

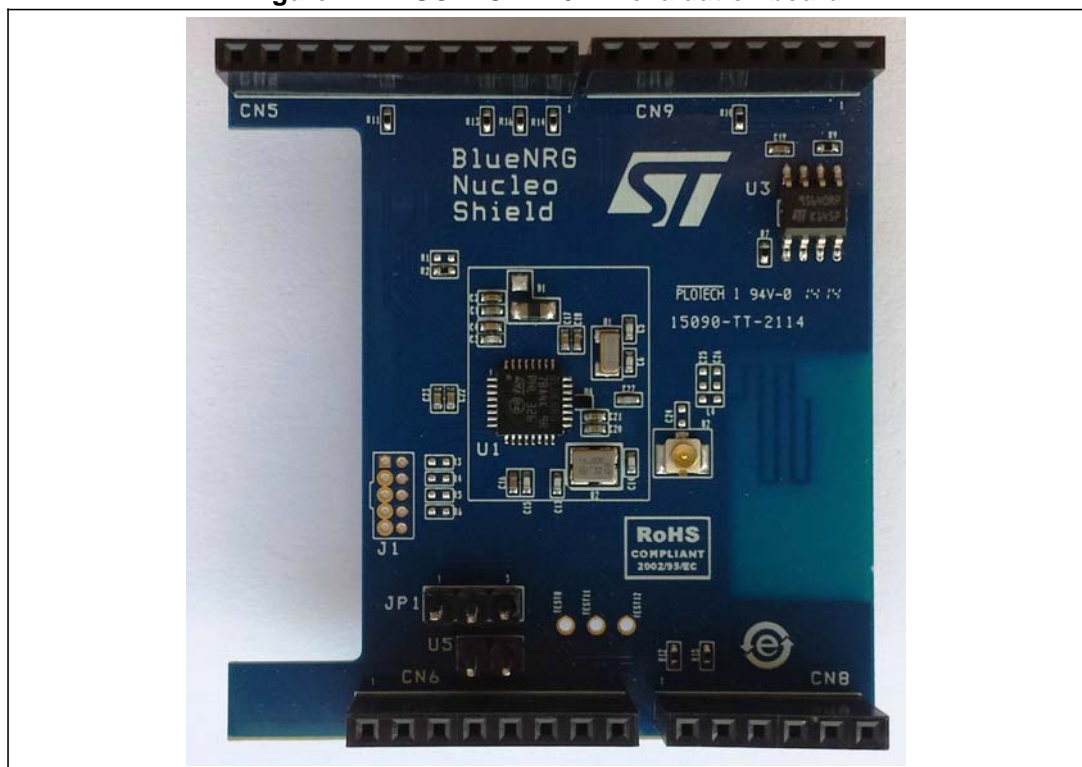
### Bluetooth low energy expansion board based on BlueNRG for STM32 Nucleo

## Introduction

This document provides detailed hardware requirements and board connections for the X-NUCLEO-IDB04A1 Bluetooth® low energy (BLE) evaluation board based on BlueNRG for STM32 Nucleo. This board is part of STMicroelectronics' offering of evaluation boards designed around the BlueNRG Bluetooth low energy wireless network processor.

The excellent performance of BlueNRG and the best matching between BlueNRG and BALF-NRG, X-NUCLEO-IDB04A1 passed the RF TEST for Japan Radio Law certification with higher margin above the specification values as well as it is FCC certified (FCC ID: S9NIDB04A1).

**Figure 1. X-NUCLEO-IDB04A1 evaluation board**



Other BlueNRG evaluation boards are available in the following kits:

STEVAL-IDB002V1: BlueNRG development platform

STEVAL-IDB003V1: BlueNRG USB dongle

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# 1 Board Description and Getting started

The X-NUCLEO-IDB04A1 is a Bluetooth low energy evaluation board to allow expansion of the STM32 Nucleo boards. It is compatible with the Arduino UNO R3 connector layout, and is designed around BlueNRG, a Bluetooth low energy, low power network coprocessor compliant with BTLE 4.0 and the BALF-NRG-01D3, an ultra-miniature balun optimized for ST BlueNRG RFIC, which integrates matching network and harmonics filter. The X-NUCLEO-IDB04A1 interfaces with the STM32 MCU via SPI pin, and the user can change the default SPI clock, the SPI chip select and SPI IRQ by changing one resistor on the evaluation board. The excellent performance of BlueNRG and the best matching between BlueNRG and BALF-NRG, X-NUCLEO-IDB04A1 passed the RF TEST for Japan Radio Law certification with higher margin above the specification values as well as it is FCC certified (FCC ID: S9NIDB04A1).

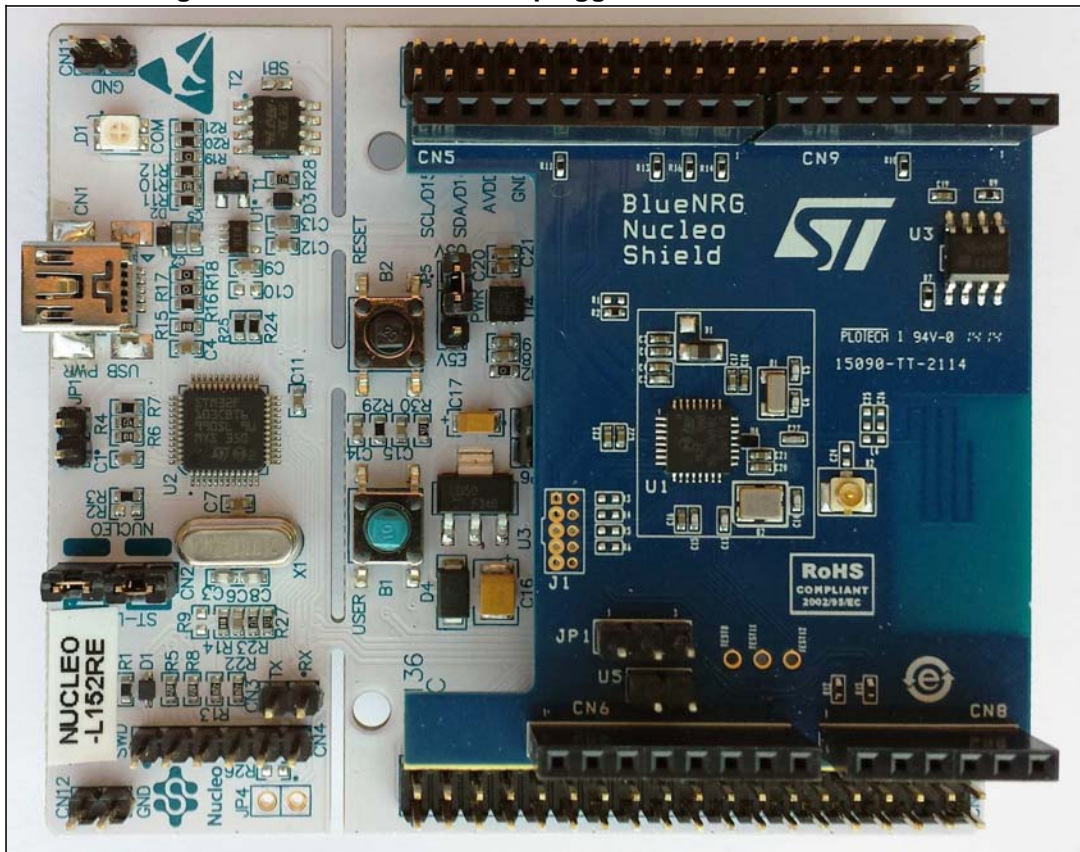
## Key features:

- BlueNRG low power, low energy Bluetooth network coprocessor
- BALF-NRG-01D3 balun & harmonic filter
- Free comprehensive development firmware library and example for BlueNRG, compatible with STM32Cube firmware
- Bluetooth low energy 4.0 master and slave compliant
- Compatible with STM32 Nucleo boards
- Equipped with Arduino UNO R3 connector
- Very low power consumption: 7.3 mA RX and 8.3 mA TX at +0 dBm
- Maximum transmission power: +8 dBm
- Excellent receiver sensitivity (-88 dBm)
- X-NUCLEO-IDB04A1 is officially certificated as a BTLE 5mW module for Japan Radio Law "TYPE" Certification by Japan government.
- X-NUCLEO-IDB04A1 is FCC certified (FCC ID: S9NIDB04A1)
- RoHS compliant

## 1.1 Hardware requirements

The X-NUCLEO-IDB04A1 is an expansion board for use with STM32 Nucleo boards (please refer to UM1724 on [www.st.com](http://www.st.com) for further information). To function correctly, the STM32 Nucleo board must be connected to the X-NUCLEO-IDB04A1 board as shown in [Figure 2](#) below.

Figure 2. X-NUCLEO-IDB04A1 plugged to STM32 Nucleo board



The interconnection between the STM32 Nucleo and the X-NUCLEO-IDB04A1 has been designed to permit the use of any STM32 Nucleo board, although the optimal combination is obtained using the NUCLEO-L152RE or NUCLEO-L053R8 hosting the ultra-low power STM32.

## 1.2 System requirements

Using the Nucleo boards with the X-NUCLEO-IDB04A1 expansion board requires the following software and hardware:

- a Windows PC (XP, Vista, 7, 8) to install the software package
- a USB type A to Mini-B USB cable to connect the Nucleo to the PC

Installation of the board firmware package (order code: X-CUBE-BLE1) and the BlueNRG graphical user interface utility on the user's PC requires the following:

- At least 128 MB of RAM
- 40 MB of hard disk space available

The X-CUBE-BLE1 firmware and related documentation is available on [www.st.com](http://www.st.com).

## 2 Hardware description

This section describes the X-NUCLEO-IDB04A1 features and provides information which could be useful for understanding the board schematics.

### 2.1 X-NUCLEO-IDB04A1 board

The board allows the user to test the functionality of the BlueNRG processor. It hosts the innovative BALF-NRG-01D3 balun & harmonic filter and its functionality can be exploited using the firmware package contained in the X-CUBE-BLE1. It is fundamental to program the microcontroller on the STM32 Nucleo board. Please refer to user manuals UM1724 and UM1725, available on [www.st.com](http://www.st.com).

The BlueNRG processor and the STM32 Nucleo board are connected through connectors CN5, CN6, CN8 and CN9 (see [Table 1](#) for details). The pins indicated with an asterisk (\*) represent an alternative pin for that specific function, i.e. SPI\_IRQ could be moved from CN8.1 to CN5.2.

**Table 1. Interconnection between STM32 Nucleo board and X-NUCLEO-IDB04A1**

		NC	IOREF	RESET	3V3	5V	GND	GND	VIN		A0	A1	A2	A3	A4	A5	
Left connectors																	
		1	2	3	4	5	6	7	8		1	2	3	4	5	6	
					3V3		GND	GND			SPI_IRQ	SPI_CSN*					
D15	D14	AREF	GND	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Right connectors																	
CN5 digital										CN9 digital							
10	9	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
			GND	SPI_CLK*	SPI_MISO	SPI_MOSI		SPI_IRQ*	SPI_MCSN	BNRG_RST				SPI_CLK			

To change the default pin SPI\_CLK, SPI\_IRQ and SPI\_CSN the user must disassemble, respectively, R10, R12 and R15, and assemble R11, R16 and R13.

The board also includes:

- a high frequency 16 MHz crystal
- a low frequency 32 kHz crystal for lowest power consumption
- a BALF-NRG-01D3 balun & harmonic filter
- an EEPROM M95640-RMN6P to store the board parameters

Not mounted:

- a JTAG connector to program the BlueNRG processor
- an SMA connector for the external antenna

### 2.1.1 Current measurements

To monitor the power consumption of entire BlueNRG X-NUCLEO-IDB04A1 board, jumper U5 can be used, inserting an ammeter probe between pins 1 and 2 of the connector. Since the power consumption of BlueNRG during most of its operating time is very low, an accurate instrument in the range of few  $\mu\text{A}$  may be required.

### 3 **Formal Notices Required by the U.S. Federal Communications Commission (“FCC”)**

Any changes or modifications to this equipment not expressly approved by STMicroelectronics may cause harmful interference and void the user’s authority to operate this equipment.

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 interference received, including any interference that may cause undesired operation.

This device uses, generates and radiated radio frequency energy. The radio frequency energy produced by this device is well below the maximum exposure allows by Federal Communications Commission (FCC).

The X-NUCLEO-IDB04A1 is FCC certified (FCC ID: S9NIDB04A1).

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.



## 7 Revision history

**Table 5. Document revision history**

Date	Revision	Changes
16-May-2014	1	Initial release.
21-Jan-2015	2	Modified: - <a href="#">Table 3</a> and <a href="#">Table 4</a> .
19-Feb-2015	3	Modified: - order code from STSW-IDB04V1 to X-CUBE-BLE1 <a href="#">Section 1.2</a> and <a href="#">Section 2.1</a> .
13-Apr-2015	4	Updated: - Part number item 27 <a href="#">Table 4</a> .
22-Apr-2015	5	FCC

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