24 GHz radar tools and development environment user manual

Infineon XENSIV™ 24 GHz radar demo kits

About this document

Scope and purpose

This user manual describes the software and firmware environment required to use the radar applications offered with Infineon's industrial XENSIV™ 24 GHz radar demo kits: Distance2Go, Position2Go, Sense2GoL and Sense2GoL Pulse.

It provides guidelines for novice users on how to build and run smart radar solutions, from basic movement detection to advanced motion detection and sensing, made easy with Infineon's 24 GHz radar chipsets, and using the Infineon firmware and software tools.

Intended audience

This document is intended for users of Infineon's 24 GHz radar demo boards who want to get started with Infineon's development kits, test several sensing demonstrations, and implement custom radar applications in the 24 GHz ISM band.

Related documents

Additional information can be found in the supplementary documentation provided with the 24 GHz radar kits (Distance2Go, Position2Go, Sense2GoL and Sense2GoL Pulse) in the Infineon Toolbox or from **www.infineon.com/24GHz**:

- D2G Application Note (AN543)
- P2G Application Note (AN553)
- P2G Software User Manual
- S2GL Application Note (AN597)
- S2GLP Application Notes (AN598 – AN602)
- S2GLP Software User Manual

Table of contents

List of figures

List of tables

1 Introduction

The 24 GHz radar demo kits from Infineon are demonstration platforms as well as starter kits for Infineon's silicon-germanium (SiGe) based 24 GHz transceiver chipset BGT24 and 32-bit ARM® Cortex™-M based XMC™ microcontrollers.

- **Distance2Go (D2G)** – BGT24MTR11 + XMC4200

  Infineon radar demo board based on the BGT24MTR11 – Frequency Modulated Continuous Wave (FMCW) and Doppler (distance, speed and direction of movement detection).
- **Position2Go (P2G)** – BGT24MTR12 + XMC4700

  Infineon radar demo board based on the BGT24MTR12 using fast-chirp FMCW for tracking (angle, distance, speed and direction of movement detection).
- **Sense2GoL (S2GL)** – BGT24LTR11 + XMC1302

  Infineon radar demo board based on the BGT24LTR11 – Doppler (motion, speed and direction of movement detection).
- **Sense2GoL Pulse (S2GLP)** – Radar Baseboard XMC4700 and BGT24LTR11 Shield with Arduino compatibility

  Infineon radar demo board based on the BGT24LTR11 – Doppler (motion, speed and direction of movement detection) with extremely low power consumption.

The 24 GHz radar demo kits provide a complete evaluation platform for radar systems including demonstration firmware and a highly interactive Graphical User Interface (GUI).

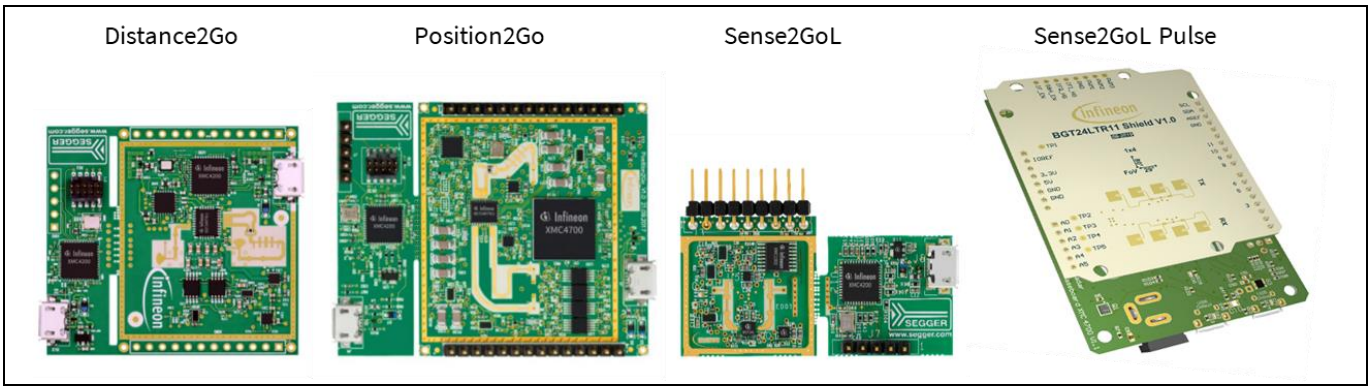


Figure 1 Infineon XENSIV™ 24 GHz radar demo kits

Users can develop their own radar-based application firmware utilizing Infineon's powerful, free-of-charge toolchain DAVE™ for microcontroller programming, customize radar applications built on generated DAVE™ code, and run them on 24 GHz radar demo kit.

Learn more about Infineon's 24 GHz products at: **www.infineon.com/24GHz**

2 Running radar applications

With each 24 GHz radar, Infineon offers various radar demonstration applications to demonstrate the radar kits' capabilities and to facilitate the development of user applications that can be used to detect:

- Motion, speed and direction of movement of multiple targets (approaching or retreating)
- Distance of multiple targets
- Position of multiple targets

2.1 Tools and software set-up

2.1.1 Infineon Toolbox

Before using the 24 GHz radar demo kit, as well as running the radar demonstration application, it is necessary to download the supporting software from Infineon.

In order to install and use Infineon plugins and tools, and gain access to the 24 GHz radar software package and documentation, you must first download and install the Infineon Toolbox using this link:
https://www.infineon.com/toolbox

Note: Please refer to the "Getting Started Infineon Toolbox Guide" document for detailed installation instructions.

Figure 2 Run Infineon Toolbox

2.1.2 24 GHz radar tools

Once Infineon Toolbox is successfully installed, you can proceed with downloading the appropriate 24 GHz radar tools: Distance2Go Kit, Position2Go Kit, Sense2GoL Kit or Sense2GoL Pulse Kit including software package and documentation, as detailed in the following instructions:

- Run the Infineon Toolbox by double-clicking on the Infineon Toolbox icon on your Windows desktop. The program starts under the **My tools** tab, as shown in Figure 3.

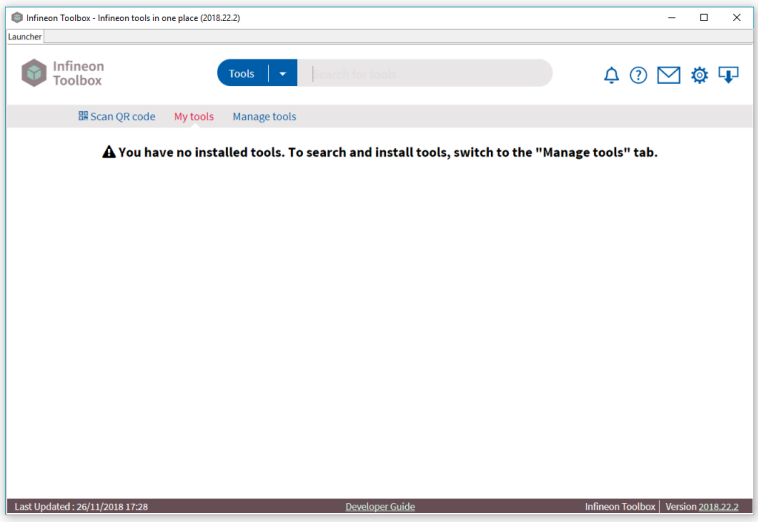


Figure 3 Infineon Toolbox tools launcher

- Click on the **Manage tools** tab, then type the 24 GHz kit name of your choice (e.g. Position2Go) in the search box and press **Enter**.

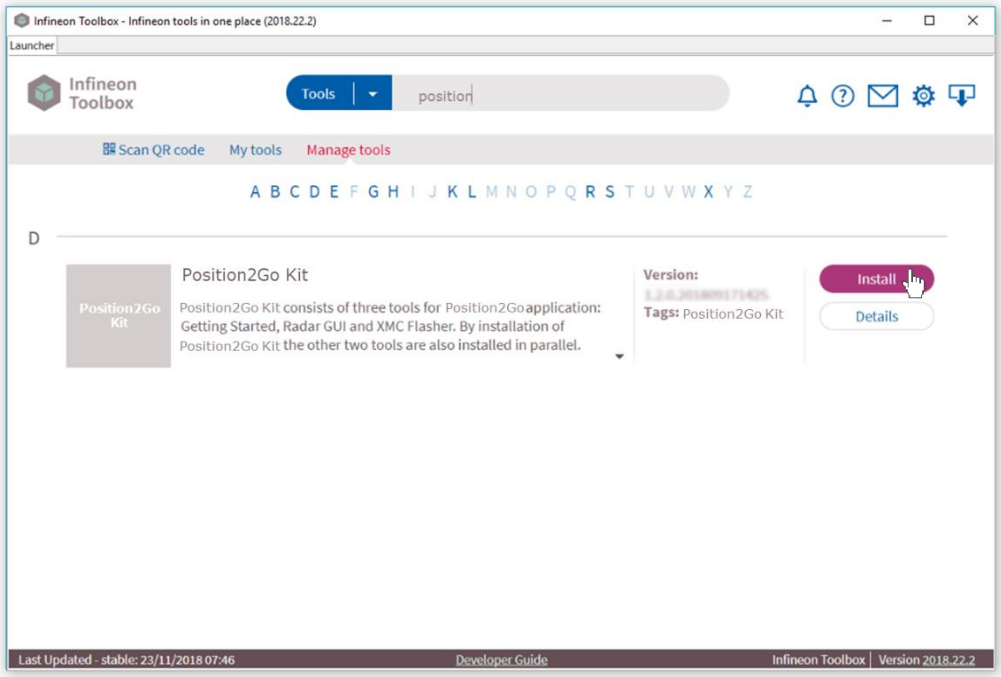


Figure 4 Infineon Toolbox tools installation

- Click on **Install**, then on **Accept** to accept the license.

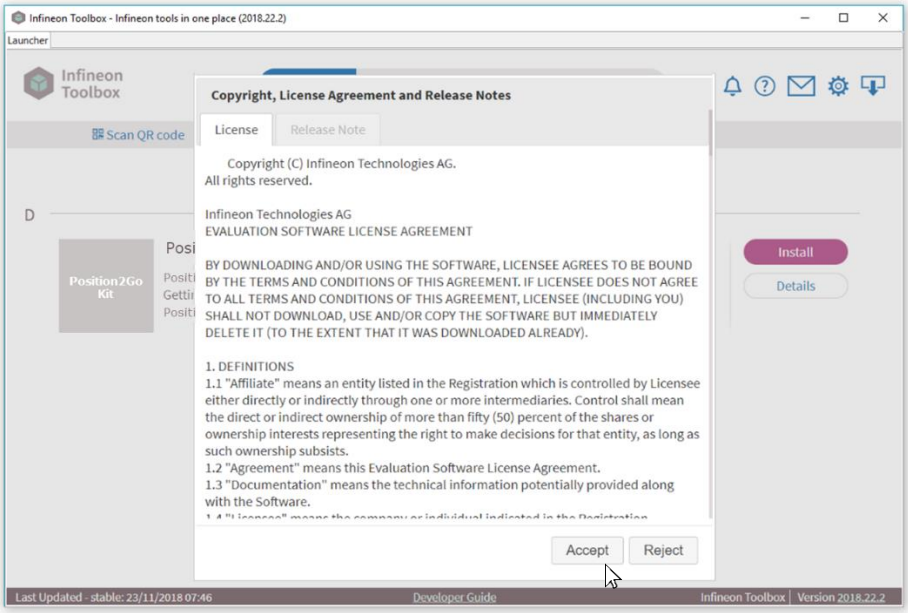


Figure 5 Radar Toolbox tools license agreement

- Click on **Yes** to restart the toolbox.
- Click on the installed kit icon to go to the start page.

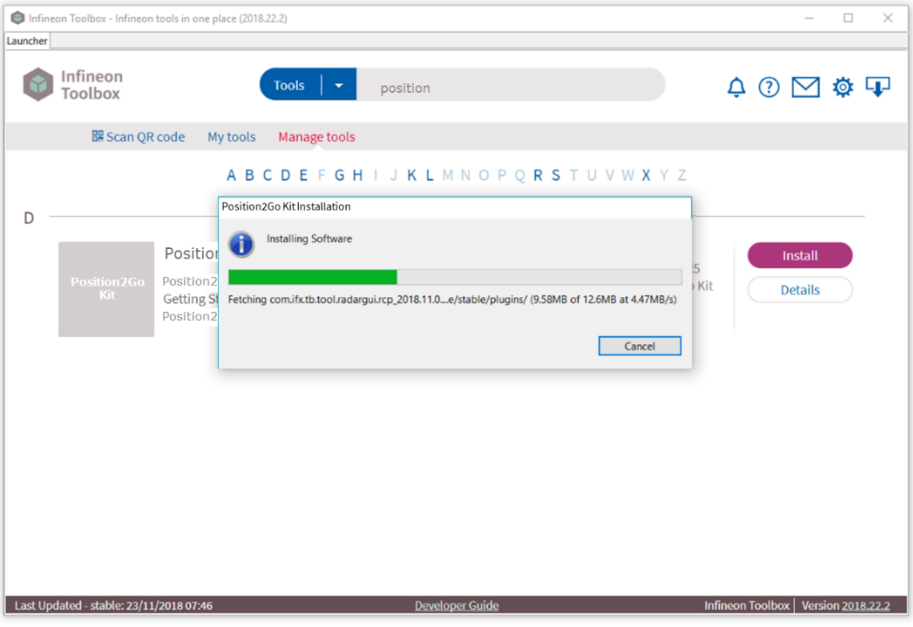


Figure 6 Kit installation progress

The 24 GHz radar kit (e.g. Position2Go Kit) consists of three tools for the Position2Go application: Position2Go Kit, Radar GUI and XMC™ Flasher, as shown in **Figure 7**. By installing the Position2Go Kit, two other tools are also installed in parallel:

- **Radar GUI** – Infineon's radar board demonstration application with highly interactive GUI for data visualization, recording and playback
- **XMC™ Flasher** – a tiny, free-of-charge tool for XMC™ MCU Flash programming

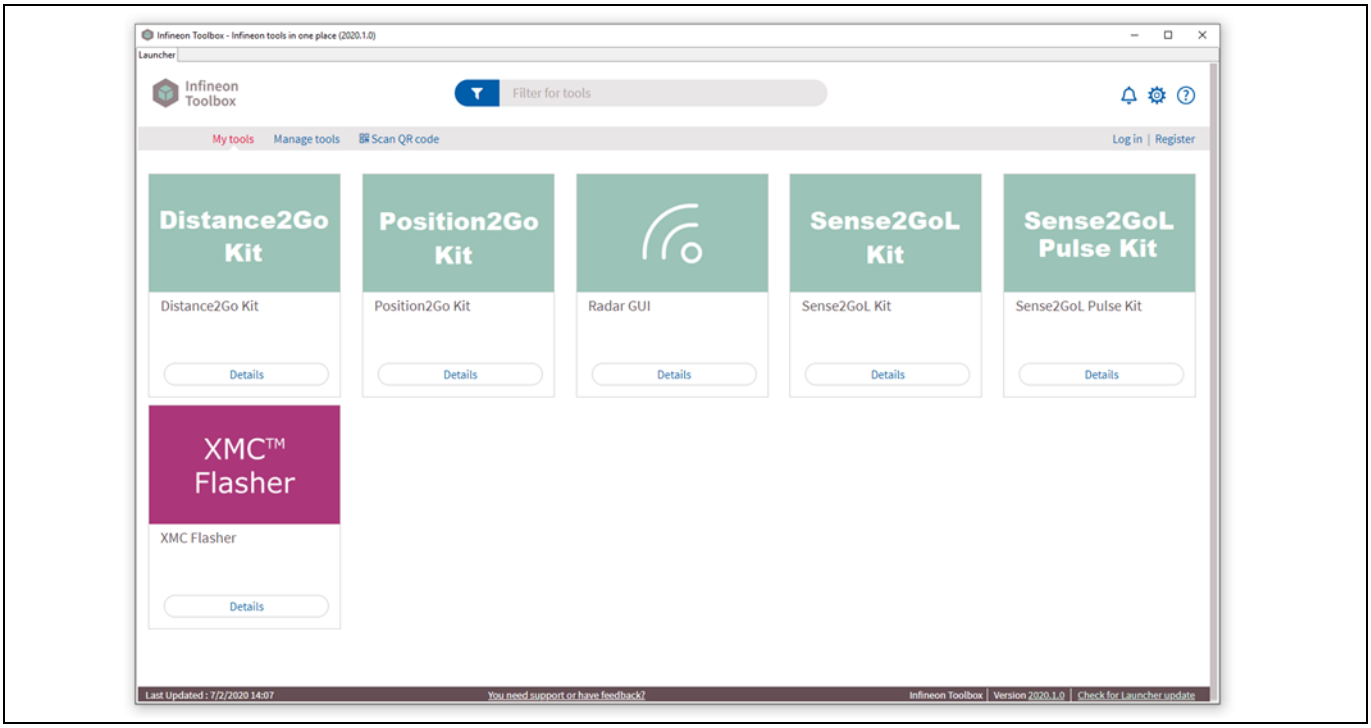


Figure 7 24 GHz radar kits – installed tools

User can download and install the 24 GHz radar SW package (e.g. P2G-HW-SW.exe for Position2Go) after starting the appropriate kit via the Infineon Toolbox (e.g. Position2Go Kit). Once installed, a folder (e.g. P2G-HW-SW) will be created on the specified path with the following structure:

- **Firmware_Software** – all software, firmware and drivers
- **Hardware** – all hardware-related files (e.g. schematics, Altium files)
- **Documentation** – all documentation (e.g. quick start guide, application notes)

2.1.3 XMC™ Flasher

The 24 GHz radar demonstration firmware is already pre-loaded in the Flash memory on the XMC™ microcontroller. This section describes how to use the binary images provided to reprogram the firmware applications. The 24 GHz radar firmware package contains binary images (*.hex) of the applications provided in the subfolder **Binary**.

The XMC™ Flasher tool can be used for on-chip Flash programming to reprogram the radar application using a binary image, as follows:

- Connect the 24 GHz radar board to a PC with USB “type A to micro-B” cables through the embedded USB connector to power up the board or to debug.

  Please refer to your 24 GHz radar board Quick Start Guide document to connect it to the PC correctly.
- Use (*.hex) binary with the XMC™ Flasher tool to reprogram the radar firmware:
  - Start the **XMC™ Flasher** tool in the Infineon Toolbox launcher.

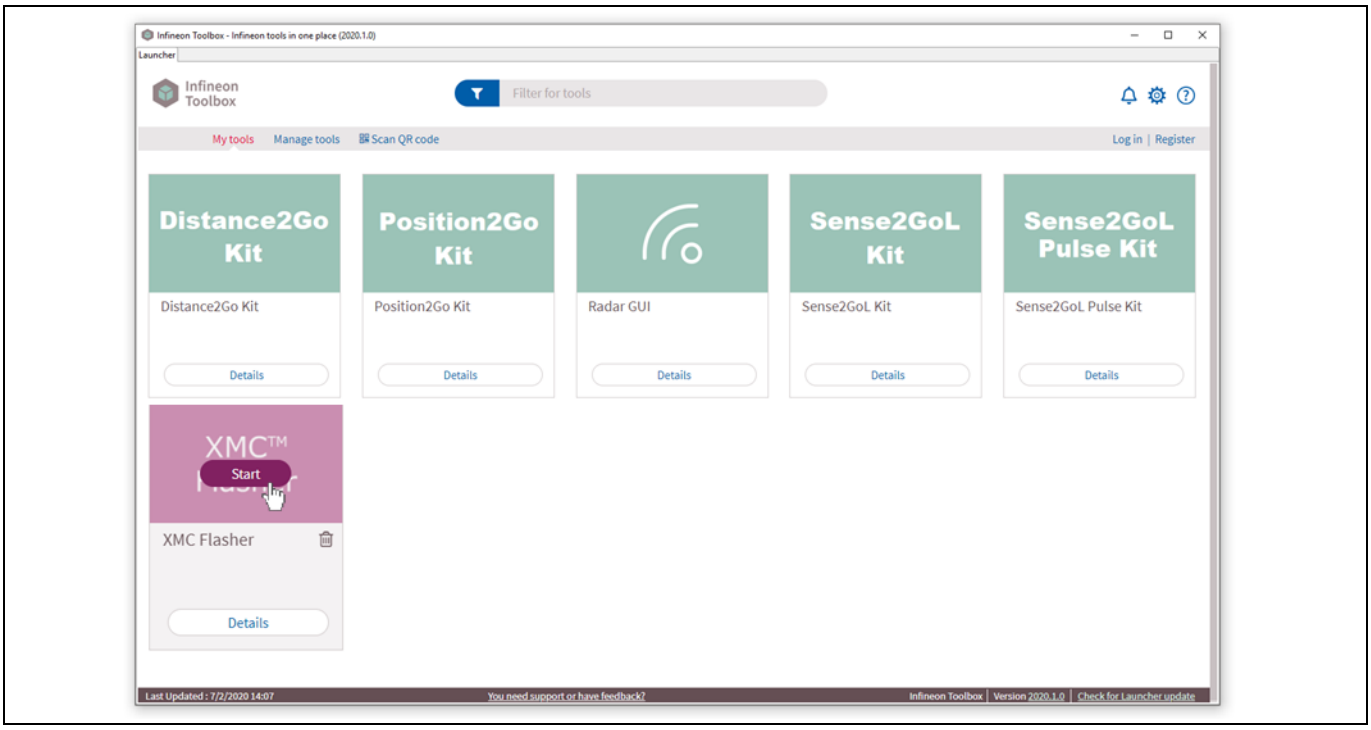


Figure 8 Start XMC™ Flasher tool via the Infineon Toolbox

  - Once started, click on the **Connect** button, then select the device name (refer to Table 1 from the **List of Targets** window and confirm with the **OK** button.

Table 1 XMC™ devices embedded in 24 GHz radar boards

24 GHz radar board	XMC™ device target
Distance2Go	XMC4200-256
Position2Go	XMC4700-2048
Sense2GoL	XMC1302-0016
Sense2GoL Pulse	XMC4700-2048

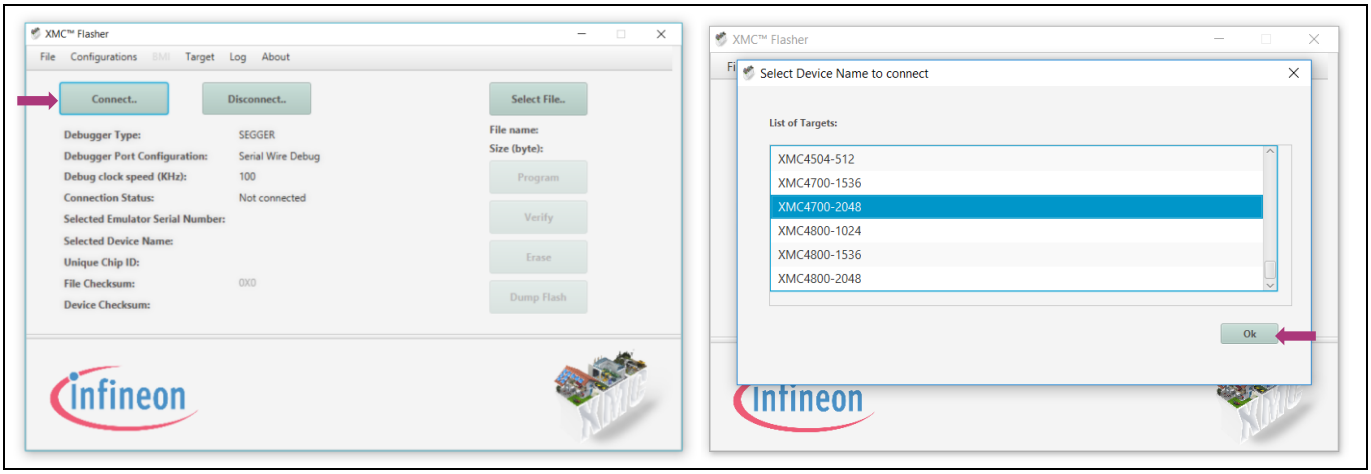
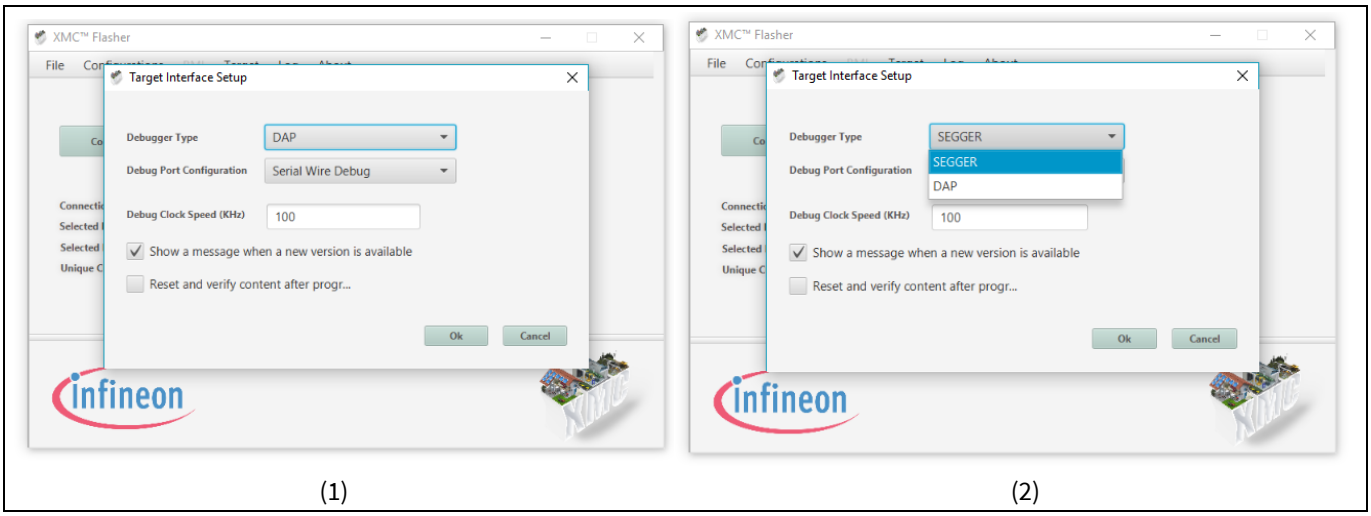


Figure 9 XMC™ Flasher device selection and connection

*Note: Please ensure that SEGGER J-Link drivers are installed before using the XMC™ Flasher tool. Otherwise, the default debugger type under XMC™ Flasher Target Interface Setup will be set to **DAP**, as shown in Figure 10 (1). Once installed, the user must change the debugger type to **SEGGER**, as shown in Figure 10 (2).*



(1) (2)

Figure 10 Change debugger type

- If the connection is established successfully, **Connection Status** turns to **Connected**. The **Unique Chip ID** is displayed as well.
- After connection is established, select the (*.hex) file by clicking on the **Select File…** button.

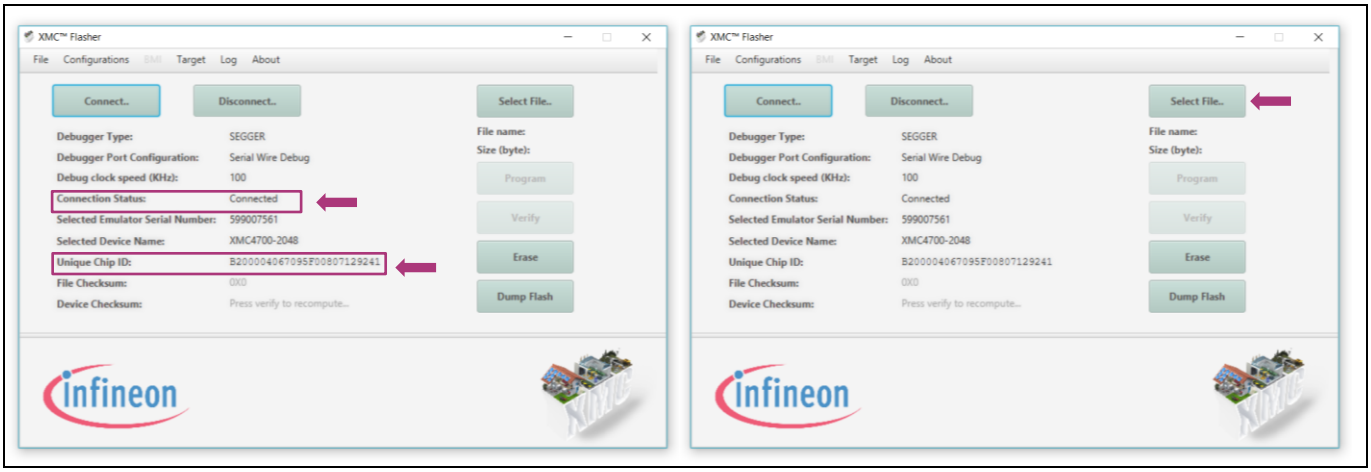


Figure 11 Binary image file selection

- Navigate to the **Binary** folder and select the (*.hex) file inside it (e.g. P2G_FW.hex), then click on **Open** in the dialog box.
- Successful selection of the (*.hex) file results in listing its filename below the **Select File…** button.

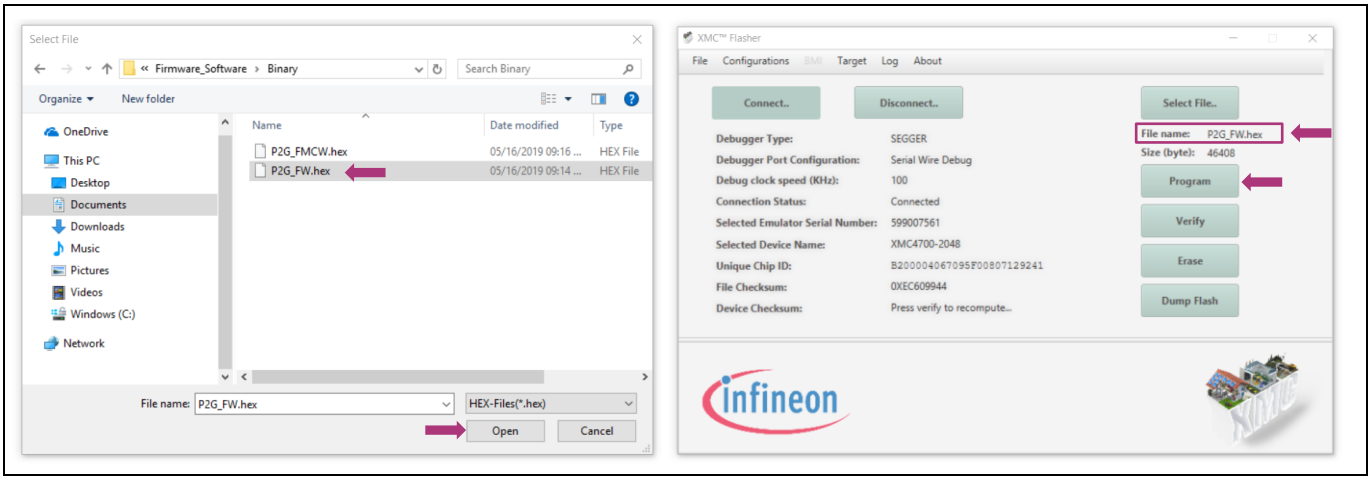


Figure 12 Binary image programming

- Click on the **Program** button, which opens the SEGGER progress window. It either verifies successful Flashing or shows an error message.
- If programming succeeds, the message **Programming is successful!** appears.

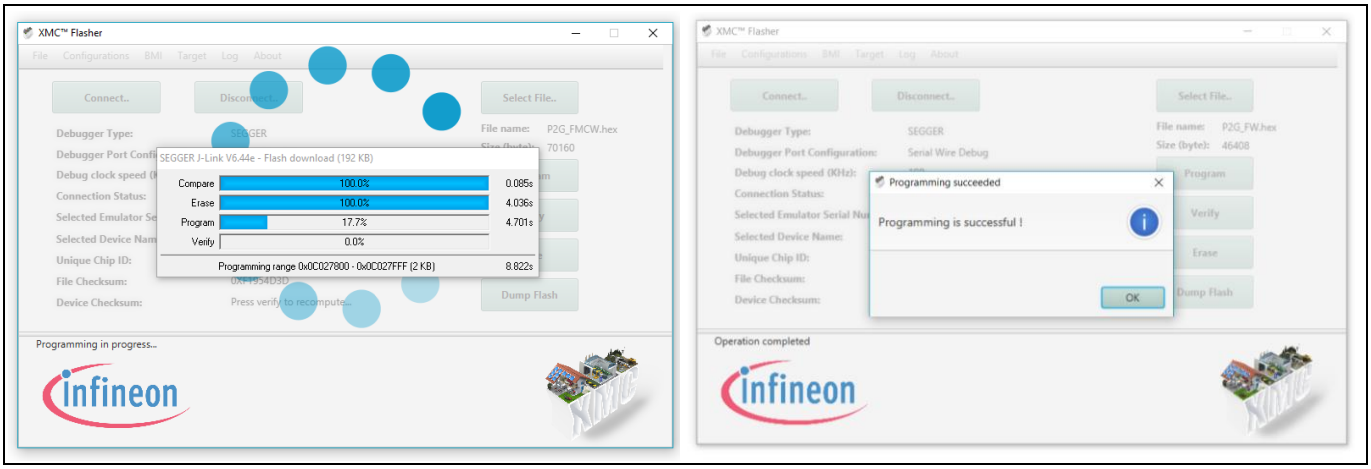


Figure 13 Programming successful

Note: The XMC™ Flasher requires a J-Link compatible debug-HW to connect to the target, which is already integrated in the 24 GHz Radar demo kit.

2.1.4 DAVE™ toolchain

DAVE™ (Digital Application Virtual Engineer), is a free-of-charge Eclipse-based Integrated Development Environment (IDE) using a GNU C-compiler that provides an extensive, configurable and reusable code repository for an XMC™ industrial microcontroller powered by ARM® Cortex®-M processors.

It is a C/C++-language software development and code generation tool for XMC™ microcontroller applications using DAVE™ APPs to configure the MCU peripherals (ADC, DMA, CCU4…), which reduces development time and allows for quick porting of the firmware across XMC™-series MCUs.

DAVE v4.1.2 or higher should be installed, or any other third-party toolchain supporting Infineon Technologies XMC™ microcontrollers, e.g. Atollic, IAR, Keil MDK, Rowley or TASKING. The latest version of DAVE™ (v4.4.2) can be downloaded from https://infineoncommunity.com/dave-download_ID645.

2.2 Graphical User Interface (GUI) solutions

2.2.1 Radar GUI

*Note: The Radar GUI tool is only supported with the **Distance2Go**, **Position2Go** and **Sense2GoL Pulse** radar software packages.*

2.2.1.1 Overview

Radar GUI is a Java-based highly interactive GUI for Windows XP/Vista/7/8/10. It provides graphical support for Infineon's radar devices and enables the visualization of real-time raw IF quadrature output signals and FFT spectrum, and enables observation of the targets' distance and velocity information from a connected 24 GHz radar device.

Radar GUI offers several methods to record data in different formats for advanced signal processing and supports multiple recording options. Each option saves corresponding data in a dedicated file, as follows:

- **Raw data** – records raw IF data as they are received from the device; data are stored in a file with .raw extension

- **Time domain data** – records extracted time domain data (I/Q signals); data are stored in a file with .tdd extension
- **Frequency domain data** – records processed spectrum data; data are stored in a file with .fdd extension
- **Target data** – records radar target list data; data are stored in a file with .tgd extension

2.2.1.2 How to use

To run the Radar GUI as a standalone application on Windows, proceed as follows:

- Run **Infineon Toolbox** by double-clicking on the Infineon Toolbox icon on your Windows desktop.
- Infineon automatically offers you the option to update **Radar GUI**. If a new version of the Radar GUI is available, a button labeled **Update** appears within the Radar GUI tab.
- Click on the **Update** button and afterward on the **Yes** button to confirm the update and get the new version of the Radar GUI tool.

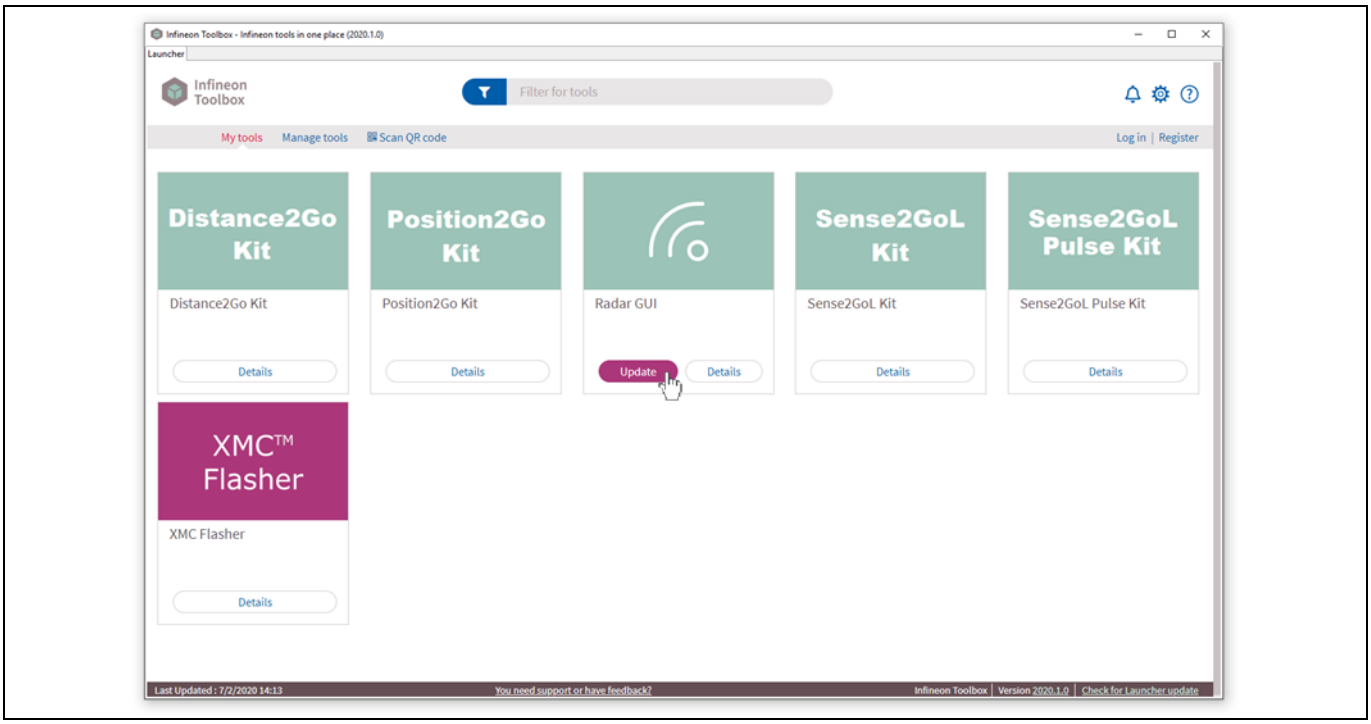


Figure 14 Infineon Toolbox launcher

- After an update, Infineon Toolbox must be restarted for the changes to take effect.
- Click on the **Start** button of the Radar GUI application available under the **My Tools** tab.

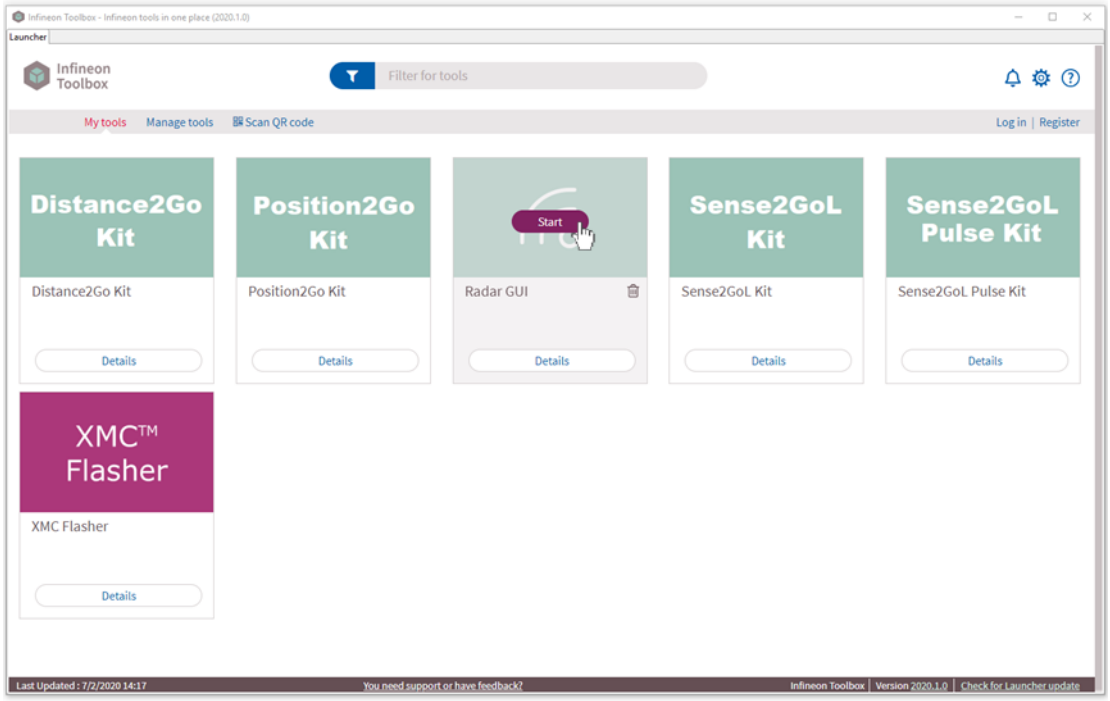


Figure 15 Start the Radar GUI application via Infineon Toolbox

- After launching the Radar GUI application the compatibility of the firmware version running in your 24 GHz radar-connected device is checked. If a newer firmware version is available, a prompt to follow the links to update the firmware appears.

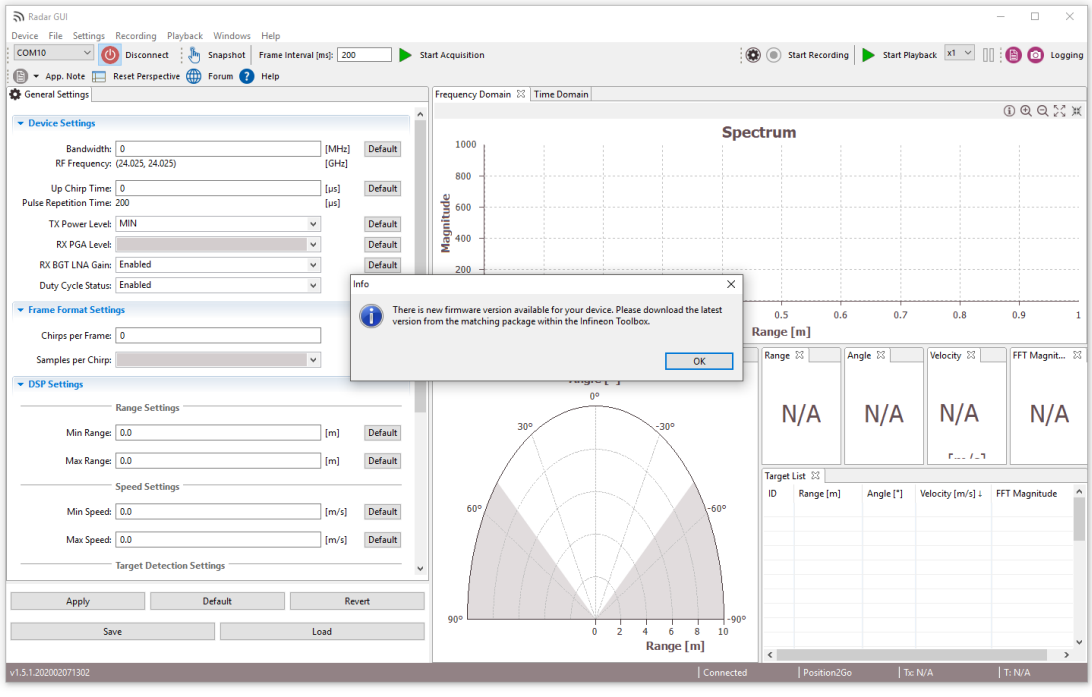


Figure 16 New firmware version available window

- Radar GUI automatically starts acquiring data from the 24 GHz radar board, when the radar firmware is running. Figure 17 shows the Radar GUI default screen acquiring FMCW data from Position2Go radar device, in which the Frequency Domain view displays the spectrum data for each antenna.
- For further information, please refer to the integrated Radar GUI help, which provides a complete overview of all features.

Figure 17 Radar GUI application window

2.2.2 Micrium µC/Probe™ XMC™ GUI

*Note: The Micrium GUI tool is **only** supported by the **Sense2GoL** radar device, and is **not compatible with the Radar GUI**.*

2.2.2.1 Overview

µC/Probe™ XMC™ from Micrium® is a free-of-charge data monitoring and visualization tool to modify and track real-time data on the XMC™ target microcontrollerin a non-intrusive way.

It enables designing a graphical dashboard with a wide range of widgets to control or fine-tune your XMC™ application, and it includes an eight-channel digital oscilloscope to visualize real-time data, controlled by a dedicated code that runs on the XMC™ target.

µC/Probe™ XMC™ is simple to install on a Windows PC and can be easily connected via the J-Link onboard debugger integrated into most of the XMC™ kits.

The latest version of µC/Probe™ XMC™ v4.3.0.9 is available for download from:
https://infineoncommunity.com/uC-Probe-XMC-software-download_ID712

2.2.2.2 How to use

The Sense2GoL software package (S2GL-HW-SW.exe) comes with a GUI based on a µC/Probe™ project from Micrium, which helps the user process collected raw data. In order to run this Micrium-based GUI project, proceed as follows:

- Go to the **/Firmware_Software/GUI** folder inside the locally installed S2GL-HW-SW package.
- Double-click the µC/Probe™ **S2GL_GUI.wspx** project, to open the GUI.
- **S2GL_GUI.wspx** can be opened in Windows Explorer, or in S2GL_Doppler DAVE™ project explorer, as shown in Figure 18.

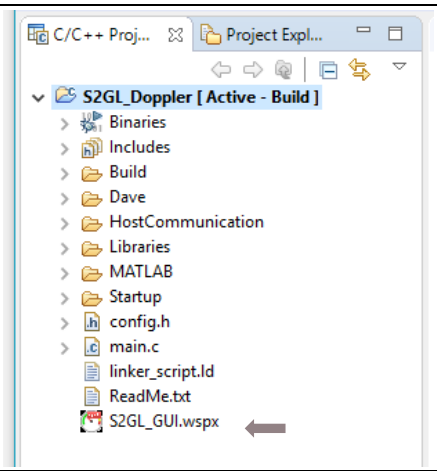


Figure 18 Open Sense2GoL GUI

The µC/Probe™ needs to be provided by the XMC™ compiling and linking process output file (ELF file). This file containing the name, data type and address of all firmware global variables is parsed by the µC/Probe™ project.

A precompiled .elf file is already available in a **/Firmware_Software/GUI** folder called **S2GL_Doppler.elf**.

*Note: After building a project, object files and an application binary file (typically in ELF format) exist in the Debug folder in the Project Explorer view file tree. Please ensure you have imported the **S2GL_Doppler.elf** file into your Micrium project each time you modify and build your S2GL_Doppler project.*

Once the GUI project has opened, the following steps need to be executed:

- Connect your Sense2GoL kit via USB (please ensure the USB port on the debugger board is connected).
- Start the GUI by clicking on the **Run** button.

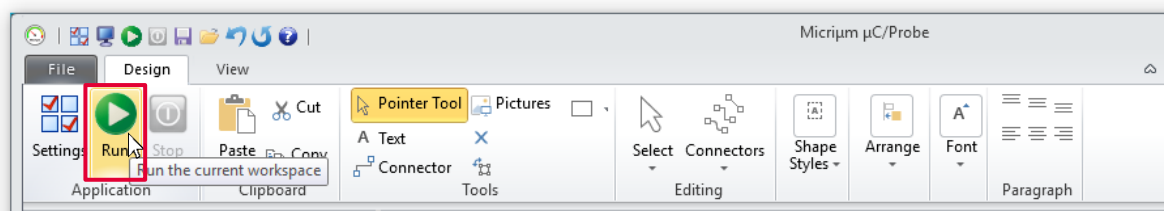


Figure 19 Run the Sense2GoL GUI

- The GUI interface in Figure 20 should appear. The size of the GUI is not adaptive and may require some adjustments to fit the screen.

- Press the **START** button to begin data collection.

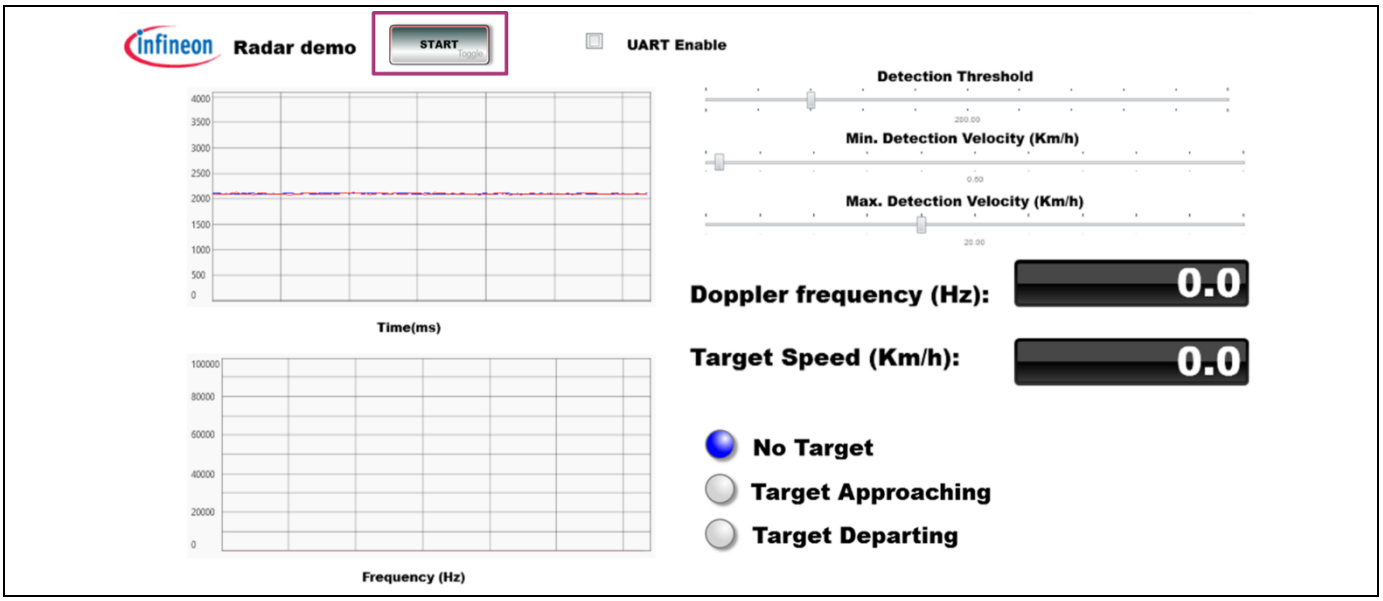


Figure 20 Start data collection

The radar should now detect movement and display data on the GUI:

- Time and frequency plots
- Threshold can also be set, default 200
- Minimum velocity (default 0.50 km/h) and maximum velocity (default 20 km/h)
- Maximum Doppler frequency and target speed
- Direction of movement

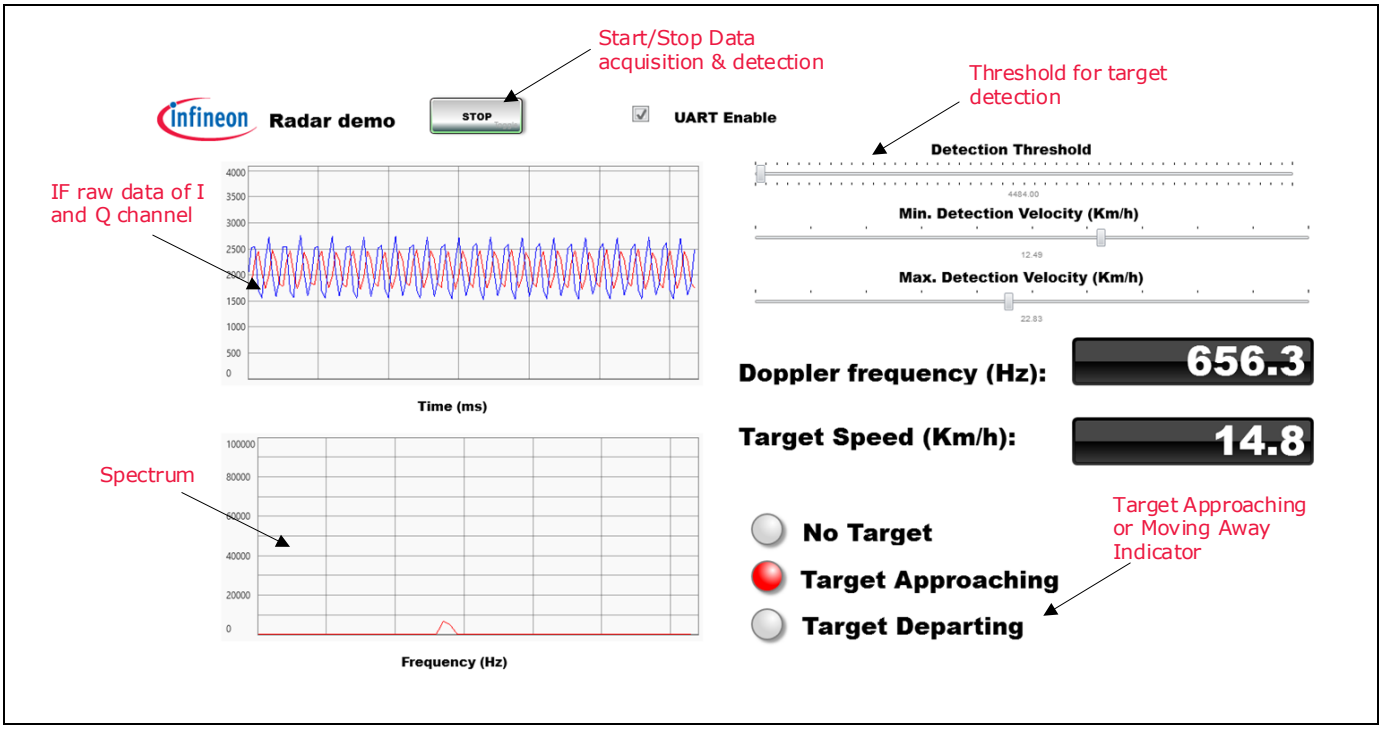


Figure 21 Data display on Micrium GUI

3 Customizing radar applications

Firmware (FW) is a piece of software written in C language to control different ICs and peripherals via the host processor, which is the XMC™ Cortex™-M MCU embedded in Infineon's 24 GHz radar demo kits.

The 24 GHz radar firmware is released as a ready-to-run DAVE™4 project, where source files are generated based on the DAVE™ APPs used, which are graphical-configurable application-oriented software components, used to enable quick reuse and customization.

This section explains how to customize, build, Flash and debug radar applications built on generated DAVE™ code, and run them on the 24 GHz radar demo kit.

3.1 Building, Flashing and debugging the DAVE™ project

After installing the DAVE™ IDE, the user can start the program to build and load the 24 GHz radar firmware applications as follows:

- Download and unzip the 24 GHz radar firmware package, making sure not to modify the package folder structure.
- Open the project workspace with the DAVE™ toolchain:
  - Run the DAVE™ toolchain and wait for the program to start, which asks for the workspace location.
  - Enter a path or browse to the desired folder via the **Browse...** button and confirm the choice with the **OK** button.

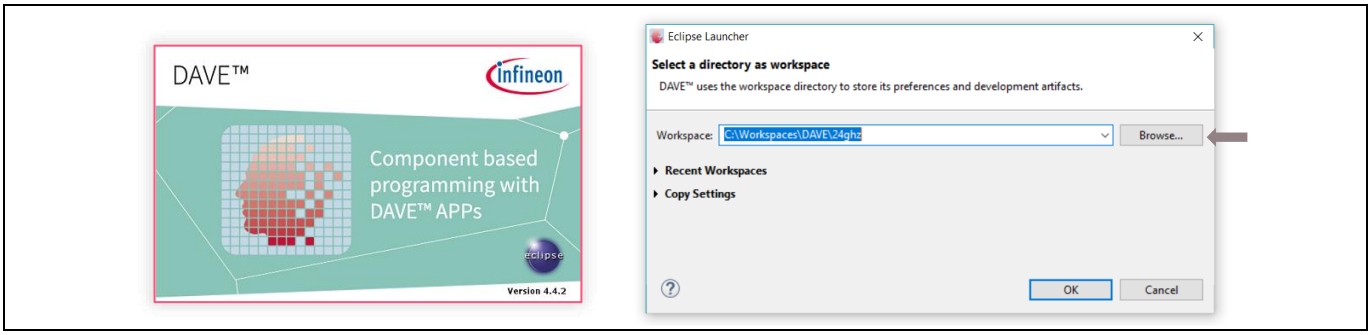


Figure 22 DAVE™ workspace launcher

Note: It is recommended that the active workspace folder is located not too many levels below the file system root to avoid build errors caused by exceeding the Windows path length character limitations.

  - Once the DAVE™ workspace is opened, select **Import...** in the **File** menu to display the Import dialog box.
  - Within the **Import** dialog box, select **Infineon**, **DAVE Project** and click on the **Next** button.

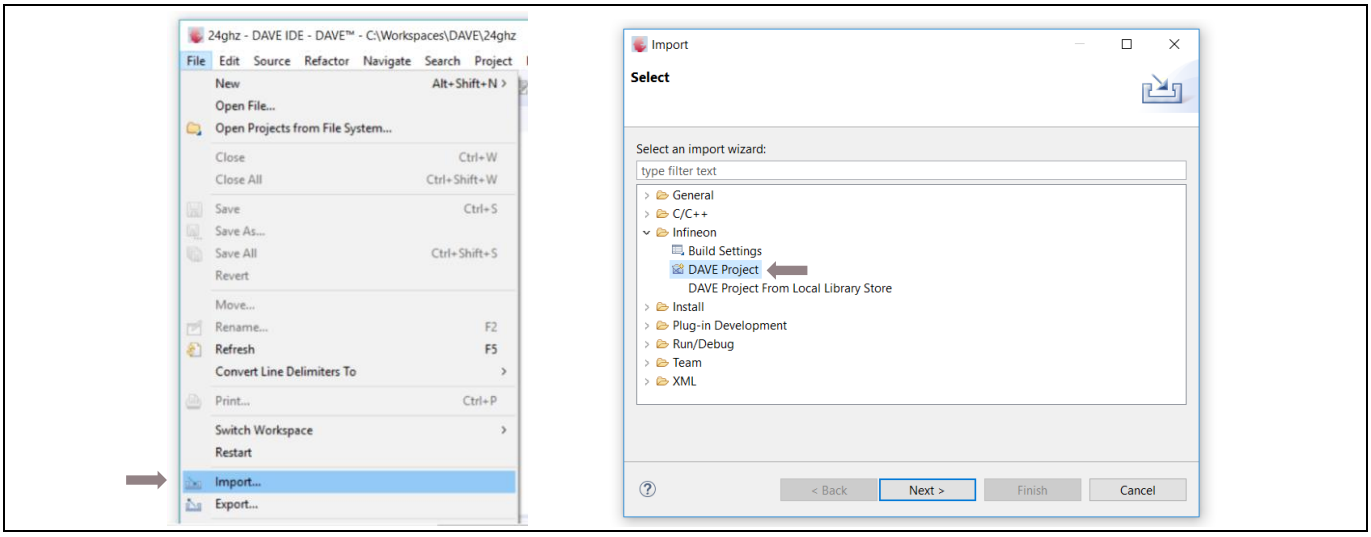


Figure 23 DAVE™ project import dialog box

- Check the **Copy Projects Into Workspace** checkbox.
- Select **Browse…** beside Select Root Directory.

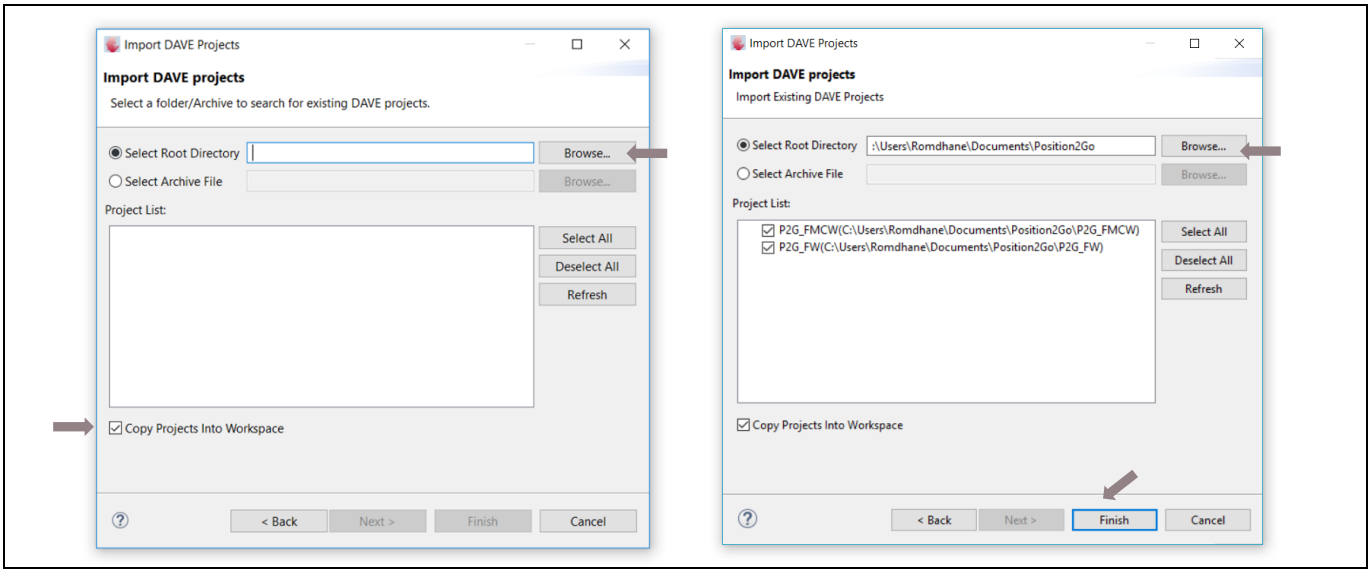


Figure 24 Import DAVE™ projects

- The project file should appear under the **Project List**. Click on the **Finish** button. A screen similar to Figure 25 should appear.

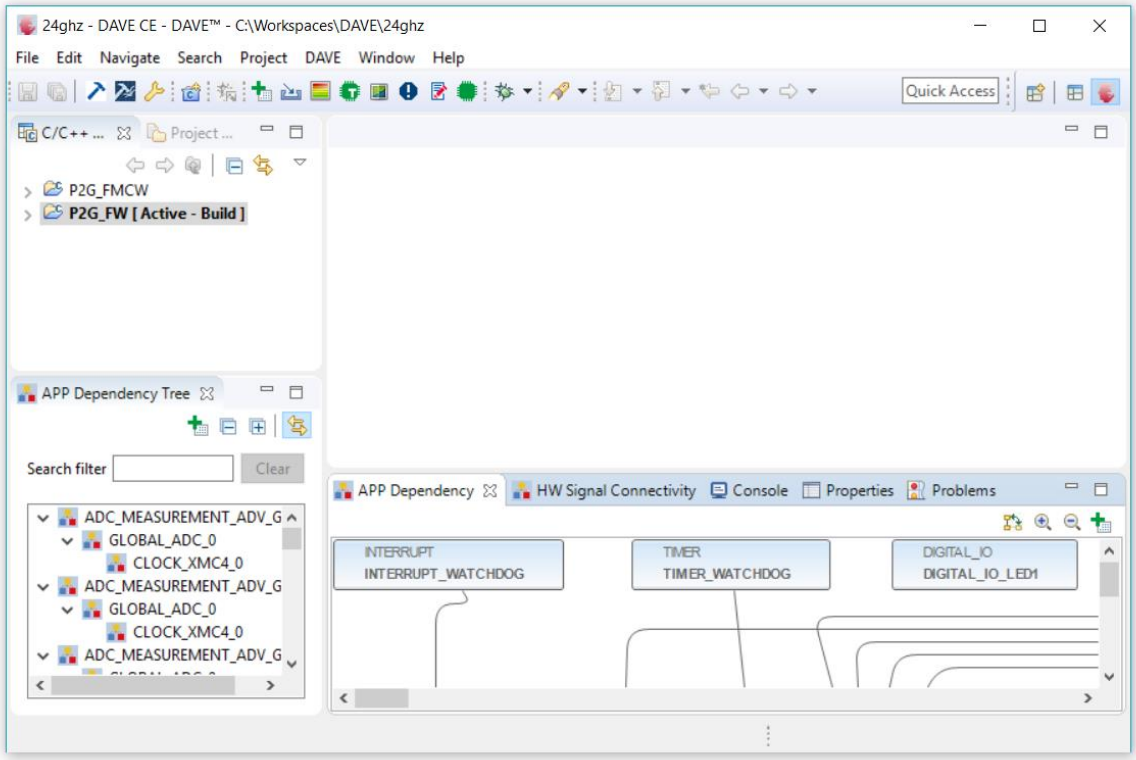


Figure 25 DAVE™ editor view

- There are two ways to build a project:
  - Click on **Build Active Project** (the icon with the blue hammer on a white background) in the toolbar.
  - Right-click on the active project **P2G_FW [Active – Build]** and then click on **Build Project**.

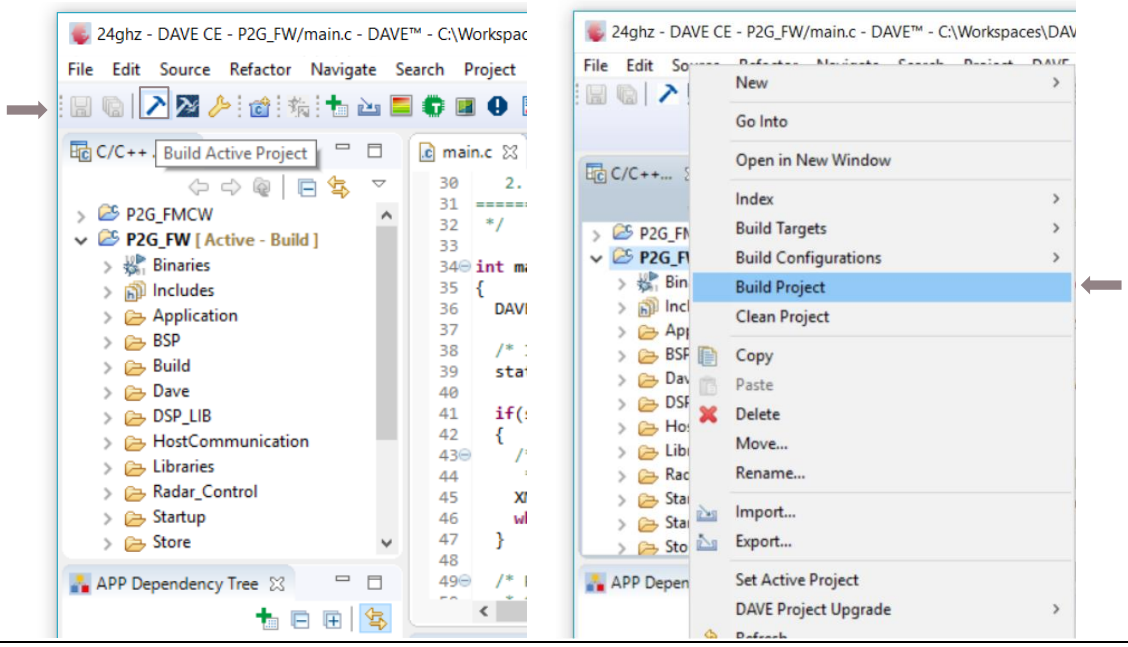


Figure 26 Build project options

- Check successful build in the **Console** window, where the build result details are displayed.

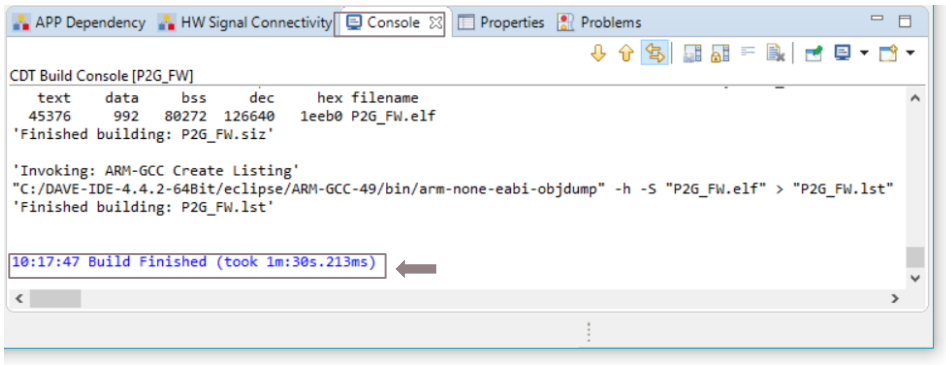


Figure 27 DAVE™ console

- Ensure that the debugger of the 24 GHz radar board is connected to the PC via USB “type A to micro-B” cable through the USB connector (e.g. X12 connector for Position2Go board).
- Set debug configurations by clicking on the drop-down menu of the **Debug** toolbar button (bug icon) and selecting **Debug Configurations…** as shown in Figure 28. Alternatively, press key F11 to directly start the debug session.

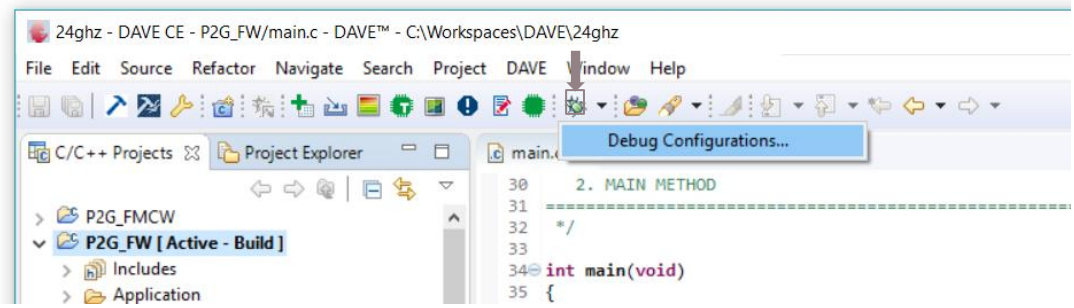


Figure 28 Start debug session toolbar button

If opening Debug Configurations, a window as shown in Figure **29** appears.

- Double-click on **GDB SEGGER J-Link Debugging** to create a new debug configuration.
- Click on the **Debug** button to Flash and start a debug session.

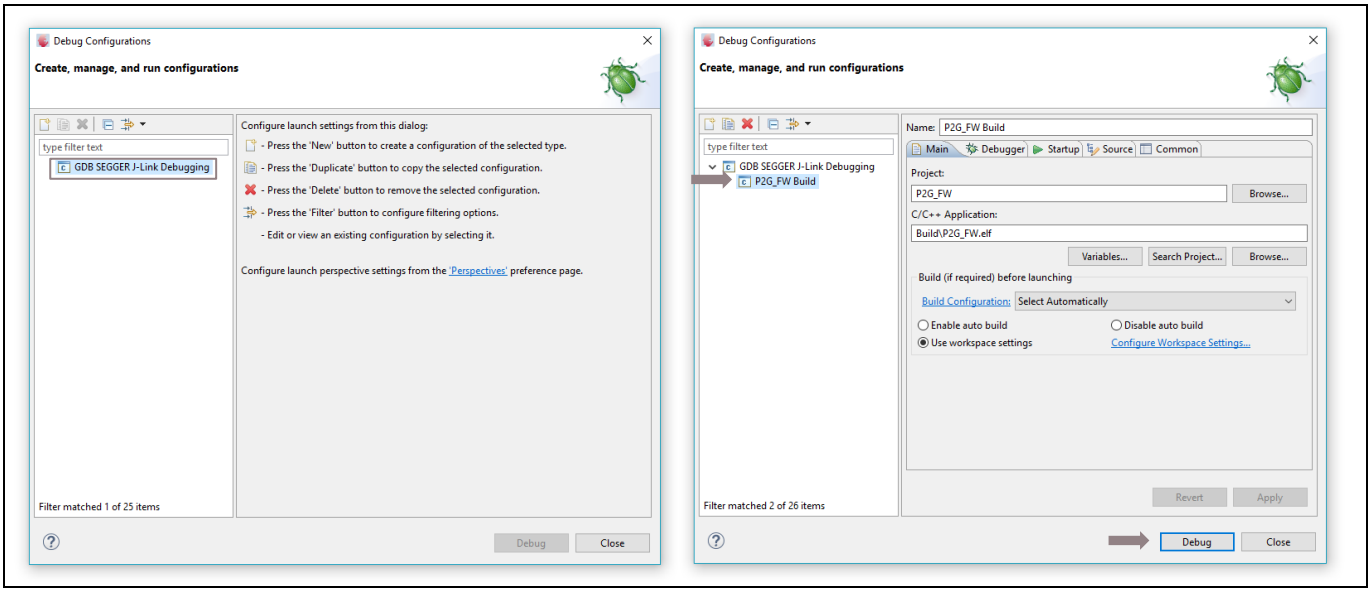


Figure 29 Debug configuration

- In this way, the Flashing process is started, the firmware image is loaded into the XMC™ microcontroller Flash memory and DAVE™ automatically switches to the debug perspective, as shown in Figure 30.

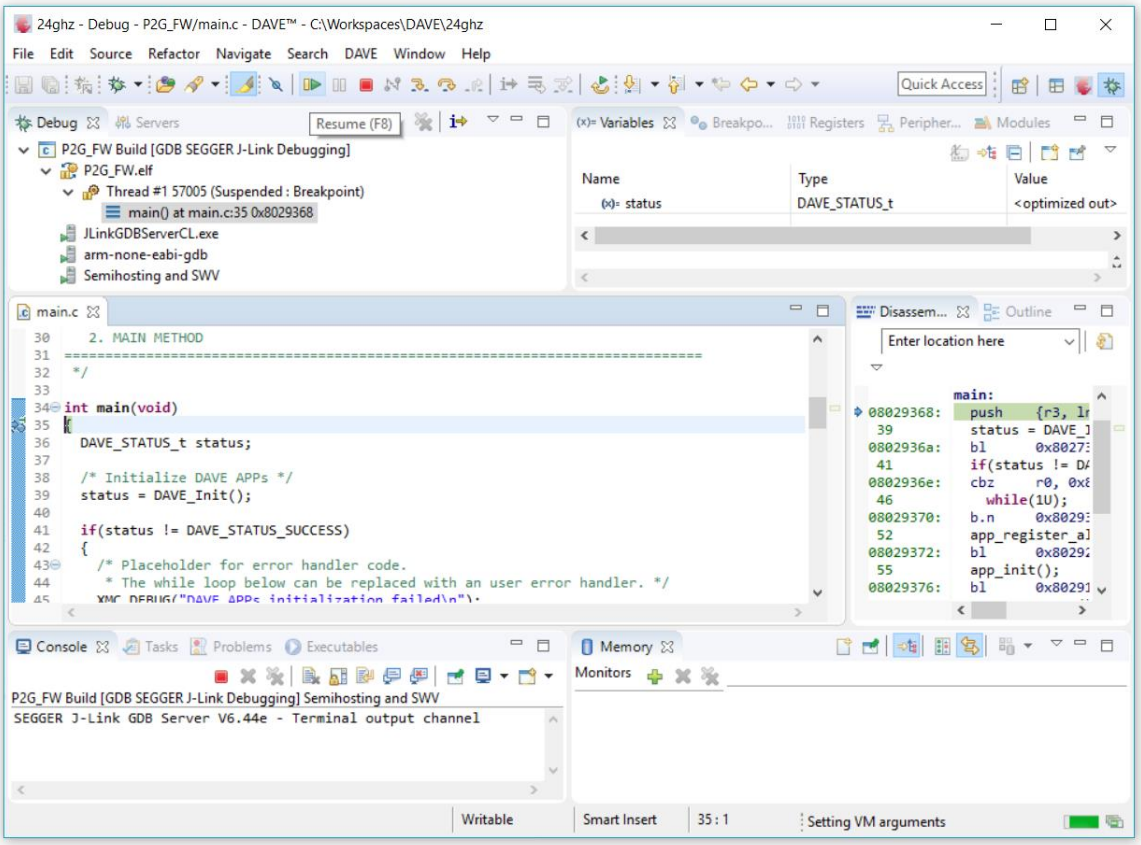


Figure 30 DAVE™ debug perspective

3.2 Firmware customization and configuration

The 24 GHz radar firmware is developed with Infineon's DAVE™ toolchain. It is a C/C++-language software development and code generation tool for XMC™ microcontroller applications using DAVE™ APPs to configure the MCU peripherals (ADC, DMA, CCU4…), which reduces development time and allows for quick porting of the firmware across XMC™-series MCUs.

The 24 GHz firmware projects can be customized by setting parameters in the configuration file **config.h**, which allows for customizing the drivers and algorithms for the user's radar application.

Table 2 lists some parameters that can be configured: enable, disable or modify some options by uncommenting and commenting or modifying the values of the related define statements.

Table 2 Define statements used for radar firmware configuration

Parameter	Description
DOPPLER_SAMPLING_FREQ_HZ	Sampling frequency for Doppler (units in Hz)
DOPPLER_FFT_SIZE	FFT length for Doppler mode, with zero padding
MINIMUM_RANGE_CM	Exclude targets below this distance (units in cm)
MAXIMUM_ RANGE_CM	Exclude targets beyond this distance (units in cm)
RANGE_DETECTION_THRESHOLD	FFT spectrum threshold to detect a target in FMCW mode
MINIMUM_SPEED_KMH	Filter out targets below this speed (units in km/h)
MAXIMUM_SPEED_KMH	Filter out targets above this speed (units in km/h)
SPEED_DETECTION_THRESHOLD	FFT spectrum threshold to detect a target in Doppler mode

On each change of the config.h file parameters' values, the project has to be re-built and Flashed again. Otherwise that can be changed on the fly via the Radar GUI configurable fields.

4 Extracting radar raw data

The 24 GHz radar demo kits can use different interfaces, enabling the user to fetch raw data from the radar board as follows:

- MATLAB radar system interface
- C radar system interface
- UART radar system library interface

Supported radar communication libraries define a set of APIs to guarantee the data transfer through the host communication protocol.

4.1 Radar host communication protocol

The communication protocol is a generic protocol to exchange messages with microcontroller-based devices over a generic byte-stream connection (typically a virtual serial port via USB). The communication is always initiated by the host, while the connected microcontroller device responds to messages received from the host. The protocol defines two types of messages:

- Payload messages – contain a block of data with arbitrary size and meaning
- Status messages – contain a 16-bit status code

Messages from the host to the device are always payload messages. Whenever the device receives a payload message from the host, it responds with one (and only one) status message. The device may also send an arbitrary number of additional payload messages preceeding that status message. Once the device has sent the status message, it will not send any more messages until it receives a new message from the host.

Each message from the host to the device is addressed to a certain logical endpoint, and each message from the device to the host is sent from a logical endpoint. The number of logical endpoints is defined by the device.

Endpoints are used to define functional groups in the device and are continuously enumerated starting with 1. At least one logical endpoint is always present. Each logical endpoint is of a defined type, which defines the meaning of the message payload exchanged with that endpoint.

Additionally, each endpoint has a version number that allows it to distinguish between slight modifications of the endpoints' set of known messages. The host can query the type and version of the endpoints present in the device.

All data received from the connected device is returned through callbacks. For each message type that can be received from the device, a separate callback function type is defined.

Within the 24 GHz radar firmware project, the host communication library contains the USB interface on host communication protocol drivers.

4.2 MATLAB radar system interface

4.2.1 Overview

The MATLAB application interface defines a set of APIs and functions that help the user access a serial communication port and communicate with the radar-defined endpoints, enabling the user to extract the raw IF data from the radar module via the USB interface to the PC/laptop for further signal processing.

Please refer to **/Firmware_Software/Communication Library/ComLib_Matlab_Interface/RadarSystemDocumentation** for more details about the interface's set of classes and functions that can be used to control the 24 GHz radar board via MATLAB.

4.2.2 How to use

A coding example to interface with the 24 GHz radar board via MATLAB and extract raw data is available. (Refer to the **extract_raw_data.m** file.) In order to run this coding example, proceed as follows:

- Go to **/Firmware_Software/Communication Library/ComLib_Matlab_Interface /RadarSystemExamples/GettingStarted** folder, and copy the path.
- Open MATLAB, then paste the path into the top tab, and the "**extract_raw_data.m**" file will show up on the left tab.
- Ensure that your 24 GHz radar board is connected, then Click on **Run** to see the raw data.

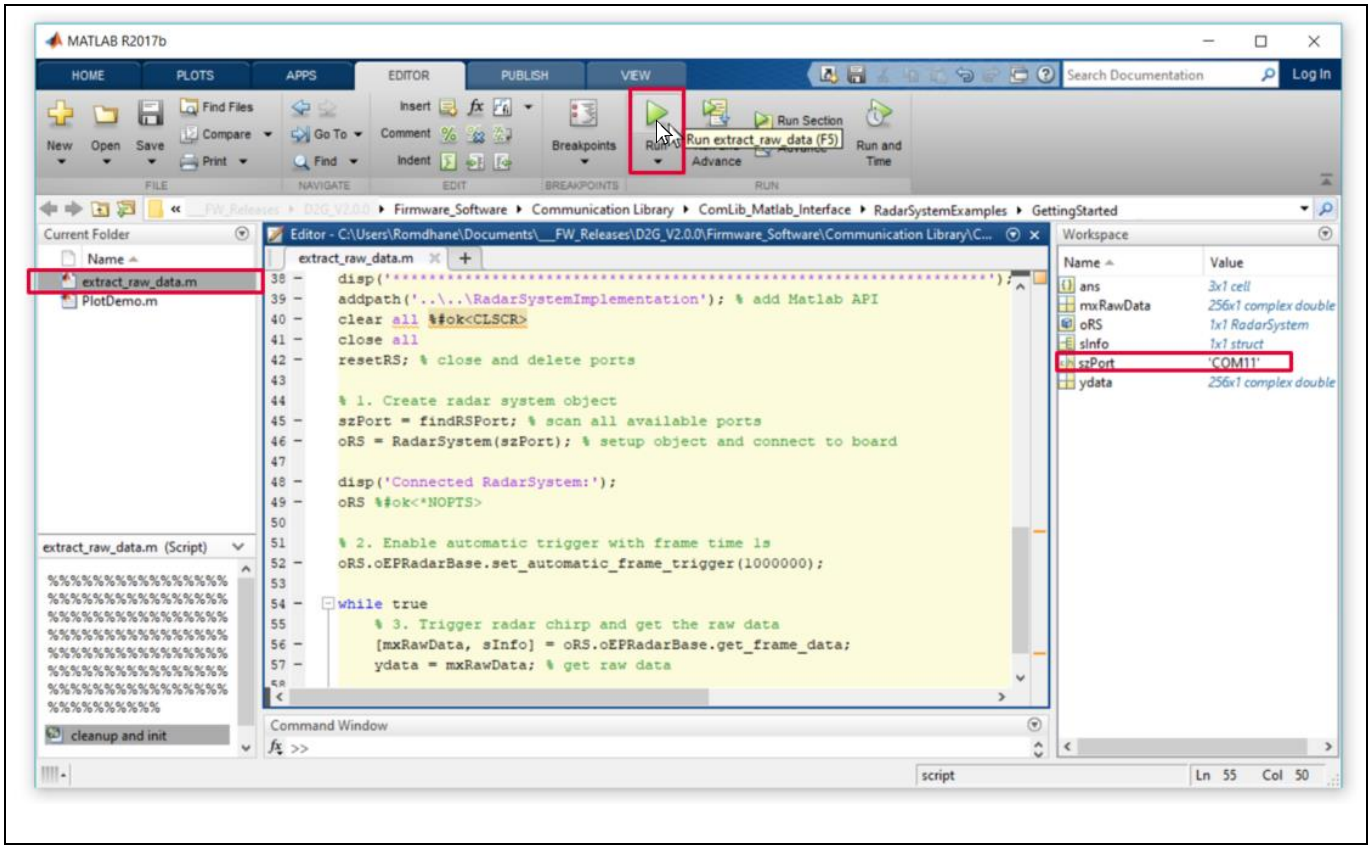


Figure 31 MATLAB radar system interface

Figure 32 shows the example running on MATLAB, extracting raw data from the D2G radar board.

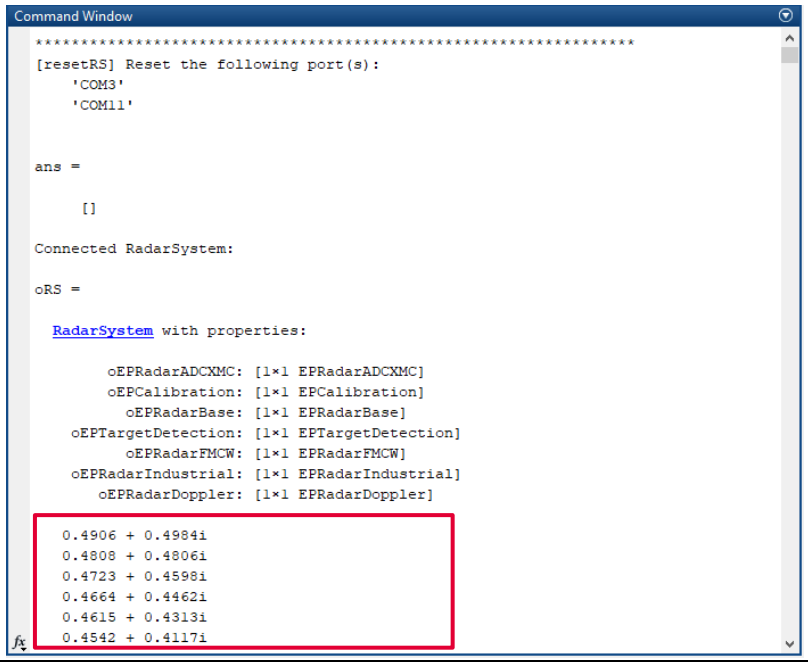


Figure 32 Raw data acquisition in MATLAB command window

4.3 C radar system interface

4.3.1 Overview

The C radar system interface defines a set of APIs that help user access a serial communication port and communicate with the radar-defined endpoints, enabling the user to demonstrate the capabilities of the 24 GHz modules.

Please refer to the **Firmware_Software/Communication Library/ComLib_C_Interface/documentation** for more details about the set of control parameters and methods that can be used to control the 24 GHz radar board using C communication library.

It is worth noting that the radar C communication library implements the API to access a serial communication port for Windows (COMPort_Windows.c), and Mac OS and Linux (COMPort_Unix.c) platforms.

*Note: The C radar system interface is **only** supported within the **Distance2Go**, **Position2Go** and **Sense2GoL Pulse** radar software packages.*

4.3.2 How to use

A coding example to interface with the 24 GHz radar board using C communication library, and to extract raw data, is available (refer to the **extract_raw_data.c** file). In order to run this coding example, proceed as follows:

- Go to the **/Firmware_Software/Communication Library/ComLib_C_Interface/examples** folder, and copy the path.
- Open your appropriate C compiler, then create a C project.
- Import the **extract_raw_data.c** file, all source *.c files under **/ComLib_C_Interface/src** and also all header *.h files under **/ComLib_C_Interface/include**.
- Ensure that your 24 GHz radar board is connected, then **Compile** and **Run** your project to see the raw data.

Figure 33 shows the example running on Visual Studio, extracting raw data from a D2G radar board.

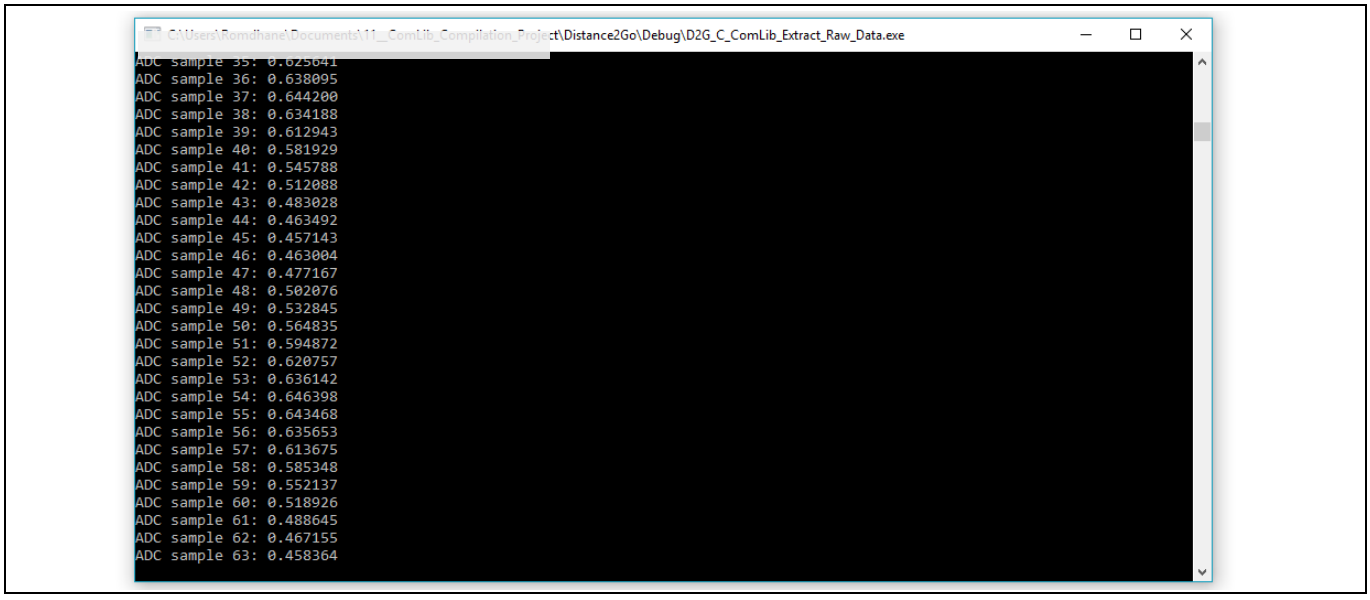


Figure 33 Raw data acquisition in Visual Studio shell

4.4 UART radar system interface

*Note: The UART radar system interface is **only** supported within the **Sense2GoL** radar software package.*

4.4.1 Overview

The UART radar system interface defines a set of APIs that help the user access a serial communication port and communicate with the radar-defined endpoints, enabling the user to fetch sampled ADC data streamed by UART.

The UART radar system interface supports the following data to be dumped at the host:

- ADC raw data:
  - I and Q (first 256 samples of I, followed by next 256 samples of Q)
  - Only I (256 samples)
  - Only Q (256 samples)
- Doppler measurements and FFT spectrum
- Signed 16-bit, unsigned 16-bit and 32-bit

4.4.2 How to use

Using the transferred data via the UART radar system interface library, it is possible to view and export ADC data via a terminal program (e.g. PuTTY), or transfer it to MATLAB for processing.

PuTTY is a free SSH, Telnet and rlogin client for Windows systems. It is open-source software available with source code and is available for download at: https://www.putty.org/

In order to fetch raw data streamed by UART, PuTTY should be configured as follows:

- **UART configuration** – full-duplex, direct mode, 128000 baud rate, 8 data-bits, 1 stop-bit, no parity
- **COM port number** – depends on the host PC; look into the device manager for the COM port number of your connected 24 GHz radar board (e.g. COM53 for Sense2GoL)

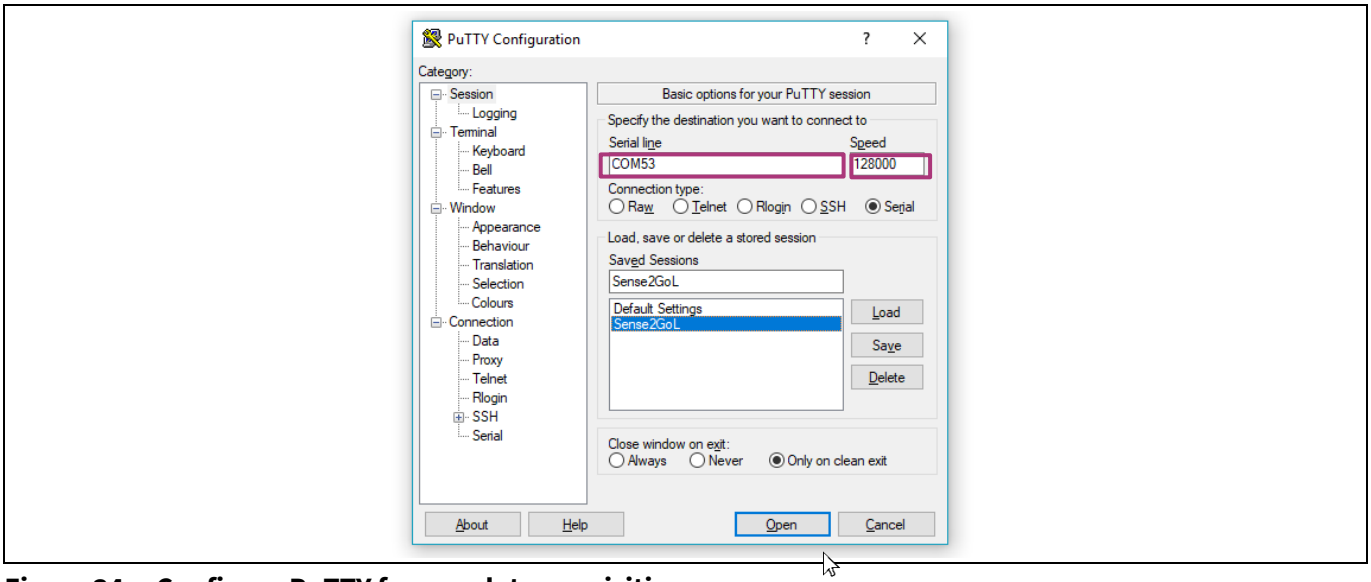


Figure 34 Configure PuTTY for raw data acquisition

Once configured, click the **Open** button to start a PuTTY serial session. ADC output data at the PuTTY shell for the I and Q raw samples looks as shown in Figure 35.

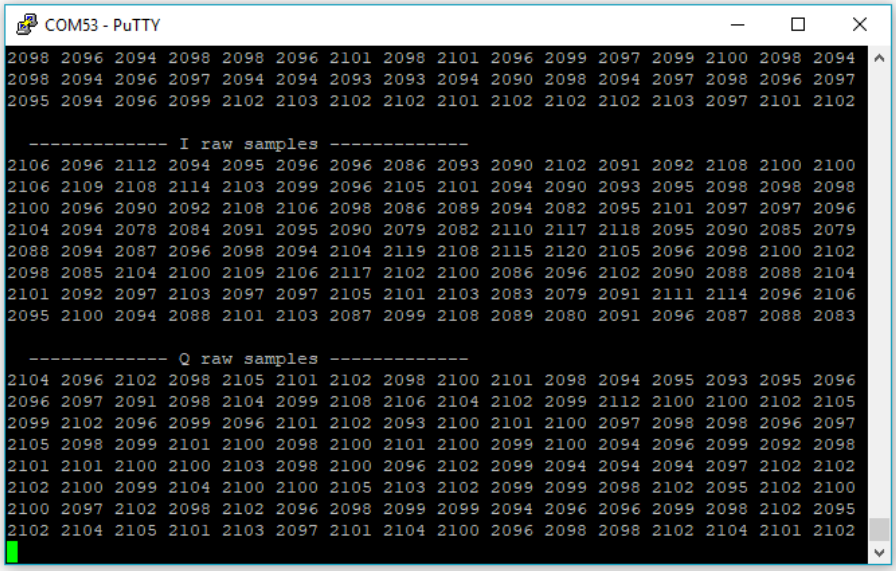


Figure 35 Raw data acquisition in PuTTY shell

5 Authors

Radar Application Engineering Team, Business Line “Radio Frequency and Sensors”

6 References

[1] 24 GHz industrial radar – FAQs

[2] Infineon Application Note – Working with DAVE™ APPs and moving fro m DAVE™ v3 to v4

[3] Infineon Toolbox – Getting Started guide

[4] Infineon Micrium® uC/Probe™ XMC™ – Getting Started guide

[5] Infineon – XMC™ Programmers and Flash Tools

Revision history

Document version	Date of release	Description of changes
V1.0	2019-06-14	Initial version
V1.1	2020-02-07	Addition of Sense2GoL Pulse demo board features

Trademarks
All referenced product or service names and trademarks are the property of their respective owners.

Edition 2020-02-07

Published by

Infineon Technologies AG

81726 Munich, Germany

Do you have a question about this document?

Email: erratum@infineon.com

Document reference
<UM_1904_PL32_1905_132048>

IMPORTANT NOTICE

The information contained in this application note is given as a hint for the implementation of the product only and shall in no event be regarded as a description or warranty of a certain functionality, condition or quality of the product. Before implementation of the product, the recipient of this application note must verify any function and other technical information given herein in the real application. Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind (including without limitation warranties of non-infringement of intellectual property rights of any third party) with respect to any and all information given in this application note.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies office (**www.infineon.com**).

WARNINGS

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Infineon:
DEMOSENSE2GOLTOBO1