Technical Article

Making mmWave Easier – Part 1

Millimeter-wave (mmWave) radar sensing systems provide rich data sets of range, velocity and angle data, but have typically been difficult to understand and challenging to implement. The team I work on is actively developing different tools to help you do three things: **discover** more about mmWave, **evaluate** examples and demos that show the capabilities of mmWave technology, and **design** your own solutions faster.

In this first installment, I'll review tools available in TI Resource Explorer, which is an organized repository of device-specific documentation, labs and examples. With TI Resource Explorer, you can quickly access tools and load various software components onto your devices for fast demonstration and prototyping. You can also find TI Resource Explorer directly inside the Code Composer Studio™ integrated development environment.

Discover mmWave

After reading about mmWave technology, you may have wondered, "What can mmWave 'see'? Can I use it to measure X?" You'll find the answers to these questions in Experiments, shown in Figure 1. Experiments are short tests that TI mmWave engineers performed using existing source-code packages to demonstrate the sensing capabilities of mmWave in different scenarios, along with the methodology so that you can replicate TI's results for your own proof of concepts and demonstrations. You can use Experiments to determine if your own application is feasible.

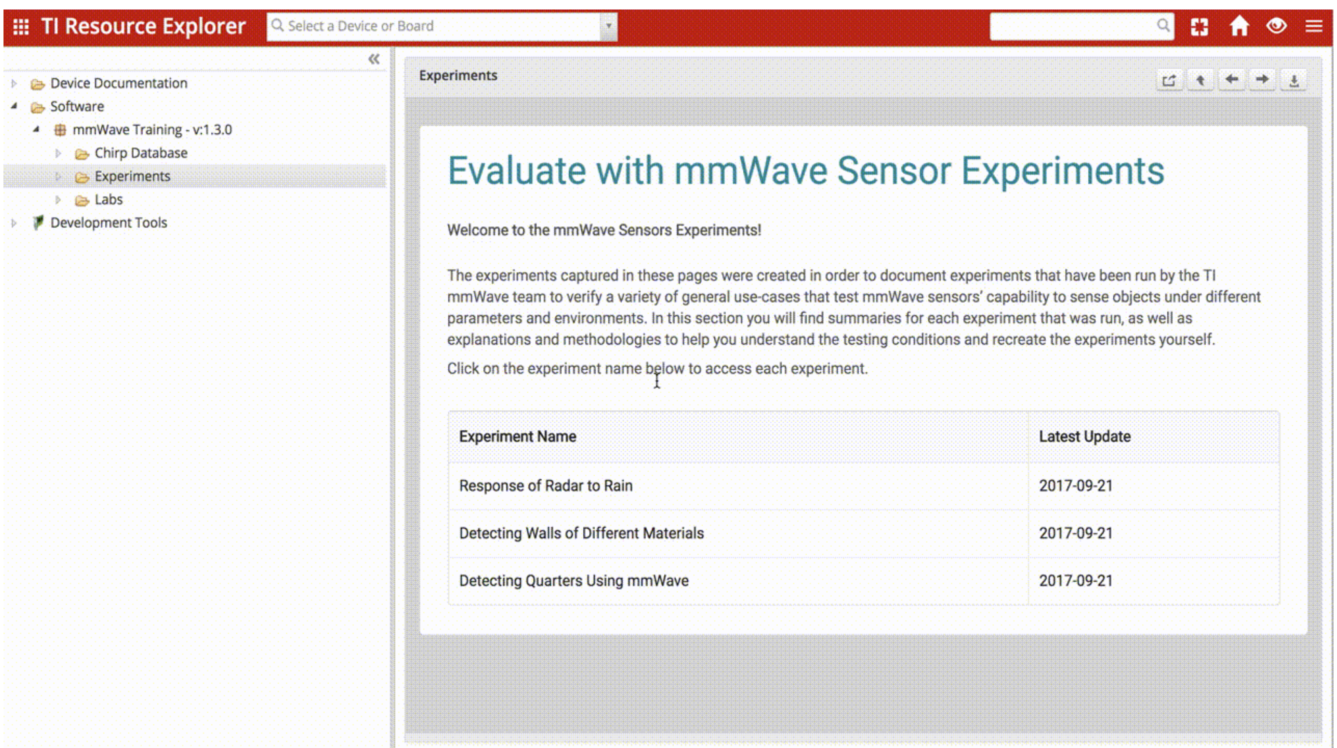

Figure 1. mmWave Experiments on TI Resource Explorer include complete descriptions, including setup and testing methodologies, so that you can easily reproduce the results

The inaugural launch of this section of TI Resource Explorer includes five experiments: detecting coins, detecting walls (including glass), measuring height of objects, detecting very fine motions, and seeing objects through rain. We will add more experiments in the future based on your feedback and questions in TI E2E™ Community forums.

Evaluate the Capabilities

Release v01.01.00.02 has dramatically simplified the TI mmWave software development kit (SDK) installer, shown in Figure 2. You can now install the mmWave SDK and all dependency packages in a single installer.

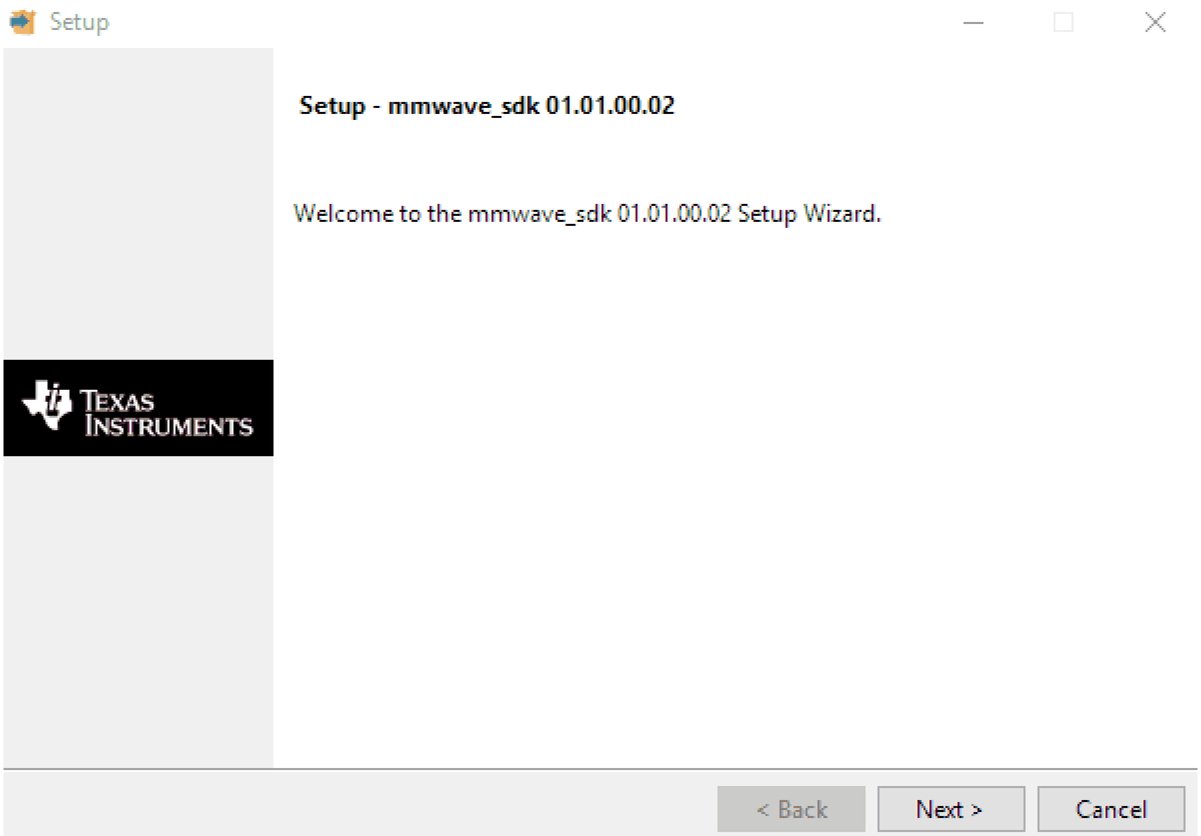

Figure 2. The mmWave SDK installer for version v01.01.00.02 brings the installation of all dependent packages into the main SDK installer

TI cloud tools will automatically detect mmWave sensor evaluation modules (EVMs) shipped after October 2017 once you've plugged the EVM into a computer and opened TI Resource Explorer. This automatic detection will enable you to see a pre-filtered view of available TI Resource Explorer offerings for a given device/EVM, including labs, experiments and chirp database entries, and get started faster with the different resources TI has available to accelerate the evaluation process.

Using the Labs in TI Resource Explorer, shown in Figure 3, you can quickly and easily reproduce and bring up different examples and demos using mmWave sensors. Each Lab contains a user's guide, release notes and a Code Composer Studio project ready for importing. If you access TI Resource Explorer through Code Composer Studio software directly, with a few clicks you can import and load a project into your environment without having to juggle separate installers or mess with project environments. Just click, import, build and load onto your EVM quickly.

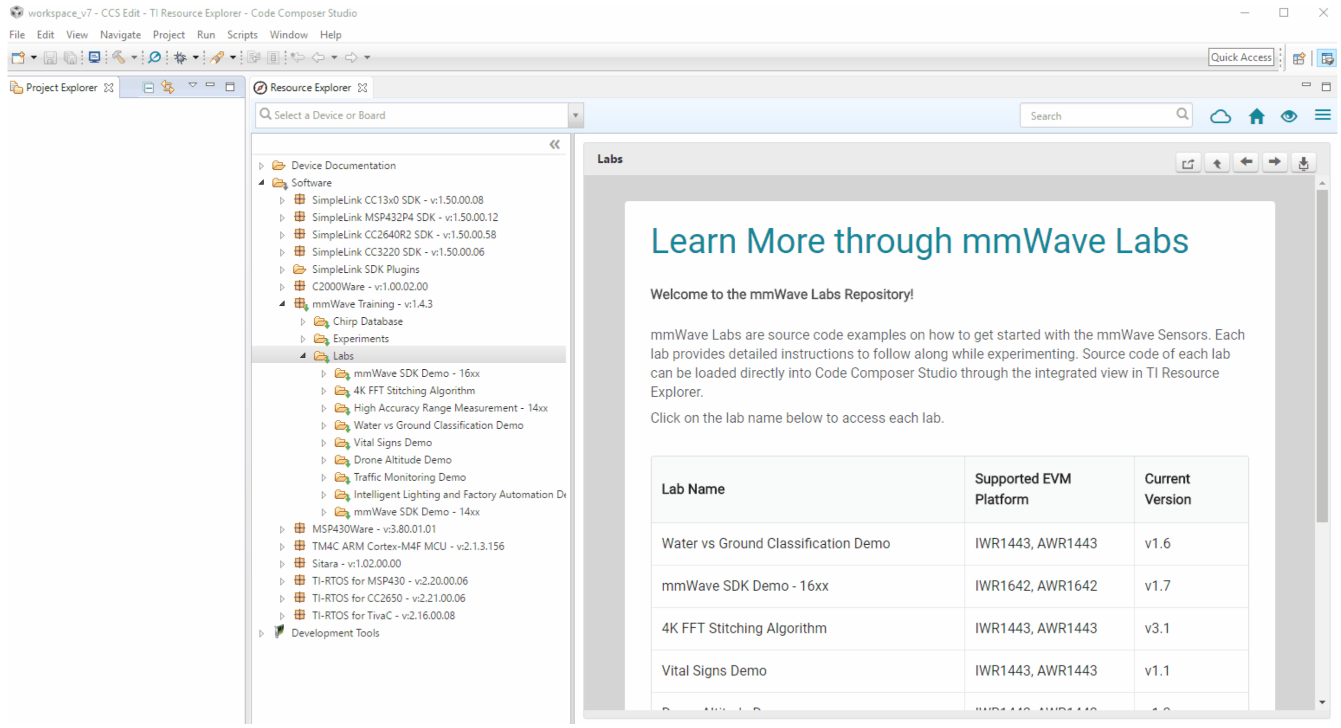

Figure 3. Using Code Composer Studio software simplifies importing and building mmWave Labs from TI Resource Explorer

Design Your Solution

The Chirp Database gives you options for multiple mmWave radio-frequency (RF) front-end chirp configurations implemented for very specific applications and/or end equipments. The database is sortable on various fields such as target device, range, velocity and range resolution. You can load the selected configuration directly into the mmWave Sensing Estimator shown in Figure 4.

The Sensing Estimator's most recent update (to v1.2 in preparation for the chirp database) improves readability and ease of use. We've provided a diagram of a typical frequency-modulated continuous-wave (FMCW) radar chirp for easier understanding of the highlighted parameters.

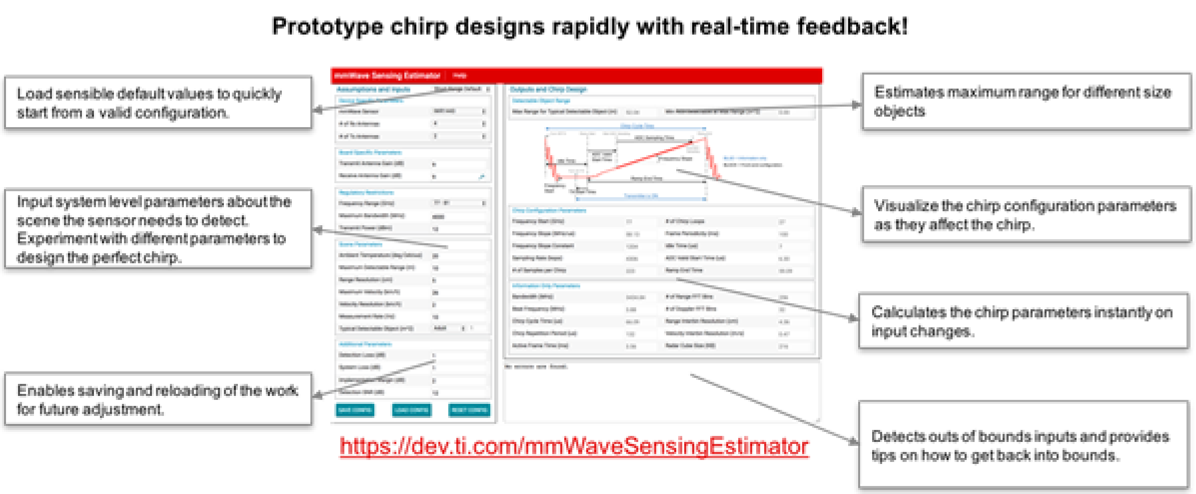

Figure 4. The mmWave Sensing Estimator allows you to input system-level parameters such as distance to targets, resolutions, etc., in order to validate whether an application is feasible and calculate the chirp parameters

mmWave is a new and powerful technology, but designing applications using mmWave radar sensors shouldn't be difficult. These TI tools are designed to be leveraged at various points in your evaluation and development cycle, to help speed time to market and make it easier to bring a solution from idea to prototype to production.

Additional Resources

- Learn more about mmWave on TI Resource Explorer
- View the mmWave Training Series.