

**Bluetooth<sup>®</sup> low energy Module  
(MK71511/MK71521)  
Application Note**

---

**How to use Sniffer for MK71521**

Issue: Nov. 19, 2020

**Notes**

- 1) The information contained herein is subject to change without notice.
- 2) When using LAPIS Technology Products, refer to the latest product information (data sheets, user's manuals, application notes, etc.), and ensure that usage conditions (absolute maximum ratings, recommended operating conditions, etc.) are within the ranges specified. LAPIS Technology disclaims any and all liability for any malfunctions, failure or accident arising out of or in connection with the use of LAPIS Technology Products outside of such usage conditions specified ranges, or without observing precautions. Even if it is used within such usage conditions specified ranges, semiconductors can break down and malfunction due to various factors. Therefore, in order to prevent personal injury, fire or the other damage from break down or malfunction of LAPIS Technology Products, please take safety at your own risk measures such as complying with the derating characteristics, implementing redundant and fire prevention designs, and utilizing backups and fail-safe procedures. You are responsible for evaluating the safety of the final products or systems manufactured by you.
- 3) Descriptions of circuits, software and other related information in this document are provided only to illustrate the standard operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. And the peripheral conditions must be taken into account when designing circuits for mass production. LAPIS Technology disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, and other related information.
- 4) No license, expressly or implied, is granted hereby under any intellectual property rights or other rights of LAPIS Technology or any third party with respect to LAPIS Technology Products or the information contained in this document (including but not limited to, the Product data, drawings, charts, programs, algorithms, and application examples, etc.). Therefore LAPIS Technology shall have no responsibility whatsoever for any dispute, concerning such rights owned by third parties, arising out of the use of such technical information.
- 5) The Products are intended for use in general electronic equipment (AV/OA devices, communication, consumer systems, gaming/entertainment sets, etc.) as well as the applications indicated in this document. For use of our Products in applications requiring a high degree of reliability (as exemplified below), please be sure to contact a LAPIS Technology representative and must obtain written agreement: transportation equipment (cars, ships, trains, etc.), primary communication equipment, traffic lights, fire/crime prevention, safety equipment, medical systems, servers, solar cells, and power transmission systems, etc. LAPIS Technology disclaims any and all liability for any losses and damages incurred by you or third parties arising by using the Product for purposes not intended by us. Do not use our Products in applications requiring extremely high reliability, such as aerospace equipment, nuclear power control systems, and submarine repeaters, etc.
- 6) The Products specified in this document are not designed to be radiation tolerant.
- 7) LAPIS Technology has used reasonable care to ensure the accuracy of the information contained in this document. However, LAPIS Technology does not warrant that such information is error-free and LAPIS Technology shall have no responsibility for any damages arising from any inaccuracy or misprint of such information.
- 8) Please use the Products in accordance with any applicable environmental laws and regulations, such as the RoHS Directive. LAPIS Technology shall have no responsibility for any damages or losses resulting non-compliance with any applicable laws or regulations.
- 9) When providing our Products and technologies contained in this document to other countries, you must abide by the procedures and provisions stipulated in all applicable export laws and regulations, including without limitation the US Export Administration Regulations and the Foreign Exchange and Foreign Trade Act..
- 10) Please contact a ROHM sales office if you have any questions regarding the information contained in this document or LAPIS Technology's Products.
- 11) This document, in part or in whole, may not be reprinted or reproduced without prior consent of LAPIS Technology.

(Note) "LAPIS Technology" as used in this document means LAPIS Technology Co., Ltd.

Copyright 2020 LAPIS Technology Co., Ltd.

---

**LAPIS Technology Co.,Ltd.**

2-4-8 Shinyokohama, Kouhoku-ku, Yokohama 222-8575, Japan  
<https://www.lapis-tech.com/en/>

## Introduction

This application note describes the method of using "nRF Sniffer for Bluetooth LE" of the development tool offered by Nordic on the evaluation-kit implemented with LAPIS's **Bluetooth**<sup>®</sup> low energy modules: MK71521 that support Bluetooth 5.

As well as this document, read the following provided documents as needed.

- MK71511 Data Sheet
- MK715x1EK1 Hardware Manual
- MK715x1EK1A/MK715x1EK1AP Hardware Manual
- MK715x1 Software Development Start-up Guide

Note: In this document, MK715x1 is used to indicate both MK71511 and MK71521.

- Bluetooth<sup>®</sup> is a registered trademark of Bluetooth SIG, Inc.  
- Other names are generally trademarks or registered trademarks of their respective development companies.

## Notation

Category	Notation	Description
• Value	<i>0xnn</i>	Represents a hexadecimal number.
	<i>0bnnnn</i>	Represents a binary number.
• Address	<i>0xnnnn_nnnn</i>	Represents a hexadecimal number. (indicates 0xnnnnnnnn)
• Unit	Word, WORD	1 word = 32 bits
	Byte, BYTE	1 byte = 8 bits
	Mega, M	$10^6$
	Kilo, K	$2^{10} = 1024$
	Kilo, k	$10^3 = 1000$
	Milli, m	$10^{-3}$
	Micro, $\mu$	$10^{-6}$
• Term	Nano, n	$10^{-9}$
	Second, s (lowercase)	Second
• Register Description	"H" level	Indicates high voltage signal levels $V_{IH}$ and $V_{OH}$ as specified by the electrical characteristics.
	"L" level	Indicates low voltage signal levels $V_{IL}$ and $V_{OL}$ as specified by the electrical characteristics.
• Register Description	Read/write attribute: R indicates read-enabled; W indicates write-enabled.	
	MSB: Most significant bit in an 8-bit register (memory)	
	LSB: Least significant bit in an 8-bit register (memory)	

## Table of Contents

Notes.....	i
Introduction .....	ii
Notation.....	iii
Table of Contents .....	iv
1. Overview .....	1
1.1. System Requirements .....	1
2. Setup .....	2
2.1. Installing USB-Serial Driver .....	2
2.2. Writing Sniffer Firmware for MK71521 .....	2
2.3. Installing Wireshark .....	2
2.4. Python Setup .....	2
2.5. Wireshark Setup .....	6
3. Operation.....	9
Revision History .....	11

# 1. Overview

nRF Sniffer for Bluetooth LE can display the wireless protocol packet for Bluetooth low energy in real time and check the wireless communication state.

The below describes Operation Environment, Setup and Operation for "nRF Sniffer for Bluetooth" using the evaluation kit implemented with MK71521.

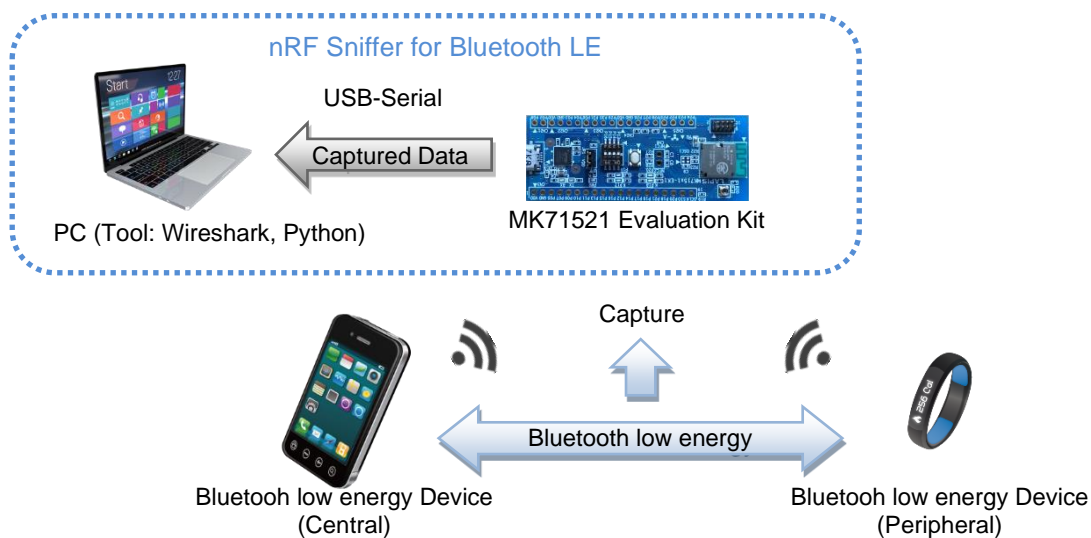
Because the firmware corresponding to "nRF Sniffer for Bluetooth LE" is not prepared, MK71511 cannot be used.

## 1.1. System Requirements

The operation environment using "nRF Sniffer for Bluetooth LE" is shown as follows.

"nRF Sniffer for Bluetooth LE" captures the wireless communication packets between two Bluetooth low energy devices, and displays captured data to Wireshark of the network protocol analyzer on PC.

Refer to "MK715x1EK1 Hardware Manual" or "MK715x1EK1A/MK715x1EK1AP Hardware Manual" for details of the evaluation kit implemented of MK71521.



**Figure 1-1 nRF Sniffer for Bluetooth LE Operation Environment**

This document is described for Windows 10. Moreover, the operation of other software is described in the following table.

**Table 1-1 Software Version**

Software	Version
nRF Sniffer (Nordic)	Version 3.0.0
Wireshark	Version 3.2.1
Python	Version 3.8.1

Refer to the following support site for details of these software.

nRF Sniffer (Nordic) : [https://infocenter.nordicsemi.com/index.jsp?topic=%2Fug\\_sniffer\\_ble%2FUG%2Fsniffer\\_ble%2Fintro.html](https://infocenter.nordicsemi.com/index.jsp?topic=%2Fug_sniffer_ble%2FUG%2Fsniffer_ble%2Fintro.html)

Wireshark : <https://www.wireshark.org/>

Python : <https://www.python.org/>

## 2. Setup

The setup procedure of the software relates to "nRF Sniffer for Bluetooth LE" is described.  
PC needs to connect to internet for the following setup procedure.

### 2.1. Installing USB-Serial Driver

When PC and the evaluation kit implemented of MK71521 are connected, the FT232RQ driver is needed.  
The FT232RQ driver corresponding to PC is installed from the following site if necessary.

URL: <http://www.ftdichip.com/Drivers/D2XX.htm>

### 2.2. Writing Sniffer Firmware for MK71521

The ZIP file of "nRF Sniffer for Bluetooth LE" is downloaded from the following site, and unzip it to one folder of PC.

URL: <https://www.nordicsemi.com/Software-and-tools/Development-Tools/nRF-Sniffer-for-Bluetooth-LE/Download#infotabs>  
ZIP file: nrf\_sniffer\_for\_bluetooth\_le\_3.0.0\_129d2b3.zip \*Version 3.0.0

Next, the Hex file of the following folder is written in Flash ROM with built-in MK71521.  
Refer to "2.6. Installing nRF Connect for Desktop" of "MK715x1 Software Development Start-up Guide" and "3.4. Writing Built Program" for method of writing the firmware. The writing procedure only of the application program is done without doing the writing procedure of SoftDevice.

Folder : ".\<nRF Sniffer Folder Name>\hex\  
Hex File : "sniffer\_pca10040\_129d2b3.hex"

The other files in ZIP file is used at Wireshark installing.

### 2.3. Installing Wireshark

The installation file of Wireshark is downloaded and executed from the following site.  
Complete the installation according to the procedure of the executed installer.

URL: <https://www.wireshark.org/>

### 2.4. Python Setup

The following procedure is executed, and Python is set up.

#### (1) Python Downloading & Installing

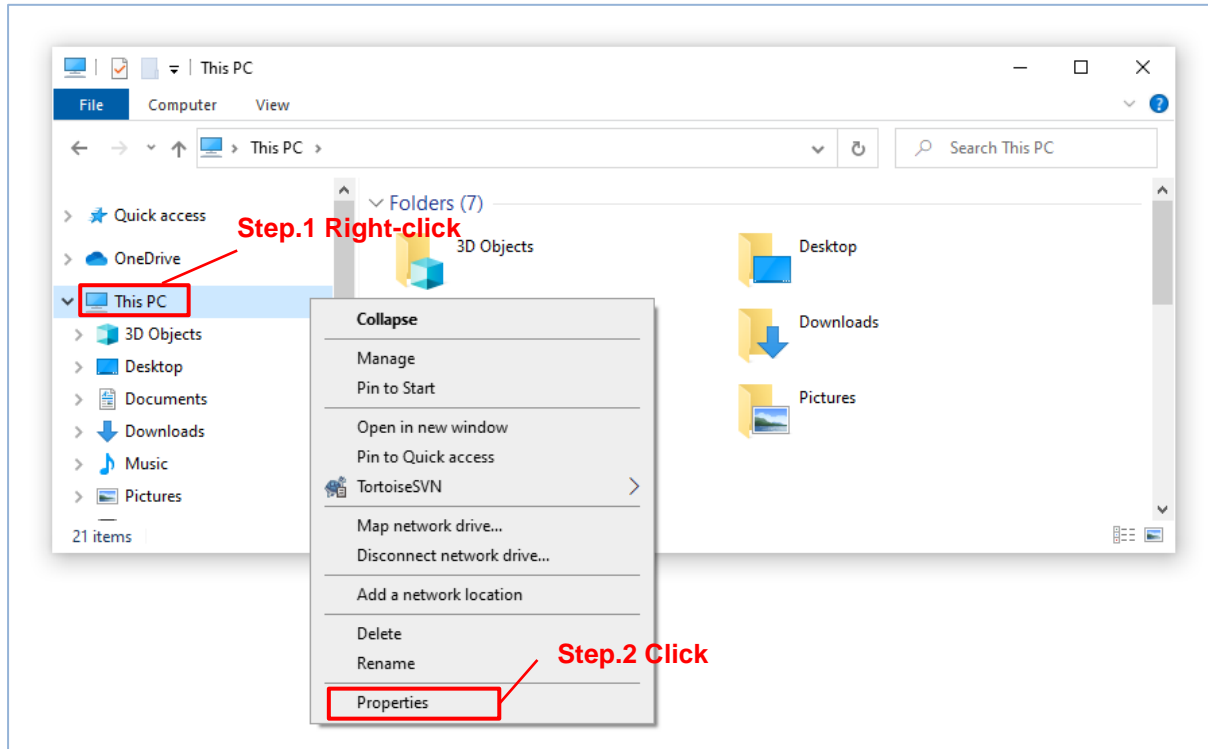
The installation file of Python is downloaded and executed from the following site.  
Complete the installation according to the procedure of the executed installer.

URL: <https://www.python.org/downloads/>

(2) Environment Variable Addition

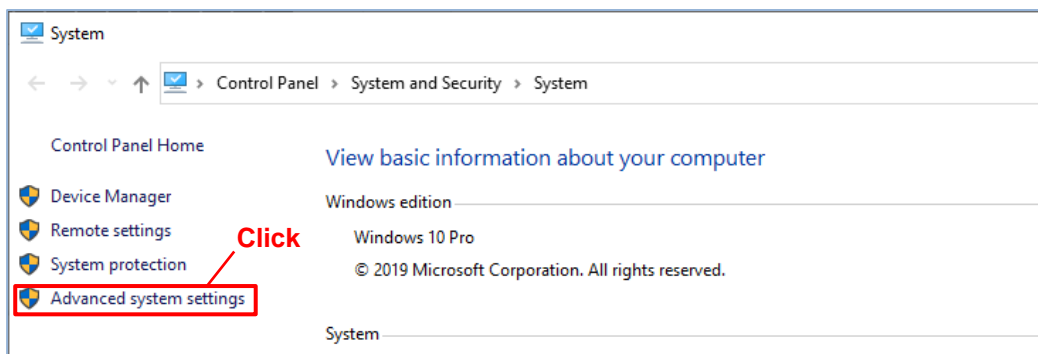
A new path is added to the system environment variable according to the following operating procedure.

Operation 1: The control panel is opened by the figure below operation of the Explorer of Windows.



**Figure 2-1 Python Environment Variable Addition (1)**

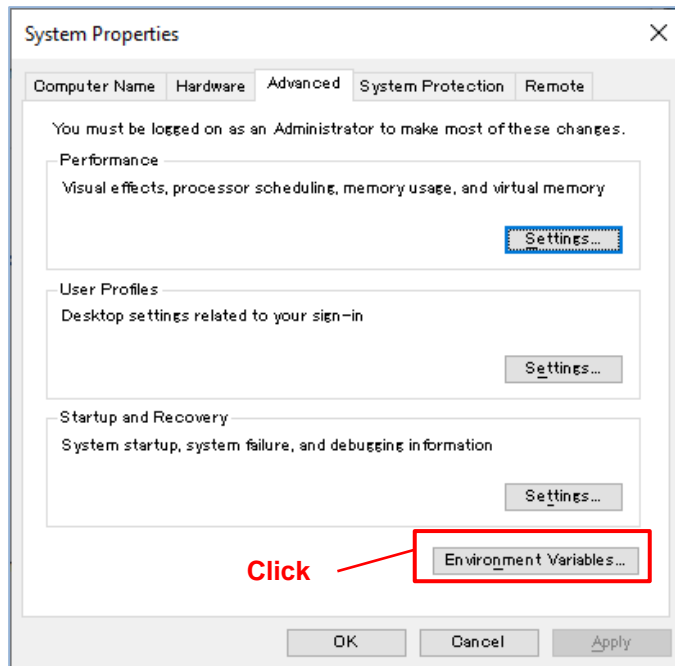
Operation 2: "System Properties" window is opened by the operation in the figure below.



**Figure 2-2 Python Environment Variable Addition (2)**

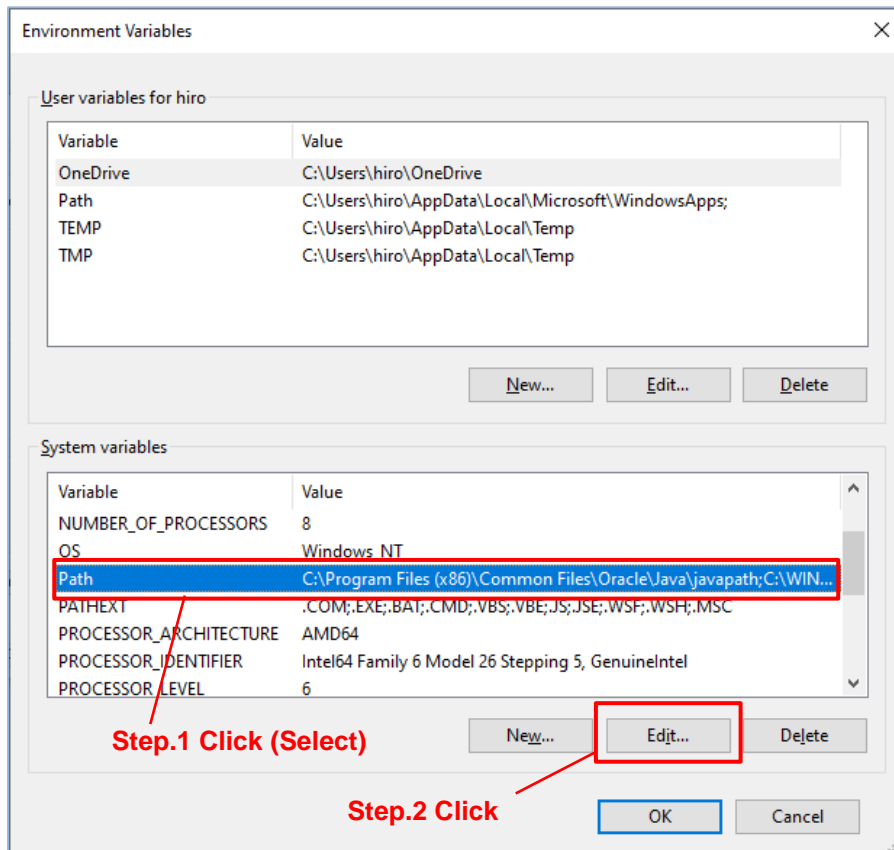


Operation 3: "Environment Variables" window is opened by the operation in the figure below.



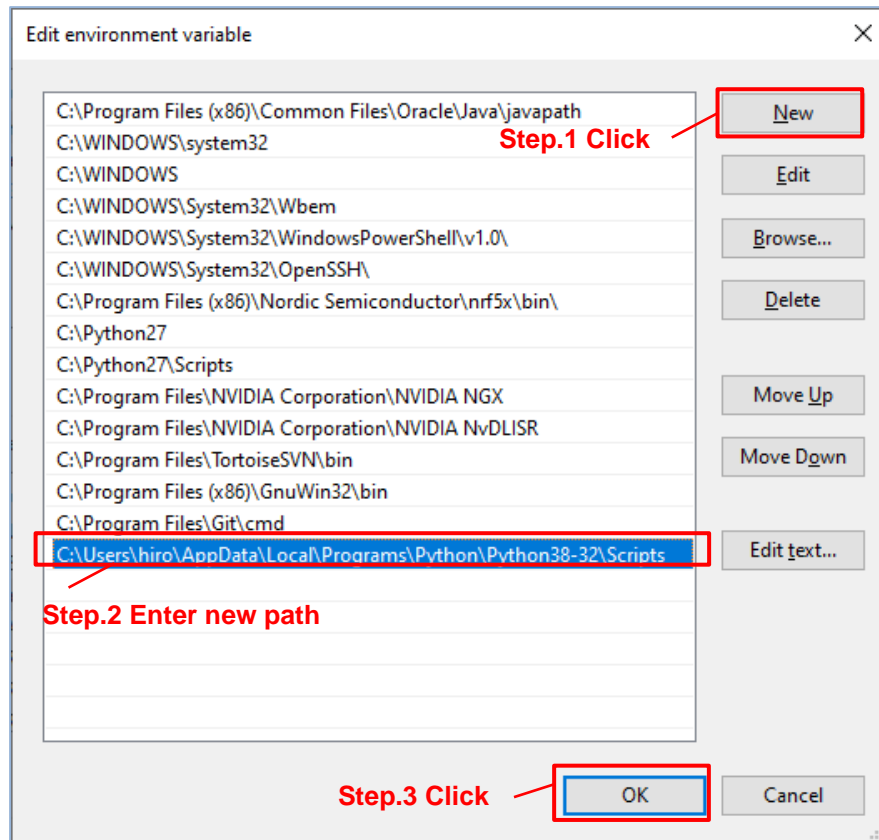
**Figure 2-3 Python Environment Variable Addition (3)**

Operation 4: "Edit environment variable" window is opened by the operation in the figure below.



**Figure 2-4 Python Environment Variable Addition (4)**

Operation 5: A new path is added to system variable by the operation in the figure below.  
The command prompt needs to restart after adding a new path.



**図 2-5 Python Environment Variable Addition (5)**

New Path : "C:\Users\\AppData\Local\Programs\Python\Python38-32\Scripts" (Reference)  
\*A new path is different according to the version of Python. Referring to the above new path, the folder path of "Pip3.exe" is confirmed after installing Python.

### (3) Serial Library Addition

The serial library is added by the following command entering.  
It is necessary to connect PC with the Internet when command is executed

```
C:\>pip install pyserial
```

**Figure 2-6 Python Serial library addition**

## 2.5. Wireshark Setup

Wireshark is set up by the following procedures.

### (1) Installing Wireshark Plug-in

The plug-in is installed to Wireshark by the following command entering.  
 It is necessary to connect PC with the Internet when command is executed

```
C:\>cd <nRF Sniffer Folder Name>\extcap

C:\Work\nRF Sniffer\extcap>pip3 install -r requirements.txt
```

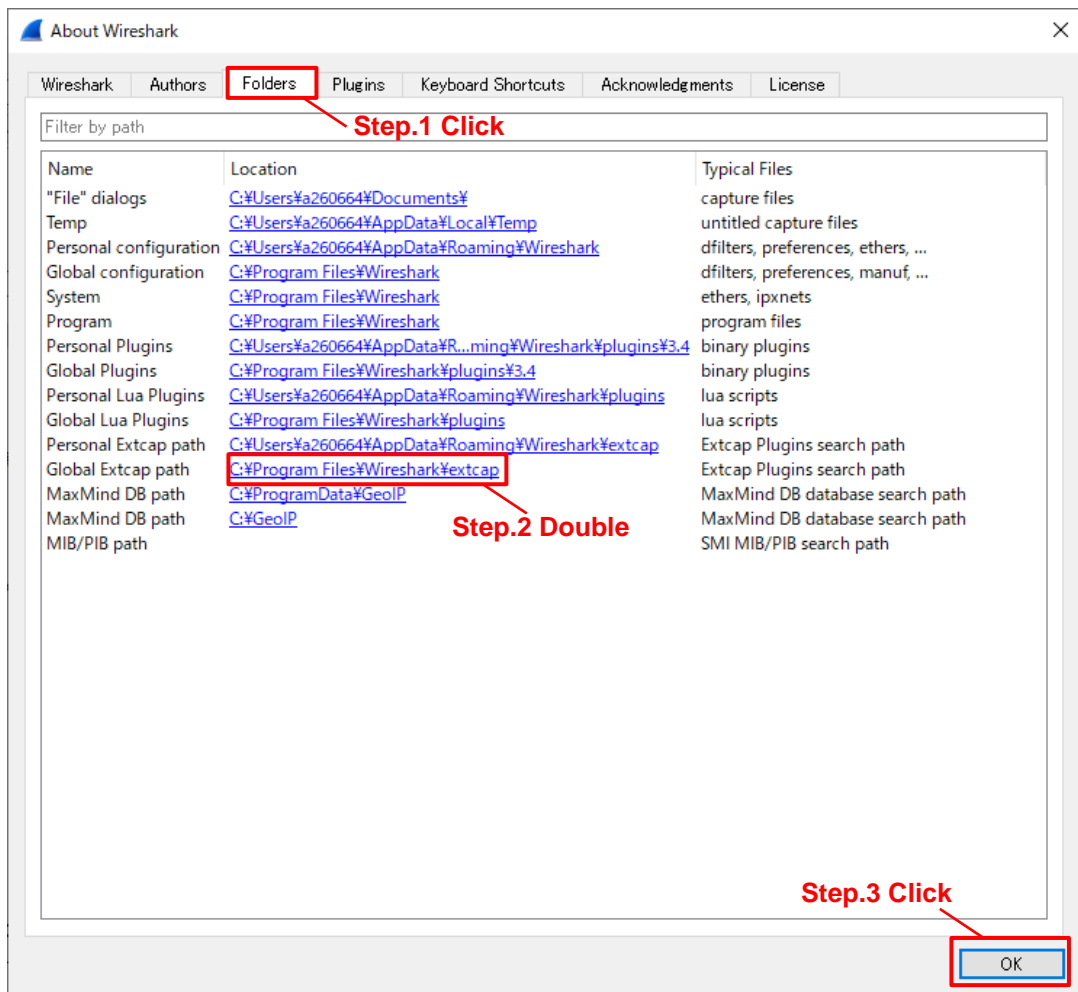
**Figure 2-7 Installing Wireshark Plug-in**

### (2) Wireshark setting

Wireshark is started and set by the following operating procedure.

Operation 1: Windows Start - "Wireshark"

Operation 2: Wireshark Menu "Help" - "About Wireshark" and the procedure of the following figure is done.



**Figure 2-8 Wireshark Setting (open Extcap folder)**

Operation 3: The files in the following folder are copied (overwrite) to the related folder of Operation 2.

Copy source: files in ".\<nRF Sniffer Folder Name>\extcap"  
 Copy destination: Related folder of Operation 2.

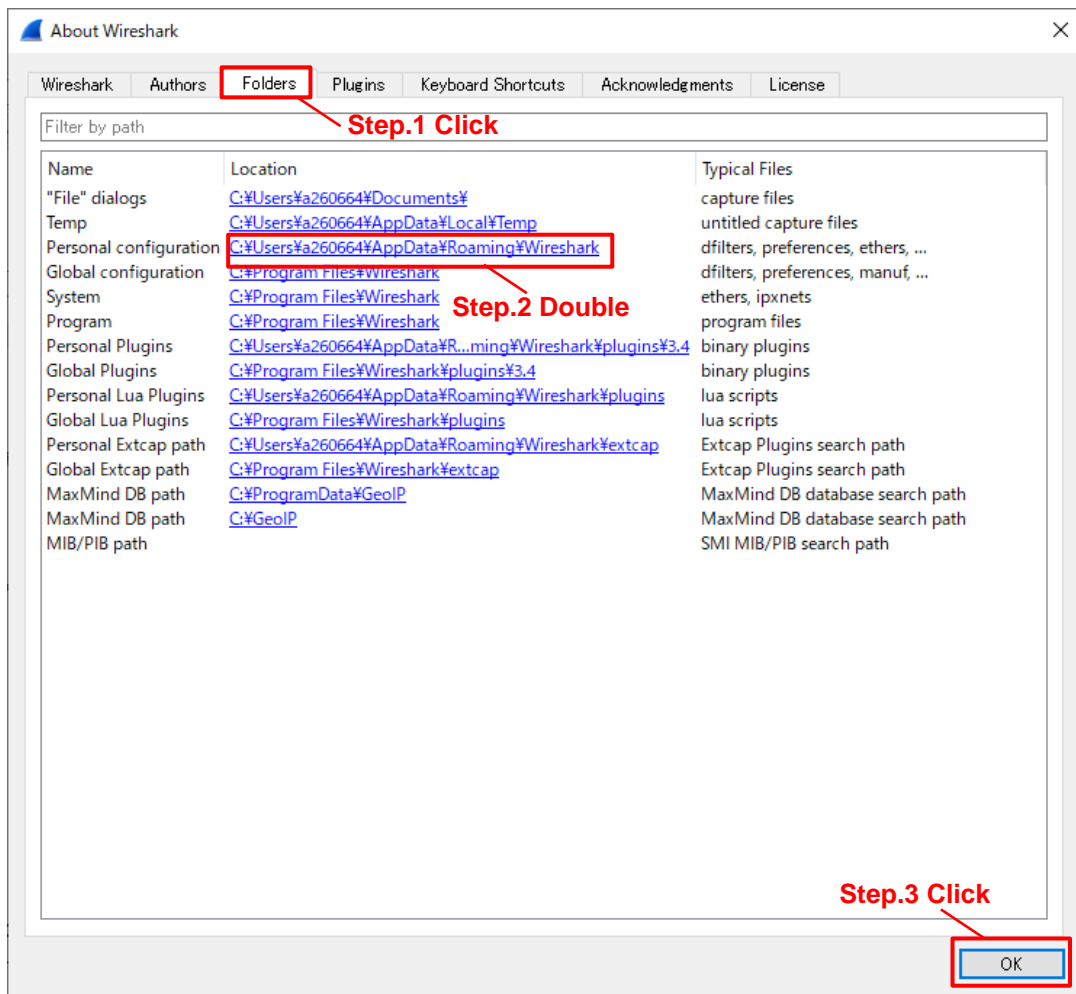
Operation 4: Change to related folder of Operation 2, the following command is executed in the command prompt.

```
C:>cd < Related folder path of Operation 2>

C:\Program Files\Wireshark\extcap>nrf_sniffer_ble.bat --extcap-interfaces
```

**Figure 2-9 Wireshark Setting (Batch execution)**

Operation 5: Wireshark Menu "Help" - "About Wireshark" and the procedure of the following figure is done.

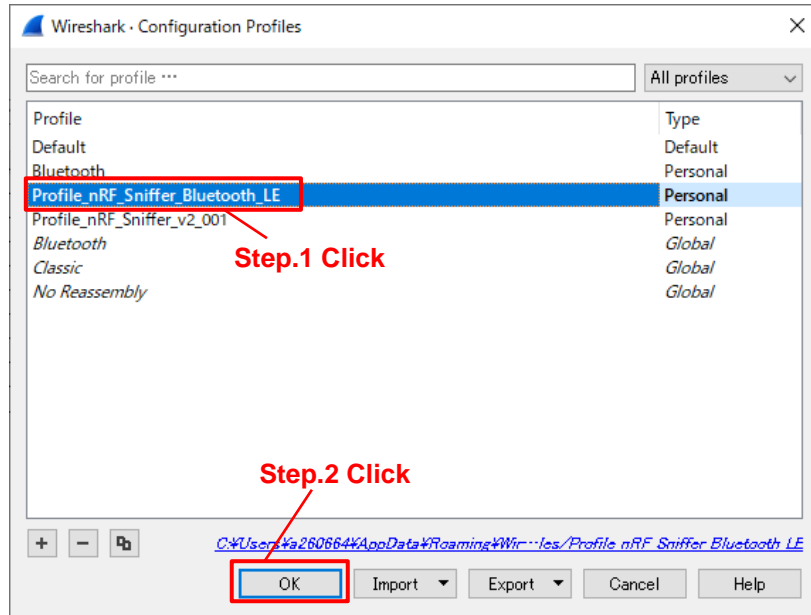


**Figure 2-10 Wireshark Setting (Open Configuration Folder)**

Operation 6: The files in the following folder are copied into the related folder " profiles" of Operation 5.

Copy source: ".\<nRF Sniffer Folder Name>\ Profile\_nRF\_Sniffer\_Bluetooth\_LE"  
 Copy destination: Into related folder " profiles" of Operation 5.

Operation 7: Wireshark Menu "Edit" - "Configuration Profiles..." and the procedure of the following figure is done.



**Figure 2-11 WiresharkSetting (Profile Setting)**

### 3. Operation

The operation method to capture the wireless communication packets for "nRF Sniffer for Bluetooth LE" is described as follows.

- (1) Connect MK71251 Evaluation-kit to PC

Prepared MK71521 evaluation kit for “nRF Sniffer for Bluetooth LE” is connected to PC.

- (2) Wireshark Start-up

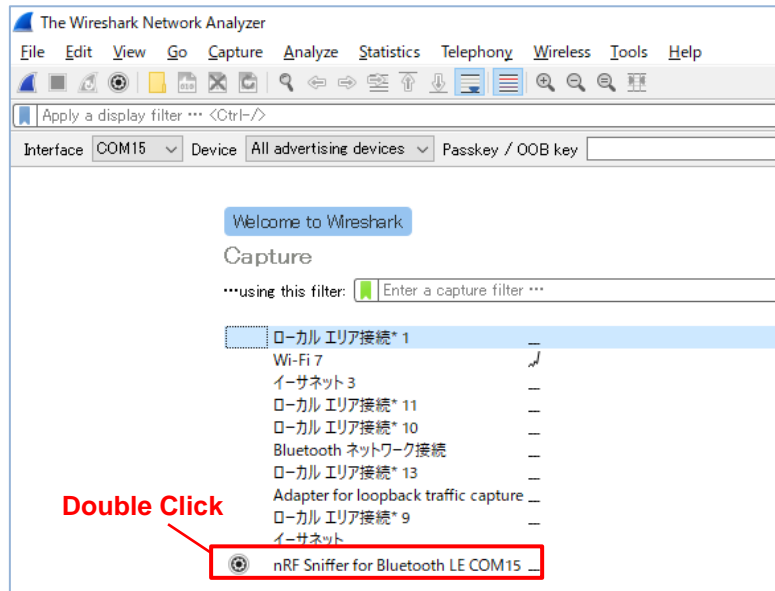
Wireshark is started by the following operation.

Operation: Windows Menu - "Wireshark"

- (3) Selecting the Network Device

After Wireshark is started, the network device is selected by operation of the figure below (red). "COM" port number is different by PC used.

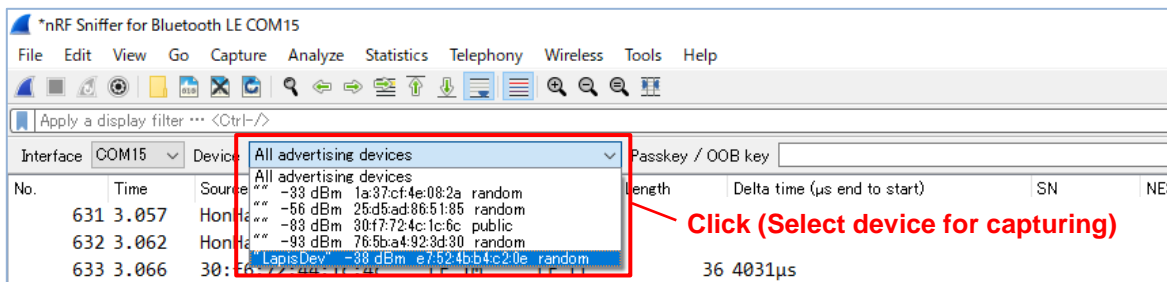
The packet list screen is displayed after the network device is selected, and the output of the capture data is started..



**Figure 3-1 Select Network Device**

- (4) Selecting the Bluetooth low energy Device for Capturing

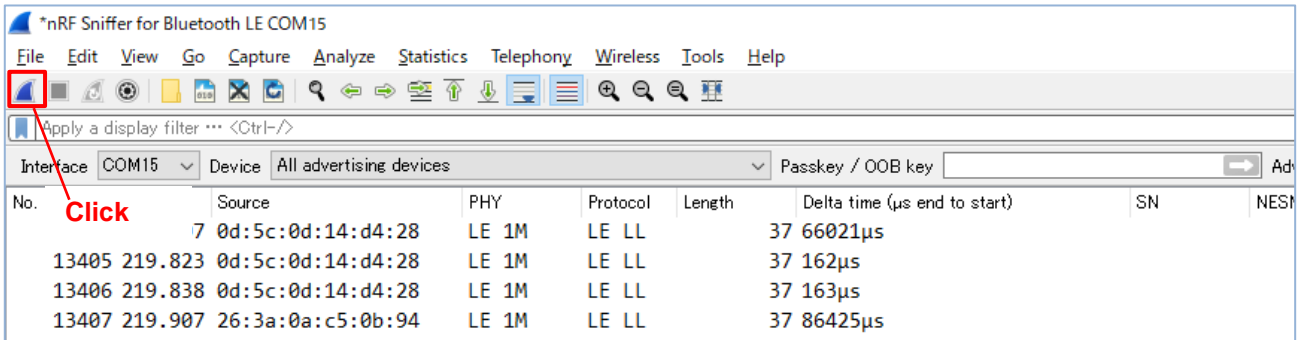
The Bluetooth low energy device is selected to display captured data at connecting by operating the figure below (red). When Bluetooth low energy device (device name or device address) is not displayed in the pull-down list, the advertising packet of the Bluetooth low energy device is captured at first.



**Figure 3-2 Selecting the Bluetooth low energy Device for Capturing**

(5) Starting the Capturing

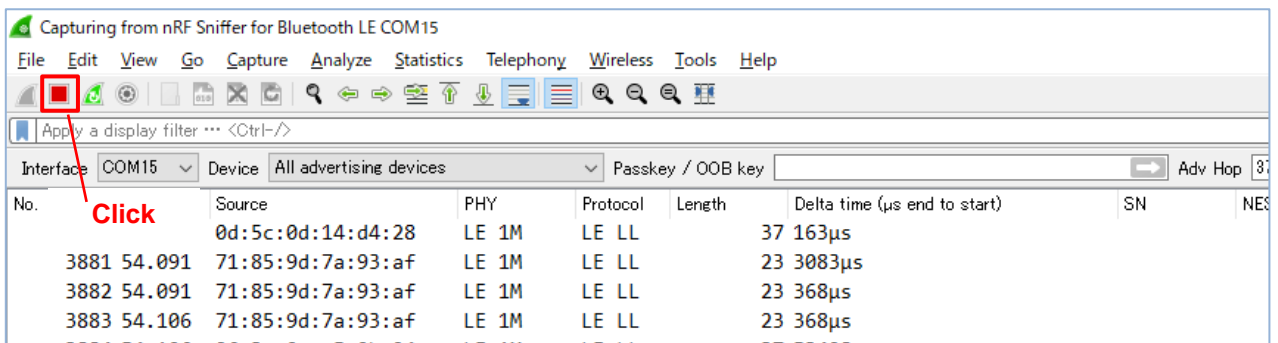
Capture is started by operating in the following figure (red).



**Figure 3-3 Starting the Capturing**

(6) Stop the Capturing

Capture is stopped by operating in the following figure (red).



**Figure 3-4 Stop the Capturing**

(7) Saving the Captured Data

The following operation saves the captured data when the capturing is the stopped condition

Operation: Wireshark Menu "File" - "Save"

### Revision History

Document No.	Issue date	Page		Remarks
		Before revision	After revision	
FEXK715x1_AN_Sniffer-01	Apr. 4, 2020	-	-	Final edition 1 <sup>st</sup>
FEXK715x1_AN_Sniffer-02	Nov. 19, 2020	2 6	2 6	Add Installing Wireshark Correct Installing Plug-in Wireshark