

NINA-B4 series certification

Stand-alone Bluetooth 5.1 low energy modules

Application note

Abstract

This application note describes the requirements for utilizing the existing regulatory certifications and declarations associated with NINA-B4 series modules.

Document information

| | | |
|------------------------|--|-------------|
| Title | NINA-B4 series | |
| Subtitle | Stand-alone Bluetooth 5.1 low energy modules | |
| Document type | Application note | |
| Document number | UBX-20037320 | |
| Revision and date | R04 | 20-Jan-2023 |
| Disclosure restriction | C1-Public+ | |

This document applies to the following products:

| Product name |
|--------------|
| NINA-B400 |
| NINA-B401 |
| NINA-B406 |
| NINA-B410 |
| NINA-B411 |
| NINA-B416 |

u-blox or third parties may hold intellectual property rights in the products, names, logos and designs included in this document. Copying, reproduction, modification or disclosure to third parties of this document or any part thereof is only permitted with the express written permission of u-blox.

The information contained herein is provided "as is" and u-blox assumes no liability for its use. No warranty, either express or implied, is given, including but not limited to, with respect to the accuracy, correctness, reliability and fitness for a particular purpose of the information. This document may be revised by u-blox at any time without notice. For the most recent documents, visit www.u-blox.com.

Copyright © u-blox AG.

Contents

| | |
|---|-----------|
| Document information | 2 |
| Contents | 3 |
| 1 Qualification status | 4 |
| 2 Qualification and approvals by country | 5 |
| 2.1 European Union regulatory compliance | 5 |
| 2.1.1 Radio Equipment Directive (RED) 2014/53/EU | 5 |
| 2.1.2 Output power limitation | 5 |
| 2.1.3 Compliance with the RoHS directive | 6 |
| 2.2 United States (FCC) | 6 |
| 2.2.1 FCC compliance | 6 |
| 2.2.2 FCC statement | 7 |
| 2.2.3 RF-exposure | 8 |
| 2.2.4 IEEE 802.15.4 channel map limitation | 8 |
| 2.2.5 End-product compliance | 8 |
| 2.3 Canada (ISED) | 9 |
| 2.3.1 Labeling and user information requirements | 9 |
| 2.3.2 RF-exposure | 10 |
| 2.4 Japan radio equipment compliance | 10 |
| 2.4.1 Compliance statement | 10 |
| 2.4.2 End product labelling requirement | 10 |
| 2.4.3 End product user manual requirement | 10 |
| 2.5 NCC Taiwan compliance | 11 |
| 2.5.1 Taiwan NCC Warning Statement | 11 |
| 2.5.2 Labeling requirements for end product | 11 |
| 2.6 KCC South Korea compliance | 12 |
| 2.7 Brazil compliance | 13 |
| 2.8 Australia and New Zealand regulatory compliance | 13 |
| 2.9 South Africa regulatory compliance | 14 |
| 2.10 Bluetooth qualification | 14 |
| 3 Pre-approved antennas list | 15 |
| 3.1 Antenna accessories | 15 |
| 3.2 Single band antennas | 15 |
| Appendix | 18 |
| A Glossary | 18 |
| Related documentation | 19 |
| Revision history | 19 |
| Contact | 19 |

1 Qualification status

 Approvals are pending.

NINA-B4 series modules are certified for use in the following countries/regions:

| Country/region | NINA-B4x0 | NINA-B4x1 | NINA-B4x6 |
|----------------|-----------|-----------|-----------|
| Europe | Approved | Approved | Approved |
| USA | Approved | Approved | Approved |
| Canada | Approved | Approved | Approved |
| Japan | Approved | Approved | Approved |
| Taiwan | Approved | Pending | Approved |
| South Korea | Approved | Approved | Approved |
| Brazil | Approved | Approved | Approved |
| Australia | Approved | Approved | Approved |
| New Zealand | Approved | Approved | Approved |
| South Africa | Pending | Pending | Pending |

Table 1: Country certification status for the NINA-B4 series modules

2 Qualification and approvals by country

2.1 European Union regulatory compliance

For information about the regulatory compliance of NINA-B4 series modules against requirements and provisions in the European Union, see the NINA-B4 Declaration of Conformity [\[1\]](#).

2.1.1 Radio Equipment Directive (RED) 2014/53/EU


NINA-B4 series modules comply with the essential requirements and other relevant provisions of Radio Equipment Directive (RED) 2014/53/EU.


2.1.2 Output power limitation

The Radio Equipment Directive requires radio transmitters that have an Equivalent Isotropically Radiated Power (EIRP) of 10 dBm or more, to either implement an adaptivity feature or reduce its medium utilization.

NINA-B4 series modules are based on the Nordic Semiconductor nRF52833 chip, which supports multiple radio protocols such as Bluetooth low energy, IEEE 802.15.4 with thread, etc.

Since Bluetooth low energy does not support either adaptivity or reduced medium utilization, a NINA-B4 Bluetooth LE implementation on the European market must have an EIRP of less than 10 dBm.

 In the European market, it is the end-product manufacturer that must ensure that these limitations are followed. If the u-blox module integrator is not the end-product manufacturer, the module integrator must make sure that this information is shared with the end product manufacturer.

 Radio protocols based on 802.15.4, which supports adaptivity is allowed an EIRP of 10 dBm or higher.

EIRP is calculated as:

$$\text{EIRP(dBm)} = P_{\text{TX}}(\text{dBm}) - L(\text{dB}) + G_{\text{TX}}(\text{dBi})$$

where, P_{TX} is the output power of the transmitter, L is the path loss of the transmission line between the transmitter and antenna, and G_{TX} is the maximum gain of the transmit antenna.

Consider the following for each of these components:

- Output power:
 - Output power setting of the NINA-B4 module - An end product user must not be able to increase the setting above the 10 dBm EIRP limit by sending configuration commands, etc.
 - The operating temperature of the end product – The output power of a transmitter is typically increased as the ambient temperature is lowered. The operating temperature range of NINA-B4 is -40 to +105 °C, and across this range the output power can typically vary by 1 dB. The output power at the lowest operating temperature (yielding the highest output power) must be considered for the EIRP calculation.
- Path loss – Long antenna cables or PCB traces, RF switches, etc, attenuate the power reaching the antenna. This path loss should be measured and taken into consideration for the EIRP calculation.
- Antenna gain - The maximum gain of the transmit antenna must be considered for the EIRP calculation.

2.1.3 Compliance with the RoHS directive

NINA-B4 series modules comply with the Directive 2011/65/EU (EU RoHS 2) and its amendment Directive (EU) 2015/863 (EU RoHS 3).

2.2 United States (FCC)

NINA-B4 series modules have received Federal Communications Commission (FCC) CFR47 Telecommunications, Part 15 Subpart C “Intentional Radiators” in accordance with Part 15.247 and Modular Transmitter approval in accordance with Part 15.212.

Provided no changes or modifications are made to the module circuitry, the modular approval of the NINA-B4 series allows an end-product manufacturer to integrate the module into an existing product without the need for additional testing or equipment authorization for the transmitter function in NINA-B4 modules. Changes or modifications could void the user’s authority to operate the equipment. The end-user must comply with all instructions provided by the Grantee, which describe the installation and/or operating conditions necessary for compliance.

The finished product is required to comply with all applicable FCC equipment authorizations regulations, requirements, and equipment functions that are not associated with the transmitter module. For example, compliance against regulations for other transmitter components within the host product must be demonstrated, and the requirements for unintentional radiators (Part 15 Subpart B “Unintentional Radiators”), such as digital devices, computer peripherals, radio receivers, etc., must also be met. Any additional authorization requirements (for verification or conformity declarations) that are not related to transmitter functions in the module transmitter may also contain any required digital logic functions.

2.2.1 FCC compliance

NINA-B4 series modules are intended for OEM integrators only. The end product must be professionally installed in way that only authorized antennas can be used. The (OEM) Integrator must assure compliance of the entire end product that includes the integrated NINA-B4 module.

For compliance with FCC Part 15B (§15.107, and if applicable the §15.109 regulations, the host manufacturer is required to show conformant operation of the installed product. The product evaluation should also confirm that the intentional emissions (15C) from the module are compliant during (fundamental and out-of-band) transmission. Additionally, the integrator must apply the appropriate equipment authorization (verification) for the new host device as defined in §15.101.

The details of the module implementation in host device are confidential. Integrators are reminded not to share the installation instructions of the module to any end-user of the final host device.

The final host device, into which this RF module is integrated must be labeled with an auxiliary label stating the FCC ID of the RF Module, such as:

“Contains FCC ID: XPYNINAB4”

"This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any received interference, including interference, that might cause undesired operation.”

"Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment."

The Integrator is responsible for satisfying SAR/ RF exposure requirements once the module has been integrated into the host device.

- ⚠ NINA-B4 series modules are intended for OEM integrators only. End-products that include u-blox modules must be professionally installed in such a way that only the authorized antennas listed included in the [Pre-approved antennas list](#) can be used.
- ⚠ If the antenna connector is easily accessible to the end-user, only Reversed Polarity SMA connectors are allowed in the final end user product.
- ⚠ The details of the module implementation in the host device (end-product) should remain confidential. Integrators are reminded not to share the module installation instructions to the end-user of the end-product (host device).
- ⚠ Any changes or modifications NOT explicitly APPROVED by u-blox AG may invalidate compliance with FCC rules part 15 and subsequently void the user's authority to operate the equipment.
- ⚠ Any changes to hardware, hosts, or co-location configuration may require new radiated emission and SAR evaluation and/or testing.
- ⚠ The end-product manufacturer (OEM integrator) is responsible for verifying the end-product compliance with FCC Part 15, subpart B limits for unintentional radiators through an accredited test facility.

| Model | FCC ID |
|-----------|------------------|
| NINA-B400 | FCC ID: XPNINAB4 |
| NINA-B401 | FCC ID: XPNINAB4 |
| NINA-B406 | FCC ID: XPNINAB4 |
| NINA-B410 | FCC ID: XPNINAB4 |
| NINA-B411 | FCC ID: XPNINAB4 |
| NINA-B416 | FCC ID: XPNINAB4 |

Table 02: FCC ID for the NINA-B4 series modules

2.2.2 FCC statement

The single-modular transmitter supported in NINA-B4 modules is a self-contained, physically delineated component for which compliance can be demonstrated independent of the host operating conditions.

The transmitter complies with all eight requirements of FCC § 15.212(a)(1), as summarized below:

1. The radio elements of the radio frequency circuitry is shielded.
2. The module has buffered modulation/data inputs to ensure that the device complies with Part 15 requirements with any type of input signal.
3. The module includes power supply regulation in the module.
4. The module contains a permanently attached antenna.
5. The module demonstrates compliance in a stand-alone configuration.
6. The module includes a permanently affixed FCC ID label.
7. The module complies with all specific rules applicable to the transmitter, including all conditions provided in the integration instructions by the grantee.
8. The module complies with RF exposure requirements.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

2.2.3 RF-exposure

This device complies with the FCC radiation exposure limits set forth for an uncontrolled environment.

NINA-B4 modules are approved for installation into mobile and/or portable host platforms and must not be co-located or operating in conjunction with any other antenna or transmitter – except in accordance with FCC multi-transmitter guidelines. End-users must be provided with transmitter operating conditions for satisfying RF Exposure compliance.

To ensure that the output power remains below the SAR evaluation Exemption limits defined in SAR test exclusion limits in KDB 447498 D01v06, customer applications integrating the NINA-B4 modules must include a separation distance of at least 5 mm between the user (or bystander) and the antenna (or radiating element).

2.2.4 IEEE 802.15.4 channel map limitation

(When the module working with the Antenna board ANT-B10, not support this technology)

The 2.4 GHz band used by 802.15.4 communications is segmented into 16 channels, ranging from channel 11 at 2405 MHz to channel 26 at 2480 MHz, with 5 MHz channel spacing. Due to the wide spectral properties of the 802.15.4 signal, the use of channel 26 results in too much power being transmitted in the FCC restricted band starting at 2483.5 MHz. As a result, channel 26 must not be used on the US/Canadian market.

2.2.5 End-product compliance

Application designs must conform to the following requirements:

- Any changes to hardware, hosts or co-location configuration may require new radiated emission and SAR evaluation and/or testing.
- Only authorized antenna(s) may be used.
- Any notification to the end user about how to install or remove the integrated radio module is NOT allowed.
- The approval of the modular transmitter in NINA-B4 series modules does not exempt the end product from being evaluated against any applicable regulatory demands. The evaluation of the end product shall be performed with the NINA-B4 module installed and operating in a way that reflects the intended use case of the end product. The upper frequency measurement range for the end product evaluation is the 5th harmonic of 2.4 GHz as declared in 47 CFR Part 15.33 (b)(1).

- The following requirements apply to all products that integrate a radio module:
 - Subpart B - UNINTENTIONAL RADIATORS
To verify that the composite device of host and module complies with the requirements of FCC part 15B the integrator shall perform sufficient measurements using equipment compliant with ANSI 63.4-2014.
 - Subpart C - INTENTIONAL RADIATORS
The integrator must carry out sufficient verification measurements, using compliant ANSI 63.10-2013 equipment, to validate that the fundamental and out-of-band emissions of the transmitter part of the composite device comply with the requirements of FCC part 15C.
- When the items listed above are fulfilled the host manufacturer can use the authorization procedures presented in Table 1 of 47 CFR Part 15.101.

2.3 Canada (ISED)

NINA-B4 series module are certified for use in accordance with the Canada under Innovation, Science and Economic Development Canada (ISED) Radio Standards Specification (RSS) RSS-247 Issue 2 and RSSGen.

2.3.1 Labeling and user information requirements

The final host device, into which this RF Module is integrated, must be labeled with an auxiliary label stating the IC of the RF Module, such as:

“Contains transmitter module IC: 8595A-NINAB4”

Le périphérique hôte final, dans lequel ce module RF est intégré "doit être étiqueté avec une étiquette auxiliaire indiquant le CI du module RF, tel que" Contient le module émetteur IC: 8595A-NINAB4

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

| Model | IC number |
|-----------|------------------|
| NINA-B400 | IC: 8595A-NINAB4 |
| NINA-B401 | IC: 8595A-NINAB4 |
| NINA-B406 | IC: 8595A-NINAB4 |
| NINA-B410 | IC: 8595A-NINAB4 |
| NINA-B411 | IC: 8595A-NINAB4 |
| NINA-B416 | IC: 8595A-NINAB4 |

Table 3: IC for the NINA-B4 series modules

2.3.2 RF-exposure

All transmitters regulated by IC must comply with RF exposure requirements listed in RSS-102 - Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands). This module is approved for installation into mobile and/or portable host platforms and must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with Industry Canada's multi-transmitter guidelines. End-users must be provided with transmitter operating conditions for satisfying RF Exposure compliance.

To ensure that the output power remains below the SAR evaluation Exemption limits defined in RSS-102 issue 5, customer applications integrating the NINA-B4 modules must include a separation distance of at least 15 mm between the user (or bystander) and the antenna (or radiating element).

2.4 Japan radio equipment compliance

2.4.1 Compliance statement

NINA-B4 series modules comply with the Japanese Technical Regulation Conformity Certification of Specified Radio Equipment (ordinance of MPT N°. 37, 1981), Article 2, Paragraph 1:

- Item 19 "2.4 GHz band wide band low power data communication system".

2.4.2 End product labelling requirement

End products based on NINA-B4 series modules and targeted for distribution in Japan must be affixed with a label with the "Giteki" marking, as shown in [Figure 1](#). The marking must be visible for inspection.



Figure 1: Giteki mark  and NINA-B4 MIC certification number

2.4.3 End product user manual requirement

As the MIC ID is not included on the NINA-B4 marking, the end product manufacturer must include a copy of the NINA-B4 Japan Radio Certificate in the end product technical documentation.

2.5 NCC Taiwan compliance

 Approvals are pending for NINA-B401 and NINA-B411.

2.5.1 Taiwan NCC Warning Statement

- 經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。
- 低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

Statement translation:

- Without permission granted by the NCC, any company, enterprise, or user is not allowed to change frequency, enhance transmitting power, or alter original characteristic as well as performance to an approved low power radio-frequency device.
- The low power radio-frequency devices shall not influence aircraft security and interfere legal communications; If any interference is found or suspected, the user shall immediately cease operating the equipment until the interference has been prevented. The said legal communications means radio communications is operated in compliance with the Telecommunications Act. The low power radio-frequency devices must be susceptible with the interference from legal communications or ISM radio wave radiated devices.

2.5.2 Labeling requirements for end product

When a product integrating a NINA-B4 series module is placed on the Taiwanese market, the product must be affixed with a label or marking containing at least the following information:

2.5.2.1 NINA-B400 label

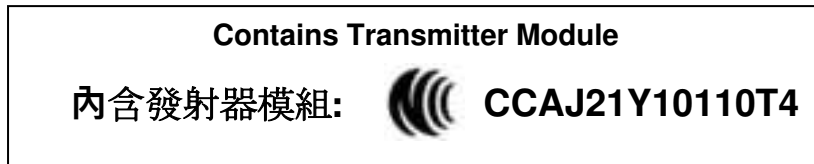


Figure 2: Example of an end product label that includes a NINA-B400 module

2.5.2.2 NINA-B406 label



Figure 3: Example of an end product label that includes a NINA-B406 module

2.5.2.3 NINA-B410 label

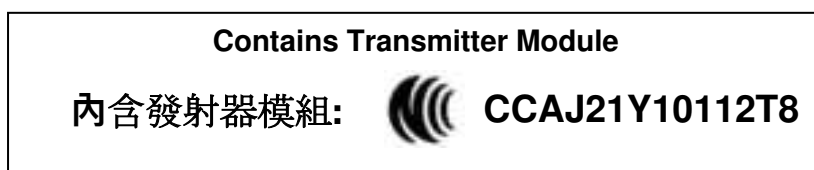


Figure 4: Example of an end product label that includes a NINA-B410 module

2.5.2.4 NINA-B416 label



Figure 5: Example of an end product label that includes a NINA-B416 module

Other wording can be used, but only if the meaning of original messaging remains unchanged. The label must be physically attached to the product and made clearly visible for inspection.



Note that each NINA-B4 module variant has its own certification number.

| Module variant | NCC ID |
|----------------|----------------|
| NINA-B400 | CCAJ21Y10110T4 |
| NINA-B401 | TBD |
| NINA-B406 | CCAJ21Y100F0T2 |
| NINA-B410 | CCAJ21Y10112T8 |
| NINA-B411 | TBD |
| NINA-B416 | CCAJ21Y100F1T4 |

Table 1: NINA-B4 series NCC ID certification numbers

2.6 KCC South Korea compliance

NINA-B4 series modules are certified by the Korea Communications Commission (KCC).

End products based on NINA-B4 series modules and targeted for distribution in South Korea must carry labels containing the KCC logo and certification number, as shown below. This information must also be included in the product user manuals.



R-C-ULX-NINA-B400



The height of the KCC logo must be at least 5 mm.

2.7 Brazil compliance

End products based on NINA-B4 series modules and targeted for distribution in Brazil must carry labels that include the Anatel logo, NINA-B4 Homologation number: 11049-21-05903 and a statement claiming that the device may not cause harmful interference but must accept it (Resolution No 506).



“Este equipamento opera em caráter secundário, isto é, não tem direito a proteção contra interferência prejudicial, mesmo de estações do mesmo tipo, e não pode causar interferência a sistemas operando em caráter primário.”

Statement translation:

“This equipment operates on a secondary basis and, consequently, must accept harmful interference, including from stations of the same kind, and may not cause harmful interference to systems operating on a primary basis.”

When the device is so small or for such use that it is not practicable to place the statement above on the label, the information shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed.

In cases where the final product is to be installed in locations where the end user is unable to see the Anatel logo, NINA-B4 Homologation number and/or statement, these graphical and textual elements must be included in the end product manual.

2.8 Australia and New Zealand regulatory compliance



The NINA-B4 module is compliant with the standards made by the Australian Communications and Media Authority (ACMA).

The modules are compliant with AS/NZS 4268:2012 standard – Radio equipment and systems – Short range devices – Limits and methods of standard measurement. The test reports for NINA-B4 modules can be used as part of the product certification and compliance folder. For more information on the test reports, email the respective support team at the local mail address in your region. See [Contact](#)

For further support and contact information, visit us at www.u-blox.com/support.

To meet the overall Australian and/or New Zealand end product compliance standards, the integrator must create a compliance folder containing all the relevant compliance test reports such as RF, EMC, electrical safety and DoC (Declaration of Conformity). It is the responsibility of the integrator to know what is required in the compliance folder for ACMA compliance.

For more information on Australia compliance, refer to the Australian Communications and Media Authority web site <http://www.acma.gov.au/>.

For more information on New Zealand compliance, refer to the New Zealand Radio Spectrum Management Group web site www.rsm.govt.nz.

2.9 South Africa regulatory compliance

Approvals are pending.

NINA-B4 series modules are compliant and certified by the Independent Communications Authority of South Africa (ICASA). End products that are made available for sale or lease or supplied in any other manner in South Africa shall have a legible label permanently affixed to its exterior surface. The label shall include the ICASA logo and the ICASA issued license number, as shown in the figure below. The minimum width and height of the ICASA logo shall be 3 mm. The approval labels must be purchased by the customer's local representative directly from the approval authority ICASA. A sample of a NINA-B4 ICASA label is shown below:



More information on registration as a Responsible Integrator and labeling requirements can be found at the following website:

Independent Communications Authority of South Africa (ICASA) web site - <https://www.icasa.org.za>

2.10 Bluetooth qualification



End products must be qualified and listed with the [Bluetooth Special Interest Group \(SIG\)](#).

Product declarations are submitted through the SIG [Bluetooth Launch Studio website](#).

NINA-B40 module series are qualified as an end product in accordance with the Bluetooth 5.1 specification and are registered with the SIG Qualified Design IDs (QDID) shown in [Table 2](#).


| Product type | QDID | Listing date |
|--------------|--------|--------------|
| End product | 157158 | 2020-10-13 |

Table 2: NINA-B40 series Bluetooth qualified design ID

For more information about Bluetooth® declaration and qualification process for end-products incorporating u-blox Bluetooth Low Energy modules based on Nordic Semiconductor nRF5 chipsets with open CPU applications, see the application note [\[3\]](#).

3 Pre-approved antennas list

This chapter lists the external antennas that are pre-approved for use together with NINA-B4 series modules.

 Note that not all antennas are approved for use in all markets/regions.

3.1 Antenna accessories

| Name | U.FL to SMA adapter cable |
|--------------------|--|
| Connector | U.FL and SMA jack (outer thread and pin receptacle) |
| Impedance | 50 Ω |
| Minimum cable loss | 0.5 dB, The cable loss must be above the minimum cable loss to meet the regulatory requirements. Minimum cable length 100 mm. |
| Comment | The SMA connector can be mounted in a panel. See NINA-B4 Series system integration manual [2] for information how to integrate the U.FL connector. |
| Approval | RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA |

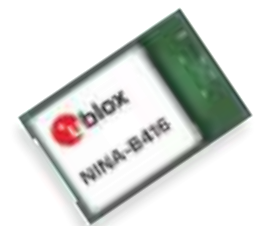


| Name | U.FL to Reverse Polarity SMA adapter cable |
|--------------------|---|
| Connector | U.FL and Reverse Polarity SMA jack (outer thread and pin) |
| Impedance | 50 Ω |
| Minimum cable loss | 0.5 dB. The cable loss must be above the minimum cable loss to meet the regulatory requirements. Minimum cable length 100 mm. |
| Comment | The Reverse Polarity SMA connector can be mounted in a panel. See NINA-B4 Series system integration manual [2] for information about how to integrate the U.FL connector. This reference design must be followed to comply with the NINA-B4 FCC/IC modular approvals. |
| Approval | FCC, IC, RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA |



3.2 Single band antennas

| NINA-B406 and NINA-B416 | |
|-------------------------|---|
| Manufacturer | Abracon |
| Gain | +3 dBi |
| Impedance | N/A |
| Size (HxWxL) | 1.1 x 3.4 x 10 mm |
| Type | PCB trace |
| Comment | PCB antenna on NINA-B406 and NINA-B416. The antenna should not be mounted inside a metal enclosure. |
| Approval | FCC, IC, RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA |



| GW.26.0111 | |
|--------------|-----------------|
| Manufacturer | Taoglas |
| Polarization | Vertical |
| Gain | +2.0 dBi |
| Impedance | 50 Ω |
| Size | Ø 7.9 x 30.0 mm |
| Type | Monopole |



GW.26.0111

| | |
|-----------|---|
| Connector | SMA (M) . |
| Comment | To be mounted on the U.FL to SMA adapter cable. |
| Approval | RED, MIC, KCC, ANATEL, ACMA and ICASA |

Wi-Fi external antenna, PN PRO-EX-348

| | |
|--------------|---|
| Manufacturer | Abracon |
| Polarization | Vertical |
| Gain | +3.0 dBi |
| Impedance | 50 Ω |
| Size | \varnothing 12.0 x 28.0 mm |
| Type | Monopole |
| Connector | Reverse Polarity SMA plug (inner thread and pin receptacle). |
| Comment | This antenna should be mounted on a metal ground plane for best performance. To be mounted on the U.FL to Reverse Polarity SMA adapter cable. An SMA version antenna is also available but not recommended for use (Ex-IT 2400 SMA 28-001). |
| Approval | FCC, IC, RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA (certified as PN Ex-IT 2400 RP-SMA 28-001) |


Wi-Fi / Bluetooth external antenna, PN PRO-EX-296

| | |
|--------------|--|
| Manufacturer | Abracon |
| Polarization | Vertical |
| Gain | +2.0 dBi |
| Impedance | 50 Ω |
| Size | \varnothing 12.0 x 28.0 mm |
| Type | Monopole |
| Cable length | 100 mm |
| Connector | U.FL. connector |
| Comment | This antenna requires to be mounted on a metal ground plane for best performance. To be mounted on a U.FL connector. See NINA-B4 Series system integration manual [2] for information how to integrate the U.FL connector. |
| Approval | RED, MIC, KCC, ANATEL, ACMA and ICASA (certified as the PN Ex-IT 2400 MHF 28) |


Wi-Fi / Bluetooth / Bluetooth LE external whip antenna, PN PRO-EX-333

| | |
|--------------|--|
| Manufacturer | Abracon |
| Polarization | Vertical |
| Gain | +3.0 dBi |
| Impedance | 50 Ω |
| Size | \varnothing 10 x 83 mm |
| Type | Monopole |
| Connector | Reverse Polarity SMA plug (inner thread and pin receptacle) |
| Comment | To be mounted on the U.FL to Reverse Polarity SMA adapter cable. An SMA antenna version is also available but not recommended for use (Ex-IT 2400 SMA 70-002). |
| Approval | FCC, IC, RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA |



Wi-Fi / Bluetooth / Bluetooth LE external whip antenna, PN PRO-EX-333

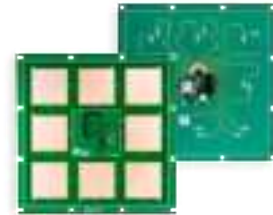
(certified as the PN Ex-IT 2400 RP-SMA 70-002)

Wi-Fi / Bluetooth / Bluetooth LE board antenna, PN PRO-IS-237

| | |
|--------------|--|
| Manufacturer | Abracon |
| Gain | +3.0 dBi |
| Impedance | 50 Ω |
| Size | 27 x 12 mm (triangular) |
| Type | Patch |
| Cable length | 100 mm |
| Connector | U.FL. connector |
| Comment | Should be attached to a plastic enclosure or part for best performance. To be mounted on a U.FL connector. See NINA-B4 Series system integration manual [2] for information how to integrate the U.FL connector. This reference design must be followed to comply with NINA-B4 FCC/IC modular approvals. |
| Approval | FCC, IC, RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA |


Bluetooth LE 5.1 direction finding antenna board, ANT-B10-00C-00

| | | |
|--------------|--|-------------------------|
| Manufacturer | u-blox | |
| Gain | Vertical Polarization | Horizontal Polarization |
| | -14.6 dBi @ 2402 MHz | -14.4 dBi @ 2402 MHz |
| | -13.9 dBi @ 2440 MHz | -14.3 dBi @ 2440 MHz |
| | -14.8 dBi @ 2480 MHz | -15.0 dBi @ 2480 MHz |
| Impedance | N/A | |
| Size | 126.09 mm x 126.09 mm | |
| Type | Antenna board with 8 dual polarized antenna patches | |
| Cable length | N/A | |
| Connector | N/A | |
| Comment | This antenna board has an NINA-B411-40B Bluetooth low energy module mounted on the board, connected to the antenna patches via an antenna switch. This module can only be operated using the u-connectLocate direction finding SW from u-blox. The board has a pin header for UART connection to an external application board. | |
| Approval | Pending | |



Appendix


A Glossary

| Abbreviation | Definition |
|--------------|---|
| FCC | Federal Communications Commission |
| ISED | Innovation, Science and Economic Development Canada |
| RED | Radio Equipment Directive |
| MIC | Ministry of Internal Affairs and Communications |
| NCC | National Communications Commission |
| KCC | Korea Communications Commission |
| ANATEL | Coordinated Universal Time |
| ACMA | Data Circuit-terminating Equipment* / Data Communication Equipment* |
| ICASA | Data Terminal Equipment |

Table 3: Explanation of the abbreviations and terms used

Related documentation

- [1] NINA-B4 Declaration of Conformity, [UBX-20043953](#)
- [2] NINA-B4 series, system integration manual, [UBX-19052230](#)
- [3] Bluetooth® qualification process, u-connectXpress and nRF5 SDK, application note, [UBX-20009220](#)

 For product change notifications and regular updates of u-blox documentation, register on our website, www.u-blox.com.

Revision history

| Revision | Date | Name | Comments |
|----------|-------------|------------|--|
| R01 | 19-Nov-2020 | fkru | Initial release |
| R02 | 5-Jul-2021 | fkru, hekf | Added FCC, ISED, Japan, South Korea and ACMA certification. Extended document scope to include NINA-B401 and NINA-B411. Updated names for ProAnt Ex-It series antennas and FlatWhip EOL in the Pre-approved antennas list . |
| R03 | 17-Aug-2022 | fkru | Revised Bluetooth qualification information. Revised former Proant antenna references with updated part numbers from Abracon and removed obsolete antennas (EOL) from the list of Pre-approved antennas list . |
| R04 | 20-Jan-2023 | mape/ovik | Added ANT-B10 to Pre-approved antennas list .. |

Contact

For further support and contact information, visit us at www.u-blox.com/support.