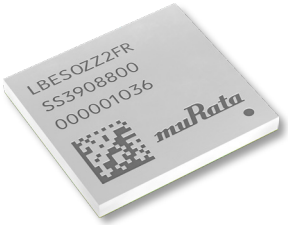
App Note

Hostless Wi-Fi™ 6 + Bluetooth® LE 5.4 / 802.15.4 Tri-Radio Module

Antenna Configuration Application Note – 1.0

- Design Name: Type 2FR/2FP
- P/N: LBES0ZZ2FR/LBEE0ZZ2FP



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About This Document

Murata's Type 2FR is a small and very high-performance module based on NXP RW612 combo chipset, supporting IEEE 802.11 a/b/g/n/ac/ax + Bluetooth LE 5.4 / 802.15.4. The default antenna configuration in the module is a single shared antenna. This application note describes how to change antenna configuration for Type 2FR.

Audience & Purpose

The intended audience includes any customer looking to integrate this module into their product. In particular RF, hardware, software, and systems engineers.

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**: Murata Click on the text to open the external link.
	Internal Hyperlink This symbol indicates a hyperlink within the document. **Example**: Scope 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 Scope

This application note describes software method to change the antenna configuration if actual design differs from the default single / shared antenna configuration.

2 Supported Configurations

There are 4 possible antenna configurations supported on the Type 2FR module. Other than the default configuration, setting any of the other requires both hardware and software modifications. The default software configuration is stored in the module OTP (One-time Programmable) memory and loaded by default. This needs to be overridden using an API based mechanism for all non-default configurations. Murata provides a simple mechanism to achieve this.

However, that does not allow the modification of any other configuration other than the antenna. **In case you need to modify other configuration parameters**, in addition to the antenna, a more complex mechanism needs to be followed, which is described in Section 8.

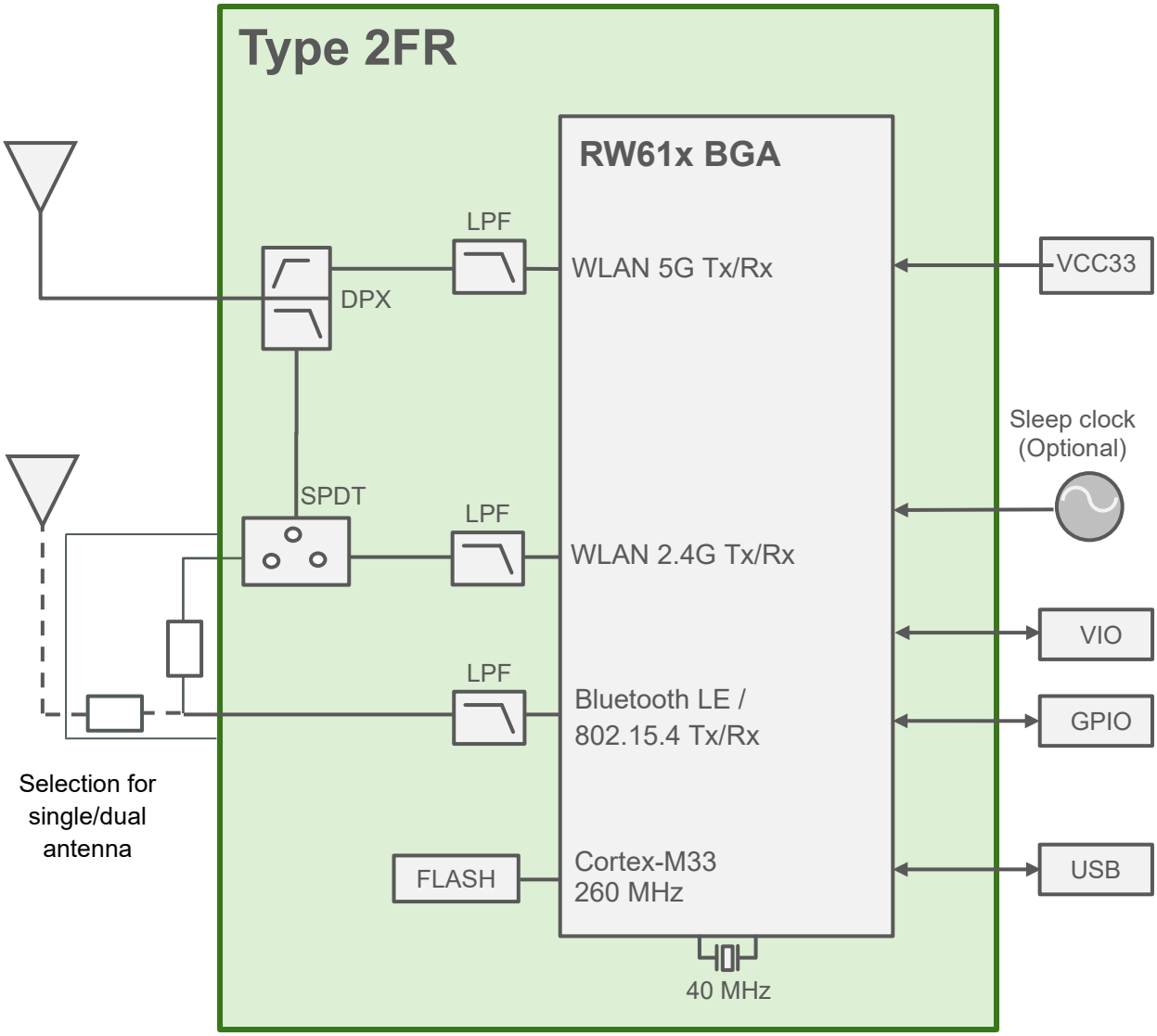
Table 2: Supported Antenna Configurations

Configuration	Description	Required Files	Covered in
Single / Shared Antenna (default)	Wi-Fi and Bluetooth share a single antenna path using a diplexer.	Not required	Section 3
Dual / Dedicated Antenna	Wi-Fi and Bluetooth each have separate, dedicated antennas.	Download	Section 4
Single / Shared Antenna with Wi-Fi Diversity	A shared antenna is used for both Wi-Fi and Bluetooth, with an additional antenna for Wi-Fi diversity.	Download	Section 5
Dual / Dedicated Antenna with Wi-Fi Diversity	Wi-Fi uses diversity antennas, while Bluetooth has a separate dedicated antenna.	Download	Section 6

3 Single / Shared Antenna (Default)

Figure 1 below shows the default antenna configuration of the 2FR module, which is a single / shared antenna. Wi-Fi and BLE share the antenna. The configuration data is stored in OTP (One Time Programmable) area when the module is produced in factory.

Figure 1: Single / Shared Antenna Block Diagram



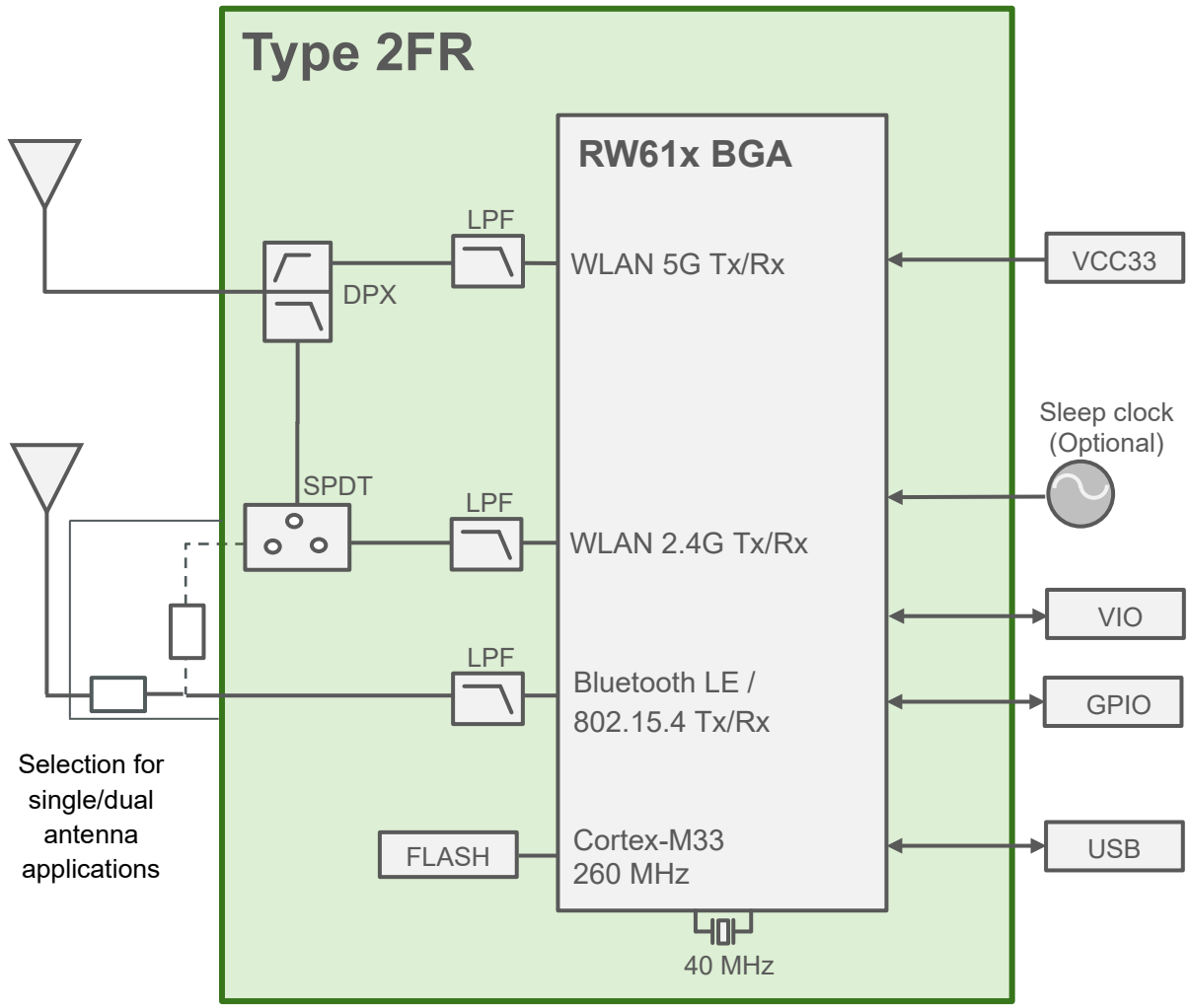
The OTP data is generally not rewritable. Therefore, to use a different antenna configuration, an alternative API based mechanism is provided.

To use this default single / shared antenna configuration, no hardware or software change is necessary. Users can use any of the examples provided by the NXP SDK to test this configuration.

4 Dual / Dedicated Antenna

The Block diagram of Type 2FR with dual / dedicated antenna configuration is shown below.

Figure 2: Dual / Dedicated Antenna Block Diagram



Download the required files as mentioned in **Table 2**. Then follow the steps provided in Section 7 to modify any Wi-Fi sample example provided with the NXP MCUXpresso SDK. In this document, we take the wifi_cli sample as an example.

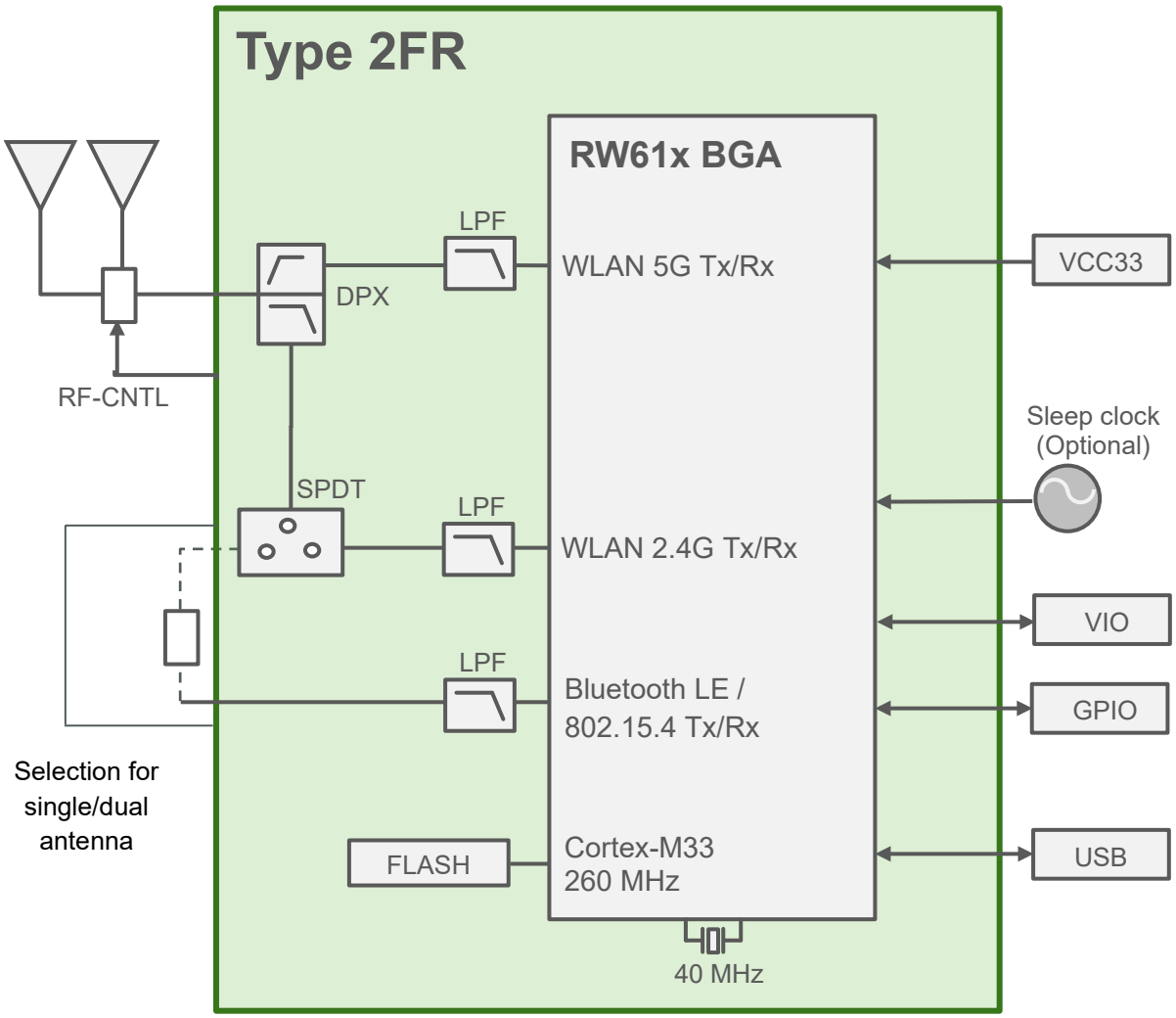
It is recommended to keep a backup of the files being modified, in case you need to revert.

- source/wifi_config.h
- wifi/wlcmgr/wlan.c
- wifi/incl/wifi_cal_data_rw61x_override.h

5 Single / Shared Antenna with Wi-Fi Diversity

The block diagram of Type 2FR with single / shared antenna configuration along with Wi-Fi diversity is shown below.

Figure 3: Single / Shared Antenna with Wi-Fi Diversity Block Diagram



Download the required files as mentioned in **Table 2**. Then follow the steps provided in Section 7 to modify any Wi-Fi sample example provided with the NXP MCUXpresso SDK. In this document, we take the wifi_cli sample as an example.

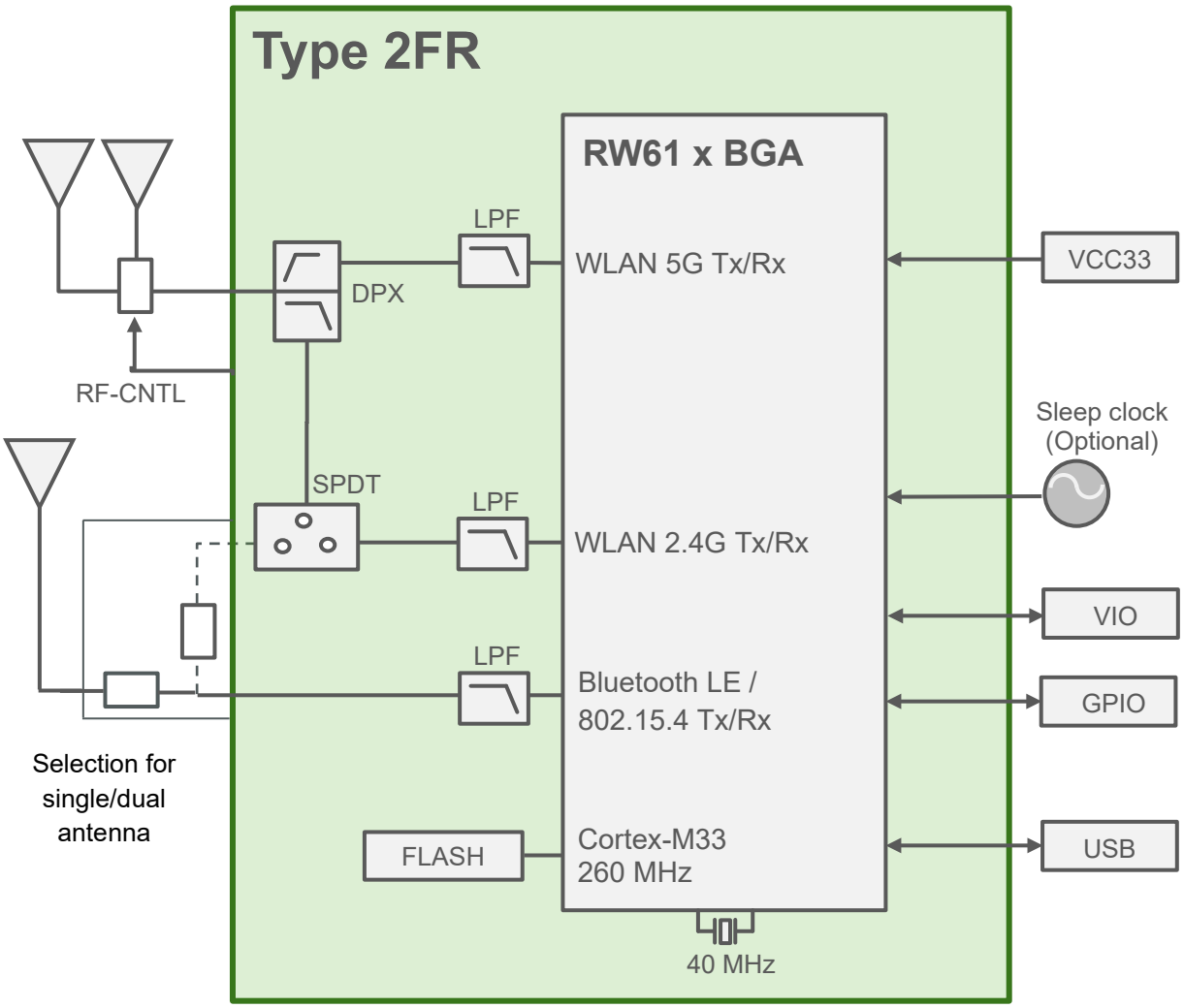
It is recommended to keep a backup of the files being modified, in case you need to revert.

- source/wifi_config.h
- wifi/wlcmgr/wlan.c
- wifi/incl/wifi_cal_data_rw61x_override.h

6 Dual / Dedicated Antenna with Wi-Fi Diversity

The block diagram of Type 2FR with dual /dedicated antenna configuration along with Wi-Fi diversity is shown below.

Figure 4: Dual / Dedicated Antenna with Wi-Fi Diversity Block Diagram



Download the required files as mentioned in **Table 2**. Then follow the steps provided in Section 7 to modify any Wi-Fi sample example provided with the NXP MCUXpresso SDK. In this document, we take the wifi_cli sample as an example.

It is recommended to keep a backup of the files being modified, in case you need to revert.

- source/wifi_config.h
- wifi/wlcmgr/wlan.c
- wifi/incl/wifi_cal_data_rw61x_override.h

7 Loading Custom Calibration Data

Download the required files as mentioned in **Table 2**. Then follow the steps below to modify any Wi-Fi sample example provided with the NXP MCUXpresso SDK.

1. **Step 1** – Import any Wi-Fi example from NXP MCUXpresso SDK. We use wifi_cli application as an example below.
2. **Step 2** – In the **source/wifi_config.h** file, define OVERRIDE_CALIBRATION_DATA and CONFIG_CUSTOM_CALDATA macros, adding the following two lines. A sample file is included in the required file section as per **Table 2**, under folder “source”.

```
#define OVERRIDE_CALIBRATION_DATA 1
#define CONFIG_CUSTOM_CALDATA 1
```

3. **Step 3** – In the **wifi/wlcmgr/wlan.c** file, modify the include header file by replacing OVERRIDE_CALIBRATION_DATA with wifi_cal_data_rw61x_override.h. A sample file is included in the required file section as per **Table 2**, under folder “source”.

```
#ifdef OVERRIDE_CALIBRATION_DATA
#include <wifi_cal_data_rw61x_override.h>
#else
```

4. **Step 4** – Replace/Add the **wifi/incl/wifi_cal_data_rw61x_override.h** file with the one in the downloaded files as per **Table 2** (or created using Labtool as per Section 8 ⊏↙)., under folder “source”. For SDK 2.16.100 or lower, this file is not present in the sample example codebase and needs to be added, while in SDK 24.12 or higher, the file is already included and must be replaced.
5. **Step 5** – Build and flash the Wi-Fi example application onto RW61x.
6. **Step 6** – Load the application. The calibration data will be applied to the device during application initialization, to enable dual / dedicated antenna.

8 Creating Custom Calibration Data

STOP if you do not need to modify the default antenna configurations already provided in the previous sections. YOU DO NOT NEED TO GO THROUGH THIS AND FOLLOWING SECTIONS.

Murata already provides ready-to-use custom calibration data for different antenna configurations, covered in previous sections. However, for those calibration data to be used, the antenna design must be the same as described in this document, e.g., RF_CNTL pin usage.

In case any other configuration changes are needed, users must create the custom calibration data header file (wifi_cal_data_rw61x_override.h) on their own. This section details the procedure.

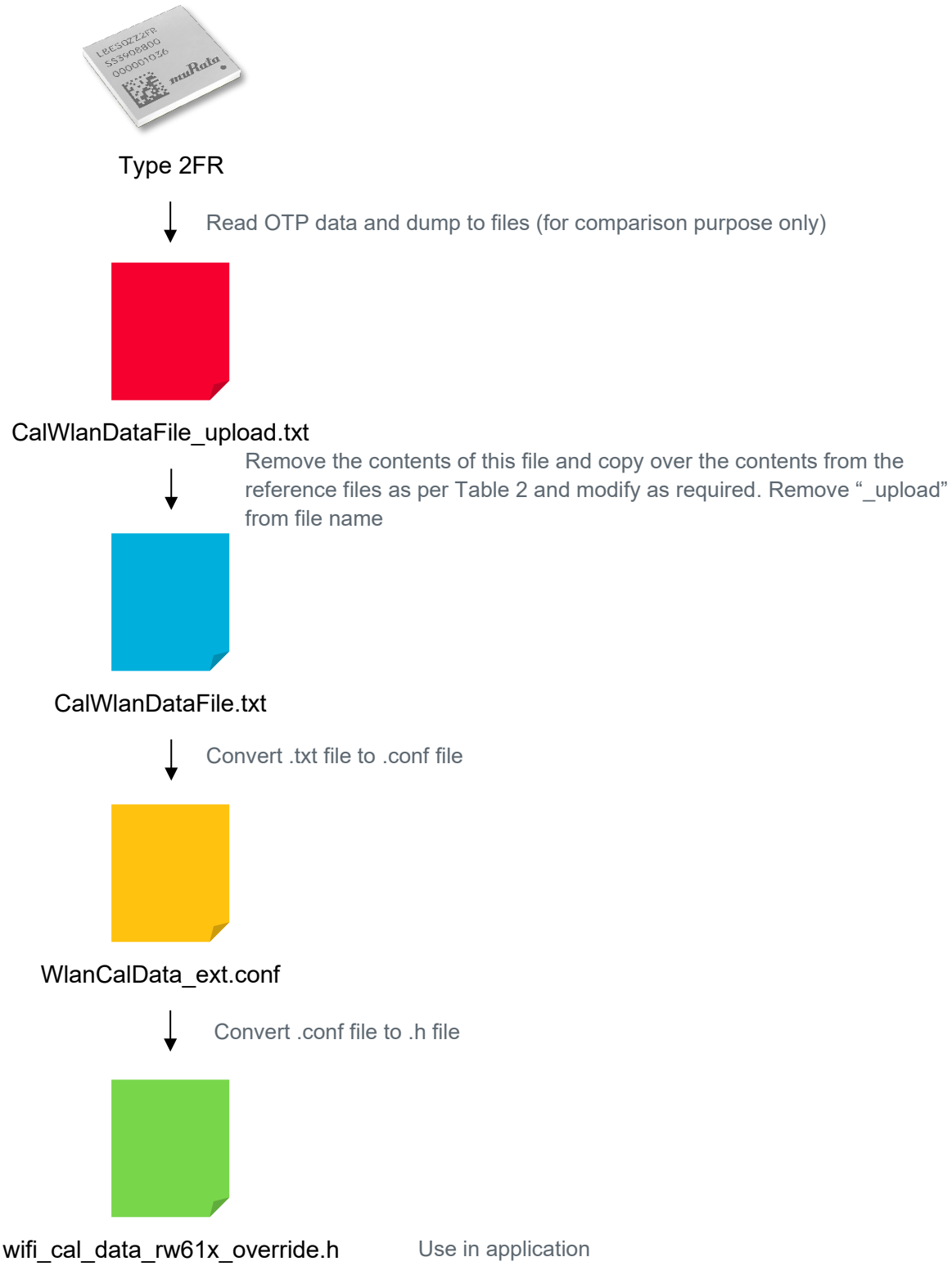
8.1 Labtool

NXP’s Labtool application is part of the Manufacturing Software package. It can be downloaded from Wireless MCU with Integrated Tri-radio: 1x1 Wi-Fi 6 + Bluetooth Low Energy 5.4 / 802.15.4 ⊏↗ . It requires an NXP login credential and permission.

You can follow the NXP document UM11801 (Manufacturing Software User Manual for RW61x) to set up Labtool. The key steps are also mentioned in Section 9 ⊏↙.

The method to generate a custom calibration data file is described in the flow diagram below.

Figure 5: Labtool Usage



The steps to perform this are as follows:

1. Read out calibration data from OTP. For Wi-Fi, this creates an output file (among others) named **CalWlanDataFile_upload.txt**. This file is a dump of the OTP Wi-Fi calibration configuration.
   a. 1 // Enter Labtool's Wi-Fi menu
   b. 44 2 // Configure the storage mode to OTP
   c. 54 // Get calibration data from OTP memory into text file
2. Modify this calibration data file to have the required changes and save it as a text file named **CalWlanDataFile.txt**.
3. Use the following Labtool commands to convert this **CalWlanDataFile.txt** file into a configuration file called **WlanCalData_ext.conf**.
   a. 1 // Enter Labtool's Wi-Fi menu
   b. 44 1 // Configure the storage mode to configuration file
   c. 53 // Write calibration data from text files to .conf file
4. Copy the content of the generated conf file into a C header file **wifi_cal_data_rw61x_override.h**, by adding "0x" in front of the data array values in the conf file generated by Labtool. Refer to Section 7 to use this header file.

In the next few sections, we will explain how the custom calibration data files for the non-default antenna configurations are created. These custom calibration files are the ones provided by Murata as per **Table 2**. These are provided as references.

8.2 Dual / Dedicated Antenna Configuration

8.2.1 Calibration File Changes

For dual / dedicated antenna configuration, the calibration file changes in CalWlanDataFile.txt are as follows.

Keep the preceding parameters of the fields that you want to update in the text file for a section even if there is no change. Those fields are used to calculate the offsets.

```
[Main_Table]
MISC_Flag=0x20
[ANT_ISO_INFO]
ANT_ISO_INFO_Entries=1
ANT_ISO_INFO_Revision=0x01
ANT_ISO_INFO_NUM_WLAN_ANT=1
ANT_ISO_INFO_NUM_BT_ANT=1
ANT_ISO_INFO_NUM_ZB_ANT=1
ANT_ISO_INFO_ANT_SHARING_INFO=0x00000808
ANT_ISO_INFO_TECH_A_FORMAT_ENTRIES0=0
ANT_ISO_INFO_ANT_A_FORMAT_ENTRIES0=0
ANT_ISO_INFO_TECH_B_FORMAT_ENTRIES0=1
ANT_ISO_INFO_ANT_B_FORMAT_ENTRIES0=0
ANT_ISO_INFO_ISOLATION_FORMAT_ENTRIES0=0x14
```

The last line is assuming the isolation of the two antenna is 20 dB (0x14). This file is already hosted in the downloadable as referred to in **Table 2**, under folder "labtool".

8.2.2 Hex Format

Labtool command “44 1” and “53” generates a WlanCalData_ext.conf file with the following content:

```
01 00
0F 00 34 00
 00 20 82 0F 00 00 00 20 00 00 00 00 00 00 00 00
 00 00 20 10 00 00 00 00 00 00 00 00 00 00 00 00
 00 14 65 63 FF FF FF FF F1 11 01 01 00 00 08 08
 FF 14 01 00
```

8.2.3 Header File

Convert to data array ext_cal_data[] in header file **source/wifi/incl/ wifi_cal_data_rw61x_override.h**, by adding “0x” in front of the data array values in the conf file generated by Labtool.

```
const uint8_t ext_cal_data[] = {
0x01, 0x00, 0x0F, 0x00, 0x34, 0x00,
0x00, 0x20, 0x82, 0x0F, 0x00, 0x00, 0x00, 0x20, 0x00, 0x00, 0x00, 0x00, 0x00,
0x00, 0x00, 0x00,
0x00, 0x00, 0x20, 0x10, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
0x00, 0x00, 0x00,
0x00, 0x14, 0x65, 0x63, 0xFF, 0xFF, 0xFF, 0xFF, 0xF1, 0x11, 0x01, 0x01, 0x00,
0x00, 0x08, 0x08,
0xFF, 0x14, 0x01
};
```

8.3 Single / Shared Antenna with Wi-Fi Diversity

8.3.1 Calibration File Changes

RF_CNTL2 and RF_CNTL3 are available to control the diversity antenna switch. RF_CNTL0 and RF_CNTL1 are already used by the module. For single / shared antenna with Wi-Fi diversity configuration, the calibration file changes in CalWlanDataFile.txt are as follows:

```
[Main_Table]
MISC_Flag=0x20
[FEM_SETTING]
FEM_DATA_Entries=2
FE_VER=4
FEMCap2G=0x01
FEMCap5G=0x01
FEM_INTERNAL_BT=0x01
FEM_BT_LOCATION=0x00
FEM_EXTERNAL_2G_LNA=0x00
FEM_EXTERNAL_5G_LNA=0x00
FEM_EXTERNAL_2G_PA=0x00
FEM_EXTERNAL_5G_PA=0x00
FEM_CONCURRENCY=0x00
FEM_2G_TVXR_A_BIT_MASK=0x000F
FEM_2G_TVXR_B_BIT_MASK=0x0000
FEM_5G_TVXR_A_BIT_MASK=0x000F
FEM_5G_TVXR_B_BIT_MASK=0x0000

// Assume CNTL 2 & 3 for the diversity switch (Where CNTL 2 high and CNTL 3
low will use diversity antenna 1)
```

```
FEM_2G_ANT_DIVERSITY_MASK=0x000C
FEM_5G_ANT_DIVERSITY_MASK=0x000C

// Wi-Fi 2.4GHz
FEM_OPERATION_MODE_MASK_ENTRIES0=0x0002
FEM_RF_CTRL_INFO0_ENTRIES0=0x0005
FEM_RF_CTRL_INFO1_ENTRIES0=0x0006
FEM_RF_CTRL_INFO2_ENTRIES0=0x0005
FEM_RF_CTRL_INFO3_ENTRIES0=0x0005
FEM_RF_CTRL_INFO4_ENTRIES0=0x0005
FEM_RF_CTRL_INFO5_ENTRIES0=0x0005
FEM_RF_CTRL_INFO6_ENTRIES0=0x0006
FEM_RF_CTRL_INFO7_ENTRIES0=0x0005
FEM_RF_CTRL_INFO8_ENTRIES0=0x0005
FEM_RF_CTRL_INFO9_ENTRIES0=0x0005
FEM_RF_CTRL_INFO10_ENTRIES0=0x0006
FEM_RF_CTRL_INFO11_ENTRIES0=0x0005
FEM_RF_CTRL_INFO12_ENTRIES0=0x0005
FEM_RF_CTRL_INFO13_ENTRIES0=0x0005
FEM_RF_CTRL_INFO14_ENTRIES0=0x0005
FEM_RF_CTRL_INFO15_ENTRIES0=0x0005
FEM_RF_CTRL_INFO16_ENTRIES0=0x0005
FEM_RF_CTRL_INFO17_ENTRIES0=0x0005
FEM_RF_CTRL_INFO18_ENTRIES0=0x0005
FEM_RF_CTRL_INFO19_ENTRIES0=0x0005

// Wi-Fi 5GHz
FEM_OPERATION_MODE_MASK_ENTRIES1=0x0020
FEM_RF_CTRL_INFO0_ENTRIES1=0x0005
FEM_RF_CTRL_INFO1_ENTRIES1=0x0006
FEM_RF_CTRL_INFO2_ENTRIES1=0x0006
FEM_RF_CTRL_INFO3_ENTRIES1=0x0006
FEM_RF_CTRL_INFO4_ENTRIES1=0x0006
FEM_RF_CTRL_INFO5_ENTRIES1=0x0006
FEM_RF_CTRL_INFO6_ENTRIES1=0x0006
FEM_RF_CTRL_INFO7_ENTRIES1=0x0006
FEM_RF_CTRL_INFO8_ENTRIES1=0x0006
FEM_RF_CTRL_INFO9_ENTRIES1=0x0006
FEM_RF_CTRL_INFO10_ENTRIES1=0x0006
FEM_RF_CTRL_INFO11_ENTRIES1=0x0006
FEM_RF_CTRL_INFO12_ENTRIES1=0x0006
FEM_RF_CTRL_INFO13_ENTRIES1=0x0006
FEM_RF_CTRL_INFO14_ENTRIES1=0x0006
FEM_RF_CTRL_INFO15_ENTRIES1=0x0006
FEM_RF_CTRL_INFO16_ENTRIES1=0x0006
FEM_RF_CTRL_INFO17_ENTRIES1=0x0006
FEM_RF_CTRL_INFO18_ENTRIES1=0x0006
FEM_RF_CTRL_INFO19_ENTRIES1=0x0006
```

This file is already hosted in the downloadable as referred to in **Table 2**, under folder “labtool”.

8.3.2 Hex Format

Labtool command “44 1” and “53” generates a WlanCalData_ext.conf file with the following content:

```
01 00
0F 00 90 00
 00 20 82 0F 00 00 00 20 00 00 00 00 00 00 00 00
 00 00 20 10 00 00 00 00 00 00 00 00 00 00 00 00
 00 70 FC 5A FF FF FF FF 00 07 02 04 00 0F 00 00
 00 0F 00 00 00 0C 00 0C FF FF 00 02 00 06 00 05
 00 05 00 05 00 05 00 05 00 05 00 06 00 05 00 05
 00 05 00 06 00 05 00 05 00 05 00 05 00 05 00 05
 00 05 00 05 FF FF 00 20 00 06 00 05 00 06 00 06
 00 06 00 06 00 06 00 06 00 06 00 06 00 06 00 06
 00 06 00 06 00 06 00 06 00 06 00 06 00 06 00 06
```

8.3.3 Header File

Convert to data array ext_cal_data[] in header file **source/wifi/incl/ wifi_cal_data_rw61x_override.h**, by adding “0x” in front of the data array values in the conf file generated by Labtool.

```
const uint8_t ext_cal_data[] = {
0x01, 0x00, 0x0F, 0x00, 0x90, 0x00,
0x00, 0x20, 0x82, 0x0F, 0x00, 0x00, 0x00, 0x20, 0x00, 0x00, 0x00, 0x00, 0x00,
0x00, 0x00, 0x00,
0x00, 0x00, 0x20, 0x10, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
0x00, 0x00, 0x00,
0x00, 0x70, 0xFC, 0x5A, 0xFF, 0xFF, 0xFF, 0xFF, 0x00, 0x07, 0x02, 0x04,
0x00,0x0F,0x00, 0x00,
0x00, 0x0F, 0x00, 0x00, 0x00, 0x0C, 0x00, 0x0C, 0xFF, 0xFF,0x00, 0x02, 0x00,
0x06, 0x00, 0x05,
0x00, 0x05, 0x00, 0x05, 0x00, 0x05, 0x00, 0x05, 0x00, 0x05, 0x00, 0x06, 0x00,
0x05, 0x00, 0x05,
0x00, 0x05, 0x00, 0x06, 0x00, 0x05, 0x00, 0x05, 0x00, 0x05, 0x00, 0x05, 0x00,
0x05, 0x00, 0x05,
0x00, 0x05, 0x00, 0x05, 0xFF, 0xFF, 0x00, 0x20, 0x00, 0x06, 0x00, 0x05, 0x00,
0x06, 0x00, 0x06,
0x00, 0x06, 0x00, 0x06, 0x00, 0x06, 0x00, 0x06, 0x00, 0x06, 0x00, 0x06, 0x00,
0x06, 0x00, 0x06,
0x00, 0x06, 0x00, 0x06, 0x00, 0x06, 0x00, 0x06, 0x00, 0x06, 0x00, 0x06, 0x00,
0x06, 0x00, 0x06
};
```

8.4 Dual / Dedicated Antenna with Wi-Fi Diversity

8.4.1 Calibration File Changes

RF_CNTL2 and RF_CNTL3 are available to control the diversity antenna switch. RF_CNTL0 and RF_CNTL1 are already used by the module. For dual / dedicated antenna with Wi-Fi diversity configuration, the calibration file changes in CalWlanDataFile.txt are as follows:

```
[Main_Table]
MISC_Flag=0x20
[FEM_SETTING]
FEM_DATA_Entries=2
FE_VER=4
```

```
FEMCap2G=0x01
FEMCap5G=0x01
FEM_INTERNAL_BT=0x01
FEM_BT_LOCATION=0x00
FEM_EXTERNAL_2G_LNA=0x00
FEM_EXTERNAL_5G_LNA=0x00
FEM_EXTERNAL_2G_PA=0x00
FEM_EXTERNAL_5G_PA=0x00
FEM_CONCURRENCY=0x00
FEM_2G_TVXR_A_BIT_MASK=0x000F
FEM_2G_TVXR_B_BIT_MASK=0x0000
FEM_5G_TVXR_A_BIT_MASK=0x000F
FEM_5G_TVXR_B_BIT_MASK=0x0000

// Assume CNTL 2 & 3 for the diversity switch (Where CNTL 2 high and CNTL 3
low will use diversity antenna 1)
FEM_2G_ANT_DIVERSITY_MASK=0x000C
FEM_5G_ANT_DIVERSITY_MASK=0x000C

// Wi-Fi 2.4GHz
FEM_OPERATION_MODE_MASK_ENTRIES0=0x0002
FEM_RF_CTRL_INFO0_ENTRIES0=0x0005
FEM_RF_CTRL_INFO1_ENTRIES0=0x0006
FEM_RF_CTRL_INFO2_ENTRIES0=0x0005
FEM_RF_CTRL_INFO3_ENTRIES0=0x0005
FEM_RF_CTRL_INFO4_ENTRIES0=0x0005
FEM_RF_CTRL_INFO5_ENTRIES0=0x0005
FEM_RF_CTRL_INFO6_ENTRIES0=0x0006
FEM_RF_CTRL_INFO7_ENTRIES0=0x0005
FEM_RF_CTRL_INFO8_ENTRIES0=0x0005
FEM_RF_CTRL_INFO9_ENTRIES0=0x0005
FEM_RF_CTRL_INFO10_ENTRIES0=0x0006
FEM_RF_CTRL_INFO11_ENTRIES0=0x0005
FEM_RF_CTRL_INFO12_ENTRIES0=0x0005
FEM_RF_CTRL_INFO13_ENTRIES0=0x0005
FEM_RF_CTRL_INFO14_ENTRIES0=0x0005
FEM_RF_CTRL_INFO15_ENTRIES0=0x0005
FEM_RF_CTRL_INFO16_ENTRIES0=0x0005
FEM_RF_CTRL_INFO17_ENTRIES0=0x0005
FEM_RF_CTRL_INFO18_ENTRIES0=0x0005
FEM_RF_CTRL_INFO19_ENTRIES0=0x0005

// Wi-Fi 5GHz
FEM_OPERATION_MODE_MASK_ENTRIES1=0x0020
FEM_RF_CTRL_INFO0_ENTRIES1=0x0005
FEM_RF_CTRL_INFO1_ENTRIES1=0x0006
FEM_RF_CTRL_INFO2_ENTRIES1=0x0006
FEM_RF_CTRL_INFO3_ENTRIES1=0x0006
FEM_RF_CTRL_INFO4_ENTRIES1=0x0006
FEM_RF_CTRL_INFO5_ENTRIES1=0x0006
FEM_RF_CTRL_INFO6_ENTRIES1=0x0006
FEM_RF_CTRL_INFO7_ENTRIES1=0x0006
FEM_RF_CTRL_INFO8_ENTRIES1=0x0006
FEM_RF_CTRL_INFO9_ENTRIES1=0x0006
FEM_RF_CTRL_INFO10_ENTRIES1=0x0006
FEM_RF_CTRL_INFO11_ENTRIES1=0x0006
FEM_RF_CTRL_INFO12_ENTRIES1=0x0006
FEM_RF_CTRL_INFO13_ENTRIES1=0x0006
FEM_RF_CTRL_INFO14_ENTRIES1=0x0006
FEM_RF_CTRL_INFO15_ENTRIES1=0x0006
```

```
FEM_RF_CTRL_INFO16_ENTRIES1=0x0006
FEM_RF_CTRL_INFO17_ENTRIES1=0x0006
FEM_RF_CTRL_INFO18_ENTRIES1=0x0006
FEM_RF_CTRL_INFO19_ENTRIES1=0x0006

[ANT_ISO_INFO]
ANT_ISO_INFO_Entries=1
ANT_ISO_INFO_Revision=0x01
ANT_ISO_INFO_NUM_WLAN_ANT=1
ANT_ISO_INFO_NUM_BT_ANT=1
ANT_ISO_INFO_NUM_ZB_ANT=1
ANT_ISO_INFO_ANT_SHARING_INFO=0x00000808
ANT_ISO_INFO_TECH_A_FORMAT_ENTRIES0=0
ANT_ISO_INFO_ANT_A_FORMAT_ENTRIES0=0
ANT_ISO_INFO_TECH_B_FORMAT_ENTRIES0=1
ANT_ISO_INFO_ANT_B_FORMAT_ENTRIES0=0
ANT_ISO_INFO_ISOLATION_FORMAT_ENTRIES0=0x14
```

This file is already hosted in the downloadable as referred to in **Table 2**, under folder “labtool”.

8.4.2 Hex Format

Labtool command “44 1” and “53” generates a WlanCalData_ext.conf file with the following content:

```
01 00
0F 00 A4 00
 00 20 82 0F 00 00 00 20 00 00 00 00 00 00 00 00
 00 00 20 10 00 00 00 00 00 00 00 00 00 00 00 00
 00 70 68 5A 00 00 00 90 00 07 02 04 00 0F 00 00
 00 0F 00 00 00 0C 00 0C FF FF 00 02 00 06 00 05
 00 05 00 05 00 05 00 05 00 05 00 06 00 05 00 05
 00 05 00 06 00 05 00 05 00 05 00 05 00 05 00 05
 00 05 00 05 FF FF 00 20 00 06 00 05 00 06 00 06
 00 06 00 06 00 06 00 06 00 06 00 06 00 06 00 06
 00 06 00 06 00 06 00 06 00 06 00 06 00 06 00 06
 00 14 66 63 FF FF FF FF F1 11 01 01 00 00 08 08
 FF 14 01 00
```

8.4.3 Header File

Convert to data array ext_cal_data[] in header file **source/wifi/incl/ wifi_cal_data_rw61x_override.h**, by adding “0x” in front of the data array values in the conf file generated by Labtool.

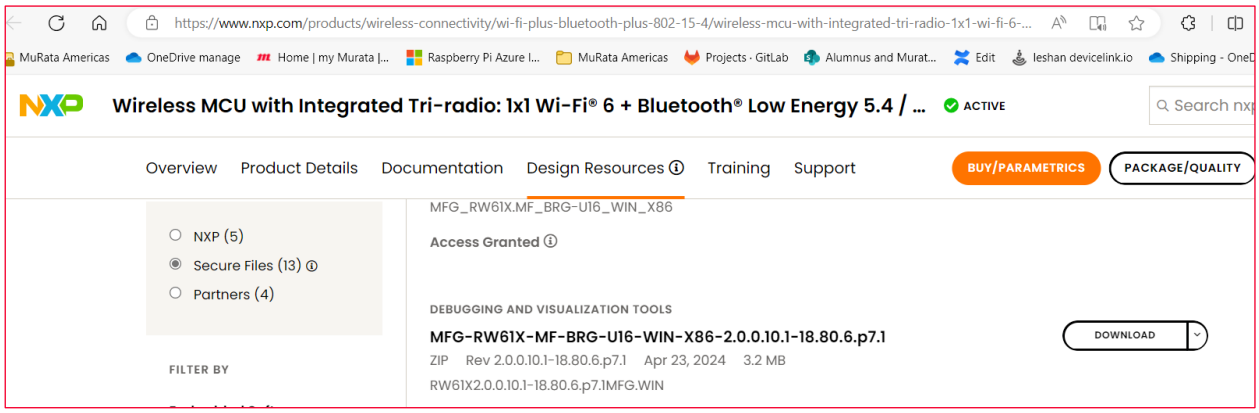
```
const uint8_t ext_cal_data[] = {
0x01, 0x00, 0x0F, 0x00, 0xA4, 0x00,
 0x00, 0x20, 0x82, 0x0F, 0x00, 0x00, 0x00, 0x20, 0x00, 0x00, 0x00, 0x00, 0x00,
0x00, 0x00, 0x00,
 0x00, 0x00, 0x20, 0x10, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
0x00, 0x00, 0x00,
 0x00, 0x70, 0x68, 0x5A, 0x00, 0x00, 0x00, 0x90, 0x00, 0x07, 0x02, 0x04, 0x00,
0x0F, 0x00,0x00,
 0x00, 0x0F, 0x00, 0x00, 0x00, 0x0C, 0x00, 0x0C, 0xFF, 0xFF, 0x00, 0x02, 0x00,
0x06,0x00,0x05,
 0x00, 0x05, 0x00, 0x05, 0x00, 0x05, 0x00, 0x05, 0x00, 0x05, 0x00, 0x06, 0x00,
0x05, 0x00, 0x05,
 0x00, 0x05, 0x00, 0x06, 0x00, 0x05, 0x00, 0x05, 0x00, 0x05, 0x00, 0x05, 0x00,
0x05, 0x00, 0x05,
```

```
 0x00, 0x05, 0x00, 0x05, 0xFF, 0xFF, 0x00, 0x20, 0x00, 0x06, 0x00, 0x05, 0x00,
0x06, 0x00,0x06,
 0x00, 0x06, 0x00, 0x06, 0x00, 0x06, 0x00, 0x06, 0x00, 0x06, 0x00, 0x06, 0x00,
0x06, 0x00, 0x06,
 0x00, 0x06, 0x00, 0x06, 0x00, 0x06, 0x00, 0x06, 0x00, 0x06, 0x00, 0x06, 0x00,
0x06, 0x00, 0x06,
 0x00, 0x14, 0x66, 0x63, 0xFF, 0xFF, 0xFF, 0xFF, 0xF1, 0x11, 0x01, 0x01, 0x00,
0x00,0x08,0x08,
 0xFF, 0x14, 0x01, 0x00,
};
```

9 Labtool Guide

1. Download the LabTool from Wireless MCU with Integrated Tri-radio: 1x1 Wi-Fi 6 + Bluetooth Low Energy 5.4 / 802.15.4 (**Figure 6**). The version we are using is **MFG-RW61X-MF-BRG-U16-WIN-X86-2.0.0.10.1-18.80.6.p7.1 (from Secure files)**.

Figure 6: Download LabTool Page



2. **For 2FR**:

   Flash with *rdrw612bga_uart_wifi_bridge.bin* app at address 0x08000000, using either JLink or MCUXpresso IDE.

   For 2FP:

   Flash with *rdrw612bga_uart_wifi_bridge_2fp.bin* app at address 0x08000000, , using either JLink or MCUXpresso IDE.

3. Flash MFG WIFI FW (MFG-RW61X-MF-BRG-U16-WIN-X86-2.0.0.10.1-18.80.6.p7.1\FwImage\A2\rw61xw_sb_mfg_fw_cpu1_a2.bin) into the 2FR/2FP, address 0x08400000.
4. Connect 2FR/2FP UART to PC.
5. Goto MFG-RW61X-MF-BRG-U16-WIN-X86-2.0.0.10.1-18.80.6.p7.1\labtool. Modify SetUp.ini to have the correct “ComNo”.
6. Double click on DutApiSisoApApp_RW610.exe (LabTool). First read out OTP. Follow the log below (the red text denotes the command to enter):

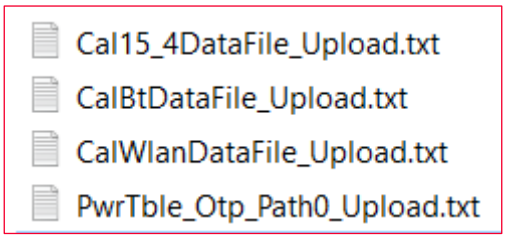
```
Name: Dut labtool
Version: 2.0.0.10.1
Date: Apr 15 2024 (23:55:34)

Note:
```

```
1. =========WiFi tool=============
2. =========BT   tool=============
3. =========15_4   tool=============

Enter CMD 99 to Exit.

Enter option: 1

Name: DutApiClass
Interface: EtherNet
Version: 2.0.0.10.1
Date: Apr 15 2024 (23:55:16)

Note:

DutIf_InitConnection: 0
-----------------------------------------------------
               RW610 (802.11a/g/b/n/ac/ax) TEST MENU
-----------------------------------------------------
Enter option: 44 2

Dut_Shared_SetStorageType():0
Set Storage Type to: 2
Enter option: 54

..
86 0..88 0..
9194 0..
97 0..
WritePwrTableFile to File "PwrTble_Otp_Path0_Upload.txt"
96 0..
89 0 0..
92 0 0..
83105
102
103
107 0..
Annex 75 Dev0 Path098 0 0..
106
108
BT1 55
BT1 100
104
..
86 0..88 0..
9194 0..
97 0..
WritePwrTableFile to File "PwrTble_Otp_Path0_Upload.txt"
96 0..
89 0 0..
92 0 0..
83105
102
103
107 0..
Annex 75 Dev0 Path098 0 0..
106
108
BT1 55
BT1 100
104
```

```
 DUTAPI_UpLoadSaveCalData: 0x00000000           CsC:1
Enter option: 99

Exiting

 DutIf_Disconnection: 0
1. =========WiFi tool=============
2. =========BT   tool=============
3. =========15_4   tool=============

Enter CMD 99 to Exit.

Enter option: 99

Exiting
```

7. If step 6 is successful, some files will be generated in the LabTool folder.

Figure 7: Generated Files in LabTool Folder



8. Rename the files to be modified, so that the **"_Upload**" is removed.
9. Open the files to modify (e.g. CalWlanDataFile.txt) and replace the content with new configuration content and save the file.

10 References

1. Type 2FR EVK User Guide, Murata
2. Type 2FR EVK Schematic, Murata

Revision History

Revision	Date	Author	Change Description
1.0	June 13, 2025	RB	Initial Release

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