



RAK10706 Signal Meter for LoRa Quick Start Guide

Prerequisites

Before going through each and every step in the installation guide of the RAK10706 Signal Meter for LoRa, make sure to prepare the necessary items listed below:

Hardware Tools

1. [RAK10706 Signal Meter for LoRa](#)
2. LoRa SubGHz Antenna with RP-SMA connector
3. USB Type-C Cable
4. Windows/Linux/macOS for PC or iOS/Android for mobile

Software Tools

Serial Terminal Application, for example [Cool Term](#) for configuration.

[WisToolBox](#) for configuration and firmware update.

NOTE

For LoRaWAN test mode it is mandatory that the device is registered on a LNS and is in range of a LoRaWAN Gateway of the network you are trying to join. Without the coverage, the Signal Meter will not be useable.

For LoRa P2P test mode it is mandatory that other LoRa P2P end nodes are available that are setup to the same frequency, SF, CR, BW and Preamble Length

Difference between the RAK10706 Signal Meter and the RAK10701 Field Tester

One of the advantages of the RAK10706 Signal Meter is that it does not require any backend installations on the LoRaWAN server (like Helium, TTN and Chirpstack) if used in LinkCheck Packet mode, and it will work with any LoRaWAN server like AWS or Actility.

The RAK10706 uses LinkCheckReq to collect information about the connection to the gateway(s).

With LinkCheck, the LoRaWAN server will report the number of gateways and the demodulation margin (calculated on the LoRaWAN server). The demodulation margin can give you information about the received signal quality (The higher the margin, the better the signal quality).

Extract from the LoRaWAN 1.0.3 Specification:

640	5.1 Link Check commands (<i>LinkCheckReq</i>, <i>LinkCheckAns</i>)
641	With the <i>LinkCheckReq</i> command, an end-device MAY validate its connectivity with the network. The command has no payload.
642	When a <i>LinkCheckReq</i> is received by the network server via one or multiple gateways, it responds with a <i>LinkCheckAns</i> command.
643	
644	
645	
646	
	Size (bytes)
	LinkCheckAns Payload
	1
	Margin
	1
	GwCnt
647	The demodulation margin (Margin) is an 8-bit unsigned integer in the range of 0..254 indicating the link margin in dB of the last successfully received <i>LinkCheckReq</i> command. A value of "0" means that the frame was received at the demodulation floor (0 dB or no margin) while a value of "20", for example, means that the frame reached the gateway 20 dB above the demodulation floor. Value "255" is reserved.
648	
649	
650	
651	
652	The gateway count (GwCnt) is the number of gateways that successfully received the last <i>LinkCheckReq</i> command.
653	

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Figure 1: LinkCheck explanation

Typical test scenarios

In all scenarios, tests can be performed in two ways:

- automatic sending in a specified interval. The interval can be set either through the built-in UI or with an AT command.
- forced sending. 3 times pushing the button enforces sending out a single packet in the pre-defined settings.
- forced sending with DR sweep (only in LoRaWAN test modes). 4 times pushing the button enforces multiple packets to be sent out. Sending starts with the lowest possible data rate and increases the data rate with each packet until the highest possible data rate has been reached.

Outdoor testing

In this scenario the location tracking should be enabled to add the tester location to the test.

results. The log files will contain the location of the tester at the time the test was performed. If no location fix could be acquired, the location will be set to Lat 0, Long 0.

Indoor testing

In this scenario the location tracking should be disabled, as the GNSS chip cannot acquire a valid location inside of buildings. The log files will not contain the location of the tester.

LinkCheck testing

If it is not possible to connect a backend server to the LoRaWAN server to process the data of the received packets, the LinkCheck method is used. It can deliver the basic information of the connection quality and if the tester is in the coverage range of gateways.

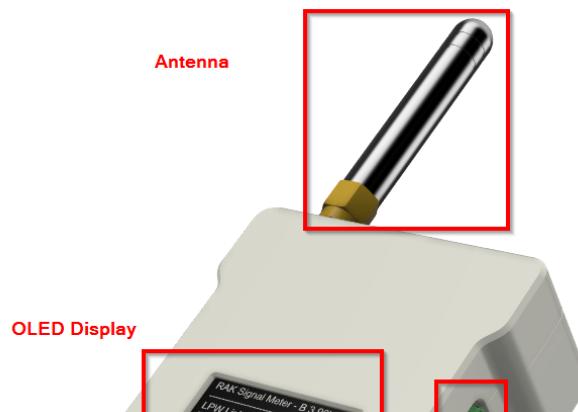
LoRa P2P testing

This is a very basic test that only shows whether the device is in range of another LoRa P2P device that is sending out packets. In this mode the device is listening and displaying information if it has received a data packet. It will as well send out data packets in the send interval that is setup on the device.

Product Configuration

RAK10706 Signal Meter Physical Interface

The user interface of the RAK10706 Signal Meter for LoRa is via OLED display and one pushbutton at the side. There is also an external LoRA antenna port via RP-SMA connector and USB-C port for charging and configuration if connected to a PC.



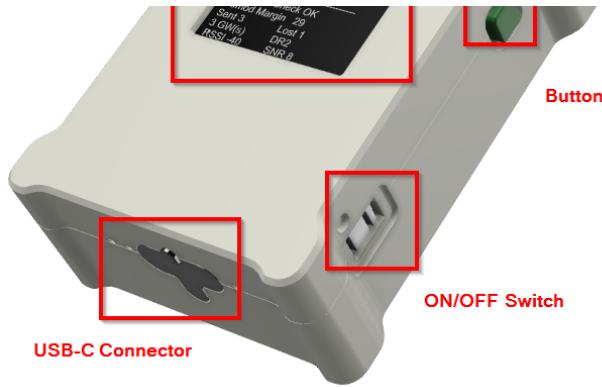


Figure 2: RAK10706 view

NOTE

You have to ensure that the LoRa antenna is attached before turning on the device.

1. To turn on the device, move the switch to ON position (ON is marked with a circle above the switch).



Figure 3: RAK10706 switch to turn on and off

2. When the device initializes, it will show the initialization info on the screen. If there is any initialization error, it will be shown. A properly working device should not have any errors shown.

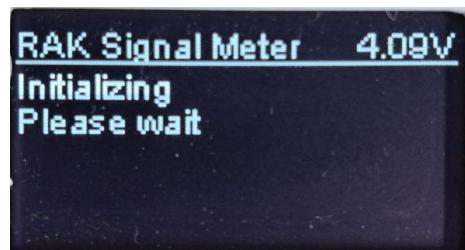


Figure 4: RAK10706 power up

3. After the successful boot-up, the main home screen will be shown. Take note, that there will be no data at the first start of the device.



Figure 5: RAK10706 power up successful

NOTE

By default the Signal Meter is in LoRaWAN LinkCheck test mode. Please follow the steps below to register the device on a LoRaWAN server.

LoRaWAN Network Servers Guide for RAK10706 Signal Meter for LoRa

The Signal Meter can work with any network server.

By default the device is in LoRaWAN mode in OTAA join mode.

Below steps are for using OTAA join mode.

Device Configuration of RAK10706 via WisToolBox

As first step connect either a Serial Terminal app (like CoolTerm) or WisToolBox over the USB cable to the device.

With WisToolBox connected (it will show the device as a RAK4630 module)





Figure 6: RAK10706 on WisToolBox

Go to **Parameters** to retrieve the LoRaWAN credentials from **LoRaWAN keys, ID, EUI**

Parameter	Value	Notes
Application EUI	AC1F09FFFE [REDACTED]	16 / 16
Application key	2B84E0...53DCEE79	[REDACTED] / 32
Device EUI	AC1F09FFFE [REDACTED]	16 / 16

Figure 7: RAK10706 on WisToolBox

Copy the Application EUI, Application Key and Device EUI. These are later required for registering the device on a LoRaWAN server.

Next, goto **Parameters, Global Settings** to set the LoRaWAN region you want to use with the device.

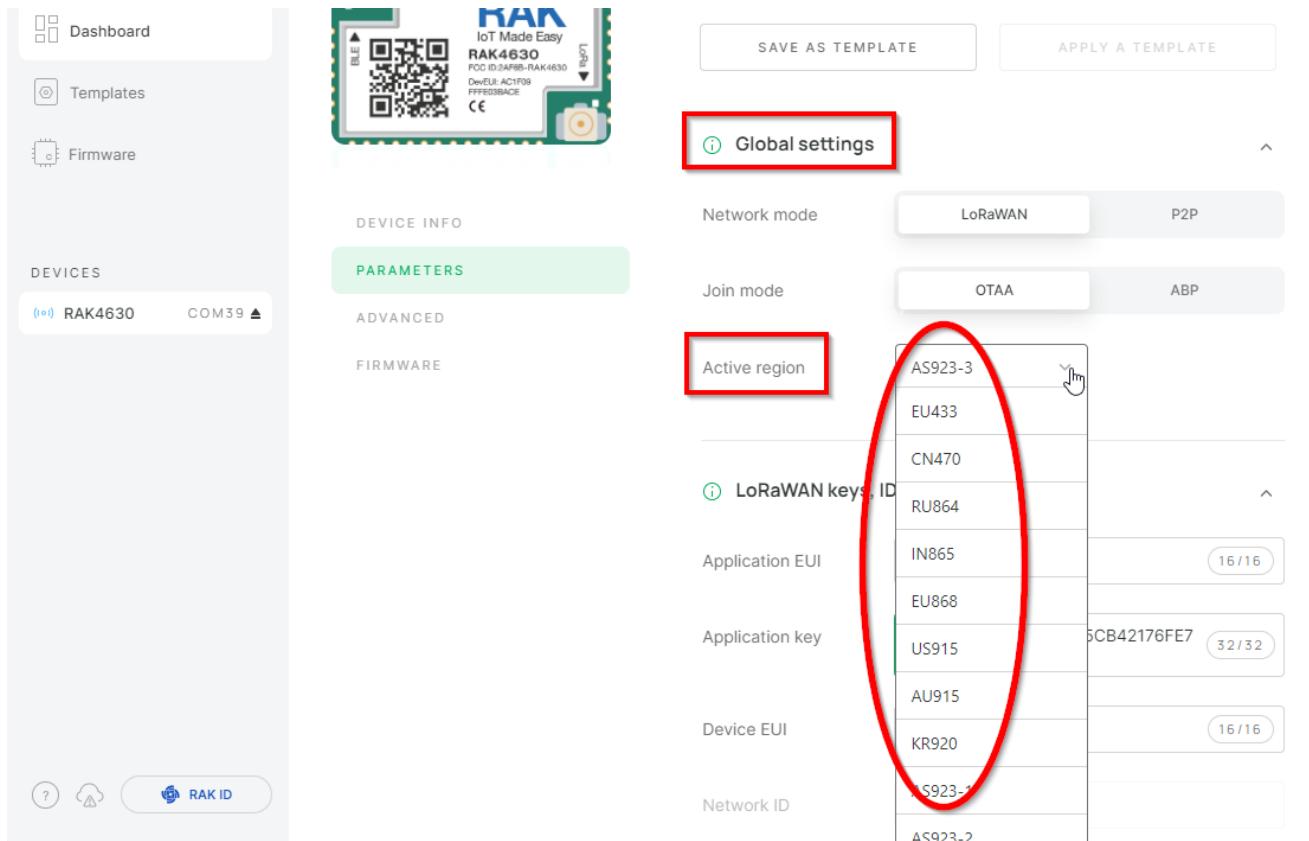


Figure 8: RAK10706 on WisToolBox

Device Configuration of RAK10706 via Serial Terminal application

If using a Serial Terminal application like CoolTerm, connect the terminal to the device. Serial parameters are 115200 Baud 8N1

- (1) Send the command AT+BAND? to get a list of available LoRaWAN regions.
- (2) Set the LoRaWAN region with AT+BAND=10 (example for AS923-3)
- (3) Send the command ATC+STATUS=? to get the DevEUI, AppEUI and AppKey for later use.

```

Untitled_0 *

File Session Edit Connection Macros View Remote Window Help
New Open Save Connect Disconnect Options Clear Data View Help

at+band?
AT+BAND,RW: get or set the active region (0 = EU433, 1 = CN470, 2 = RU864, 3 = IN865, 4 = EU868, 5
= US915, 6 = AU915, 7 = KR920, 8 = AS923-1 , 9 = AS923-2 , 10 = AS923-3 , 11 = AS923-4 , 12 =
LA915)
OK
AT+BAND=10
OK
ATC+STATUS=?
Device Status:
Test Mode: LinkCheck

```

```
Module: RAK4630
Version: RUI3_Tester_V2.0.5
Send time: 0 s
Network mode LoRaWAN
Network joined
Region: 10
Region: AS923-3
OTAA mode
DevEUI=AC1F09FFFE
AppEUI=AC1F09FFFE
AppKey=2B84E0|753DCEE79
Custom settings
Testmode = 0
Display saver off
Custom Packet = 01020304
OK
```

Figure 9: RAK10706 on Serial Terminal Application

LoRaWAN server configuration for RAK10706 Signal Meter

You can check each guide on how to use the RAK10706 Signal Meter for LoRa in the following network servers. yarn

- [The Things Network](#)
- [Chirpstack](#)
- [Loriot](#)

For other network servers the procedure iw very similar.

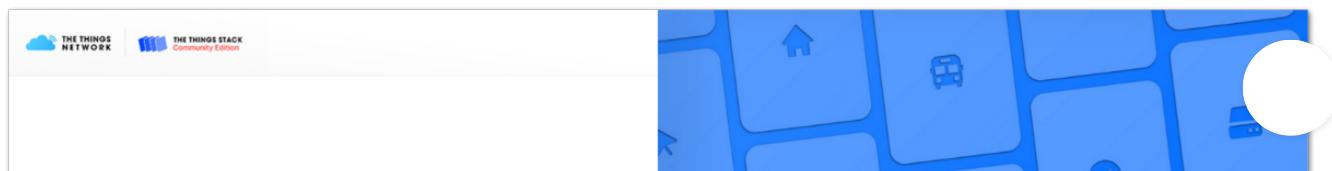
NOTE

This section will focus on the configuration of each network server. The procedure of [Device Configuration of RAK10706 via WisToolBox](#) is the same for all network server and will be covered in a separate section of the guide.

RAK10706 Signal Meter Guide for The Things Network

This section shows how to use the RAK10706 Signal Meter for LoRa to The Things Stack.

1. Log in to TTNv3. To do so, head to the TTNv3 [site](#) and select your cluster. If you already have a TTN account, you can use your The Things ID credentials to log in.



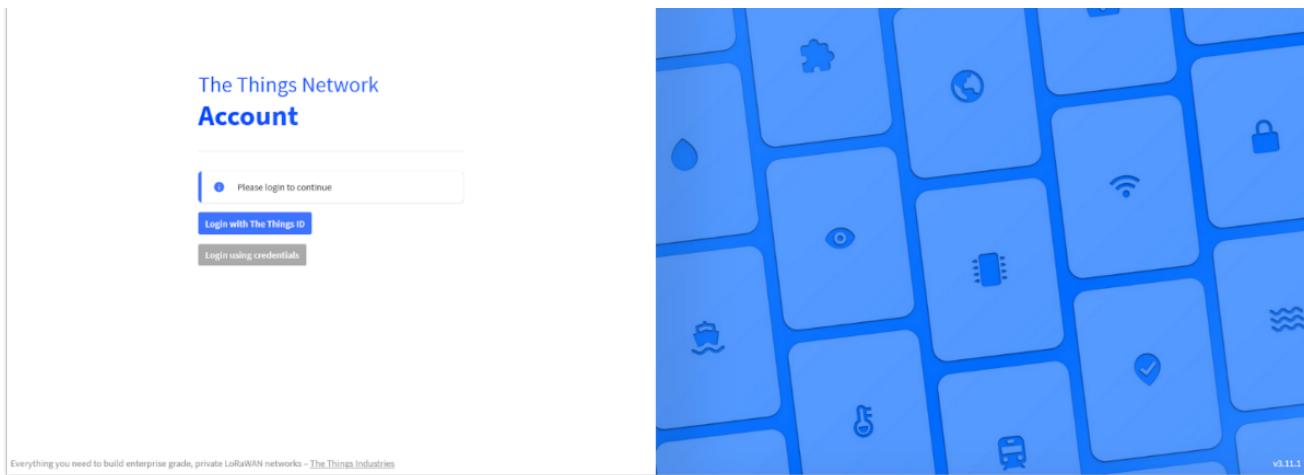


Figure 10: The Things Stack home page

Figure 11: Console page after a successful login

NOTE

To connect RAK10706 Signal Meter to TTNv3, you should already have connected a gateway in range to TTNv3. Or, you have to be sure that you are in the range of a public gateway.

2. Now that you are logged in to the platform, the next step is to create an application. In your console, click **Create an application**.

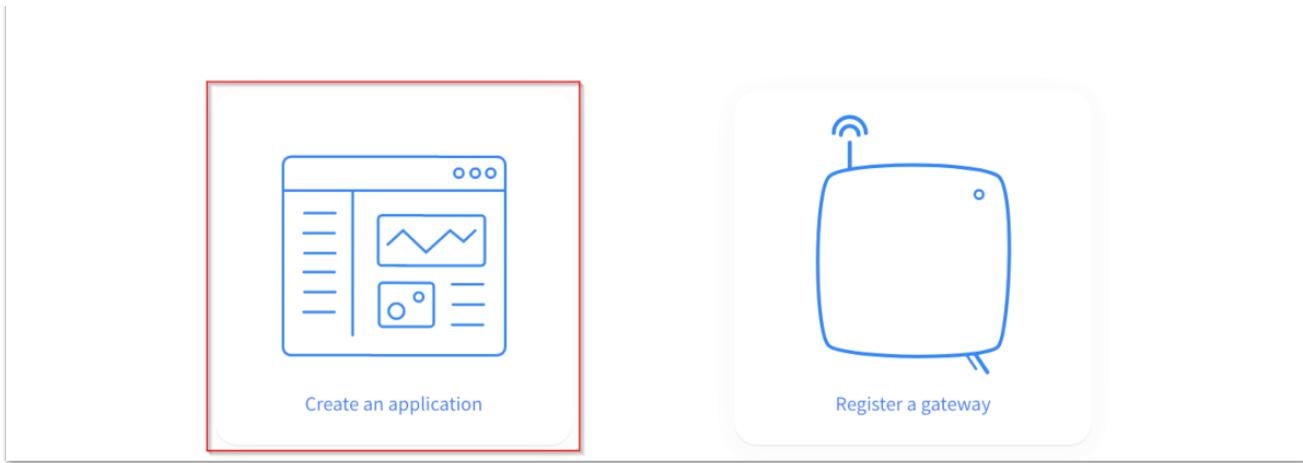


Figure 12: Create an application

- To have an application registered, you need to input first the specific details and necessary information about your application then click **Create application**.

Figure 13: Creating an Application

- If you had no error during the previous step, you should now be on the application console page. The next step is to **add end-devices to your TTN application**.

The screenshot shows the 'End devices' section of the The Things Stack interface. At the top right, there is a search bar labeled 'Search by ID', a 'Import end devices' button, and a prominent red-bordered '+ Add end device' button. Below the header, there are columns for 'ID', 'Name', 'DevEUI', 'JoinEUI', and 'Last activity'. On the far left, a sidebar includes 'General settings' and a 'Hide sidebar' link.

Figure 14: Add end-devices to your TTN application

5. To register the RAK10701-P Field Tester Pro, you need to click **Manually** first.

This screenshot shows the 'Register end device' page. The navigation bar at the top has two tabs: 'From The LoRaWAN Device Repository' (which is blue) and 'Manually' (which is red). The main content area is titled '1. Select the end device' and contains a dropdown menu for 'Brand' with the placeholder 'Type to search...'. Below it is a note: 'Cannot find your exact end device? [Get help here](#) and [try manual device registration](#)'. The next section is '2. Enter registration data', which currently says 'Please choose an end device first to proceed with entering registration data'. At the bottom is a 'Register end device' button.

Figure 15: Adding end devices manually

6. Choose the following configurations in adding the end devices. You must choose the correct Frequency Plan and the LoRaWAN version must be 1.0.3.

This screenshot shows the 'Register end device' page with several configuration fields highlighted by red boxes. The 'Frequency plan' dropdown is set to 'Europe 863-870 MHz (SF9 for RX2 - recommended)'. The 'LoRaWAN version' dropdown is set to 'LoRaWAN Specification 1.0.3'. The 'Regional Parameters version' dropdown is set to 'RP001 Regional Parameters 1.0.3 revision A'. Below these, there are sections for 'DevEUI' and 'AppEUI', each with a 'Generate' button and a 'Fill with zeros' link.

Figure 16: Configurations for adding end devices

7. Click **Show advanced activation, LoRaWAN class, and cluster settings**, then select **Over the air action (OTAA)**.

The screenshot shows the TTN LoRaWAN Apps interface under the 'End devices' section. The 'Activation mode' dropdown is set to 'Over the air activation (OTAA)'. The 'Additional LoRaWAN class capabilities' dropdown is set to 'None (class A only)'. Under 'Network defaults', the 'Use network's default MAC settings' checkbox is checked. Under 'Cluster settings', the 'Use external LoRaWAN backend servers' checkbox is unchecked. The 'DevEUI' field contains a partially filled hex value 'AC 0F 09 FF FF 00 00 07' with a 'Generate' button and a note '0/50 used'. The 'AppEUI' field has a 'Fill with zeros' button. The 'AppKey' field has a 'Generate' button. The 'End device ID' field contains 'my-new-device' with a note 'This value is automatically prefilled using the DevEUI'.

Figure 17: OTAA settings

8. Then input the LoRaWAN OTAA parameters you retrieved before from the device.

Finally, click **Register End Device**.

The screenshot shows the TTN LoRaWAN Apps interface under the 'End devices' section. The 'DevEUI' field now contains the full hex value 'AC 0F 09 FF FF 00 00 07'. The 'AppEUI' and 'AppKey' fields are highlighted with red boxes. The 'End device ID' field contains 'eui-ac1f09ffe03ef47' with a note 'This value is automatically prefilled using the DevEUI'. At the bottom, the 'Register end device' button is highlighted with a red box.

Figure 18: Registering the end device

9. You should now be able to see the device on the TTN console after you fully register your device.

The screenshot shows the TTN main dashboard. The top navigation bar includes 'Overview', 'Applications', 'Gateways', 'Organizations', and user information for 'rak-discovery'. The left sidebar shows 'LoRaWan Devices Application' with sections for 'Overview', 'End devices', 'Live data', and 'Payload formatters'. The main content area shows the 'Applications > LoRaWan Devices Application > End devices > eui-ac1f09ffe03ef47' path. The device card for 'eui-ac1f09ffe03ef47' displays its ID and notes 'n/a' for activity. Below the card are tabs for 'Overview', 'Live data', 'Messaging', 'Location', 'Payload formatters', 'Claiming', and 'General settings'.

The screenshot shows the 'Device details' page for a registered device. The sidebar on the left includes sections for Uplink, Downlink, Integrations, Collaborators, API keys, and General settings. The main area displays device information: End device ID (eui-ac1f09fffe03ef47), Description (This end device has no description), Created at (Dec 14, 2021 12:50:14), Activation information (AppEUI, DevEUI, Root key ID, AppKey, NwkKey), and Session information. A 'LIVE View' panel on the right shows a map and the message 'Waiting for events from eui-ac1f09fffe03ef47...'. A note at the bottom right says 'No location information available'.

Figure 19: OTAA device successfully registered to TTN

- After adding the application, device, you should see the join request/accept, uplinks and downlinks to The Things Stack console.

RAK10706 Signal Meter Guide for Chirpstack

To use Chirpstack for RAK10706, you must have a working installation of the Chirpstack LoRaWAN network server. It can be on a dedicated machine, Raspberry Pi, or in a cloud VPS instance.

- To start with Chirpstack, you must create a device profile for your RAK10706 Signal Meter device. You must select **LoRaWAN MAC version 1.0.3** which is the LoRaWAN specification version that the RAK10706 Signal Meter supports.

The screenshot shows the 'Device-profiles' page in Chirpstack. The left sidebar lists: Dashboard, Network-servers, Gateway-profiles, Organizations, All users, API keys, BeeGee-Chirpstack, Org. dashboard, Org. users, Org. API keys, and Service profiles. The main area shows a device profile named 'LoRaWAN-Field-Tester-AS923-3'. The 'GENERAL' tab is selected, displaying fields for Device-profile name (LoRaWAN-Field-Tester-AS923-3), LoRaWAN MAC version (1.0.3), LoRaWAN Regional Parameters revision (RP002-1.0.3), and ADR algorithm (Default ADR algorithm (LoRa only)). A red box highlights the '1.0.3' entry in the MAC version field.

Figure 20: Creating Device Profile in Chirpstack

- You must enable **Device supports OTAA** as the network join method as well.

The screenshot shows the same 'Device-profiles' page in Chirpstack as Figure 20, but with a red box highlighting the 'Device supports OTAA' checkbox under the 'JOIN (OTAA / ABP)' tab. This indicates that the OTAA join method is enabled for the device profile.

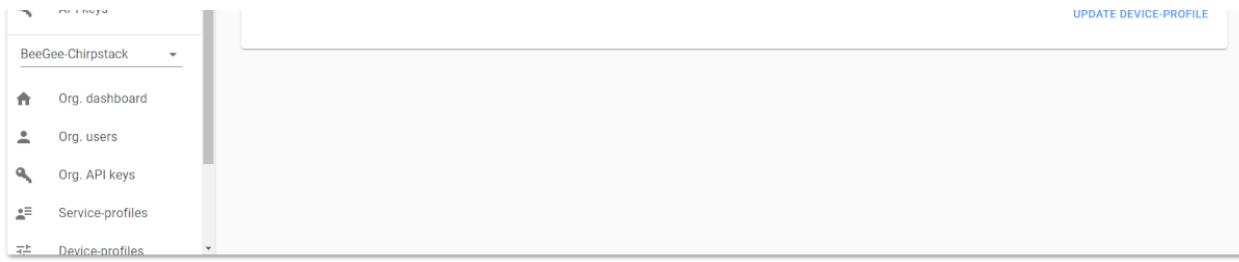


Figure 21: Enable support for OTAA

- After creating the device profile, you can now create an application and add the RAK10706 device. And then attached the **Device-profile** you created. Use the DevEUI and AppEUI you have retrieved from the RAK10706 before.

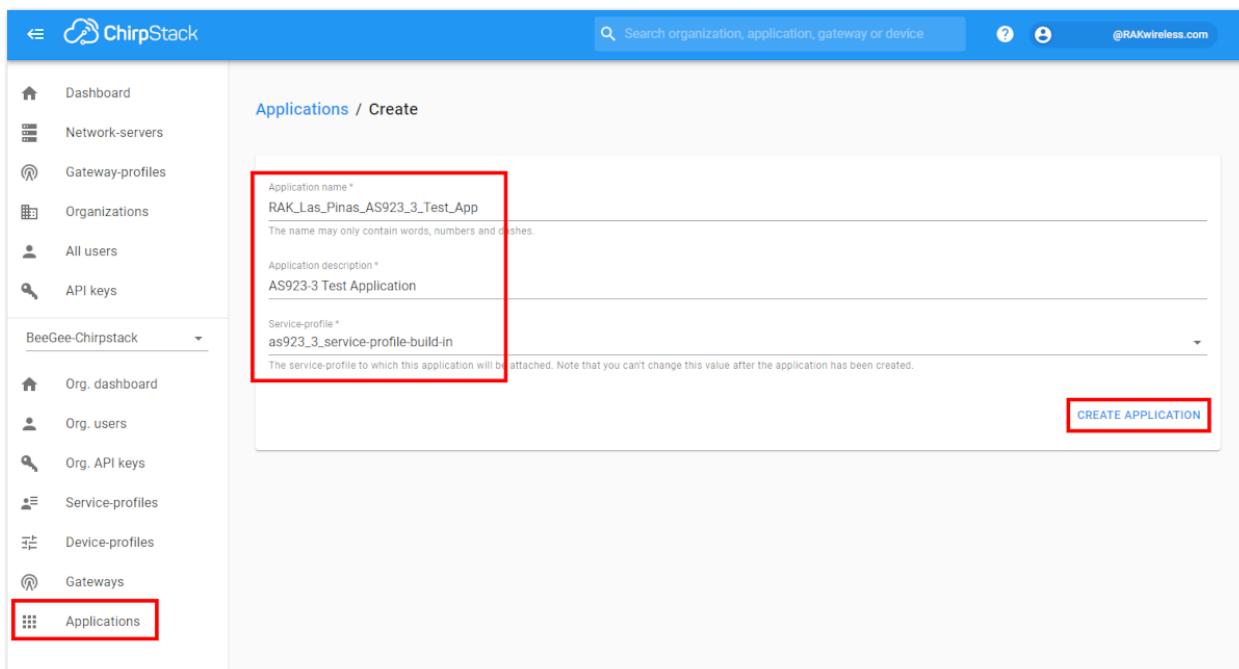


Figure 22: Create application in Chirpstack

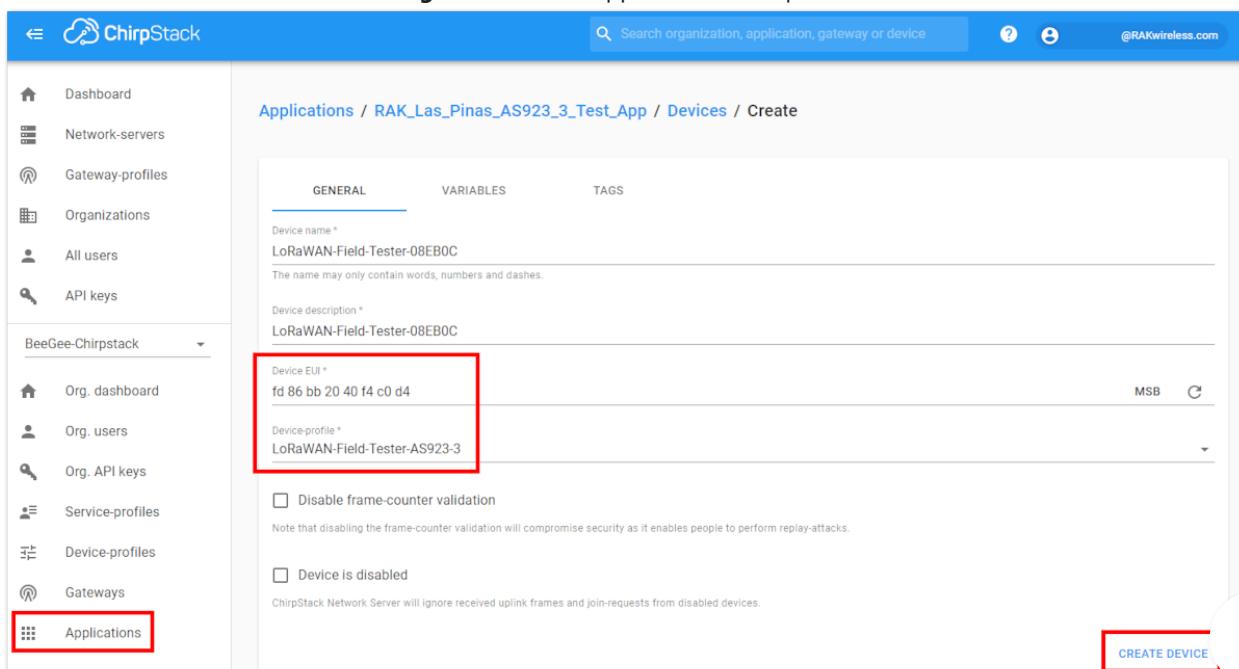


Figure 23: Create device in Chirpstack.

The screenshot shows the ChirpStack web interface for managing a LoRaWAN device. On the left, a sidebar lists organizational and application-level navigation. The main content area shows the path: Applications / RAK_Las_Pinas_AS923_3_Test_App / Devices / LoRaWAN-Field-Tester-08EB0C. Below this, a navigation bar includes tabs for DETAILS, CONFIGURATION, KEYS (OTAA) (which is highlighted with a red box), ACTIVATION, DEVICE DATA, and LORAWAN FRAMES. The KEYS (OTAA) tab contains fields for the Application key (with a value shown as a series of asterisks) and a note about supporting LoRaWAN 1.1. A 'SET DEVICE-KEYS' button is at the bottom right. In the top right corner, there are user profile and search icons.

Figure 24: Device APPKEY

5. You also need to secure that you have a Gateway registered in Chirpstack and with the correct Network Server profile.

Figure 25: Gateways registered in Chripstack

RAK10706 Signal Meter Guide for LORIOT

In this document, you will find a step-by-step guide for performing a field mapping test using LORIOT network management system and Datacake's platform to visualize your results. This solution will help you in your network planning ventures and ensure your decisions are data-driven and adequate to your surroundings.

Prerequisites

- [RAK10706 Signal Meter for LoRa](#)
- [LORIOT account](#)
- Gateway

Setting LORIOT as the LNS

1. Forward a gateway to LORIOT, which will be the LNS (LoRa Network Server) for this use case. For registration of the gateway to LORIOT, you will need the gateway's MAC and EUI, which can be found on the Overview page of WisGateOS 2.

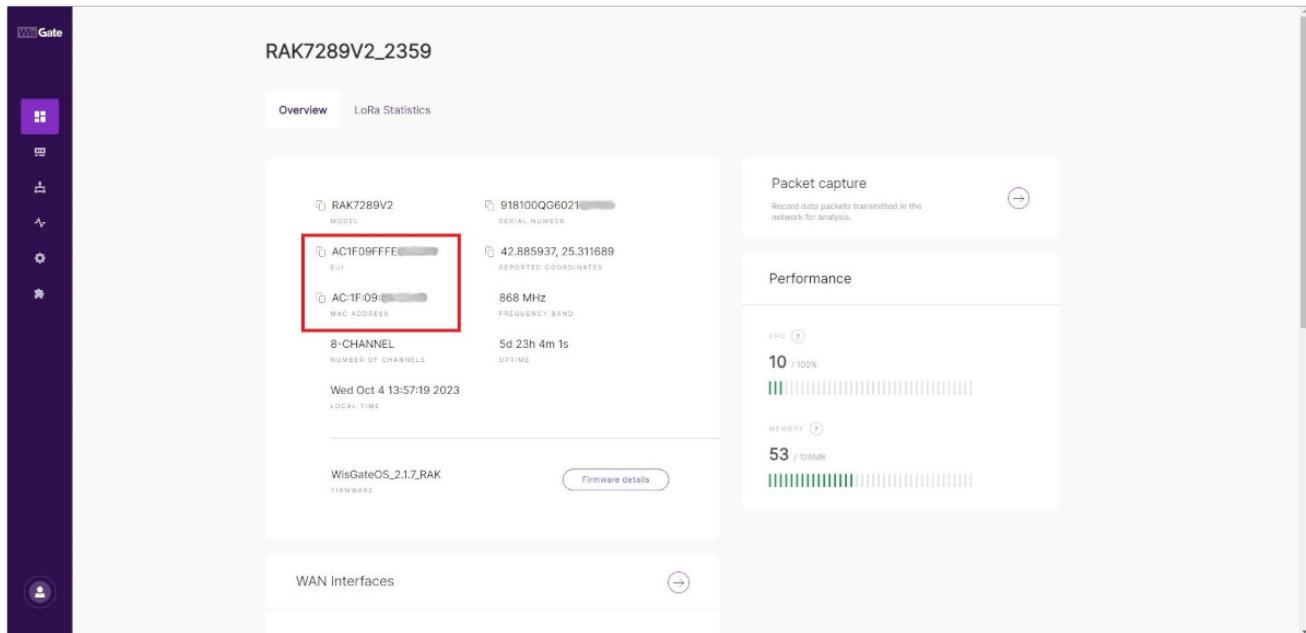


Figure 26: WisGate Edges web UI

2. Go to your LORIOT profile. From the menu on the left, navigate through **Networks > your_network > +Add Gateway**.

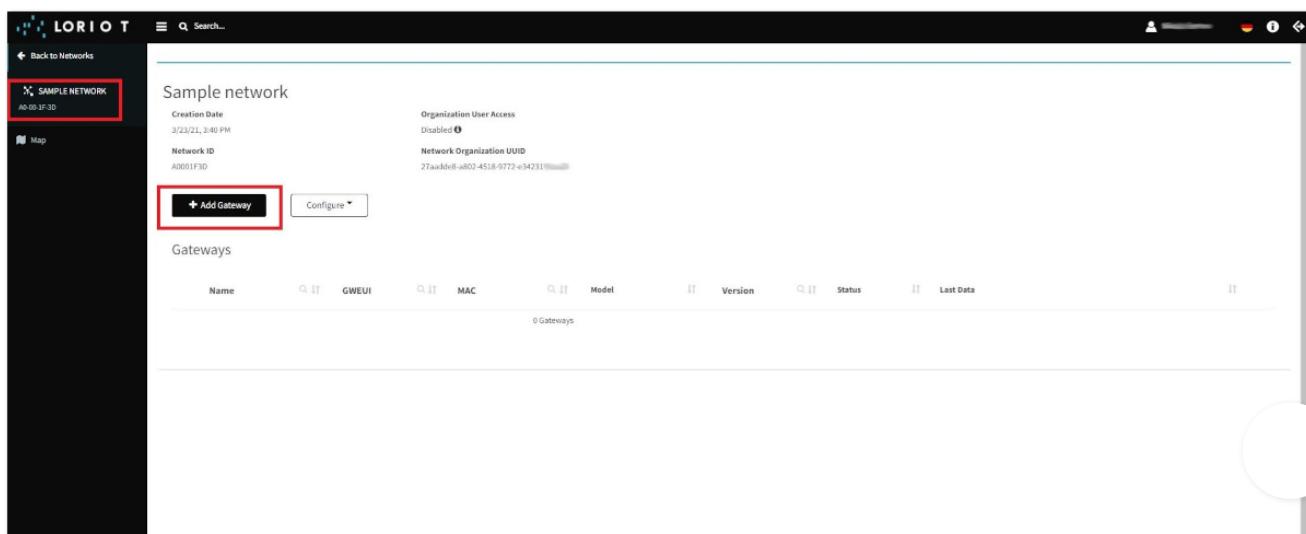




Figure 27: LORIOT console

NOTE

The LORIOT platform provides you with a **Sample Network** at the point of your profile creation. You can use it for free. If you wish to create a new one, or delete the provided one, you will need a paid plan to continue.

3. For the base platform select **Basics Station Semtech**. You will be asked to provide eth0 MAC address and EUI, which you obtained in step 1. After filling in these values, press the **Register Basics Station Semtech gateway** at the bottom of the page.

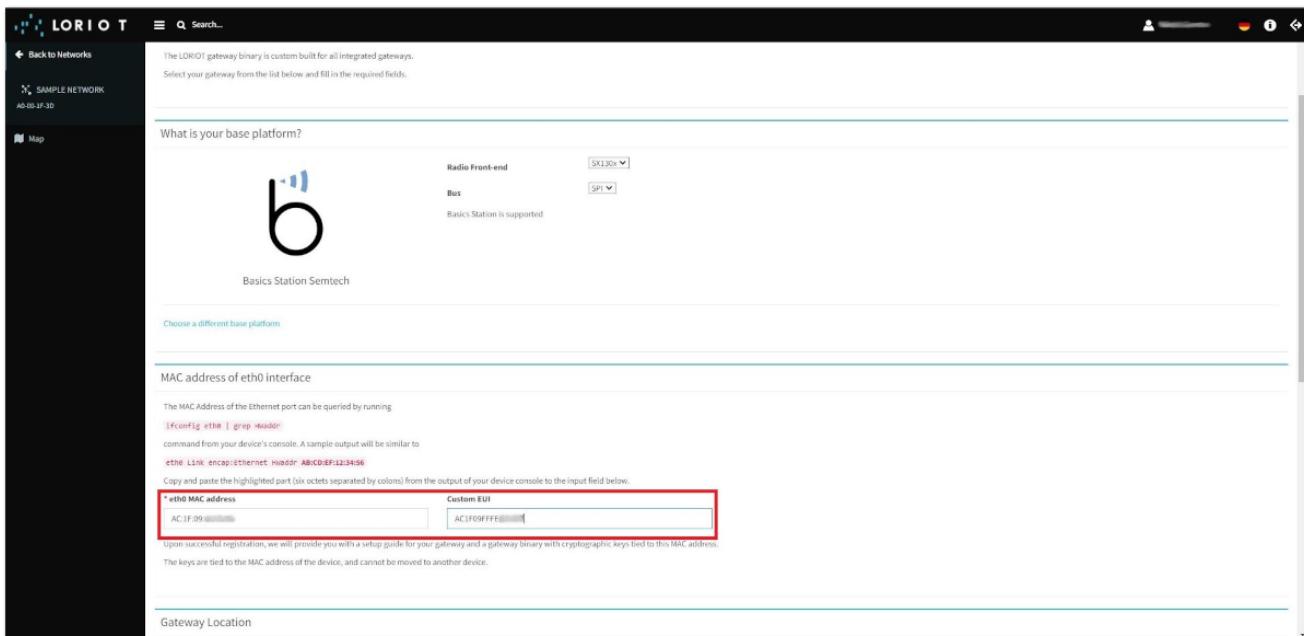
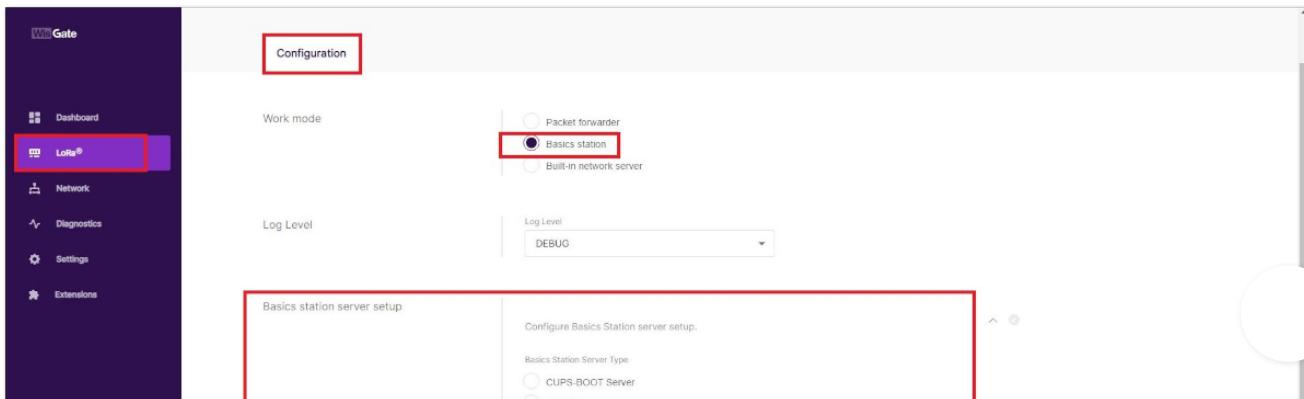


Figure 28: Registering The Gateway To LORIOT

4. The last thing you need to do to connect your gateway with LORIOT LNS is to provide the Basics Station configuration to the gateway. This can be done by going to the gateway's **web UI > LoRa > Configuration** and doing a Basics station server setup.



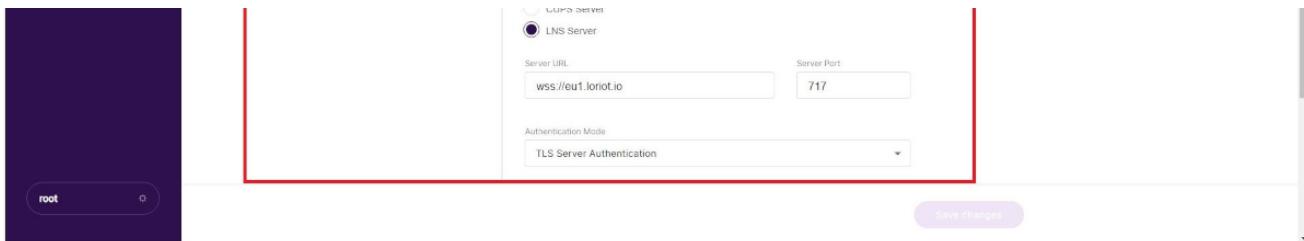


Figure 29: Gateway Configuration Page

You can find the Trust (CA Certificate), the Server URL, and the Server port in LORIOT by navigating to the newly registered **Gateway > Certificate**. Use the configuration provided by LORIOT as it may differ from the guide depending on your region.

Figure 30: Certificate

5. If the steps are followed correctly, the gateway should show a **Connected** status.

Adding the Device to LORIOT

- Add the device to LORIOT. In the LORIOT platform, navigate to **Applications > your_application** and use the **Enroll Device** utility from the menu on the left. Fill out your Device EUI, Join (APP) EUI, and Application Key.



Figure 31: Adding The Device To The LORIOT Platform

NOTE

The LORIOT platform provides you with a **Sample Application** at the point of your profile creation. You can use it for free. If you wish to create a new one or delete the provided one, you will need a paid plan to continue.

RAK10706 Signal Meter Built-In UI

RAK10706 Button Functions

The button on the side of the RAK10706 has different functions, depending on the status of the device.

Generic function of the button if the Settings UI is not active

Long Press ==> switch off / on the display for power savings

Single click ==> no function

Double click ==> enter the Settings UI (stops the testing mode, no more test packets are sent and received packets are ignored)

3 clicks ==> Force a downlink packet to be sent

4 clicks ==> Force multiple downlink packets with DR sweep. Sending starts with the lowest possible data rate and increases the data rate with each packet until the highest possible data rate has been reached.

5 clicks ==> no function (to avoid accidental reset of device)

6 clicks ==> Reset the device

7 clicks ==> Enter Bootloader Mode for firmware upgrades

Function of the button if the Settings UI is active

When the UI is active, the button change to different functions.

Single click ==> go up one level in the UI. If the top level is reached, the UI will be closed, and if required, changes are saved on the device.

Double click ==> change or select the second menu item. ==> select the next item from a list of options

3 clicks ==> change or select the third menu item. ==> select the previous item from a list of options

4 clicks ==> change or select the forth menu item.

5 clicks ==> change or select the fifth menu item.

6 clicks ==> change or select the sixth menu item.

7 clicks ==> change or select the seventh menu item.

Change settings on-the-fly

Opening the settings UI with a double click on the button allows to change basic settings without the need to connect a laptop or computer over USB.

The button function in the Settings UI changes, depending on the settings level. In general, a single click goes up one level in the settings.

For other items, the number in front of the item indicates the number of clicks required to activate the level.

If a level has selectable items, the selected items is marked with ==> instead of its number.

If a level has an item that can be toggled on/off, the status is shown after the item name.

Overview of all settings levels:

Top Level

- (2) Get test settings info (mode, send interval, location status, display saver status)
- (3) Change device settings (Change send interval, enable/disable location, enable/

disable display saver)

- (4) Change test mode (LoRaWAN, LoRa P2P)
- (5) Change LoRa P2P or LoRaWAN settings

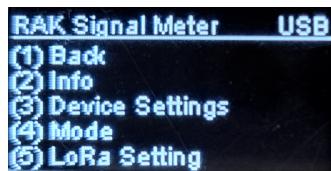


Figure 32: Top Level

NOTE

Device might reset on leaving the settings if test mode has changed.

Test settings info

- Current test settings

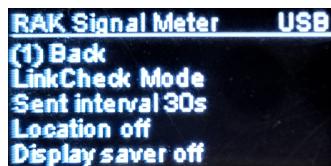


Figure 33: Current test settings

Device settings

- (2) Change send interval
- (3) Enable/Disable location tracking (toggle)
- (4) Enable/Disable display saver (toggle)

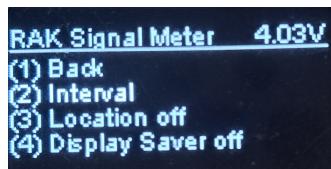


Figure 34: Device settings

NOTE

Location on keeps the GNSS module powered up for faster location acquisition (faster battery drain) Display Saver on switches off the display after 1 minute. The display can be turned on with a single button click.

Send interval

- (2) 10 seconds more
- (3) 10 seconds less

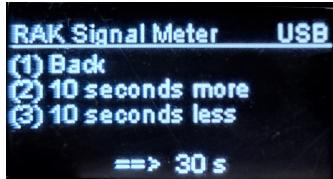


Figure 35: Send interval

Test Mode

- (2) LinkCheck test mode (no back-end required)
- (3) LoRa P2P test mode
- (4) Field Tester compatible test mode. Has limited functionality and requires back-end, see RAK10701 Field Tester Quick Start Guide
- (5) Field Tester PLUS compatible test mode. Has limited functionality and requires back-end, see RAK10701 Field Tester PLUS Quick Start Guide

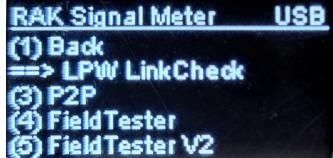


Figure 36: Test Mode

LoRaWAN setting (only in LoRaWAN test modes)

- (2) Enable/Disable ADR
- (3) Change DR
- (4) Change TX power
- (5) Change LoRaWAN region

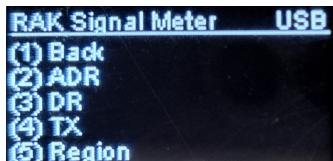


Figure 37: LoRaWAN settings

ADR

- (2) ADR on/off (toggle)

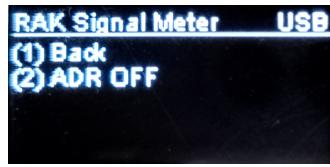


Figure 38: ADR settings

DR

- (2) select next higher data rate
- (3) select next lower data rate

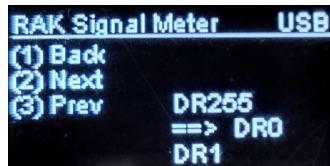


Figure 39: DR settings

TX

- (2) select next higher TX power
- (3) select next lower TX power

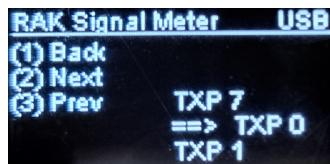


Figure 40: TXP settings

Region

- (2) select next region
- (3) select previous

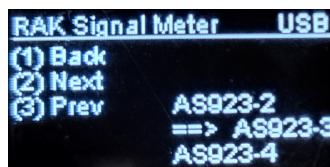


Figure 41: LoRaWAN region selection

LoRa P2P setting (only in LoRa P2P test modes)

- (2) Change send frequency

- (3) Change spreading factor
- (4) Change bandwidth
- (5) Change coding rate
- (6) Change TX power

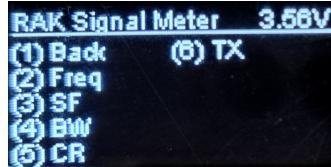


Figure 42: LoRa P2P settings

Send frequency

- (2) 0.1MHz up
- (3) 0.1MHz down



Figure 43: Send frequency

Spreading factor

- (2) select next higher SF
- (3) select next lower SF

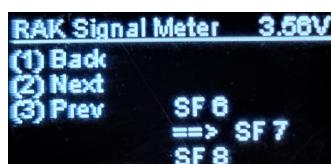


Figure 44: SF settings

Bandwidth

- (2) select next higher BW
- (3) select next lower BW



Figure 45: BW settings

Coding rate

- (2) select next higher CR
- (3) select next lower CR

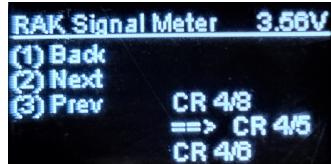


Figure 46: CR settings

TX power

- (2) select next higher TX power
- (3) select next lower TX power

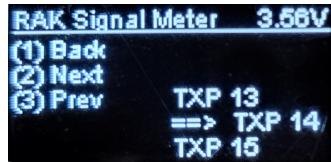


Figure 47: TX power settings

Custom AT commands

The RAK10706 application includes multiple custom AT commands:

- ATC+SENDINT to set the send interval time or heart beat time. The device will send a payload with this interval. The time is set in seconds, e.g. AT+SENDINT=600 sets the send interval to 600 seconds or 10 minutes.
- ATC+MODE to set the test mode. 0 using LPWAN LinkCheck, 1 using LoRa P2P, 2 using FieldTester protocol, 3 using FieldTester PLUS protocol.
- ATC+STATUS to get status information from the device.
- ATC+PCKG to setup a custom payload that is used in the uplink packets (only Linkcheck test mode and LoRa P2P test mode).
- ATC+LOGS to retrieve or erase saved log files from the SD card (if SD card is present).
See AT command for log files
- ATC+RTC to set or get time of RTC (if RTC module is present). Set format = [yyyy:mm:dd:hh:MM] (discard leading zeros!)

Setup with AT commands

LoRa P2P Setup

To use the device in LoRa P2P mode it has to be set into this mode with

```
AT+NWM=0
```

The device might reboot after this command, if it was not already in P2P mode.

Then the LoRa P2P parameters have to be setup. In this example, I am setting the device to 916100000 Hz frequency, 125kHz bandwidth, spreading factor 7, coding rate 4/5, preamble length 8 and TX power of 5dBm:

```
AT+PRECV=0  
AT+P2P=916000000:7:0:1:8:5  
ATC+MODE=2
```



NOTE

If the credentials were set already (they are saved in the flash of the device), the switch to P2P testing can as well be done with ATC+MODE=2

The device might reboot after this command, if it was not already in LoRa P2P mode.

The command AT+PRECV=0 is required to stop the device from listening. While in RX mode, parameters cannot be changed.

To be able to receive packets from other devices, they have to be setup to exactly the same parameters.

LoRaWAN LinkCheck Setup

To use the device in LoRaWAN mode it has to be set into this mode with

```
AT+NWM=1
```

The device might reboot after this command, if it was not already in LoRaWAN mode. Then the LoRaWAN parameters and credentials have to be setup. In this example, I am setting the device to AS923-3, OTAA join mode, unconfirmed packet mode, enable link check and then reset the device to perform a LoRaWAN JOIN sequence:

```
AT+BAND=10
AT+NJM=1
AT+CFM=0
AT+LINKCHECK=2
AT+DEVEUI=AC1F09FFFFE000000
AT+APPEUI=AC1F09FFFFE000000
AT+APPKEY=AC1F09FFFFE000000AC1F09FFFFE000000
ATC+MODE=0
ATZ
```

NOTE

If the credentials were set already (they are saved in the flash of the device), the switch to LinkCheck testing can as well be done with

ATC+MODE=0

The device might reboot after this command, if it was not already in LoRaWAN mode.

The device has to be registered in a LoRaWAN server with these credentials and a gateway in range has to be connected to the LoRaWAN server. Otherwise the device cannot join and there are no tests possible! If the device cannot join the network, it will show an error on the display:

LoRaWAN Join Failed

In this case double check all settings on the device and LoRaWAN server and check if a gateway is in range and connected to the LoRaWAN server.

LoRaWAN FieldTester & FieldTester Pro Setup

NOTE

These test modes do not offer the complete functionality of the RAK10701-L and RAK10701-PLUS Field Testers.

To use the device in LoRaWAN mode it has to be set into this mode with

```
AT+NWM=1
```

The device might reboot after this command, if it was not already in LoRaWAN mode. Then the LoRaWAN parameters and credentials have to be setup. In this example, I am setting the device to AS923-3, OTAA join mode, confirmed packet mode, disable link check and then reset the device to perform a LoRaWAN JOIN sequence:

```
AT+BAND=10
AT+NJM=1
AT+CFM=1
AT+LINKCHECK=0
AT+DEVEUI=AC1F09FFFE000000
AT+APPEUI=AC1F09FFFE000000
AT+APPKEY=AC1F09FFFE000000AC1F09FFFE000000
ATC+MODE=3
ATZ
```

NOTE

If the credentials were set already (they are saved in the flash of the device), the switch to FieldTester testing can as well be done with

```
ATC+MODE=3
```

The device might reboot after this command, if it was not already in LoRaWAN mode.

In FieldTester Mode a backend server has to be setup as integration in the LoRaWAN server. Without this backend server, the FieldTester Mode does not work. More information about available backend solutions can be found in the RAK10701 documentation

The device has to be registered in a LoRaWAN server with these credentials and a

gateway in range has to be connected to the LoRaWAN server. Otherwise the device cannot join and there are no tests possible! If the device cannot join the network, it will show an error on the display:

LoRaWAN Join Failed

In this case double check all settings on the device and LoRaWAN server and check if a gateway is in range and connected to the LoRaWAN server.

Usage

The principle usage for all modes is similar. After selecting the mode and setting the correct parameters and credentials, the device will send uplink packets in the selected send interval.

A IMPORTANT

When using FieldTester Mode, the device requires to have a valid location fix from its builtin GNSS module. Otherwise it will not send any uplink packets.

LoRa P2P

If the setup of all devices is the same and a packet is received, the display will show the received LoRa P2P packets:

- P2P received packet number
- Frequency, spreading factor and bandwidth
- RSSI
- SNR

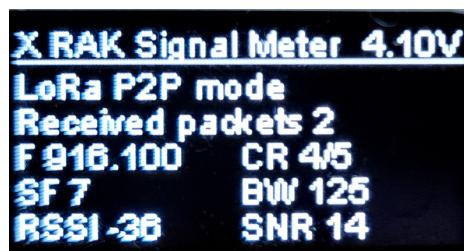


Figure 48: LoRa P2P RX

! NOTE

A uplink can be manually triggered by pushing the button three times.

After a packet was sent out it is shown on the display:

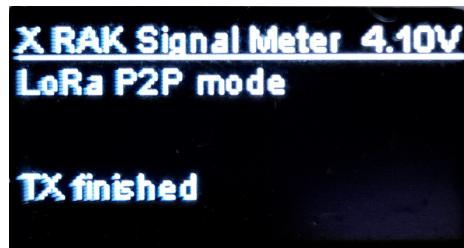


Figure 49: LoRa P2P RX

LoRaWAN LinkCheck

After the device has joined the network, it will send confirmed packets with LinkCheck request enabled to the LoRaWAN server. The LoRaWAN server will answer to the LinkCheck request. The display will show

- Linkcheck result
- Demodulation Margin from the LoRaWAN server
- DR of the sent packet
- Number of gateways
- Number of sent and lost packets
- RSSI and SNR of the received packet

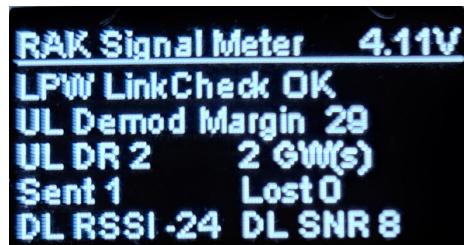


Figure 50: LoRaWAN LinkCheckAns

If the device is out of the range of gateways (after it had joined before), it will show an error message if the LoRaWAN server did respond to the LinkCheck request:

- Linkcheck result
- Number of sent and lost packets
- Error value
- DR of the sent packet

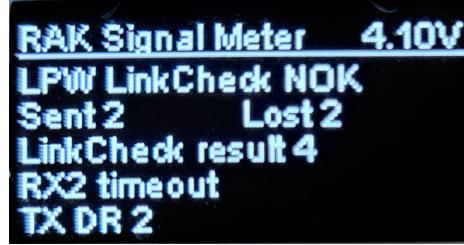


Figure 51: LoRaWAN no LinkCheckAns

NOTE

A uplink can be manually triggered by pushing the button three times.

To check all possible data rates, multiple uplinks can be triggered by pushing the button four times. The packets will be sent starting with the lowest possible DR and with each packet the DR is increased until the highest possible DR has been reached.

LoRaWAN FieldTester

After the device has joined the network, it will send confirmed packets with location information to the LoRaWAN server. The LoRaWAN server will forward this information together with gateway information to the backend server. The backend server will create and send a downlink packet to the tester. The display will show

- RSSI and SNR level of the received downlink packet
- Number of gateways that received the packet
- Min and Max RSSI levels seen by the gateways
- Min and Max calculated distance between the tester and the gateways
- Number of sent packets and number of lost packets



Figure 52: Fieldtester display

Before sending a uplink packet, the tester will try to acquire a location.



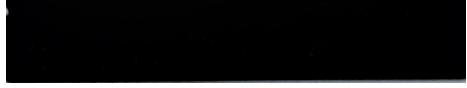


Figure 53: Fieldtester location acquisition

If a location fix can be acquired, an uplink packet will be sent, then wait for the downlink packet from the backend server. You can see in the head line of the display the **O** indicating that a location was acquired.



Figure 54: Fieldtester location fix

If no location fix can be acquired, an error will be displayed and no packet will be sent. You can see in the head line of the display the **X** indicating that no location was acquired.



Figure 55: Fieldtester location failure

NOTE

A uplink can be manually triggered by pushing the button three times.

To check all possible data rates, multiple uplinks can be triggered by pushing the button four times. The packets will be sent starting with the lowest possible DR and with each packet the DR is increased until the highest possible DR has been reached.

IMPORTANT

In FieldTester Mode a backend server has to be setup as integration in the LoRaWAN server. Without this backend server, the FieldTester Mode does not work.

More information about available backend solutions can be found in the [RAK10701 documentation](#) .

Log files (If SD card is present)

If a SD card is present, the results of the coverage tests are written in CSV format to the SD card.

The files start from 0000-log.csv and on every restart a new file with an upcounting number is created.

AT commands for log files

ATC+LOGS=? is used to retrieve the log files over the USB port. This makes it possible to read the log files without removing the SD card from the device.

ATC+LOGS=e is used to erase all log files from the SD card.

Linkcheck mode log format

When in Linkcheck mode for LoRaWAN, the log file has the following format:

If location is enabled

time;Mode;Gw;Lat;Lng;RX RSSI;RX SNR;Demod;TX DR;Lost

If location is disabled

time;Mode;Gw;RX RSSI;RX SNR;Demod;TX DR;Lost

time	Mode	Gw	Lat	Lng	RX RSSI	RX SNR
Time stamp (available if LNS has provided the time or if a RTC module is attached)	0 for LinkCheck mode	Number of gateways	Latitude (if location is active and location fix)	Longitude (if location is active and location fix)	RSSI of downlink	SNR of downlink
2024-10-07	0	1	14.521355	121.106880	-91	8

time	Mode	Gw	Lat	Lng	RX RSSI	RX SNR
14:35:20						

FieldTester mode log format

When in FieldTester mode for LoRaWAN, the log file has the following format:

time;Mode;Gw;Lat;Lng;min RSSI;max RSSI;RX RSSI;RX SNR;min Dist;max Dist; TX DR

time	Mode	Gw	Lat	Lng	min RSSI	max RSSI
Time stamp (available if LNS has provided the time or if a RTC module is attached)	2 for FieldTester mode	Number of gateways	Latitude (can be 0.0 if no location fix, e.g. indoor testing)	Longitude (can be 0.0 if no location fix, e.g. indoor testing)	min RSSI seen by gateways	max RSSI seen by gateway
2024-10-07 14:39:00	2	1	14.521355	121.106880	-50	-50

P2P mode log format

When in Linkcheck mode for LoRaWAN, the log file has the following format:

If location is enabled

time;Mode;Lat;Lng;RX RSSI;RX SNR

If location is disabled

time;Mode;RX RSSI;RX SNR

time	Mode	Lat	Lng	RX RSSI	RX SNR
Time stamp (available if LNS has provided the time or if a RTC module is attached)	1 for LinkCheck mode	Latitude (if location is active and location fix)	Longitude (if location is active and location fix)	RSSI of downlink	SNR of downlink
2024-10-07 14:51:21	1	14.521355	121.106880	-38	12

Miscellaneous

This part of the guide shows the Field Tester interface and how to update the firmware.

- [Firmware Update](#)

Upgrading the Firmware

It is recommended to update to the latest version of the firmware. To do this, download the latest [RAK10706 WisNode Signal Meter firmware](#) and use the WisToolBox to update the custom firmware.

1. Drag the downloaded firmware to the WisToolBox custom firmware section.

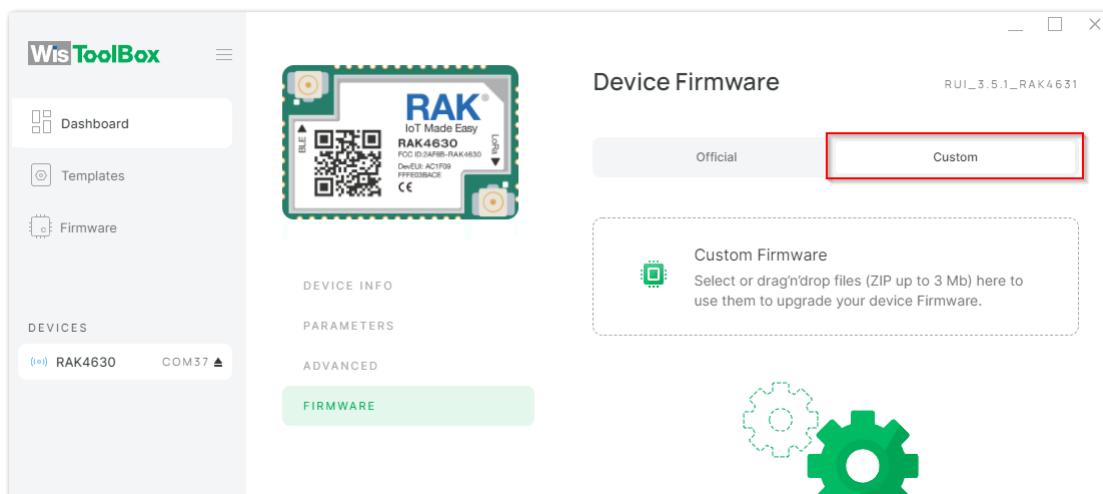




Figure 56: WisToolBox firmware

2. After the firmware file is uploaded to the application, you can now select **UPGRADE DEVICE**.

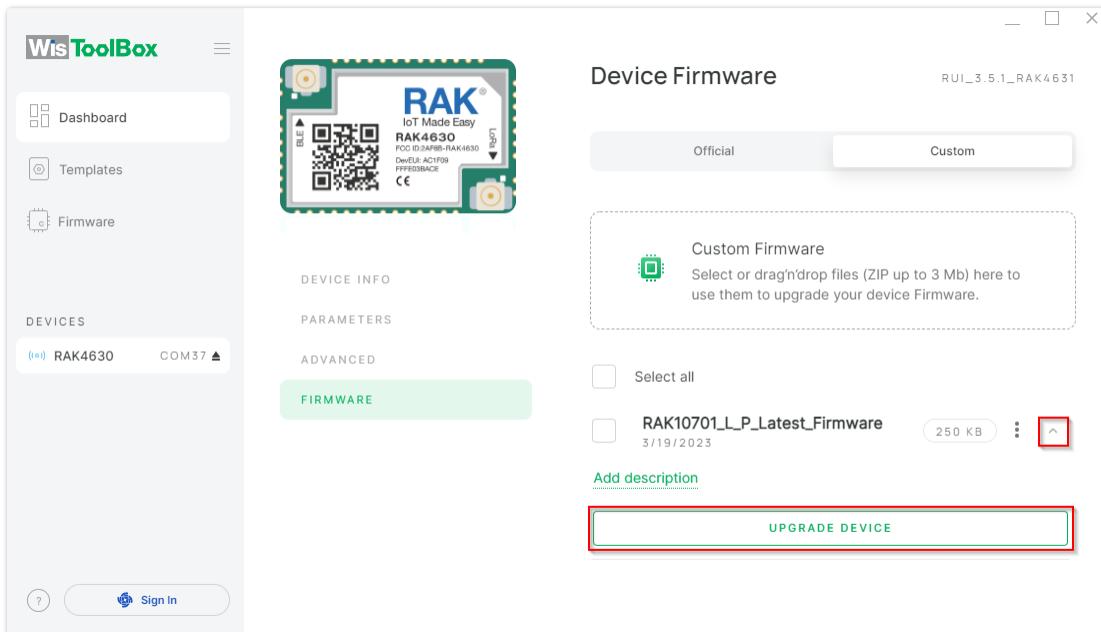


Figure 57: Upload the latest firmware

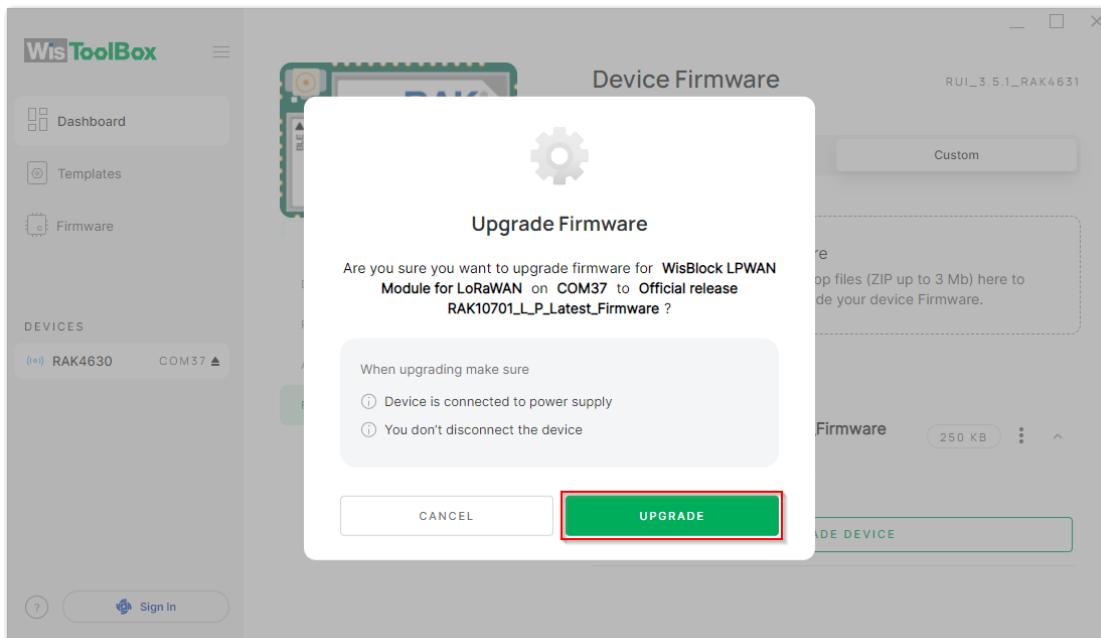


Figure 58: Confirm upgrading of firmware

3. If all proceed with no error, you should see **Firmware update successful** notification, and the RAK10701-P will restart automatically.



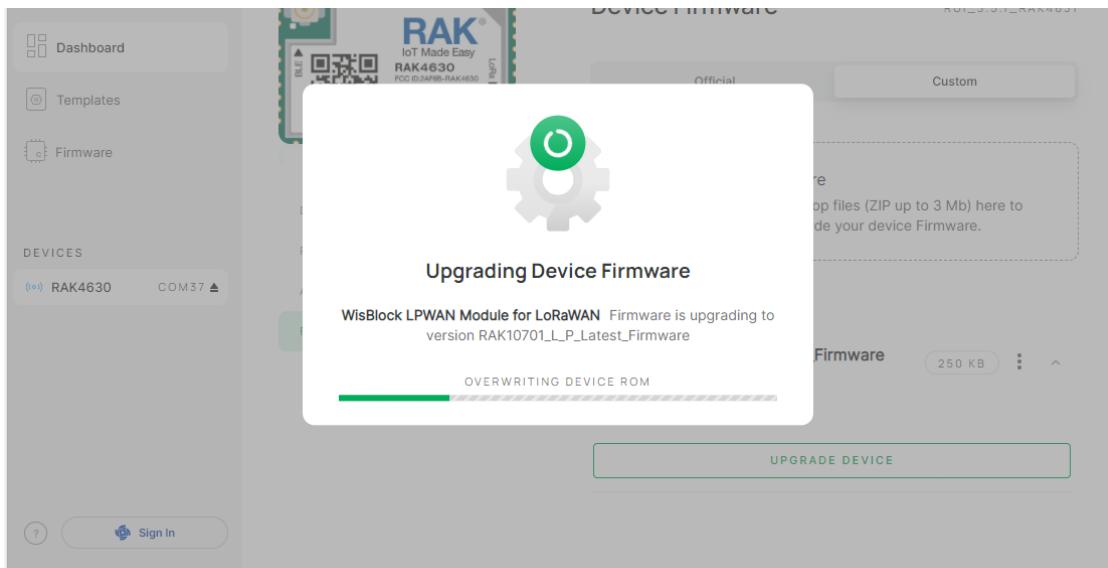


Figure 59: Ongoing upgrading of firmware

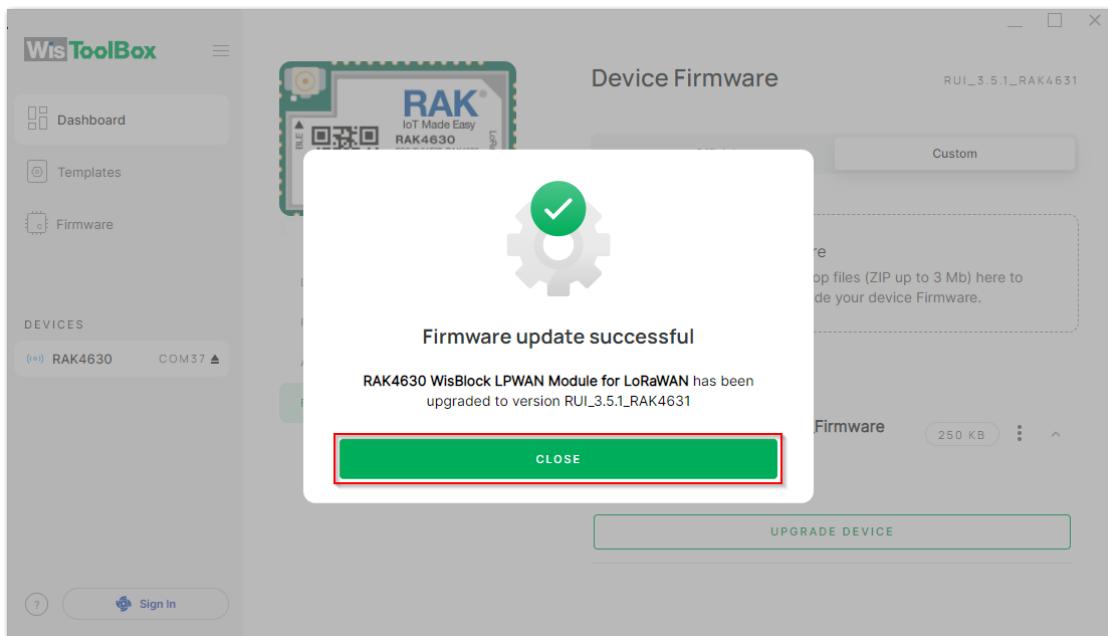


Figure 60: Successful upload of latest firmware

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