

Type 2BP UWB Module EVK

- NXP SR150 Chipset

Overview of Evaluation and Software Development - Rev. C

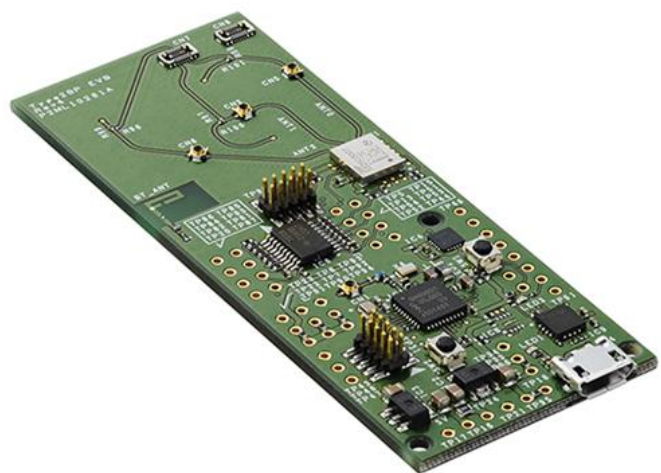


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About This Document

This document describes the steps for UWB ranging performance testing and starting software development using Type 2BP Evaluation Kit (EVK), including calibration.









Audience & Purpose

This document is meant for the RF engineers and developers who will perform Ultra-Wideband (UWB) ranging tests and develop software using Type 2BP EVK.

Document Conventions

Table 1 describes the document conventions.

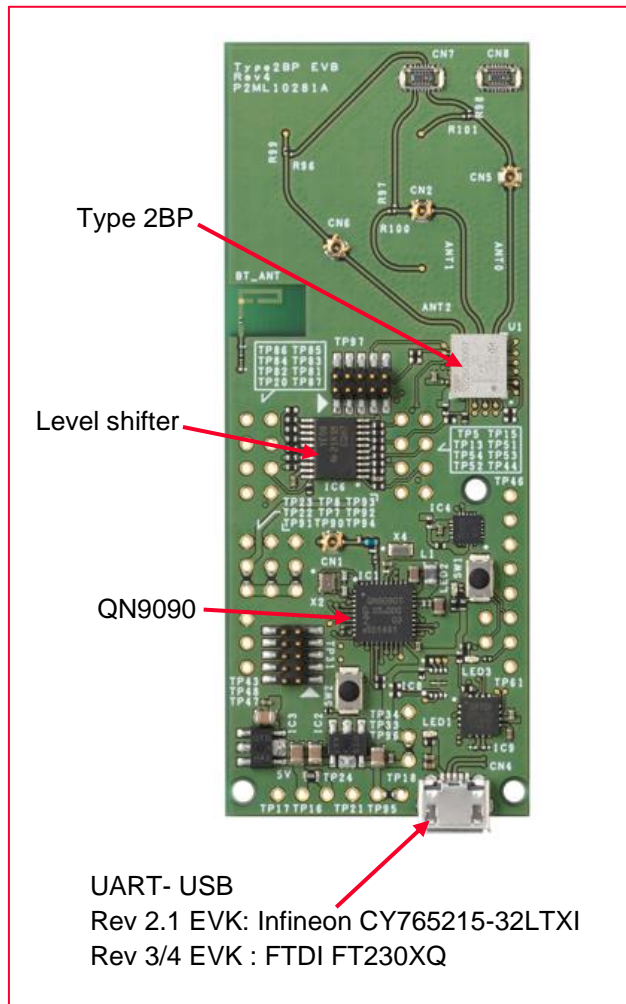
Table 1: Document Conventions

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: Development Steps  Click on the text to open the link.
<code>Console input/output or code snippet</code>	Console I/O or Code Snippet This text Style denotes console input/output or a code snippet.
<code># Console I/O comment // Code snippet comment</code>	Console I/O or Code Snippet Comment This text Style denotes a console input/output or code snippet comment. <ul style="list-style-type: none"> • 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 Software Structure

The Type 2BP EVK is shown in **Figure 1**.

Figure 1: Type 2BP EVK



The Type 2BP/SR150 firmware is combined into the binary for QN9090. It is downloaded automatically when the EVK is powered on.

There are two modes of the binary:

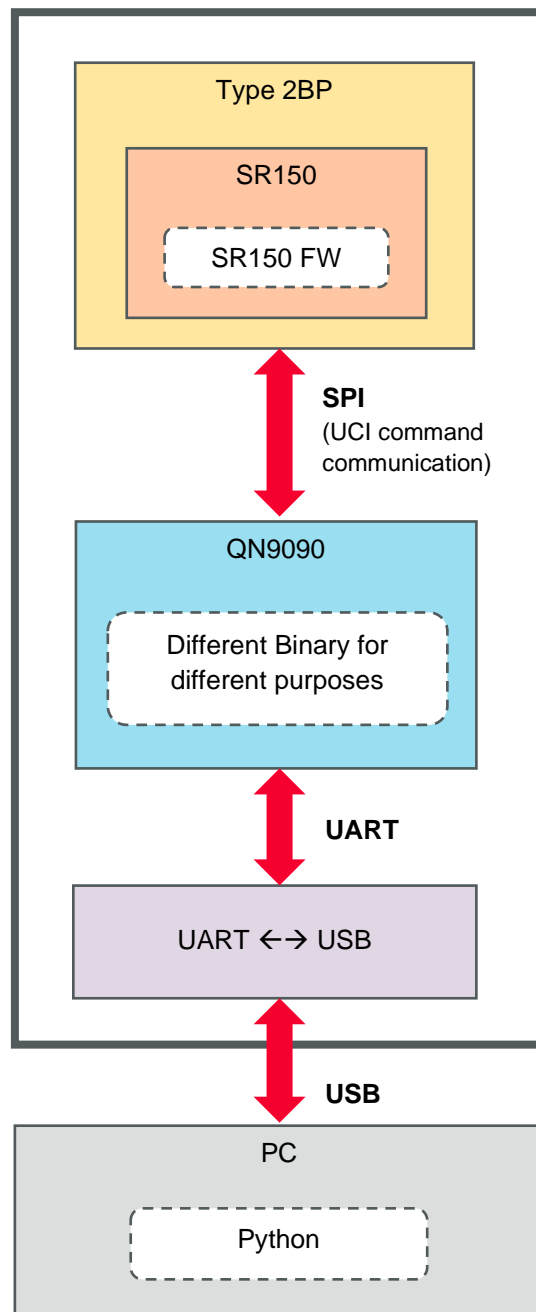
1. **Standalone mode:** This mode is for the final product. In this mode, the Type 2BP is controlled by the program in QN9090. A sample program of the standalone mode is provided in the SDK.
2. **PnP mode:** PnP mode is used for UWB performance confirmation and calibration during the development stage. This bypasses the UCI commands to UART, allowing Type 2BP to be controlled from PC using UCI commands.



The same firmware is used for both standalone mode and PnP mode.

The structure is shown in **Figure 2** below.

Figure 2: Type 2BP EVK Software Structure



2 Development Steps

A typical product development using the Type 2BP module goes through the stages and steps shown below in **Figure 3**.

Figure 3: Development Steps

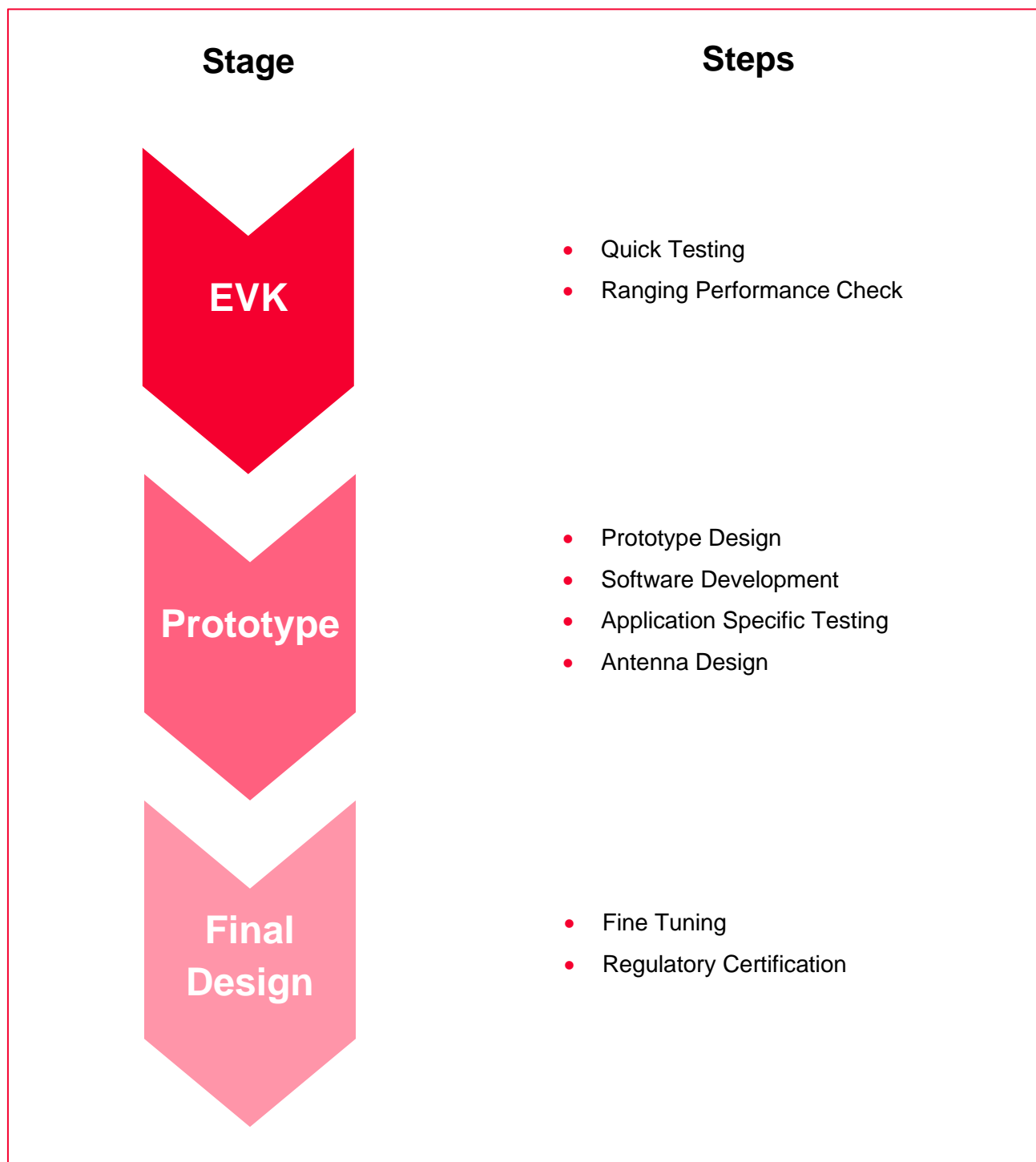



Table 2 below lists the available documentation and resources for each of these stages.

Table 2: Development Stage Documentation and Resources

Stage	Documentation and Resources
EVK	<ul style="list-style-type: none"> • Quick Start Guide • Connection guide for mobile phones • PnP Test Guide • PnP Python Script for SDK • AoA Test Result
Prototype	<ul style="list-style-type: none"> • Starting Software Development Guide • Hardware Design Guide • EVK Schematic • EVK Components Placement • EVK Design file (brd / dxf file) • EVK Stack information • EVK Antenna Measurement Result • AoA Calibration Guide • Applying Calibration Values Guide • ToF (Antenna delay) Calibration Guide • Factory calibration guide
Final Design	<ul style="list-style-type: none"> • RF Test Tool Guides

This document describes the following steps, which are a part of the Development process, as described in [Section 1](#) :

1. UWB ranging performance test using PnP binary.
2. UWB ranging demo using Type 2BP EVK.
3. Starting software development using Type 2BP EVK
4. How to calibrate and how to apply calibration value.

The sections below describe the steps in detail.

2.1 Step 1: UWB Ranging Performance Test Using PnP Binary

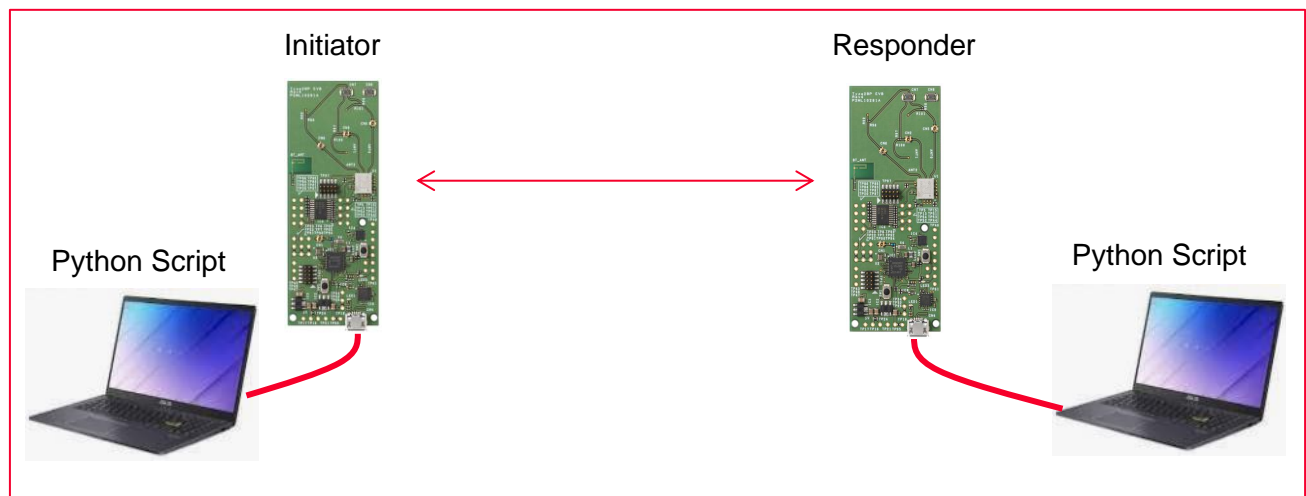
This is a UWB ranging (distance, Angle of Arrival (AoA)) performance test using Type 2BP EVK.

The PnP binary is used to communicate between PC and Type 2BP by UCI command.

Because the setting parameters are in the Python script and easily changeable, it is intended to be used during UWB performance test / calibration during development stage.

Figure 4 shows the UWB ranging performance setup.

Figure 4: UWB Ranging Performance Setup



For more information, refer to the related documentation:

- PnP Test Guide

2.2 Step 2: UWB Ranging Demo Using Type 2BP EVK

This step is for DEMO of UWB ranging. There are two types of demo firmware available.

2.2.1 EVK Pair Ranging Test

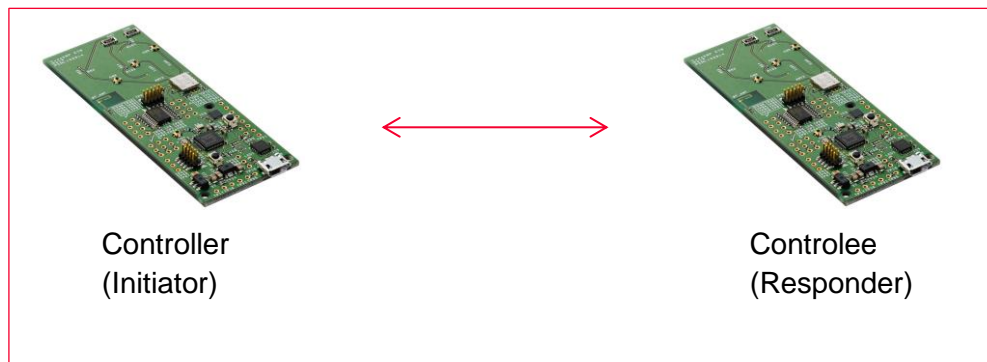
In this test, a pair of Type 2BP EVKs are used as Controller and Controlee. When powered on, the EVKs automatically start UWB ranging and output log to serial port.



This firmware is not fine-tuned for distance and AoA. It is not suitable for detailed performance evaluation. Requires overwrite of the EVK binary.

Figure 5 shows the EVK pair ranging test setup.

Figure 5: EVK Pair Ranging Test Setup



2.2.2 Apple Device Connection Test

In this test, the demo app needs to be started on the Apple device (it needs to be installed first) and the Type 2BP EVK needs to be powered on. The Apple device will start ranging and display the ranging result.



Need to overwrite from default binary to Stand alone mode binary.

For more information, refer to the related documentation:

- Starting Software Development Guide
- Connection guide for mobile phones

2.3 Step 3: Starting Software Development Using Type 2BP EVK

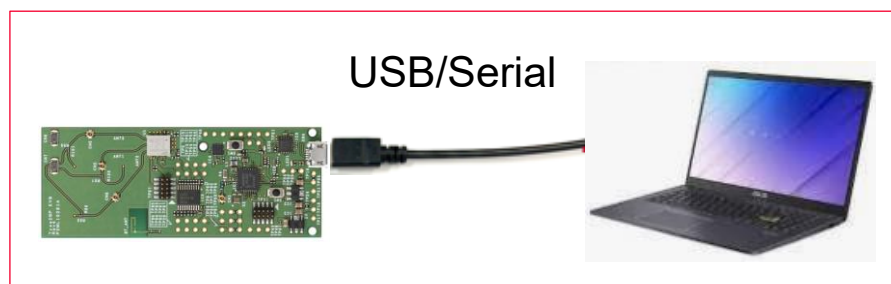
To develop product software (standalone binary) using Type 2BP EVK, the NXP SDK needs to be used. This is required to develop final product software (standalone binary). There are several sample codes in the SR150 SDK, that can be referred to for faster start to development.

The software requirement on the PC is:

- NXP IDE (MCUXpresso)
- NXP QN9090 SDK
- NXP SR150 SDK
- Python
- DK6Programmer

The DK6Programmer software is used to flash binary on the EVK. **Figure 6** show the connection setup.

Figure 6: Software Development Setup



For more information, refer to the related documentation:

- Starting Software Development Guide

2.4 Step 4: How to Calibrate and Apply Calibration Value

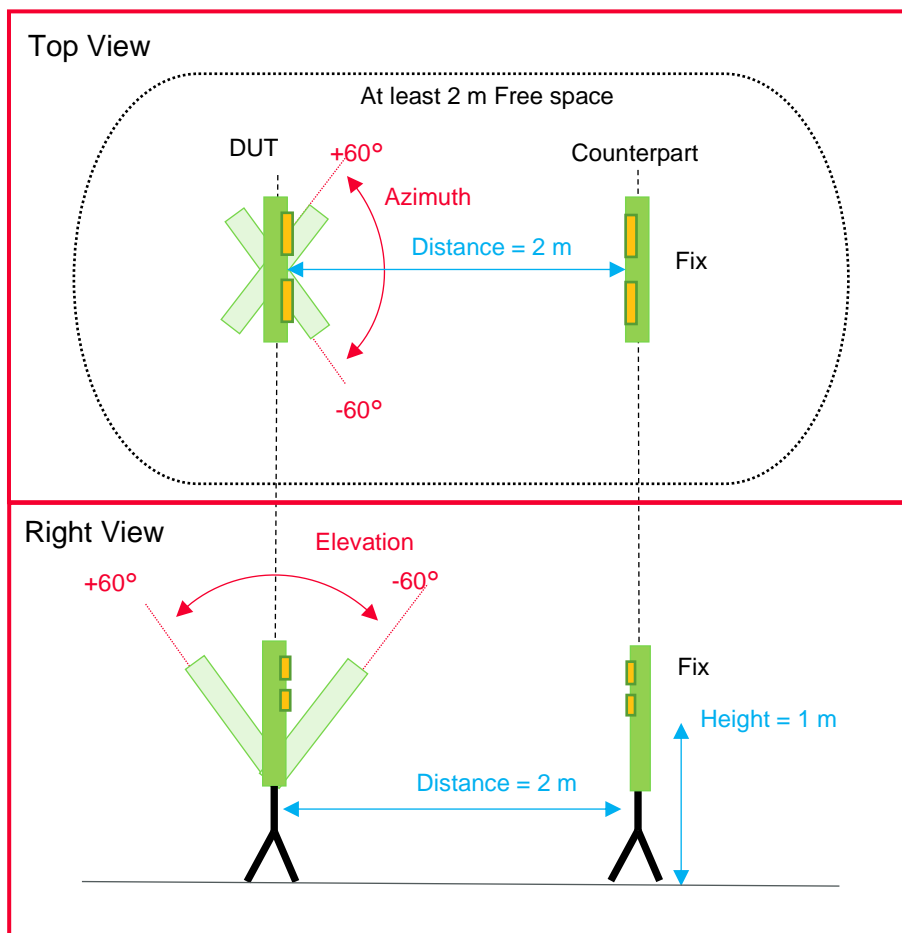
This section describes the calibration procedure using PnP binary to calibrate distance and AoA accuracy in customer product in which the Type 2BP module is installed. It also describes how to apply calibration value in the stand alone binary and for customer products.

The UWB ranging performance is sensitive for environment like distance between module RF pin to antenna (electrical length of the distance affects the distance), antenna performance, and antenna placement.

Generally, distance and AoA calibration are necessary with same UWB RF condition as that of the final product.

Refer to the calibration guide for calibration procedure and method. The **Figure 7** below shows the recommended calibrations setup.

Figure 7: Recommended Calibrations Setup

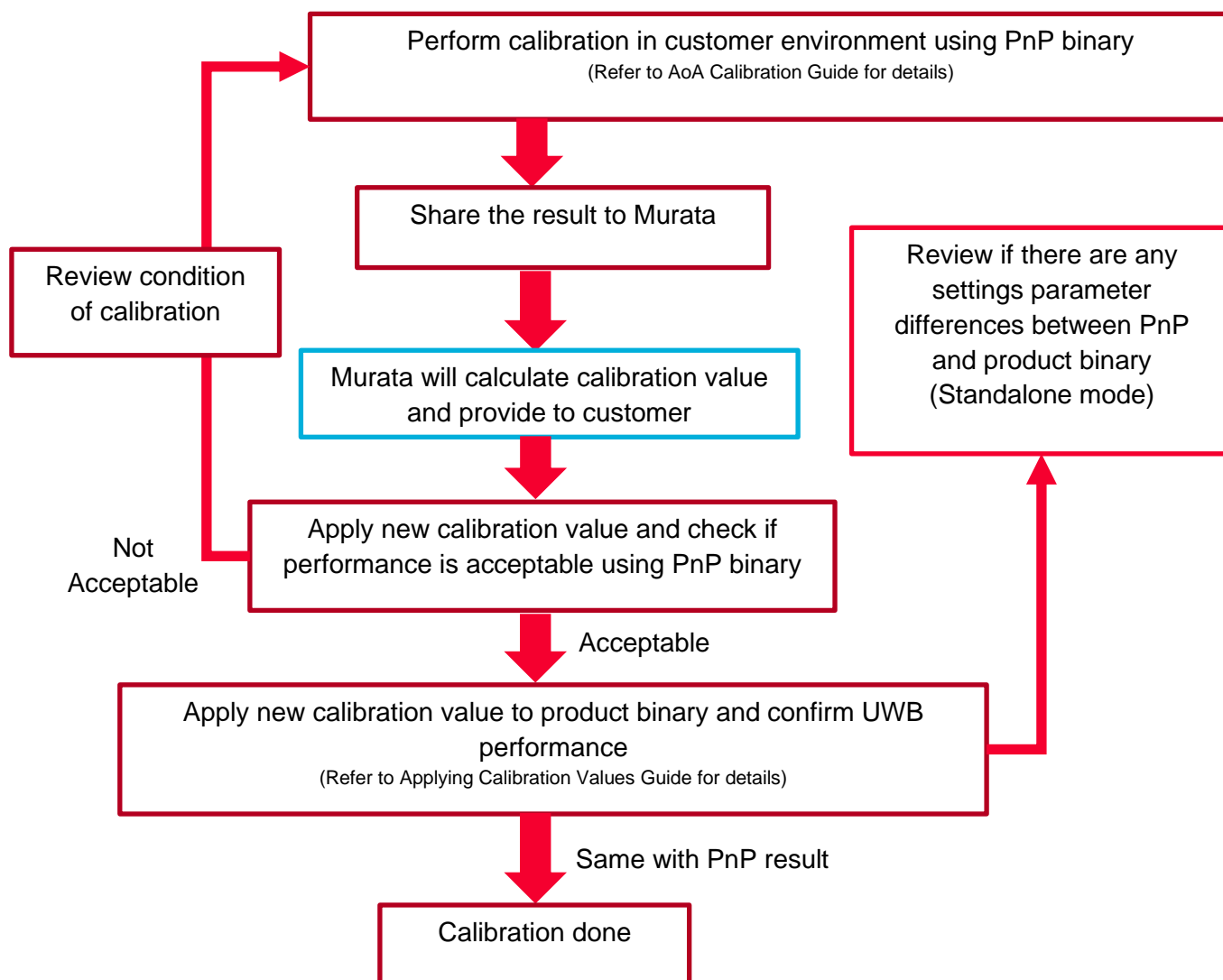


After calibration is done, it is recommended to test using PnP binary.

After calibration is done, Murata will calculate calibration value to apply in the final product software.

The flow of the calibration process is described in the following **Figure 8**.

Figure 8: Flow of Calibration



For more information, refer to the related documentation and resources:

- AoA Calibration Guide
- Applying Calibration Values Guide
- ToF (Antenna delay) Calibration Guide
- Factory calibration guide

Revision History

Revision	Date	Author	Change Description
A	Nov 11, 2021		Initial release
B	Oct 12, 2022		Updated for EVB Rev4.0 design
C	Mar 18, 2024		Document format changed



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