eurofins | Product Service

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-TFC247BL-V02
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	DAkkS - Registration number : D-PL-12092-01-03 (ISED) ISED Testing Laboratory site: 3470A 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
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	Radwan Jaafar	
Tested by (+ signature) (Responsible for Test)	Dr.-Ing. Dhamia Almozani	D. Al-Khatoni .....
Tested by (+ signature) (Responsible for Test)	Florian Voigt	F. Voigt .....
Approved by (+ signature) (Test Lab Engineer)	Wilfried Treffke	W. Treffke .....
Date of Issue	2023-02-24	
Total number of pages	203	

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)		
Partially 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	2023-01-03	Initial Release	R. Jaafar
02	2023-02-24	Replaced document: G0M-2205-1454-TFC247BL-V01 Replaced by: G0M-2205-1454-TFC247BL-V02 Reason: Correction of calibration dates in section 3.8 and 3.9	R. Jaafar

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
EUT	Equipment Under Test
FCC	Federal Communications Commission
ISED	Innovation, Science and Economic Development Canada
RBW	Resolution bandwidth
RMS	Root mean square
VBW	Video bandwidth
V_{NOM}	Nominal supply voltage

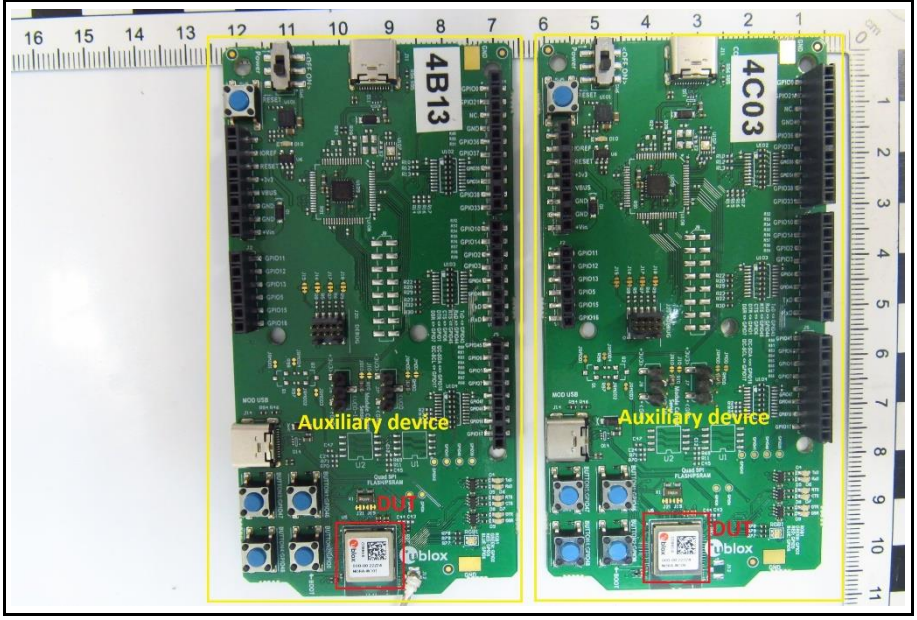
REPORT INDEX

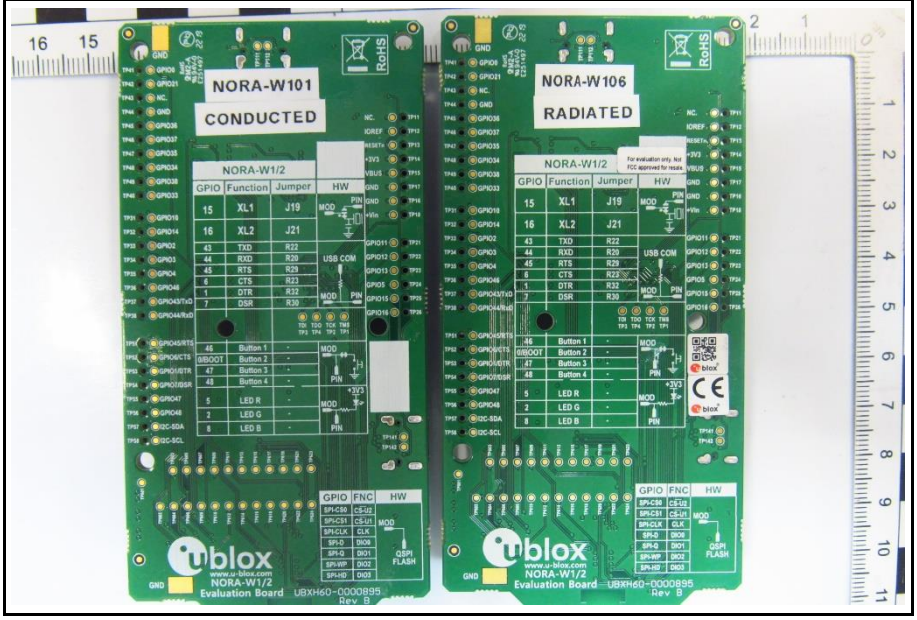
1 Equipment (Test Item) Under Test

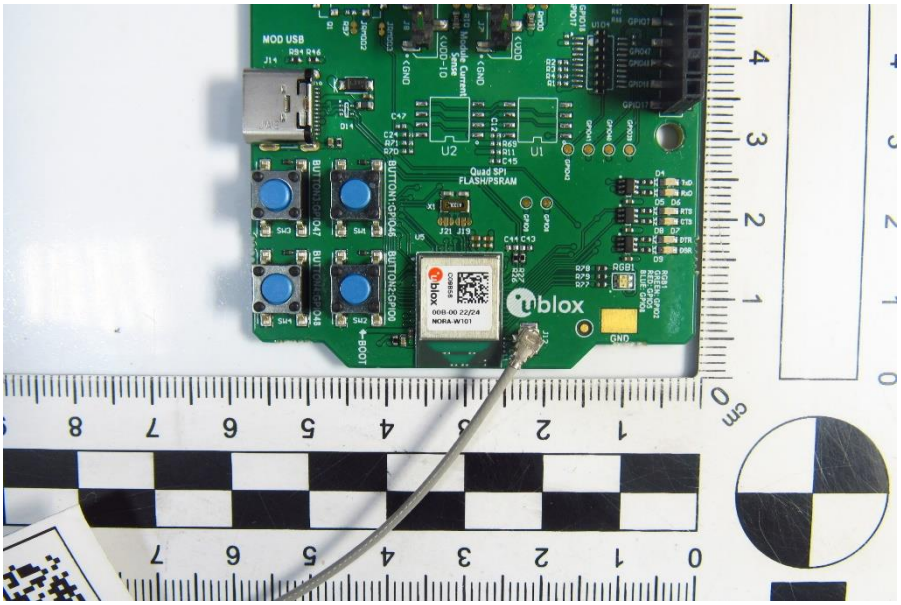
Description	Stand-alone multiradio module		
Model	NORA-W101		
Additional Model(s)	NORA-W106		
Brand Name(s)	u-blox		
Serial Number(s)	NORA-W101: 919100.0400.000 NORA-W106: 919200.0400.000		
Test Sample Id(s)	40682 (4B16) 40680 (4C03)		
Hardware Version(s)	04		
Software Version(s)	V1.08		
PMN	NORA-W101, 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	Bluetooth LE 5.0		
Bluetooth Specification	LE 1M PHY		Yes
	LE 2M PHY		Yes
	LE Coded PHY S=8 (125 kbit)		Yes
	LE Coded PHY S=2 (500 kbit)		Yes
	Stable Modulation Index - Transmitter		No
	Stable Modulation Index - Receiver		No
Modulation	2-GFSK		
Number of antenna ports	1		
Antenna-1 NORA-W101	Type	External (Monopole)	
	Model	PRO-EX-333	
	Manufacturer	Abracon	
	Gain	3.0 dBi (customer declaration) 3.07 dBi (measured)	
Antenna-2 NORA-W101	Type	External (Patch)	
	Model	PN PRO-IS-237	
	Manufacturer	Abracon	
	Gain	3.0 dBi (customer declaration) 1.61 dBi (measured)	
Antenna NORA-W106	Type	Integrated (PCB antenna)	
	Model	AT1608-A2R4NAA	
	Manufacturer	Abracon	
	Gain	3.0 dBi (customer declaration) 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 (datasheet declaration)	
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	-0.9 dBi (datasheet declaration)	

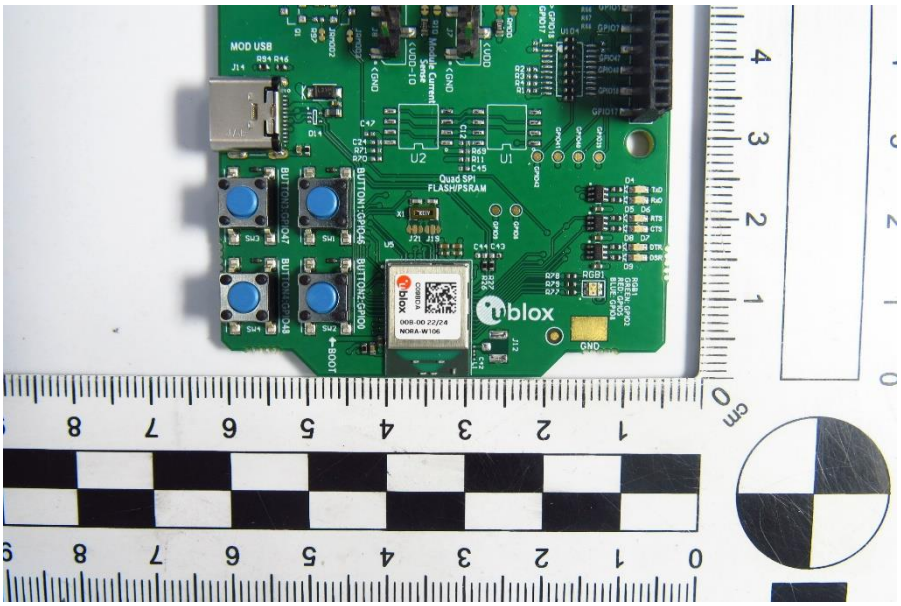
Antenna NORA-W101 (Antenna is of same kind as PRO-EX-333 but is not tested or evaluated by lab)	Type	External
	Model	PRO-EX-348
	Manufacturer	Abracon
	Gain	3.0 dBi (datasheet declaration)
Antenna NORA-W101 (Antenna is of same kind as PRO-EX-333 but is not tested or evaluated by lab)	Type	External
	Model	PRO-EX-296
	Manufacturer	Abracon
	Gain	3.0 dBi (datasheet declaration)
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 (datasheet declaration)
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 (datasheet declaration)
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	

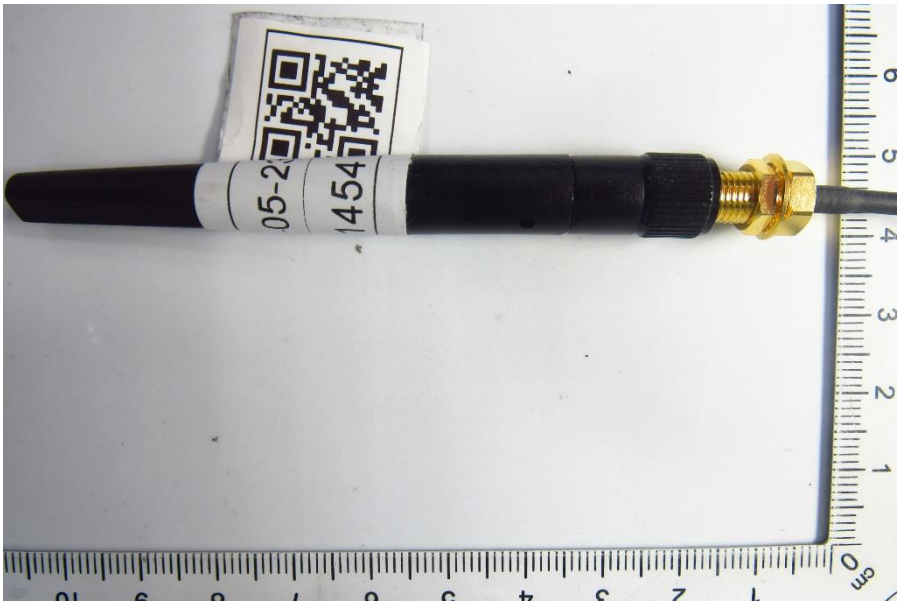
1.1 Photos – Equipment External

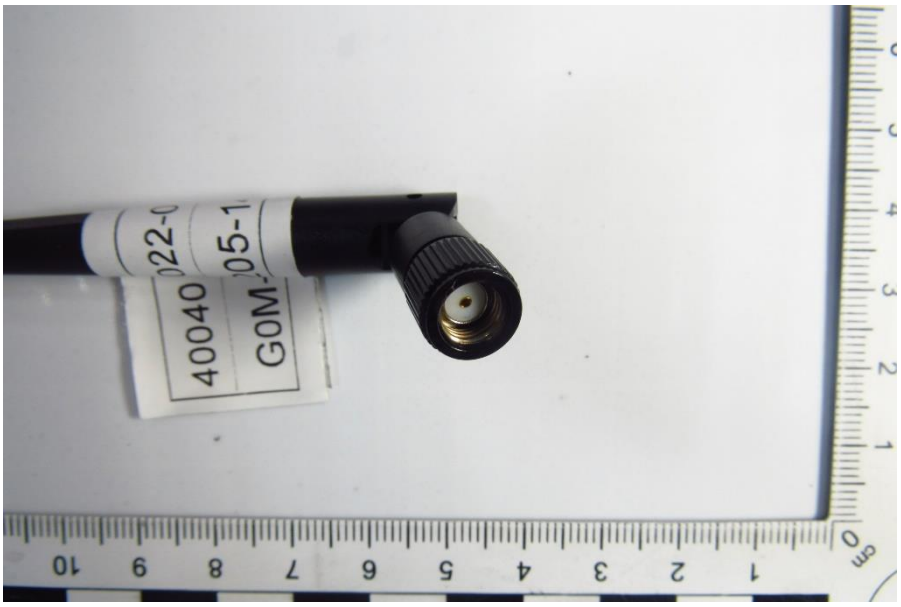
EUT PCBs top side. NORA-W101 left, NORA-W106 right


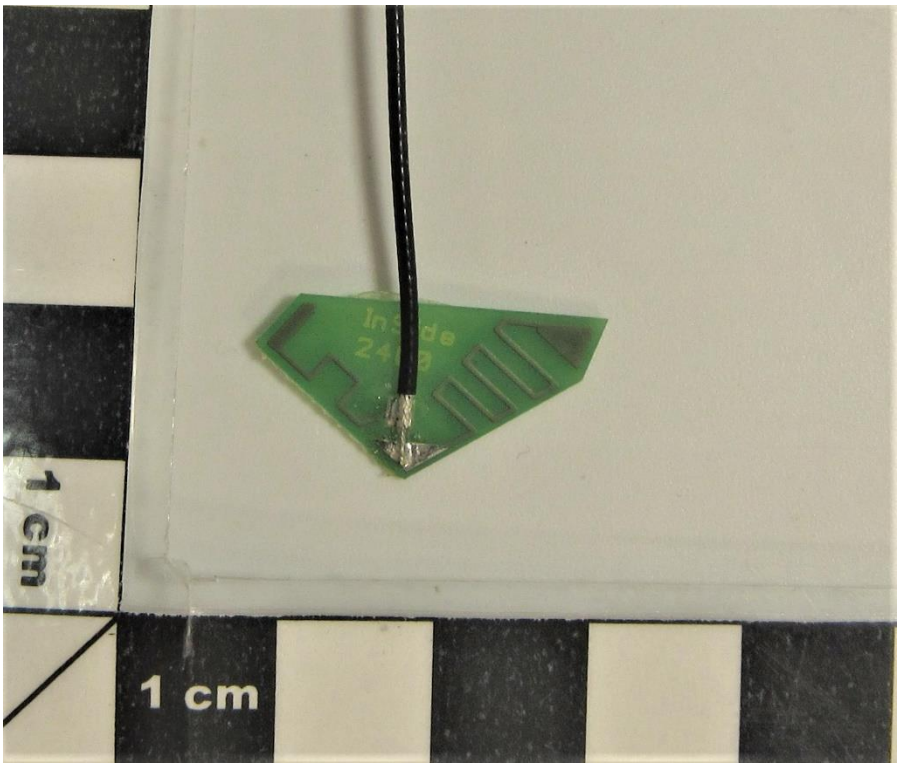
EUT PCB bottom side. NORA-W101 left, NORA-W106 right


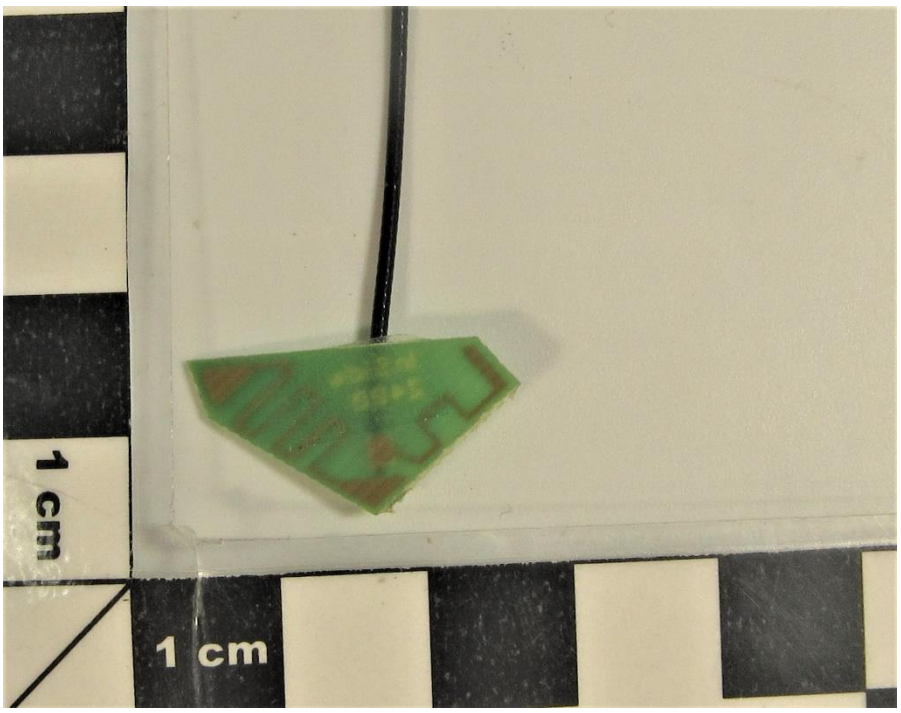
EUT radio module NORA-W101 view


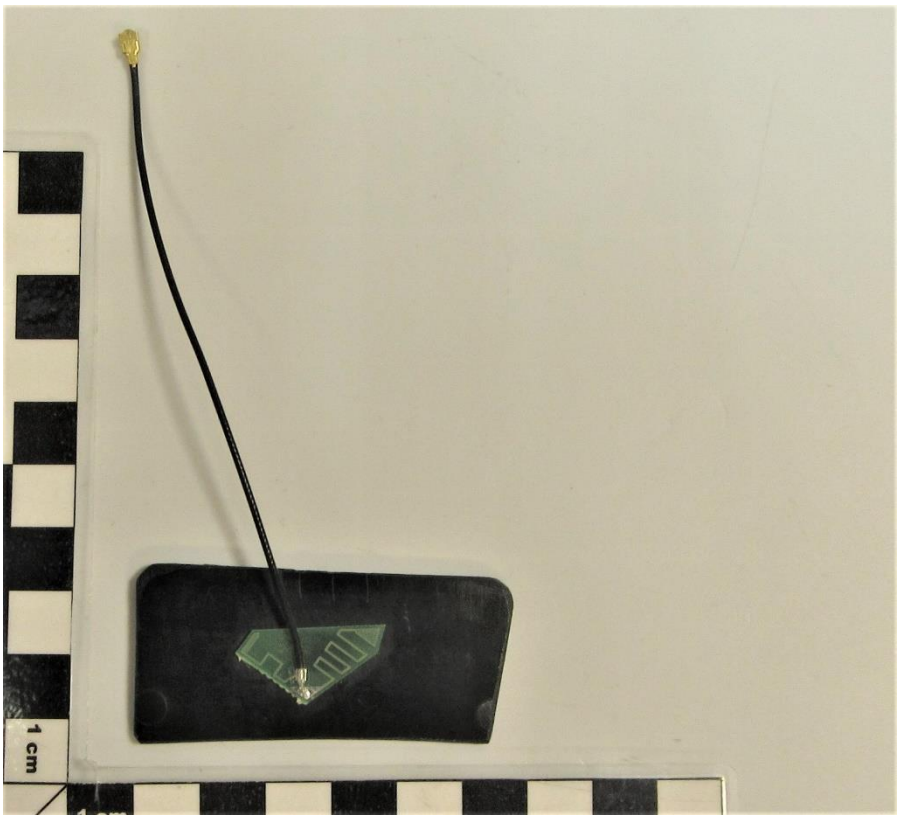
EUT radio module NORA-W106 view


External antenna PRO-EX-333


External antenna PRO-EX-333 connector


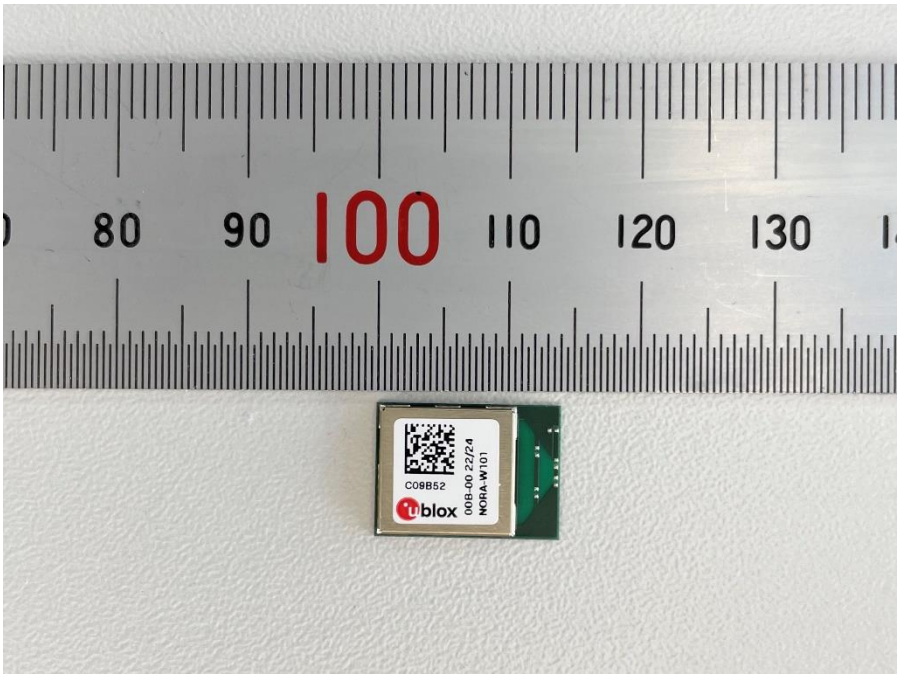
external antenna (PN PRO-IS-237)-front


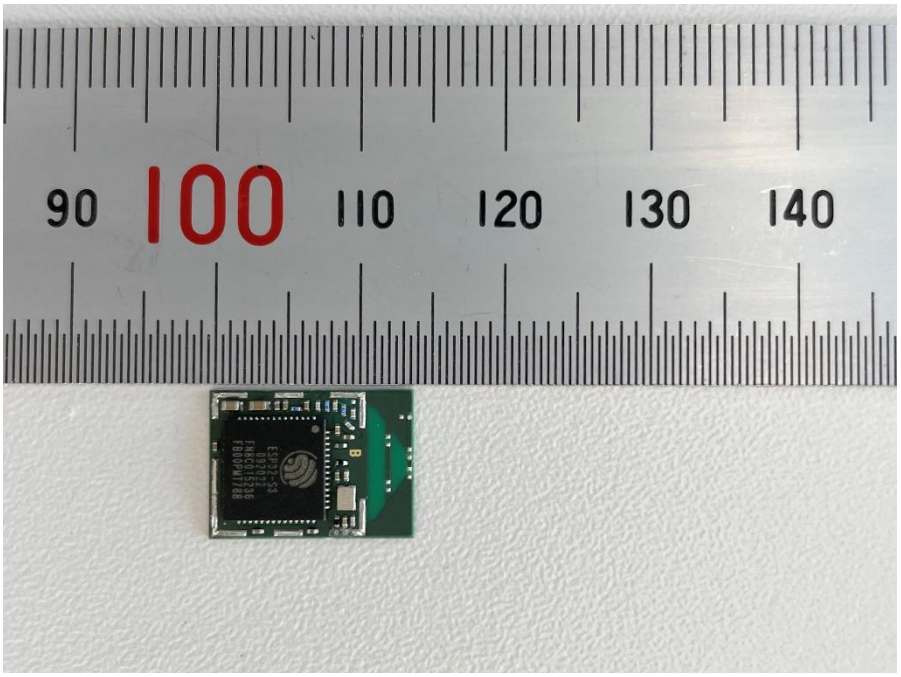
External antenna (PN PRO-IS-237)-Back


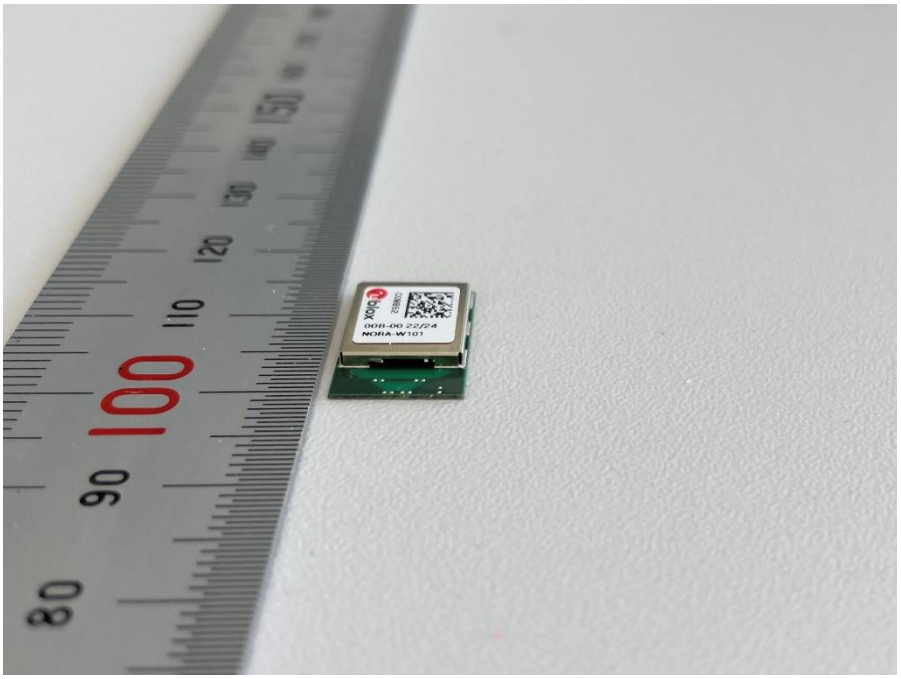
External antenna (PN PRO-IS-237)-with plastic background


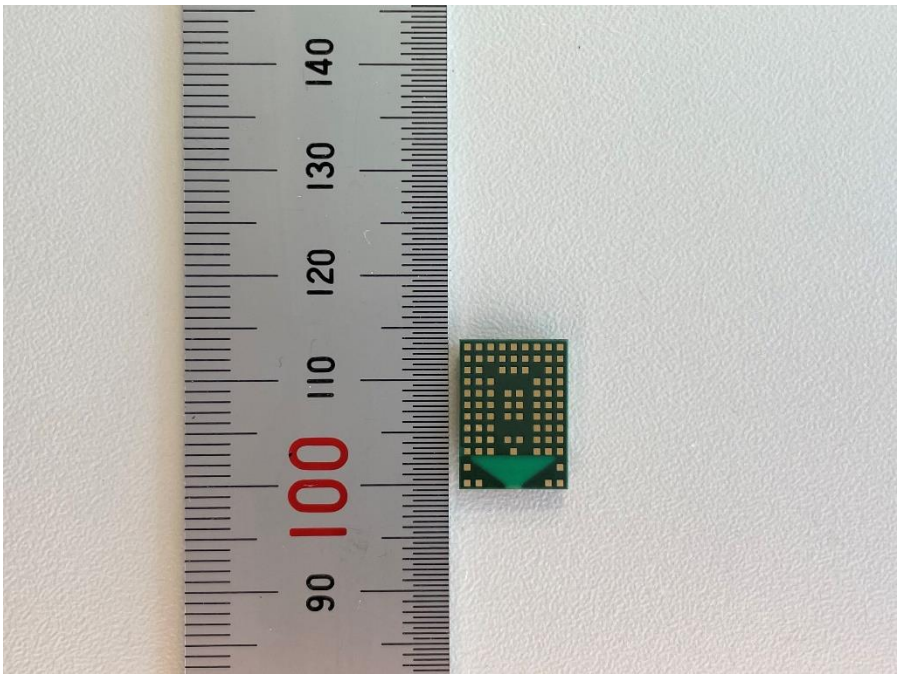
1.2 Photos – Equipment Internal

Comment: All internal photos are provided by customer and they aren't evaluated by the test laboratory.

NORA-W101 top view


NORA-W101 top view without shielding


NORA-W101 perspective view


NORA-W101 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	EspRFTestTool	Espressif	v2.8	
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
Comment:				

1.4 Test Modes

Mode	Description
1 Mbps	Mode = Transmit Modulation = GFSK Packet Type = PRBS9 Packet Length =250 Bytes Spreading = None Duty cycle = 84 %
2 Mbps	Mode = Transmit Modulation = GFSK Packet Type = PRBS9 Packet Length =250 Bytes Spreading = None Duty cycle = 56 %
Coded PHY S2 (500 kb/s)	Mode = Transmit Modulation = GFSK Packet Type = PRBS9 Packet Length =250 Bytes Spreading = None Duty cycle = 89 %
Coded PHY S8 (128 kb/s)	Mode = Transmit Modulation = GFSK Packet Type = PRBS9 Packet Length =250 Bytes Spreading = None Duty cycle = 96 %
Receive	Mode = Receive
Comment:	

1.5 Test Frequencies

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

1.6 Sample emission level calculation

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

Reading:

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

A.F.:

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

Reading on Analyzer (dBµV) + A.F. (dB/m) = Net field strength (dBµV/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:

Limit (dBµV/m) = 20*log (µV/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 additionally tested variants.				
Note 2: This test was performed in full for the main tested module NORA-W101 and partially (Spot-check) for the additionally 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

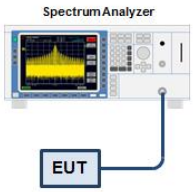
3.1.1 Information

Test Information	
Reference	ISED RSS-Gen, Issue 5 A2 (section 6.7)
Measurement Method	ANSI C63.10 6.9.3
Measurement Uncertainty	± 1.26 %
Test Sample ID	40677
Operator	Dr.-Ing. Dhamia Almozani
Date	2022-08-15

3.1.2 Limits

Limits
None (Informational only)

3.1.3 Setup

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

3.1.6 Results

Test Results 1 Mbps		
Mode	Frequency [MHz]	Bandwidth [MHz]
GFSK	2402	1.025
GFSK	2440	1.030
GFSK	2480	1.035

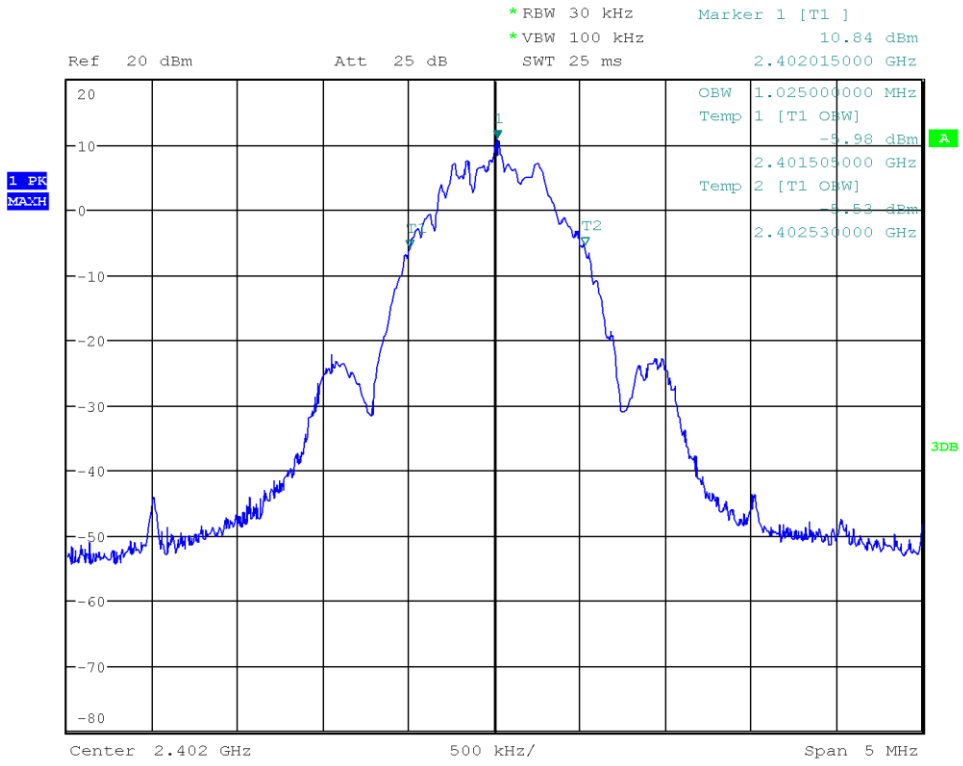
Test Results 2 Mbps		
Mode	Frequency [MHz]	Bandwidth [MHz]
GFSK	2402	2.030
GFSK	2440	2.030
GFSK	2480	2.035

Test Results Coded PHY S2 (500 kb/s)		
Mode	Frequency [MHz]	Bandwidth [MHz]
GFSK	2402	1.020
GFSK	2440	1.025
GFSK	2480	1.035

Test Results Coded PHY S8 (128 kb/s)		
Mode	Frequency [MHz]	Bandwidth [MHz]
GFSK	2402	1.045
GFSK	2440	1.055
GFSK	2480	1.055

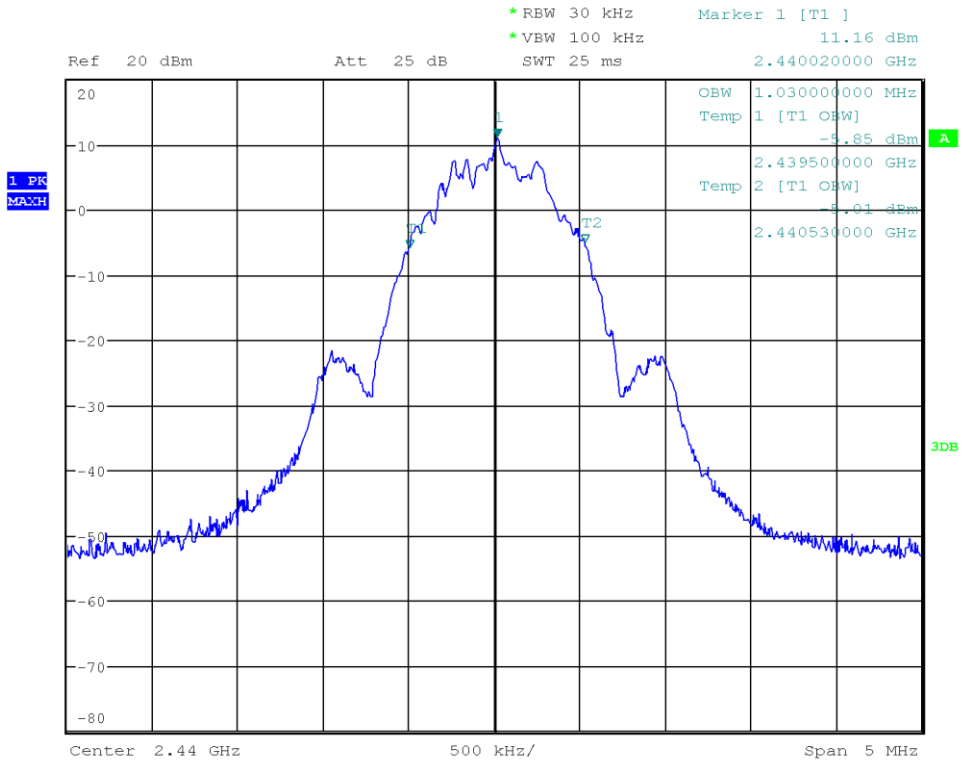
Occupied Bandwidth

Project Number:	G0M-2205-1454
Applicant:	u-blox AG
Model Description:	Stand-alone multiradio module
Model:	NORA-W101
Test Sample ID:	40677
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= 1 Mbps, PRBS9, Payload length = 250
Occupied Bandwidth [MHz]:	1.025



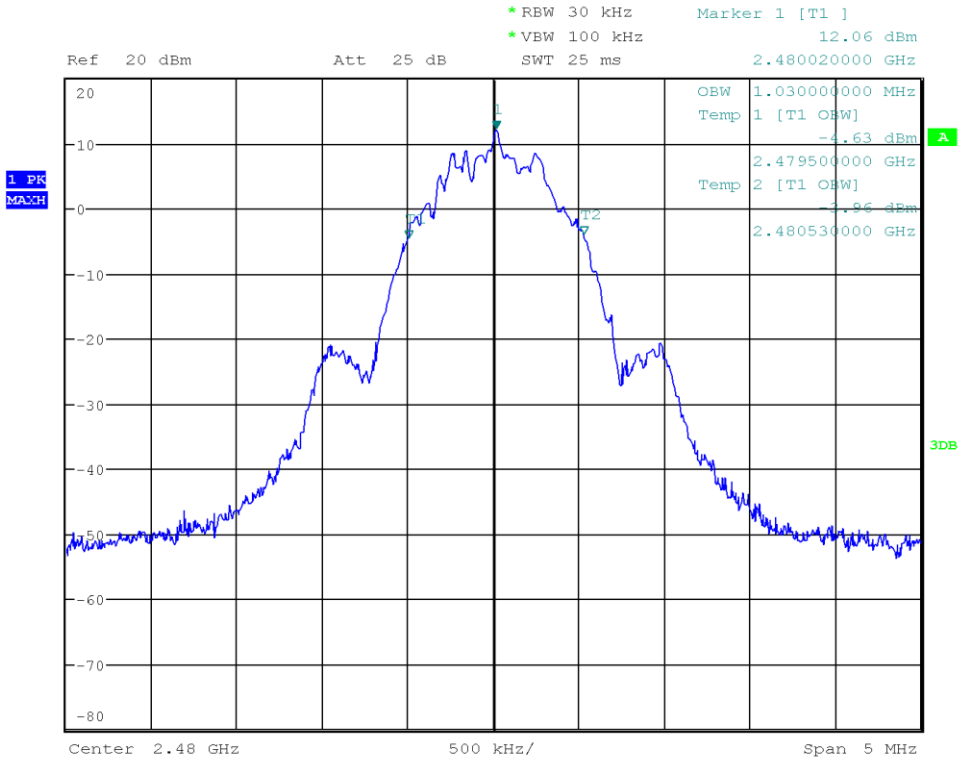
Occupied Bandwidth

Project Number:	G0M-2205-1454
Applicant:	u-blox AG
Model Description:	Stand-alone multiradio module
Model:	NORA-W101
Test Sample ID:	40677
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= 1 Mbps, PRBS9, Payload length = 250
Occupied Bandwidth [MHz]:	1.030



Occupied Bandwidth

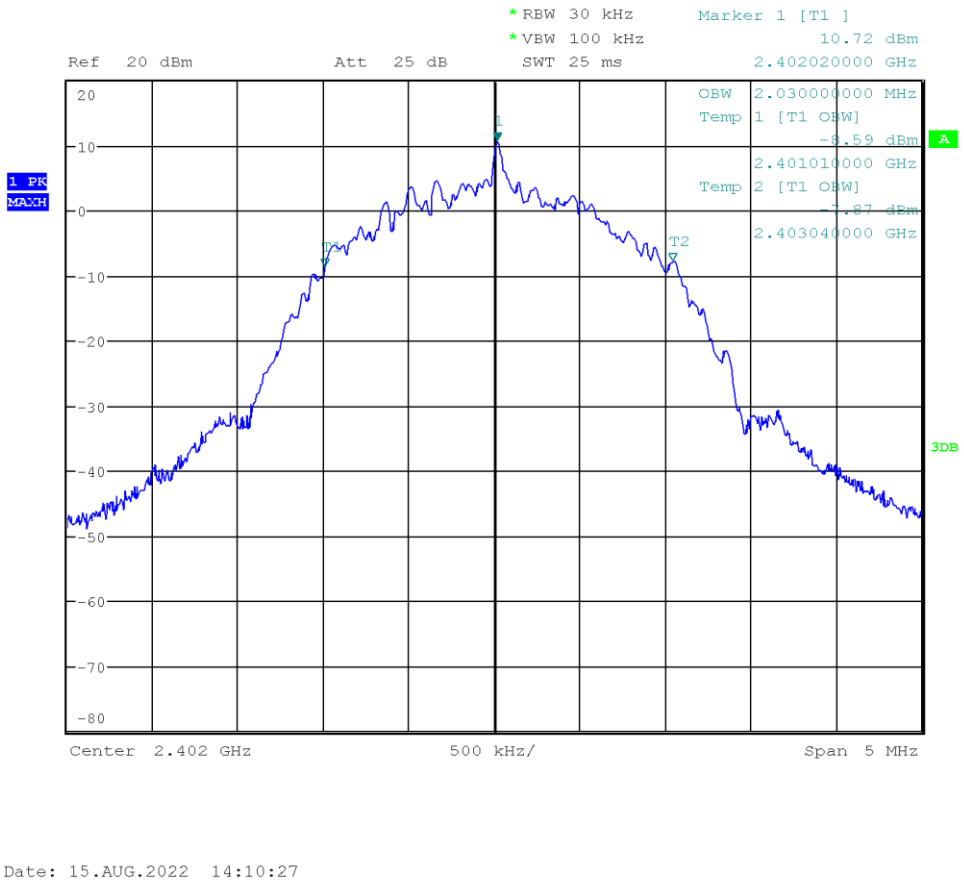
Project Number:	G0M-2205-1454
Applicant:	u-blox AG
Model Description:	Stand-alone multiradio module
Model:	NORA-W101
Test Sample ID:	40677
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= 1 Mbps, PRBS9, Payload length = 250
Occupied Bandwidth [MHz]:	1.035



Date: 15.AUG.2022 14:06:14

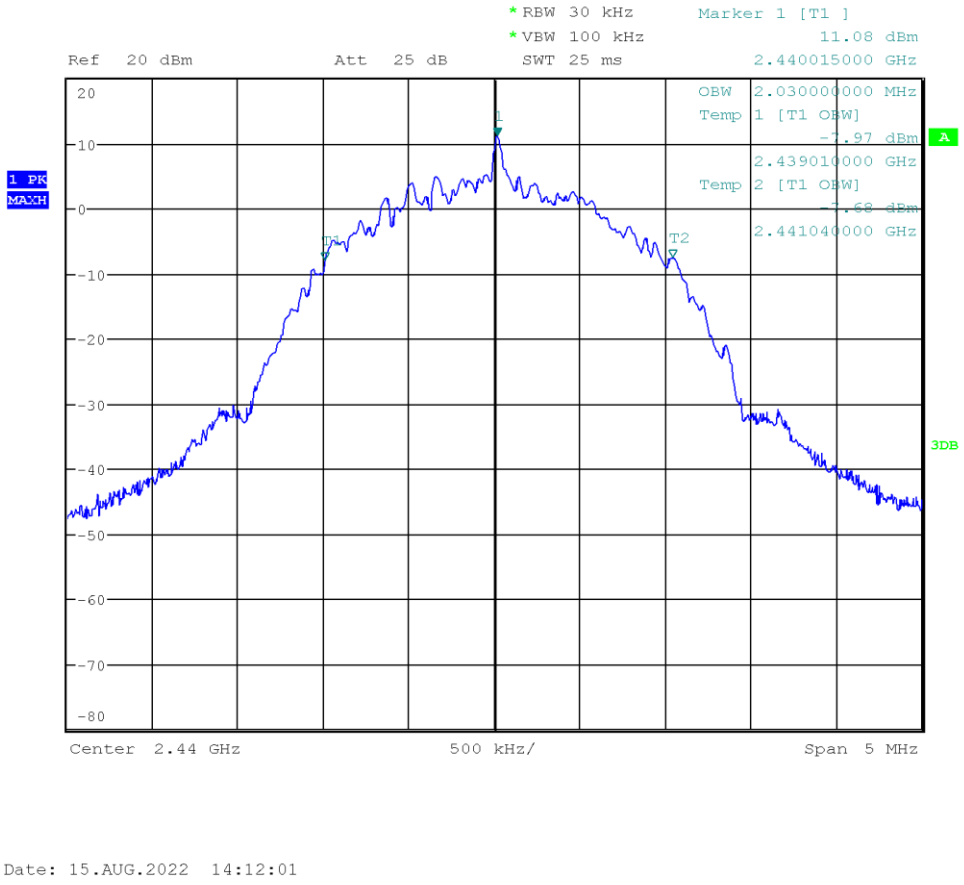
Occupied Bandwidth

Project Number:	G0M-2205-1454
Applicant:	u-blox AG
Model Description:	Stand-alone multiradio module
Model:	NORA-W101
Test Sample ID:	40677
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= 2 Mbps, PRBS9, Payload length = 250
Occupied Bandwidth [MHz]:	2.030



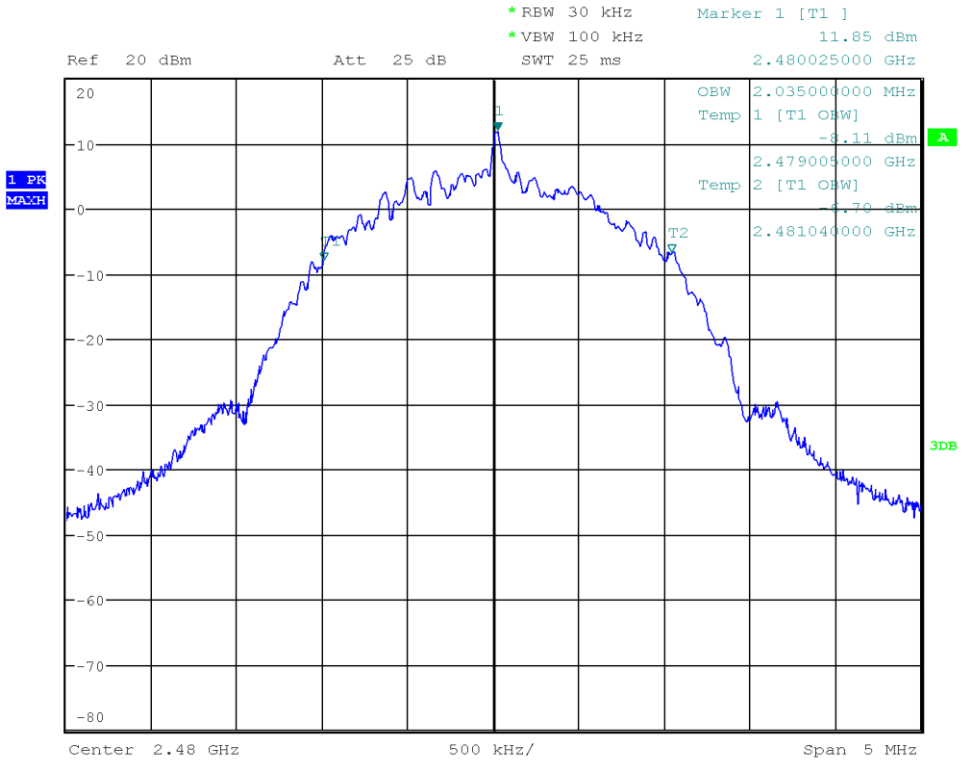
Occupied Bandwidth

Project Number:	G0M-2205-1454
Applicant:	u-blox AG
Model Description:	Stand-alone multiradio module
Model:	NORA-W101
Test Sample ID:	40677
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= 2 Mbps, PRBS9, Payload length = 250
Occupied Bandwidth [MHz]:	2.030



Occupied Bandwidth

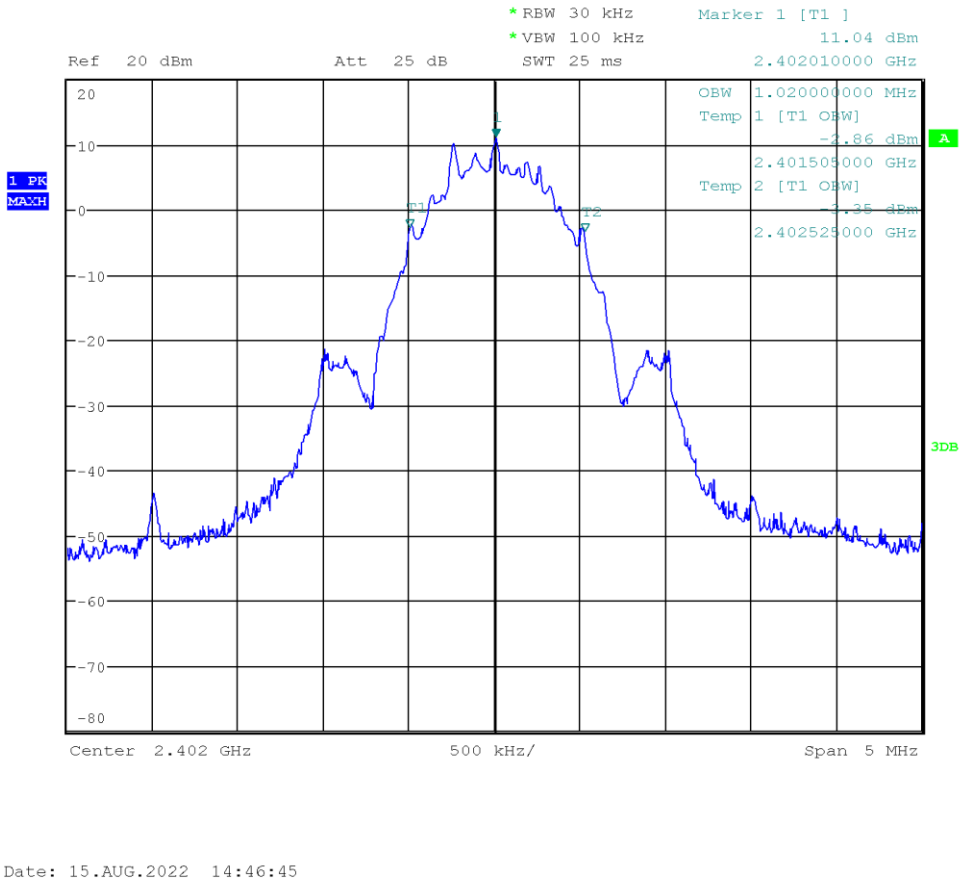
Project Number:	G0M-2205-1454
Applicant:	u-blox AG
Model Description:	Stand-alone multiradio module
Model:	NORA-W101
Test Sample ID:	40677
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= 2 Mbps, PRBS9, Payload length = 250
Occupied Bandwidth [MHz]:	2.035



Date: 15.AUG.2022 14:13:14

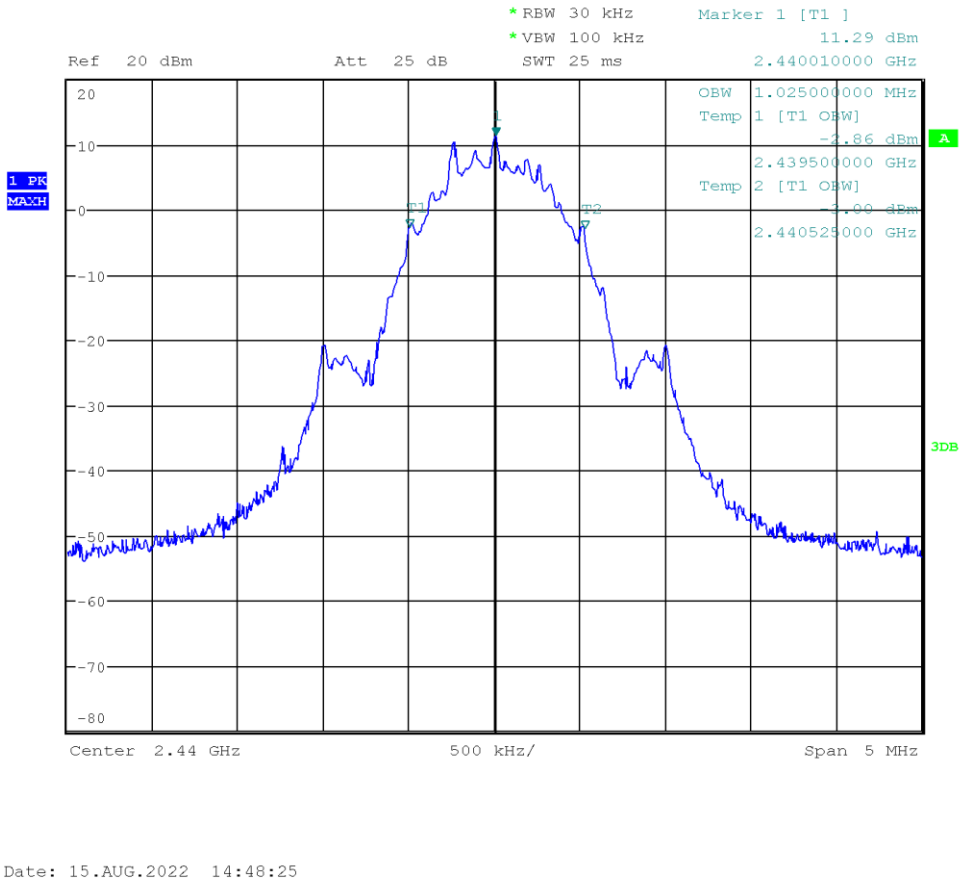
Occupied Bandwidth

Project Number:	G0M-2205-1454
Applicant:	u-blox AG
Model Description:	Stand-alone multiradio module
Model:	NORA-W101
Test Sample ID:	40677
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= LE coded PHY S2 (500 kb/s) , PRBS9, Payload length = 250
Occupied Bandwidth [MHz]:	1.020



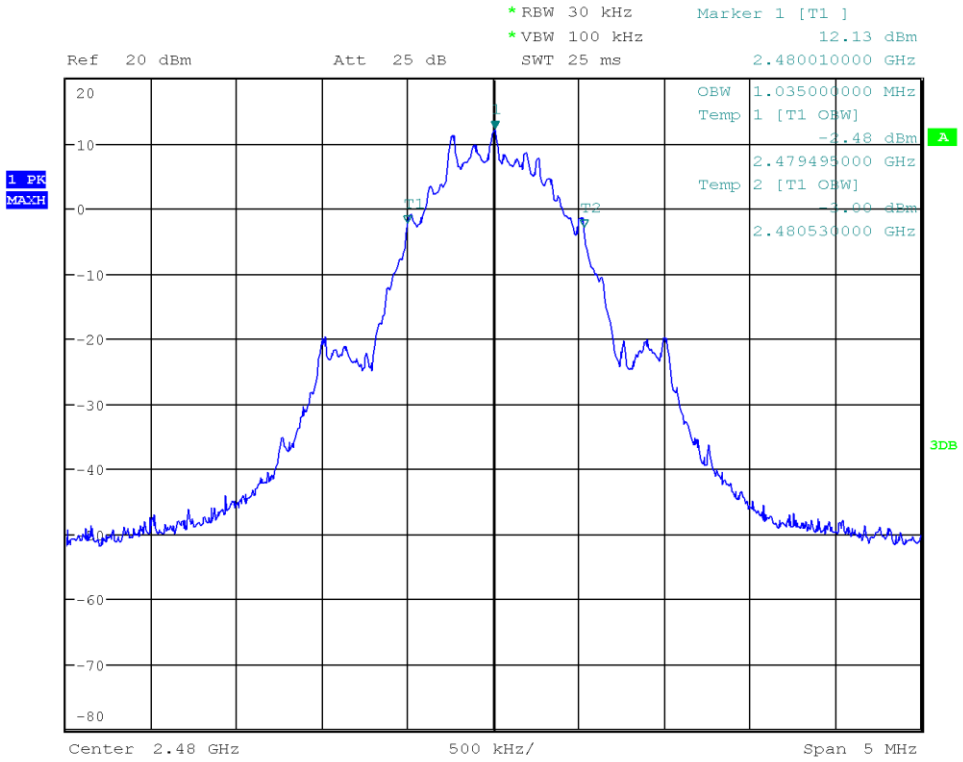
Occupied Bandwidth

Project Number:	G0M-2205-1454
Applicant:	u-blox AG
Model Description:	Stand-alone multiradio module
Model:	NORA-W101
Test Sample ID:	40677
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= LE coded PHY S2 (500 kb/s) , PRBS9, Payload length = 250
Occupied Bandwidth [MHz]:	1.025



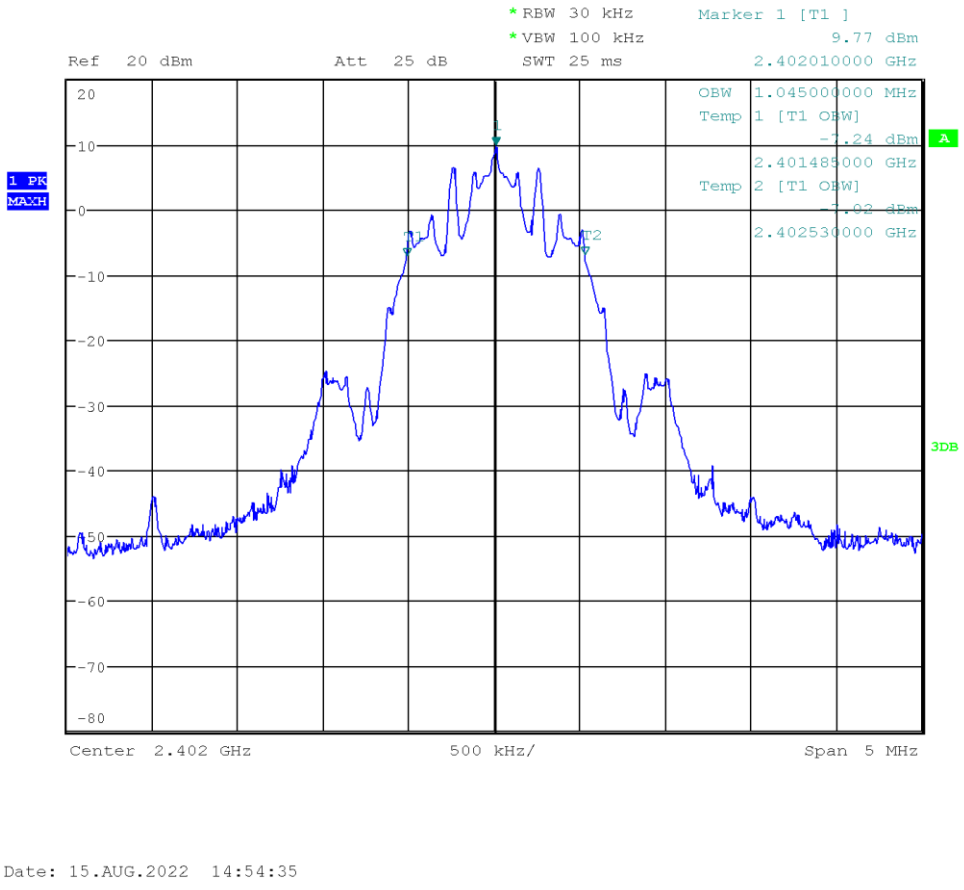
Occupied Bandwidth

Project Number:	G0M-2205-1454
Applicant:	u-blox AG
Model Description:	Stand-alone multiradio module
Model:	NORA-W101
Test Sample ID:	40677
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= LE coded PHY S2 (500 kb/s) , PRBS9, Payload length = 250
Occupied Bandwidth [MHz]:	1.035



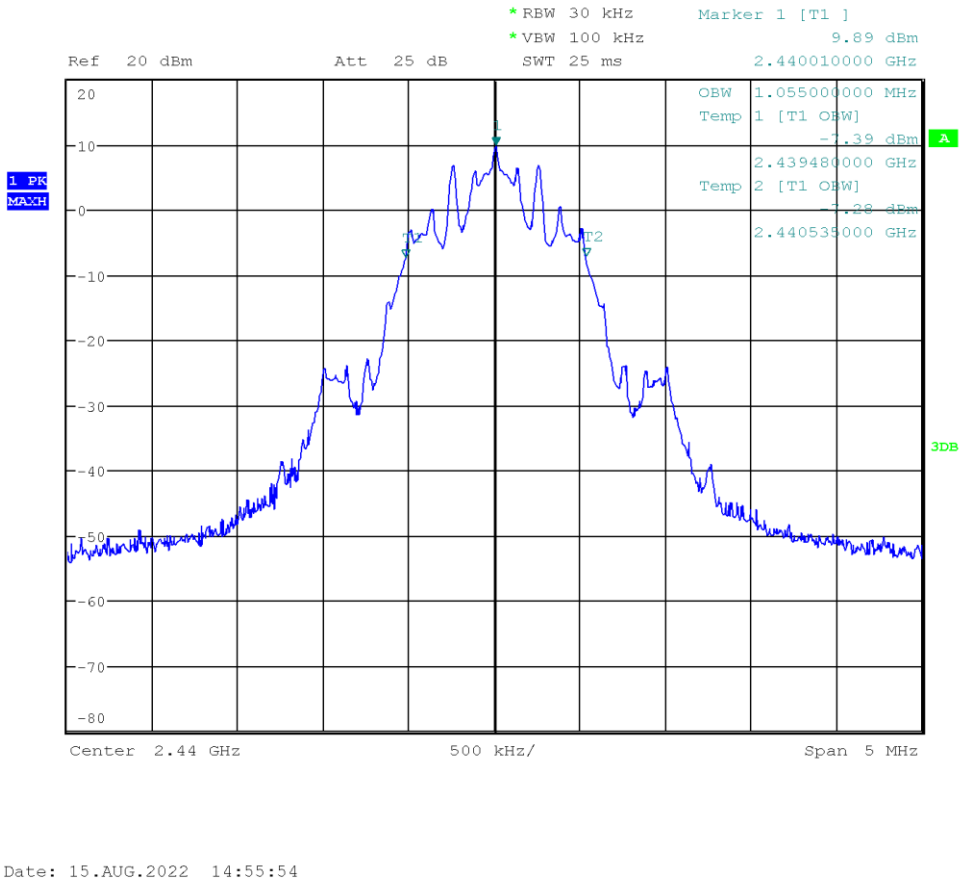
Occupied Bandwidth

Project Number:	G0M-2205-1454
Applicant:	u-blox AG
Model Description:	Stand-alone multiradio module
Model:	NORA-W101
Test Sample ID:	40677
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= LE coded PHY S8 (128 kb/s) , PRBS9, Payload length = 250
Occupied Bandwidth [MHz]:	1.045



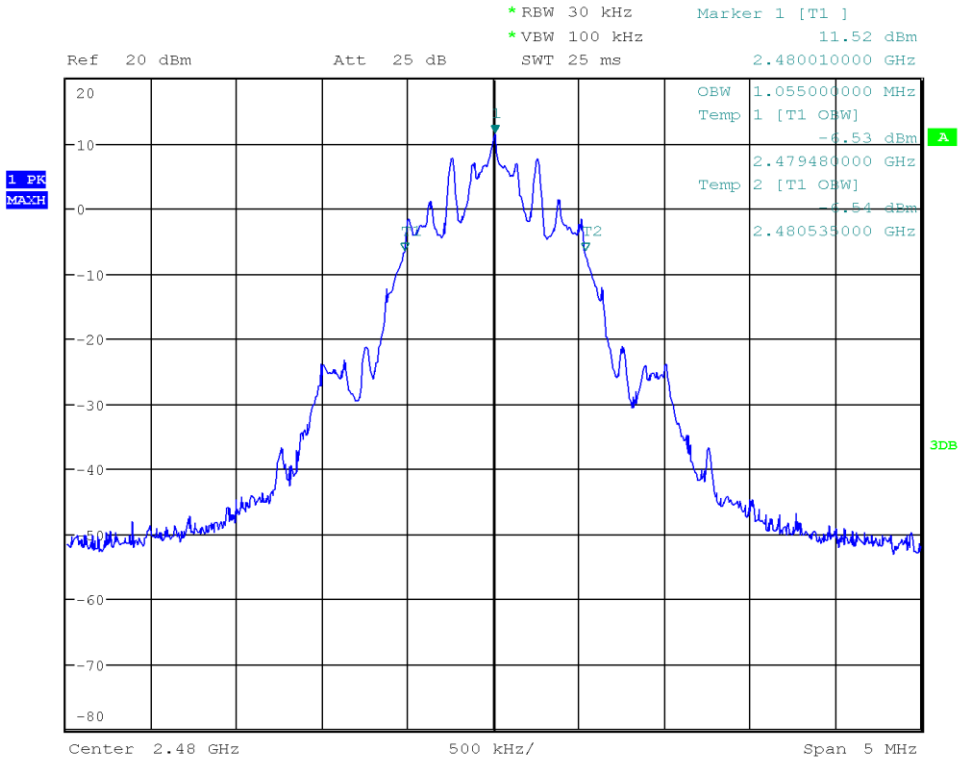
Occupied Bandwidth

Project Number:	G0M-2205-1454
Applicant:	u-blox AG
Model Description:	Stand-alone multiradio module
Model:	NORA-W101
Test Sample ID:	40677
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= LE coded PHY S8 (128 kb/s) , PRBS9, Payload length = 250
Occupied Bandwidth [MHz]:	1.055



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 Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 6.9.3
Operational Mode:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= LE coded PHY S8 (128 kb/s) , PRBS9, Payload length = 250
Occupied Bandwidth [MHz]:	1.055



3.2 Test Conditions and Results - 6 dB bandwidth

3.2.1 Information

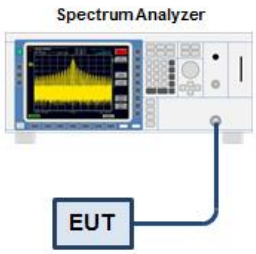
Test Information	
Reference	FCC § 15.247(a)(2); ISED RSS-247, Issue 2 (section 5.2)
Measurement Method	ANSI C63.10 11.8
Measurement Uncertainty	± 1.26 %
Operator	Dr.-Ing. Dhamia Almozani
Date	2022-08-15

3.2.2 Limits

Limits
≥ 500kHz

3.2.3 Setup

Test 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 1 Mbps				
Mode	Frequency [MHz]	Bandwidth [kHz]	Limit [kHz]	Verdict
GFSK	2402	640	500	PASS
GFSK	2440	640	500	PASS
GFSK	2480	640	500	PASS

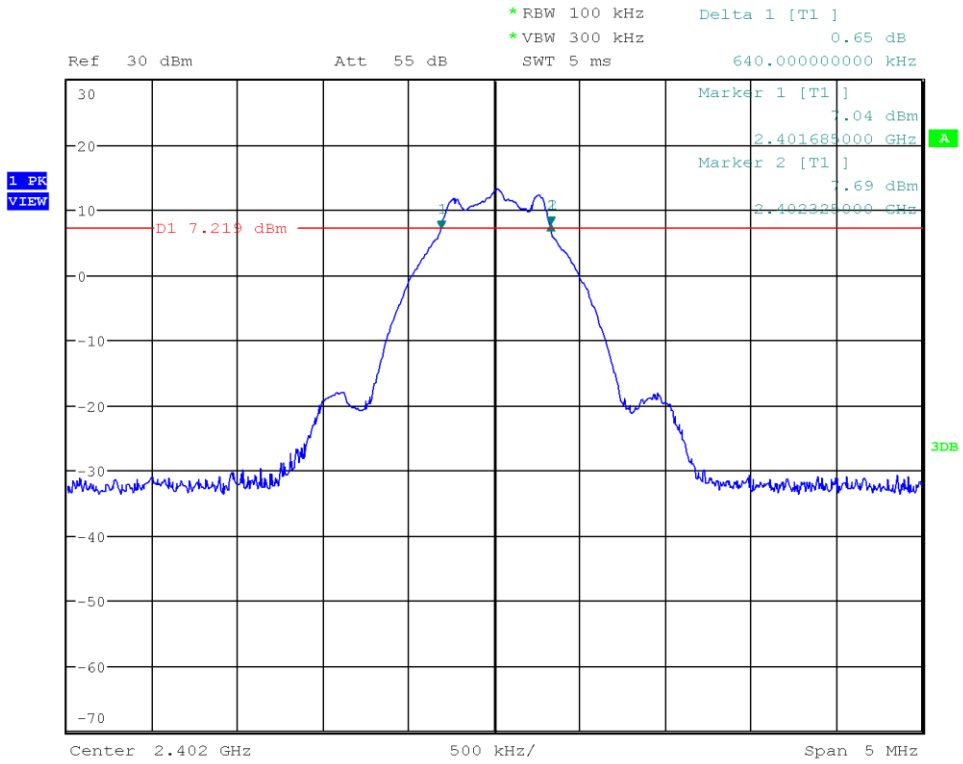
Test Results 2 Mbps				
Mode	Frequency [MHz]	Bandwidth [kHz]	Limit [kHz]	Verdict
GFSK	2402	1110	500	PASS
GFSK	2440	1115	500	PASS
GFSK	2480	1110	500	PASS

Test Results Coded PHY S2 (500 kb/s)				
Mode	Frequency [MHz]	Bandwidth [kHz]	Limit [kHz]	Verdict
GFSK	2402	640	500	PASS
GFSK	2440	640	500	PASS
GFSK	2480	645	500	PASS

Test Results Coded PHY S8 (128 kb/s)				
Mode	Frequency [MHz]	Bandwidth [kHz]	Limit [kHz]	Verdict
GFSK	2402	585	500	PASS
GFSK	2440	615	500	PASS
GFSK	2480	580	500	PASS

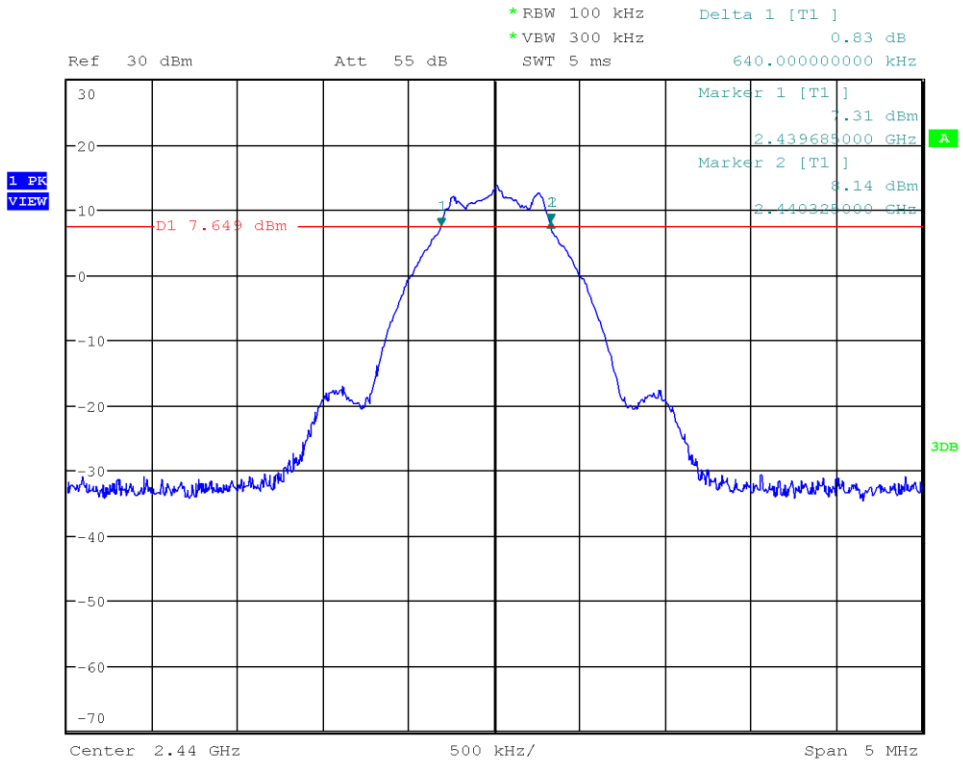
DTS (6 dB) Bandwidth

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:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= 1 Mbps, PRBS9, Payload length = 250
Lower Frequency [MHz]:	2401.685
Upper Frequency [MHz]:	2402.325
6 dB Bandwidth [kHz]:	640



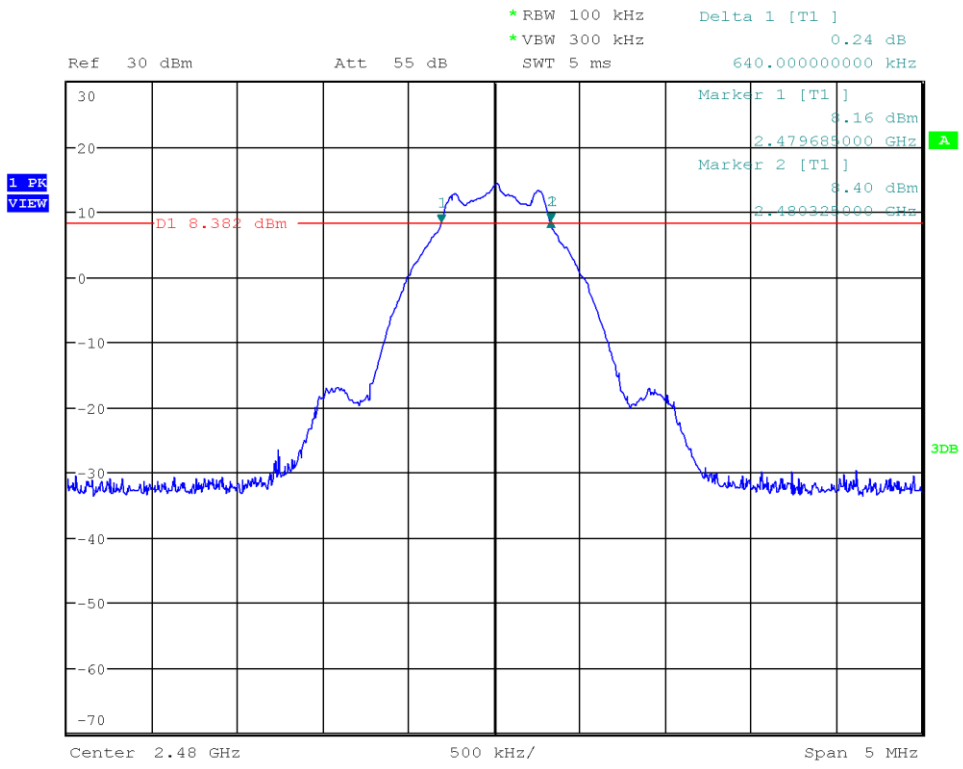
DTS (6 dB) Bandwidth

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:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= 1 Mbps, PRBS9, Payload length = 250
Lower Frequency [MHz]:	2439.685
Upper Frequency [MHz]:	2440.325
6 dB Bandwidth [kHz]:	640



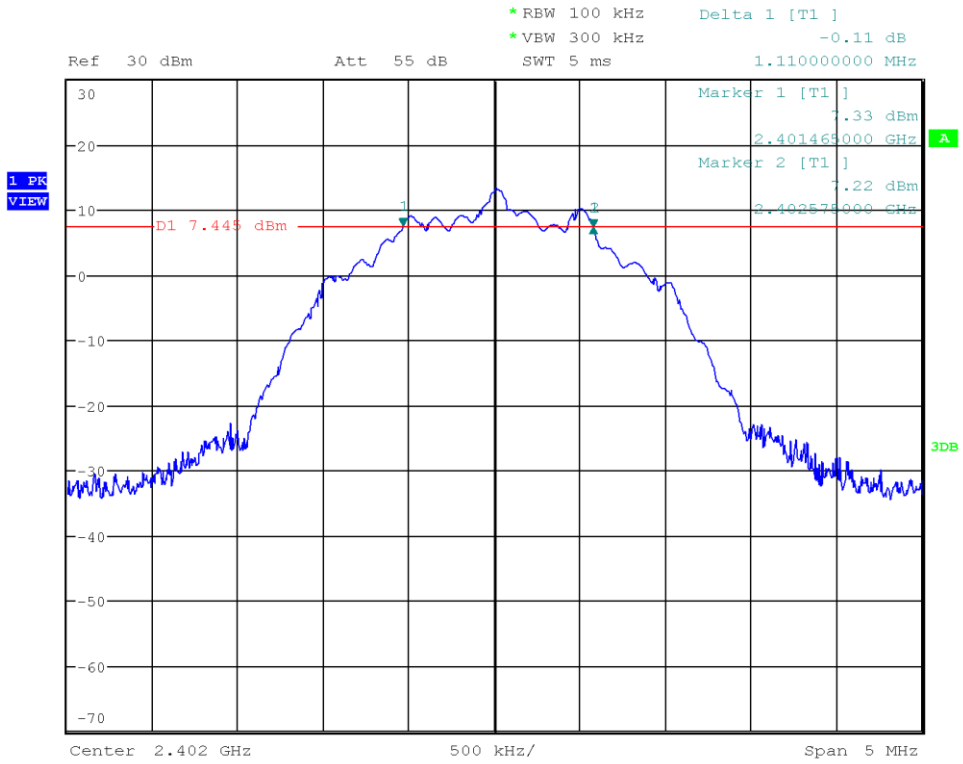
DTS (6 dB) Bandwidth

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:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= 1 Mbps, PRBS9, Payload length = 250
Lower Frequency [MHz]:	2479.685
Upper Frequency [MHz]:	2480.325
6 dB Bandwidth [kHz]:	640



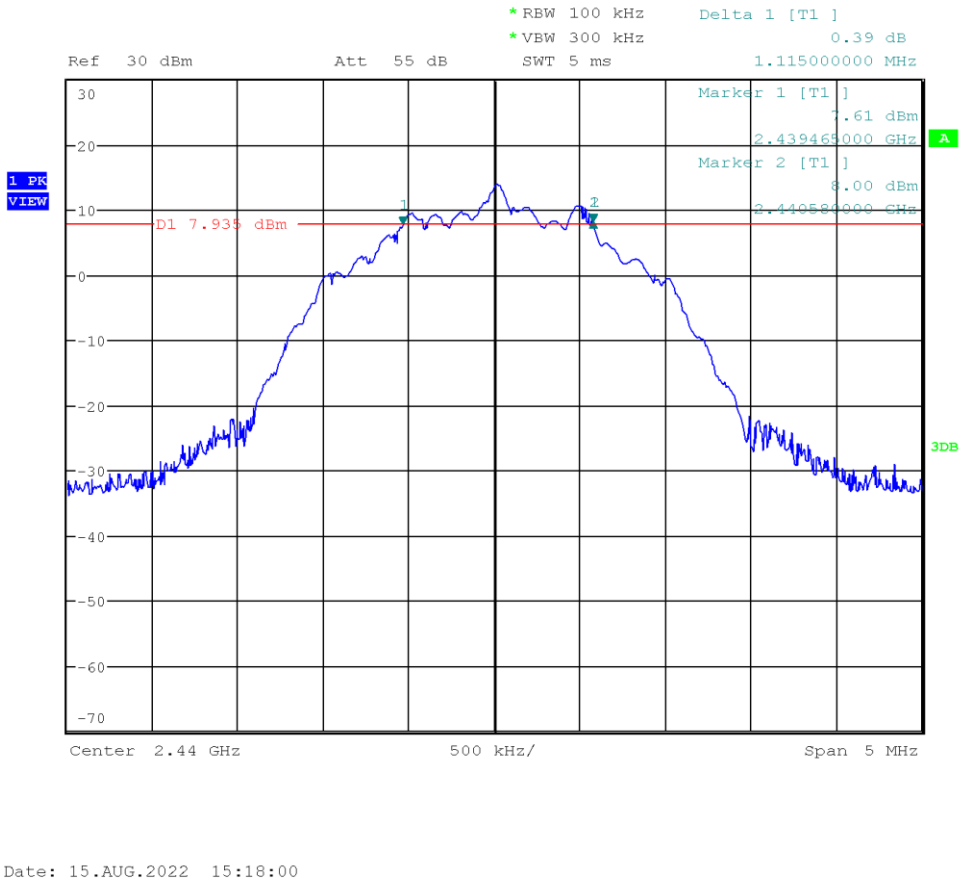
DTS (6 dB) Bandwidth

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:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= 2 Mbps, PRBS9, Payload length = 250
Lower Frequency [MHz]:	2401.465
Upper Frequency [MHz]:	2402.575
6 dB Bandwidth [kHz]:	1110



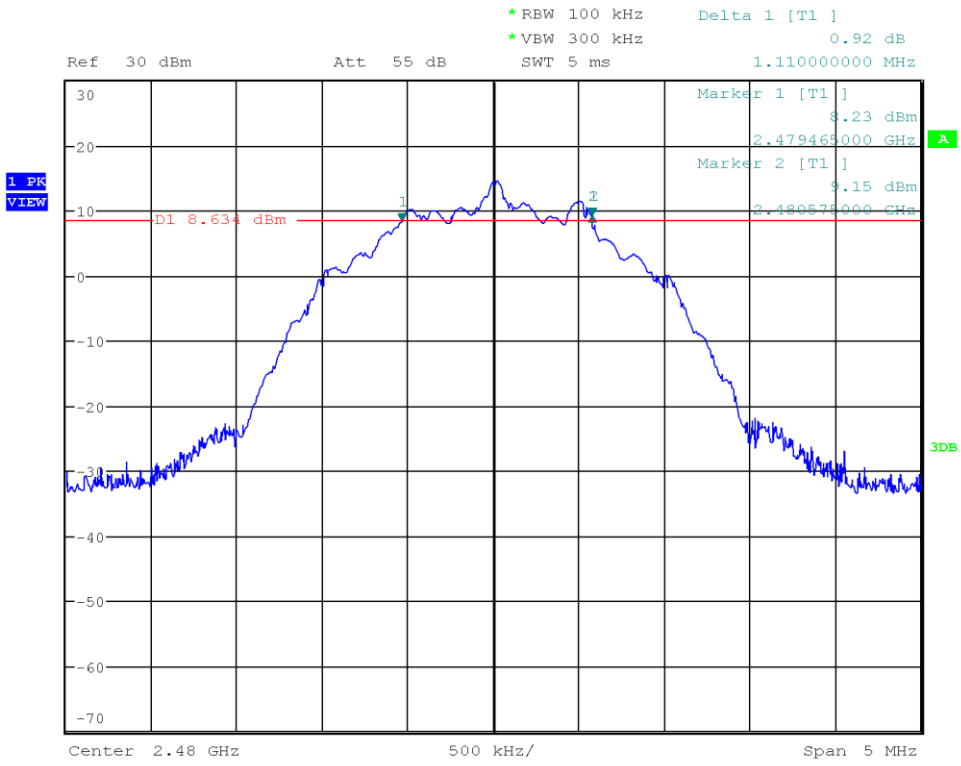
DTS (6 dB) Bandwidth

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:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= 2 Mbps, PRBS9, Payload length = 250
Lower Frequency [MHz]:	2439.465
Upper Frequency [MHz]:	2440.580
6 dB Bandwidth [kHz]:	1115



DTS (6 dB) Bandwidth

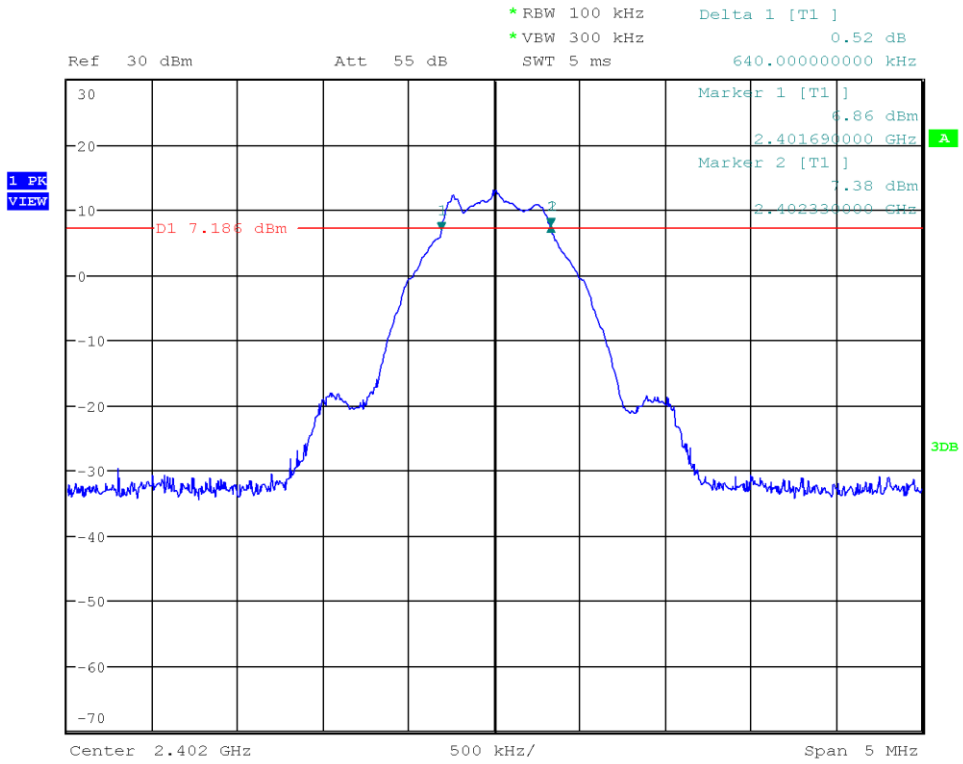
Project Number:	G0M-2205-1454
Applicant:	u-blox AG
Model Description:	Stand-alone multiradio module
Model:	NORA-W101
Test Sample ID:	40677
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= 2 Mbps, PRBS9, Payload length = 250
Lower Frequency [MHz]:	2479.465
Upper Frequency [MHz]:	2480.575
6 dB Bandwidth [kHz]:	1110



Date: 15.AUG.2022 15:19:01

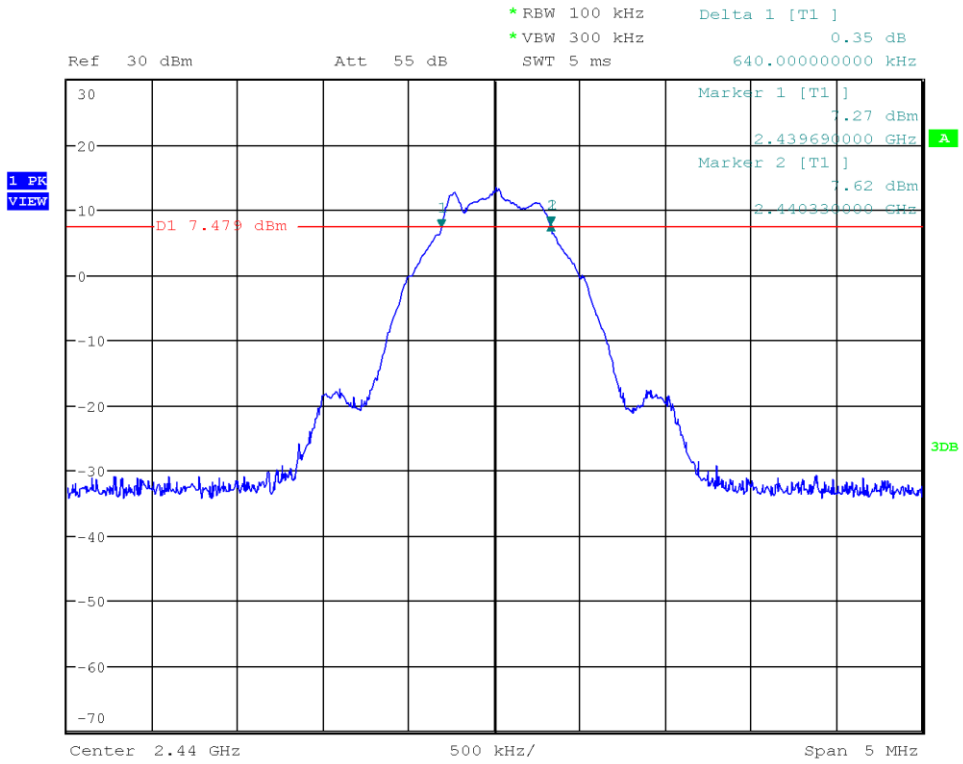
DTS (6 dB) Bandwidth

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:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= Coded PHY S2, PRBS9, Payload length = 250
Lower Frequency [MHz]:	2401.690
Upper Frequency [MHz]:	2402.330
6 dB Bandwidth [kHz]:	640



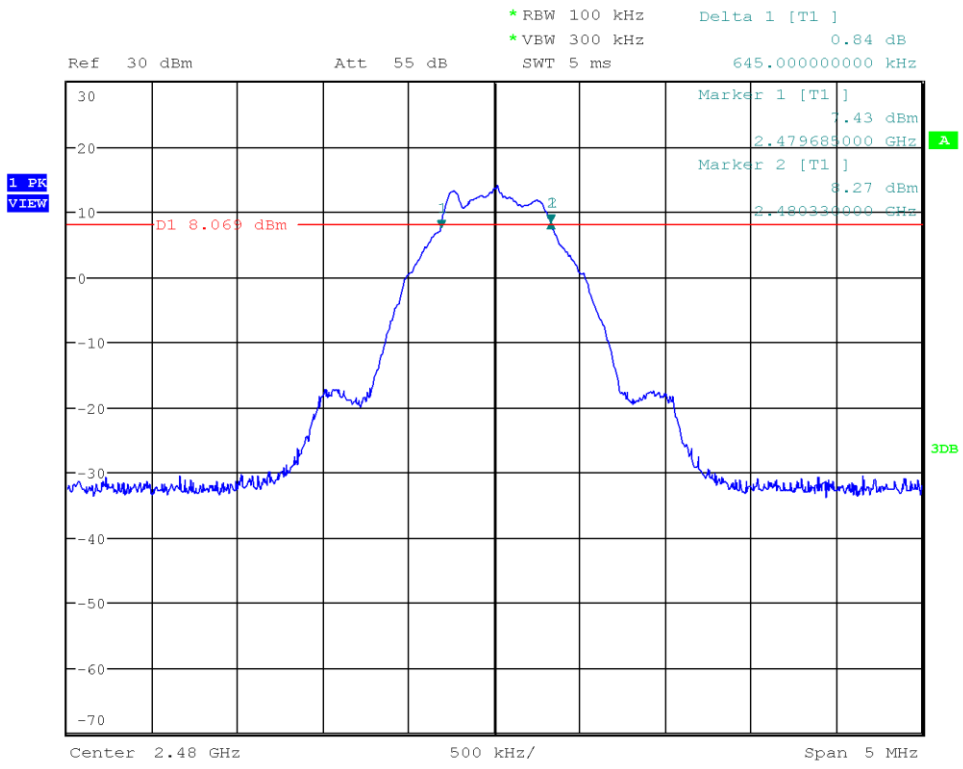
DTS (6 dB) Bandwidth

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:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= Coded PHY S2, PRBS9, Payload length = 250
Lower Frequency [MHz]:	2439.690
Upper Frequency [MHz]:	2440.330
6 dB Bandwidth [kHz]:	640



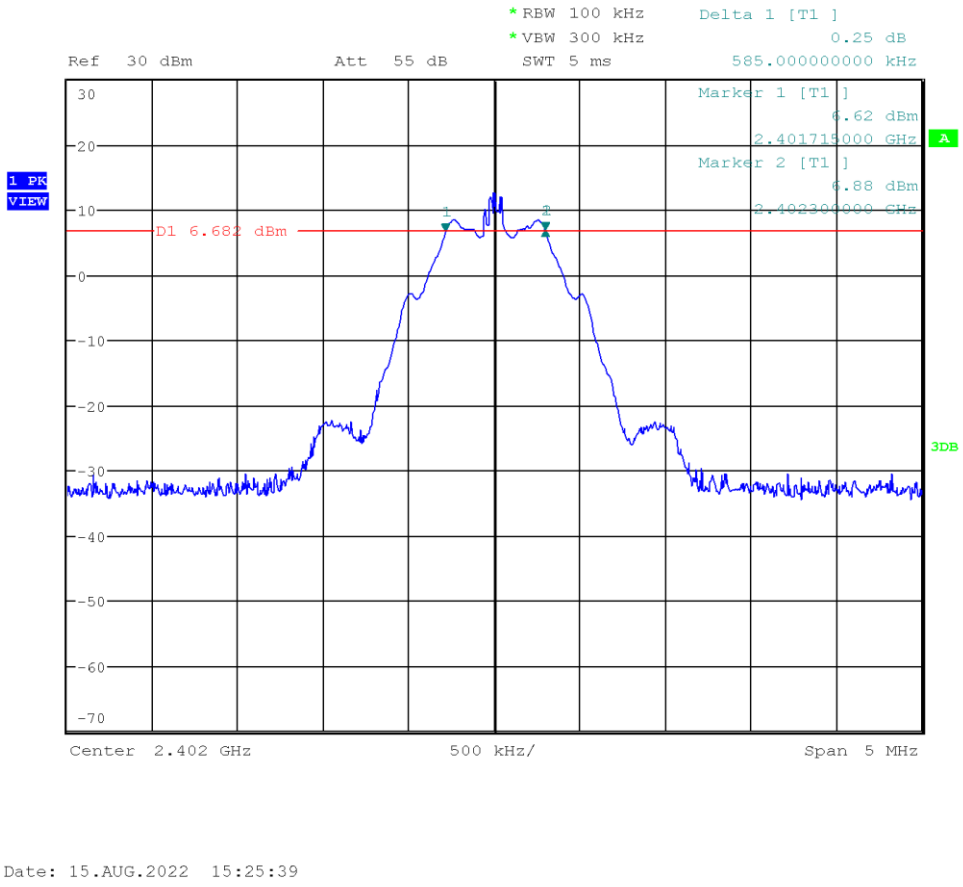
DTS (6 dB) Bandwidth

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:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= Coded PHY S2, PRBS9, Payload length = 250
Lower Frequency [MHz]:	2479.685
Upper Frequency [MHz]:	2480.330
6 dB Bandwidth [kHz]:	645



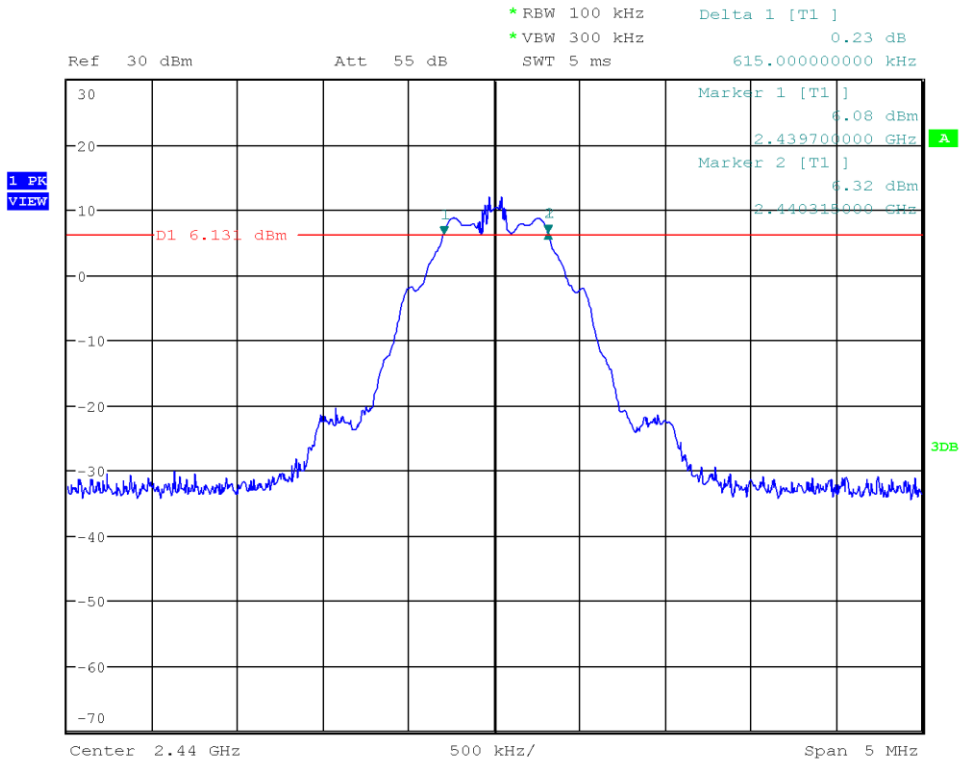
DTS (6 dB) Bandwidth

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:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= Coded PHY S8, PRBS9, Payload length = 250
Lower Frequency [MHz]:	2401.715
Upper Frequency [MHz]:	2402.300
6 dB Bandwidth [kHz]:	585



DTS (6 dB) Bandwidth

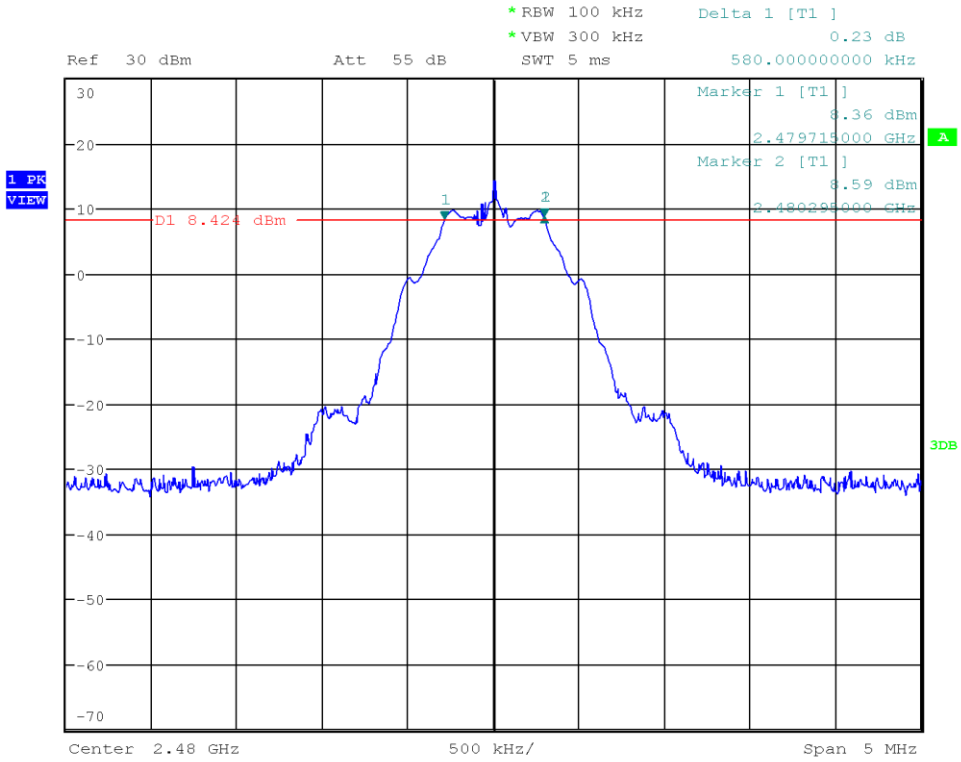
Project Number:	G0M-2205-1454
Applicant:	u-blox AG
Model Description:	Stand-alone multiradio module
Model:	NORA-W101
Test Sample ID:	40677
Reference Standards:	FCC 15.247, RSS-247
Reference Method:	ANSI C63.10:2013, Section 11.8.1 Option 1
Operational Mode:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= Coded PHY S8, PRBS9, Payload length = 250
Lower Frequency [MHz]:	2439.700
Upper Frequency [MHz]:	2440.315
6 dB Bandwidth [kHz]:	615



Date: 15.AUG.2022 15:26:47

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:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= Coded PHY S8, PRBS9, Payload length = 250
Lower Frequency [MHz]:	2479.715
Upper Frequency [MHz]:	2480.295
6 dB Bandwidth [kHz]:	580



Date: 15.AUG.2022 15:27:53

3.3 Test Conditions and Results - Maximum peak conducted output power

3.3.1 Information

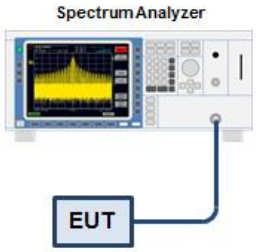
Test Information	
Reference	FCC § 15.247(b); ISED RSS-247, Issue 2 (section 5.4)
Measurement Method	ANSI C63.10 11.9.1
Measurement Uncertainty	± 2.86 dB
Operator	Dr.-Ing. Dhamia Almozani
Date	2022-08-16

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

Test Setup



3.3.4 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

3.3.5 Procedure

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

3.3.6 Results

Test Results 1 Mbps				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2402	16.594	0.0456	1.0	PASS
2440	16.968	0.0498	1.0	PASS
2480	17.647	0.0585	1.0	PASS

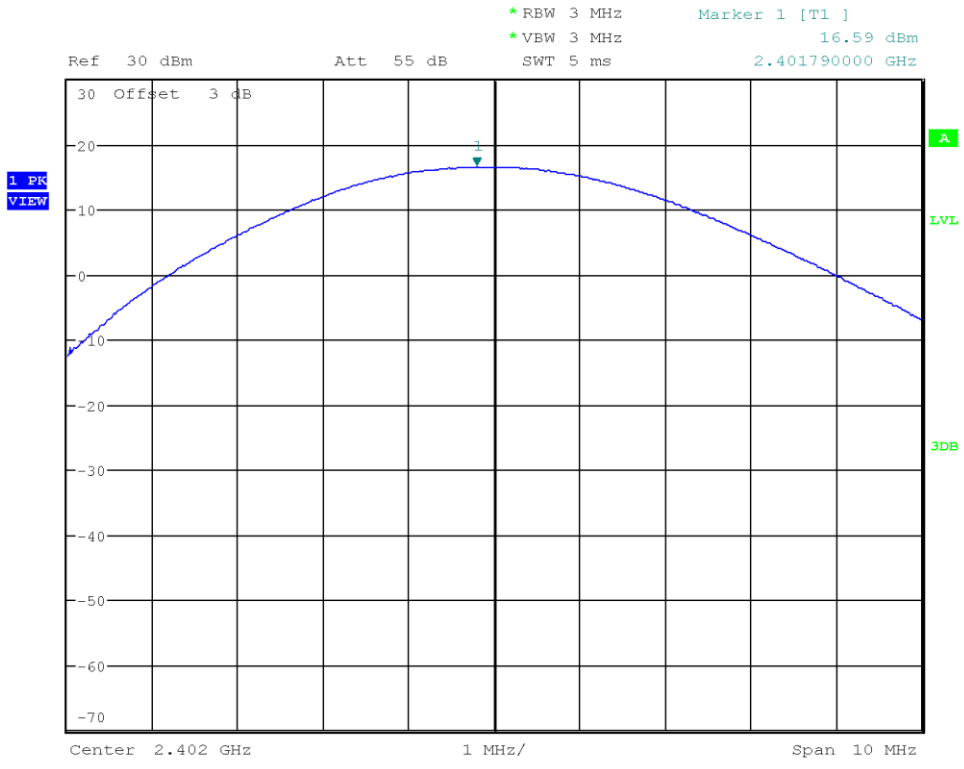
Test Results 2 Mbps				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2402	16.824	0.0481	1.0	PASS
2440	17.285	0.0535	1.0	PASS
2480	18.086	0.0644	1.0	PASS

Test Results Coded PHY S2 (500 kb/s)				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2402	16.430	0.0440	1.0	PASS
2440	16.807	0.0479	1.0	PASS
2480	17.495	0.0562	1.0	PASS

Test Results Coded PHY S8 (128 kb/s)				
Channel [MHz]	Power [dBm]	Power [W]	Limit [W]	Verdict
2402	16.370	0.0434	1.0	PASS
2440	16.805	0.0479	1.0	PASS
2480	17.583	0.0573	1.0	PASS

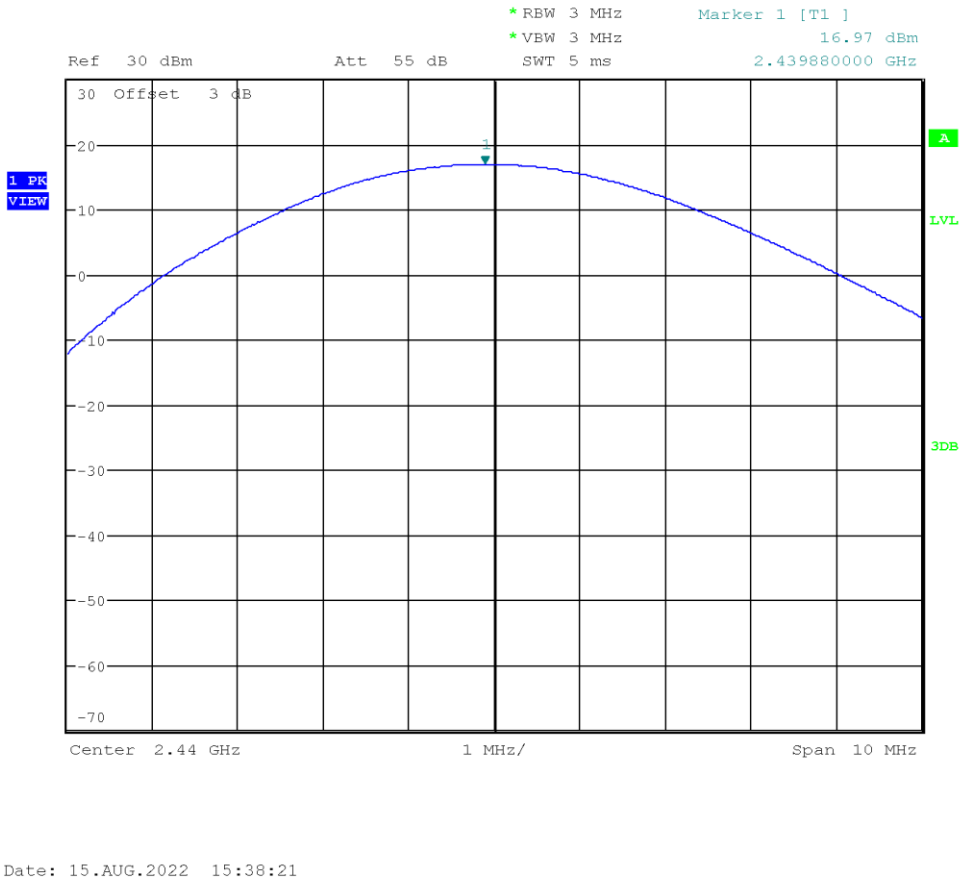
Peak Conducted Output Power

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 11.9.1.1
Operational Mode:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= 1 Mbps, PRBS9, Payload length = 250
Peak Power [dBm]:	16.594
Peak Power [W]:	0.0456



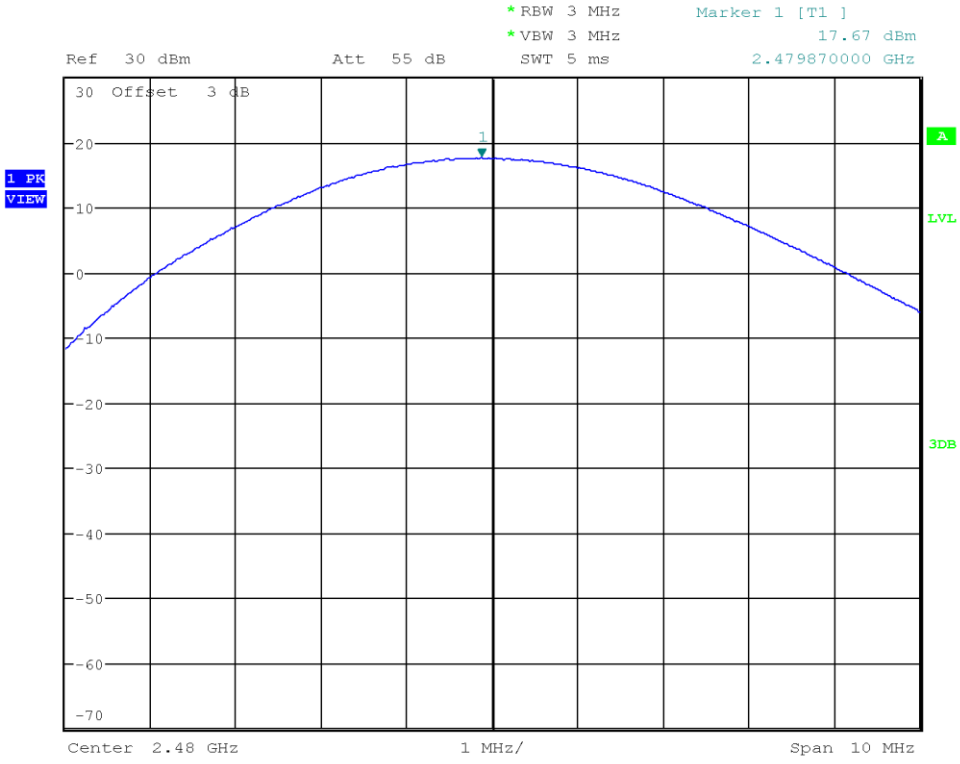
Peak Conducted Output Power

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 11.9.1.1
Operational Mode:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= 1 Mbps, PRBS9, Payload length = 250
Peak Power [dBm]:	16.968
Peak Power [W]:	0.0498



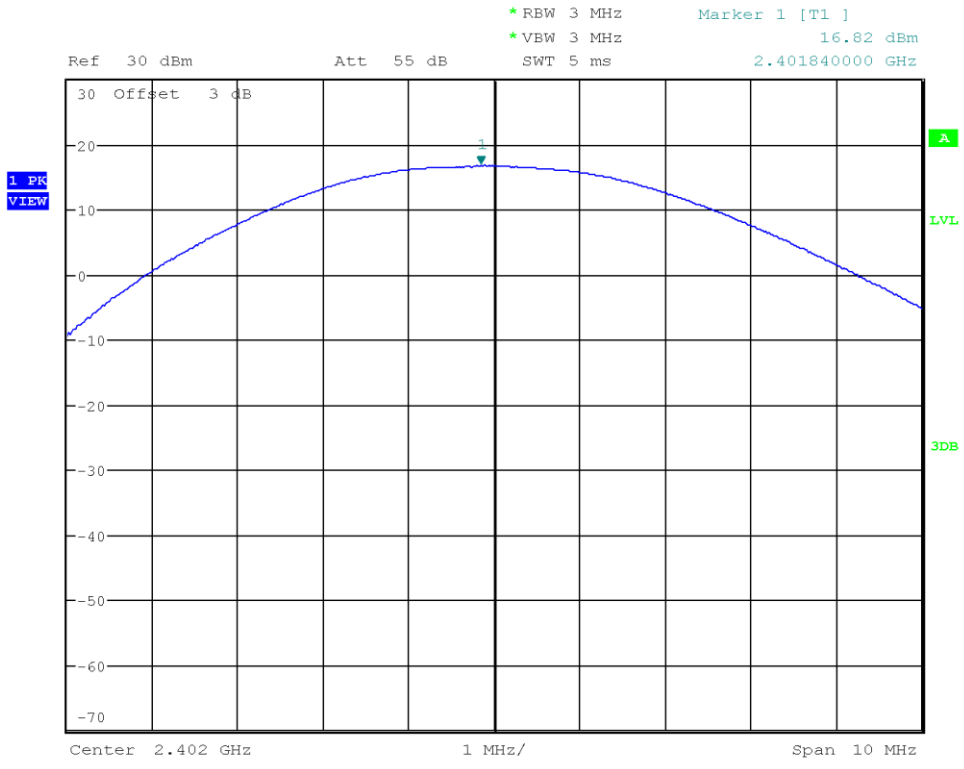
Peak Conducted Output Power

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 11.9.1.1
Operational Mode:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= 1 Mbps, PRBS9, Payload length = 250
Peak Power [dBm]:	17.674
Peak Power [W]:	0.0585



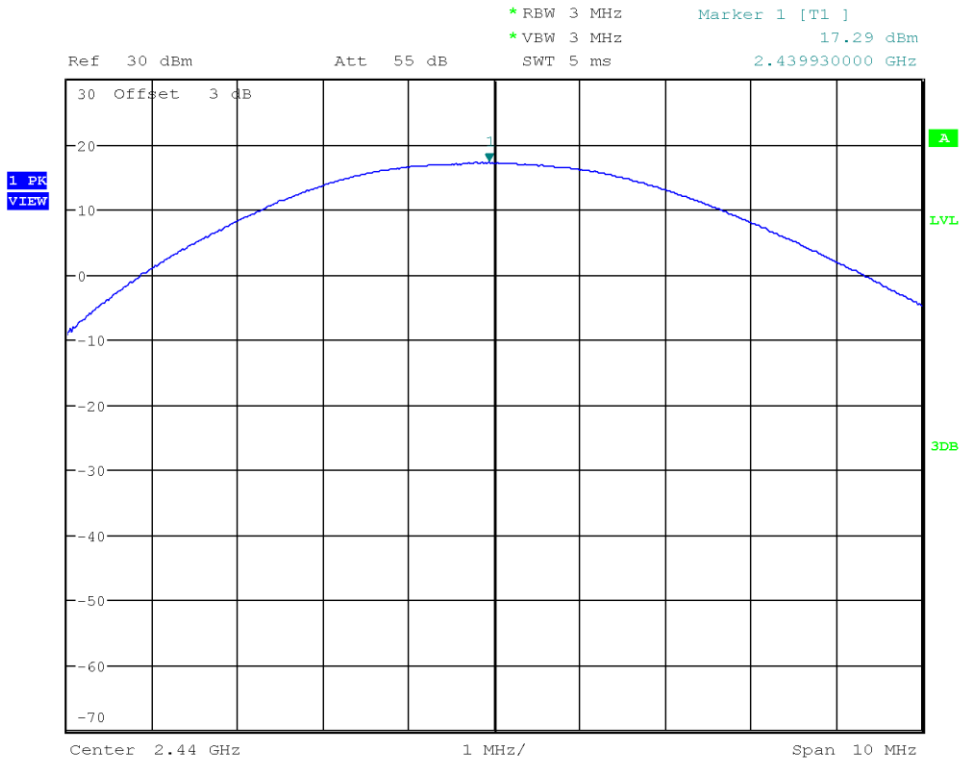
Peak Conducted Output Power

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 11.9.1.1
Operational Mode:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= 2 Mbps, PRBS9, Payload length = 250
Peak Power [dBm]:	16.824
Peak Power [W]:	0.0481



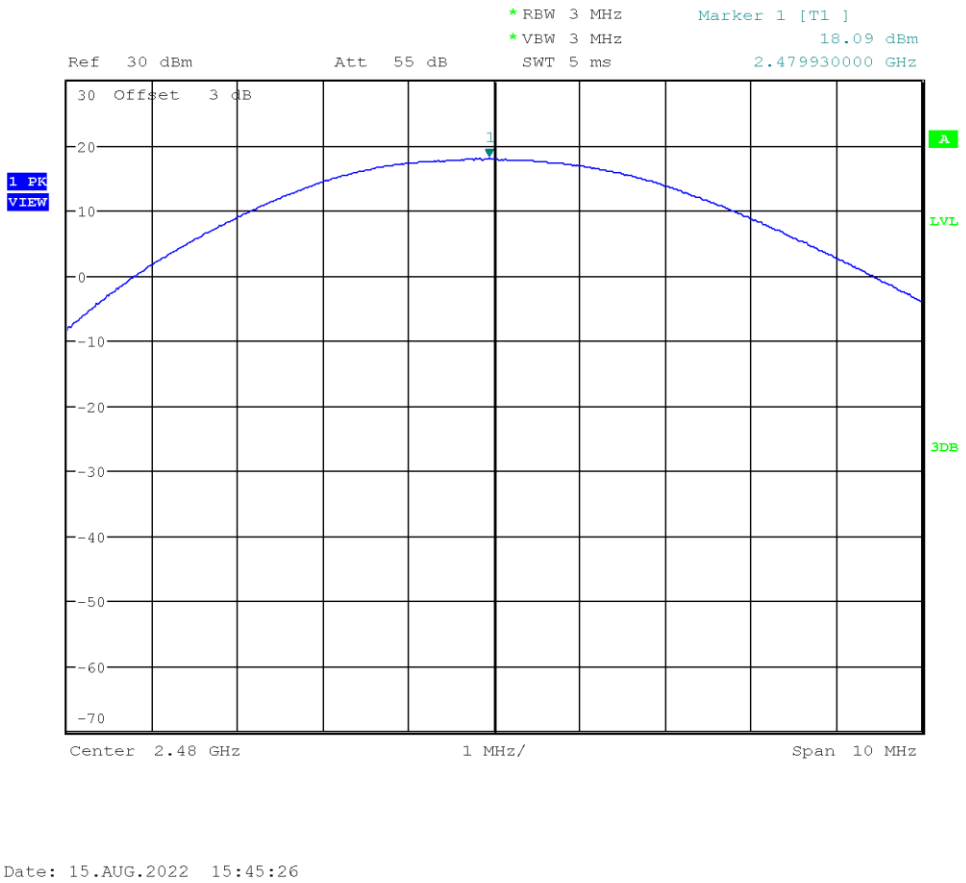
Peak Conducted Output Power

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 11.9.1.1
Operational Mode:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= 2 Mbps, PRBS9, Payload length = 250
Peak Power [dBm]:	17.285
Peak Power [W]:	0.0535



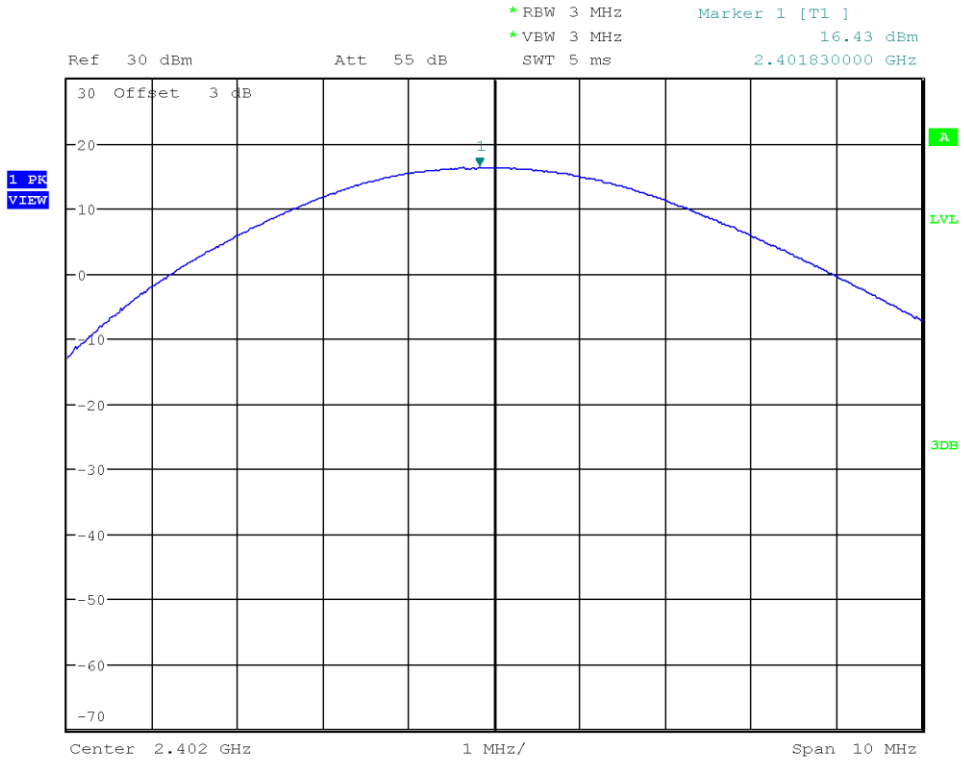
Peak Conducted Output Power

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 11.9.1.1
Operational Mode:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= 2 Mbps, PRBS9, Payload length = 250
Peak Power [dBm]:	18.086
Peak Power [W]:	0.0644



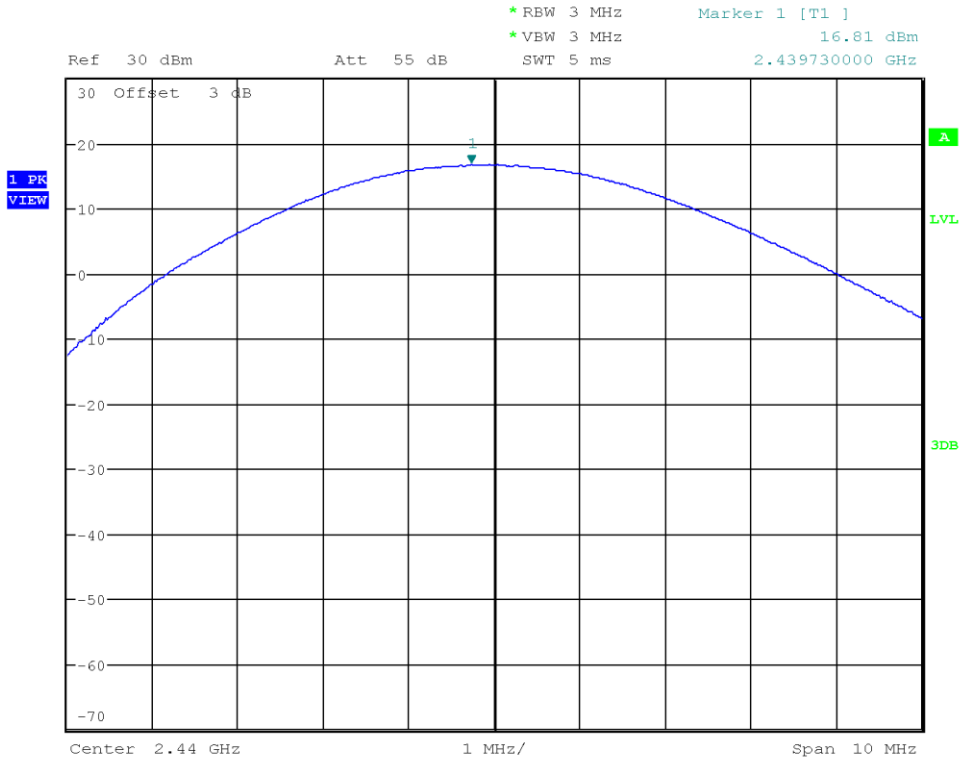
Peak Conducted Output Power

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 11.9.1.1
Operational Mode:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= Coded PHY S2 (500 kb/s) , PRBS9, Payload length = 250
Peak Power [dBm]:	16.430
Peak Power [W]:	0.0440



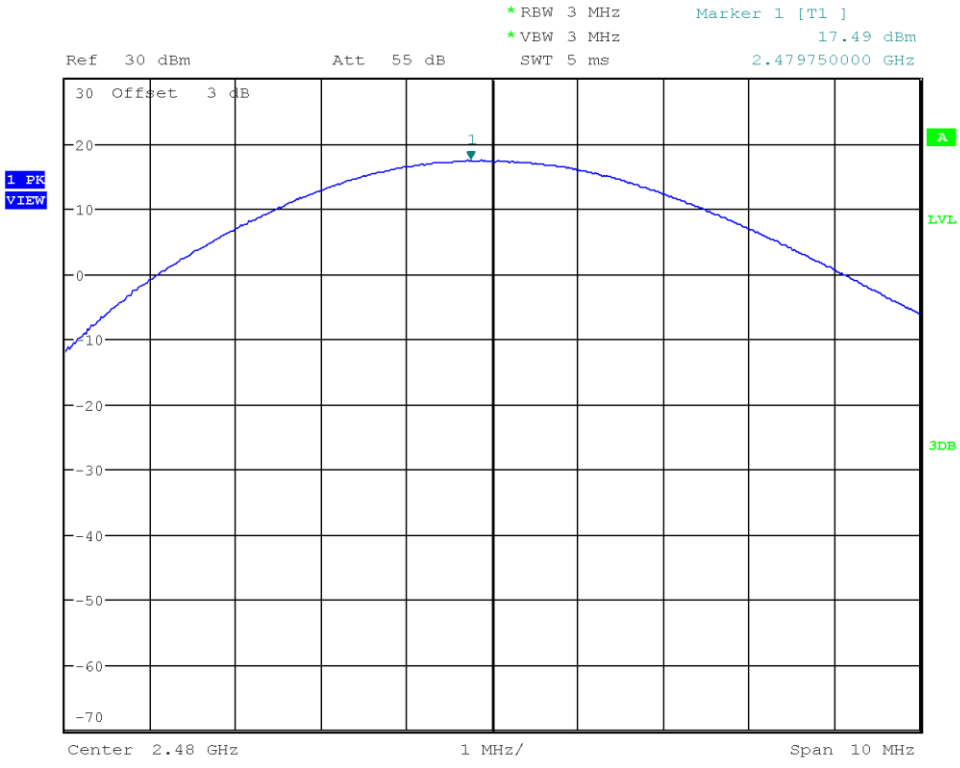
Peak Conducted Output Power

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 11.9.1.1
Operational Mode:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= Coded PHY S2 (500 kb/s) , PRBS9, Payload length = 250
Peak Power [dBm]:	16.807
Peak Power [W]:	0.0479



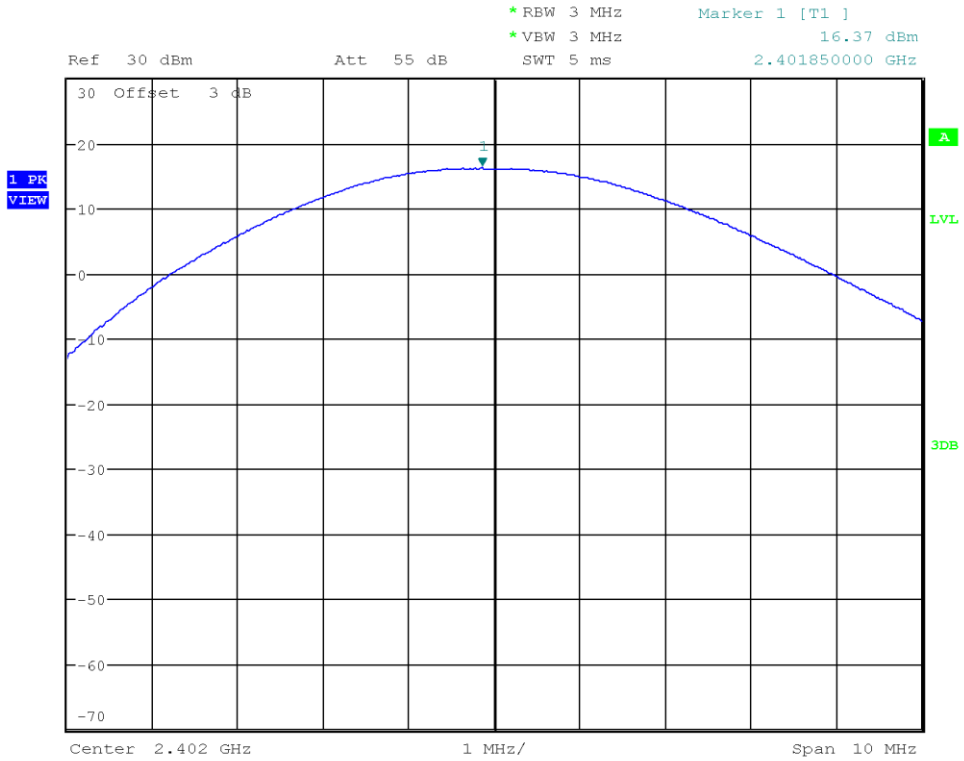
Peak Conducted Output Power

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 11.9.1.1
Operational Mode:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= Coded PHY S2 (500 kb/s) , PRBS9, Payload length = 250
Peak Power [dBm]:	17.495
Peak Power [W]:	0.0562



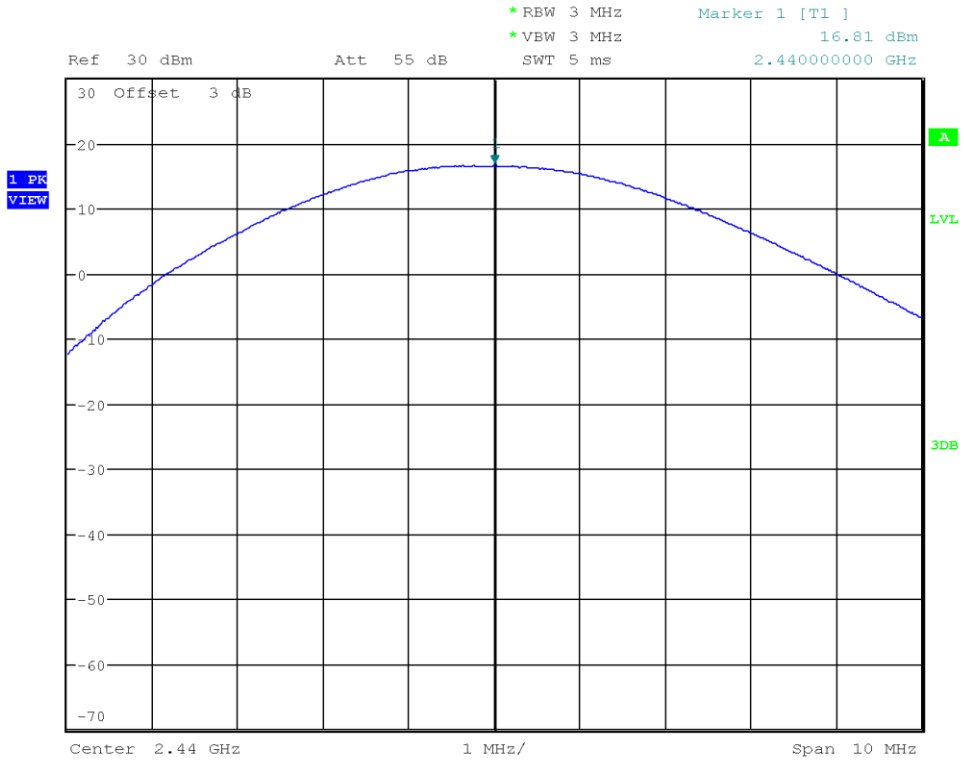
Peak Conducted Output Power

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 11.9.1.1
Operational Mode:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= Coded PHY S8 (128 kb/s) , PRBS9, Payload length = 250
Peak Power [dBm]:	16.370
Peak Power [W]:	0.0434



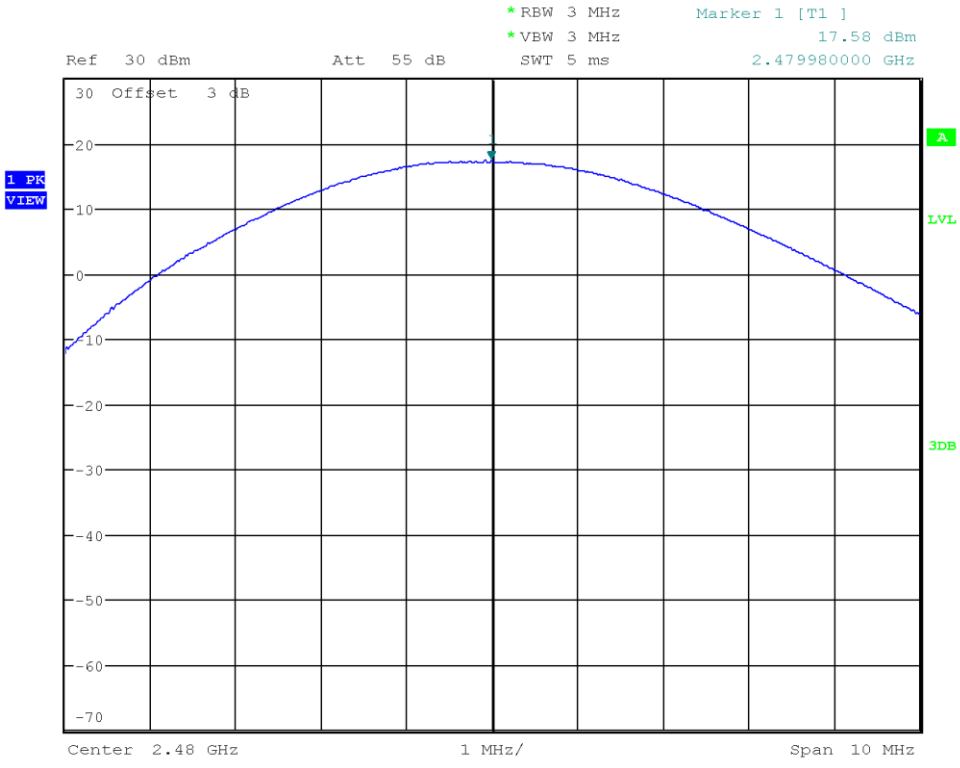
Peak Conducted Output Power

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 11.9.1.1
Operational Mode:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= Coded PHY S8 (128 kb/s) , PRBS9, Payload length = 250
Peak Power [dBm]:	16.805
Peak Power [W]:	0.0479



Peak Conducted Output Power

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 11.9.1.1
Operational Mode:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-15
Note:	Data rate= Coded PHY S8 (128 kb/s) , PRBS9, Payload length = 250
Peak Power [dBm]:	17.583
Peak Power [W]:	0.0573



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3.4 Test Conditions and Results - Power spectral density

3.4.1 Information

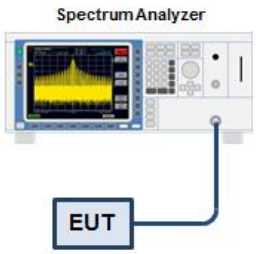
Test Information	
Reference	FCC § 15.247(e); ISED RSS-247, Issue 2 (section 5.2)
Measurement Method	ANSI C63.10 11.10.2, 14.3.2
Measurement Uncertainty	± 2.86 dB
Operator	Dr.-Ing. Dhamia Almozani
Date	2022-08-16

3.4.2 Limits

Limits
8 dBm / 3 kHz

3.4.3 Setup

Test 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 ≥ 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 1 Mbps			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
2402	3.870	8.0	PASS
2440	4.799	8.0	PASS
2480	5.150	8.0	PASS
RBW = 10 kHz			

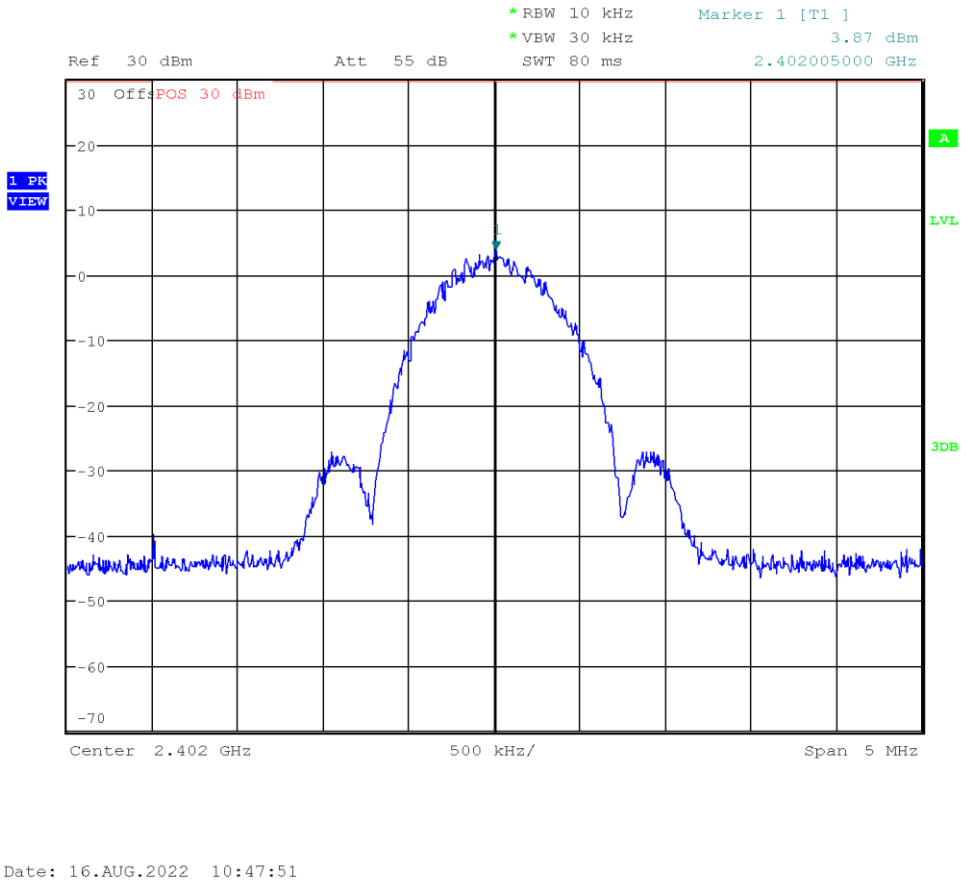
Test Results 2 Mbps			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
2402	3.517	8.0	PASS
2440	4.011	8.0	PASS
2480	5.085	8.0	PASS
RBW = 10 kHz			

Test Results Coded PHY S2 (500 kb/s)			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
2402	7.129	8.0	PASS
2440	7.282	8.0	PASS
2480	7.958	8.0	PASS
RBW = 10 kHz			

Test Results Coded PHY S8 (128 kb/s)			
Channel [MHz]	PSD [dBm/RBW]	Limit [dBm/3kHz]	Verdict
2402	6.383	8.0	PASS
2440	6.814	8.0	PASS
2480	7.548	8.0	PASS
RBW = 3 kHz			

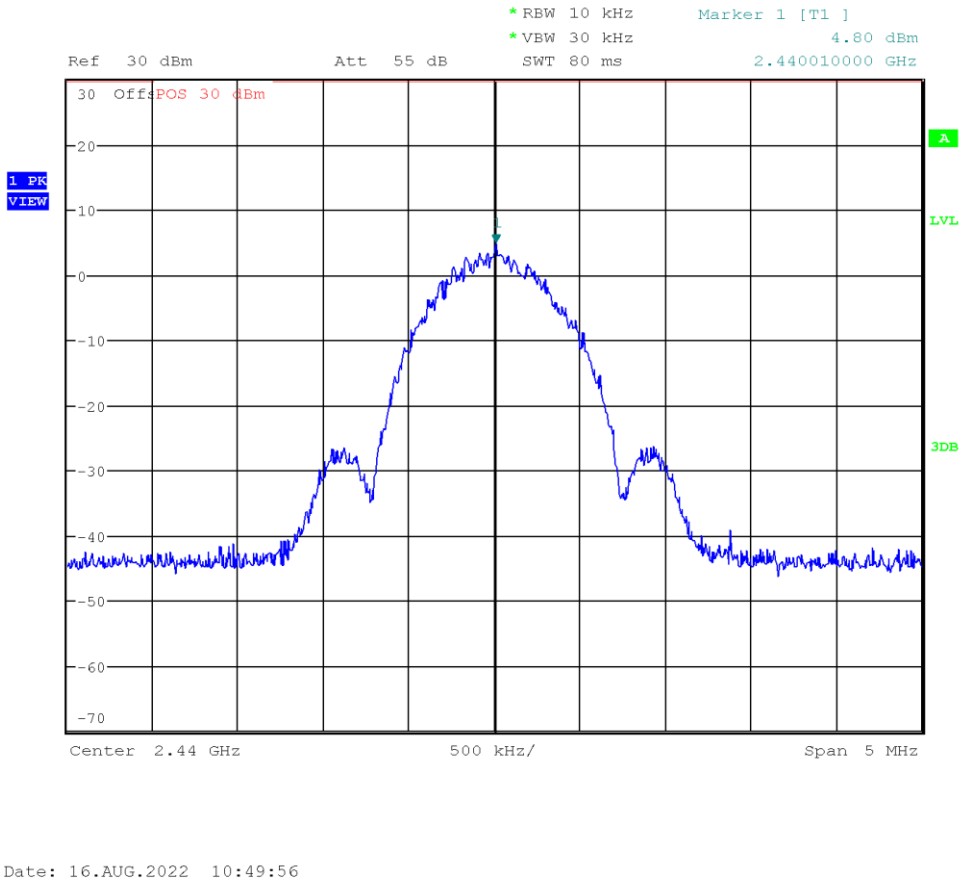
Peak Power Spectral Density

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:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-16
Note:	Data rate= 1 Mbps, PRBS9, Payload length = 250
Peak Frequency [MHz]:	2402.005
Spectral Density [dBm/RBW]:	3.870
Resolution Bandwidth [kHz]:	10 kHz



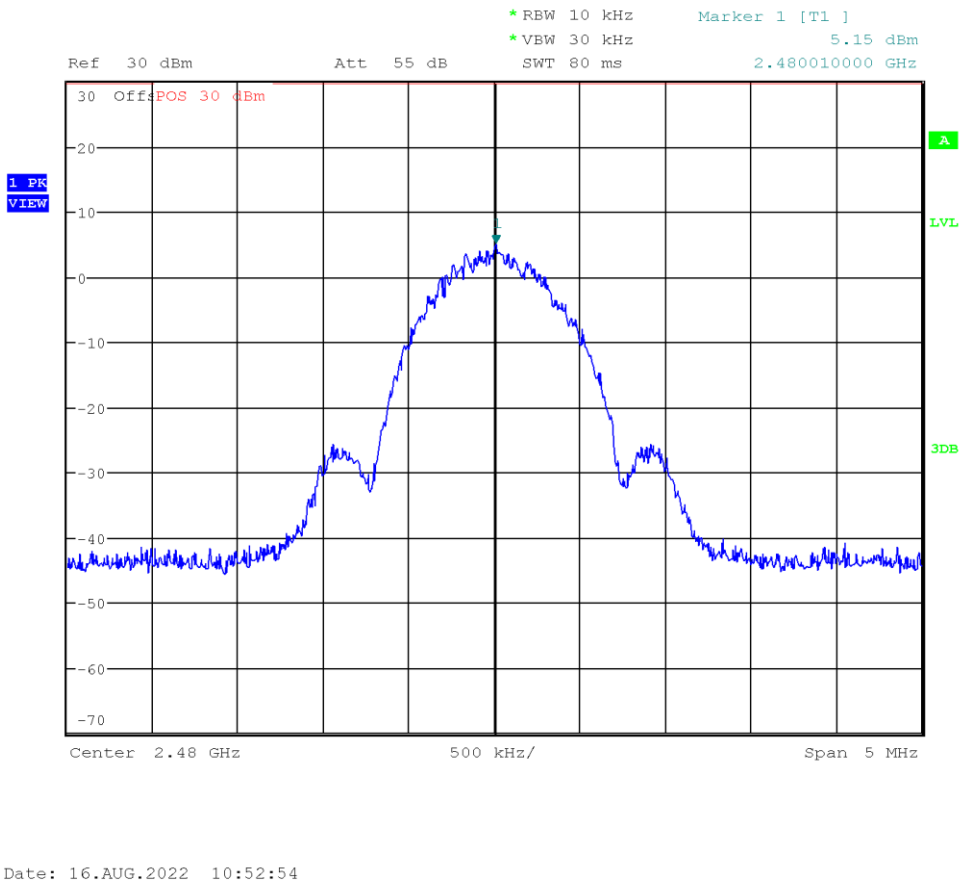
Peak Power Spectral Density

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:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-16
Note:	Data rate= 1 Mbps, PRBS9, Payload length = 250
Peak Frequency [MHz]:	2440.010
Spectral Density [dBm/RBW]:	4.799
Resolution Bandwidth [kHz]:	10 kHz



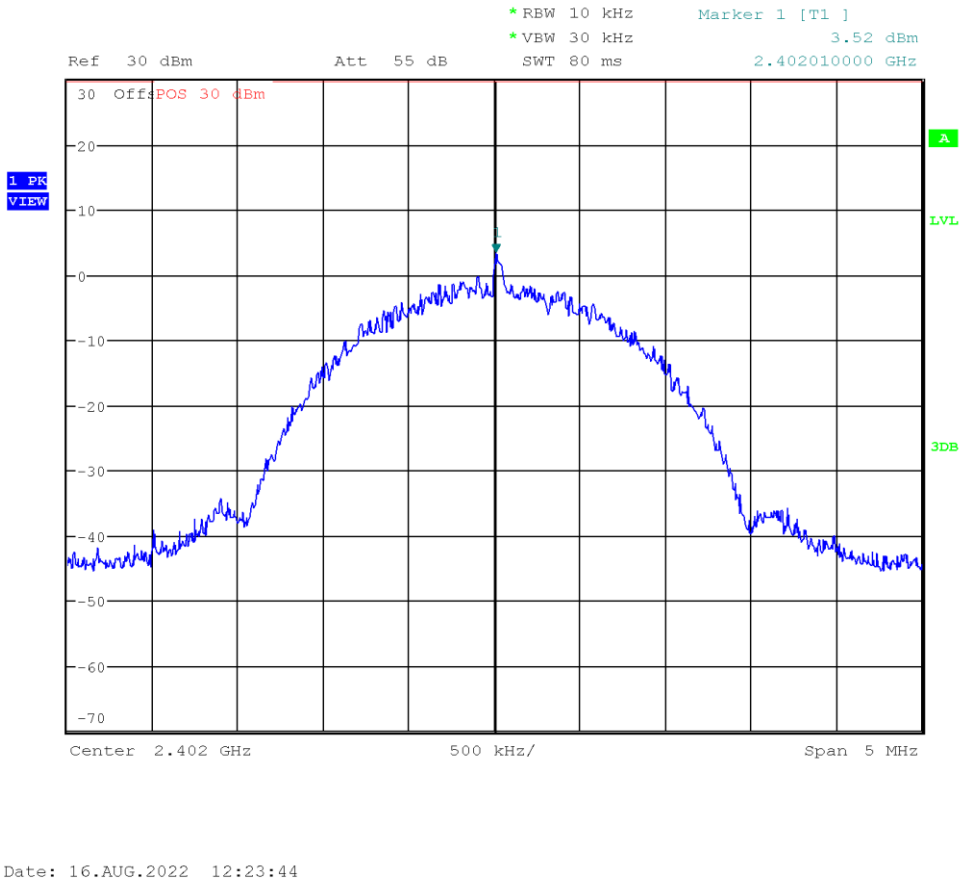
Peak Power Spectral Density

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:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-16
Note:	Data rate= 1 Mbps, PRBS9, Payload length = 250
Peak Frequency [MHz]:	2480.010
Spectral Density [dBm/RBW]:	5.150
Resolution Bandwidth [kHz]:	10 kHz



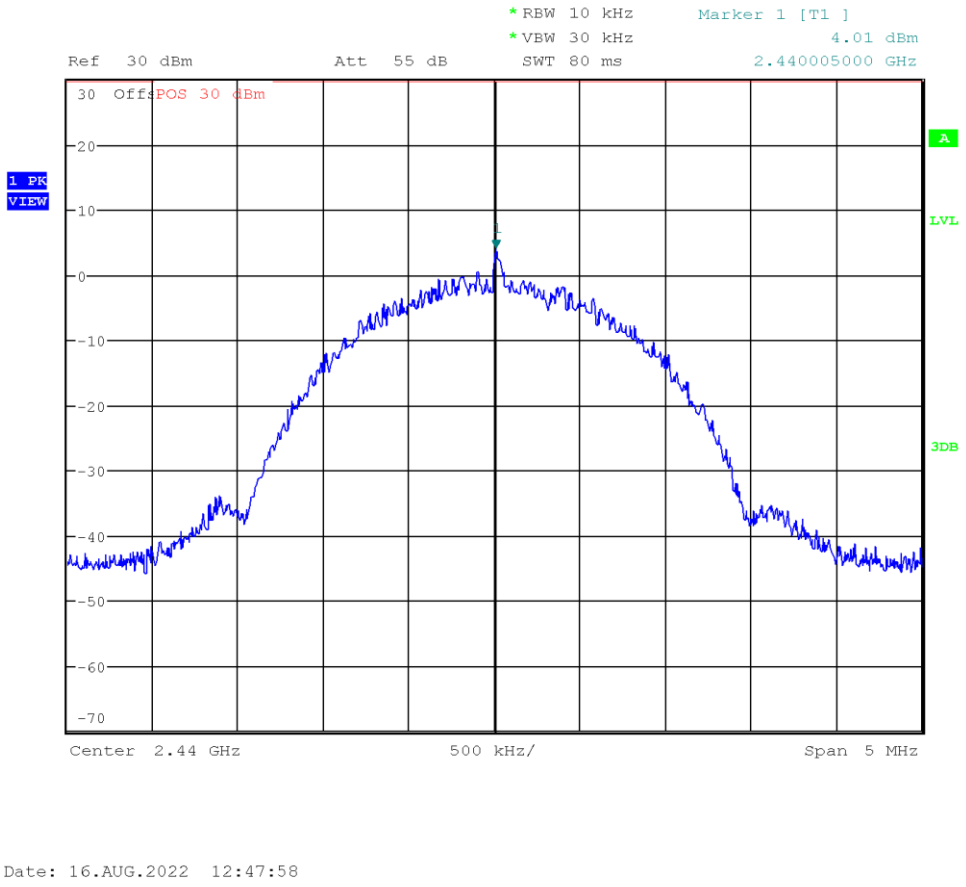
Peak Power Spectral Density

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:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-16
Note:	Data rate= 2 Mbps, PRBS9, Payload length = 250
Peak Frequency [MHz]:	2402.010
Spectral Density [dBm/RBW]:	3.517
Resolution Bandwidth [kHz]:	10 kHz



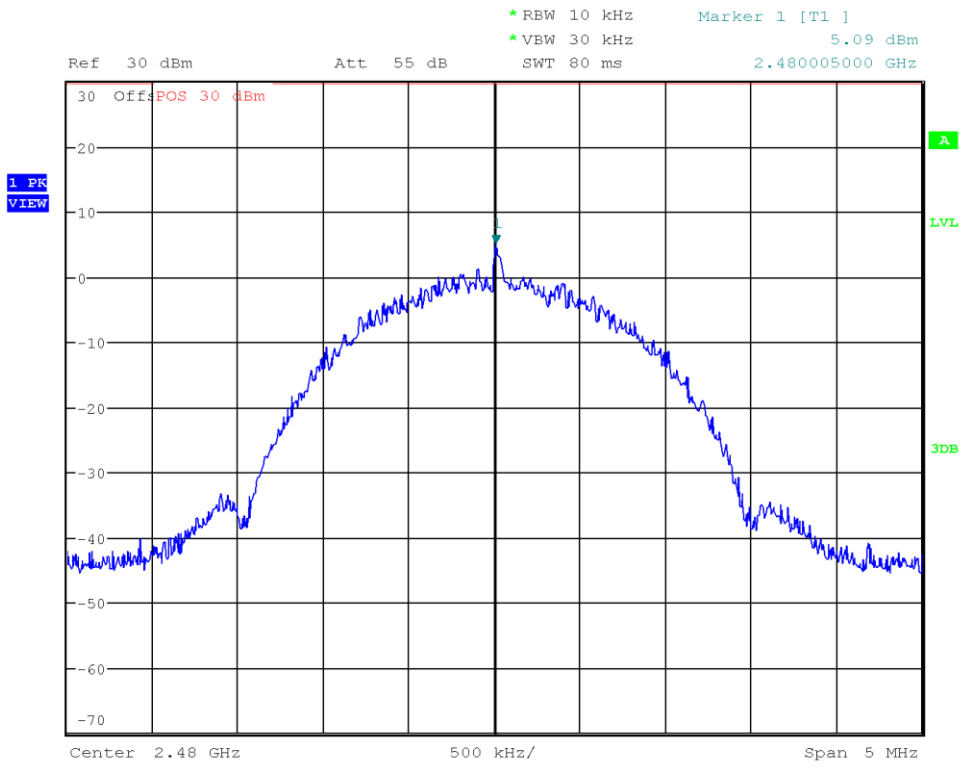
Peak Power Spectral Density

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:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-16
Note:	Data rate= 2 Mbps, PRBS9, Payload length = 250
Peak Frequency [MHz]:	2440.005
Spectral Density [dBm/RBW]:	4.011
Resolution Bandwidth [kHz]:	10 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:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-16
Note:	Data rate= 2 Mbps, PRBS9, Payload length = 250
Peak Frequency [MHz]:	2480.005
Spectral Density [dBm/RBW]:	5.085
Resolution Bandwidth [kHz]:	10 kHz



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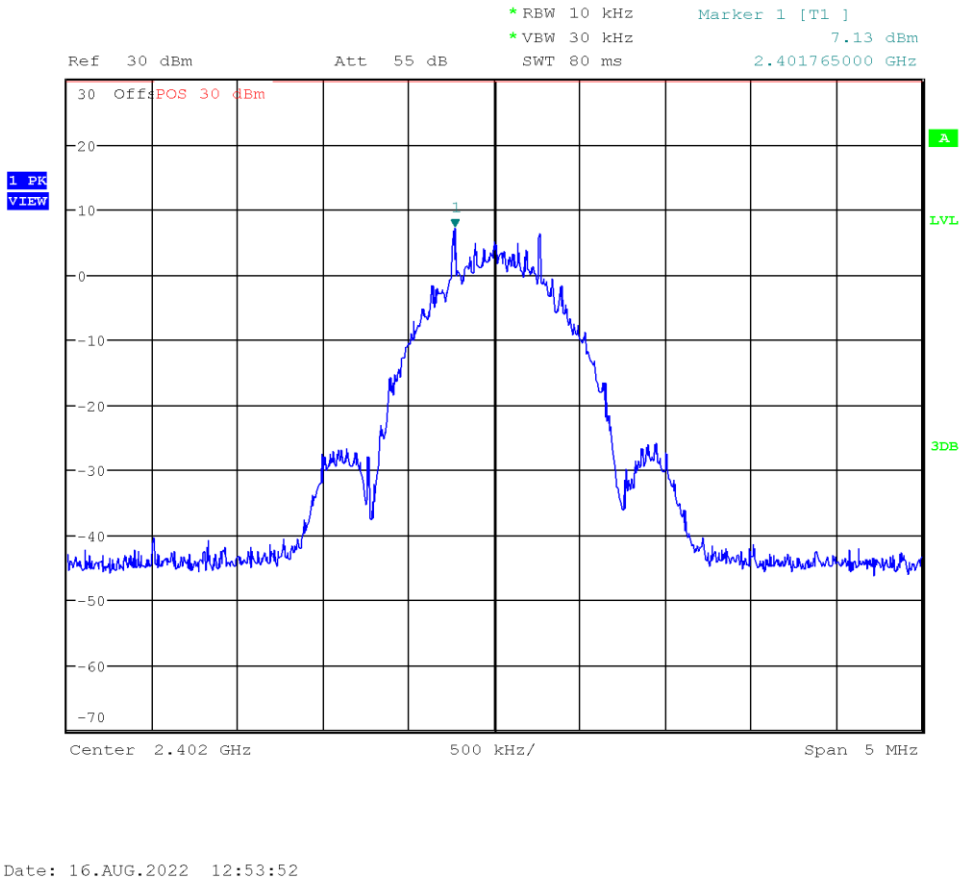
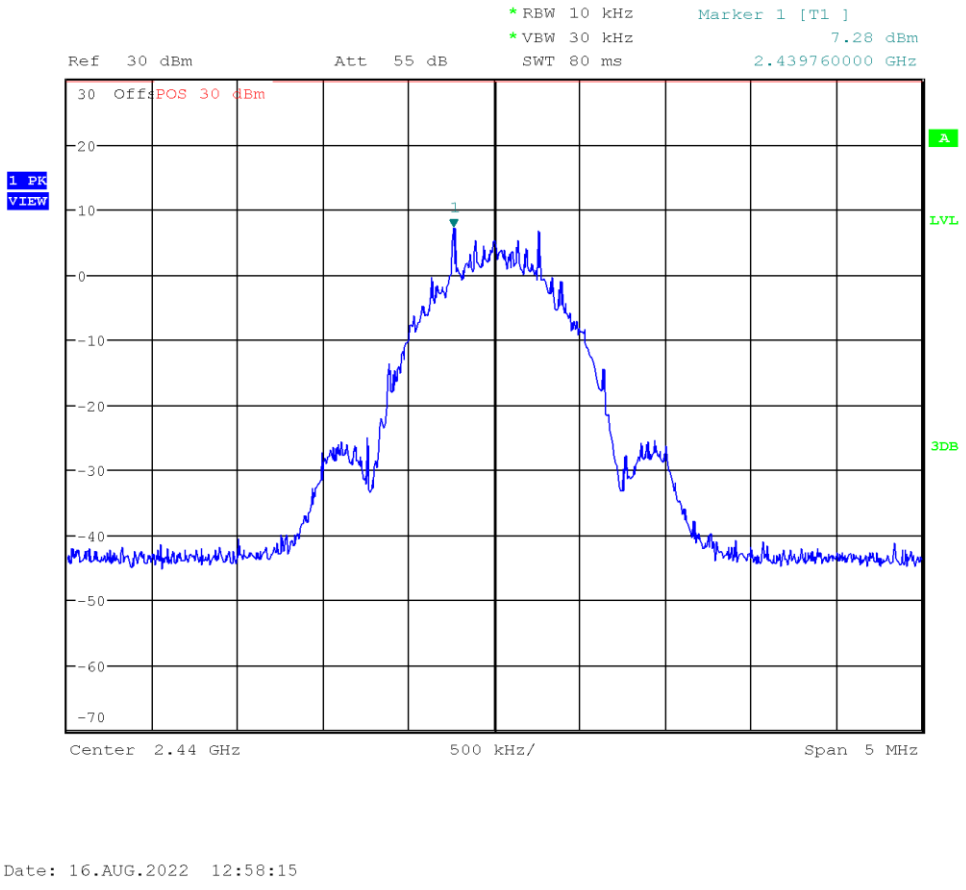
Peak Power Spectral Density

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:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-16
Note:	Data rate= Coded PHY S2 (500 kb/s) , PRBS9, Payload length = 250
Peak Frequency [MHz]:	2401.765
Spectral Density [dBm/RBW]:	7.129
Resolution Bandwidth [kHz]:	10 kHz



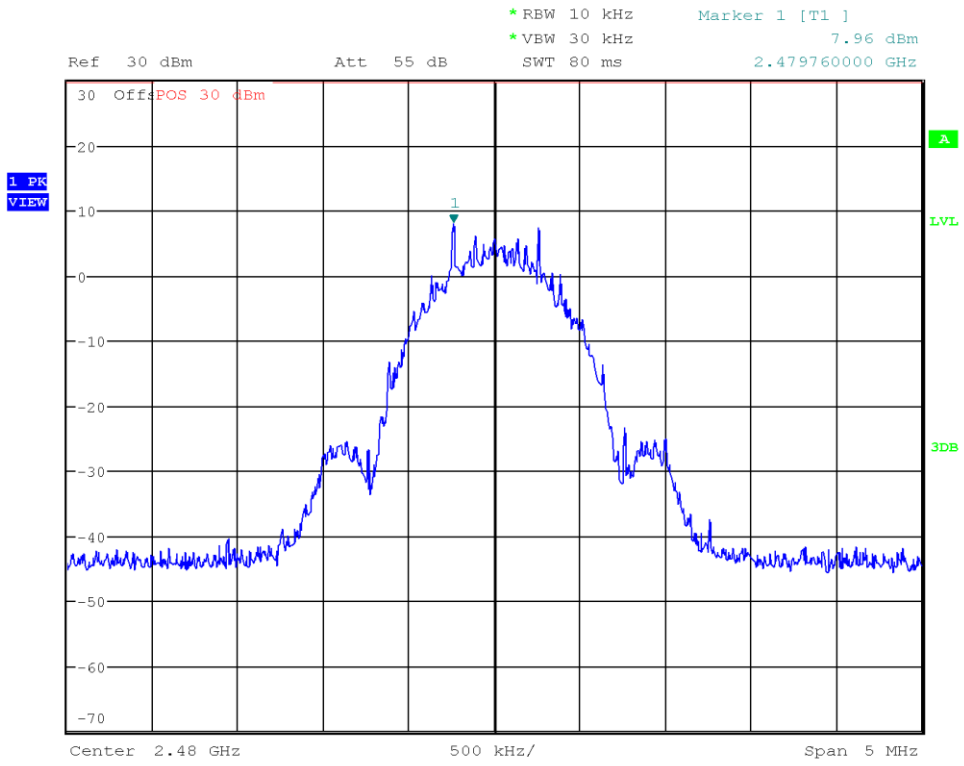
Peak Power Spectral Density

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:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-16
Note:	Data rate= Coded PHY S2 (500 kb/s) , PRBS9, Payload length = 250
Peak Frequency [MHz]:	2439.760
Spectral Density [dBm/RBW]:	7.282
Resolution Bandwidth [kHz]:	10 kHz



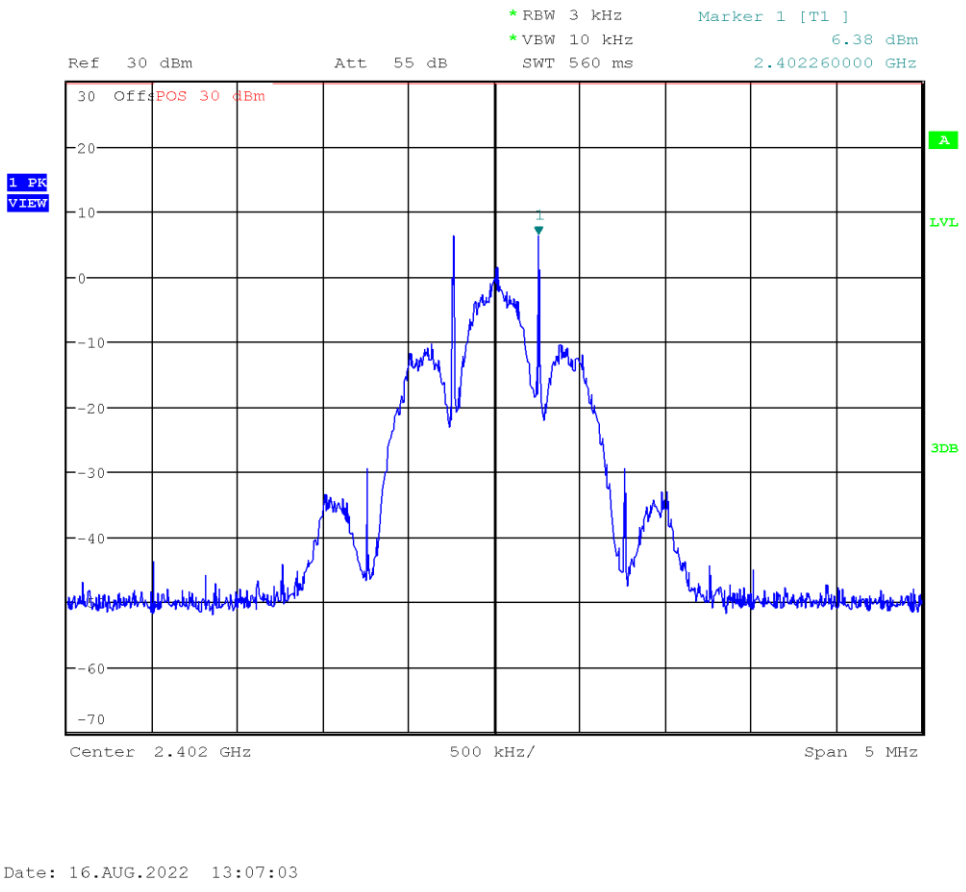
Peak Power Spectral Density

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:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-16
Note:	Data rate= Coded PHY S2 (500 kb/s) , PRBS9, Payload length = 250
Peak Frequency [MHz]:	2479.760
Spectral Density [dBm/RBW]:	7.958
Resolution Bandwidth [kHz]:	10 kHz



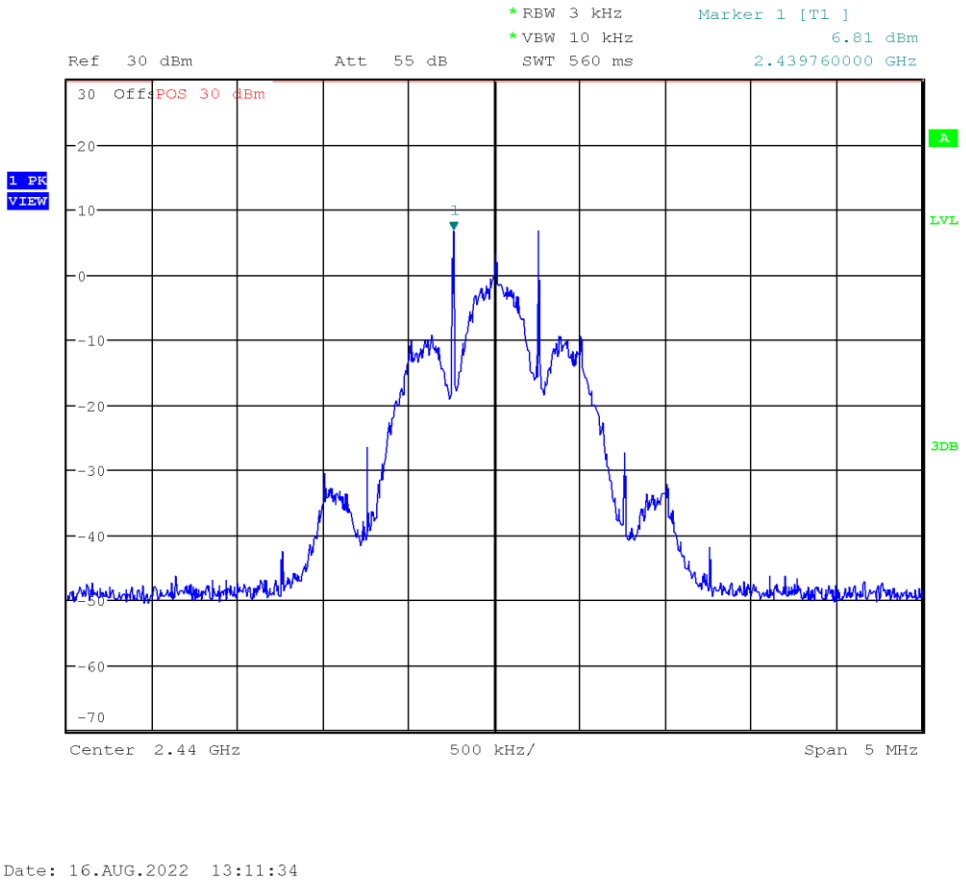
Peak Power Spectral Density

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:	GFSK, Channel: 0, 2402 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-16
Note:	Data rate= Coded PHY S8 (128 kb/s) , PRBS9, Payload length = 250
Peak Frequency [MHz]:	2402.260
Spectral Density [dBm/RBW]:	6.383
Resolution Bandwidth [kHz]:	3 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:	GFSK, Channel: 19, 2440 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-16
Note:	Data rate= Coded PHY S8 (128 kb/s) , PRBS9, Payload length = 250
Peak Frequency [MHz]:	2439.760
Spectral Density [dBm/RBW]:	6.814
Resolution Bandwidth [kHz]:	3 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:	GFSK, Channel: 39, 2480 MHz
Operating Conditions:	Tnom/Vnom
Operator:	Dhamia Almozani
Test Site:	Eurofins Product Service GmbH
Test Date:	2022-08-16
Note:	Data rate= Coded PHY S8 (128 kb/s) , PRBS9, Payload length = 250
Peak Frequency [MHz]:	2479.760
Spectral Density [dBm/RBW]:	7.548
Resolution Bandwidth [kHz]:	3 kHz