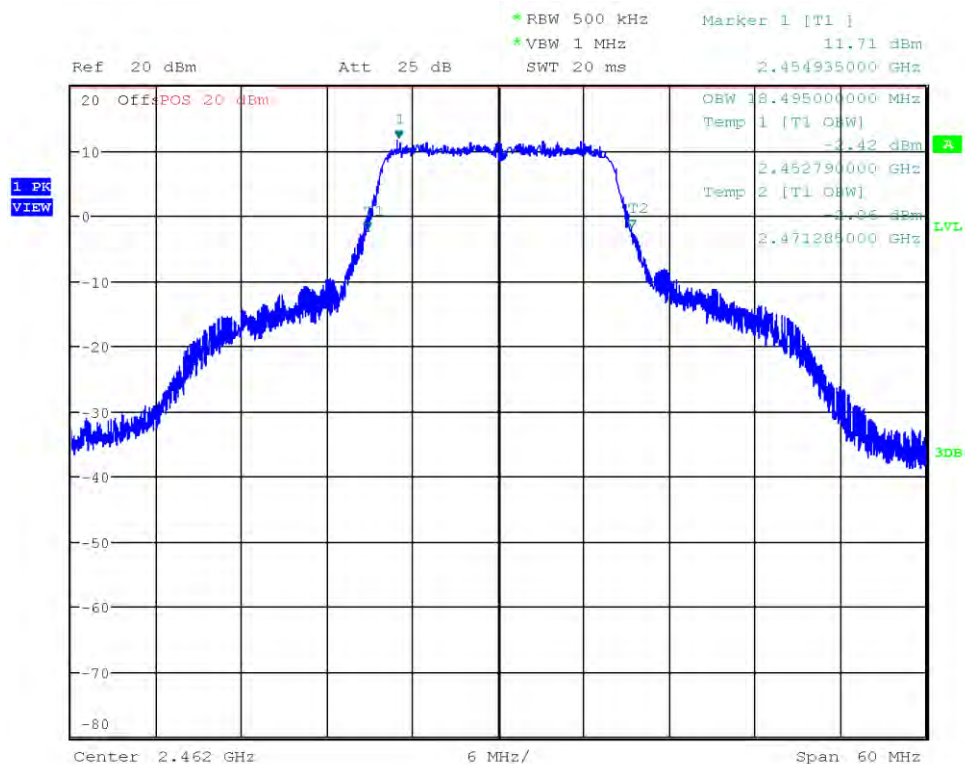
Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.11 g, Channel: 6, 2437
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=6 Mbps (worse case)
 Occupied Bandwidth [MHz]: 18.345



Date: 22.AUG.2022 10:59:50

Occupied Bandwidth

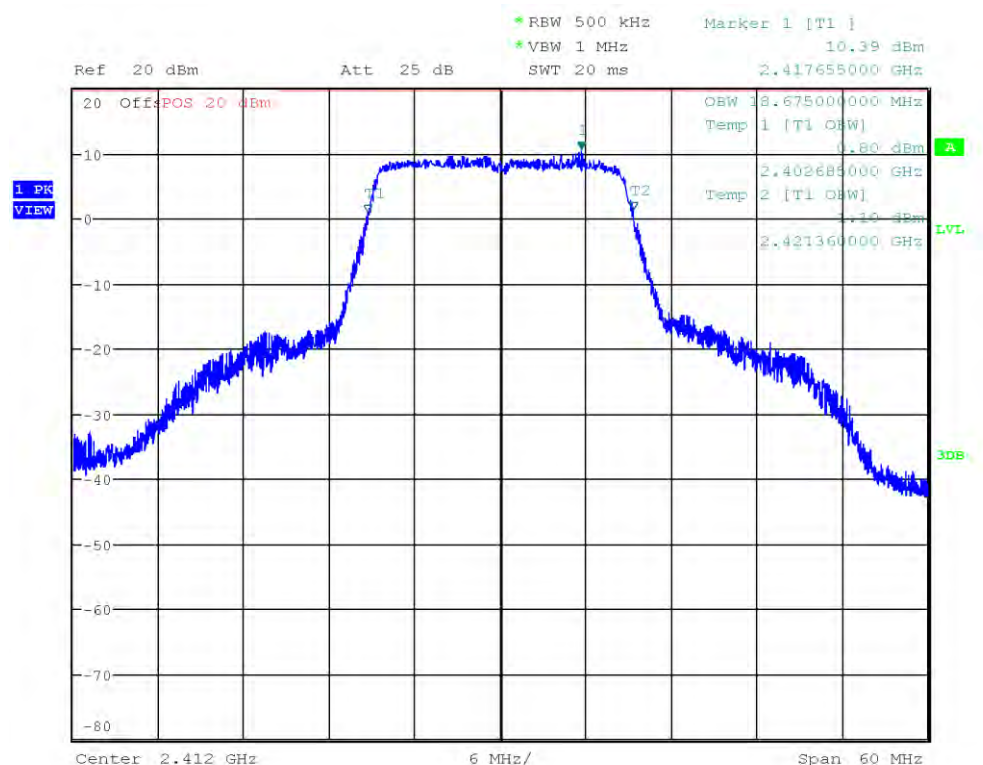
Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.11 g, Channel: 11, 2462
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=6 Mbps (worse case)
 Occupied Bandwidth [MHz]: 18.495



Date: 22.AUG.2022 11:00:40

Occupied Bandwidth

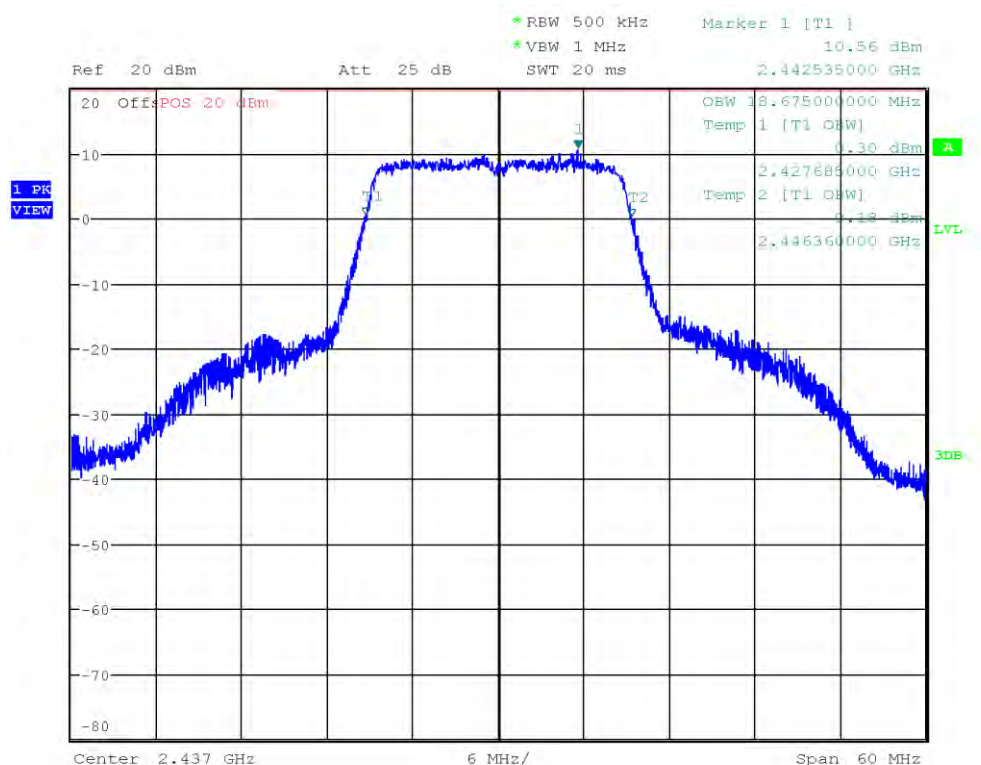
Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.11 n HT20, Channel: 1, 2412
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=0 MCS (worse case)
 Occupied Bandwidth [MHz]: 18.675



Date: 22.AUG.2022 11:05:56

Occupied Bandwidth

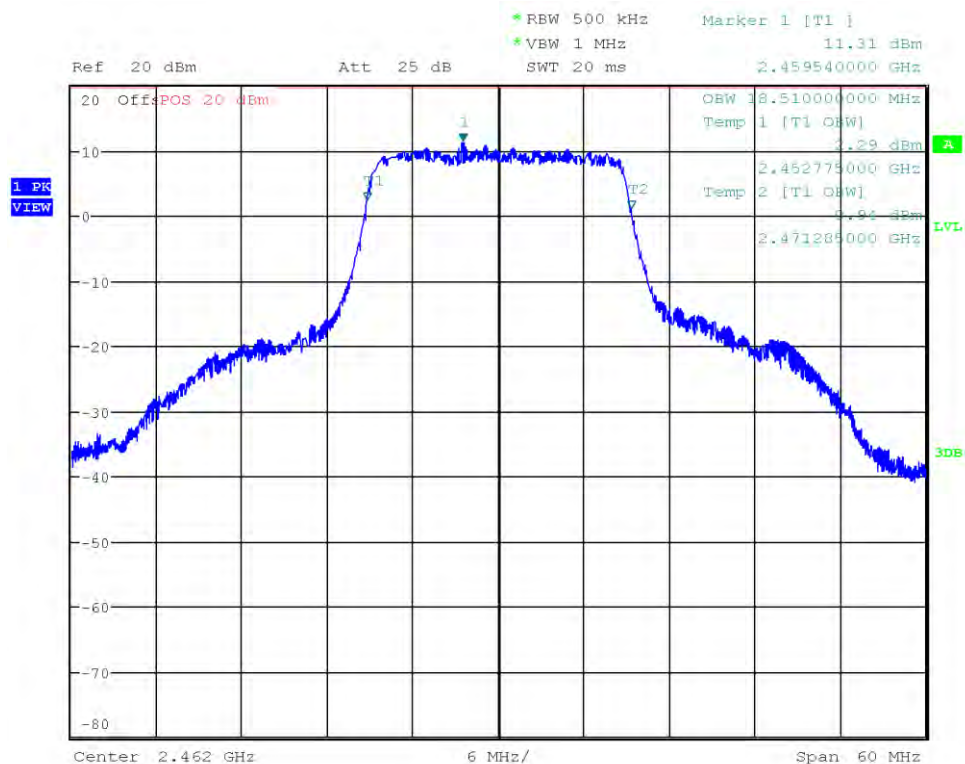
Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.11 n HT20, Channel: 6, 2437
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=0 MCS (worse case)
 Occupied Bandwidth [MHz]: 18.675



Date: 22.AUG.2022 11:06:49

Occupied Bandwidth

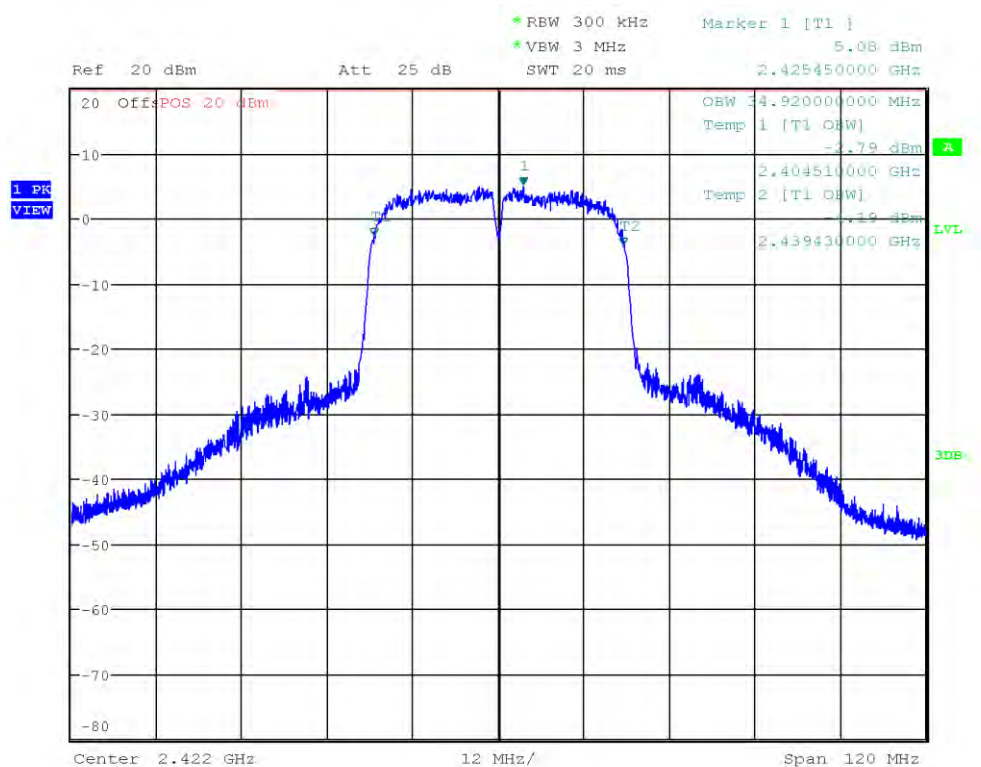
Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.11 n HT20, Channel: 11, 2462
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=1 MCS (worse case)
 Occupied Bandwidth [MHz]: 18.510



Date: 22.AUG.2022 11:08:41

Occupied Bandwidth

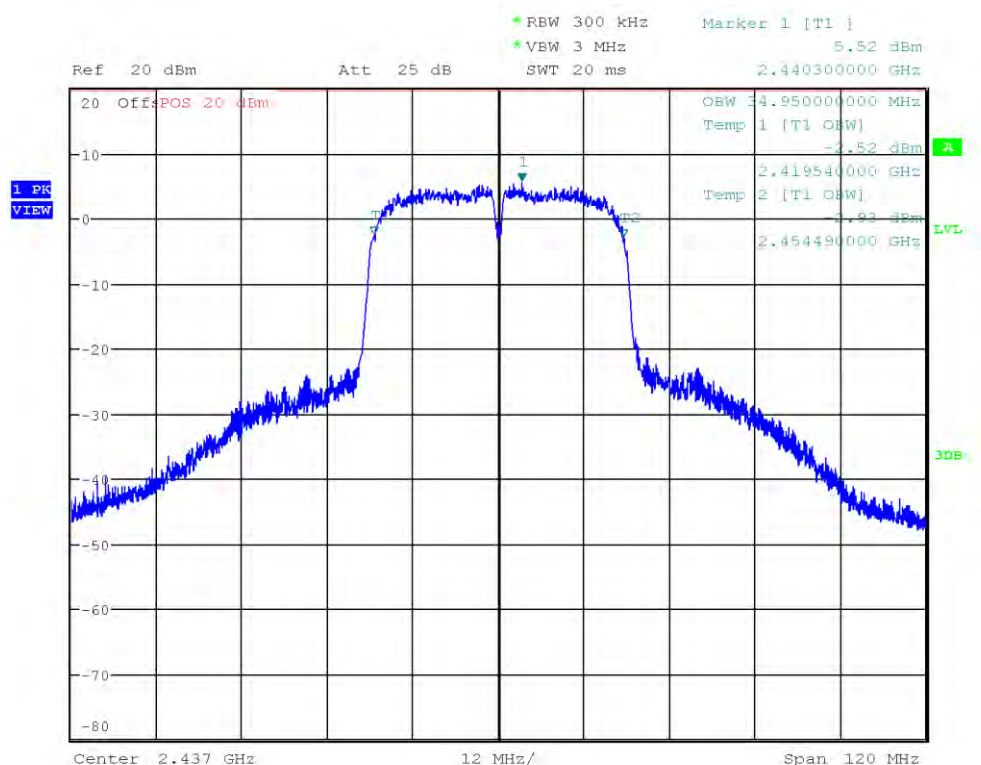
Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.11 n HT40, Channel: 3, 2422
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=0 MCS (worse case)
 Occupied Bandwidth [MHz]: 34.920



Date: 22.AUG.2022 11:10:57

Occupied Bandwidth

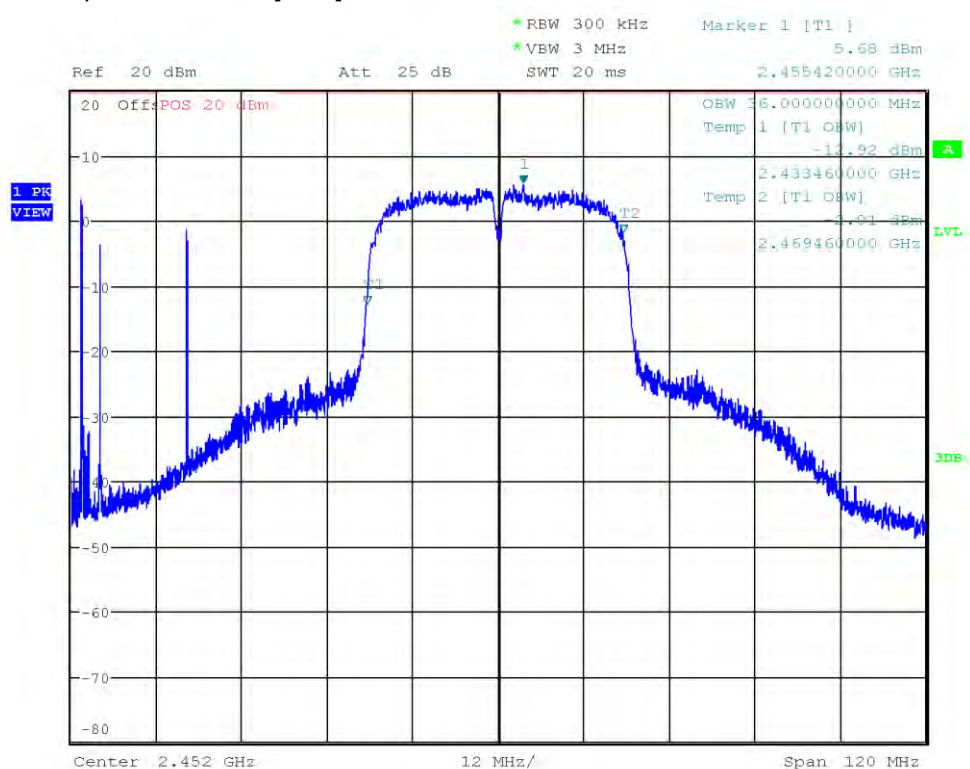
Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.11 n HT40, Channel: 6, 2437
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=0 MCS (worse case)
 Occupied Bandwidth [MHz]: 34.950



Date: 22.AUG.2022 11:12:16

Occupied Bandwidth

Project Number:	G0M-2205-1454
Applicant:	u-blox AG
Model Description:	Stand-alone multiradio module
Model:	NORA-W101
Test Sample ID:	40677
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	IEEE 802.11 n HT40, Channel: 9, 2452
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-22
Antenna port:	1
Note:	Mode=0 MCS (worse case)
Occupied Bandwidth [MHz]:	36.000



Date: 22.AUG.2022 11:14:42

3.2 Test Conditions and Results - 6 dB bandwidth

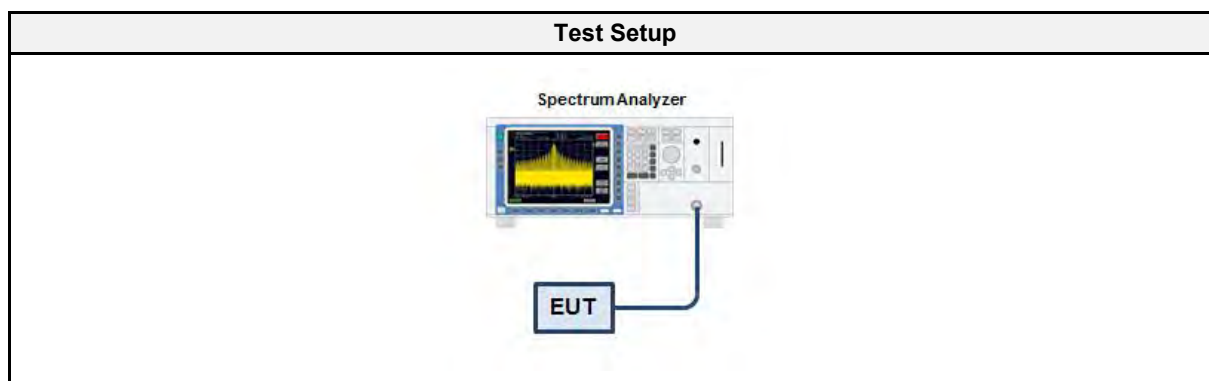
3.2.1 Information

Test Information	
Reference	FCC § 15.247(a)(2); ISED RSS-247, Issue 2 (section 5.2)
Measurement Method	ANSI C63.10 11.8
Measurement Uncertainty	$\pm 1.26 \%$
Operator	Dr.-Ing. Dhamia Almozani
Date	2022-08-22
Comment	Measurements were performed with attenuation level = 0 (corresponds to 0 dB)

3.2.2 Limits

Limits
$\geq 500\text{kHz}$

3.2.3 Setup



3.2.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSU 26	EF01003	2022-07	2023-07
Cable (diverse)	— (diverse)	— (diverse)	EF00779 CAABZ	2022-02	2023-02

3.2.5 Procedure

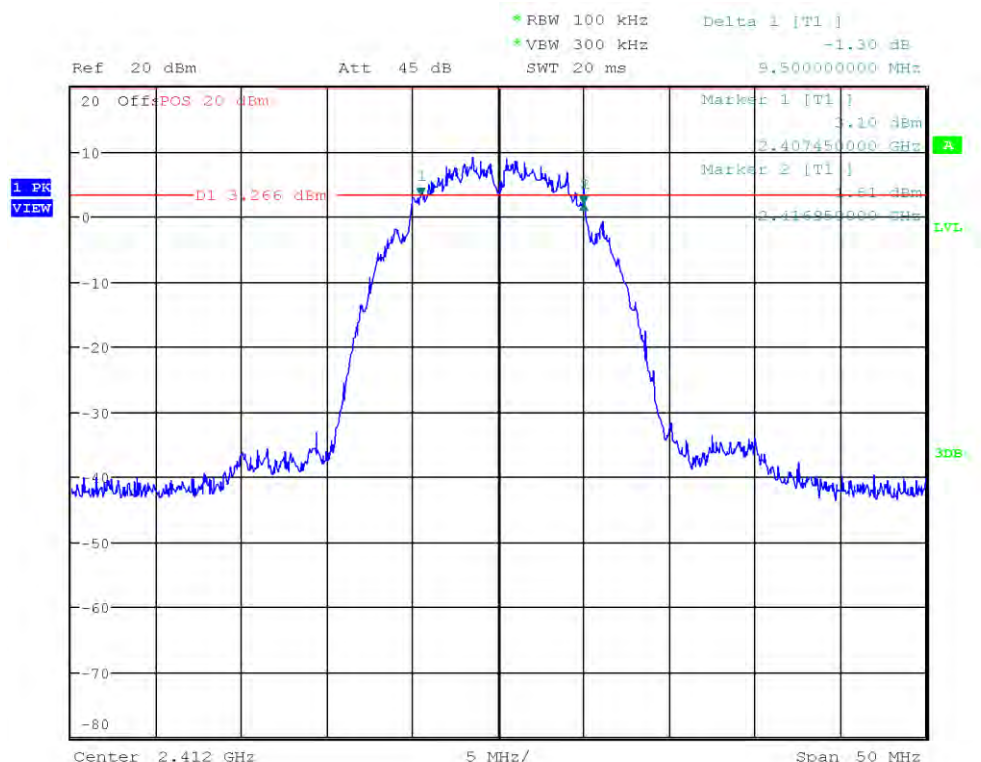
Test Procedure
1. EUT set to test mode 2. Span set to at least twice the emission spectrum 3. Detector set to peak and max hold and RBW is set to 100 kHz 4. Envelope peak value of emission spectrum is selected 5. Marker on envelope of spectrum is set to level of -6 dB to the left of the peak 6. Marker 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
DSSS	2412	9500	500	PASS
DSSS	2437	8800	500	PASS
DSSS	2462	9050	500	PASS
OFDM	2412	16300	500	PASS
OFDM	2437	16300	500	PASS
OFDM	2462	16300	500	PASS
HT20	2412	17600	500	PASS
HT20	2437	17600	500	PASS
HT20	2462	17600	500	PASS
HT40	2422	32600	500	PASS
HT40	2437	32700	500	PASS
HT40	2452	32600	500	PASS

DTS (6 dB) Bandwidth

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.11 b, Channel: 1, 2412 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=1 Mbps (worse case)
 Lower Frequency [MHz]: 2407.450
 Upper Frequency [MHz]: 2416.950
 6 dB Bandwidth [kHz]: 9500



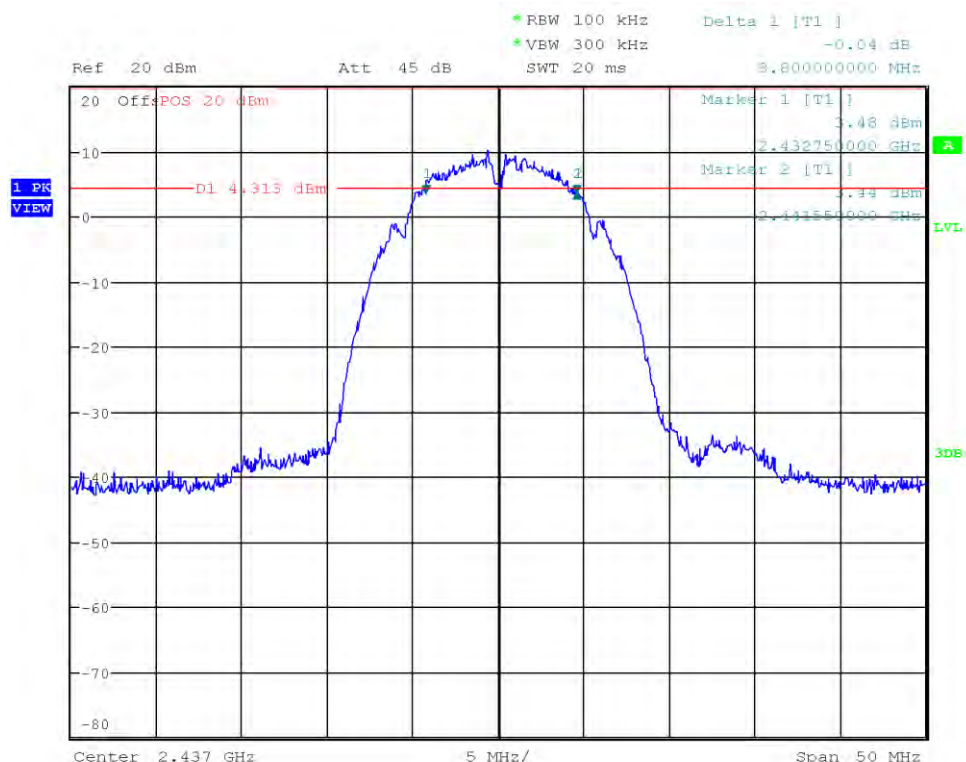
Date: 22.AUG.2022 11:22:50

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

DTS (6 dB) Bandwidth

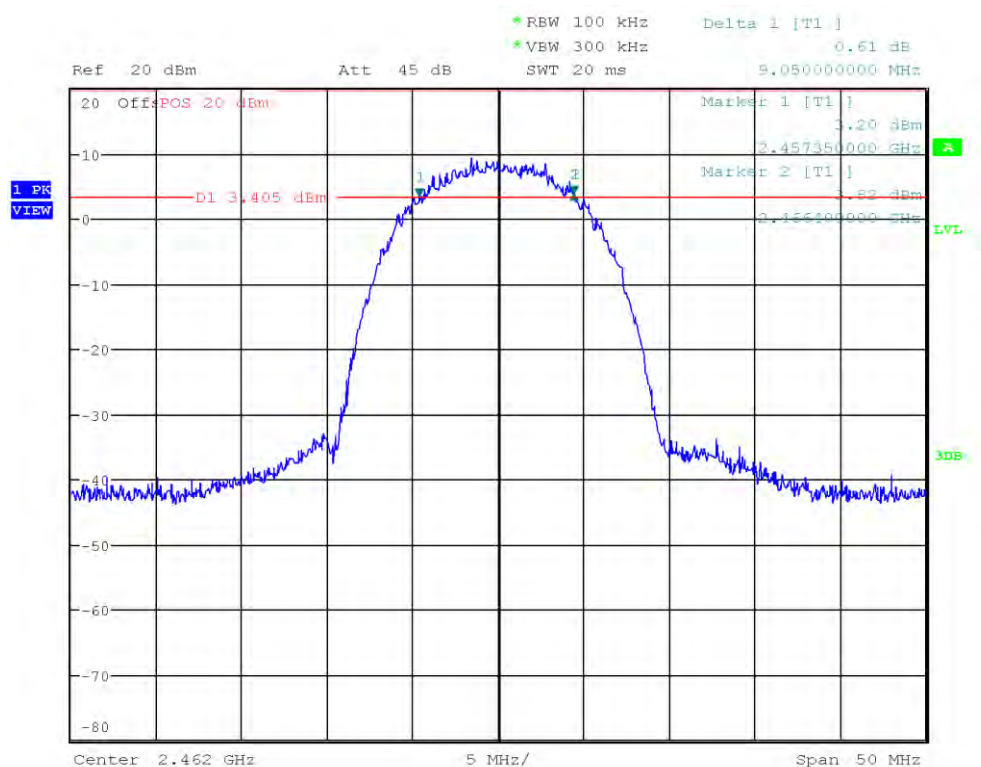
Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.11 b, Channel: 6, 2437 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=2 Mbps (worse case)
 Lower Frequency [MHz]: 2432.750
 Upper Frequency [MHz]: 2441.550
 6 dB Bandwidth [kHz]: 8800



Date: 22.AUG.2022 11:25:21

DTS (6 dB) Bandwidth

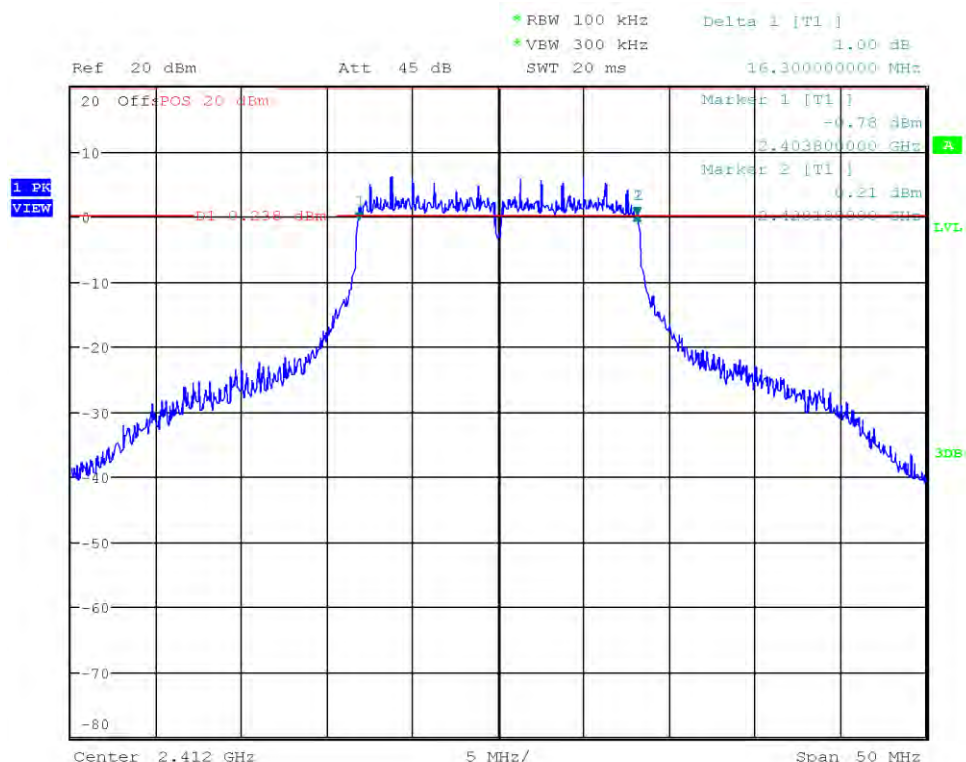
Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.11 b, Channel: 11, 2462 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=5.5 Mbps (worse case)
 Lower Frequency [MHz]: 2457.350
 Upper Frequency [MHz]: 2466.400
 6 dB Bandwidth [kHz]: 9050



Date: 22.AUG.2022 11:26:21

DTS (6 dB) Bandwidth

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.11 g, Channel: 1, 2412 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=6 Mbps (worse case)
 Lower Frequency [MHz]: 2403.800
 Upper Frequency [MHz]: 2420.100
 6 dB Bandwidth [kHz]: 16300



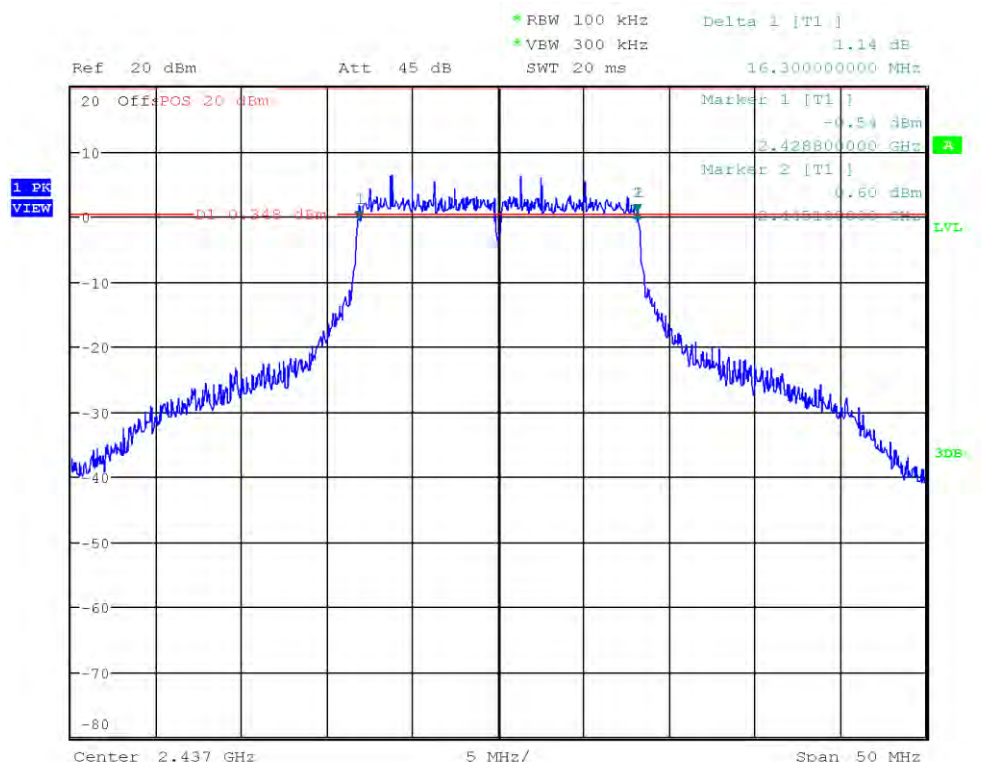
Date: 22.AUG.2022 11:29:06

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

DTS (6 dB) Bandwidth

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.11 g, Channel: 6, 2437 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=6 Mbps (worse case)
 Lower Frequency [MHz]: 2428.800
 Upper Frequency [MHz]: 2445.100
 6 dB Bandwidth [kHz]: 16300



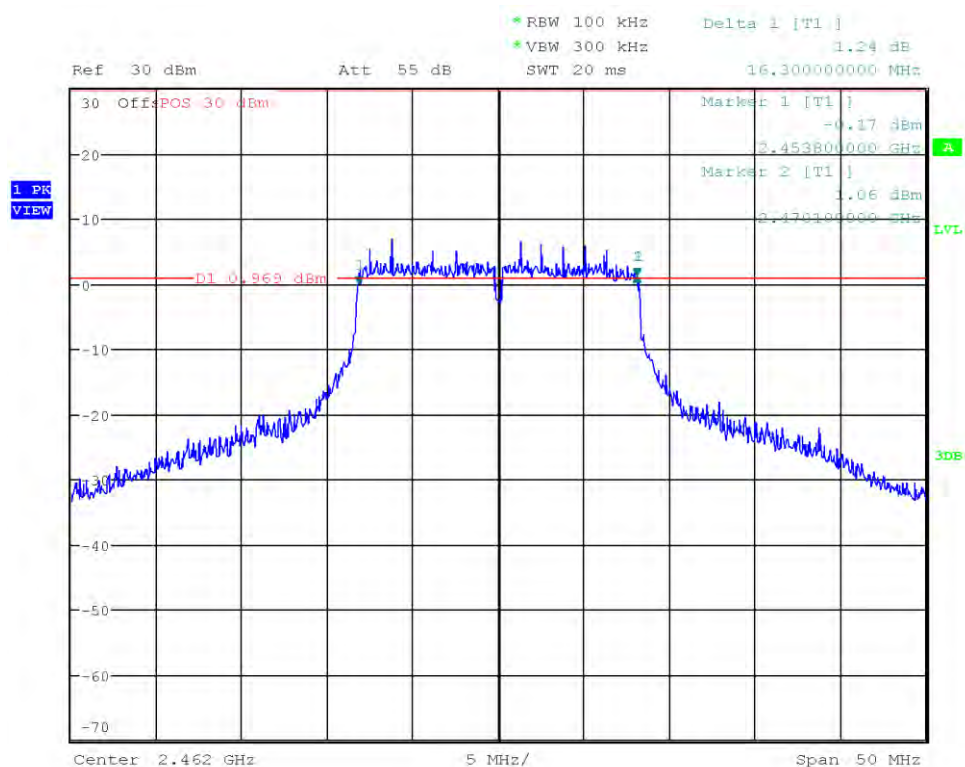
Date: 22.AUG.2022 11:29:50

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

DTS (6 dB) Bandwidth

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.11 g, Channel: 11, 2462 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=6 Mbps (worse case)
 Lower Frequency [MHz]: 2453.800
 Upper Frequency [MHz]: 2470.100
 6 dB Bandwidth [kHz]: 16300



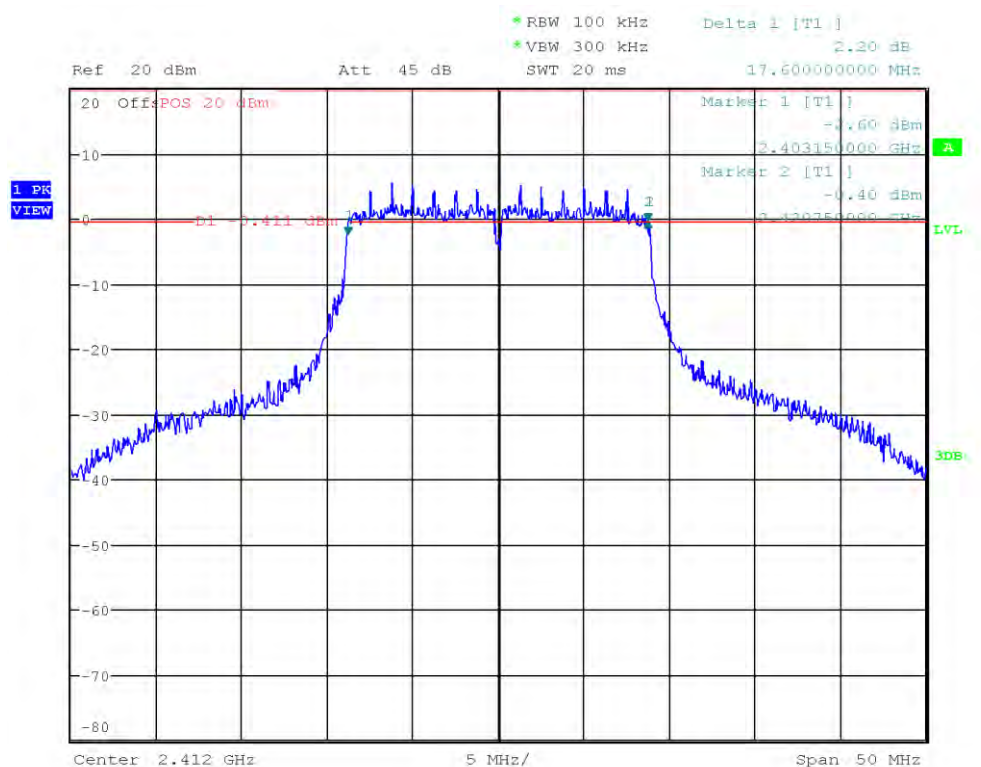
Date: 22.AUG.2022 11:30:47

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

DTS (6 dB) Bandwidth

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.11 n HT20, Channel: 1, 2412 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=0 MCS (worse case)
 Lower Frequency [MHz]: 2403.150
 Upper Frequency [MHz]: 2420.750
 6 dB Bandwidth [kHz]: 17600



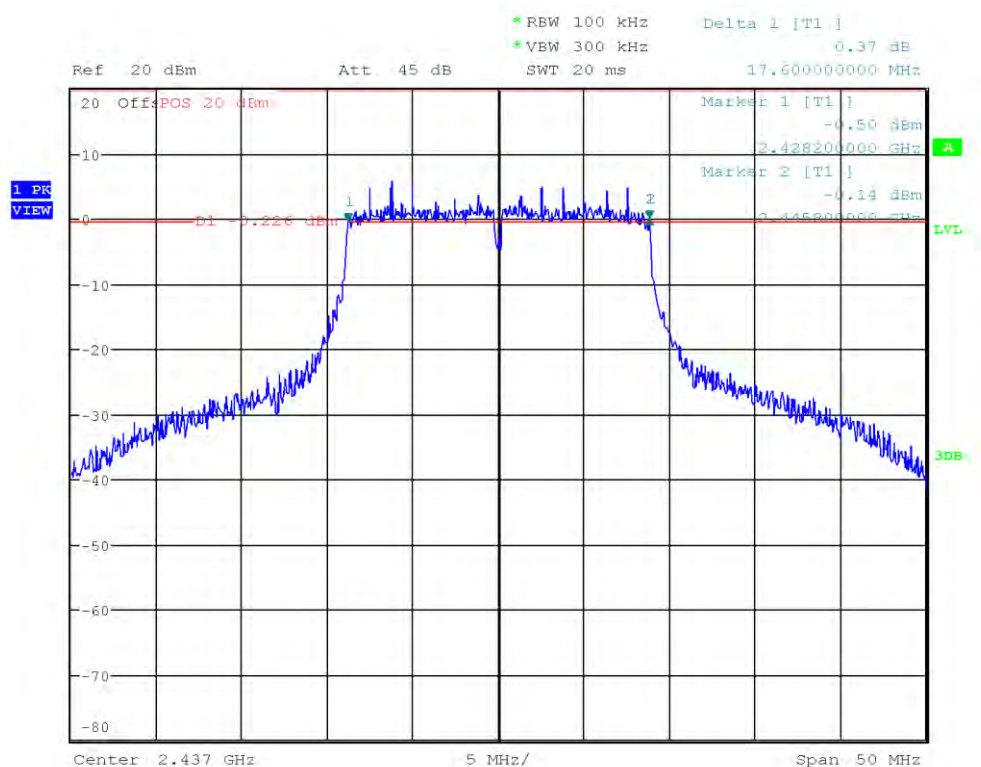
Date: 22.AUG.2022 11:33:45

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

DTS (6 dB) Bandwidth

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.11 n HT20, Channel: 6, 2437 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=0 MCS (worse case)
 Lower Frequency [MHz]: 2428.200
 Upper Frequency [MHz]: 2445.800
 6 dB Bandwidth [kHz]: 17600



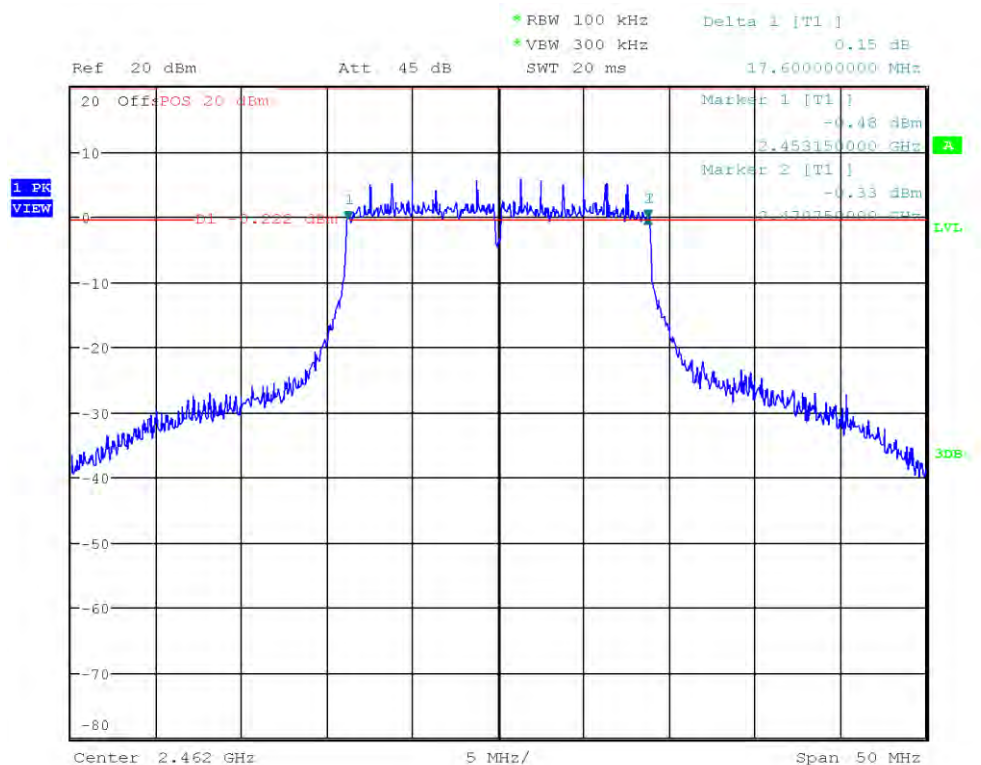
Date: 22.AUG.2022 11:34:42

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

DTS (6 dB) Bandwidth

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.11 n HT20, Channel: 11, 2462 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=1 MCS (worse case)
 Lower Frequency [MHz]: 2453.150
 Upper Frequency [MHz]: 2470.750
 6 dB Bandwidth [kHz]: 17600



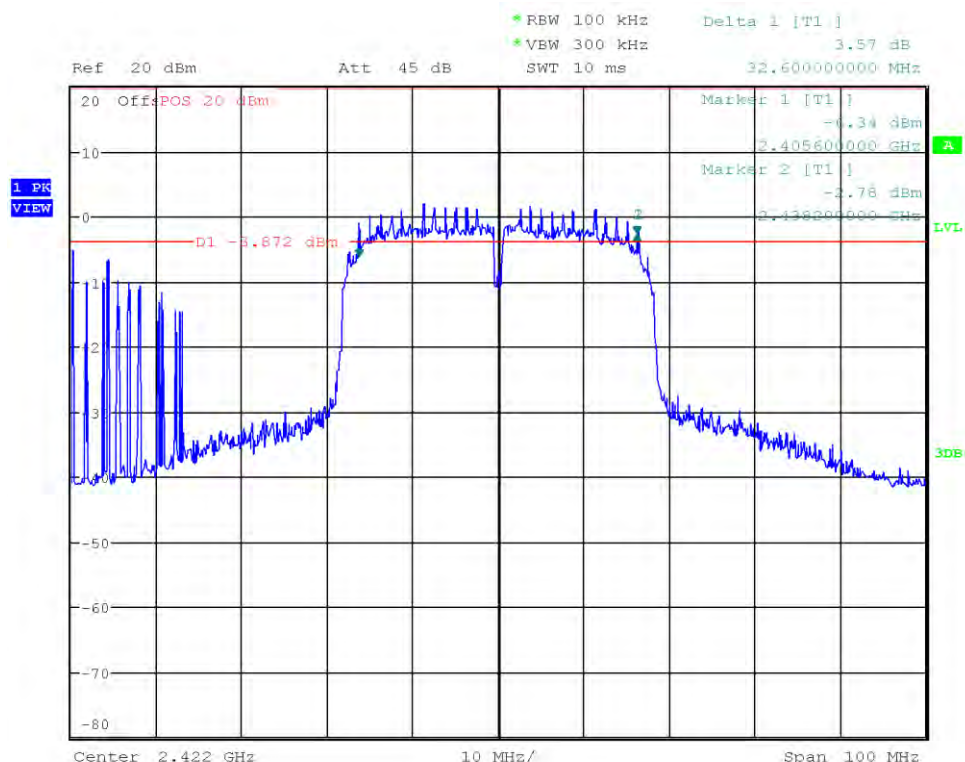
Date: 22.AUG.2022 11:35:45

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

DTS (6 dB) Bandwidth

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.11 n HT40, Channel: 3, 2422 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=0 MCS (worse case)
 Lower Frequency [MHz]: 2405.600
 Upper Frequency [MHz]: 2438.200
 6 dB Bandwidth [kHz]: 32600



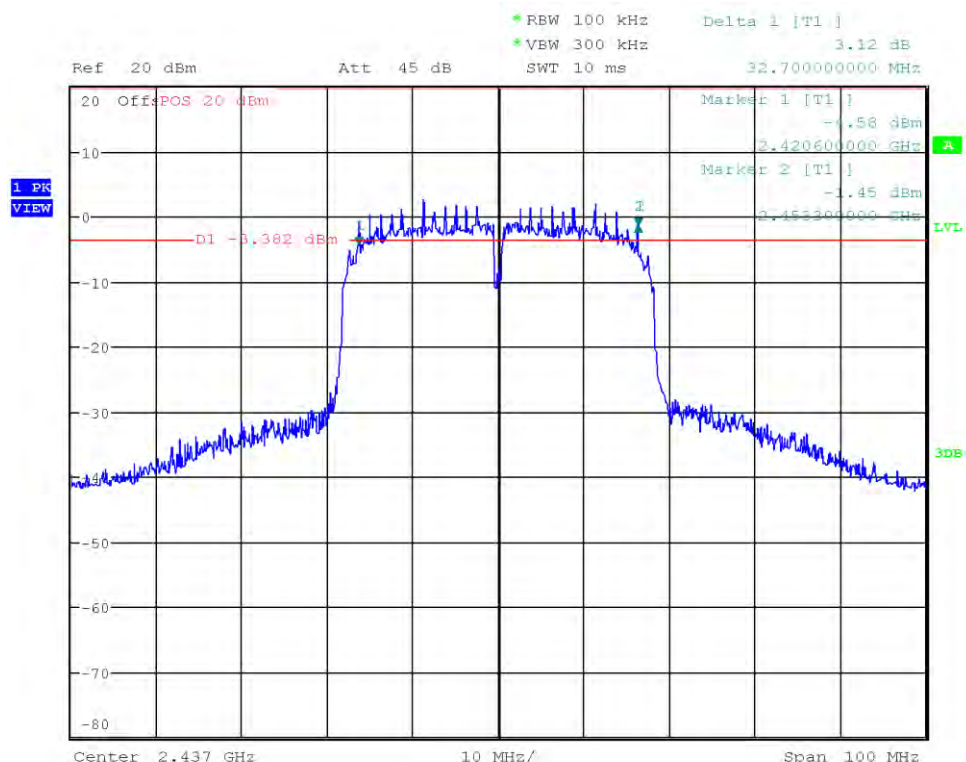
Date: 22.AUG.2022 11:39:45

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

DTS (6 dB) Bandwidth

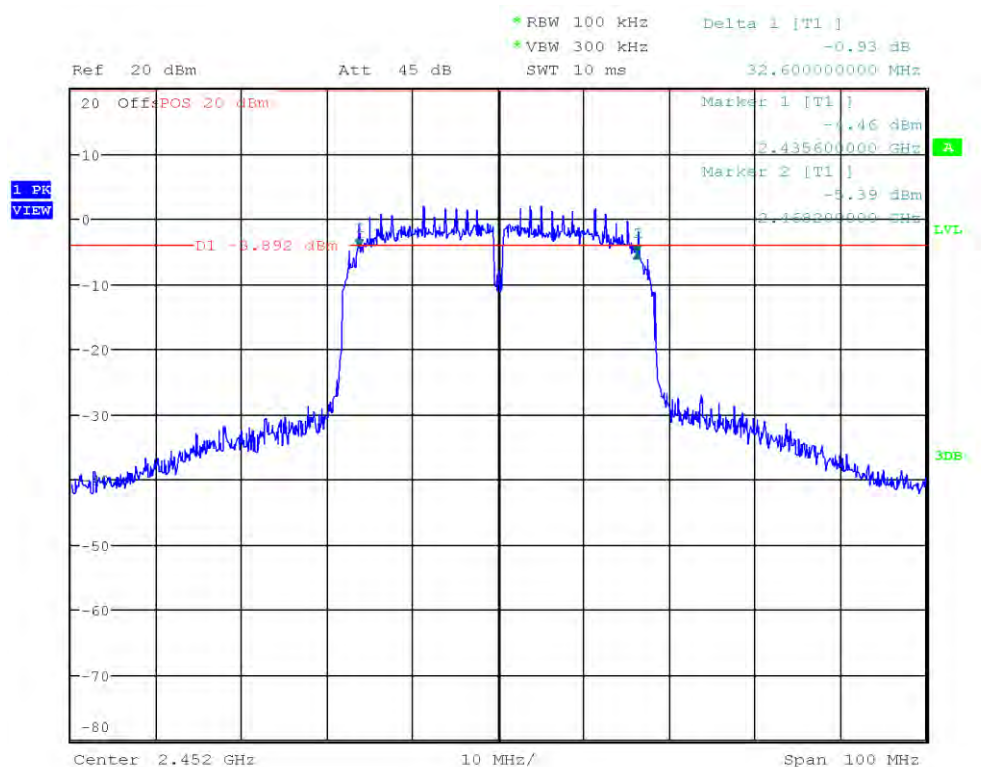
Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.11 n HT40, Channel: 6, 2437 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=0 MCS (worse case)
 Lower Frequency [MHz]: 2420.600
 Upper Frequency [MHz]: 2453.300
 6 dB Bandwidth [kHz]: 32700



Date: 22.AUG.2022 11:40:56

DTS (6 dB) Bandwidth

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.11 n HT40, Channel: 9, 2452 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode=0 MCS (worse case)
 Lower Frequency [MHz]: 2435.600
 Upper Frequency [MHz]: 2468.200
 6 dB Bandwidth [kHz]: 32600



Date: 22.AUG.2022 11:41:50

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

3.3 Test Conditions and Results - Maximum peak conducted output power

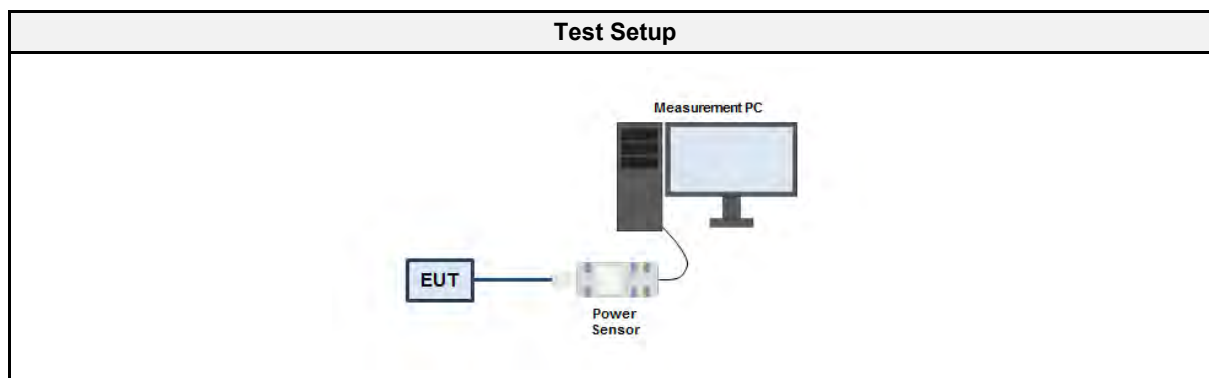
3.3.1 Information

Test Information	
Reference	FCC § 15.247(b); ISSED RSS-247, Issue 2 (section 5.4)
Measurement Method	ANSI C63.10 11.9.1
Measurement Uncertainty	± 2.86 dB
Operator	Dr.-Ing. Dhamia Almozani
Date	2022-08-22
Comment	Measurements were performed with attenuation level = 0 (corresponds to 0 dB)

3.3.2 Limits

Limits
1 W (30 dBm)
The conducted output power limit specified above is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in the table, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.3.3 Setup



3.3.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Power Sensor	R&S	NRP-Z81	EF00830	2021-08	2022-08

3.3.5 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

3.3.6 Results

Test Results - DSSS				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2412	19.56	0.09	1.0	PASS
2437	19.84	0.10	1.0	PASS
2462	18.87	0.08	1.0	PASS

Test Results - OFDM				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2412	22.85	0.19	1.0	PASS
2437	23.1	0.20	1.0	PASS
2462	22.94	0.20	1.0	PASS

Test Results - HT20				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2412	22.99	0.20	1.0	PASS
2437	23.12	0.21	1.0	PASS
2462	23.20	0.21	1.0	PASS

Test Results - HT40				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2422	22.29	0.17	1.0	PASS
2437	23.35	0.22	1.0	PASS
2452	22.54	0.18	1.0	PASS

3.4 Test Conditions and Results - Power spectral density

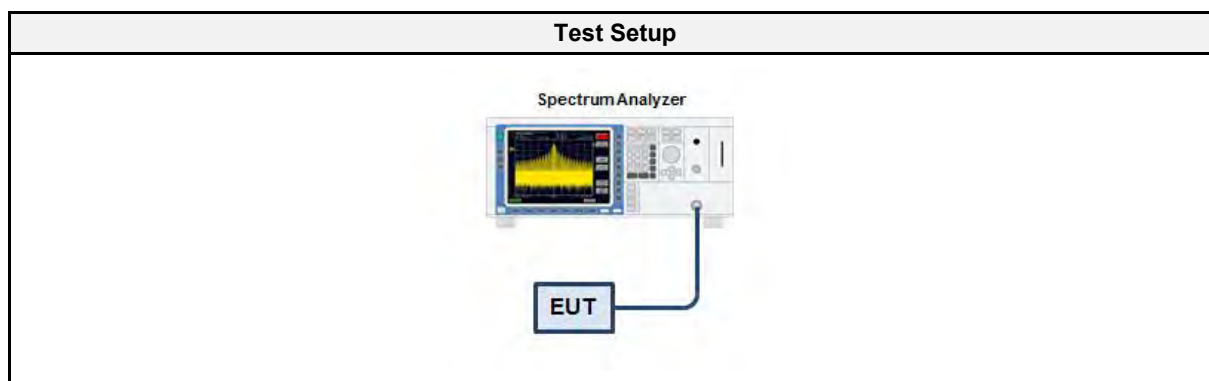
3.4.1 Information

Test Information	
Reference	FCC § 15.247(e); ISSED RSS-247, Issue 2 (section 5.2)
Measurement Method	ANSI C63.10 11.10.2, 14.3.2
Measurement Uncertainty	± 2.86 dB
Operator	Dr.-Ing Dhamia Almozani
Date	2022-08-22
Comment	Measurements were performed with attenuation level = 0 (corresponds to 0 dB)

3.4.2 Limits

Limits
8 dBm / 3 kHz

3.4.3 Setup



3.4.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSU 26	EF01003	2022-07	2023-07
Cable (diverse)	— (diverse)	— (diverse)	EF00779 CAABZ	2022-02	2023-02

3.4.5 Procedure

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

3.4.6 Results

Test Results - DSSS			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
2412	-0.361	8.0	PASS
2437	-0.614	8.0	PASS
2462	0.128	8.0	PASS

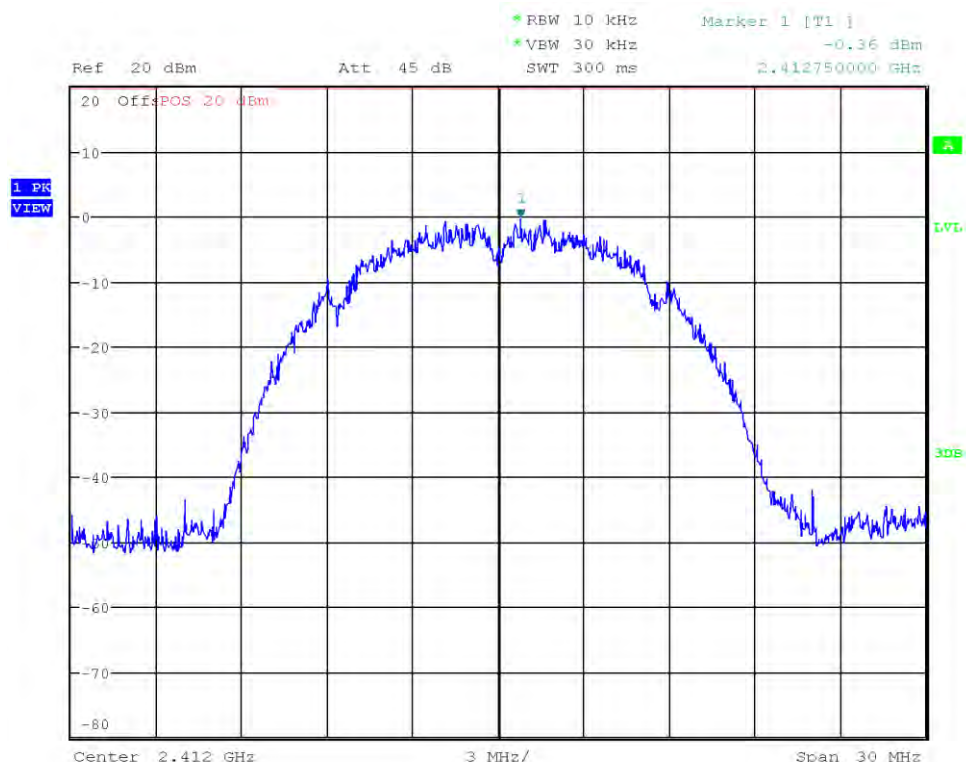
Test Results - OFDM			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
2412	1.705	8.0	PASS
2437	1.649	8.0	PASS
2462	1.958	8.0	PASS

Test Results - HT20			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
2412	0.219	8.0	PASS
2437	0.630	8.0	PASS
2462	1.183	8.0	PASS

Test Results - HT40			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
2422	1.758	8.0	PASS
2437	2.035	8.0	PASS
2452	2.017	8.0	PASS
RBW = 100 kHz			

Peak Power Spectral Density

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: IEEE 802.11 b, Channel: 1, 2412 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 1 Mbps (worse case)
 Peak Frequency [MHz]: 2412.750
 Spectral Density [dBm/RBW]: -0.361
 Resolution Bandwidth [kHz]: 10 kHz



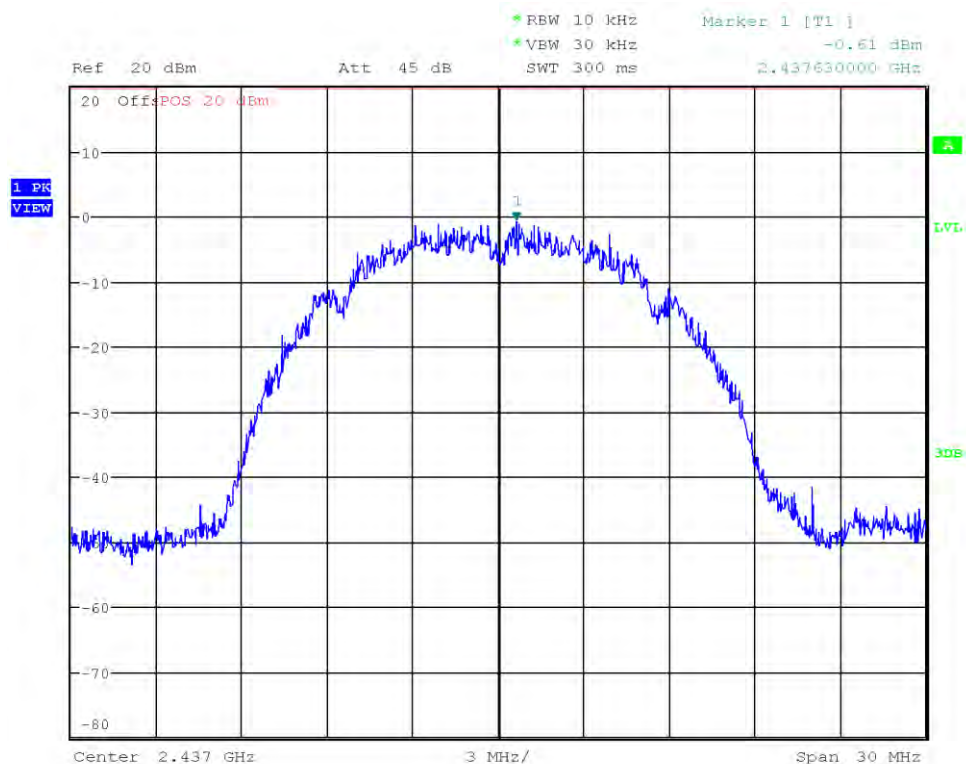
Date: 22.AUG.2022 11:46:54

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Peak Power Spectral Density

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: IEEE 802.11 b, Channel: 6, 2437 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 2 Mbps (worse case)
 Peak Frequency [MHz]: 2437.630
 Spectral Density [dBm/RBW]: -0.614
 Resolution Bandwidth [kHz]: 10 kHz



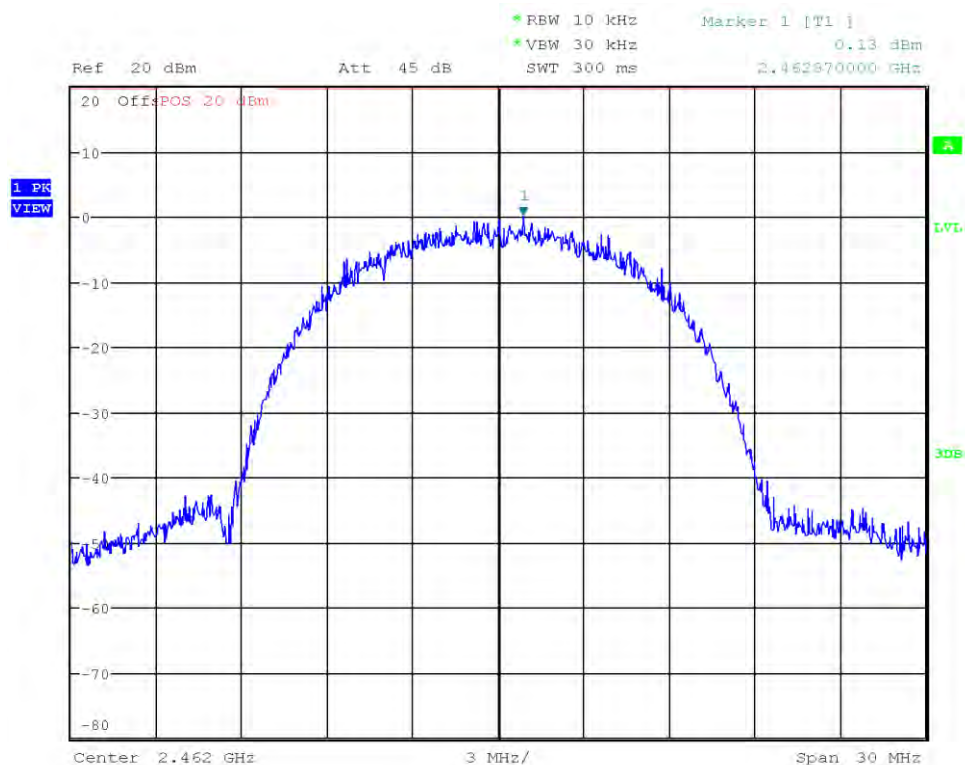
Date: 22.AUG.2022 11:51:27

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Peak Power Spectral Density

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: IEEE 802.11 b, Channel: 11, 2462 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 5.5 Mbps (worse case)
 Peak Frequency [MHz]: 2462.870
 Spectral Density [dBm/RBW]: 0.128
 Resolution Bandwidth [kHz]: 10 kHz



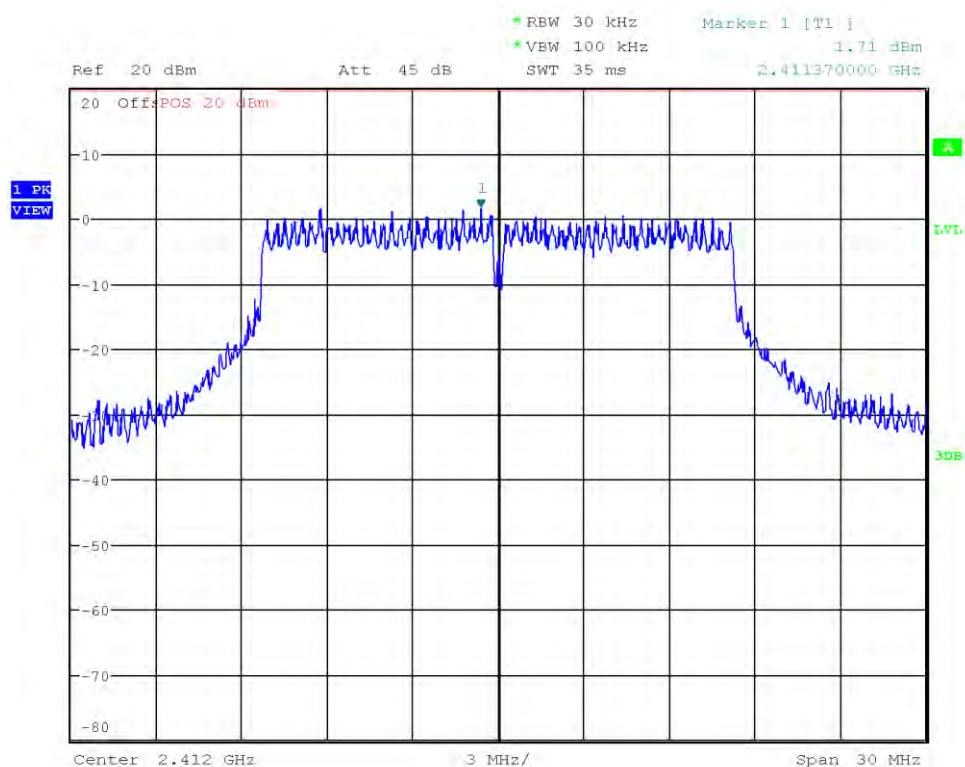
Date: 22.AUG.2022 11:54:04

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Peak Power Spectral Density

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: IEEE 802.11 g, Channel: 1, 2412 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 6 Mbps (worse case)
 Peak Frequency [MHz]: 2411.370
 Spectral Density [dBm/RBW]: 1.705
 Resolution Bandwidth [kHz]: 30 kHz



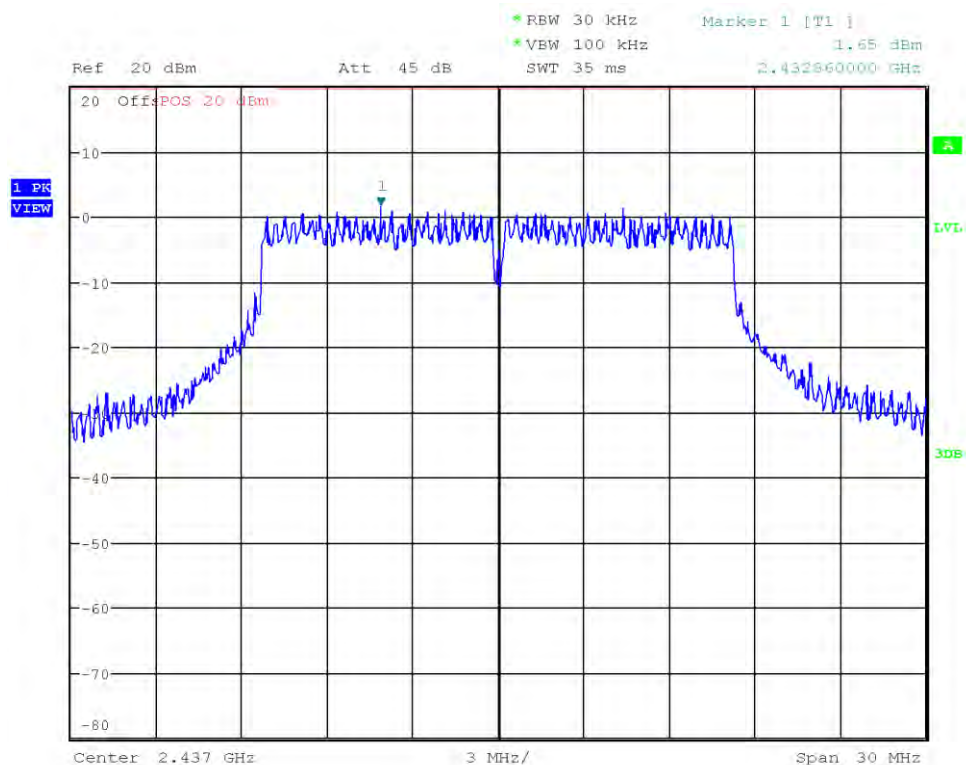
Date: 22.AUG.2022 11:56:53

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Peak Power Spectral Density

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: IEEE 802.11 g, Channel: 6, 2437 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 6 Mbps (worse case)
 Peak Frequency [MHz]: 2432.860
 Spectral Density [dBm/RBW]: 1.649
 Resolution Bandwidth [kHz]: 30 kHz



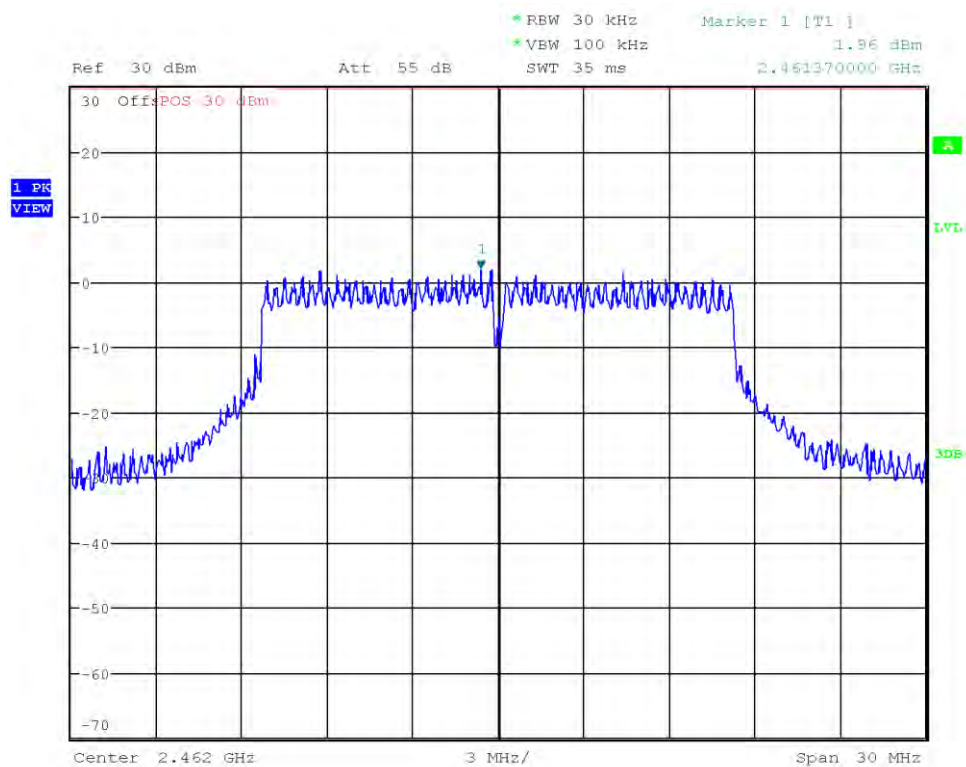
Date: 22.AUG.2022 11:58:02

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Peak Power Spectral Density

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: IEEE 802.11 g, Channel: 11, 2462 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 6 Mbps (worse case)
 Peak Frequency [MHz]: 2461.370
 Spectral Density [dBm/RBW]: 1.958
 Resolution Bandwidth [kHz]: 30 kHz



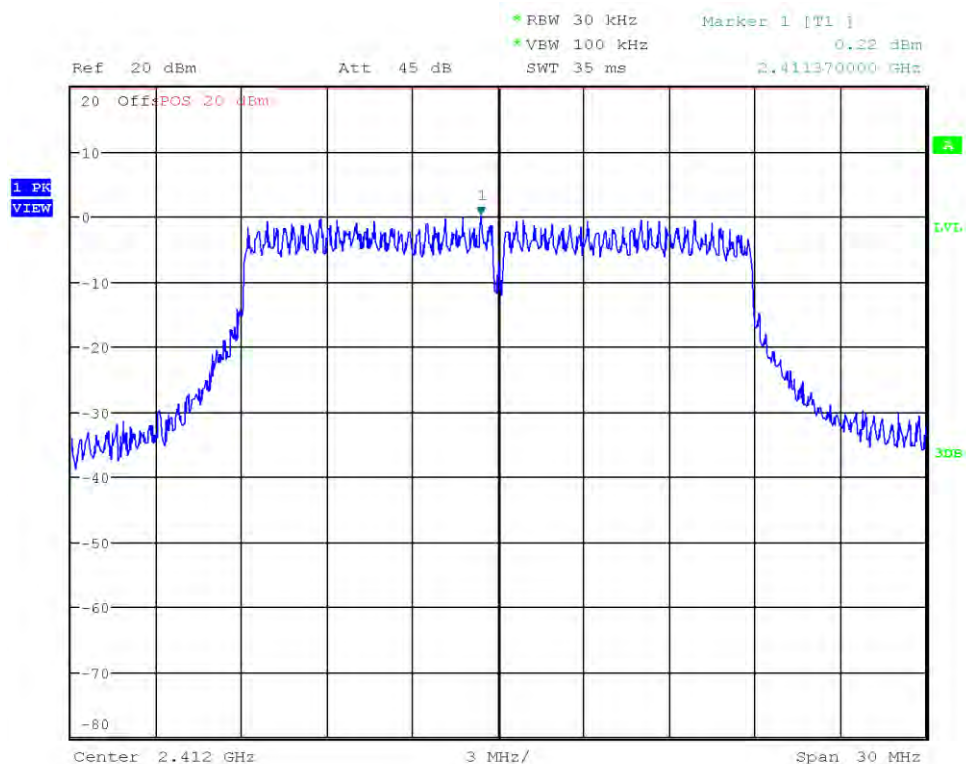
Date: 22.AUG.2022 11:59:36

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Peak Power Spectral Density

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: IEEE 802.11 n HT20, Channel: 1, 2412 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 0 MCS (worse case)
 Peak Frequency [MHz]: 2411.370
 Spectral Density [dBm/RBW]: 0.219
 Resolution Bandwidth [kHz]: 30 kHz



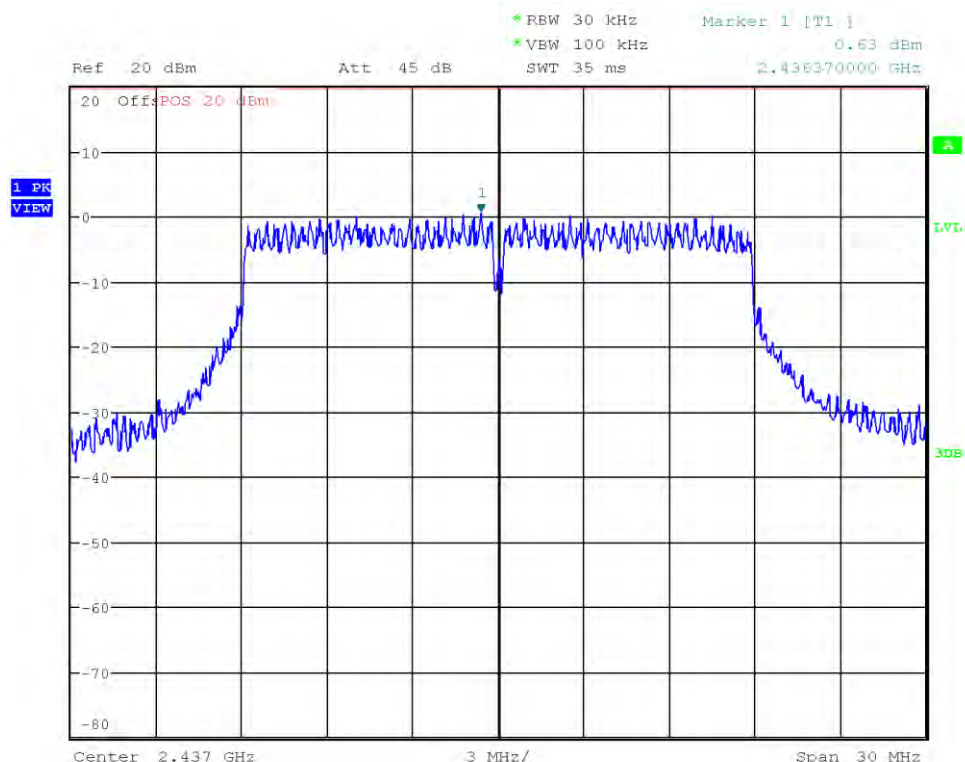
Date: 22.AUG.2022 12:02:24

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Peak Power Spectral Density

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: IEEE 802.11 n HT20, Channel: 6, 2437 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 0 MCS (worse case)
 Peak Frequency [MHz]: 2436.370
 Spectral Density [dBm/RBW]: 0.630
 Resolution Bandwidth [kHz]: 30 kHz



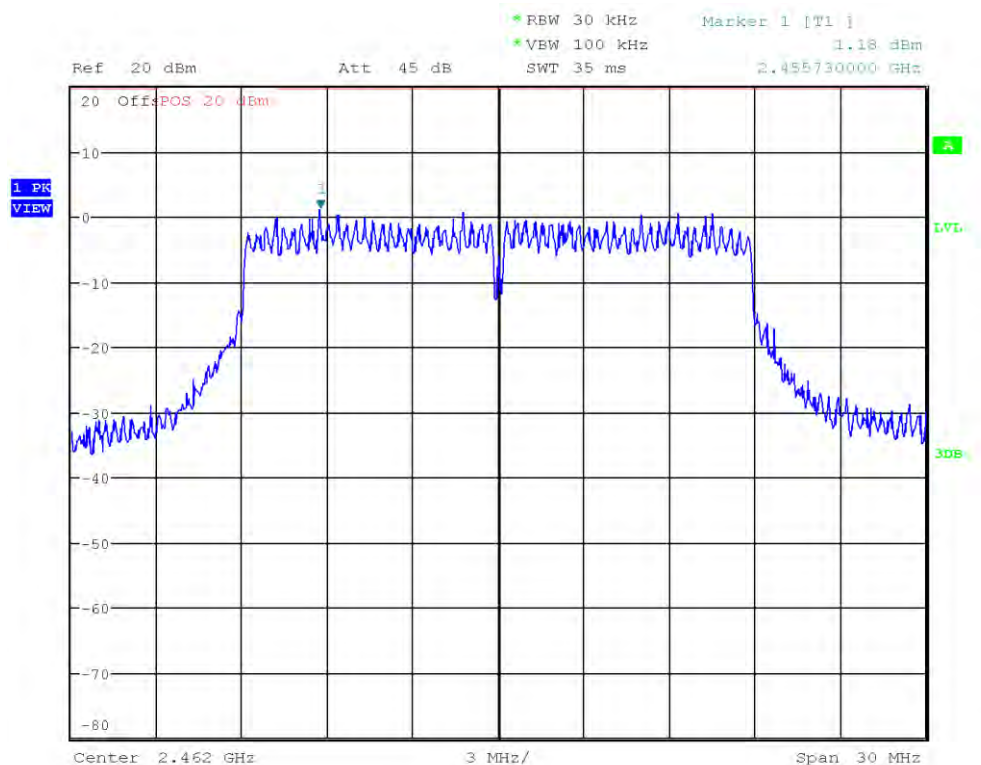
Date: 22.AUG.2022 12:03:29

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Peak Power Spectral Density

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: IEEE 802.11 n HT20, Channel: 11, 2462 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 1 MCS (worse case)
 Peak Frequency [MHz]: 2455.730
 Spectral Density [dBm/RBW]: 1.183
 Resolution Bandwidth [kHz]: 30 kHz



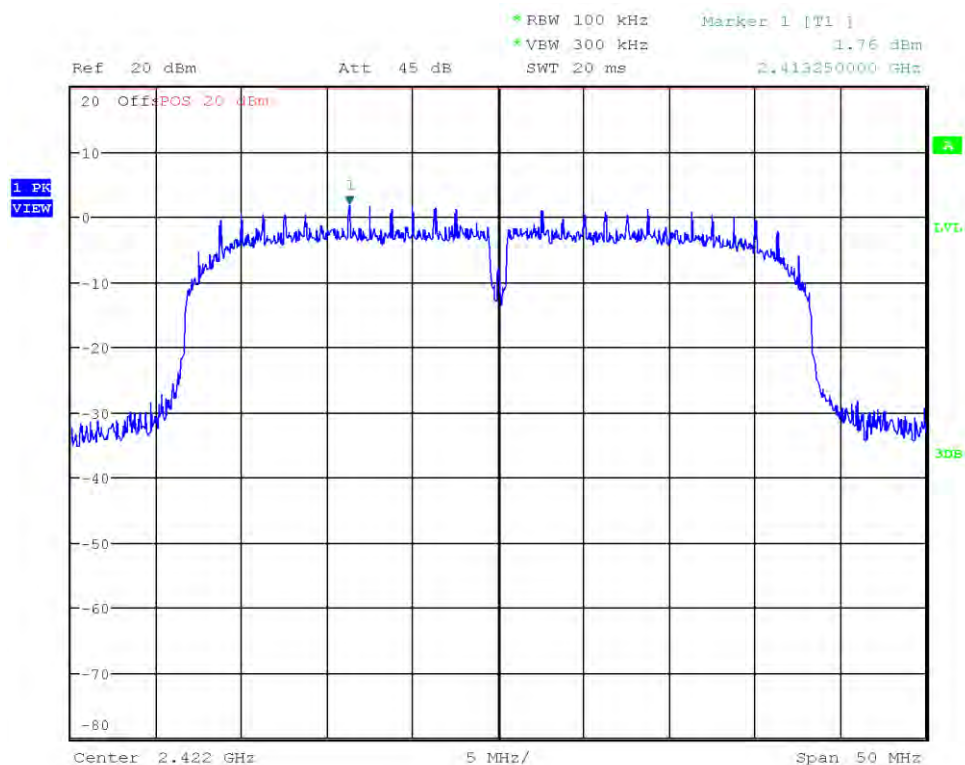
Date: 22.AUG.2022 12:04:58

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Peak Power Spectral Density

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: IEEE 802.11 n HT40, Channel: 3, 2422 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 0 MCS (worse case)
 Peak Frequency [MHz]: 2413.250
 Spectral Density [dBm/RBW]: 1.758
 Resolution Bandwidth [kHz]: 100 kHz



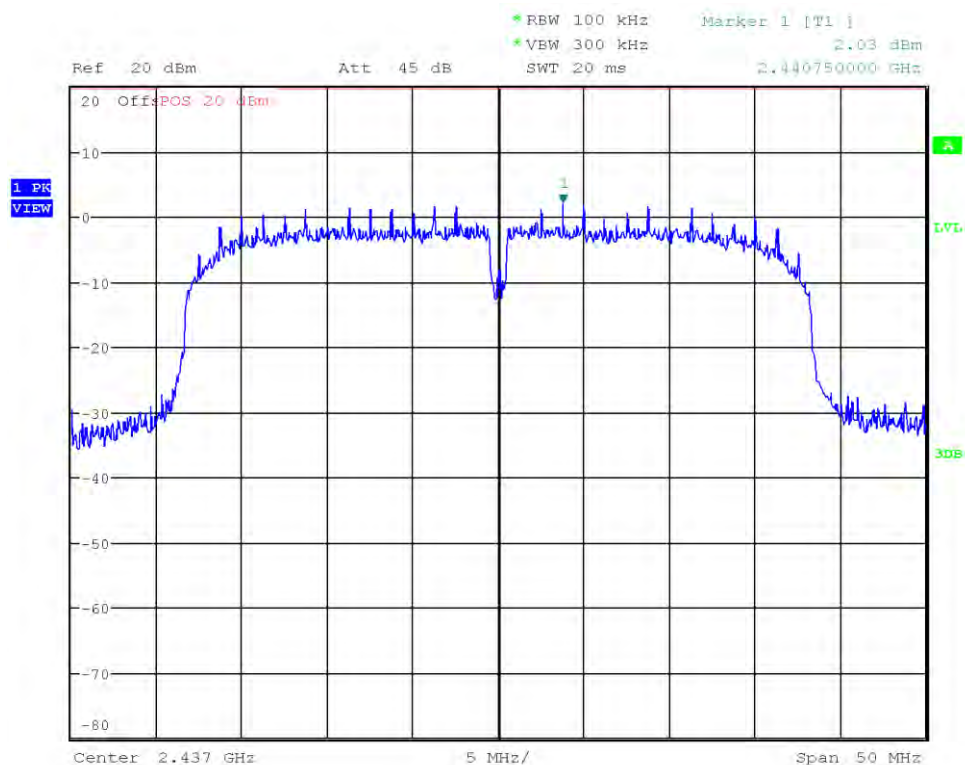
Date: 22.AUG.2022 12:06:30

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Peak Power Spectral Density

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: IEEE 802.11 n HT40, Channel: 6, 2437 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 0 MCS (worse case)
 Peak Frequency [MHz]: 2440.750
 Spectral Density [dBm/RBW]: 2.035
 Resolution Bandwidth [kHz]: 100 kHz



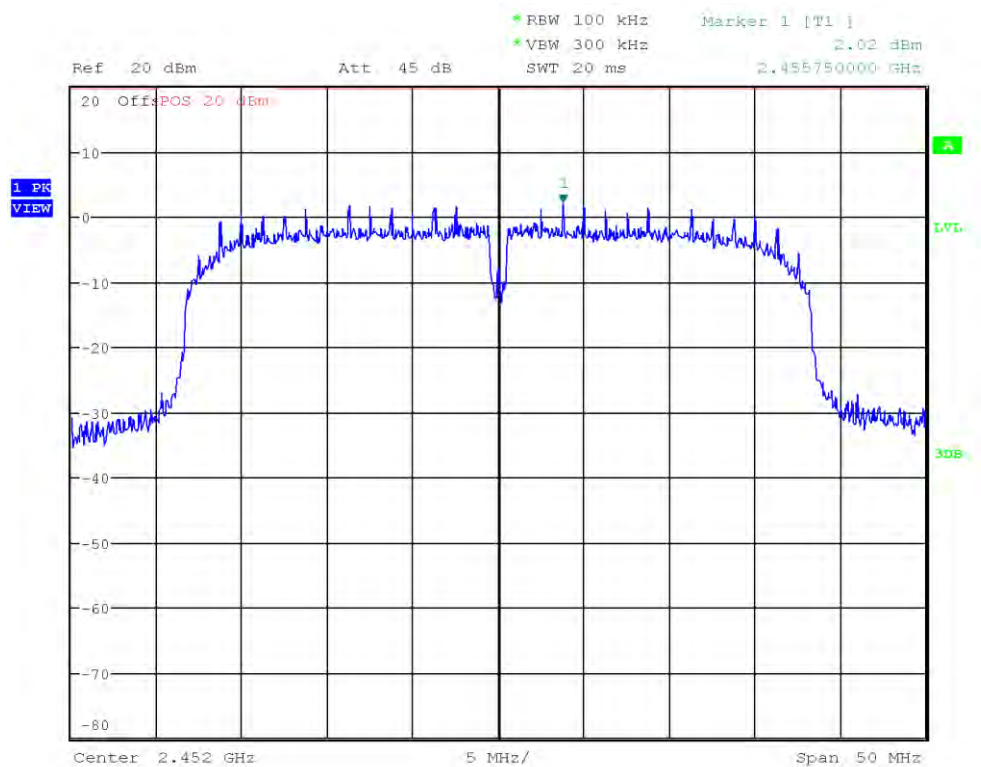
Date: 22.AUG.2022 12:07:24

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Peak Power Spectral Density

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.10.2
 Operational Mode: IEEE 802.11 n HT40, Channel: 9, 2452 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 0 MCS (worse case)
 Peak Frequency [MHz]: 2455.750
 Spectral Density [dBm/RBW]: 2.017
 Resolution Bandwidth [kHz]: 100 kHz



Date: 22.AUG.2022 12:09:07

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

3.5 Test Conditions and Results - AC powerline conducted emissions

3.5.1 Information

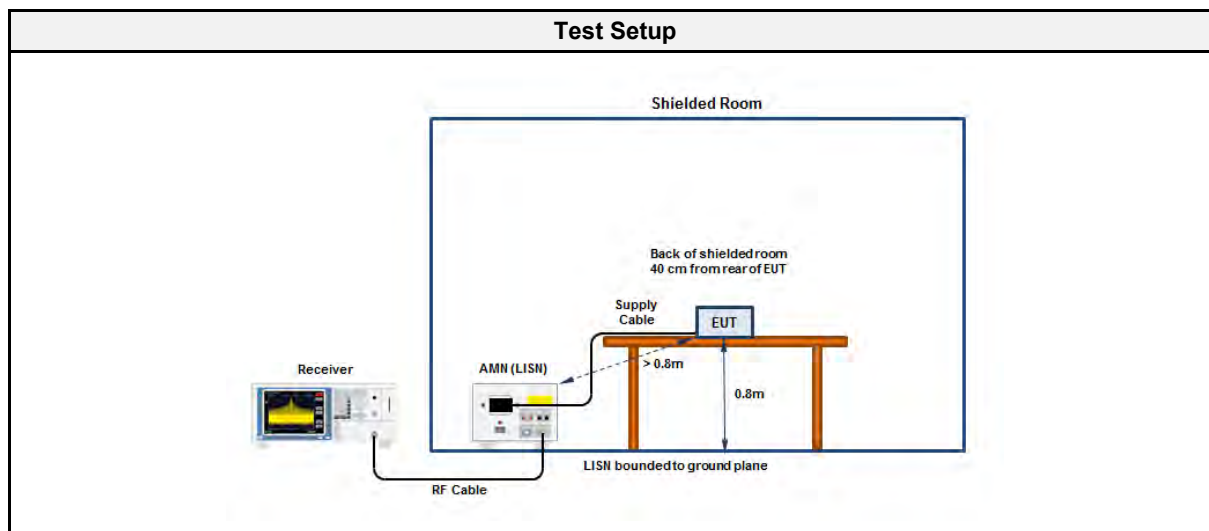
Test Information	
Reference	FCC § 15.207; ISED RSS-247, Issue 2 (section 3.1)
Measurement Method	ANSI C63.10 6.2
Measurement Uncertainty	± 3.82 dB
Operator	Florian Voigt
Date	2022-08-29
Comment	Measurements were performed with attenuation level = 0 (corresponds to 0 dB)

3.5.2 Limits

Limits		
Frequency [MHz]	Quasi-Peak [dB μ V]	Average [dB μ V]
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5	56	46
5 - 30	60	50

* Limit decreases linearly with the logarithm of the frequency

3.5.3 Setup

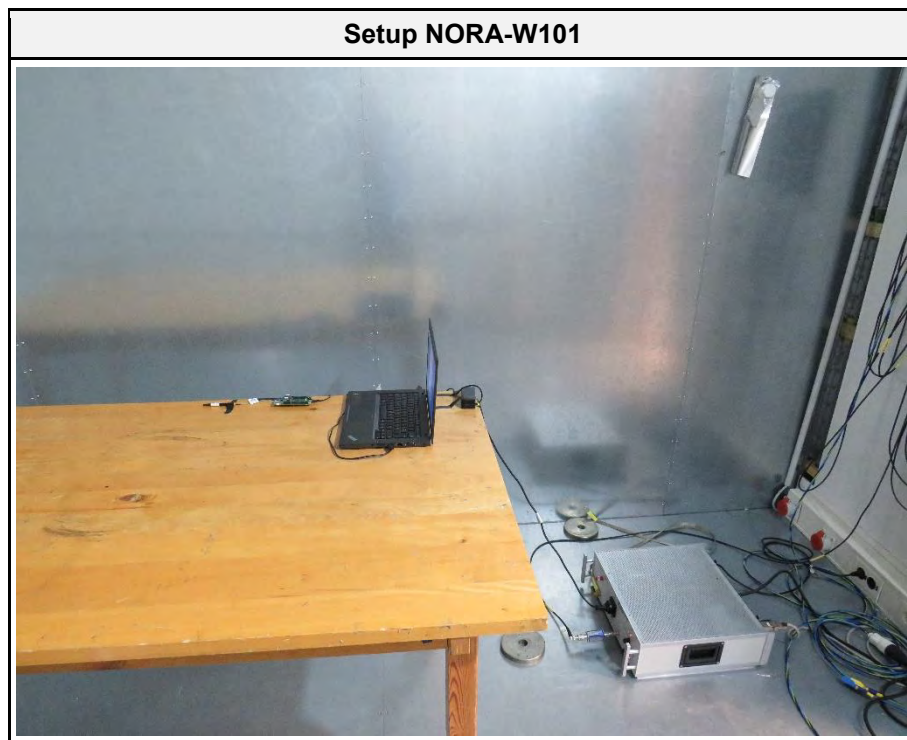


3.5.4 Equipment

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

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

3.5.5 Setup Photos

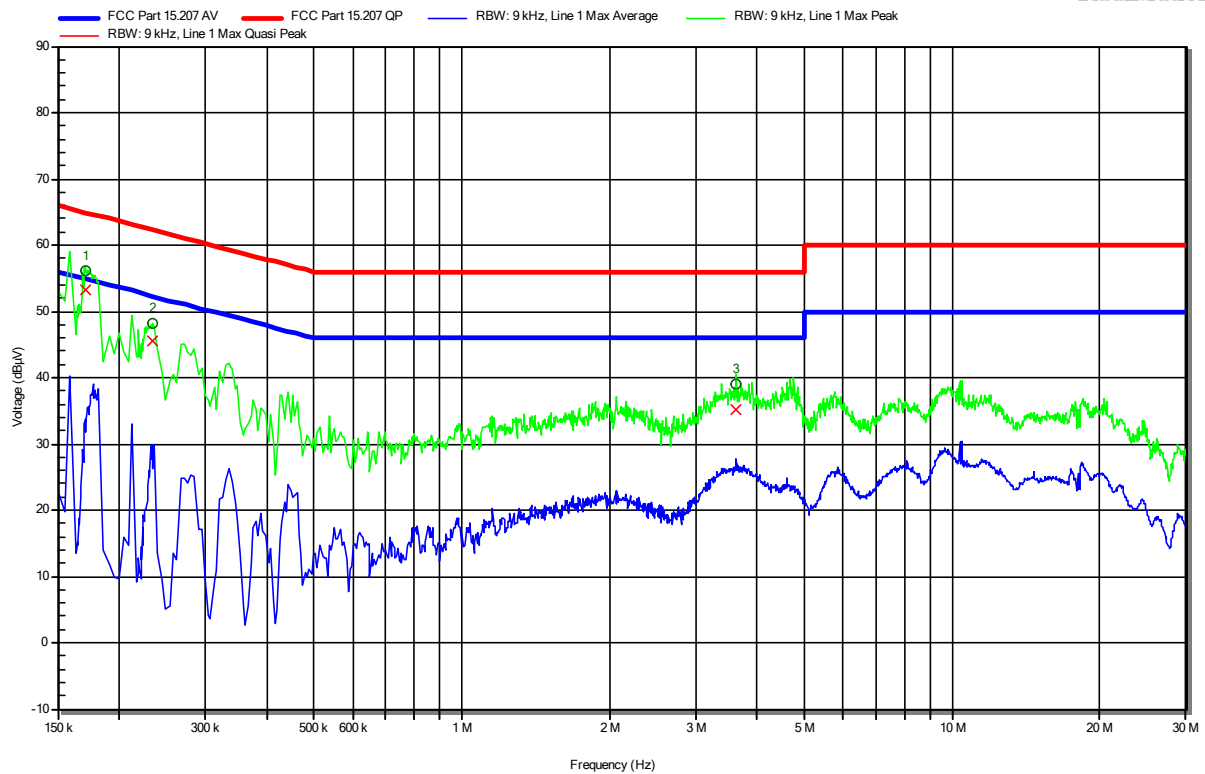


Conducted emissions at the mains power port according to 47 CFR Part 15.247, RSS-247

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40679
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Voigt
 Test Date: 2022-08-29
 Operating Conditions: ambient temperature: 23 °Celsius
 power input: 5.0 V DC
 LISN: Schwarzbeck NSLK 8127 RC L1
 Operational Mode: IEEE802.11g; 6 Mbps; CH 1_2412 MHz; OFDM; BW20
 EUT Configuration:
 Applied to Port: 120 VAC / 60 Hz
 Note 1:

Index 155

RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	171.6 kHz	53.32 dBμV	64.88 dBμV	-11.57 dB	Pass	Line 1
2	233.7 kHz	45.64 dBμV	62.32 dBμV	-16.68 dB	Pass	Line 1
3	3.624 MHz	35.16 dBμV	56 dBμV	-20.84 dB	Pass	Line 1

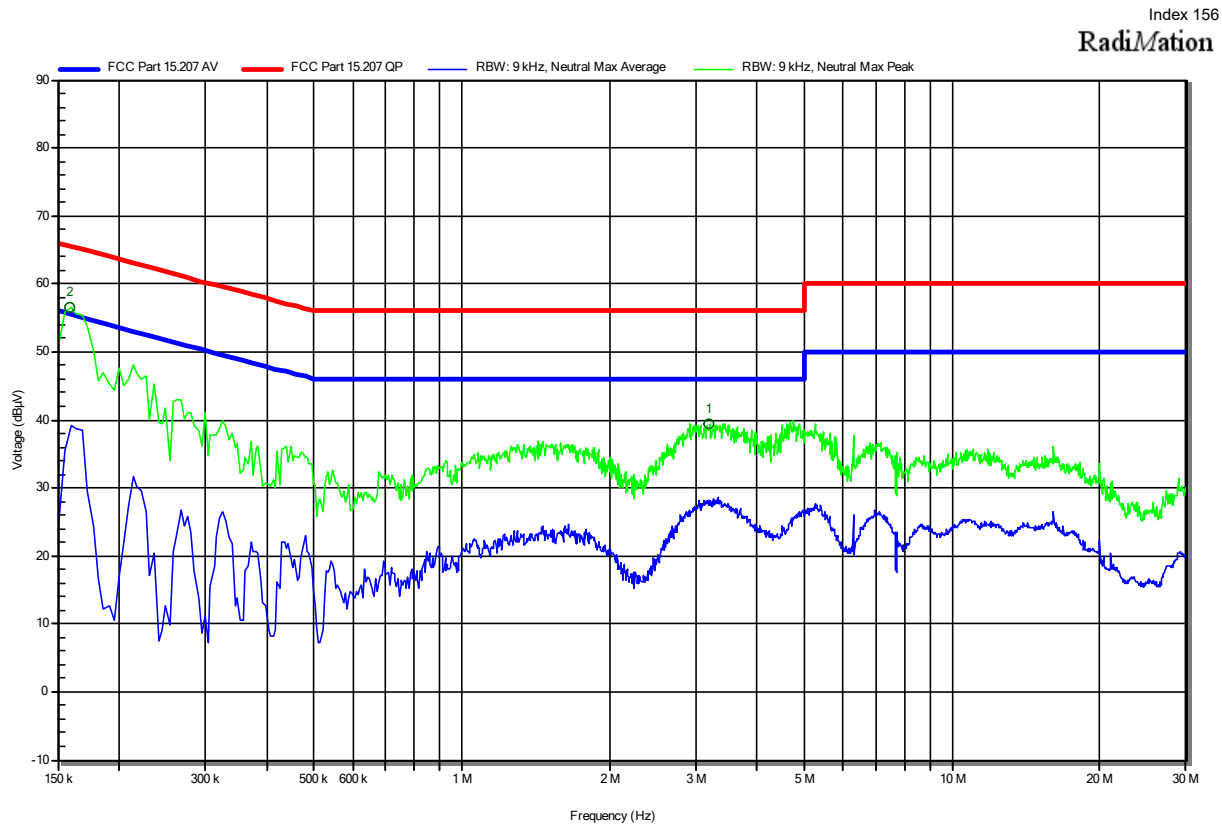
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	171.6 kHz	33.33 dBμV	54.88 dBμV	-21.56 dB	Pass	Line 1
2	233.7 kHz	29.83 dBμV	52.32 dBμV	-22.49 dB	Pass	Line 1
3	3.624 MHz	26.97 dBμV	46 dBμV	-19.03 dB	Pass	Line 1

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Conducted emissions at the mains power port according to 47 CFR Part 15.247, RSS-247

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40679
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Voigt
 Test Date: 2022-08-29
 Operating Conditions: ambient temperature: 23 °Celsius
 power input: 5.0 V DC
 LISN: Schwarzbeck NSLK 8127
 Operational Mode: IEEE802.11g; 6 Mbps; CH 1_2412 MHz; OFDM; BW20
 EUT Configuration:
 Applied to Port: 120 VAC / 60 Hz
 Note 1:



Peak Number	Frequency	LISN
1	3.197 MHz	Neutral
2	159 kHz	Neutral

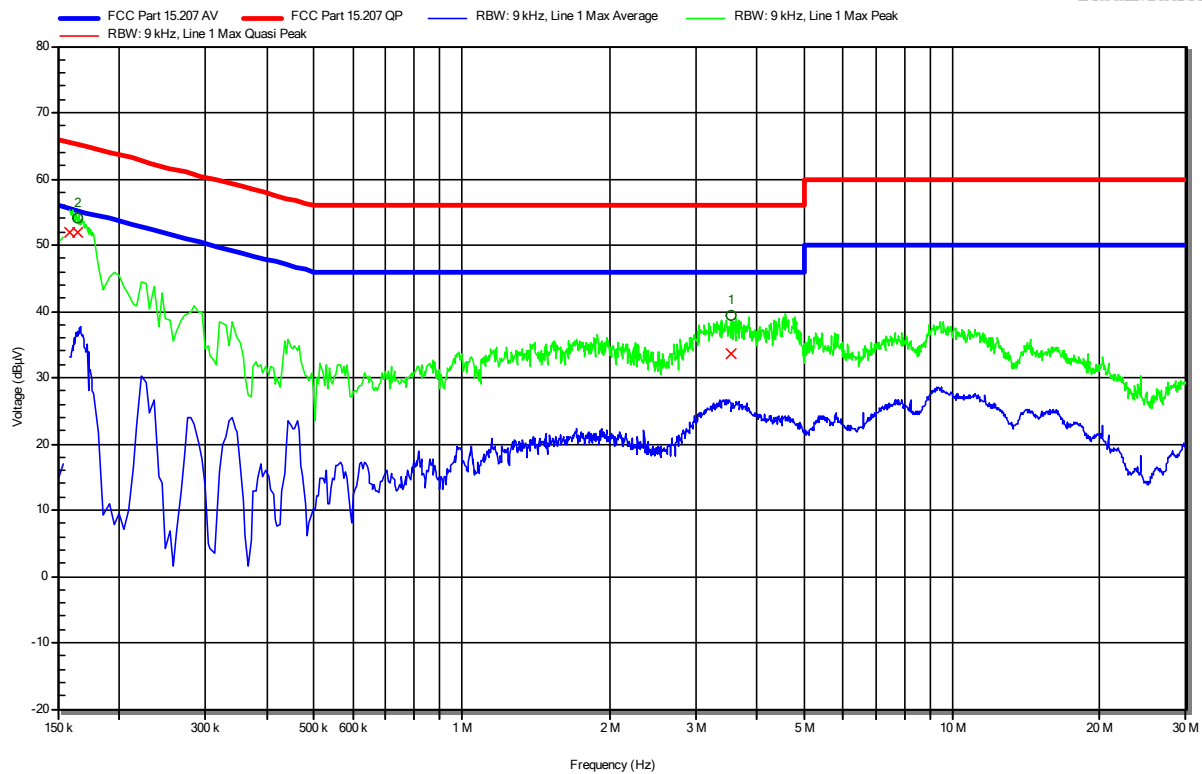
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	3.197 MHz	28.11 dBµV	46 dBµV	-17.89 dB	Pass	Neutral
2	159 kHz	39.07 dBµV	55.52 dBµV	-16.45 dB	Pass	Neutral

Conducted emissions at the mains power port according to 47 CFR Part 15.247, RSS-247

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40679
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Voigt
 Test Date: 2022-08-29
 Operating Conditions: ambient temperature: 23 °Celsius
 power input: 5.0 V DC
 LISN: Schwarzbeck NSLK 8127 RC L1
 Operational Mode: IEEE802.11g; 6 Mbps; CH 6_2437 MHz; OFDM; BW20
 EUT Configuration:
 Applied to Port: 120 VAC / 60 Hz
 Note 1:

Index 157

RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	3.548 MHz	33.66 dBµV	56 dBµV	-22.34 dB	Pass	Line 1
2	164.4 kHz	51.94 dBµV	65.24 dBµV	-13.3 dB	Pass	Line 1
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	3.548 MHz	25.18 dBµV	46 dBµV	-20.82 dB	Pass	Line 1
2	164.4 kHz	36.94 dBµV	55.24 dBµV	-18.3 dB	Pass	Line 1

Test Report No.: G0M-2205-1454-TFC247WF-V02

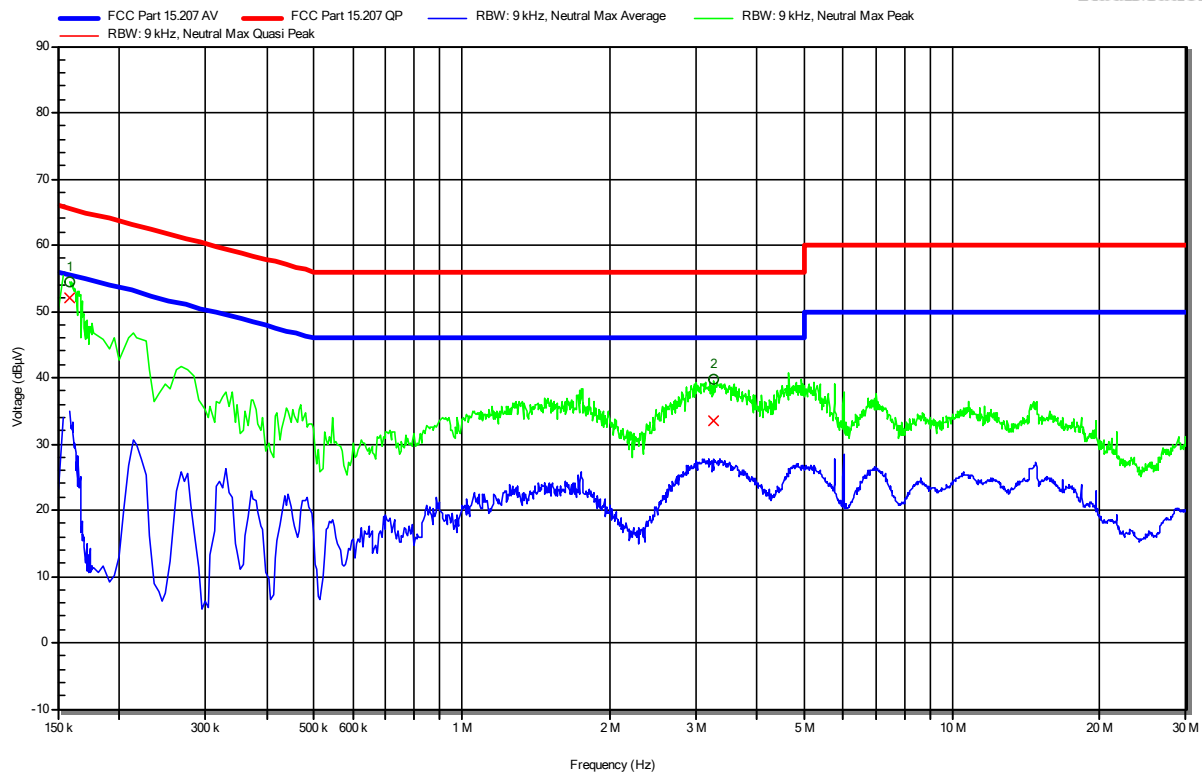
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Conducted emissions at the mains power port according to 47 CFR Part 15.247, RSS-247

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40679
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Voigt
 Test Date: 2022-08-29
 Operating Conditions: ambient temperature: 23 °Celsius
 power input: 5.0 V DC
 LISN: Schwarzbeck NSLK 8127
 Operational Mode: IEEE802.11g; 6 Mbps; CH 6_2437 MHz; OFDM; BW20
 EUT Configuration:
 Applied to Port: 120 VAC / 60 Hz
 Note 1:

Index 158

RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	159 kHz	52.01 dBμV	65.52 dBμV	-13.5 dB	Pass	Neutral
2	3.255 MHz	33.48 dBμV	56 dBμV	-22.52 dB	Pass	Neutral

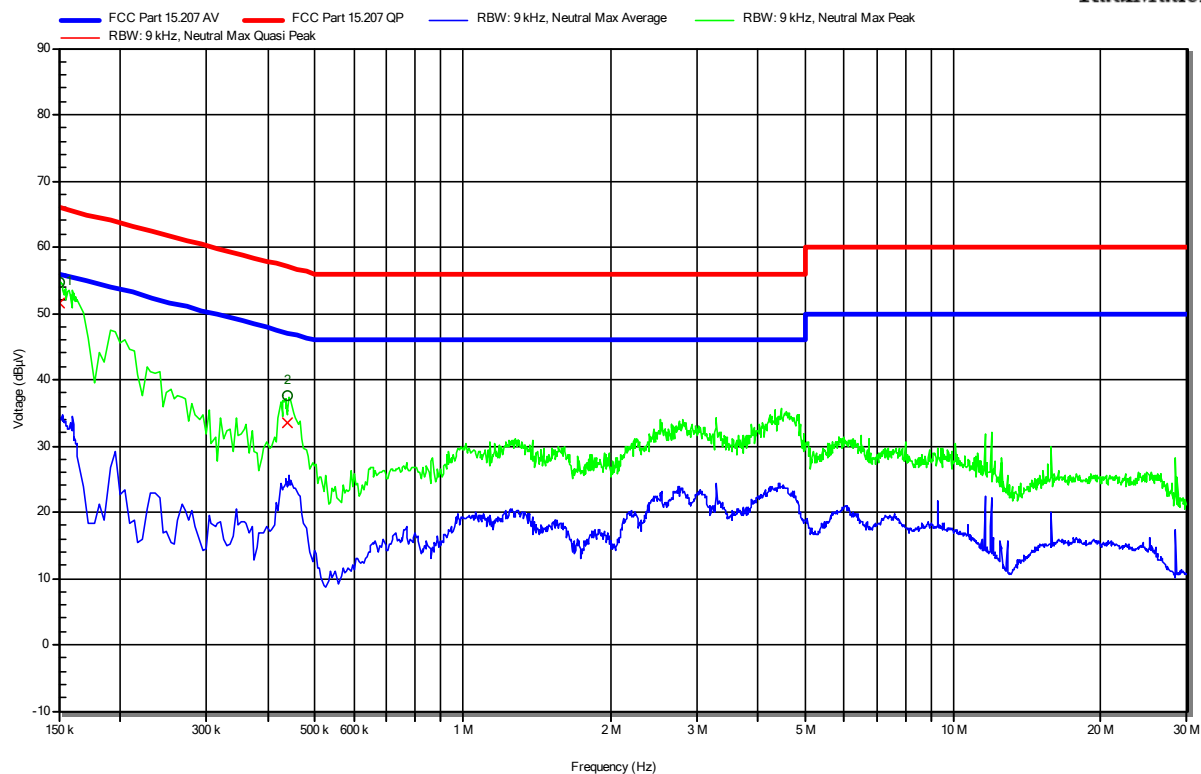
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	159 kHz	34.48 dBμV	55.52 dBμV	-21.04 dB	Pass	Neutral
2	3.255 MHz	25.97 dBμV	46 dBμV	-20.03 dB	Pass	Neutral

Conducted emissions at the mains power port according to RSS-247, RSS-Gen

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40679
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Voigt
 Test Date: 2022-08-29
 Operating Conditions: ambient temperature: 23 °Celsius
 power input: 5.0 V DC
 LISN: Schwarzbeck NSLK 8127
 Operational Mode: RX; IEEE802.11g; CH 6_2437 MHz; OFDM; BW20
 EUT Configuration:
 Applied to Port: 120 VAC / 60 Hz
 Note 1:

Index 159

RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	150 kHz	51.58 dBµV	66 dBµV	-14.42 dB	Pass	Neutral
2	438 kHz	33.42 dBµV	57.1 dBµV	-23.68 dB	Pass	Neutral

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	150 kHz	33.44 dBµV	56 dBµV	-22.56 dB	Pass	Neutral
2	438 kHz	24.24 dBµV	47.1 dBµV	-22.86 dB	Pass	Neutral

Test Report No.: G0M-2205-1454-TFC247WF-V02

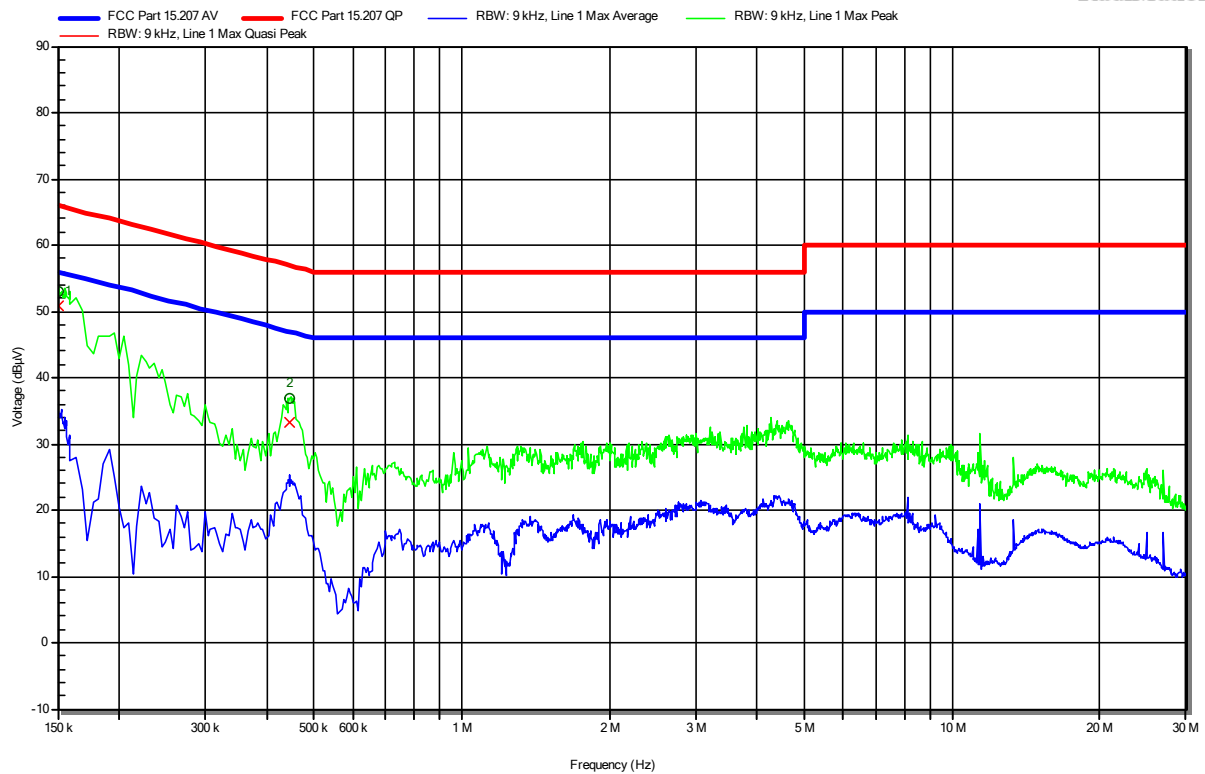
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Conducted emissions at the mains power port according to RSS-247, RSS-Gen

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40679
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Voigt
 Test Date: 2022-08-29
 Operating Conditions: ambient temperature: 23 °Celsius
 power input: 5.0 V DC
 LISN: Schwarzbeck NSLK 8127 RC L1
 Operational Mode: RX; IEEE802.11g; CH 6_2437 MHz; OFDM; BW20
 EUT Configuration:
 Applied to Port: 120 VAC / 60 Hz
 Note 1:

Index 160

RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	150 kHz	50.87 dBμV	66 dBμV	-15.13 dB	Pass	Line 1
2	447 kHz	33.18 dBμV	56.93 dBμV	-23.75 dB	Pass	Line 1
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	150 kHz	34.92 dBμV	56 dBμV	-21.08 dB	Pass	Line 1
2	447 kHz	24.43 dBμV	46.93 dBμV	-22.5 dB	Pass	Line 1

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

3.6 Test Conditions and Results - Band-edge compliance

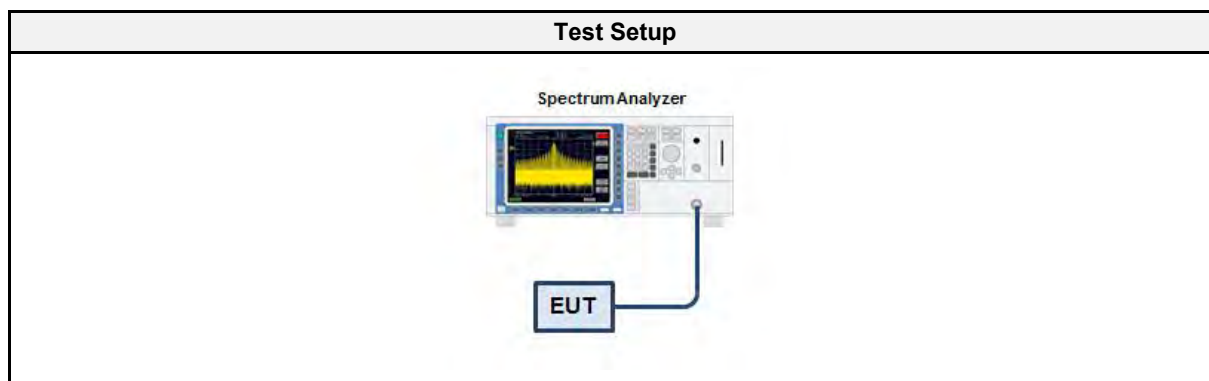
3.6.1 Information

Test Information	
Reference	FCC § 15.247(d); ISSED RSS-247, Issue 2 (section 5.5)
Measurement Uncertainty	± 3.64 dB
Measurement Method	ANSI C63.10 11.13
Operator	Dr.-Ing Dhamia Almozani
Date	2022-08-22
Comment	Measurements were performed with attenuation level = 0 (corresponds to 0 dB)

3.6.2 Limits

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

3.6.3 Setup



3.6.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSU 26	EF01003	2022-07	2023-07
Cable (diverse)	– (diverse)	– (diverse)	EF00779 CAABZ	2022-02	2023-02

3.6.5 Procedure

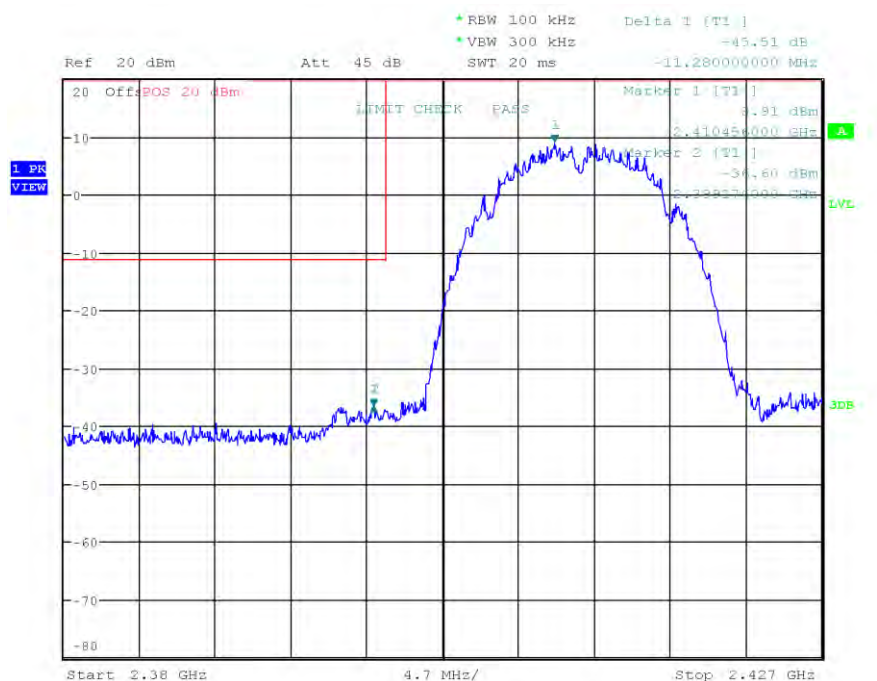
Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Span set around lower band edge and detector is set to peak and max hold 3. Resolution bandwidth is set to 100 kHz 4. Markers are set to peak emission levels within frequency band and outside frequency band 5. Band edge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

3.6.6 Results

Test Results				
Mode	Channel [MHz]	Out-of-band Attenuation [dB]	Limit [dB]	Verdict
DSSS	2412	-45.52	-20	PASS
DSSS	2462	-49.16	-20	PASS
OFDM	2412	-27.81	-20	PASS
OFDM	2462	-35.11	-20	PASS
HT20	2412	-29.59	-20	PASS
HT20	2462	-37.56	-20	PASS
HT40	2422	-32.2	-20	PASS
HT40	2452	-34.31	-20	PASS

Emissions in nonrestricted frequency bands at the Band-edge

Project Number:	G0M-2205-1454
Applicant:	u-blox AG
Model Description:	Stand-alone multiradio module
Model:	NORA-W101
Test Sample ID:	40677
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11 b, Channel: 1, 2412 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-22
Antenna port:	1
Note:	Mode= 1 Mbps (worse case)
Band-edge	Lower
In-band Frequency [MHz]:	2410.456
Max. in-band Level [dBm/100 kHz]:	8.913
Out-of-band Frequency [MHz]:	2399.176
Max. out-of-band Level [dBm/100 kHz]:	-36.602
Attenuation [dB]:	-45.52



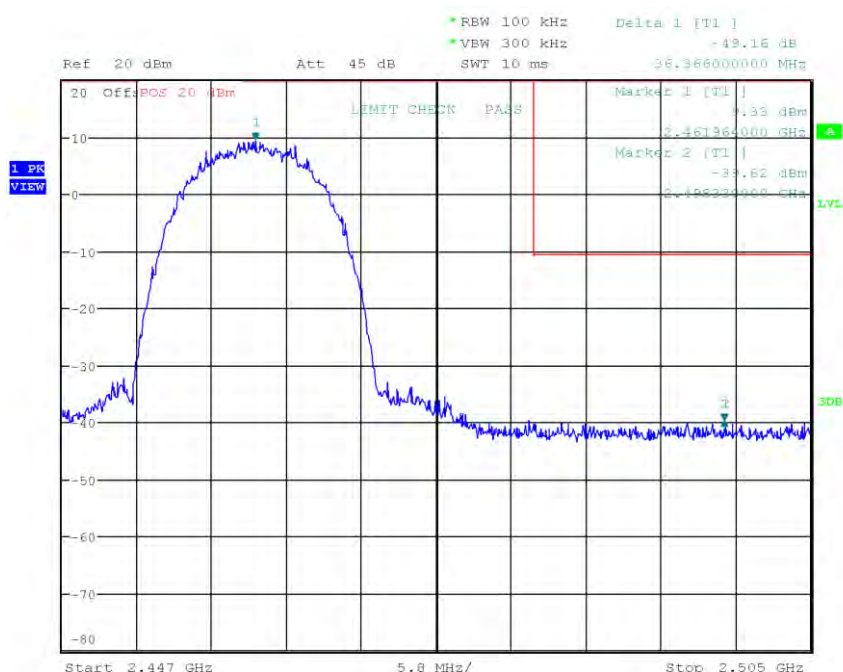
Date: 22.AUG.2022 13:06:06

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Emissions in nonrestricted frequency bands at the Band-edge

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.11 b, Channel: 11, 2462 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 5.5 Mbps (worse case)
 Band-edge Upper
 In-band Frequency [MHz]: 2461.964
 Max. in-band Level [dBm/100 kHz]: 9.332
 Out-of-band Frequency [MHz]: 2498.33
 Max. out-of-band Level [dBm/100 kHz]: -39.824
 Attenuation [dB]: -49.16



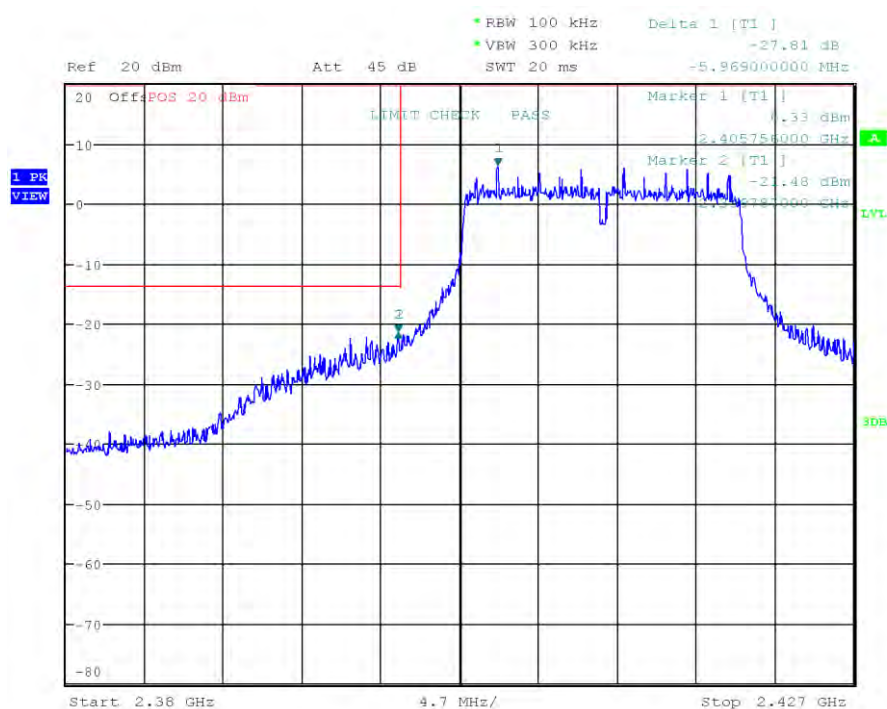
Date: 22.AUG.2022 13:12:29

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Emissions in nonrestricted frequency bands at the Band-edge

Project Number:	G0M-2205-1454
Applicant:	u-blox AG
Model Description:	Stand-alone multiradio module
Model:	NORA-W101
Test Sample ID:	40677
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11 g, Channel: 1, 2412 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-22
Antenna port:	1
Note:	Mode= 6 Mbps (worse case)
Band-edge	Lower
In-band Frequency [MHz]:	2405.756
Max. in-band Level [dBm/100 kHz]:	6.333
Out-of-band Frequency [MHz]:	2399.787
Max. out-of-band Level [dBm/100 kHz]:	-21.476
Attenuation [dB]:	-27.81



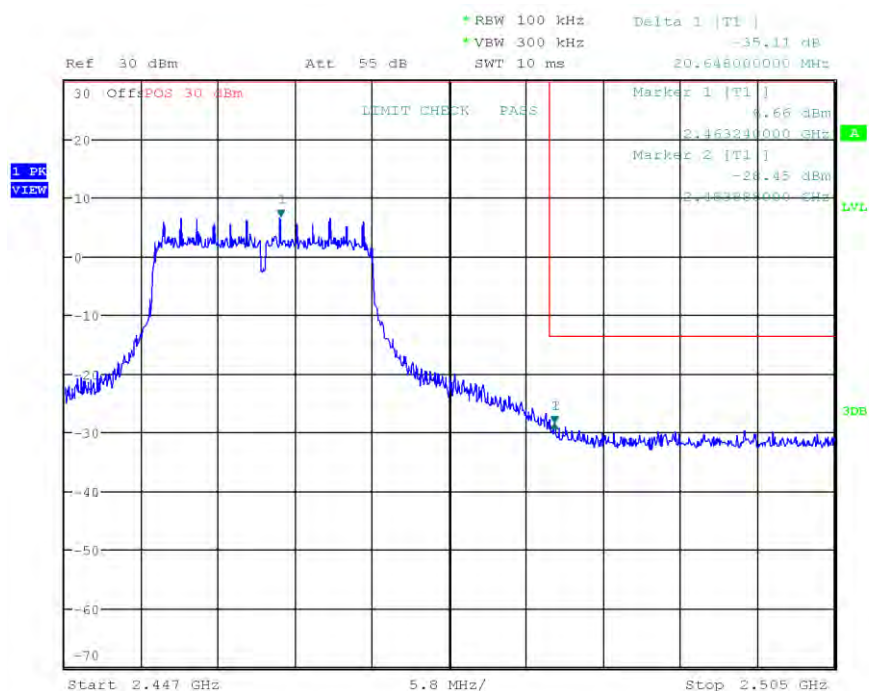
Date: 22.AUG.2022 13:14:58

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Emissions in nonrestricted frequency bands at the Band-edge

Project Number:	G0M-2205-1454
Applicant:	u-blox AG
Model Description:	Stand-alone multiradio module
Model:	NORA-W101
Test Sample ID:	40677
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.11
Operational Mode:	IEEE 802.11 g, Channel: 11, 2462 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-22
Antenna port:	1
Note:	Mode= 6 Mbps (worse case)
Band-edge	Upper
In-band Frequency [MHz]:	2463.24
Max. in-band Level [dBm/100 kHz]:	6.659
Out-of-band Frequency [MHz]:	2483.888
Max. out-of-band Level [dBm/100 kHz]:	-28.451
Attenuation [dB]:	-35.11



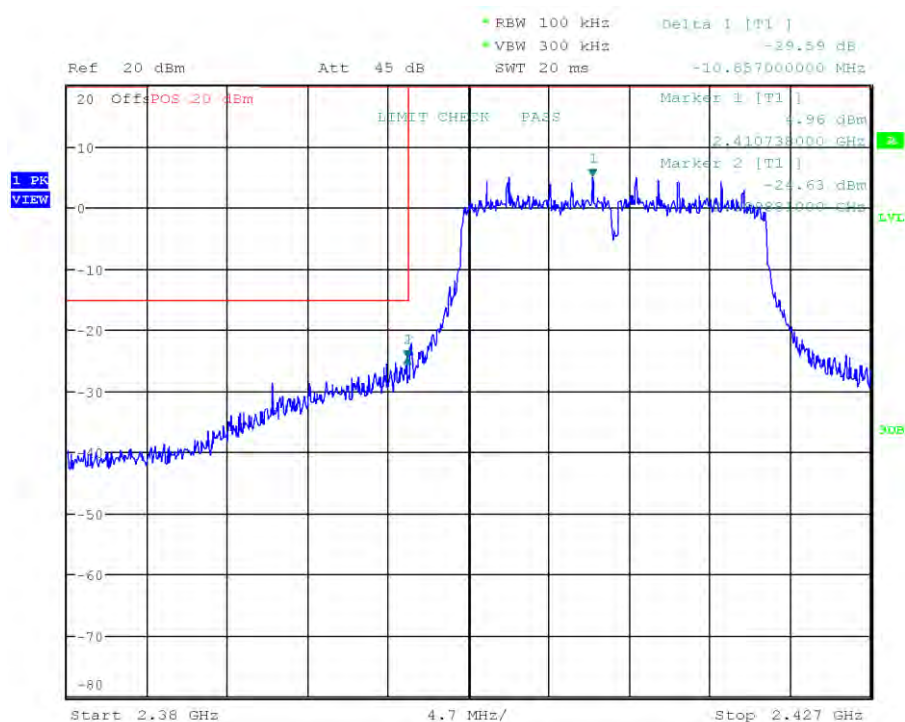
Date: 22.AUG.2022 13:17:06

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Emissions in nonrestricted frequency bands at the Band-edge

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.11 n HT20, Channel: 1, 2412 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 0 MCS (worse case)
 Band-edge Lower
 In-band Frequency [MHz]: 2410.738
 Max. in-band Level [dBm/100 kHz]: 4.956
 Out-of-band Frequency [MHz]: 2399.881
 Max. out-of-band Level [dBm/100 kHz]: -24.634
 Attenuation [dB]: -29.59



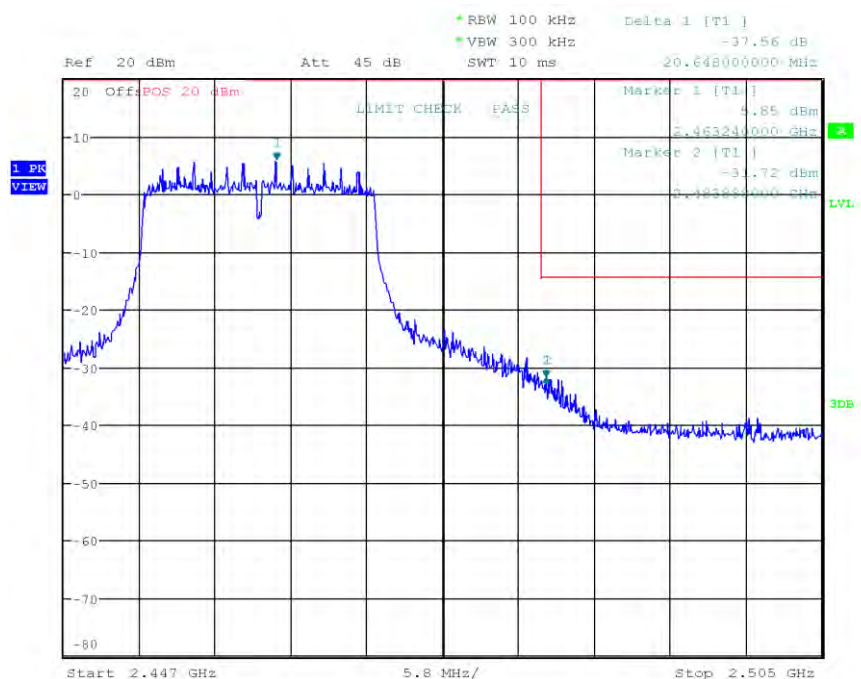
Date: 22.AUG.2022 13:26:04

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Emissions in nonrestricted frequency bands at the Band-edge

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.11 n HT20, Channel: 11, 2462 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 1 MCS (worse case)
 Band-edge: Upper
 In-band Frequency [MHz]: 2463.24
 Max. in-band Level [dBm/100 kHz]: 5.846
 Out-of-band Frequency [MHz]: 2483.888
 Max. out-of-band Level [dBm/100 kHz]: -31.715
 Attenuation [dB]: -37.56



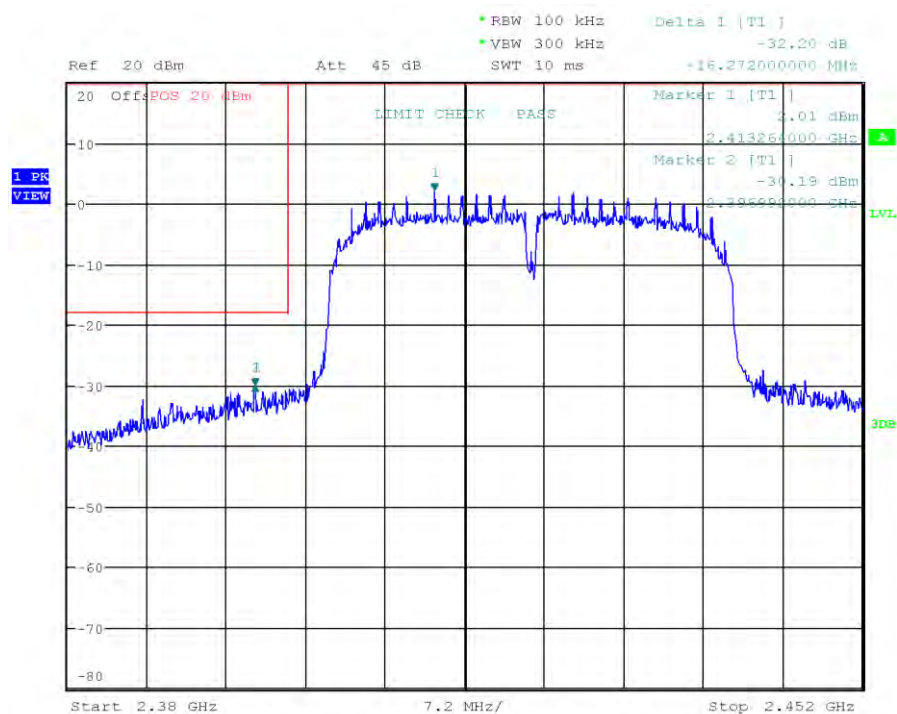
Date: 22.AUG.2022 13:27:03

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Emissions in nonrestricted frequency bands at the Band-edge

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.11 n HT40, Channel: 3, 2422 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 0 MCS (worse case)
 Band-edge Lower
 In-band Frequency [MHz]: 2413.264
 Max. in-band Level [dBm/100 kHz]: 2.009
 Out-of-band Frequency [MHz]: 2396.992
 Max. out-of-band Level [dBm/100 kHz]: -30.189
 Attenuation [dB]: -32.2



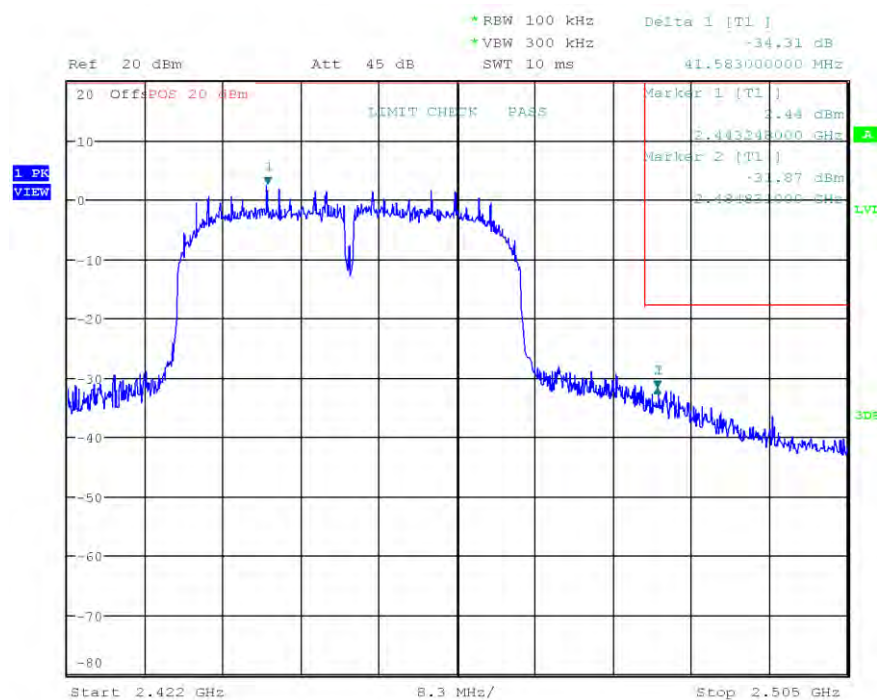
Date: 22.AUG.2022 13:23:25

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Emissions in nonrestricted frequency bands at the Band-edge

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.11 n HT40, Channel: 9, 2452 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 0 MCS (worse case)
 Band-edge Upper
 In-band Frequency [MHz]: 2443.248
 Max. in-band Level [dBm/100 kHz]: 2.439
 Out-of-band Frequency [MHz]: 2484.831
 Max. out-of-band Level [dBm/100 kHz]: -31.867
 Attenuation [dB]: -34.31



Date: 22.AUG.2022 13:24:23

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

3.7 Test Conditions and Results - Conducted spurious emissions

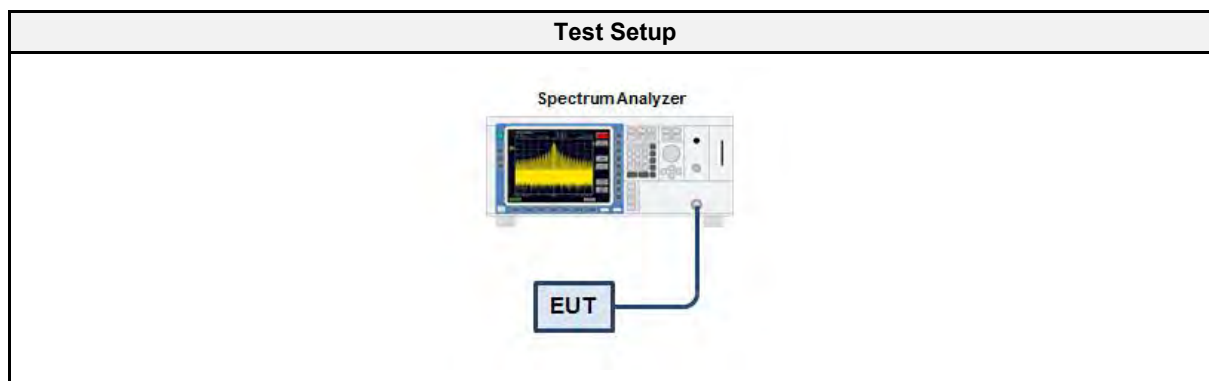
3.7.1 Information

Test Information	
Reference	FCC § 15.247(d); ISED RSS-247, Issue 2 (section 5.5)
Measurement Uncertainty	± 4.25 dB
Measurement Method	ANSI C63.10 11.11
Operator	Dr.-Ing Dhamia Almozani
Date	2022-08-22
Comment	Measurements were performed with attenuation level = 0 (corresponds to 0 dB)

3.7.2 Limits

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

3.7.3 Setup



3.7.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyser	R&S	FSU 26	EF01003	2022-07	2023-07
Cable (diverse)	– (diverse)	– (diverse)	EF00779 CAABZ	2022-02	2023-02

3.7.5 Procedure

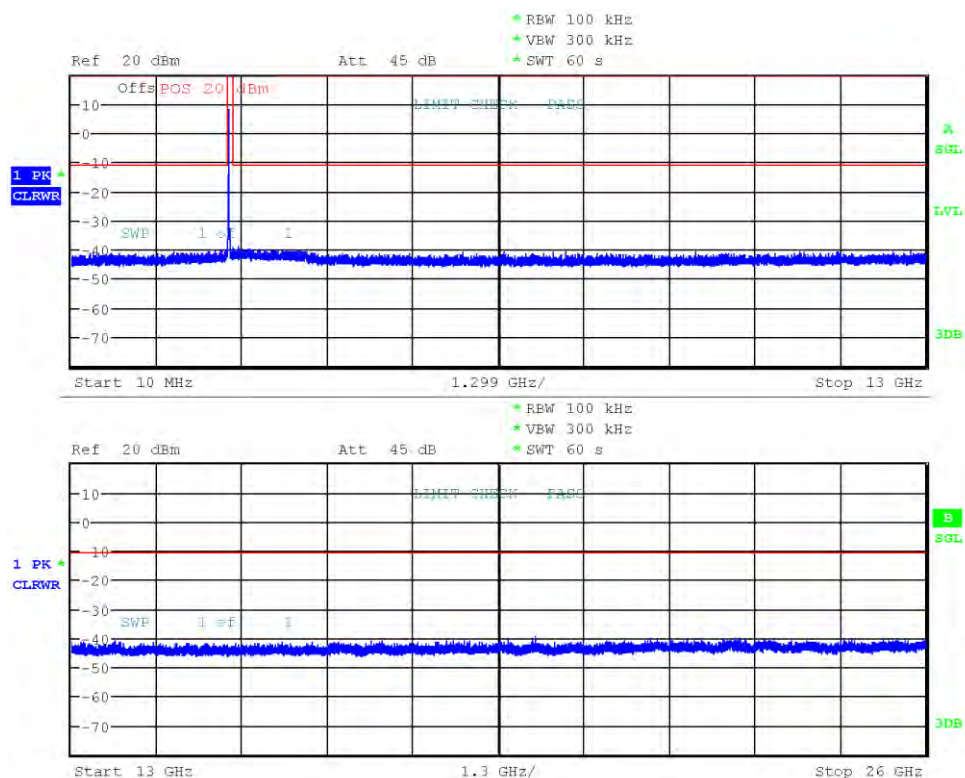
Test Procedure
1. EUT set to test mode (Communication tester is used if needed) 2. Span set around lower band edge and detector is set to peak and max hold 3. Resolution bandwidth is set to 100 kHz 4. Markers are set to peak emission levels outside frequency band

3.7.6 Results

Test Results		
Mode	Channel [MHz]	Verdict
DSSS	2412	PASS
DSSS	2437	PASS
DSSS	2462	PASS
OFDM	2412	PASS
OFDM	2437	PASS
OFDM	2462	PASS
HT20	2412	PASS
HT20	2437	PASS
HT20	2462	PASS
HT40	2422	PASS
HT40	2437	PASS
HT40	2452	PASS

Conducted Spurious Emissions

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.11 b, Channel: 1, 2412 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 1 Mbps (worse case)
 Max. in-band Frequency [MHz]: 2410.4
 Max. in-band Level [dBm/100 kHz]: 9.4
 Out-of-band Limit [dBm/100 kHz]: -10.6



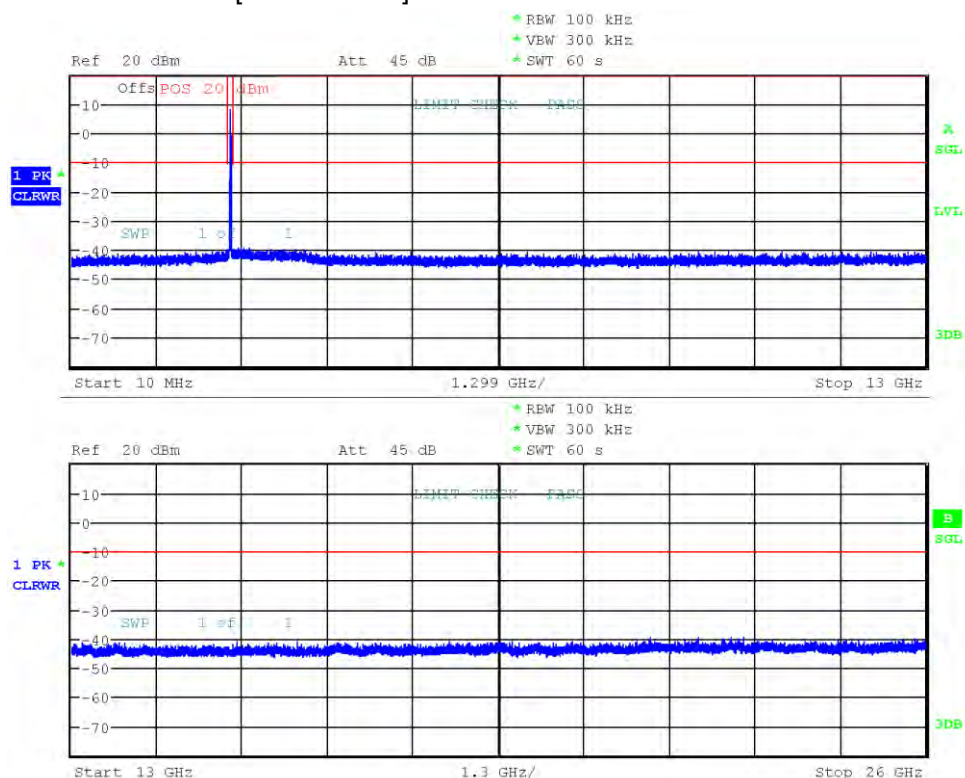
Date: 22.AUG.2022 13:51:57

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Conducted Spurious Emissions

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.11 b, Channel: 6, 2437 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 2 Mbps (worse case)
 Max. in-band Frequency [MHz]: 2436.4
 Max. in-band Level [dBm/100 kHz]: 9.8
 Out-of-band Limit [dBm/100 kHz]: -10.2



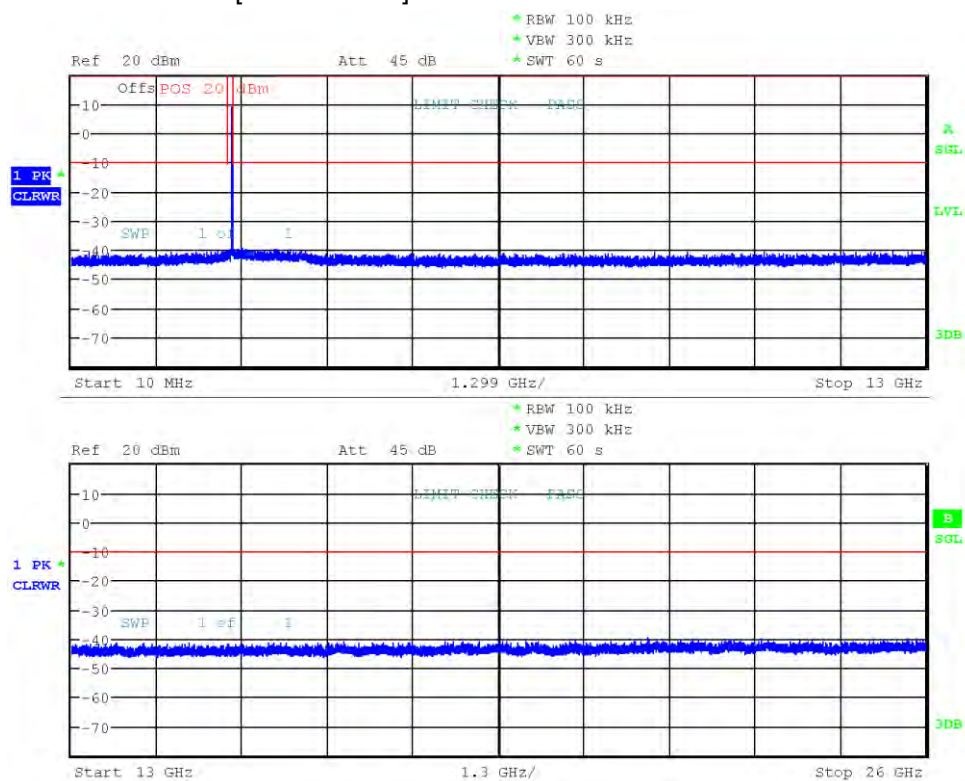
Date: 22.AUG.2022 13:56:33

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Conducted Spurious Emissions

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.11 b, Channel: 11, 2462 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 5.5 Mbps (worse case)
 Max. in-band Frequency [MHz]: 2462.0
 Max. in-band Level [dBm/100 kHz]: 9.8
 Out-of-band Limit [dBm/100 kHz]: -10.2



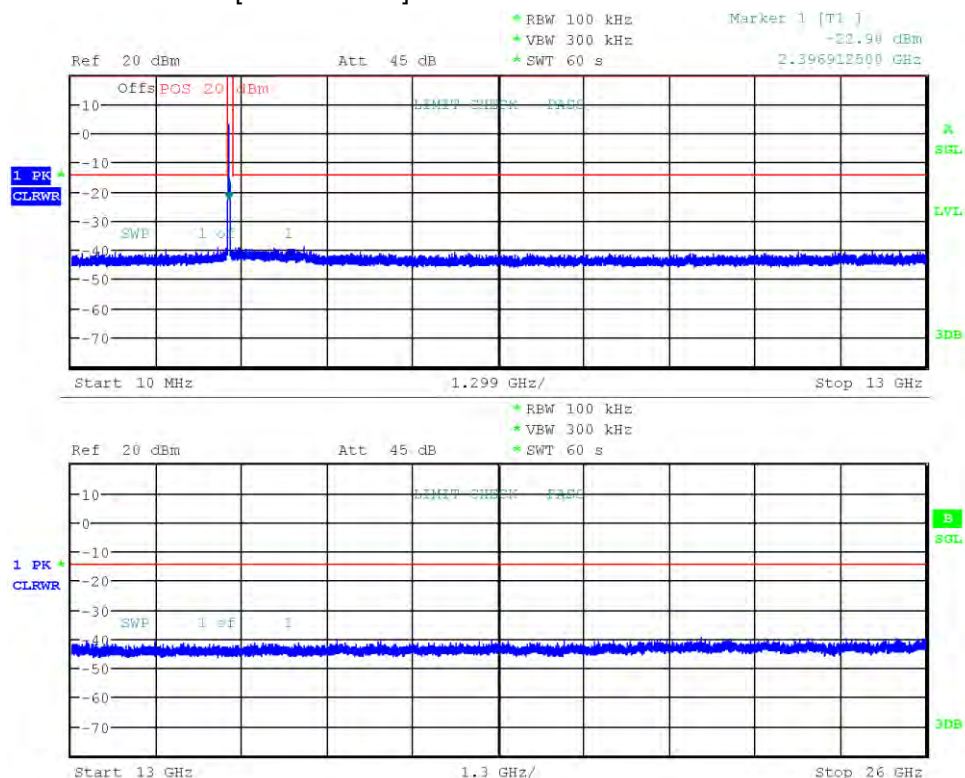
Date: 22.AUG.2022 14:02:35

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Conducted Spurious Emissions

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.11 g, Channel: 1, 2412 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 6 Mbps (worse case)
 Max. in-band Frequency [MHz]: 2410.7
 Max. in-band Level [dBm/100 kHz]: 6.0
 Out-of-band Limit [dBm/100 kHz]: -14.0



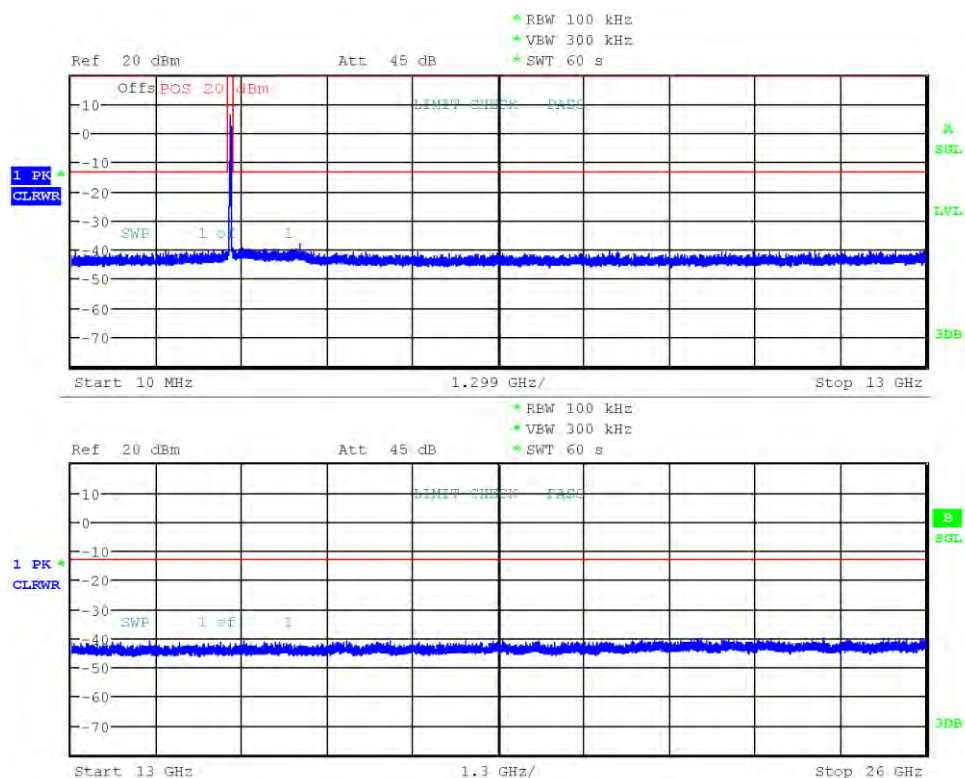
Date: 22.AUG.2022 14:19:38

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Conducted Spurious Emissions

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.11 g, Channel: 6, 2437 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 6 Mbps (worse case)
 Max. in-band Frequency [MHz]: 2430.7
 Max. in-band Level [dBm/100 kHz]: 6.7
 Out-of-band Limit [dBm/100 kHz]: -13.3



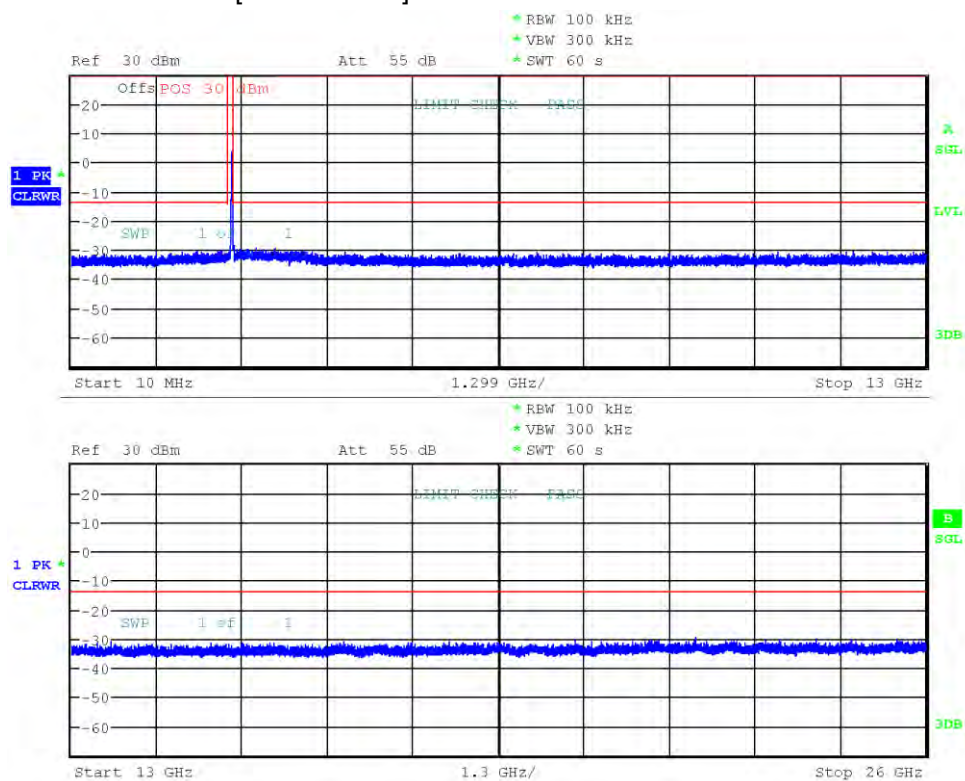
Date: 22.AUG.2022 14:22:45

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Conducted Spurious Emissions

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.11 g, Channel: 11, 2462 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 6 Mbps (worse case)
 Max. in-band Frequency [MHz]: 2463.3
 Max. in-band Level [dBm/100 kHz]: 6.6
 Out-of-band Limit [dBm/100 kHz]: -13.4



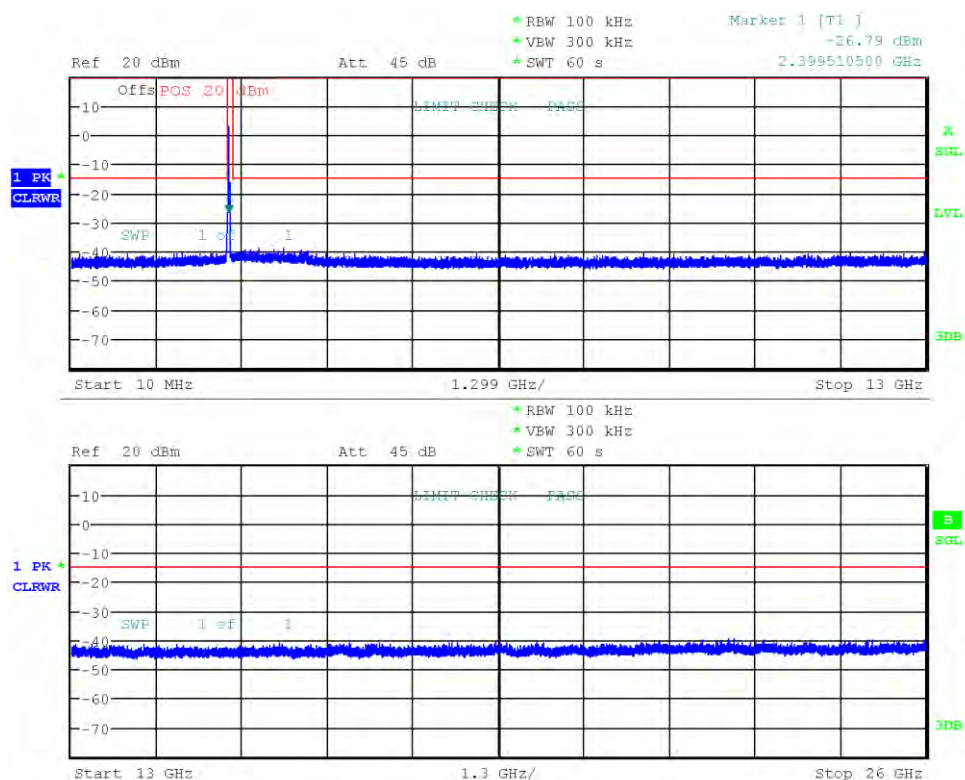
Date: 22.AUG.2022 14:25:53

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Conducted Spurious Emissions

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.11 n HT20, Channel: 1, 2412 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 0 MCS (worse case)
 Max. in-band Frequency [MHz]: 2405.8
 Max. in-band Level [dBm/100 kHz]: 5.4
 Out-of-band Limit [dBm/100 kHz]: -14.6



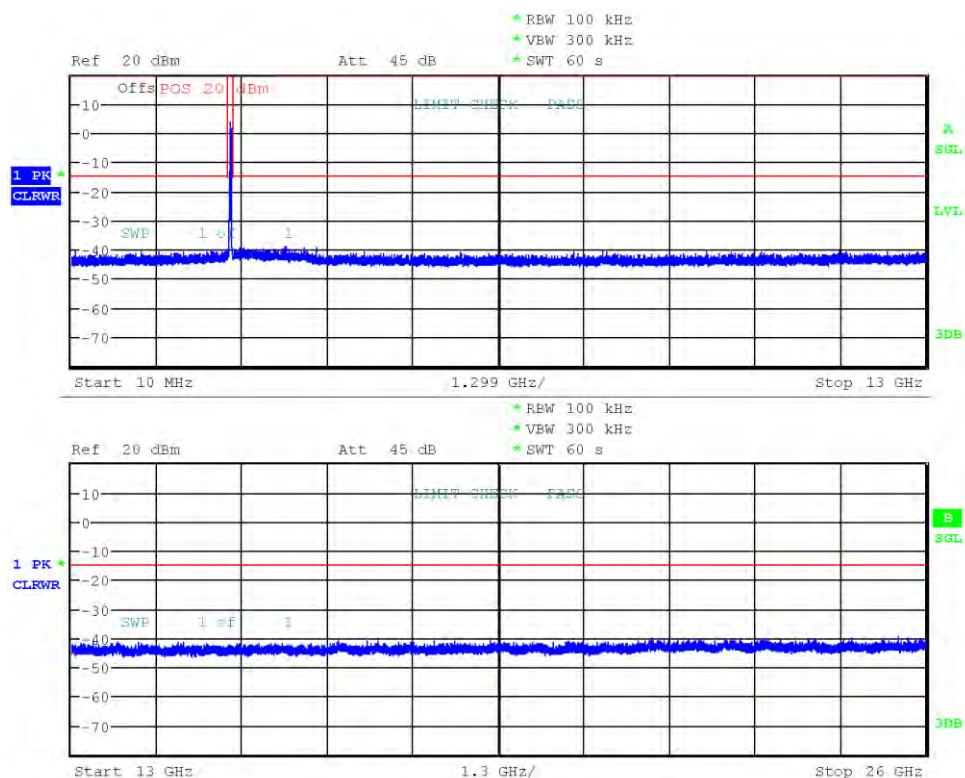
Date: 22.AUG.2022 14:48:35

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Conducted Spurious Emissions

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.11 n HT20, Channel: 6, 2437 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 0 MCS (worse case)
 Max. in-band Frequency [MHz]: 2438.3
 Max. in-band Level [dBm/100 kHz]: 5.3
 Out-of-band Limit [dBm/100 kHz]: -14.7



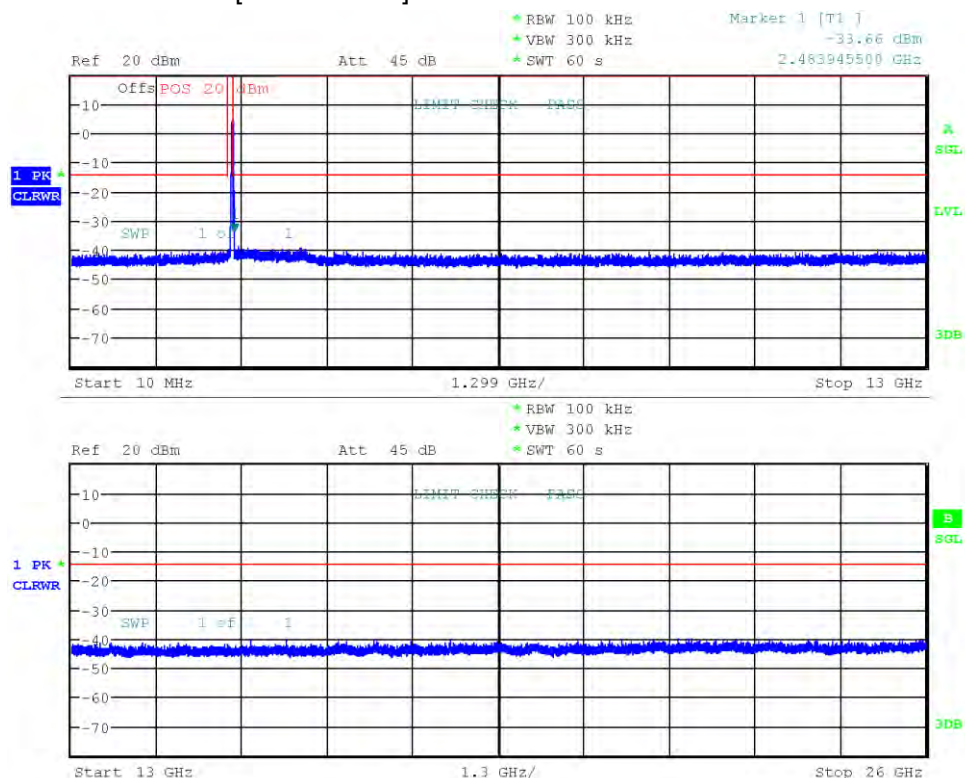
Date: 22.AUG.2022 14:53:40

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Conducted Spurious Emissions

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.11 n HT20, Channel: 11, 2462 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-22
 Antenna port: 1
 Note: Mode= 1 MCS (worse case)
 Max. in-band Frequency [MHz]: 2455.8
 Max. in-band Level [dBm/100 kHz]: 5.9
 Out-of-band Limit [dBm/100 kHz]: -14.1



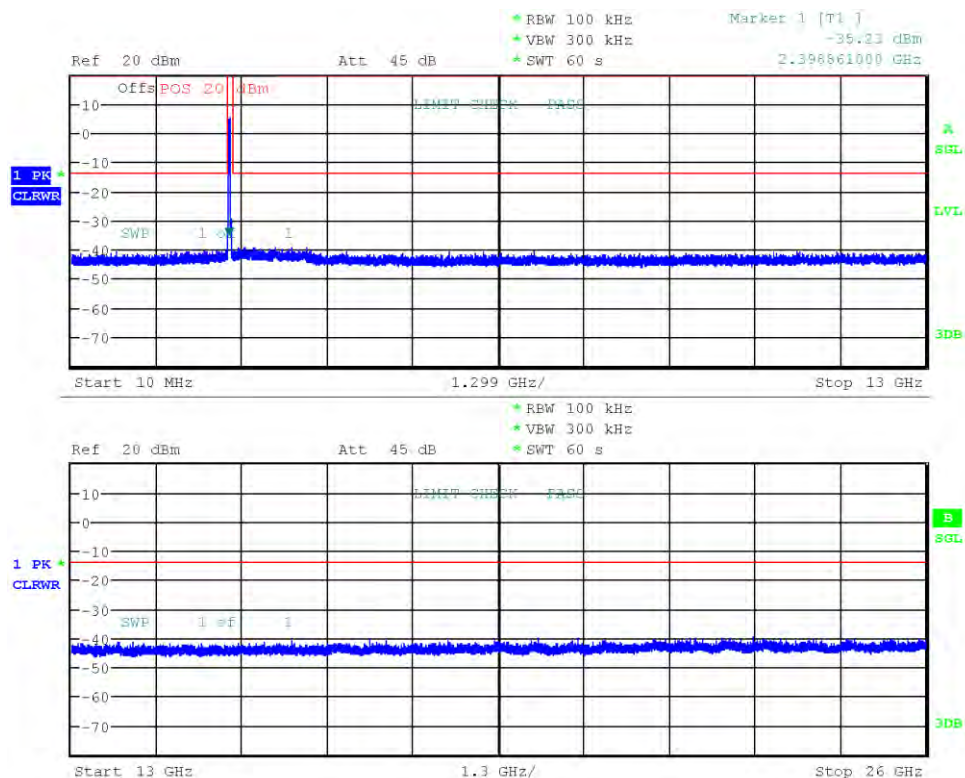
Date: 22.AUG.2022 14:57:29

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Conducted Spurious Emissions

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.11 n HT40, Channel: 3, 2422 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-24
 Antenna port: 1
 Note: Mode= 0 MCS
 Max. in-band Frequency [MHz]: 2415.8
 Max. in-band Level [dBm/100 kHz]: 6.1
 Out-of-band Limit [dBm/100 kHz]: -13.9



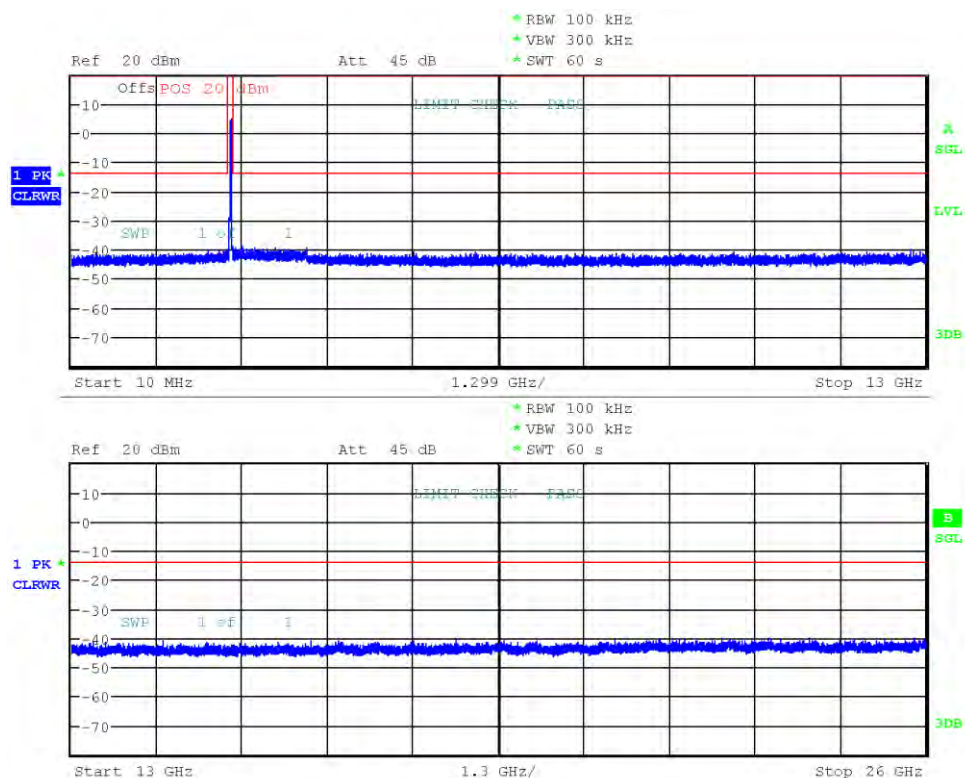
Date: 24.AUG.2022 14:04:19

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Conducted Spurious Emissions

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.11 n HT40, Channel: 6, 2437 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-24
 Antenna port: 1
 Note: Mode= 0 MCS
 Max. in-band Frequency [MHz]: 2442.0
 Max. in-band Level [dBm/100 kHz]: 6.2
 Out-of-band Limit [dBm/100 kHz]: -13.8



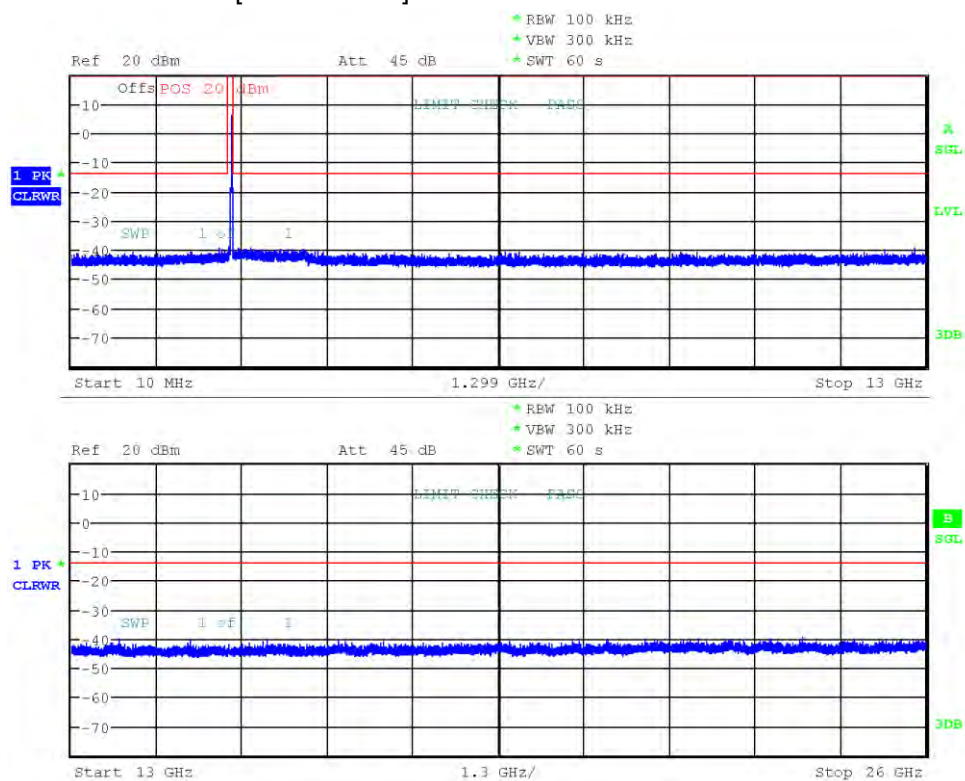
Date: 24.AUG.2022 14:07:15

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

Conducted Spurious Emissions

Project Number: G0M-2205-1454
 Applicant: u-blox AG
 Model Description: Stand-alone multiradio module
 Model: NORA-W101
 Test Sample ID: 40677
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.11 n HT40, Channel: 9, 2452 MHz
 Operating Conditions: Tnom/Vnom
 Operator: Dhamia Almozani
 Test Site: Eurofins Product Service GmbH
 Test Date: 2022-08-24
 Antenna port: 1
 Note: Mode= 0 MCS
 Max. in-band Frequency [MHz]: 2445.8
 Max. in-band Level [dBm/100 kHz]: 6.5
 Out-of-band Limit [dBm/100 kHz]: -13.5



Date: 24.AUG.2022 14:14:37

Test Report No.: G0M-2205-1454-TFC247WF-V02

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

3.8 Test Conditions and Results - Transmitter radiated emissions

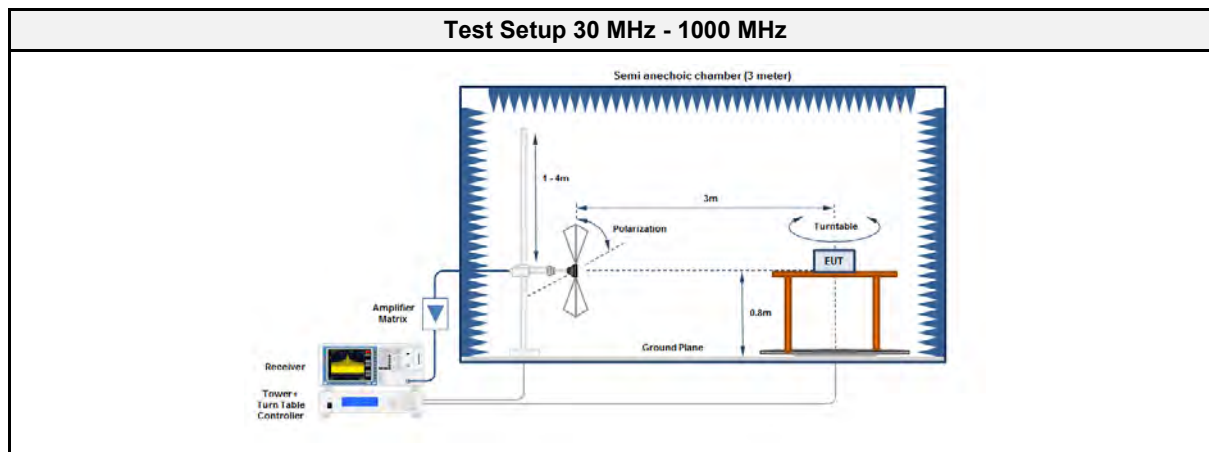
3.8.1 Information

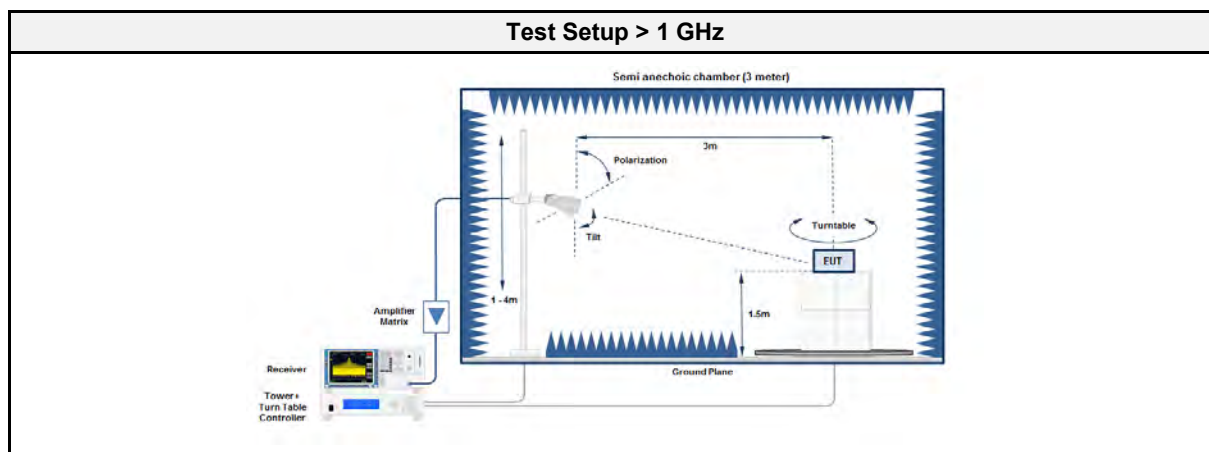
Test Information	
Reference	FCC § 15.247(d); FCC § 15.209; ISSED RSS-Gen, Issue 5 A2 (section 6.13)
Measurement Uncertainty	± 5.95 dB
Measurement Method	ANSI C63.10 6.4, 6.5, 6.6, 11.12
Operator	Odai Qawasmeh and Radwan Jaafar
Date	2022-08-29, 2022-09-16, 2022-10-19/20 and 2022-11-11
Comment	Measurements were performed with attenuation level = 0 (corresponds to 0 dB)

3.8.2 Limits

Limits			
Frequency range [MHz]	Detector	Field strength [µV/m]	Measurement distance [m]
0.009 - 0.09	Average	2400/F[kHz]	300
0.09 - 0.110	Quasi-Peak	2400/F[kHz]	300
0.110 - 0.490	Average	2400/F[kHz]	300
0.490 - 1.705	Quasi-Peak	24000/F[kHz]	30
1.705 - 30.0	Quasi-Peak	30	30
30 - 88	Quasi-Peak	100	3
88 - 216	Quasi-Peak	150	3
216 - 960	Quasi-Peak	200	3
960 - 1000	Quasi-Peak	500	3
>1000	Average	500	3

3.8.3 Setup





3.8.4 Equipment

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

Test Equipment 30 MHz - 1000 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2021-02	2024-02
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2021-07	2023-01
Antenna	R&S	HK 116	EF00030	2021-05	2024-05
Antenna	R&S	HL 223	EF00187	2022-06	2025-06

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC2	EF01616	2021-09 2022-10	2022-09 2023-10
Spectrum analyzer	R&S	FSW43	EF00896	2022-08	2023-08
Horn antenna	Schwarzbeck	BBHA 9120B	EF01678	2021-03	2024-03
Antenna	Schwarzbeck	HWRD 650	EF01679	2021-03	2024-03
Antenna	Amplifier Research	AT4560	EF00302	2021-06	2023-06

3.8.5 Procedure

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

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

3.8.6 Results

Test Results – DSSS – 1 Mbit/s - NORA W101						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2412	2386.1	57.28	pk	ver	74.00	-16.72
2412	2386.1	48.14	avg	ver	54.00	-05.86
2412	4824	47.39	pk	hor	74.00	-26.61
2412	4824	42.17	avg	hor	54.00	-11.83
2412	17778	44.04	pk	ver	74.00	-29.96
2412	17778	31.93	avg	ver	54.00	-22.07
2412	18163	47.01	pk	ver	74.00	-26.99
2412	18163	34.94	avg	ver	54.00	-19.06
2462	2487.8	55.89	pk	ver	74.00	-18.11
2462	2487.8	49.27	avg	ver	54.00	-04.73
Note: For full results see ANNEX A						

Test Results – OFDM – 6 Mbit/s - NORA W101						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2412	269.1596	32.50	qpk	hor	46.00	-13.53
2412	2388.6	62.23	pk	ver	74.00	-11.77
2412	2388.6	48.96	avg	ver	54.00	-05.04
2412	4825.1	44.65	pk	ver	74.00	-29.35
2412	4825.1	32.30	avg	ver	54.00	-21.70
2412	17813	43.42	pk	ver	74.00	-30.58
2412	17813	32.71	avg	ver	54.00	-21.29
2412	18041	46.41	pk	ver	74.00	-27.59
2412	18041	36.27	avg	ver	54.00	-17.73
2437	168.0528	20.20	qpk	ver	43.50	-23.30
2437	269.0225	27.70	qpk	hor	46.00	-18.30
2437	4874.7	45.09	pk	ver	74.00	-28.91
2437	4874.7	36.97	avg	ver	54.00	-17.03
2437	17816	44.56	pk	hor	74.00	-29.44
2437	17816	31.81	avg	hor	54.00	-22.19
2437	18622	47.99	pk	ver	74.00	-26.01
2437	18622	35.19	avg	ver	54.00	-18.81
2462	2483.5	71.53	pk	ver	74.00	-02.47
2462	2483.5	51.80	avg	ver	54.00	-02.20
2462	4925	45.38	pk	ver	74.00	-28.62
2462	4925	38.59	avg	ver	54.00	-15.41
2462	17789	44.04	pk	ver	74.00	-29.96
2462	17789	33.48	avg	ver	54.00	-20.52
2462	18184	48.11	pk	ver	74.00	-25.89
2462	18184	36.69	avg	ver	54.00	-17.31
Note: For full results see ANNEX A						

Test Results - HT20 – MCS1 - NORA W101						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2412	2389.5	58.68	pk	ver	74.00	-15.32
2412	2389.5	48.31	avg	ver	54.00	-05.69
2462	2483.5	66.93	pk	ver	74.00	-07.07
2462	2483.5	50.79	avg	ver	54.00	-03.21
2462	4924	44.55	pk	ver	74.00	-29.45
2462	4924	36.04	avg	ver	54.00	-17.96
2462	17779	43.47	pk	hor	74.00	-30.53
2462	17779	31.62	avg	hor	54.00	-22.38
2462	18124	47.59	pk	ver	74.00	-26.41
2462	18124	34.64	avg	ver	54.00	-19.36
Note: For full results see ANNEX A						

Test Results - HT40 – MCS0 - NORA W101						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2422	2388.9	61.89	pk	ver	74.00	-12.11
2422	2388.9	50.26	avg	ver	54.00	-03.74
2437	2389.5	56.93	pk	ver	74.00	-17.07
2437	2389.5	44.28	avg	ver	54.00	-09.72
2437	2483.7	58.77	pk	ver	74.00	-15.23
2437	2483.7	47.42	avg	ver	54.00	-06.58
2437	11403	39.88	pk	ver	74.00	-34.12
2437	11403	27.46	avg	hor	54.00	-26.54
2437	18200	48.07	pk	hor	74.00	-25.93
2437	18200	35.95	avg	ver	54.00	-18.05
2452	2483.5	68.10	pk	ver	74.00	-05.90
2452	2483.5	49.87	avg	ver	54.00	-04.13
Note: For full results see ANNEX A						

Test Results – DSSS – 1 Mbit/s - Variant 1 (NORA-W106 with PCB antenna AT1608-A2R4NAA)						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2412	4820.5	44.51	pk	ver	74.00	-29.49
2412	4820.5	30.27	avg	ver	54.00	-23.73
2412	18545	48.21	pk	hor	74.00	-25.79
2412	18545	34.51	avg	hor	54.00	-19.49
Note: For full results see ANNEX B						

Test Results – OFDM – 6 Mbit/s - Variant 1 (NORA-W106 with PCB antenna AT1608-A2R4NAA)						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2412	119.998	26.00	pk	ver	43.50	-17.48
2412	18463	47.17	pk	hor	74.00	-26.83
2412	18463	34.61	avg	hor	54.00	-19.39
2437	407.62	22.10	qpk	ver	46.00	-23.86
2437	2388.8	54.91	pk	ver	74.00	-19.09
2437	2388.8	38.11	avg	ver	54.00	-15.89
2437	18477	47.18	pk	ver	74.00	-26.82
2437	18477	34.58	avg	ver	54.00	-19.42
2462	119.913	04.30	qpk	ver	43.50	-39.22
2462	2483.5	63.76	pk	ver	74.00	-10.24
2462	2483.5	48.17	avg	ver	54.00	-05.83
2462	18504	47.30	pk	ver	74.00	-26.70
2462	18504	34.69	avg	ver	54.00	-19.31
Note: For full results see ANNEX B						

Test Results - HT20 – MCS1 - Variant 1 (NORA-W106 with PCB antenna AT1608-A2R4NAA)						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2462	2483.6	61.92	pk	ver	74.00	-12.08
2462	2483.6	48.93	avg	ver	54.00	-05.07
2462	17888	43.59	pk	ver	74.00	-30.41
2462	17888	30.38	avg	ver	54.00	-23.62
2462	18504	47.33	pk	ver	74.00	-26.67
2462	18504	34.82	avg	ver	54.00	-19.18
Note: For full results see ANNEX B						

Test Results - HT40 – MCS0 - Variant 1 (NORA-W106 with PCB antenna AT1608-A2R4NAA)						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2437	2483.5	55.61	pk	ver	74.00	-18.39
2437	2483.5	39.64	avg	ver	54.00	-14.36
2437	17808	44.41	pk	hor	74.00	-29.59
2437	17808	31.00	avg	hor	54.00	-23.00
2437	18490	47.20	pk	ver	74.00	-26.80
2437	18490	34.78	avg	ver	54.00	-19.22
Note: For full results see ANNEX B						

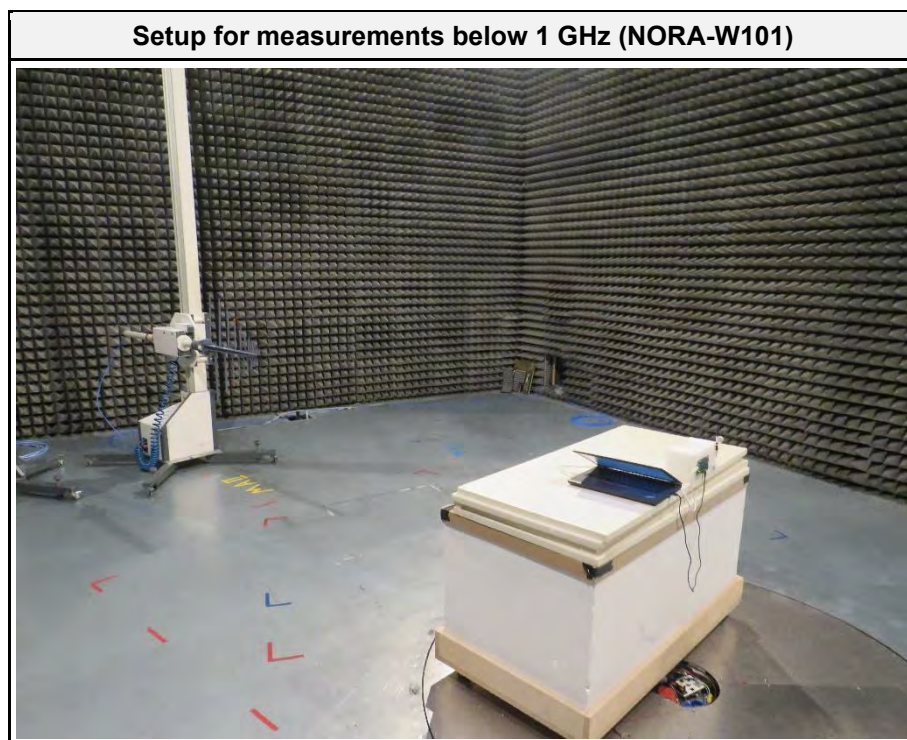
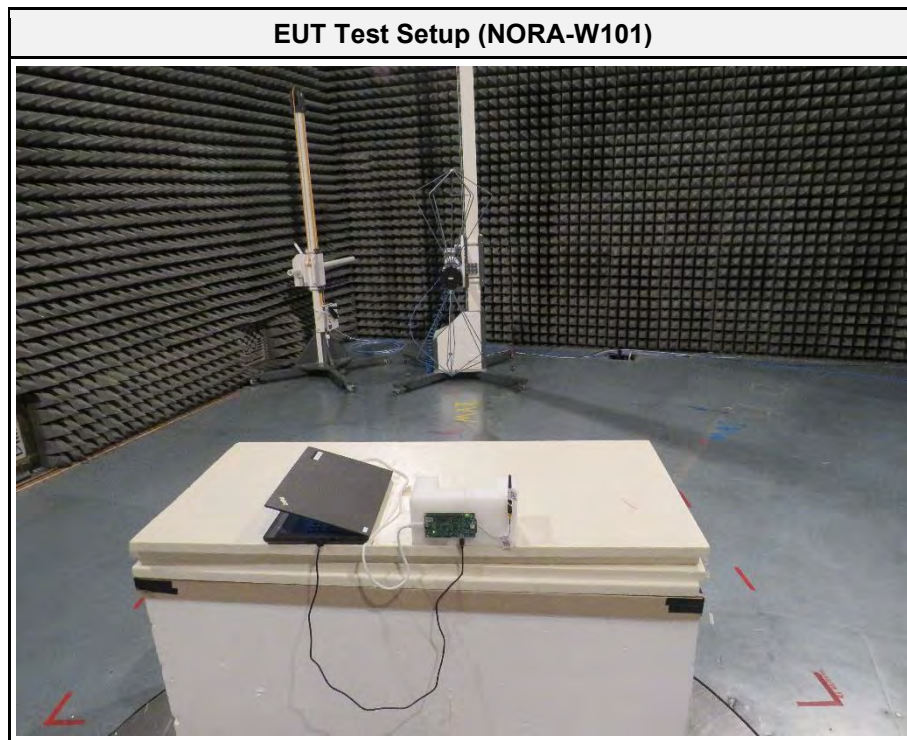
Test Results – DSSS – 1 Mbit/s – Variant 2 (NORA W101 with external antenna PN PRO-IS-237)						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2412	2385.5	53.82	pk	ver	74.00	-20.18
2412	2385.5	42.43	avg	ver	54.00	-11.57
2462	2486.6	57.25	pk	hor	74.00	-16.75
2462	2486.6	45.44	avg	hor	54.00	-08.56
2462	2488.5	56.78	pk	hor	74.00	-17.22
2462	2488.5	44.85	avg	hor	54.00	-09.15
Note: Only emissions with pk values greater than -20.0 dBm are included. For full results see ANNEX C						

Test Results – OFDM – 6 Mbit/s – Variant 2 (NORA W101 with external antenna PN PRO-IS-237)						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2412	611.58	26.40	pk	ver	46.00	-19.58
2412	2387.5	62.50	pk	ver	74.00	-11.50
2412	2387.5	45.26	avg	ver	54.00	-08.74
2412	2389.9	65.67	pk	ver	74.00	-08.33
2412	2389.9	48.09	avg	ver	54.00	-05.91
Note: Only emissions with pk values greater than -20.0 dBm are included. For full results see ANNEX C						

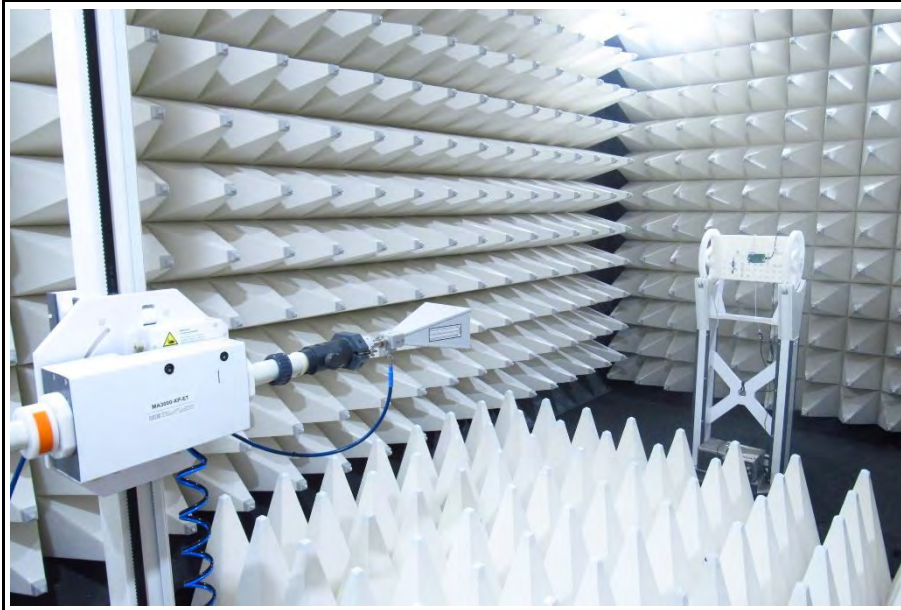
Test Results - HT20 – MCS1 – Variant 2 (NORA W101 with external antenna PN PRO-IS-237)						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2412	2389.9	55.43	pk	hor	74.00	-18.57
2412	2389.9	42.84	avg	hor	54.00	-11.16
2412	2492.6	48.34	pk	hor	74.00	-25.66
2412	2492.6	37.06	avg	hor	54.00	-16.94
Note: For full results see ANNEX C						

Test Results - HT40 – MCS0 – Variant 2 (NORA W101 with external antenna PN PRO-IS-237)						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2437	2489	49.87	pk	hor	74.00	-24.13
2437	2489	39.94	avg	hor	54.00	-14.06
2437	18153	47.60	pk	ver	74.00	-26.40
2437	18153	36.38	avg	ver	54.00	-17.62
Note: For full results see ANNEX C						

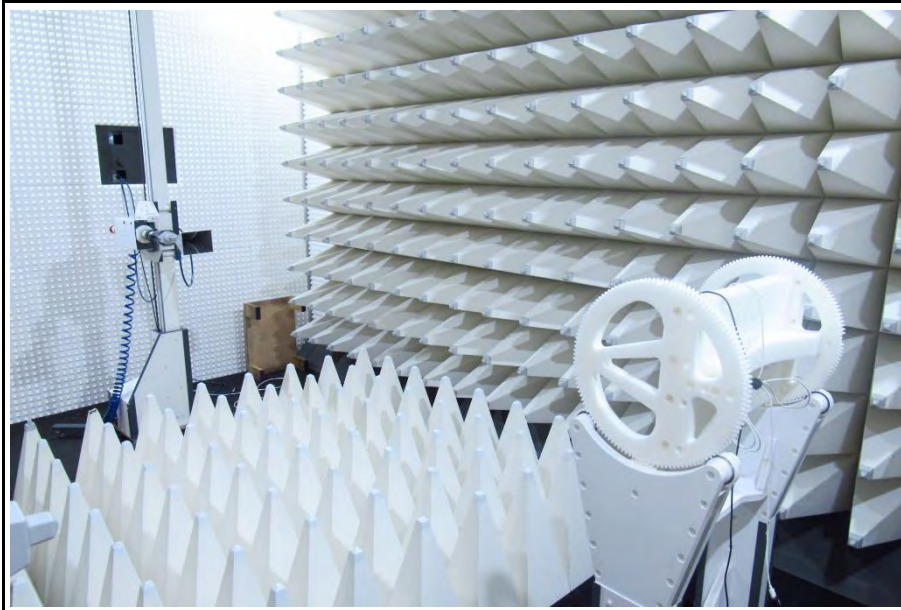
3.8.7 Setup Photos



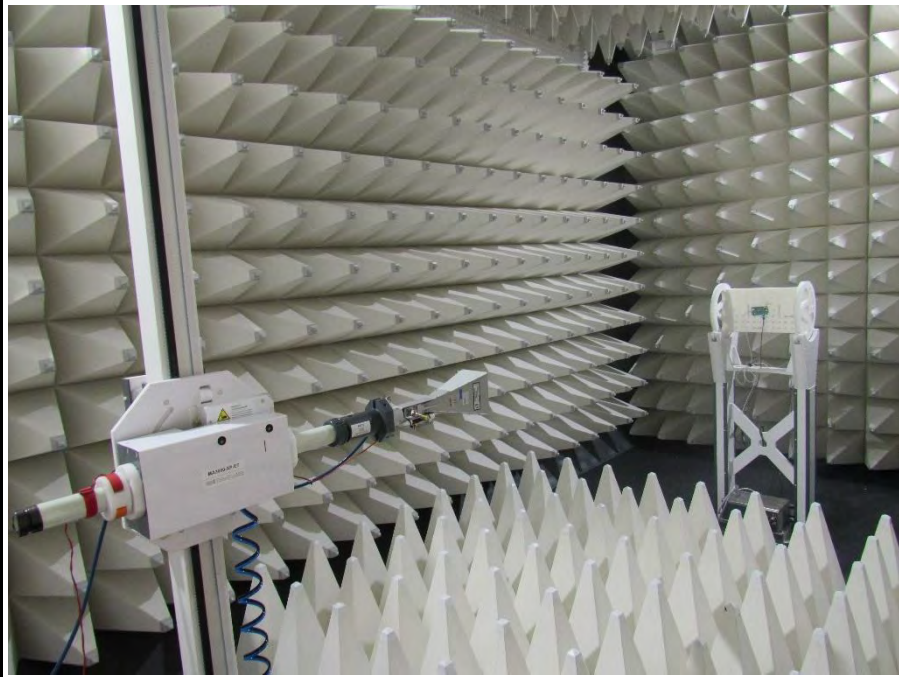
Setup for measurements above 1 GHz (NORA-W101)



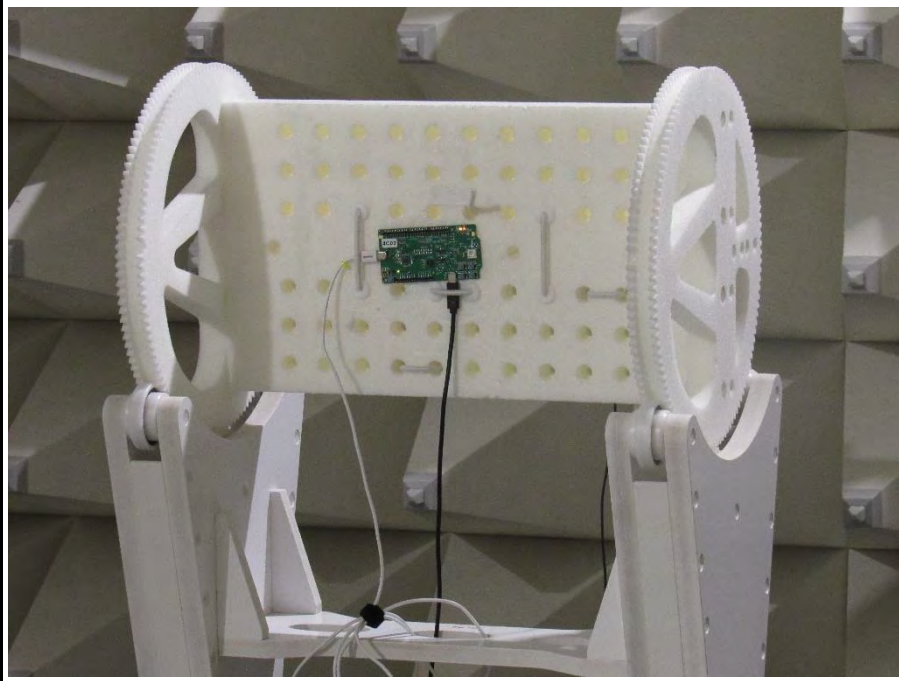
Setup for measurements above 1 GHz (NORA-W101)



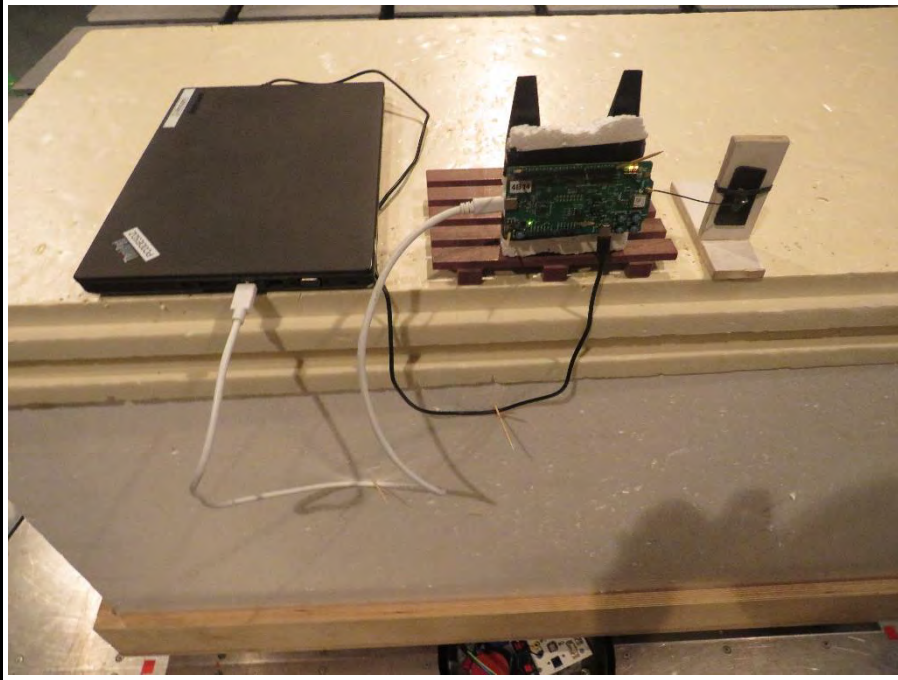
Setup for measurements above 1 GHz for Variant 1 (NORA-W106 with PCB antenna)



EUT Test Setup for Variant 1 (NORA-W106 with PCB antenna)



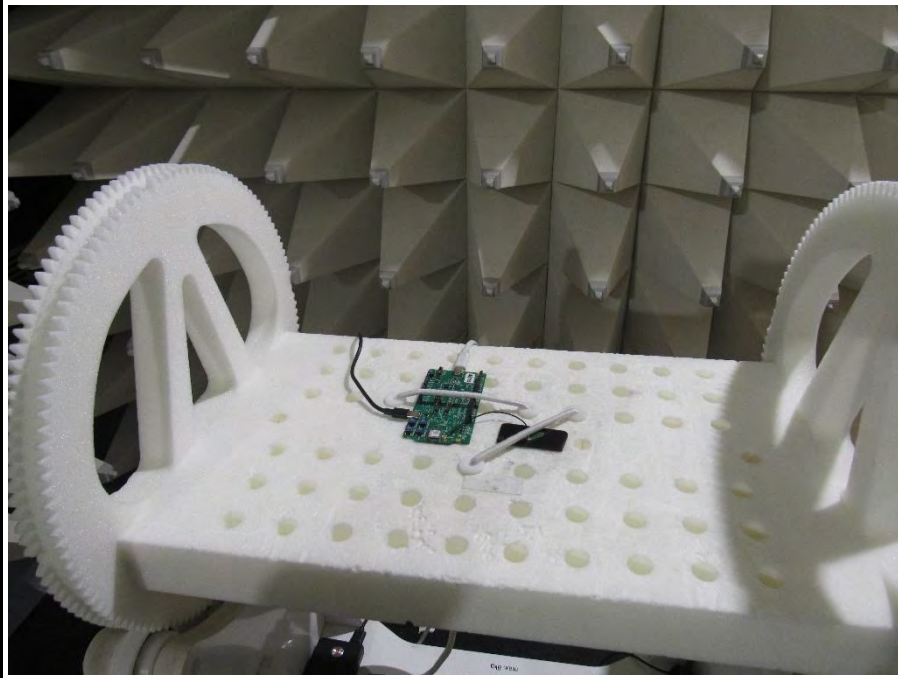
EUT Test Setup below 1 GHz for Variant 2 (NORA-W101 with external antenna PN PRO-IS-237)



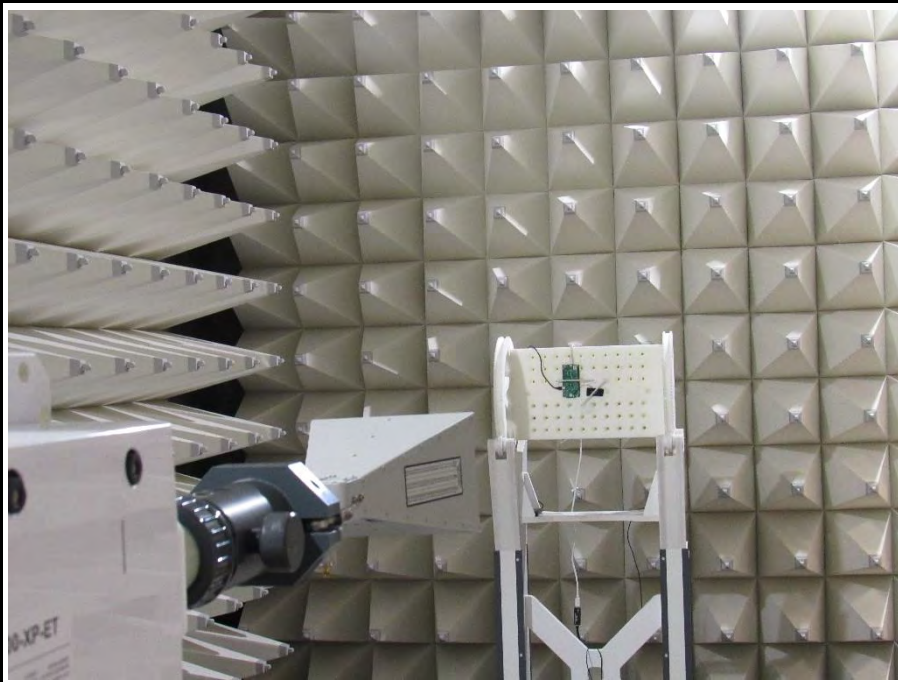
Setup for measurements below 1 GHz for Variant 2 (NORA-W101 with external antenna PN PRO-IS-237)



EUT Test Setup above 1 GHz for Variant 2 (NORA-W101 with external antenna PN PRO-IS-237)



Setup for measurements above 1 GHz for Variant 2 (NORA-W101 with external antenna PN PRO-IS-237)



3.9 Test Conditions and Results - Receiver radiated emissions

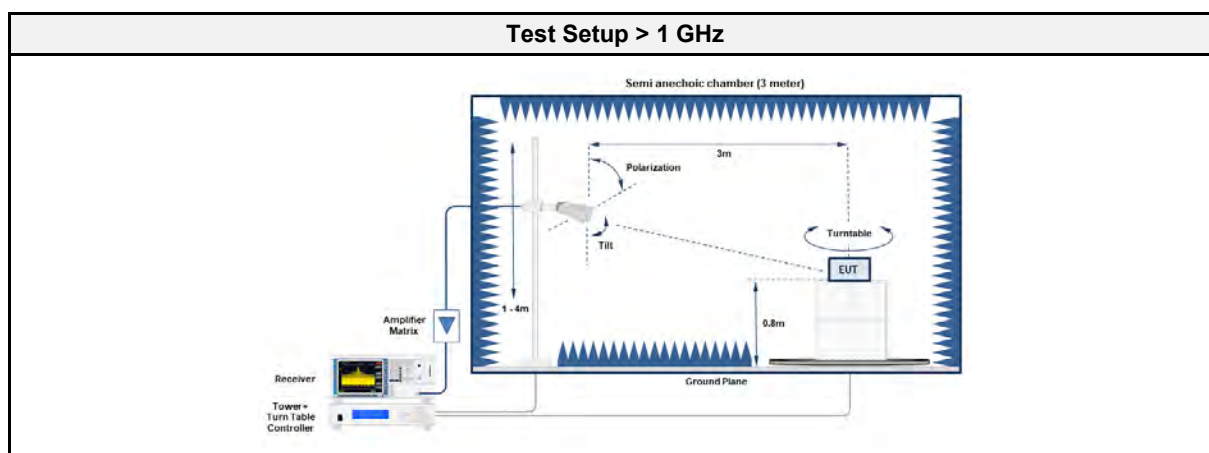
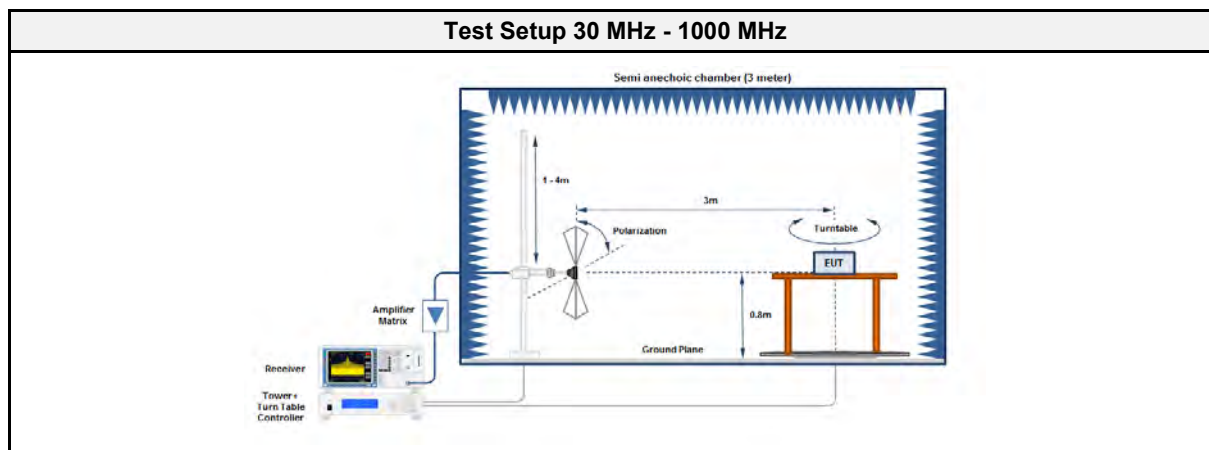
3.9.1 Information

Test Information	
Reference	ISED RSS-247, Issue 2 (section 3.1)
Measurement Uncertainty	± 5.95 dB
Measurement Method	ANSI C63.4-2014 8.1-8.3
Operator	Florian Voigt + Odai Qawasmeh
Date	2022-08-26, 2022-08-29 and 2022-11-11

3.9.2 Limits

Limits			
Frequency range [MHz]	Detector	Field strength [$\mu\text{V/m}$]	Measurement distance [m]
30 - 88	Quasi-Peak	100	3
88 - 216	Quasi-Peak	150	3
216 - 960	Quasi-Peak	200	3
960 - 1000	Quasi-Peak	500	3
>1000	Average	500	3

3.9.3 Setup



3.9.4 Equipment

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

Test Equipment 30 MHz - 1000 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2021-02	2024-02
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2021-07	2023-01
Antenna	R&S	HK 116	EF00030	2021-05	2024-05
Antenna	R&S	HL 223	EF00187	2022-06	2025-06

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF01011	2022-06	2025-06
Measurement Receiver	Agilent	N9038A-526/WXP	EF01070	2021-07	2023-01
Antenna	Schwarzbeck	BBHA 9120D	EF01561	2021-11	2024-11
Antenna	Schwarzbeck	HWRD 650	EF01679	2021-03	2024-03

3.9.5 Procedure

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

3.9.6 Results

Test Results – NORA W101						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2437	81.816	20.50	pk	hor	40.00	-19.51
2437	135.0727	30.90	pk	hor	43.50	-12.64
2437	284.96	32.10	pk	hor	46.00	-13.85
2437	323.86	31.90	pk	hor	46.00	-14.11
2437	417.76	30.60	pk	hor	46.00	-15.39
2437	909.48	31.00	pk	hor	46.00	-15.02
2437	5852	46.59	pk	hor	74.00	-27.41
2437	5852	38.43	avg	hor	53.98	-15.55
Note: For full results see ANNEX D						

Test Results – Variant 1 (NORA-W106 with PCB antenna AT1608-A2R4NAA)						
Channel [MHz]	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Margin [dB]
2437	79.3042	15.00	qpk	ver	40.00	-25.00
2437	5804	44.81	pk	ver	74.00	-29.19
2437	5804	39.57	avg	ver	53.98	-14.41
Note: For full results see ANNEX E						

Test Results – Variant 2 (NORA-W101 with external antenna PN PRO-IS-237)						
Channel [MHz]	Emission [MHz]	Level [dBµV/m]	Det.	Pol.	Limit [dBµV/m]	Margin [dB]
2437	149.9903	24.40	pk	ver	43.50	-19.13
2437	679.84	35.70	pk	ver	46.00	-10.30
2437	679.84	28.50	qpk	ver	46.00	-17.51
2437	6494	49.61	pk	ver	74.00	-24.39
2437	6494	38.82	avg	ver	53.98	-15.16
2437	17812	48.51	pk	ver	74.00	-25.49
2437	17812	34.54	avg	ver	53.98	-19.44
Note: For full results see ANNEX F						