Getting Started Guide

xWRL6844 Software Getting Started Guide

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1 Introduction

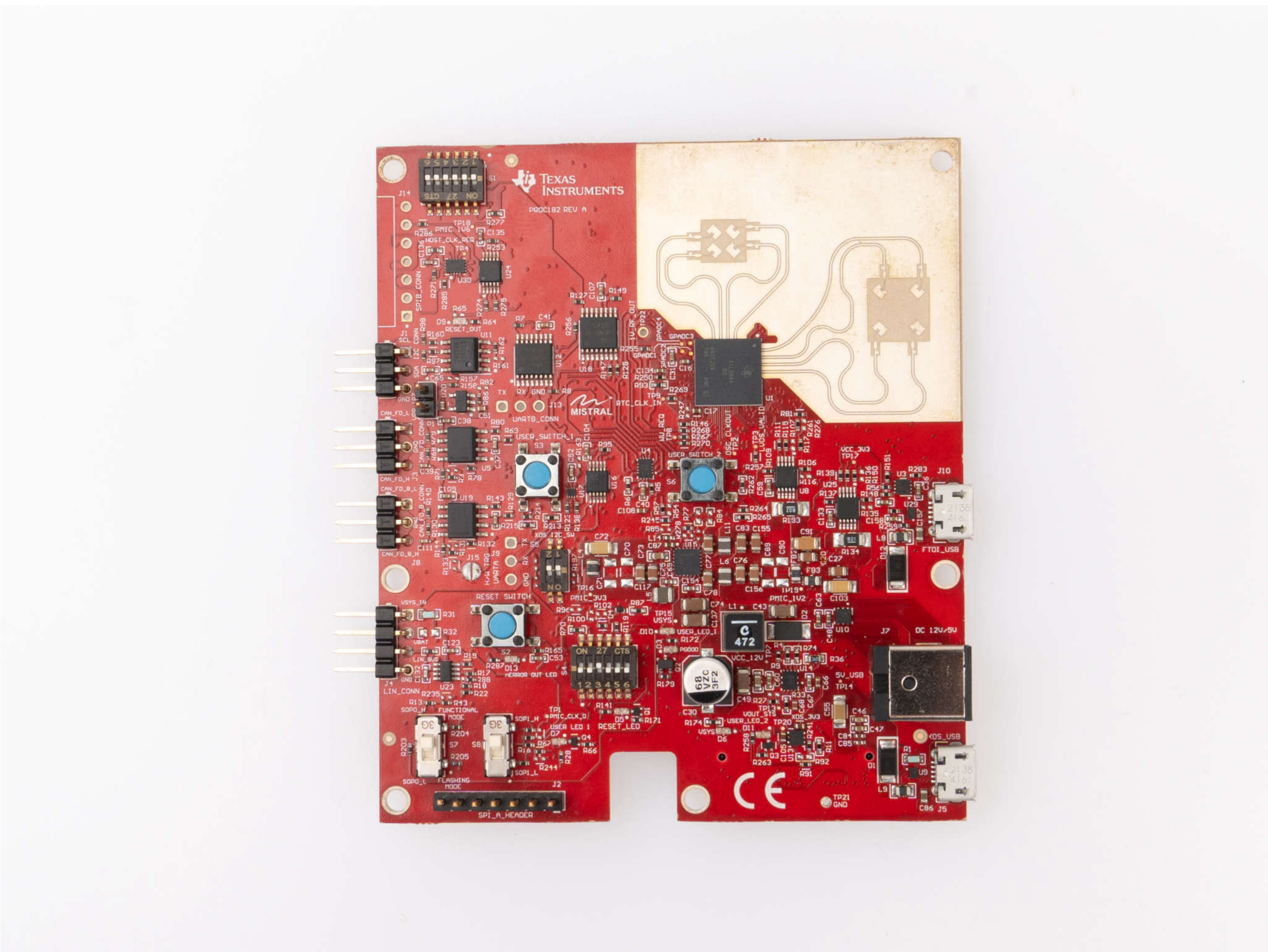


Figure 1-1. xWRL6844EVM

The xWRL6844 enables low-power 60GHz radar designs for automotive and industrial applications. In this document, you will find links to resources to get started with your SW evaluation of this radar solution.

Check out our technical article for an overview of how xWRL6844 enables low power, AI enabled in-cabin sensing.

2 Software Quickstart Guide

The following is a step-by-step overview to get the Out of Box demo running on the xWRL6844 device.

1. **Install Software**

   To get started, install the latest version of the mmWave Low-Power SDK 6 and the EVM drivers:

   a. Latest version of mmWave-L-SDK-6
   b. XDS110 drivers (bundled with CCS)
2. **Setup Demo Hardware / Software**

   a. Connect to EVM via the micro USB port at bottom right of board labeled XDS_USB. **You do not need to connect to the barrel jack.**
   b. Navigate to the MMWAVE-L-SDK download location and run the mmWave Radar Visualizer. The visualizer is located at <MMWAVE_L_SDK6_INSTALL_DIR>\mmwave_l_sdk_06_00_02_00\tools\visualizer\visualizer.exe.
3. **Flash Application Binary**

   a. Open the "Flash" tab in the visualizer and select the COM port of the EVM. *It should be automatically detected.* If not, look for the "XDS110 Class Application /User UART" COM port in your Device Manager, and select this port in the GUI. (Note: If you don't see the correct COM ports in the Device Manager, you need to install the XDS110 drivers listed in step 1 "Install Software" above).
   b. Then, select the xWRL6844 in the drop down. *It should be automatically detected.*
   c. Place the device into flashing mode by setting the switches as shown in the visualizer.

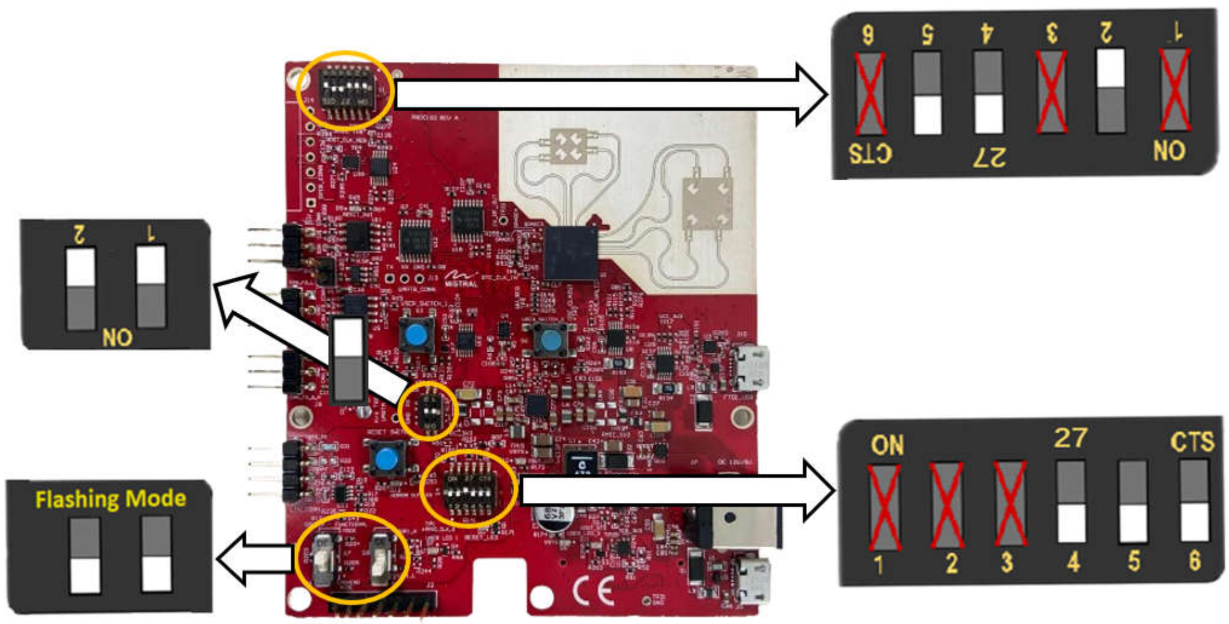


Figure 2-1. Flashing mode switch settings

   d. Then, press the Reset SWITCH/button to register the SOP settings. Reset button is labeled "RESET SWITCH".
   e. Finally, press "Switch Settings Confirmed" in the visualizer.

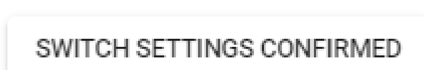


Figure 2-2. Confirm switch settings button

f. Select the desired device binary. The "Range-Doppler Image" (**mmwave_demo.release.appimage**) is the Out of Box binary. Also, custom binaries can be uploaded here.

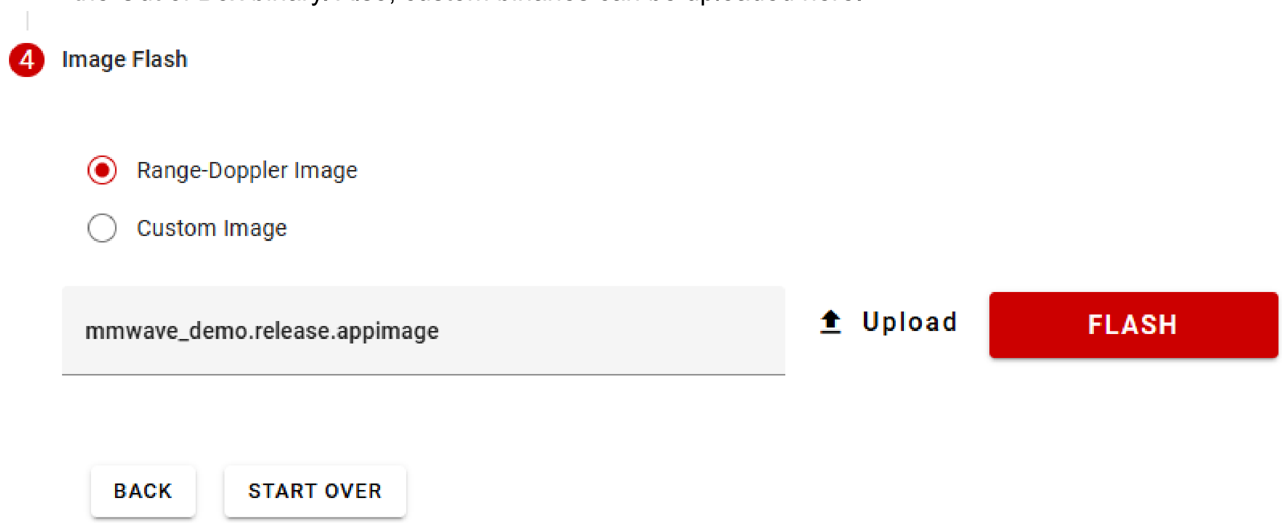


Figure 2-3. Image flash options

g. Select the "Flash" button. Upon a successful flash, you will receive a message that flashing was successful.

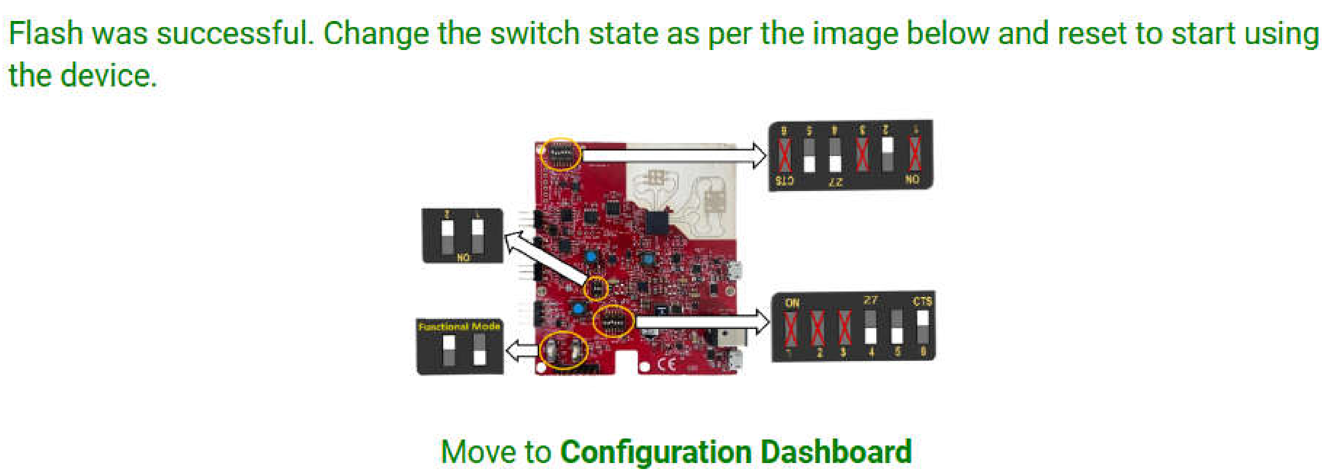


Figure 2-4. Successful flash

h. Change the switch state as per the settings shown in the visualizer at this stage; this places the device into functional mode. Then press the Reset SWITCH/button to register the SOP settings. (Note: For more help on device setup, see Section 2.3 of the EVM User's Guide on Switch Settings.)

4. **Send Chirp Configuration**

   Move to the "Configuration Dashboard" tab in the visualizer.

a. First confirm the COM ports and baud rate is correct. Then, under "Configuration Selection", select your desired configuration. The 4TX 4RX TDM configuration is the default configuration.

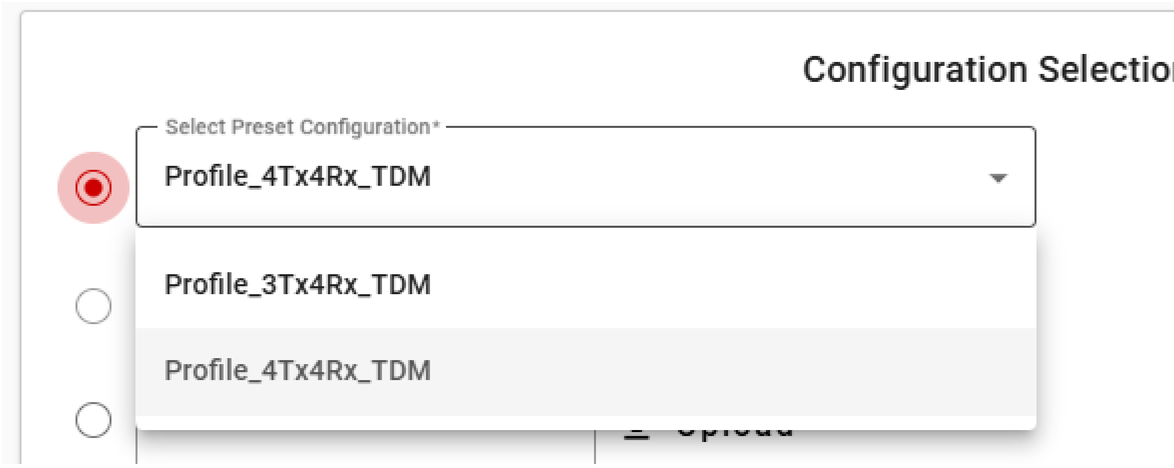


Figure 2-5. Configuration selection

b. Finally, select "Send Selected Config". (Note: CLI output can be seen in the bottom right pane)

5. **View Plots**

   Once the commands are set, the Visualizer will open the "Plots" tab and display real-time visualizations of radar data.

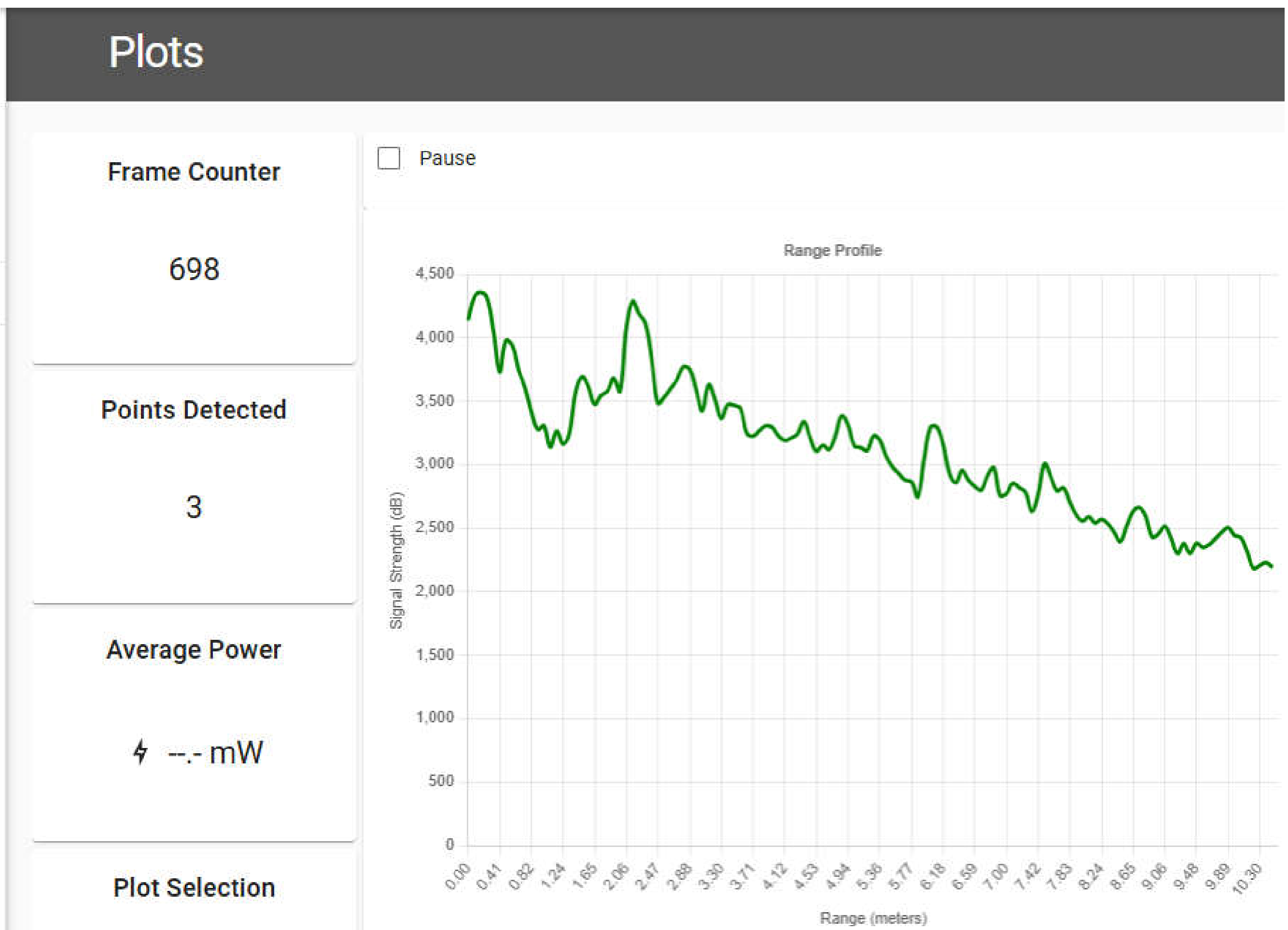


Figure 2-6. Radar data visualization

3 Software Evaluation Flow

The mmWave Radar products have an ecosystem of resources to help you with RF evaluation, application performance evaluation and software design.

3.1 About Radar Evaluation

There are three major components to TI's radar demonstrations. These are the chirp configurations, device binary, and visualizer. A general evaluation workflow is as follows:

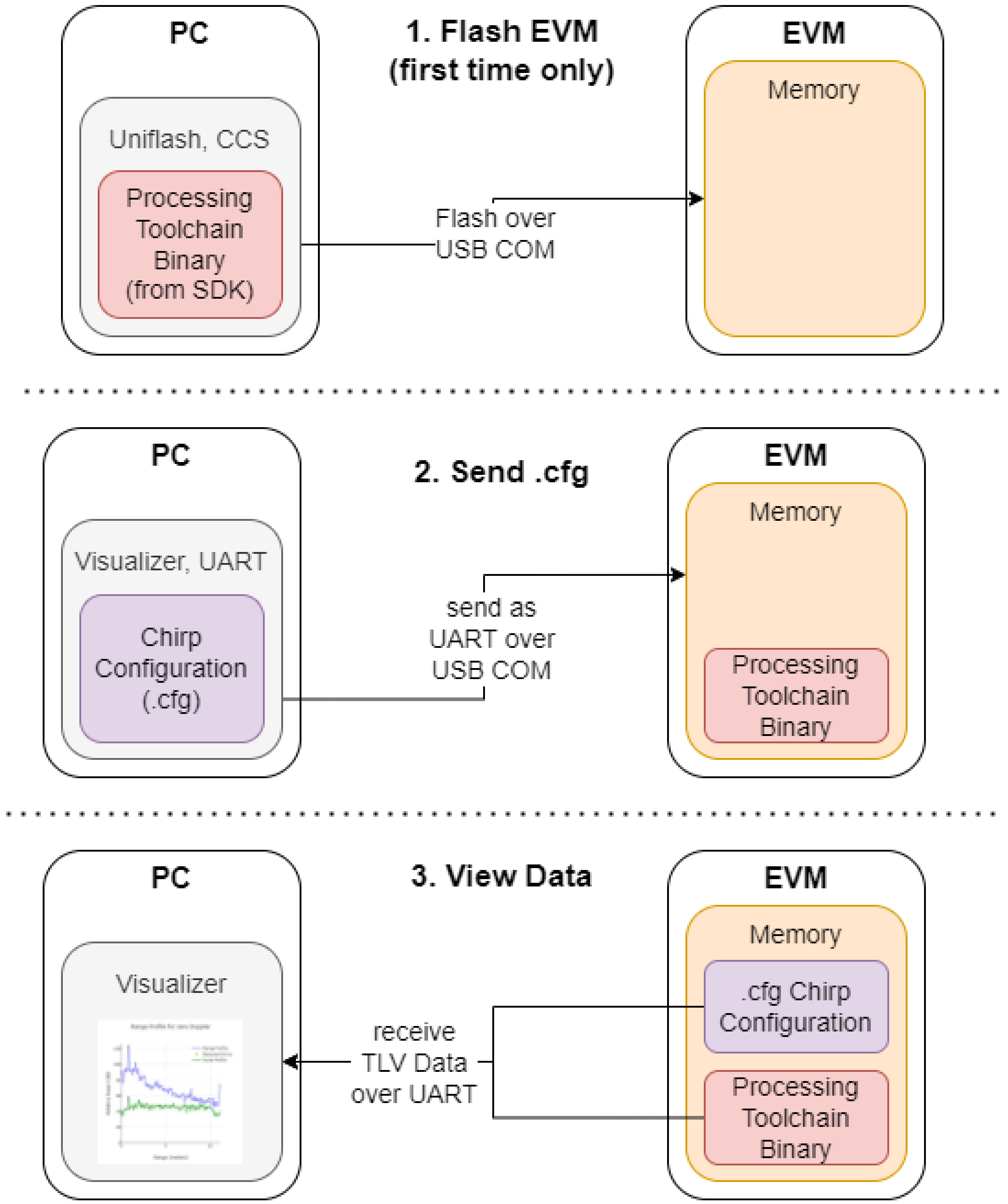


Figure 3-1. Three steps for evaluation

Chirp Configuration

Fundamentally, mmWave FMCW radars transmit pulses called *chirps* which, after reflected off of a target, can be used to determine the target's range, velocity and azimuth.

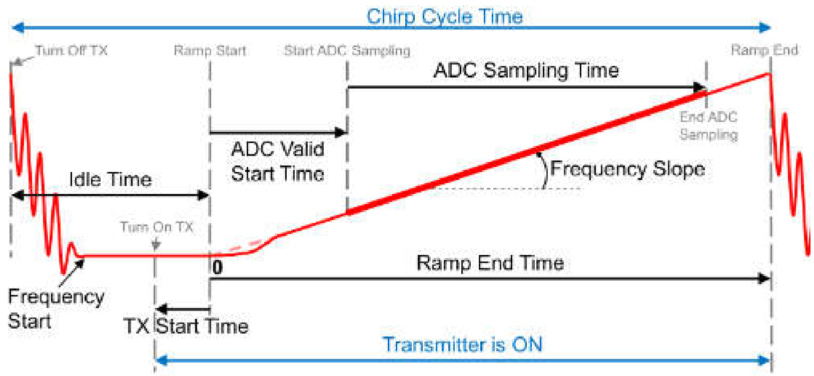


Figure 3-2. Configuration diagram

By tuning the physical characterstics (such as frequency slope and number of chirps), a radar's range, resolution, and power consumption can be optimized. TI mmWave radar devices store chirp characteristics in **Chirp Configuration** files. The chirp configuration file may also contain parameters for algorithmic and application specific modifications. Chirp configurations are uploaded to the device over UART at runtime, allowing for chirp and demo modifications without needing to reflash the device with a new binary.

Application Binary

Raw data from these reflected chirps are processed on-device by a signal chain on the **application binary**. This firmware is flashed onto the device and processes raw radar data into real-time position and velocity information. Application specific binaries targeted for specific applications, such as Child Presence Detection, can be found in the Radar Toolbox in the TI Resource Explorer. Once processed, the device will begin sending this real-time position and velocity information in the TLV format over UART to the user's computer to be visualized.

Visualizers

Visually verifying the radar's output in real-time is useful for evaluation. Visualizers can take the EVM's UART output and render the point cloud and classification information in 3D space. A general-purpose visualizer is found in the MMWAVE-L-SDK and application specific visualizer can be found in the Radar Toolbox.

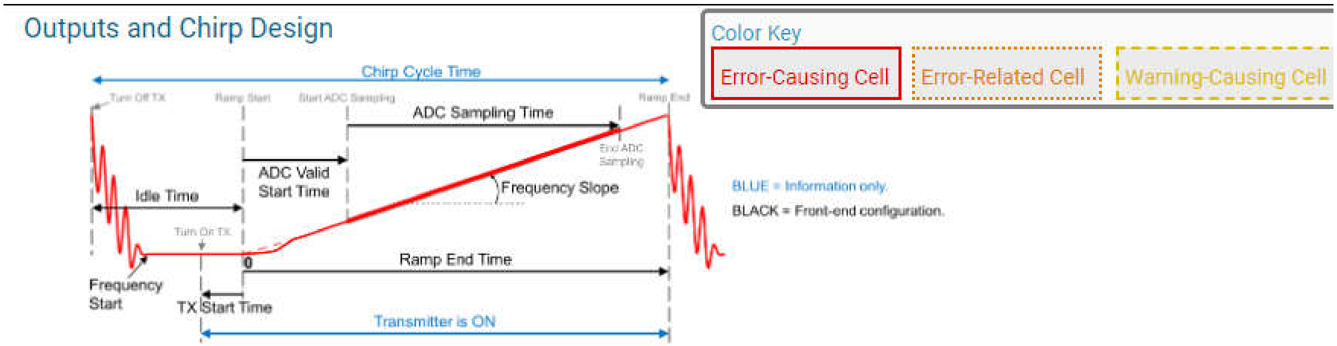
3.2 More Resources

Radar Toolbox

In TI Resource Explorer, you can find the Radar Toolbox which houses getting started information, software documentation, and example software demos for a range of industrial, personal electronics and automotive applications. Once a user has the SDK out of box demo running, the Radar Toolbox is the next step to finding radar SW for your project.

Sensing Estimator

The Sensing Estimator tool can be used to estimate the range and resolution of a provided configuration. Navigate to the "Advanced Chirp Design and Tuning" tab and paste your configuration to get started.



Chirp Configuration Parameters

Frequency Start (GHz)	60	# of Chirp Loops	27
Frequency Slope (MHz/us)	70.923	Frame Periodicity (ms)	100
Frequency Slope Constant	1469	Idle Time (us)	7
Sampling Rate (ksps)	5.914	ADC Valid Start Time (us)	5.700
# of Samples per Chirp	249	Ramp End Time	48.801
# of Burst in a Frame	1	# of Chirps in a Burst	54
		Burst Periodicity (us)	3121

Figure 3-3. Sensing Estimator

You can also estimate the power consumption of a given configuration in the "Power Estimator" tab pictured below.

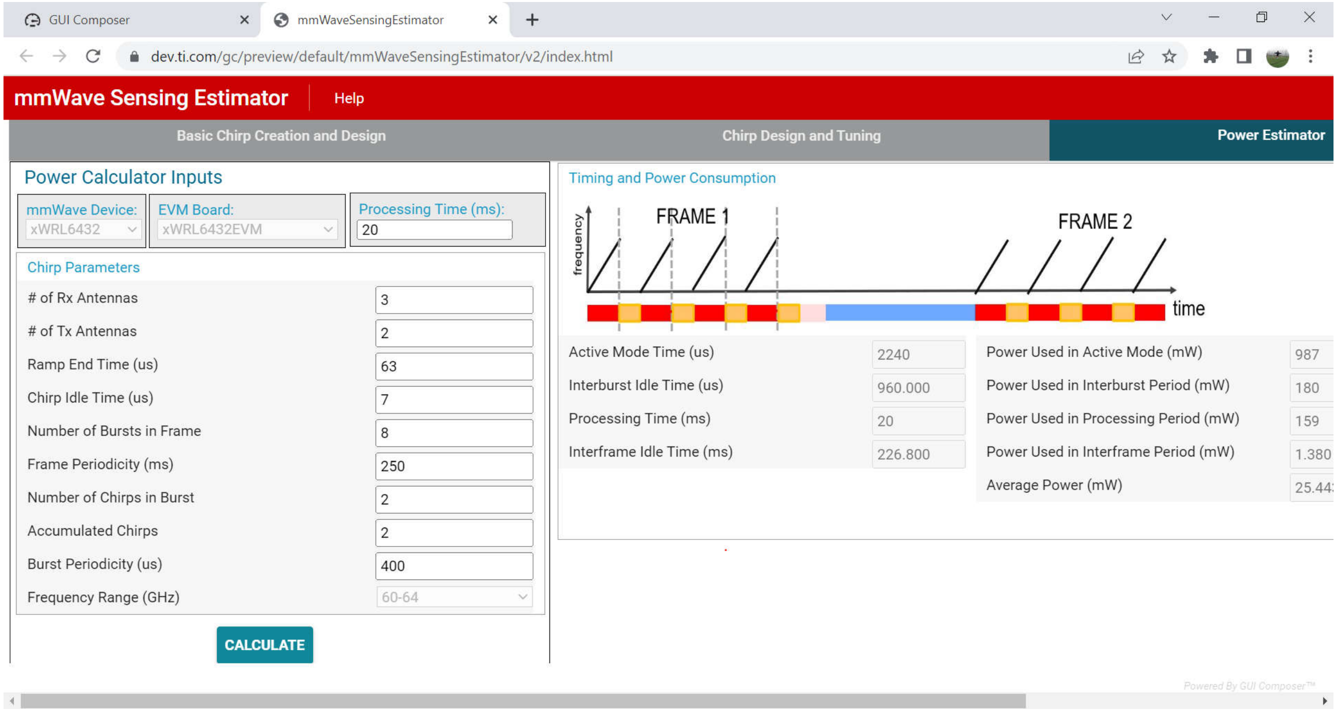


Figure 3-4. Power estimator

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