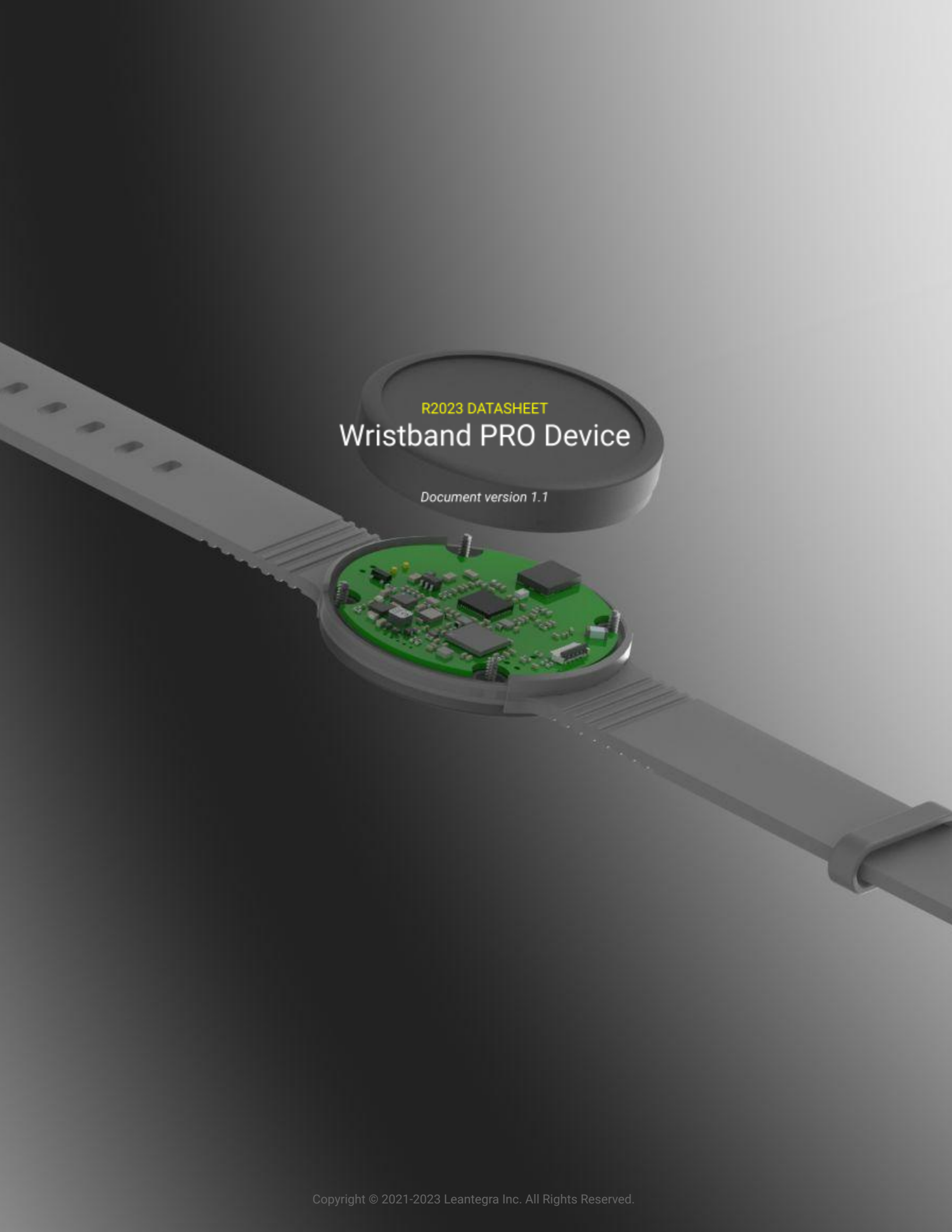

R2023 DATASHEET

Wristband PRO Device

Document version 1.1

DOCUMENT REVISIONS

Version	Date	Author	Comments
v1.0	2022-10-19	Oleg Puzanov	Draft version
v1.1	2023-01-26	Oleg Puzanov	Updated BLE GATT parameters and MQTT messages.

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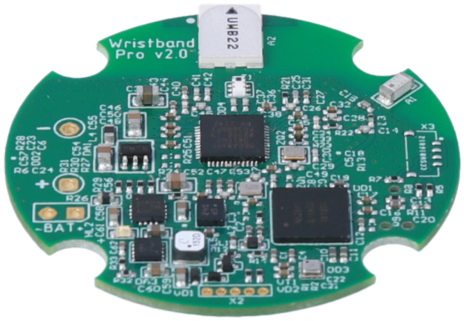
Wristband PRO: With / Without Front Panel

Wristband PRO: PCB



Wristband PRO is an industrial-grade wristband device for personnel tracking using UWB and BLE RTLS. Two-way alerting and sensor telemetry features over UWB and BLE are included in addition to location tracking.

The device also includes Bosch 6-axis IMU, barometer and the power supply over magnetic connector to stay compliant with IP67 requirements. Wristband PRO also has a front panel with two LEDs and a programmable button, which is used for alerting by default.

The default usage scenarios for Wristband PRO include personnel tracking in various industrial environments, such as factories, warehouses and non-ATEX mining areas. For example:

- 2D-3D position tracking for workers in steel factories.
- Location-enabled alerting scenarios in emergency situations for personnel.
- Location tagging for sensor data, which is collected by service technicians - for example: location tagging for pyrometers, which measure temperature at factory ovens.
- Native integration with the Collision Avoidance and Proximity Detection Subsystem (see Chapter 6.7).

Please consider using Tag PRO/LITE devices instead of Wristband PRO when your project requires RTLS tags to be attached to helmets or other PPE items. Some additional details can be found on the Leantegra website.

Wristband PRO can be powered by a rechargeable 3.7V 320 mAh Li-Po accumulator or directly from the magnetic connector. No accumulator is needed for the direct power supply over the magnetic connector.

Several RTLS technologies are supported in both hardware and software of Wristband PRO devices:

- UWB for 1D-3D RTLS scenarios based on TWR and our custom algorithm with 5-10 cm accuracy. Maximum range for UWB TWR is 70-80 meters for the case of SMD chip antenna, which is a default option.
- Custom UWB TDoA algorithm for highly scalable and low-power 2D RTLS scenarios, which need 50-60 cm accuracy for RTLS. Maximum range for UWB TDoA is 70-80 meters for the case of SMD chip antenna, which is a default option.
- Tunnel UWB/BLE RTLS algorithms, which were developed specifically for underground mines (see Chapter 6.5).
- BLE zoning based on RSSI and Kalman filtering - suitable for room-level tracking scenarios.
- Height tracking based on the embedded barometer - suitable for floor/level detection with less RTLS anchors.
- Sensor telemetry for over UWB or BLE payloads - accelerometer, gyroscope, temperature (see Chapter 6.8).

The payload format for UWB and BLE protocols of Wristband Pro has been customized to include non-RTLS data from other sensors - for example: barometer, accelerometer, gyroscope, temperature sensors, methane sensors etc.

Multiple configuration parameters are available via BLE GATT, as well as OTA firmware upgrade via nRF52 DFU bootloader (see Chapter 7).

Wristband PRO devices are natively supported by Leantegra RTLS Server and CVO Portal software. Lower-level protocol integrations with Wristband PRO are possible via BLE GATT or using MQTT messages from Locator PRO devices.

Wristband LITE

Wristband LITE is a reduced version of Wristband PRO with the goal to reduce costs by removing the following features:

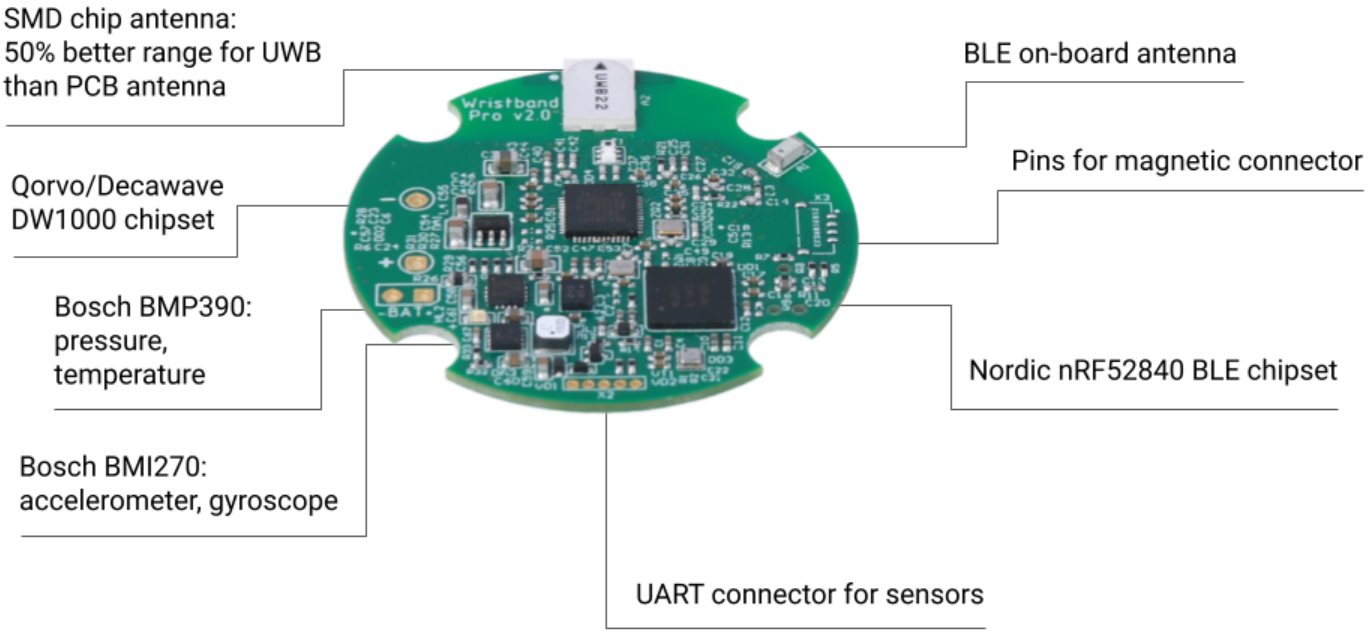
- UWB chipset, circuitry and antenna
- Bosch BMP390 barometer
- Optional: front panel with LEDs and button

Wristband LITE is used for location tracking and two-way alerting scenarios based on BLE and IMU only. This configuration might be suitable when room-level tracking is enough for your project requirements.

Important - at this stage Wristband PRO/LITE devices do not have ATEX certifications and shouldn't be installed in coal mines or other locations, where ATEX Zone 0-2 certificates are required. If you need ATEX-certified UWB or BLE devices, then please check some other devices on the Leantegra website.

2. Key Characteristics

2.1. PCB Components



- **BLE chipset and antenna:** Nordic nRF52840, SMD chip antenna
- **UWB chipset and antenna:** Qorvo/Decawave DW1000, SMD chip antenna
- **6-axis IMU (accelerometer, gyroscope):** Bosch BMI270
- **Barometer:** Bosch BMP390
- **Two options for power supply:**
    - Direct power supply over the magnetic connector - no accumulator is needed
    - Rechargeable 3.7V Li-Po accumulator (recharging via magnetic connector)
- **Connectors:**
    - Protected magnetic connector
    - Connector for NFC antenna
    - Internal UART connector for sensors
    - Internal connector for Li-Po / Li-Ion accumulator

2.2. Magnetic Connector

Connected Charging Cable	Pins of the Magnetic Connector
	

2.3. Front Panel

Button and LED Indicators

2.4. Antenna Characteristics

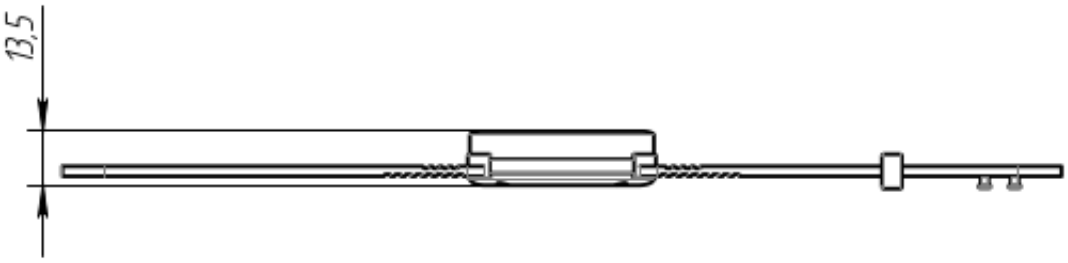
Radiation patterns and electrical characteristics for the antennas are available in the corresponding datasheets:

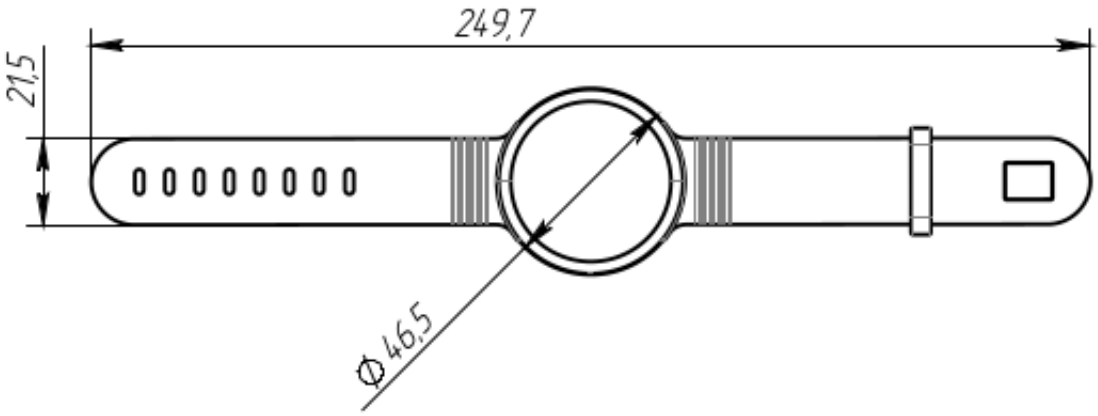
- Datasheet for UWB antenna
- Datasheet for BLE antenna

2.5. Electrical and Environmental

- Enclosure IP compliance: IP67
- Temperature range with the default enclosure: -20 °C … + 60 °C
- PCB temperature range: -40 °C … +85 °C
- Power supply and consumption:
    - Magnetic connector: 5V, 1A
    - Rechargeable 3.7V 320 mAh Li-Po accumulator with other options available: 250mAh, 500 mAh

2.6. Enclosure Dimensions





3. Configuration Parameters

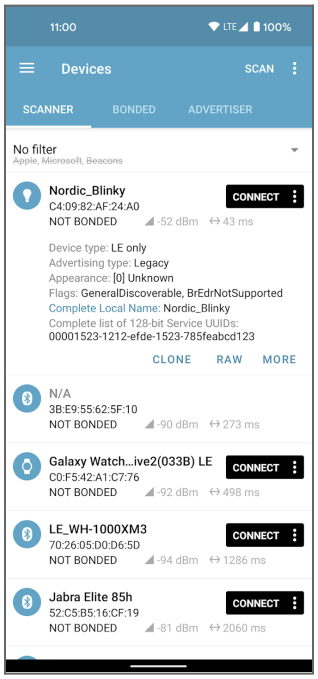
3.1. Brief Overview

Wristband PRO/LITE devices support configurations via **BLE GATT** interface using Leantegra Config App or 3rd-party applications, such as Nordic nRF Connect.

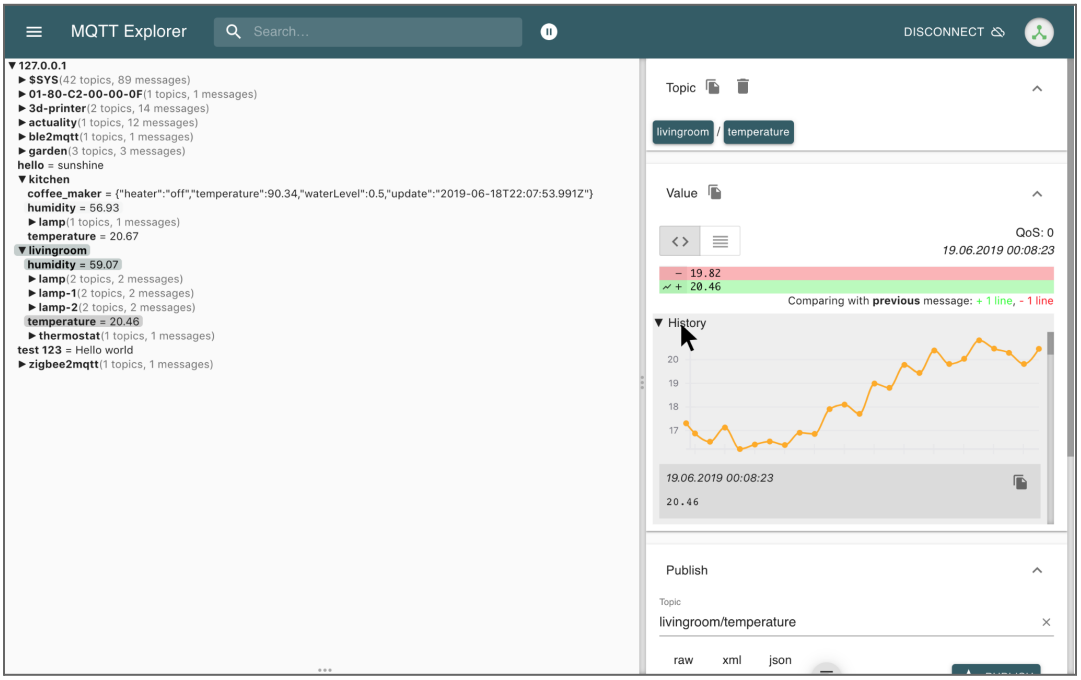
Please consider that the MQTT interface for configurations is not supported at this stage by Wristband PRO/LITE.

Important - if you're using nRF Connect App for changing any BLE GATT parameters, then please **disconnect** after such changes. The new values won't be applied until disconnecting via BLE.

nRF Connect App



MQTT Explorer



3.2. Parameters Table

Name	Read, Write	UUID for BLE GATT	Format	Comments
Serial Number	RW	0x5201	16 bytes, string	Should be changed only once
BLE MAC Address	R	0x5202	6 bytes, byte array	Standard MAC address
Battery Level	R	0x5203	1 byte, uint8	By default, values are in %
Firmware Version	R	0x5204	10 bytes, string	Might includes letters and numbers
Device Name	RW	0x5205	20 bytes, string	User-friendly name of this device
UWB RTLS Mode: TWR or TDoA	RW	0x5206	1 byte, uint8	1: TWR; 2: TDoA
Adaptive Transmission Mode	RW	0x5207	1 byte, uint8	0: Disabled; 1: Enabled
Active Blink Rate	RW	0x5208	2 bytes, uint16	From 50 msec to 60 seconds
Inactive Blink Rate	RW	0x5209	2 bytes, uint16	From 50 msec to 180 seconds. Setting zero means disabling any transmissions while inactive.
UWB Channel: 1-7	RW	0x520a	1 byte, uint8	1: Channel #1; 2: Channel #2 etc. Default = Channel #7
UWB Data Rate	RW	0x520b	1 byte, uint8	1: 6.8 MBit/sec; 2: 850 KBit/sec; 3: 110 KBit/sec Default = 110 KBit/sec
UWB Preamble Size	RW	0x520c	1 byte, uint8	1: 64; 2: 128; 3: 256; 4: 512; 5: 1024; 6: 2048; 7: 4096 Default = 2048
UWB PRF	RW	0x520d	1 byte, uint8	1: 16 MHz; 2: 64 MHz Default = 16 MHz

UWB PAN ID	RW	0x520e	2 bytes, uint16	Network ID for UWB RTLS
Enable Search for TWR	RW	0x520f	1 byte, uint8	0: Disabled; 1: Enabled If search is disabled, then tag stops searching after it finds MAX_ANCHOR_NUM_TWR (below).
Maximum Anchors for TWR	RW	0x5210	1 byte, uint8	The maximum number of anchors for TWR search - from 3 to 255.
UWB "Smart Power" Mode	RW	0x5211	1 byte, uint8	0: The longest range; 1: The lowest power consumption
BLE iBeacon Blink Rate	RW	0x5212	2 bytes, uint16	From 100 msec to 10 seconds. Setting zero means disabling any iBeacon transmissions at all.
BLE GATT Password	RW	0x5213	20 bytes, string	If not empty, then all GATT parameters are password-protected
LED Control	RW	0x5214	1 byte, uint8	0: Disable LEDs; 1: Enable LEDs;
Button Control	RW	0x5215	1 byte, uint8	0: Disable button; 1: Enable button;
Restart-Shutdown	W	0x5264	1 byte, uint8	Write-only parameter: 1: Restart; 2: Shutdown; 99: Factory reset;

4. Data Interfaces

4.1. BLE GATT

BLE GATT interface is used by Wristband PRO for two purposes:

1. Configuration parameters (see Chapter 3.2)
2. Data exchange with mobile applications - for example: Android HMI application for Collision Avoidance.

When mobile applications need to communicate with Wristband PRO/LITE in the offline mode, independently from any LAN or WAN connections, then the BLE GATT interface is the most optimal choice. It can stream the RTLS data with acceptable latency and throughput, which are needed for Collision Avoidance Systems and similar applications.

Sample BLE GATT characteristic, which is used by Android HMI for Collision Avoidance System (CAS):

SERVICE_UUID for CAS: 00005100-1210-ef1e-1423-7851af03d463
CHARACTERISTIC_UUID for CAS: 00005111-1210-ef1e-1423-7851af03d463

GATT characteristic value - 4 bytes:

- Nearest distance in meters: (value & 0xFFFF) / 100
- Number of vehicles: (value & 0xFF0000) >> 16
- Number of people: (value & 0xFF000000) >> 24

4.2. JSON over MQTT

JSON over MQTT is the default protocol for RTLS data communications with Locator LITE/PRO devices. But it is not available for Wristband PRO/LITE, so it is mentioned in this document for **informational purposes only**.

MQTT is used by Locator PRO/LITE to communicate with Leantegra RTLS Server, but there is no limitation here - any MQTT brokers, compatible with MQTT 3.1.1 specification, can be used for direct data exchanges with Locator PRO/LITE devices. Some examples of MQTT brokers:

- VerneMQ - used by Leantegra RTLS server
- HiveMQ
- Mosquitto

Please note that some projects might require QoS2 support for MQTT, so we recommend using VerneMQ by default, because it supports all MQTT QoS policies.

MQTT is used by Locator PRO for the following purposes:

- Sending RTLS data - UWB TWR, TDoA and all other types of RTLS use MQTT for data payloads.
- Configuration parameters - MQTT is used for “mirroring” BLE GATT parameters (see Chapter 3.2). It means that each configuration parameter can be changed using BLE GATT or MQTT.
- OTA firmware upgrade - triggering the firmware upgrade via publishing to the specific MQTT topic.

Sample MQTT messages:

UWB TDoA Message	UWB TWR Message
{ "MessageID": 8011593, "MessageType": 0, "LocatorID": "UWBANCH0001", "TagID": "f2:e8:b8:50:63:a1", "DeviceType": "uwb2", "Timestamp_ref_1": 1071423525934, "TimestampTDoA": 1072283984540, "Timestamp_ref_2": 1081407487022, "Counter": 0, "Sensor_Own_Pressure": 101325, "Sensor_Own_Temperature": 19.7, "Sensor_Tag_Pressure": 101321, "Sensor_Tag_Temperature": 19.5 "Sensor_Tag_AccX": 2205, "Sensor_Tag_AccY": 1510, "Sensor_Tag_AccZ": 14914, "Sensor_Tag_GyrX": 392, "Sensor_Tag_GyrY": -910, "Sensor_Tag_GyrZ": -237, "Timestamp": 1107511,	{ "MessageID": 542201,, "MessageType": 0, "LocatorID": "UWBANCH0001", "TagID": "f2:e8:b8:50:63:a1", "DeviceType": "uwb", “Distance”: 2438, "Sensor_Own_Pressure": 101322, "Sensor_Own_Temperature": 19.2, "Sensor_Tag_Pressure": 101321, "Sensor_Tag_Temperature": 19.5 "Sensor_Tag_AccX": 2205, "Sensor_Tag_AccY": 1510, "Sensor_Tag_AccZ": 14914, "Sensor_Tag_GyrX": 392, "Sensor_Tag_GyrY": -910, "Sensor_Tag_GyrZ": -237, "Timestamp": 982511, }

5. UWB Details

5.1. Typical Configurations

When selecting the most optimal UWB parameters, such as UWB preamble and data rate, the following basic recommendations should be considered:

- Smaller UWB frame durations are enabled by configuring shorter UWB preambles and higher data rates.
- Smaller UWB frame durations consume less power and prolong battery life.
- Smaller UWB frame durations enable higher RTLS tag densities, but limit the maximum range of UWB signals and obstacle penetration possibilities.
- When you need the best possible range for UWB signals, then configure longer UWB preambles and lower data rates.

Typical configurations:

Better Tag Density	Better Range
Preamble: 256 Data rate: 6.8 Mbit/sec	Preamble: 2048 Data rate: 110 Kbit/sec

By default, Wristband PRO devices are configured with 2048 preamble and 110 Kbit/sec data rate.

5.2. Adaptive Transmission Feature

Wristband PRO device supports power saving by using the adaptive transmission feature for UWB - using different blink rates in active and inactive modes, which are triggered by the accelerometer values:

- Active mode - any motion for the last 10 seconds
- Inactive mode - no motion for the last 10 seconds

Specific thresholds for the accelerometer values are calibrated inside the firmware code and can’t be changed at runtime.

Blink rates for active and inactive modes are configured via BLE GATT parameters (see Chapter 3.2) - for example:

- Active blink rate - 500 msec
- Inactive blink rate - 10 seconds

By using the adaptive transmission feature it is possible to achieve 3-4 times smaller power consumption numbers for UWB TWR or TDoA. Still, some other UWB parameters might be considered when planning the battery life for Wristband PRO devices (see Chapter 5.1).

6. RTLS Features

6.1. Brief Overview

Wristband PRO device and Leantegra RTLS software enable highly customizable and configurable RTLS features with several algorithms based on UWB and BLE. Please see Chapter 3.2 for the relevant configuration parameters - for example: changing between UWB TWR and TDoA, selecting UWB channels, enabling BLE RSSI tracking etc.

The below table provides a brief summary for each RTLS technology or algorithm:

Feature Name	Technologies	Average Accuracy	Average Range	Key Advantages
UWB TWR	1D, 2D, 3D RTLS	5-20 cm	70-80 meters	The best location accuracy.
UWB TDoA	2D RTLS	30-60 cm	70-80 meters	Highly scalable, low power consumption.
Tunnel UWB RTLS	1D UWB TWR	30-60 cm	50-60 meters	Works with 2 RTLS anchors, good balance of accuracy and cost for underground mines.
Reverse BLE RTLS (Tunnel BLE)	1D BLE RTLS, Matchpoints	10-20 meters	60-80 meters	No cables are needed for tunnels, low cost RTLS for underground mines.
BLE Zoning	BLE RSSI Tracking	2-3 meters	15-20 meters	Simple option for room-level tracking.
Collision Avoidance and PDS	UWB TWR, BLE RSSI Tracking, BLE GATT	10-50 cm	100+ meters	Integrated system with Android HMI for vehicles.
Height Tracking	Barometer or 3D RTLS	30-50 cm (relative). Using Bosch BMP390 by default.	70-80 meters	Only one RTLS anchor is needed for height tracking.
Orientation-Motion	Gyroscope,	Depends on the	70-80 meters	Only one RTLS anchor is

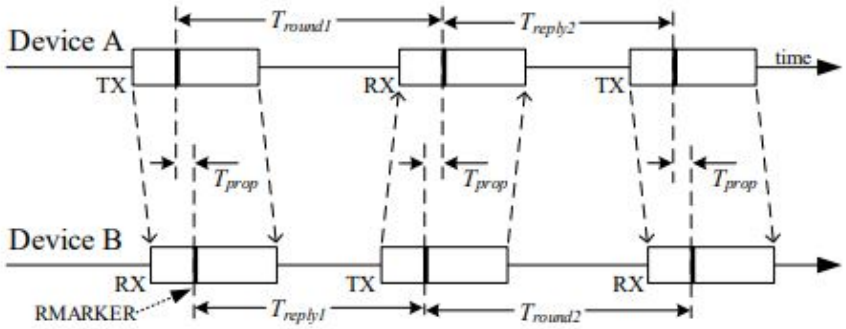
Tracking	Accelerometer	UWB tag. Using Bosch BMI270 by default.		needed for tracking orientation and motion.

6.2. UWB TWR

The firmware of Wristband PRO implements a custom DS-TWR algorithm: double-sided **two-way ranging**.

This algorithm requires three UWB frames to be exchanged between an RTLS anchor and each RTLS tag for calculating distances. The original implementation of DS-TWR from Qorvo / Decawave was customized to achieve a better ranging accuracy.

We observed 4-5 times improvement for the ranging accuracy with our customized DS-TWR algorithm compared to the default implementation, which is bundled with Qorvo / Decawave DW1000 libraries.



Both range and tag density for UWB TWR can be adjusted according to the project requirements by changing the corresponding parameters using BLE GATT (see Chapter 3.2). The most important parameters for range and tag density are “UWB Data Rate”, “Preamble Size” and “UWB Ranging Rate” (on the tag side).

The basic approach is that the longer preamble with the lower data rates increases the resulting UWB range, but decreases the resulting UWB tag density.

Main characteristics:

- Accuracy:
  - 5-10 cm for static (or slowly moving) objects.
  - 10-30 cm for moving objects.

- Range:
    - Settings for longer range: best case LOS - 80 meters, worst case LOS - 60 meters.
    - Settings for higher density: best case LOS - 50 meters, worst case LOS - 30 meters.
- Tag density:
    - Settings for longer range : 1 Hz rate - up to 120 tags, 5 Hz rate - up to 25 tags.
    - Settings for higher density: 1 Hz rate - up to 800 tags, 5 Hz rate - up to 160 tags.

When to use:

- When the location accuracy is very important and you need sub-30 cm accuracy.
- When you need UWB ranging only (distance) between two objects, instead of the location coordinates.
- 1D UWB RTLS scenarios for tunnels or rails - can't be implemented using TDoA.
- 3D UWB RTLS scenarios have a better Z-axis accuracy with less RTLS anchors.

When not to use:

- When your RTLS installation must be powered by batteries or accumulators, which can't be frequently recharged. Power consumption for UWB TWR is 50-100 times higher than for the case of TDoA!
- When the tag density is really high - for example: tracking 1000+ objects inside the same area.

6.3. UWB TDoA

Fully wireless and asynchronous TDoA (Time Difference of Arrival) algorithm, which doesn't require clock synchronizations among RTLS anchors. Our patent-pending UWB TDoA implementation is included into the firmware of Wristband PRO and other Leantegra UWB devices.

Battery life is the main concern for UWB TWR systems, because the task of recharging or replacing batteries might become a major issue from both operational and financial perspectives.

At the same time, reducing UWB transmissions and data rates for battery saving purposes might not be accepted as an optimal solution. For example: Leantegra UWB devices have the so-called "adaptive blink rates" based on accelerometers and motion recognition. Still, some projects require 24x7 location monitoring for continuously moving assets, so the adaptive blink rates will not help to resolve the power consumption issue.

TDoA requires only one broadcast TX message from each UWB tag for positioning. Comparison: TWR requires three messages between each UWB tag and each UWB anchor – 9 messages in total for 3 anchors.

Main characteristics:

- Accuracy:
    - 30-50 cm for static (or slowly moving) objects.
    - 50-60 cm for moving objects.
- Range:
    - Settings for longer range: best case LOS - 80 meters, worst case LOS - 60 meters.

    - Settings for higher density: best case LOS - 50 meters, worst case LOS - 30 meters.
- Tag density:
    - Settings for longer range : 1 Hz rate - up to 360 tags, 5 Hz rate - up to 75 tags.
    - Settings for higher density: 1 Hz rate - up to 2400 tags, 5 Hz rate - up to 480 tags.

When to use:

- When your project requirements define 50-100 cm location accuracy for 2D RTLS scenarios.
- Long-term RTLS installations with “install-and-forget” approach - when onsite maintenance is expensive and must be rare. For example: changing batteries for UWB tags every 6-12 months.
- When the tag density is really high - for example: tracking 1000+ objects inside the same area.
- When you need the lowest possible power consumption for the whole UWB RTLS system - anchors and tags.

When not to use:

- When you need sub-30 cm location accuracy from UWB RTLS.
- 1D UWB RTLS for tunnels or rails - can’t be implemented using TDoA.
- 3D UWB RTLS installations - still possible with TDoA, but good accuracy for Z-axis needs more RTLS anchors to be installed.

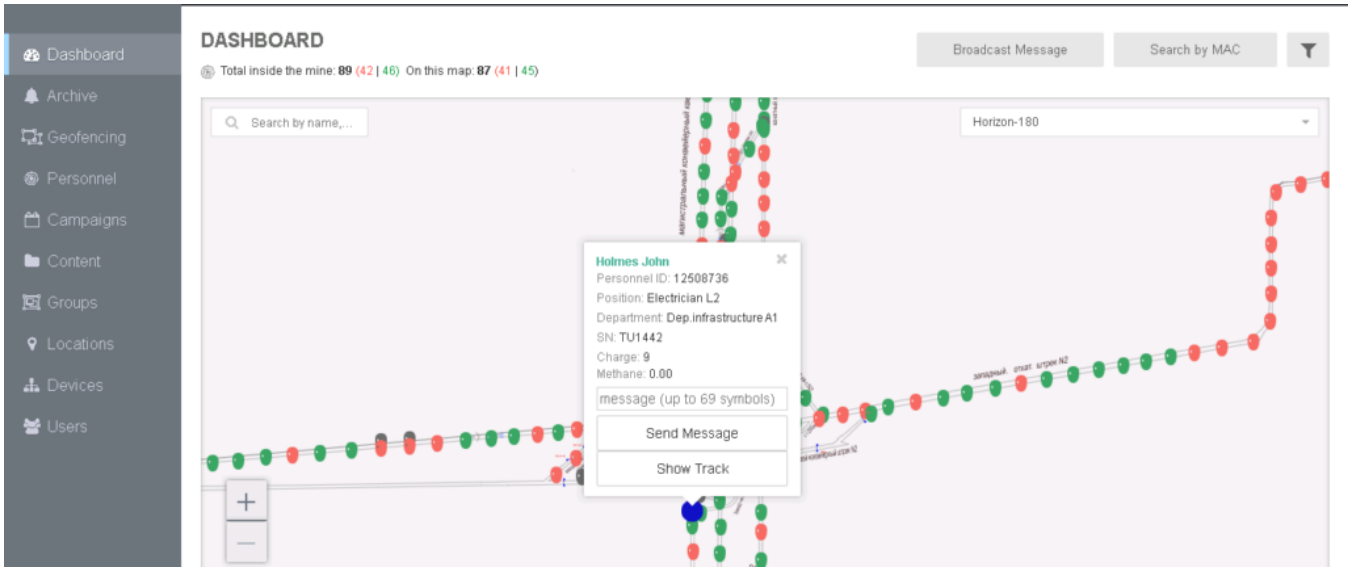
6.4. Tunnel UWB RTLS

The tunnel RTLS has been developed specifically for underground mines, but can be used anywhere where long corridors or rails are present. Both tunnel UWB and tunnel BLE RTLS enable location tracking with 2 anchors only, while the classic RTLS setup requires at least 3 anchors to be present.

To enable the tunnel UWB RTLS two Locator PRO/LITE devices must be installed at the ceiling within 40-60 meters from each other. The actual distance between two Locator PRO/LITE devices depends upon LOS-NLOS characteristics:

- For the case of good line-of-sight (LOS) conditions it is safe to install Locator PRO/LITE devices at 60 meters from each other.
- Good LOS conditions mean that UWB signals between each Locator PRO/LITE and UWB tag will not face any obstacles, such as human bodies.
- When UWB tags might be behind human bodies, then Locator PRO/LITE devices must be installed 40 meters from each other.

Leantegra CVO Portal - Map Dashboard



When to use:

- When you have areas in underground mines or long corridors, which require sub-50 cm location accuracy.
- When you physically can't install the needed RTLS anchors for 2D or 3D RTLS, because of the environmental specifics.

When not to use:

- When you need 2D or 3D RTLS.
- When you don't need high accuracy for 1D RTLS, then you can use the tunnel BLE RTLS instead of UWB.
- When you can't provide the needed power supply for each UWB anchor and must use batteries. Then using the tunnel BLE RTLS is a better option, because it is based on BLE beacons, which can operate for 2+ years on the same battery charge.

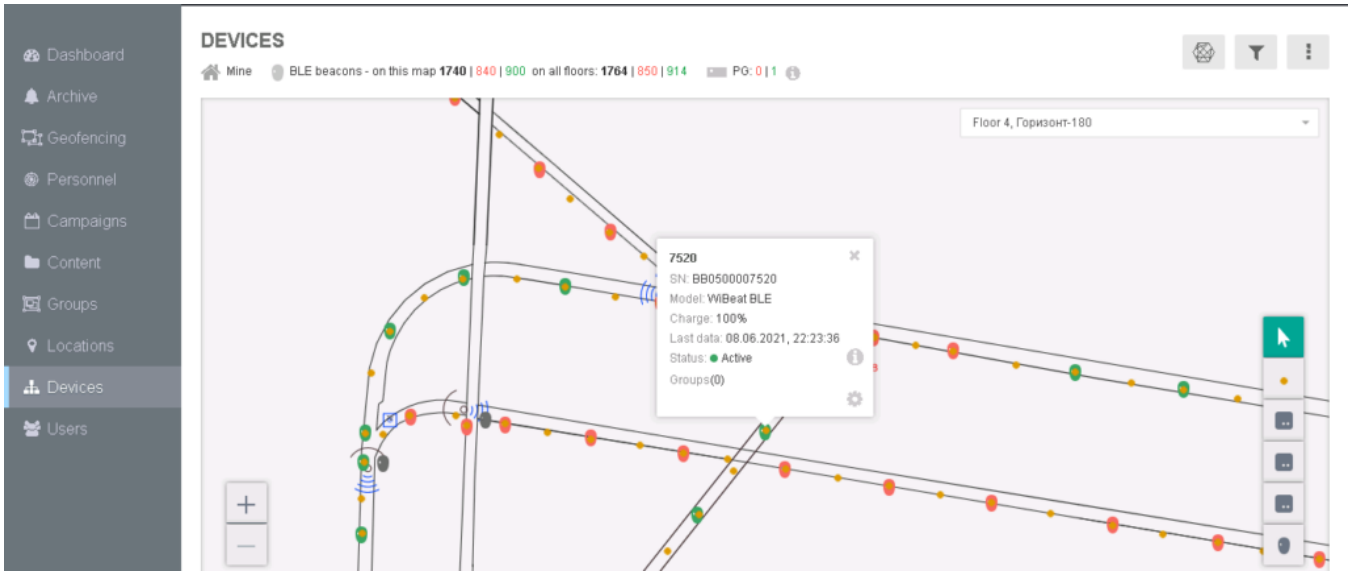
6.5. Reverse BLE RTLS (Tunnel BLE)

The reverse BLE RTLS feature was originally developed for coal mines to track miners using BLE beacons and mining cap lamps. It is based on the reverse RTLS architecture, where BLE beacons are installed along tunnels and RTLS anchors are carried by personnel inside their cap lamps.

This architecture enables low cost RTLS installations in underground mines by removing the need for cabling and power supply per each RTLS anchor. This is especially relevant for ATEX environments, such as coal mines, where costs of electrical equipment are really high.

Important - Wristband PRO/LITE is not the most optimal choice for the reverse BLE RTLS. Please check some other Leantegra RTLS devices with ATEX certifications, which you can find on our website.

Leantegra CVO Portal - Map Dashboard



When to use:

- When power supply and cabling for each RTLS anchor is expensive - for example: ATEX certified power supply units.
- When you have a large total length for underground tunnels (e.g. 50+ km) and you need to find a balance between cost and accuracy.
- When you need good scalability to track thousands of people or assets in underground mines.
- When 10-20 meters for location accuracy is enough.

When not to use:

- When you need a better location accuracy than 10 meters.
- When you need 2D or 3D RTLS.

6.6. BLE Zoning

RSSI-based tracking over BLE is available in the firmware of Wristband PRO/LITE and can be configured via BLE GATT parameters (see Chapter 3.2):

- Changing the blink rate for iBeacon frame broadcasting - from 100 msec to 10 seconds. Setting to zero means disabling any iBeacon broadcasting at all.

BLE zoning is a good choice for room-level or zone-level tracking with an average accuracy of 2-3 meters. Still, it is not recommended as a basis for any 1D, 2D or 3D RTLS scenarios.

Important - despite the available algorithms (e.g. Kalman filtering) in the firmware of Leantegra devices and RTLS Server there is no guarantee that RSSI-based tracking and BLE zoning will provide the needed accuracy. Various obstacles and multipath environments might impact the resulting accuracy in a major way. Please use this feature with caution and select UWB instead of BLE for all scenarios, where predictable accuracy is needed.

6.7. Collision Avoidance and Proximity Detection Subsystem

The firmware of Wristband PRO supports the features of Collision Avoidance and Proximity Detection Subsystem, which is a part of Leantegra CVO Platform R2023:

- Data communications with the Android HMI application over BLE GATT.
- Ranging vehicles and people over UWB TWR and custom payloads.
- Triggering the control signals over UART interfaces as a feedback to the ranging events.

Android HMI Application

6.8. Sensor Data Transmission

The firmware of Wristband PRO supports the custom UWB payloads for carrying extra data from sensors.

The default version supports accelerometer, gyroscope, barometer and temperature data over UWB. Such sensor data is forwarded in the raw form via MQTT by Locator PRO anchor without any averaging or any other pre-processing. Please see Chapter 4.2 for the format descriptions of MQTT messages.

Wristband PRO has its own barometer and temperature sensors on-board, which are also monitored by the firmware and transmitted over UWB.

Extra information about IMU and barometer modules, which are used by Wristband PRO, can be obtained from the sensor datasheets:

- Accelerometer and gyroscope: Bosch BMI270
- Barometer: Bosch BPM390

7. OTA Firmware Upgrade

At this stage the firmware upgrade process for Wristband PRO/LITE devices is handled using the standard Nordic nRF52 DFU upgrade over BLE and the available tools from Nordic Semiconductor:

- nRF Connect for Mobile (default option)
- nRF Connect for Desktop
- Command line utility: *nrfutil*

The firmware is distributed as a ZIP file, which is then uploaded via BLE to the target device using one of the above tools.

Sample command for launching the upgrade process from the command line using *nrfutil*:

```
nrfutil dfu ble -pkg tag_pro_fw1_9_2.zip  -ic NRF52 -p COM3 -n "WristbandPro1" -f
```