

# **ProLink LoRaWAN EndNode Modem HCI Specification (AU915)**

Specification Version 2.0

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## Document Information

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## Revision History

| Version | Note  |
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| 0.1     | Created, Initial Version<br>Reference: WiMOD LoRaWAN EndNode Modem HCI Spec V1.24   |
| 1.0     | Reference: WiMOD LoRaWAN EndNode Modem HCI Spec V2.0<br>Update for LoRaWAN v1.0.4   |
| 1.1     | Document renamed<br>Reference: WiMOD LoRaWAN EndNode Modem HCI Spec V2.2<br>Reference: RP002-1.0.1 LoRaWAN® Regional Parameters document (LoRa Alliance).   |
| 2.0     | Valid from firmware V3.0, Build Count 194<br>Document renamed to support the ProLink LoRaWAN FW<br>Reference: ProLink LoRaWAN EndNode Modem HCI Spec<br>Reference: RP002-1.0.1 LoRaWAN® Regional Parameters document (LoRa Alliance). |

## Aim of this Document

This document describes the ProLink LoRaWAN<sup>®1</sup> EndNode Modem Host Controller Interface (HCI) protocol which is part of the ProLink LoRaWAN<sup>®</sup> EndNode Modem firmware. This firmware can be used in combination with the WiMOD LoRa radio module family.

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<sup>1</sup> LoRa<sup>®</sup> is a registered trademark of Semtech Corporation. LoRaWAN<sup>®</sup> is a registered trademark of the LoRa Alliance<sup>®</sup>.

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# 1. Introduction

## 1.1 Overview

This document is an extension to the ProLink LoRaWAN® EndNode Modem HCI document [1], covering the changes included in the ProLink LoRaWAN® EndNode Modem firmware for AU 915-928MHz ISM Band.

Note that if this region is selected the LoRaWAN® stack will disable any duty cycle restrictions automatically. In this case, the “Duty Cycle Control” option available under the “Radio Stack Configuration” (see [1]) refers to the adjustment of the time between two consecutive uplink (in the same frequency) to 20s, in case the end-device is configured to use less than 50 hopping channels.

## 2. Appendix

### 2.1 LoRaWAN® Multi Band Support

#### 2.1.1 Radio Band Indices

| Index | Band Description |
|-------|------------------|
| 41    | AU 915 MHz       |

#### 2.1.2 AU 915 MHz Band

##### 2.1.2.1 Data Rate Indices

| Index | Data Rate / Spreading Factor | Bandwidth | Indicative physical bit rate [bit/s] | Comments   |
|-------|------------------------------|-----------|--------------------------------------|--|
| 0     | LoRa / SF12                  | 125 kHz   | 250                                  | Only available if DwellTime set to 0 by the LoRaWAN server |
| 1     | LoRa / SF11                  | 125 kHz   | 440                                  |  |
| 2     | LoRa / SF10                  | 125 kHz   | 980                                  | Default setting  |
| 3     | LoRa / SF9                   | 125 kHz   | 1760                                 |  |
| 4     | LoRa / SF8                   | 125 kHz   | 3125                                 |  |
| 5     | LoRa / SF7                   | 125 kHz   | 5470                                 |  |
| 6     | LoRa / SF8                   | 500 kHz   | 12500                                |  |
| 8     | LoRa / SF12                  | 500 kHz   | 980                                  |  |
| 9     | LoRa / SF11                  | 500 kHz   | 1760                                 |  |
| 10    | LoRa / SF10                  | 500 kHz   | 3900                                 |  |
| 11    | LoRa / SF9                   | 500 kHz   | 7000                                 |  |
| 12    | LoRa / SF8                   | 500 kHz   | 12500                                |  |
| 13    | LoRa / SF7                   | 500 kHz   | 21900                                |  |

### 2.1.2.2 Uplink Channel Indices

| Index   | Frequency Channel                       | Comments                                 |
|---------|---|--|
| 0 - 7   | 915.2 – 916.6 MHz (in steps of 200 kHz) | Data Rates 0 - 5 / Sub-band Mask1: Bit 0 |
| 8 - 15  | 916.8 – 918.2 MHz (in steps of 200 kHz) | Data Rates 0 - 5 / Sub-band Mask1: Bit 1 |
| 16 - 23 | 918.4 – 919.8 MHz (in steps of 200 kHz) | Data Rates 0 - 5 / Sub-band Mask1: Bit 2 |
| 24 - 31 | 920.0 – 921.4 MHz (in steps of 200 kHz) | Data Rates 0 - 5 / Sub-band Mask1: Bit 3 |
| 32 - 39 | 921.6 – 923.0 MHz (in steps of 200 kHz) | Data Rates 0 - 5 / Sub-band Mask1: Bit 4 |
| 40 - 47 | 923.2 – 924.6 MHz (in steps of 200 kHz) | Data Rates 0 - 5 / Sub-band Mask1: Bit 5 |
| 48 - 55 | 924.8 – 926.2 MHz (in steps of 200 kHz) | Data Rates 0 - 5 / Sub-band Mask1: Bit 6 |
| 56 - 63 | 926.4 – 927.8 MHz (in steps of 200 kHz) | Data Rates 0 - 5 / Sub-band Mask1: Bit 7 |
| 64 - 71 | 915.9 – 927.1 MHz (in steps of 1.6 MHz) | Data Rates 6 / Sub-band Mask2: Bits 0-7  |

### 2.1.2.3 Downlink Channel Indices

| Index   | Frequency Channel                       | Comments  |
|---------|---|---|
| 0 - 7   | 923.3 – 927.5 MHz (in steps of 600 kHz) | Data Rates 8 - 13                                 |
| 8 - 15  | 923.3 – 927.5 MHz (in steps of 600 kHz) | Data Rates 8 - 13                                 |
| 16 - 23 | 923.3 – 927.5 MHz (in steps of 600 kHz) | Data Rates 8 - 13                                 |
| 24 - 31 | 923.3 – 927.5 MHz (in steps of 600 kHz) | Data Rates 8 - 13                                 |
| 32 - 39 | 923.3 – 927.5 MHz (in steps of 600 kHz) | Data Rates 8 - 13                                 |
| 40 - 47 | 923.3 – 927.5 MHz (in steps of 600 kHz) | Data Rates 8 - 13                                 |
| 48 - 55 | 923.3 – 927.5 MHz (in steps of 600 kHz) | Data Rates 8 - 13                                 |
| 56 - 63 | 923.3 – 927.5 MHz (in steps of 600 kHz) | Data Rates 8 - 13                                 |
| 64 - 71 | 923.3 – 927.5 MHz (in steps of 600 kHz) | Data Rates 8 - 13                                 |
| 128     | 923 300 000Hz                           | Default Frequency for Rx2<br>Default Data Rate: 8 |

## 2.2 Proprietary LoRa® Communication Support

This section describes the physical radio parameters valid for the proprietary LoRa® communication in the AU 915-928MHz ISM Band:

- **Frequency**  
915.9 MHz, 917.5 MHz, 919.1 MHz, 920.7 MHz, 922.3 MHz, 923.9 MHz, 925.5 MHz and 927.1 MHz
- **Data rate**  
From SF7BW500 (21.9kbps) to SF8BW500 (12.5kbps)
- **Transmission Power**  
Maximum of +20dBm EIRP is allowed

### 2.2.1 Default Radio Configuration

The following table lists the default configuration for the specific default parameters for AU 915-928MHz ISM Band.

| Parameter            | Value AU915 |
|----------------------|-------------|
| Modulation           | 0 = LoRa®   |
| RF Carrier Frequency | 915.9 MHz   |
| Signal Bandwidth     | 2 = 500 kHz |
| Spreading Factor     | 8 = SF8     |
| Error Coding         | 1 = 4/5     |
| Power Level          | 7 = 7 dBm   |

## 2.3 List of Abbreviations

|       |   |
|-------|---|
| FW    | Firmware                                    |
| HCI   | Host Controller Interface                   |
| LR    | Long Range                                  |
| LoRa  | Long Range                                  |
| RAM   | Random Access Memory                        |
| RF    | Radio Frequency                             |
| RSSI  | Received Signal Strength Indicator          |
| RTC   | Real Time Clock                             |
| SLIP  | Serial Line Internet Protocol               |
| SNR   | Signal to Noise Ratio                       |
| UART  | Universal Asynchronous Receiver/Transmitter |
| WiMOD | Wireless Module by IMST                     |

## 2.4 List of References

[1] ProLink\_LoRaWAN\_EndNode\_Modem\_HCI\_Spec.pdf.



### **3. Regulatory Compliance Information**

The use of radio frequencies is limited by national regulations. The applicable regulation requirements are subject to change. IMST GmbH does not take any responsibility for the correctness and accuracy of the aforementioned information. National laws and regulations, as well as their interpretation can vary with the country. In case of uncertainty, it is recommended to contact either IMST's accredited Test Center or to consult the local authorities of the relevant countries.

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