NXP Semiconductors
User's Guide

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Kinetis USB-KW41Z Wireless Protocol Sniffer

Quick Start Guide

This document describes the usage of the USB-KW41Z evaluation board with the wireless protocol sniffer firmware, Wireshark adapter and the Wireshark tool itself. The sniffer firmware is also compatible with the NXP Test Tool for Connectivity Products protocol analyzer. This document describes the usage in Bluetooth® Low Energy v4.2 and in the IEEE® 802.15.4 modes with Wireshark. Test Tool specific usage is described separately in the tool's documentation.

Contents

1 Hardware Setup

The hardware setup consists of a USB-KW41Z BLE Sniffer dongle which should be connected to a USB port or to an USB hub connected to a Windows® system capable of running the Wireshark tool.

Figure 1: USB-KW41Z dongle

2 Firmware Images

The following firmware images, distributed in the KW41Z connectivity software packages, are necessary for the two microcontrollers residing on the USB-KW41Z evaluation board (KW41Z and K22F):

`<installation_folder>\tools\wireless\binaries\sniffer_usbkw41z_kw41z.bin`

Hybrid (802.15.4 and BLE) sniffer firmware for the KW41Z silicon on the USB-KW41Z board

`<installation_folder>\tools\wireless\binaries\sniffer_usbkw41z_k22f.bin`

Hybrid (802.15.4 and BLE) sniffer firmware for the K22F silicon on the USB-KW41Z board, linked at 0x0 (no OpenSDA bootloader provisioning)

`<installation_folder>\tools\wireless\binaries\sniffer_usbkw41z_k22f_0x8000.bin`

Hybrid (802.15.4 and BLE) sniffer firmware for the K22F silicon on the USB-KW41Z board, linked at 0x8000 (OpenSDA bootloader provisioning)

3 Flashing the Sniffer Firmware Using External J-Link Probe

While the sniffer firmware may come pre-flashed on the USB-KW41Z board, it may need to be re-flashed if the board does not contain it.

The Freescale KW41Z enablement software package includes the sniffer binary firmware images for the two microcontrollers soldered on the USB-KW41Z board: K22F and KW41Z. Both microcontrollers have an exposed 10-pin SWD/JTAG debug interface which can be used to flash these firmware images.

In order to flash the two pieces of firmware needed on the USB-KW41Z, a J-Link probe is needed along with the latest J-Link software from www.segger.com.

Execute **jlink.exe** from the Segger package installation and type the following commands in the command window for flashing the images on the two microcontrollers respectively, while making sure to connect the J-Link probe to the proper microcontroller's debug port (J1 for KW41Z and J6 for K22F). **Make sure that the binary files are in the same folder with the jlink.exe executable**.

3.1 Common

Select the proper emulator connected to USB-KW41 stick.

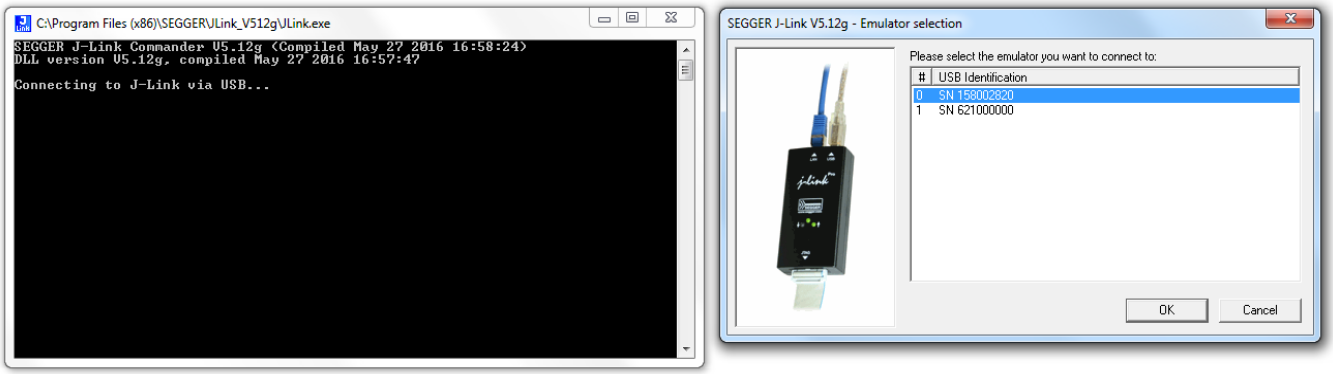

Figure 2: Emulator Selection

Type “connect” in order to establish a target connection.

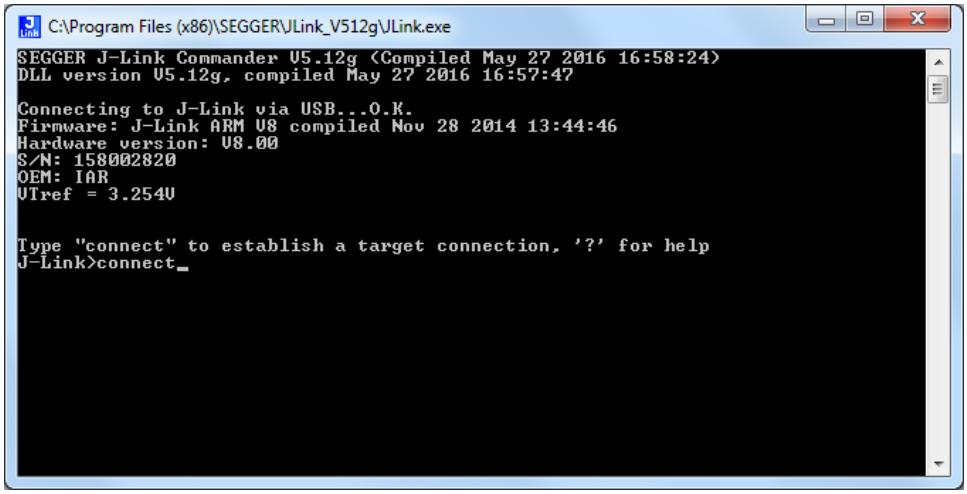

Figure 3: Connect to target

3.2 Flashing MK22FN512xxx12

Select MK22FN512xxx12 device.

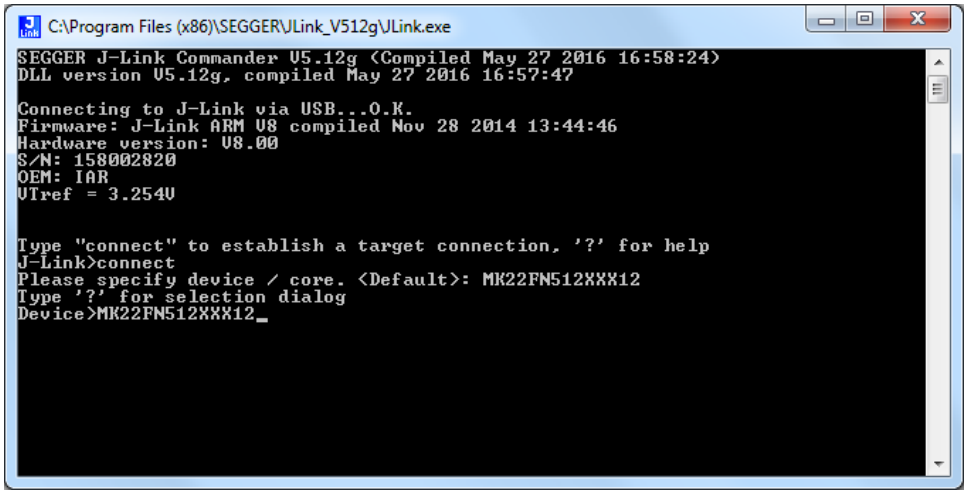

Figure 4: MK22FN512xxx12 device selection

Select JTAG target interface.

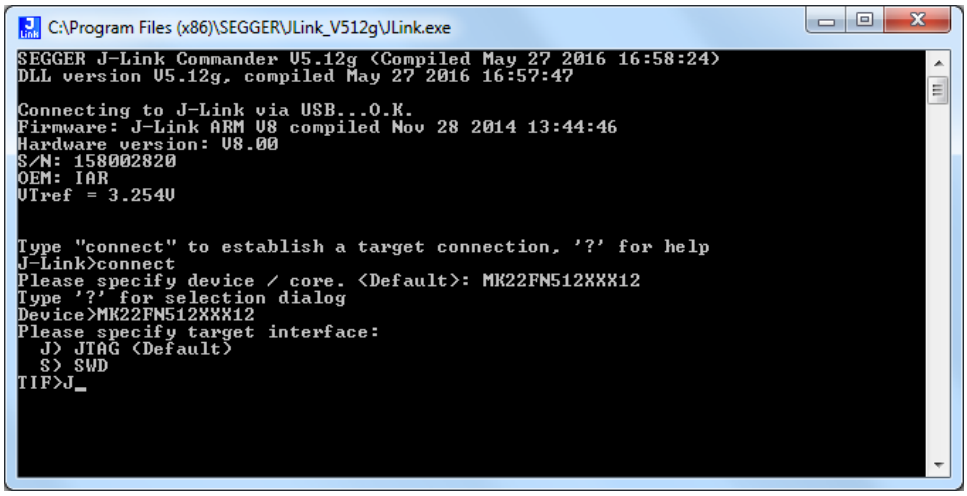

Figure 5: JTAG interface selection

Press “Enter” to Auto-detect the device position in JTAG chain.

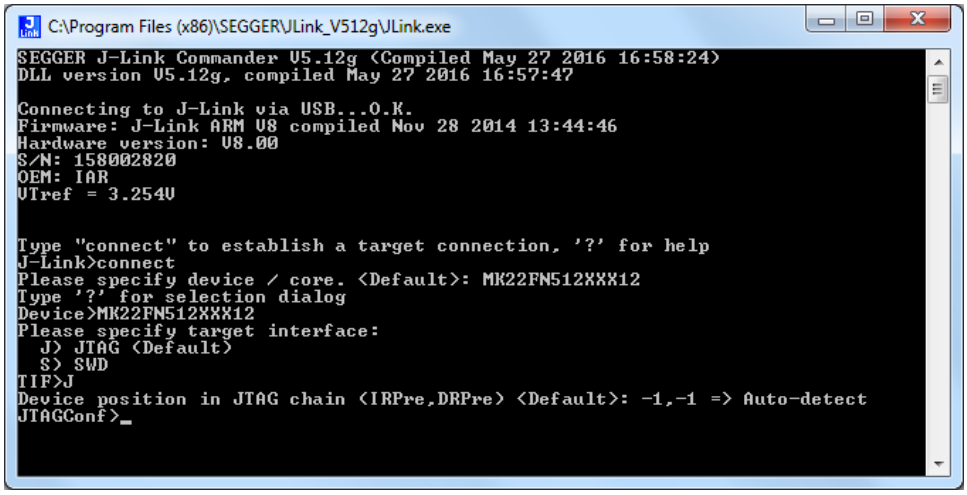

Figure 6: JTAG chain device position

Press “Enter’ to select the default interface speed.

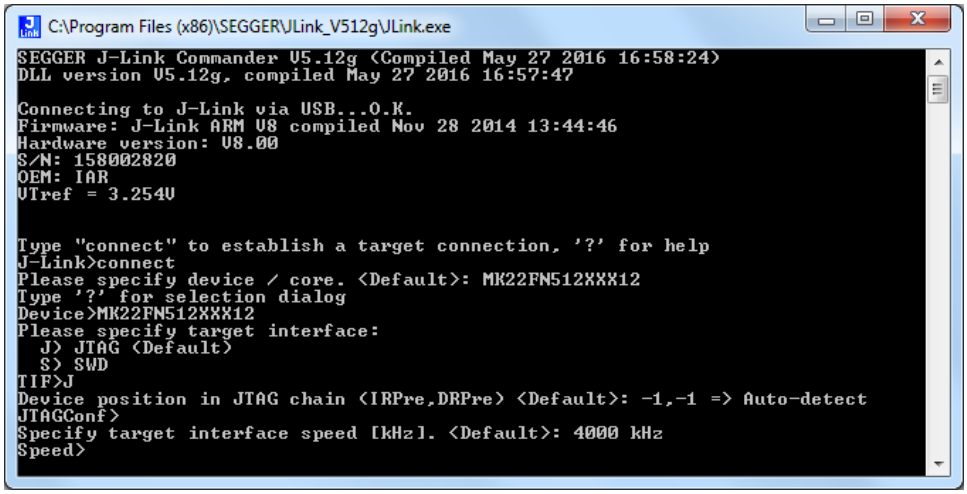

Figure 7: JTAG interface speed selection

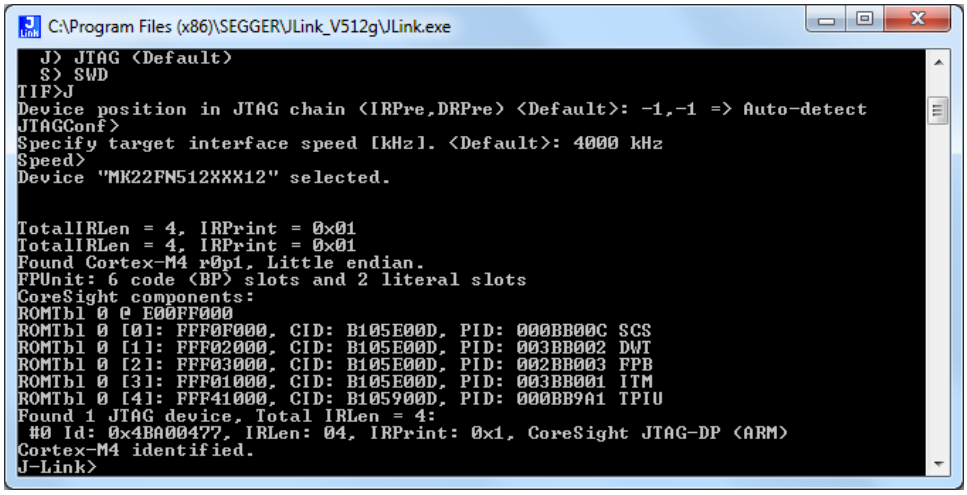

Figure 8: Cortex-M4 identified

Type **loadbin sniffer_usbkw41z_k22f.bin 0** in order to flash the binary file.

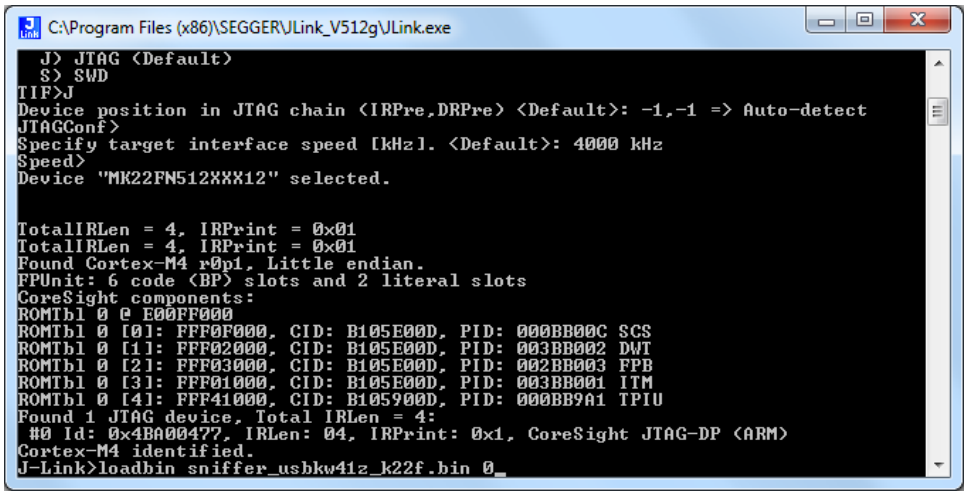

Figure 9: Load binary file

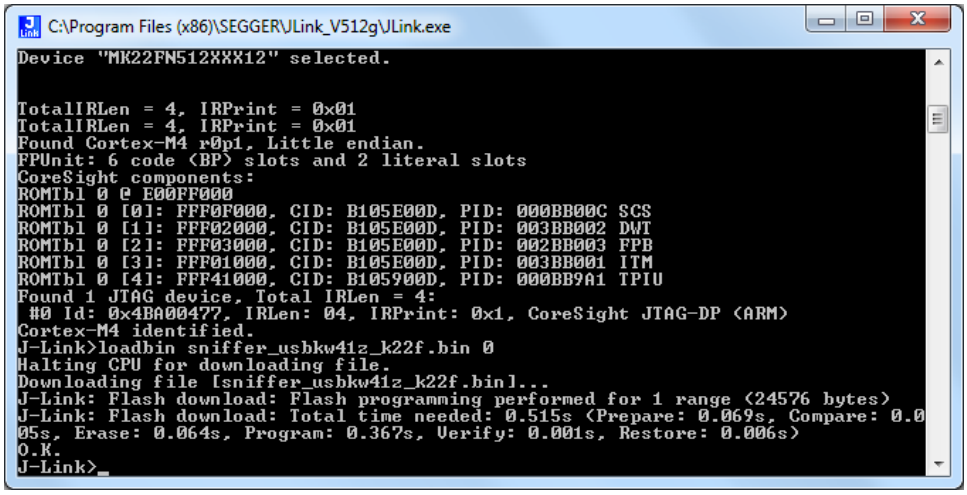

Figure 10: Download completed successfully

3.3 Flashing MKW41Z512xx4

Select MKW41Z512xxx4 device.

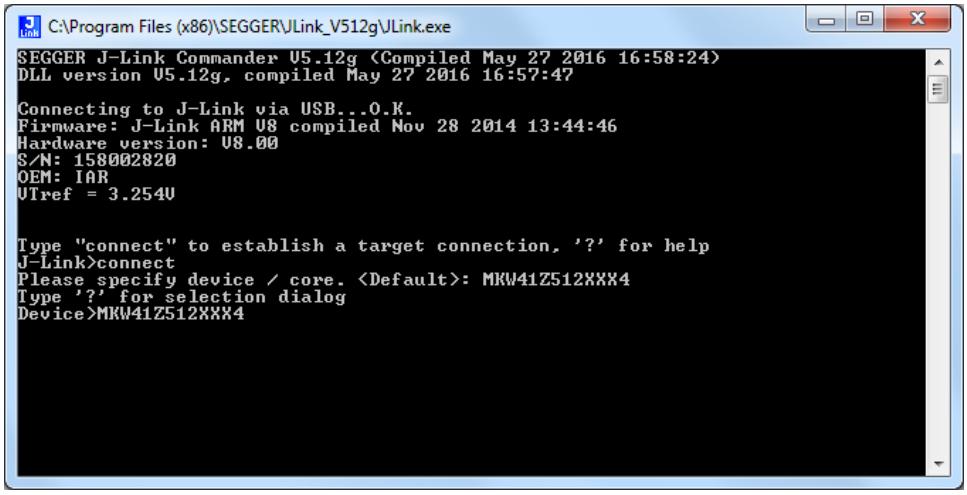

Figure 11: MKW41Z512xxx4 device selection

Select SWD target interface.

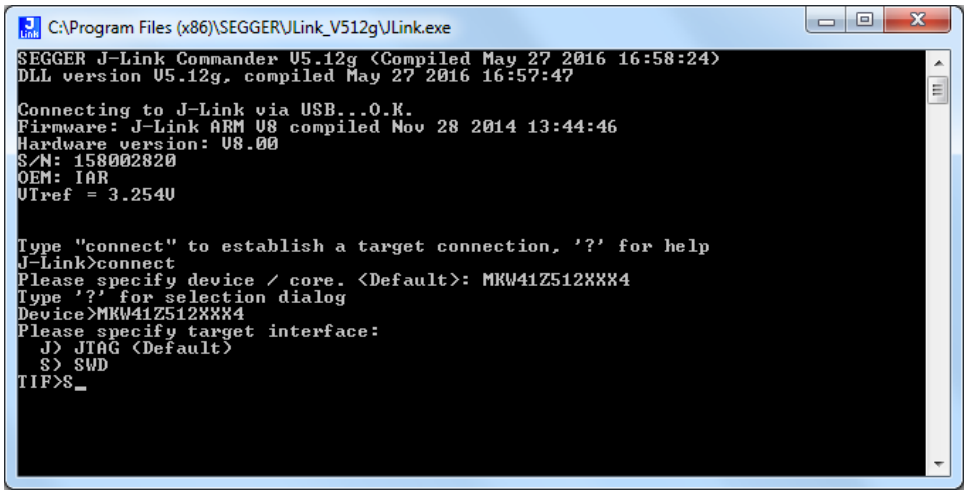

Figure 12: SWD interface selection

Press “Enter’ to select the default interface speed.

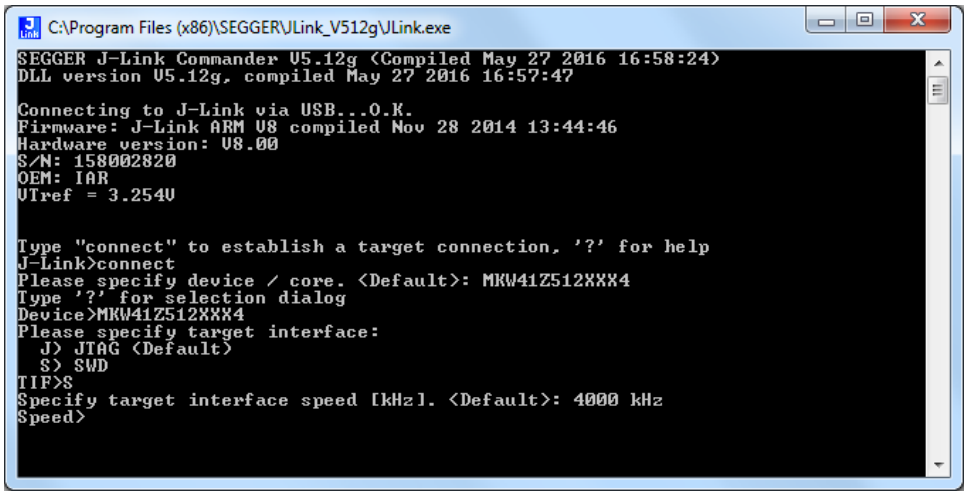

Figure 13: SWD interface speed selection

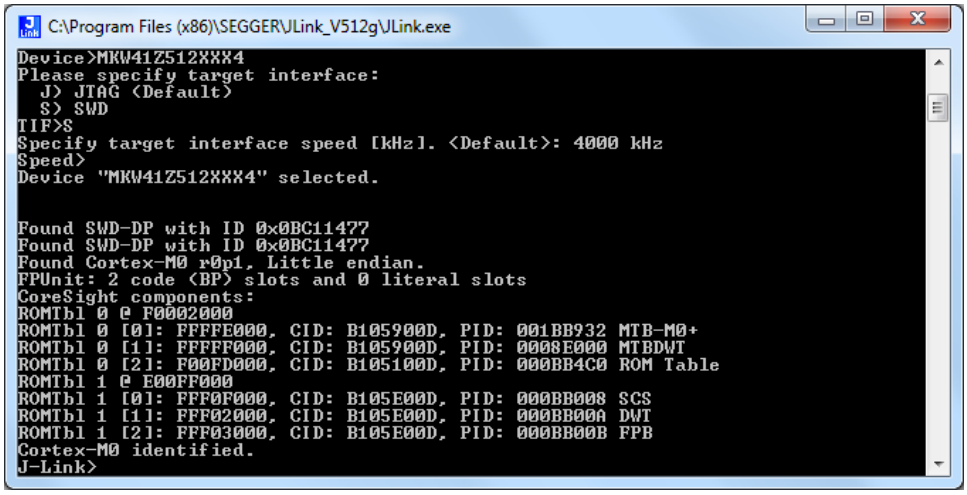

Figure 14: Cortex-M0 identified

Type **loadbin sniffer_usbkw41z_kw41z.bin 0** in order to flash the binary file.

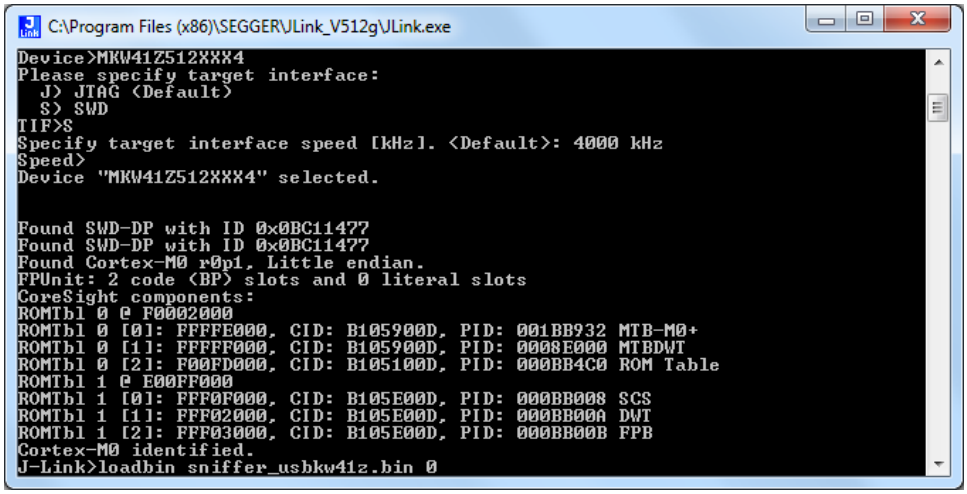

Figure 15: Load binary file

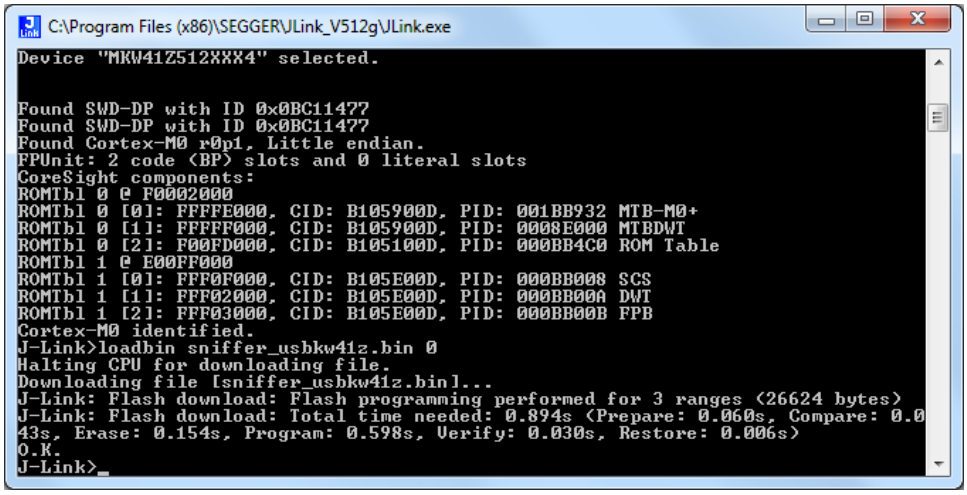

Figure 16: Download completed successfully

4 User Interface – Kinetis Protocol Analyzer Adapter

NOTE

In order to be able to use the USB-KW41Z BLE and IEEE® 802.15.4 sniffer, **Kinetis Protocol Analyzer Adapter** software have to be installed on the Windows® machine. This software is available for download on the NXP website. Please follow the installation instructions in the respective package.

Launch **Kinetis Protocol Analyzer Adapter** software. It will automatically start to detect the connected Sniffer interfaces.

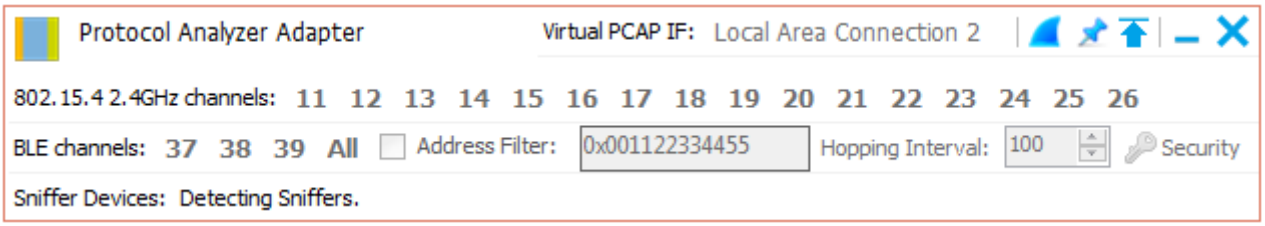

Figure 17: Kinetis Protocol Analyzer Adapter

After the detection is complete the connected device name will appear in Sniffer Devices row.

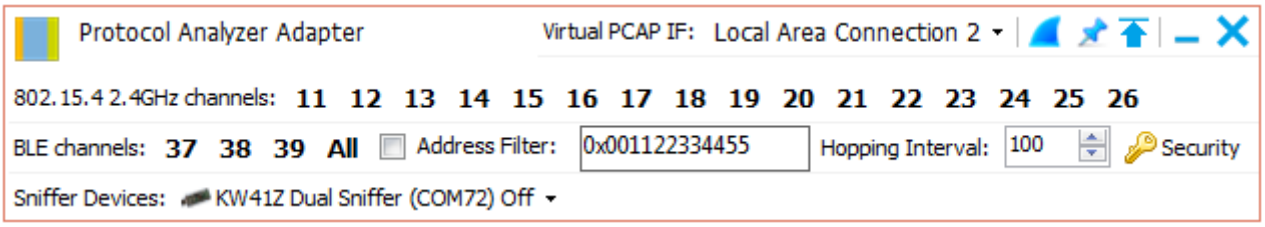

Figure 18: Sniffer Detection completed

Start the Wireshark Network Analyzer by clicking the icon in upper right corner.

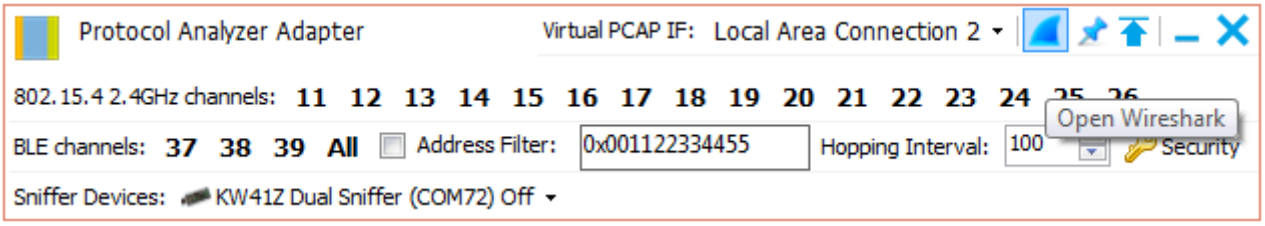

Figure 19: Wireshark Network Analyzer Shortcut

Start the Wireshark Capture session on the Local Area Connection created by the Kinetis Protocol Analyzer Adapter.

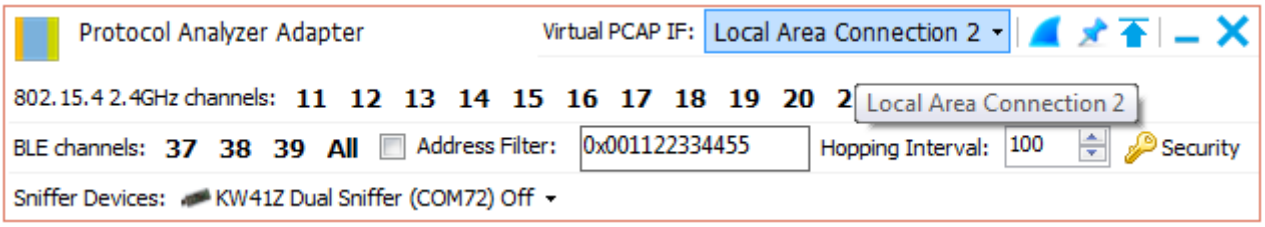

Figure 20: Local Area Connection virtual interface

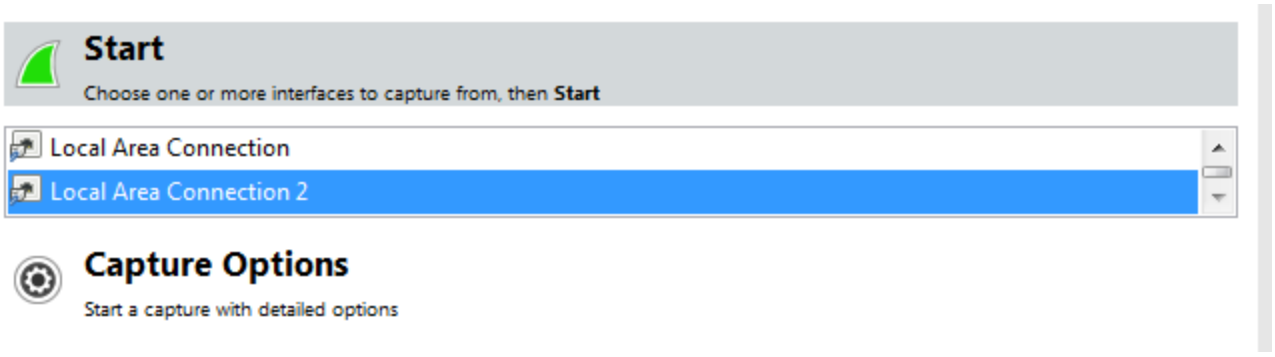

Figure 21: Start Wireshark on the required network interface

4.1 Sniffing Bluetooth® Low Energy v4.2 Wireless Communications

Start the capture by pressing one (or many) Advertising Channel button(s).

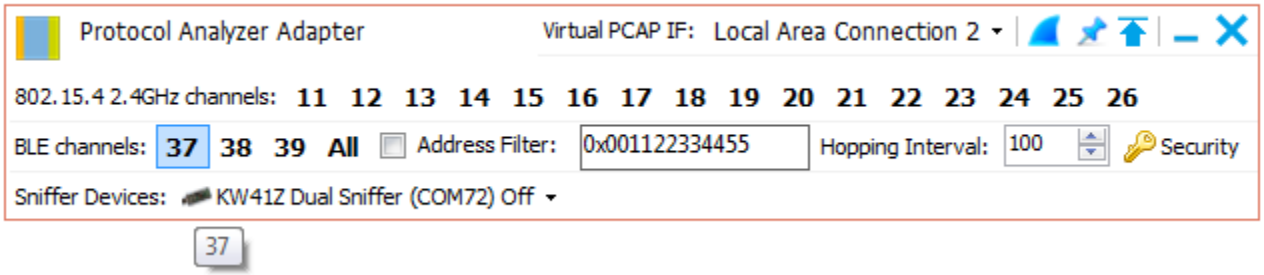

Figure 22: Advertising Channel selection

The incoming advertising data will be displayed in the Wireshark Network Analyzer's capture window.

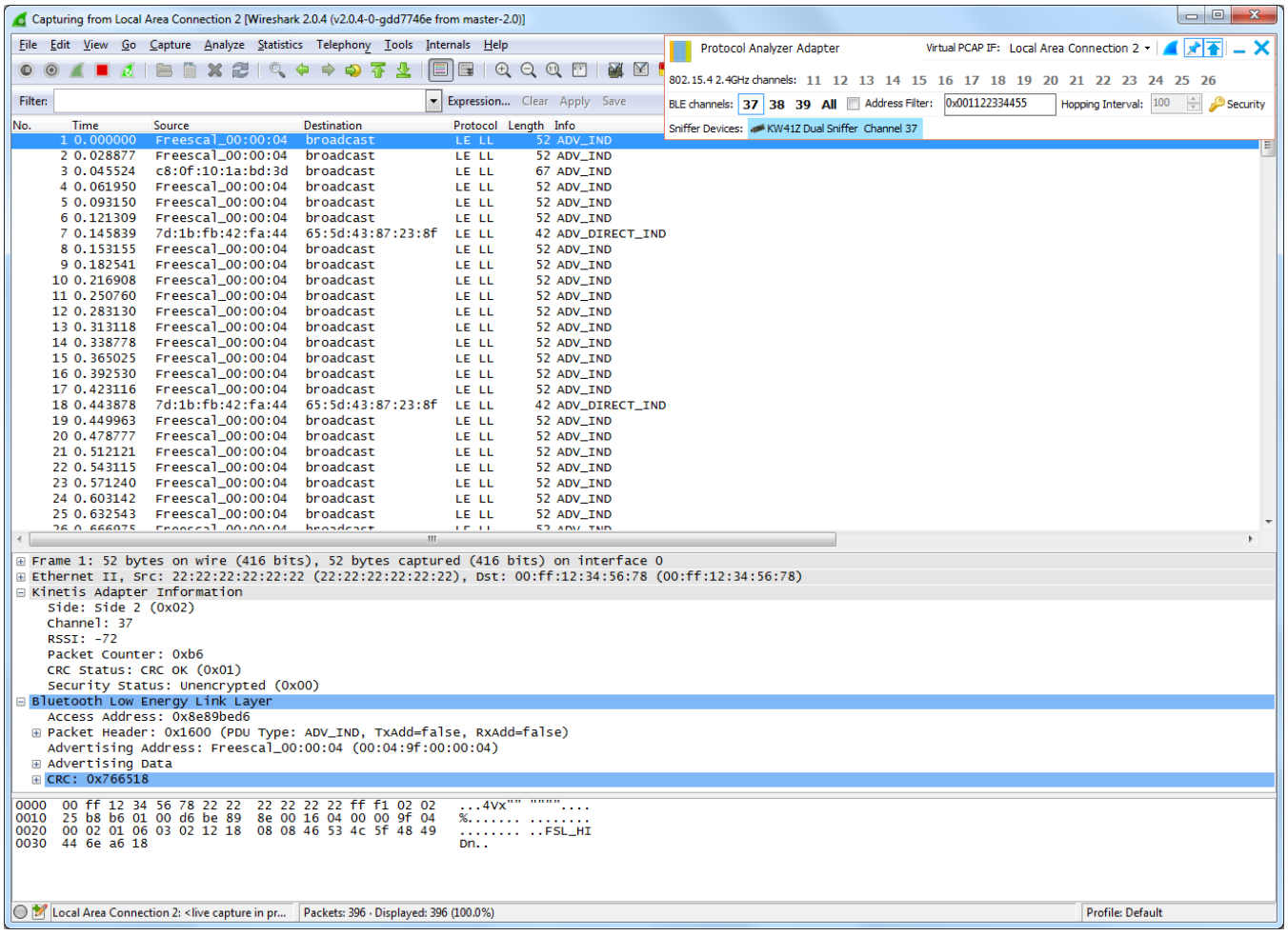

Figure 23: Wireshark Capture window

In order to filter the packets by Advertising Address, the Address Filter have to be set.

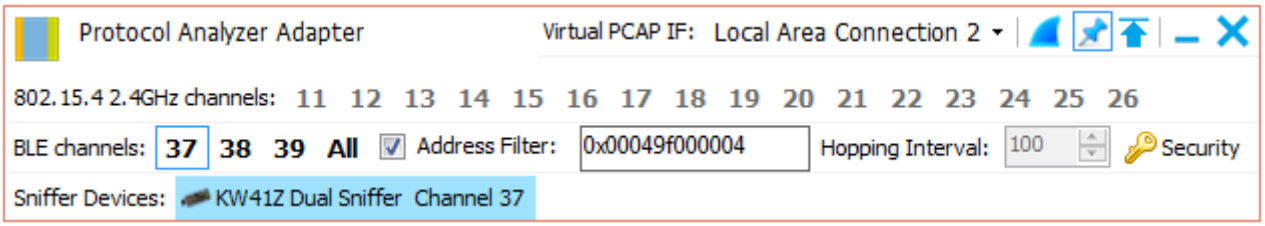

Figure 24: Advertising Address Filtering

If the Advertising Address is not known or not taken into consideration, an advertising channel dwell or hop interval for the advertising channels can be defined. The hopping interval is in milliseconds and is used if no Address was set to be filtered and more than 2 advertising channels were selected.

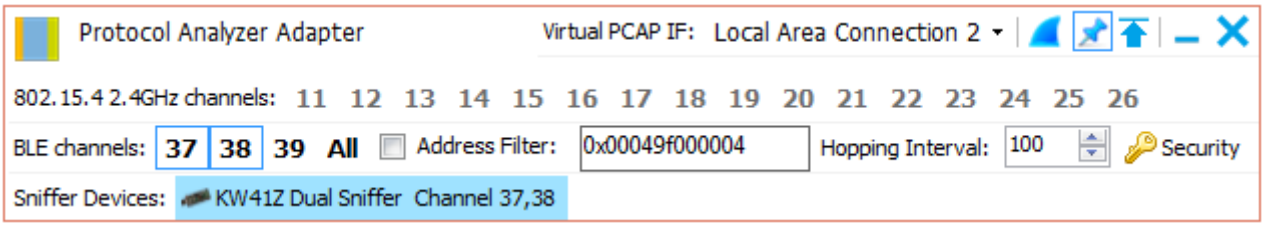

Figure 25: Advertising Hop Interval

For the encrypted connections the PIN and Long Term key values can be set from the “Security” window in order to successfully decrypt the received frames.

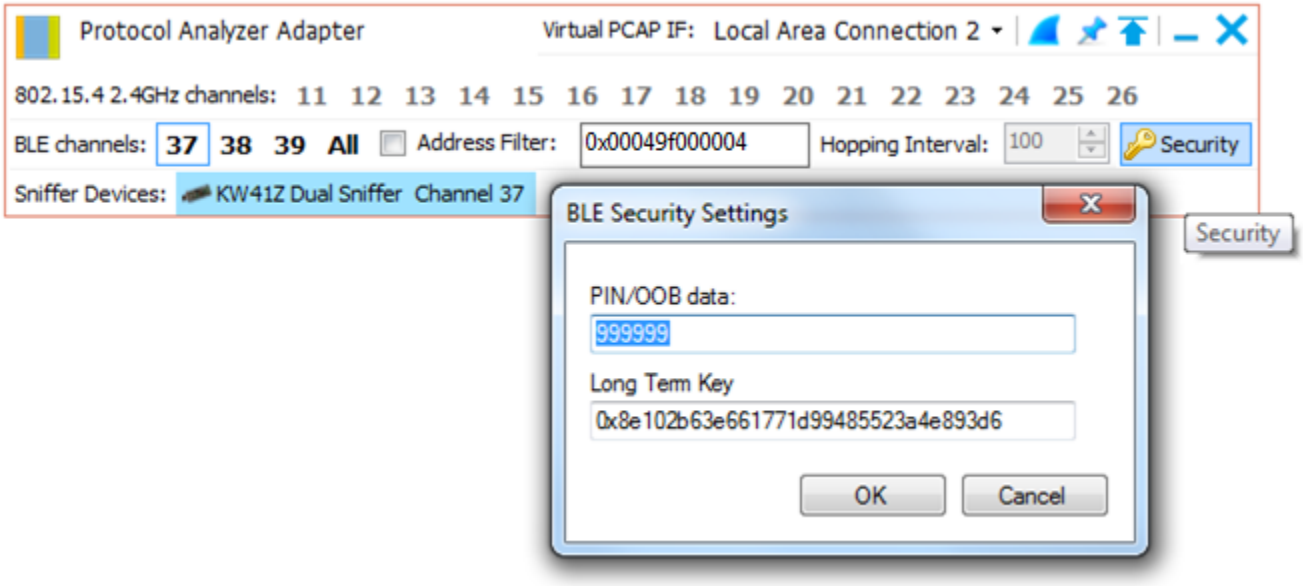

Figure 26: Security Settings

If a Connection Request packet is received, the sniffer will start to follow the connection.

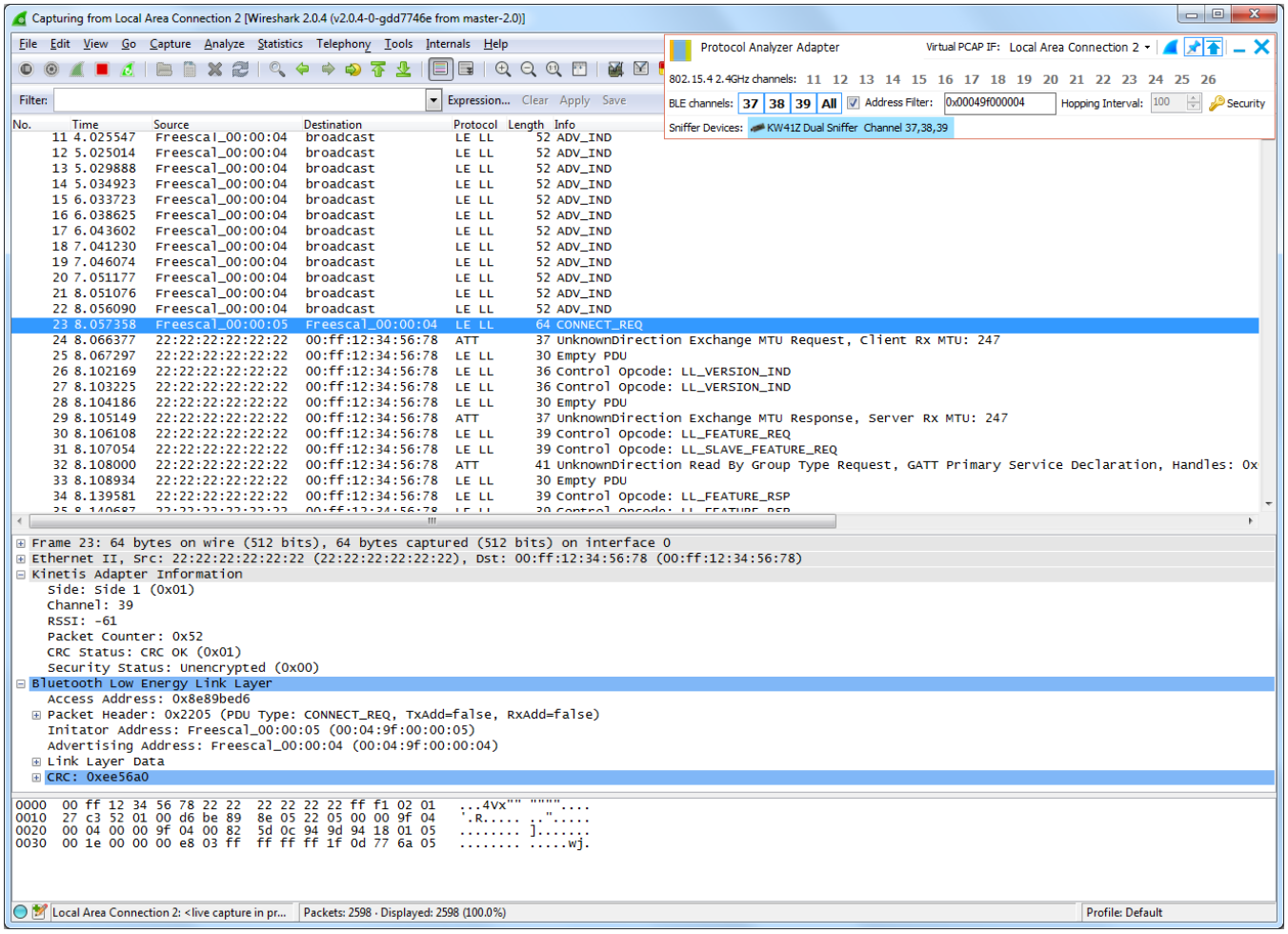

Figure 27: Connection Follow

4.2 Sniffing IEEE® 802.15.4 Wireless Communications

4.2.1 Wireshark Protocol Analyzer Adapter

Start the capture by pressing one of the 802.15.4 Channel buttons when the sniffer is idle.

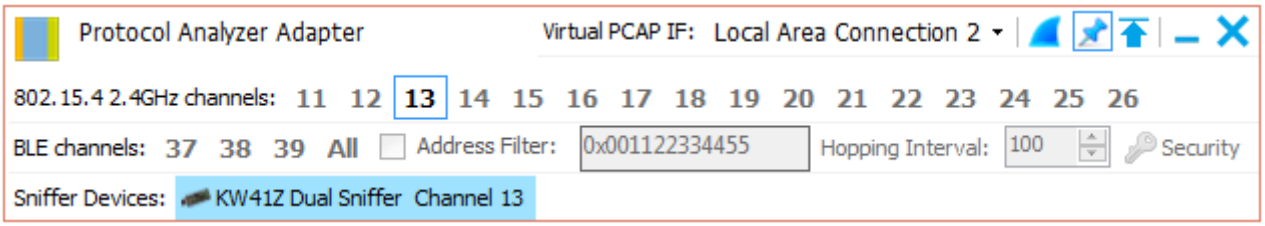

Figure 28: 802.15.4 Channel selection

The incoming data will be displayed in the Wireshark Network Analyzer's capture window.

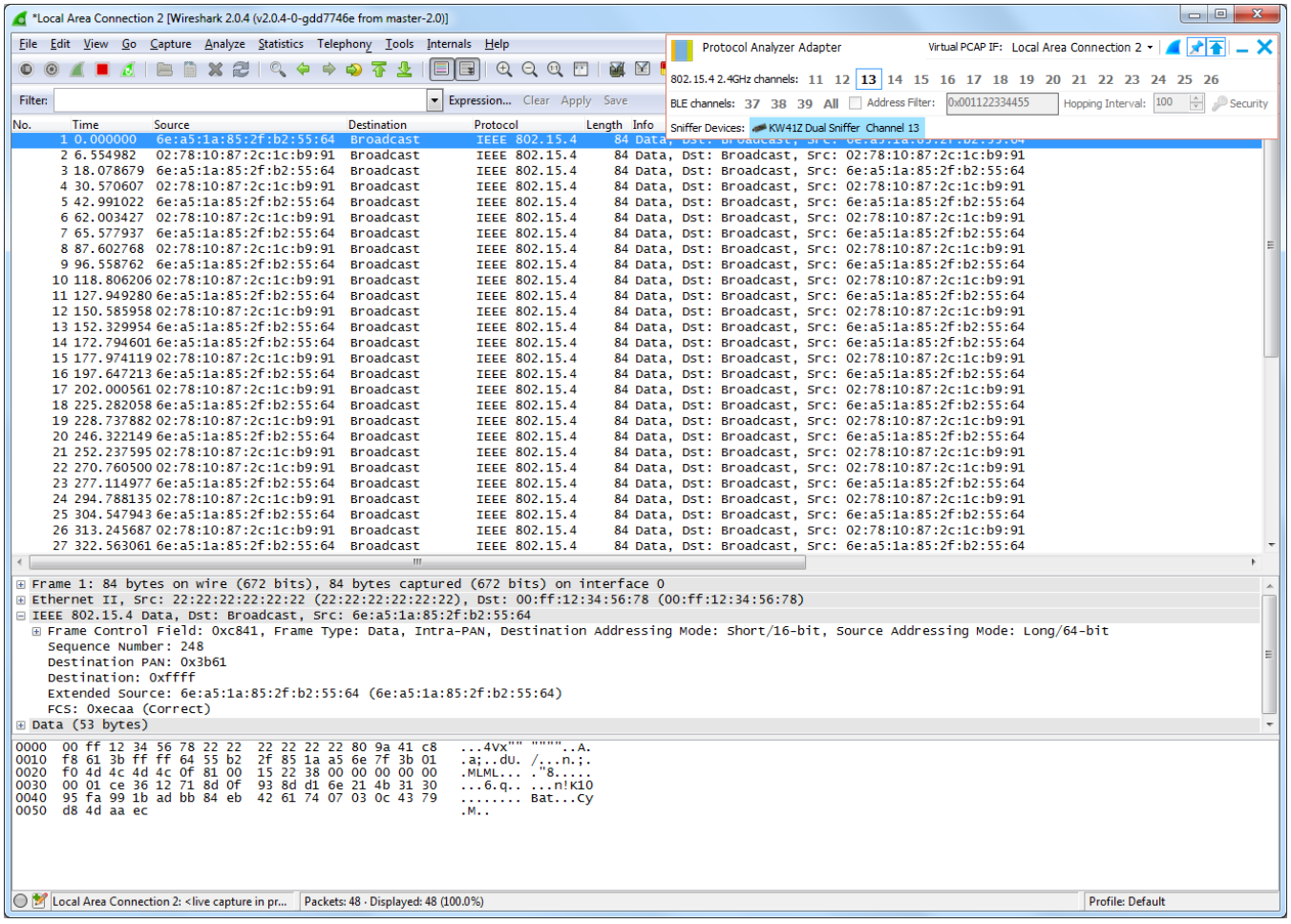

Figure 29: Wireshark capture window

4.2.2 Test Tool for Connectivity Products

The USB-KW41Z sniffer is compatible with the Test Tool for Connectivity Products IEEE 802.15.4 protocol analyzer, starting with version 12.6 of the tool. For more information, please refer chapter 6 of NXP Test Tool User's Guide (*TTUG.pdf*).

5 Revision history

This table summarizes revisions to this document.

Table 1. **Revision history**

Revision number	Date	Substantive changes
0	04/2016	Initial release
1	7/2016	Updated J-Link commands
2	09/2016	Added test tool information

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