



Getting Started Guide

mmWave LAB Driver Vital Signs

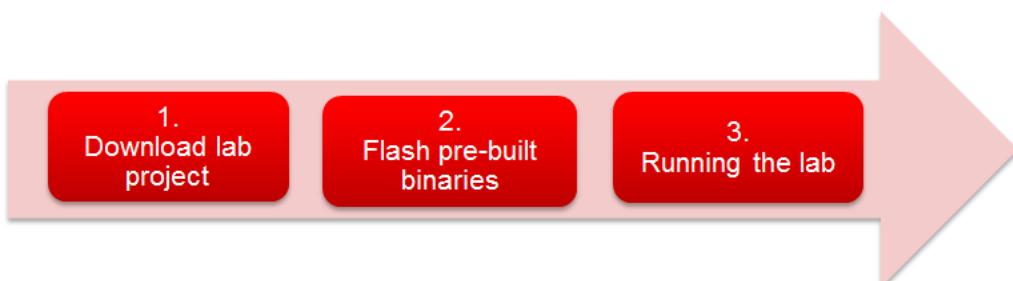
Overview

- This lab demonstrates the use of mmWave technology to accurately measure the driver vital signs such as breathing rate and heart rate.
- The mmWave sensor AWR1642BOOST evaluation module (EVM) is used for lab demonstration
- The programmable DSP on the TI AWR1642 mmWave sensor is used to filter out the breathing and heart beat pattern from chest displacements and estimate the breathing rate and heart rate
- The mmWave sensor can be placed in the front or in the back of the driver seat.
- Breathing rate and heart rate as well as the corresponding waveforms are displayed on the PC-GUI for lab demonstration.

Required Hardware

- AWR1642BOOST ES 2.0 EVM
- Micro USB cable (included in the EVM package)
- 5V/2.5A Power Supply
 - [Purchase from Digikey](#)
 - <https://www.digikey.com/product-detail/en/cuiinc/SMI36-5-V-P5/102-3589-ND/5415060>

Getting Started



Step 1: Download the Lab Project

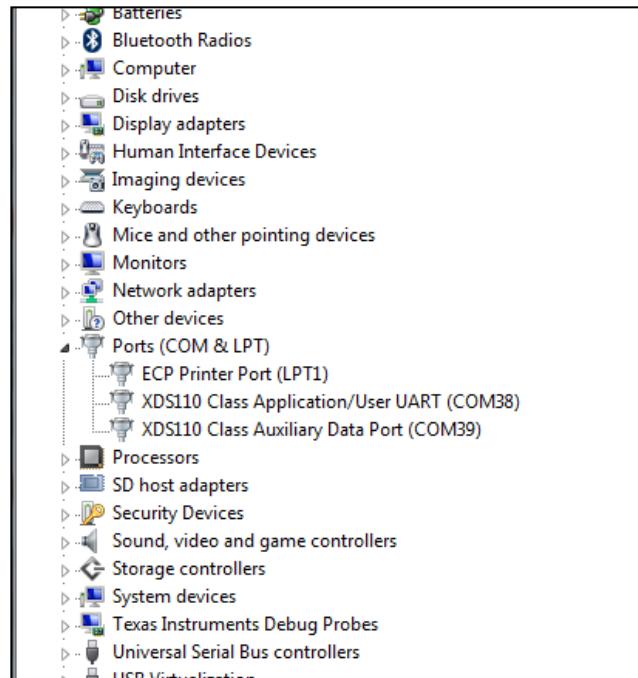
- The mmWave Lab projects are available as part of the TI CLOUD TOOLS under **Resource Explorer**
- Open the following page: <https://dev.ti.com/> and select **Resource Explorer**
- In the Resource Explorer Window, select **Software ▶ mmWave Sensors ▶ Automotive Toolbox**
- Click the Download button  in the window that opens on the right side
- Download and install the Automotive Toolbox zip file
- The pre-built binaries are located in the folder:
 - \labs\lab0001-driver-vital-signs\pre-built-binaries\vitalSigns_16xx.bin

Step 2: Flash Lab Binaries

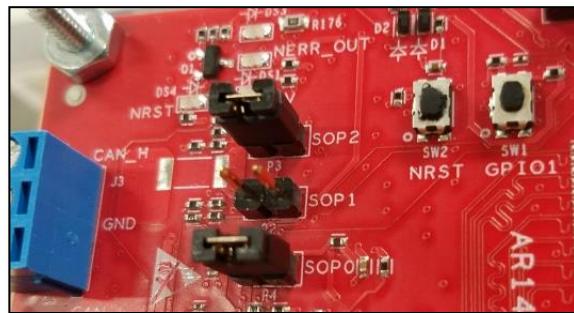
- Power on the EVM using a 5V/2.5A power supply.
- Connect the EVM to your PC and check the COM ports in Windows Device Manager
- The EVM exports two virtual COM ports as shown below:
- XDS110 Class Application/User UART (COM_{UART}):
- Used for passing configuration data and firmware to the EVM
- XDS110 Class Auxiliary Data Port (COM_{AUX})
- Used to send processed radar data output
- Note the COM_{UART} and COM_{AUX} port numbers, as they will be used later for flashing and running the Lab.

COM_{UART}: COM38 COM_{AUX}: COM39

- The actual port numbers on your machine may be different



- Put the EVM in flashing mode by connecting jumpers on SOP0 and SOP2 as shown in the image.
- Open the **UniFlash** tool
- Download from TI.com/tool/uniflash
- In the **New Configuration** section, locate and select the appropriate device AWR1642BOOST
- Click **Start** to proceed



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✓ Selected Device: AWR1642 BoosterPack

✓ Selected Connection: Serial Connection (Auto Selected)

3
Start
Edit

- In the **Program** tab, browse and locate demo binary file shown in Step 1

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UniFlash Session ▾ About

Configured Device : Serial Connection > AWR1642 [download ccxml]

⚙ Settings • Cortex_R4_0

Program	Select and Load Images
Settings & Utilities	Flash Image(s)
Standalone Command Line	<input checked="" type="checkbox"/> Meta Image 1 xwr16xx_mmw_demo.bin Size: 422.13 KB <input style="float: right; margin-right: 10px;" type="button" value="Browse"/> <input style="float: right; margin-right: 10px;" type="button" value="X"/>
	<input type="checkbox"/> Meta Image 2 <input style="margin-right: 10px;" type="button" value="Browse"/> <input type="button" value="X"/>

- In the **Settings & Utilities** tab, fill the **COM Port** text box with the Application/User UART COM port number (**COM_{UART}**) noted earlier

▼ Setup

Note: Example - COM1 (Windows), /dev/ttyACM0 (Linux)

COM Port: **COM38**

Target Memory Selection: SFLASH

- Return to the **Program** tab, power cycle the device and click on **Load Images**
- When the flash procedure completes, UniFlash's console should indicate: [SUCCESS] Program Load completed successfully
- Power off the board and remove the jumper from only header **SOP2** (this puts the board back in functional mode)

Step 3: Run the Lab

- Install [XDS Emulation Package](#) on the PC host if needed from the following
 - http://processors.wiki.ti.com/index.php/XDS_Emulation_Software_Package.
- If CCS is installed on the PC host, the XDS Emulation package has already been installed during the CCS installation process.
- Execute the Demo GUI located in:
 - **`\labs\lab0001-driver-vital-signs\gui\gui_exe\VitalSignsRadar_Demo.exe`**
- Screen below will appear if GUI starts. If the GUI does not start please install the Visual Studio 2017 runtime vc_redist.x64.exe from the following link
 - <https://support.microsoft.com/en-us/help/2977003/the-latest-supported-visual-c-downloads>



- In the GUI, select “Measurements from the Front” if it is desired to place the mmWave sensor in the front.
- Check that EVM is powered on and the USB cable connected to the PC host running the GUI. In the GUI, select “Start”.

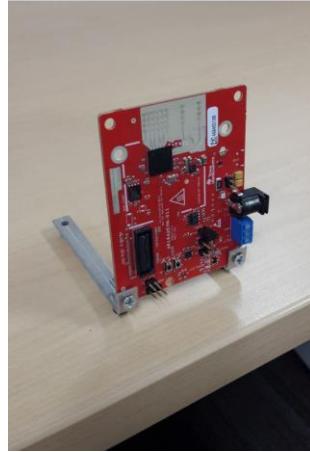
- A snapshot of the PC-GUI showing the measured vital signs is shown below



mmWave Sensor Placement

- The Driver Vital Signs Demo supports placing the sensor in front or in the back of the driver.
- In order to test with **Sensor in Front**, the EVM can be placed on metal brackets as shown below

- The subject should sit in a chair about 0.3-0.8m in front of the sensor.
- For the initial measurement the subject should stay still for 10-15 seconds to allow the application to calibrate. For subsequent measurements the subject must stay still for 5-10 seconds.



- In order to test with **Sensor in Back**, the EVM can be placed in the back of a car seat or in a seat cushion. This can be done by placing the EVM in an enclosure as shown below.

