Type 2BP UWB Module EVK

- NXP SR150

Connection Guide for Mobile Phones – Rev. E

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About This Document

This guide describes what to expect when using SDK v04.06.00 and mobile phone demo applications on iPhone® and Android™.

Audience & Purpose

This guide is for solutions developers and engineers who will develop software on Murata Type 2BP module.

Document Conventions

Table 1 describes the document conventions.

Table 1: Document Conventions

Conventions	Description
	Warning Note Indicates very important note. Users are strongly recommended to review.
	Info Note Intended for informational purposes. Users should review.
	Menu Reference Indicates menu navigation instructions. **Example**: Insert➜Tables➜Quick Tables➜Save Selection to Gallery
	External Hyperlink This symbol indicates a hyperlink to an external document or website. **Example**: Type 2BP Product Page Click on the text to open the external link.
	Internal Hyperlink This symbol indicates a hyperlink within the document. **Example**: Overview Click on the text to open the link.
`Console input/output or code snippet`	**Console I/O or Code Snippet** This text *Style* denotes console input/output or a code snippet.
`# Console I/O comment` `// Code snippet comment`	**Console I/O or Code Snippet Comment** This text *Style* denotes a console input/output or code snippet comment. • Console I/O comment (preceded by "#") is for informational purposes only and does not denote actual console input/output. • Code Snippet comment (preceded by "//") may exist in the original code.

1 Overview

This guide details the process of using SDK v04.06.00 demo applications to test UWB features with iPhone and Android mobile phones.

Figure 1 shows the mobile phone connection setup with Type 2BP EVK for running the demo applications.

Figure 1: Mobile Phone Connection Setup with Type 2BP EVK Demo Application
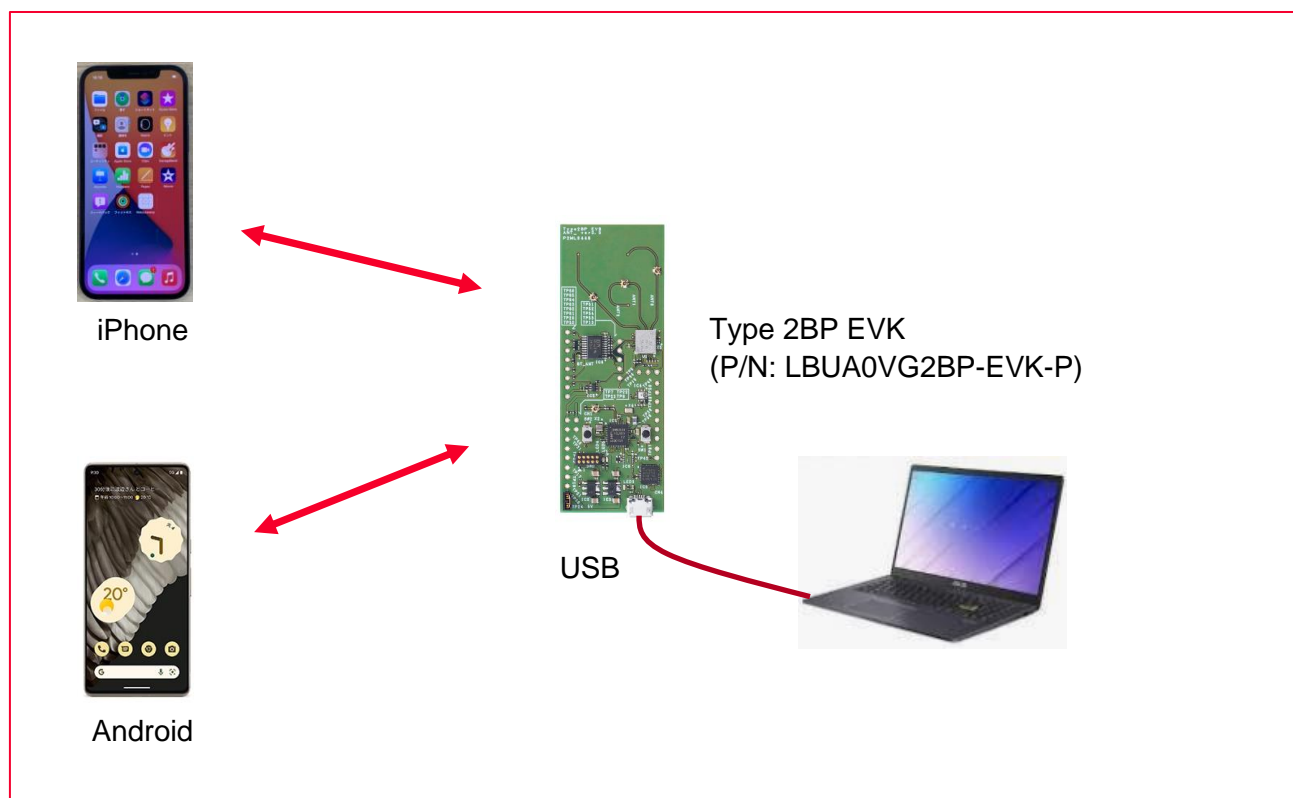
After powering on (plug in USB) the Type 2BP EVK, it automatically starts in the pair ranging mode with mobile phones.

2 Build Demo Application

Hardware modification is required for Type 2BP EVK revisions Rev 3.1 or older. Please refer to EVK Rework Guide ⬚↗.

- SDK v04.06.00 requires SDK modifications and calibration data to be applied when connecting to mobile phones, so applying the necessary patch file is recommended.

  Please refer to the How to make pre-built binary ⬚↗ document for details on applying the patch file and Applying Calibration Values Guide ⬚↗ document for details on applying the calibration data.

- Build the "demo_nearby_interaction" application in the SDK and download the binary image to the QN9090 of Type 2BP EVK. For details of the building procedure, please refer to the Starting Software Development Guide ⤢.
- Murata also provides a prebuilt binary file with the demo application built in. Use the Starting Standalone binary and Patch file for Type2BP EVK(v04.06.00) ⤢ found on the SDK site.
- For more information, refer to the NXP guide AN13737-Software_configuration_to_interact_with_mobile_phones.pdf ⤢.

3 UWB Supported Devices

The UWB supported devices are:

- Apple® devices with U1 chip integrated
- Android device

3.1 Apple Device (U1 Chip Integrated)

The U1 chip is present in Apple mobile phones starting from iPhone 11 (excluding iPhone SE). In this document, iPhone12 and 14 are used as examples.

Figure 2: Apple iPhone 12

iOS 15 or later required.

Please check the sites below for more details:

- Explore Nearby Interaction with Third-party Accessories ⤢
- Nearby Interaction with UWB ⤢

3.2 Android Device

There are multiple Android devices that support UWB (check here ↗ for a list). In this document, Google Pixel™ 7 Pro is used as an example.

Figure 3: Google Pixel 7 Pro Android Phone

✋	Android 13 or later required

Please check webpages below:

- Core UWB Package Summary ↗
- Core UWB Release ↗
- UWB Jetpack Example ↗

4 Demo Application 1: Apple Nearby Interaction

Refer to the Apple Documentation ↗ to build and download the demo application in the Apple iPhone.

After successfully building and downloading the demo application, the "NIAccessory" app icon can be seen in the app list, as shown in **Figure 4**.

Figure 4: NIAccessary Demo Application Icon
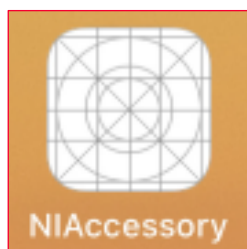
Figure 5 shows the hardware setup to perform the nearby interaction test with the Type 2BP EVK.

Figure 5: Apple Nearby Interaction Test 1 - 30 Centimeter Distance
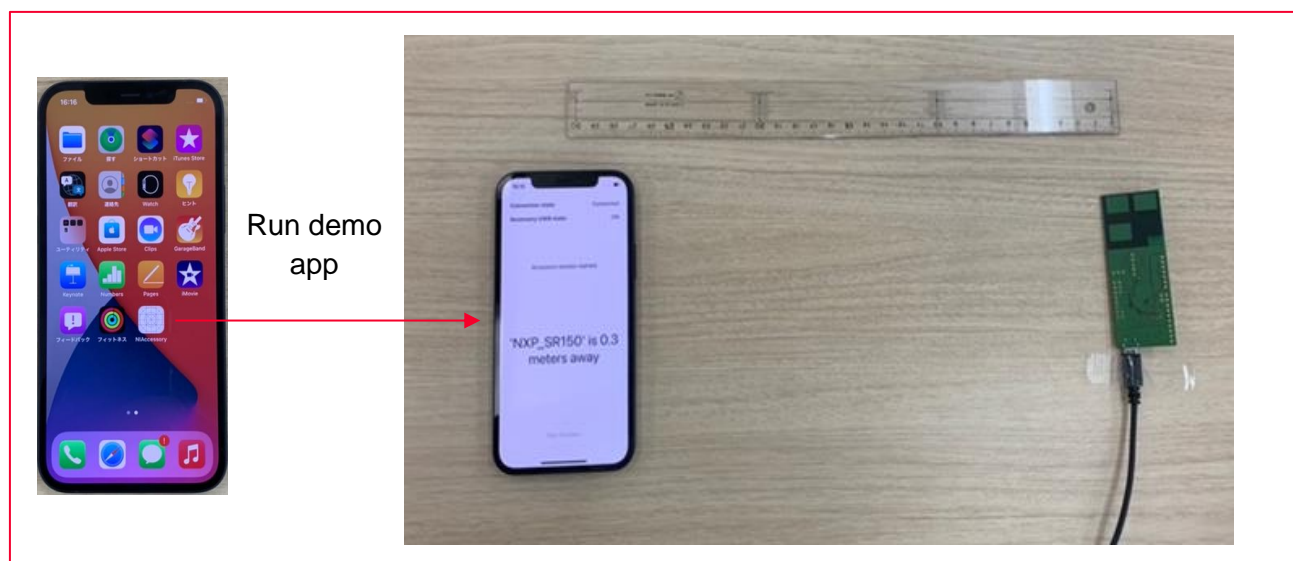
Once run, the iPhone 12 will detect the Type 2BP EVK and start ranging. In this example, the EVK is 30 centimeters away, and the iPhone demo app shows 0.3 meter as the ranging result.

ⓘ   The same result was confirmed with iPhone 13 and 14 as well.

Figure 6 shows another test setup where the iPhone from 1 meter away from the Type 2BP EVK. As can be seen in the image, the demo app correctly shows the distance to be around 1 meter.

Figure 6: Apple Nearby Interaction Test 2 - 1 Meter Distance

> This demo app only shows ranging (distance) result.

5 Demo Application 2: NXP UWB AR Demo

"NXP Trimensions AR" application is available on App Store, as shown in **Figure 7**. Install this App to perform the test.

Figure 7: NXP Trimensions AR App

Figure 8 shows the test setup and the ranging result.

Figure 8: NXP UWB AR Demo Ranging Test 1 - Single Ranging with Type 2BP EVK

Once the "NXP Trimensions AR" app is run, the iPhone 12 will detect the Type 2BP EVK and start ranging. This app shows both range and direction.

In this test, the module is 30 centimeters away. The ranging result is 0.3 meter.

> ℹ️ The same result was confirmed to work well with iPhone 13 and 14 as well.

Figure 9 shows another test result where simultaneous ranging is performed with the iPhone 12 to detect both a Type 2BP EVK and a Type 2DK EVK.

Figure 9: NXP UWB AR Demo Ranging Test 2 - Simultaneous Ranging
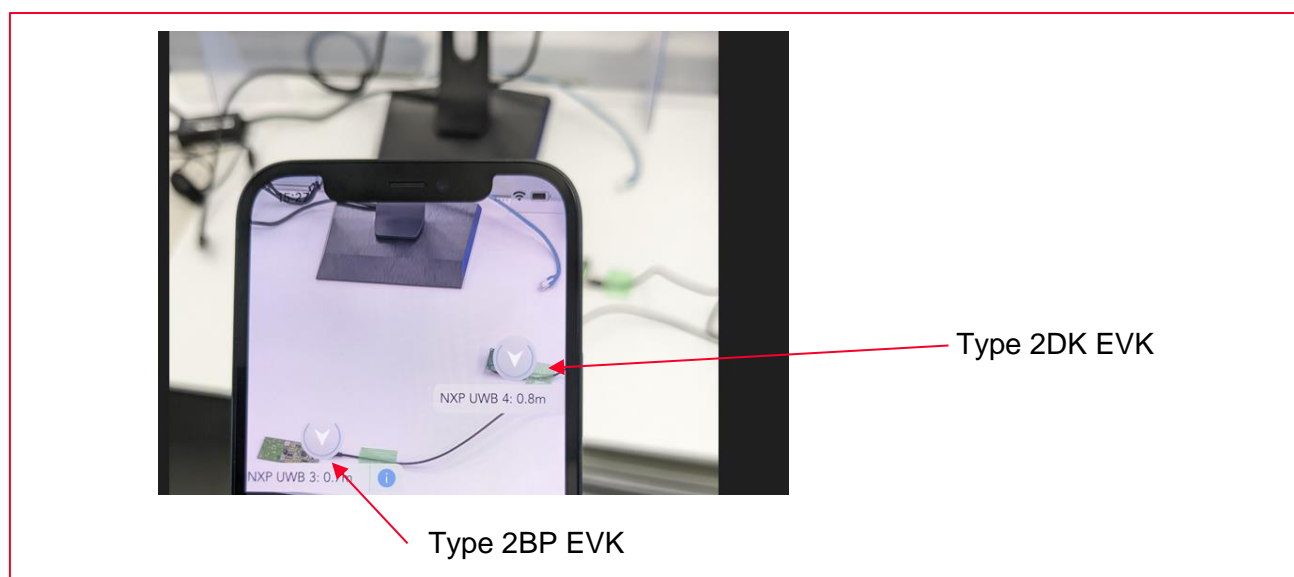
6 Demo Application 3: NXP UWB Mobile Kit

This section describes the UWB Ranging demo on Android device using the UWB Jetpack Example application.

Both the demo application code and the demo application (.apk file) are available in GitHub ⬀.

Download the UWB Jetpack Example apk ⬀ file on the Android phone and install it.

> ⓘ It has been confirmed that the app will work on devices with Android 13 and Google Play Services version v23.25.18 and above.

Conditions for checking operation:

- Smartphone: Pixel7 Pro / Galaxy S22+
- Android version: Android13
- Google Play Service version: 23.25.18

Figure 10 shows the app running on Google Pixel 7 Pro phone detect the Type 2BP EVK and perform ranging.

Figure 10: NXP UWB Mobile Kit Ranging Test

In this example, the Type 2BP EVK is 30 centimeters away from the phone. The ranging result by the app is 31 centimeters. This app also shows distance, azimuth, and directions.

> ⓘ The same result was confirmed with Galaxy S22+ as well.

7 Simultaneous ranging between Type2BP and multiple smartphones

This section describes the simultaneous ranging with smartphones using the demo_nearby_interaction demo application. In this case, two iPhones and one Android device to verify the ranging as shown in **Figure 11**.

Figure 11: Evaluation environment.
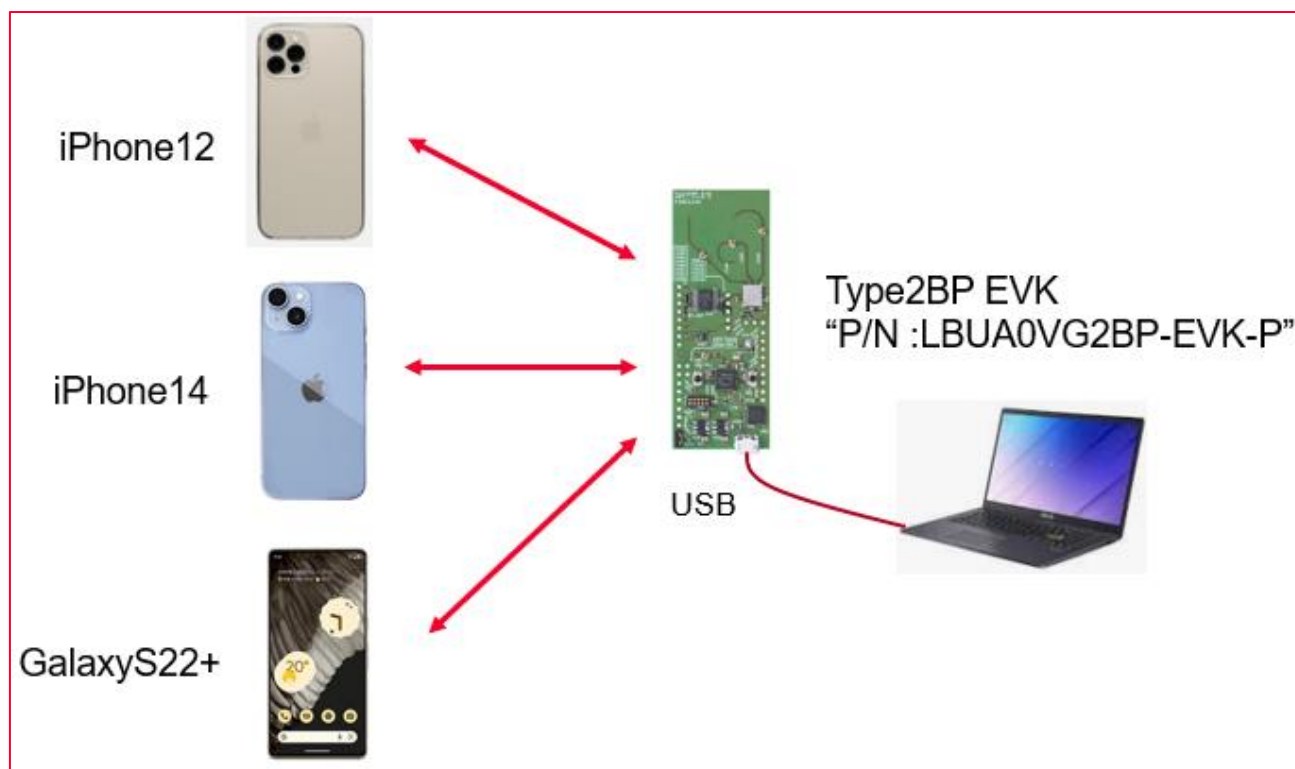
Step1. Power on Type2BP-EVK.

Type2BP will start advertising.

```
###############################################
## Demo Nearby Interaction (BLE tracker) : SR150
## UWBIOT_v04.06.00
###############################################
Device_MAC_ID = 00:60:37:39:30:61
BLE Start adv
```

Step2. Start NXP Trimensions AR App in iPhone12

Type2BP will connect to iPhone12 in BLE, and will start ranging.

```
APP      :INFO :BLE Connected to peer #1, 1 peers connected

TMLUWB  :TX > :SEND               :2A020001 02
BLE Start adv
 :
 :
```

```
TMLUWB   :RX < :RECV                  :6200005C 02000000 01000000 00C60000
00010000 00000000 00000000 01E1AC00 001E0009 0464131D 64000000 00000005
00000000 00000000 00000000 22000000 01020102 00020203 09041AF4 4103131D
6E454103 2F2F97D0 80D02F2F 94D080D0
APP      :INFO :TWR[0].nLos           : 0
APP      :INFO :TWR[0].distance       : 30
APP      :INFO :TWR[0].aoa_azimuth: 8.9
APP      :INFO :TWR[0].aoa_elevation      : 58.19
```

This ranging Session ID is 0x00000001.

Step3. Start NXP Trimensions AR App in iPhone14

Type2BP will connect to iPhone14 in BLE, and will start ranging.

```
APP      :INFO :BLE Connected to peer #2, 2 peers connected

BLE Start adv
 :
 :
TMLUWB   :RX < :RECV                  :6200005C 01000000 02000000 00A20000
00010000 00000000 00000000 014E8C00 002000C1 0764211C 64000000 00000005
00000000 00000000 00000000 22000000 01020102 00020203 C10778EA 4103211C
E83F4103 2B2B90D0 80D03131 93D080D0
APP      :INFO :TWR[0].nLos           : 0
APP      :INFO :TWR[0].distance       : 32
APP      :INFO :TWR[0].aoa_azimuth: 15.65
APP      :INFO :TWR[0].aoa_elevation      : 56.33
TMLUWB   :RX < :RECV                  :6200005C 3F000000 01000000 00C60000
00010000 00000000 00000000 01E1AC00 002B0078 1364031B 64000000 00000005
00000000 00000000 00000000 22000000 01020102 00020203 7813ECD4 4103031B
BC2D4103 2B2B7DD0 80D03030 80D080D0
APP      :INFO :TWR[0].nLos           : 0
APP      :INFO :TWR[0].distance       : 43
APP      :INFO :TWR[0].aoa_azimuth: 38.120
APP      :INFO :TWR[0].aoa_elevation      : 54.3
```

This ranging Session ID is 0x00000002.

Step4. Start UWB Jetpack Example App in Galaxy S22+

Type2BP will connect to Galaxy S22+ in BLE, and will start ranging.

```
APP      :INFO :BLE Connected to peer #3, 3 peers connected

BLE Start adv
 :
 :
TMLUWB   :RX < :RECV                  :6200005C 02000000 03000000 00F00000
00010000 00000000 00000000 01605000 002200E3 1064001E 64000000 00000005
00000000 00000000 00000000 22000000 01020102 00020203 E3101AD7 3F03001E
A4374003 292920D0 40D03030 1CD040D0
APP      :INFO :TWR[0].nLos           : 0
APP      :INFO :TWR[0].distance       : 34
APP      :INFO :TWR[0].aoa_azimuth: 33.99
APP      :INFO :TWR[0].aoa_elevation      : 60.0
TMLUWB   :RX < :RECV                  :6200005C 1C000000 02000000 00C60000
00010000 00000000 00000000 01EE5500 00290028 0764001E 64000000 00000005
00000000 00000000 00000000 22000000 01020102 00020203 2807FCEA 4103001E
C2464103 2C2C84D0 80D02F2F 82D080D0
APP      :INFO :TWR[0].nLos           : 0
```

```
APP     :INFO :TWR[0].distance        : 41
APP     :INFO :TWR[0].aoa_azimuth: 14.40
APP     :INFO :TWR[0].aoa_elevation       : 60.0
TMLUWB  :RX < :RECV                 :6200005C B5000000 01000000 00C60000
00010000 00000000 00000000 01E1AC00 01060000 1E64D000 64000000 00000005
00000000 00000000 00000000 22000000 01020102 00020203 001E80B7 4003D000
EEFA4003 242461D0 80D0262C 56D000D1
APP     :INFO :TWR[0].nLos             : 1
APP     :INFO :TWR[0].distance        : 6
APP     :INFO :TWR[0].aoa_azimuth: 60.0
APP     :INFO :TWR[0].aoa_elevation       : 1.80
```

This ranging Session ID is 0x00000003.

It can be confirmed that the Type2BP is ranging with three smartphones.

Revision History

Revision	Date	Author	Change Description
A	Jun 02, 2023		Initial release
B	Jul 21, 2023		4.3 NXP UWB Mobile Kit: Updated Android information
C	Jul 28, 2023		4.3 NXP UWB Mobile Kit: Updated Android information
D	Jul 28, 2023		3 UWB Support Device: Updated Android information
E	Apr 12, 2024		Added 7.Simultaneous ranging between Type2BP and multiple smartphones Document format changed