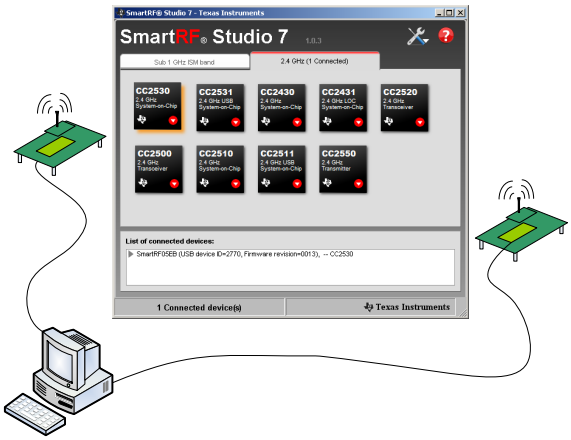
SmartRF™ Studio 7 Overview

Low Power RF Development Tools

Texas Instruments

What is SmartRF Studio 7?

- SmartRF Studio 7 is a tool for evaluating TI LPRF ICs and for generating device register values
- The program can also be used to test RF performance and to test and tune customer specific hardware solutions



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SmartRF Studio 7 is a PC application to be used in combination with several development kit for Texas Instruments' "CCxxxx" RF-ICs. It runs on Windows 2000, XP, Vista (32 bit) and 7 (32 bit) and uses either USB or parallel port to communicate with the evaluation board (EB) which has an evaluation module (EM) with the RF chip mounted. A radio on custom boards can also be tested with SmartRF Studio by wiring it to an EB board or a CC Debugger.

SmartRF Studio 7 helps designers of radio systems to easily evaluate the RF-IC at an early stage in the design process. The program provides an easy-to-operate PC interface to all of the chip's radio configuration registers, and it is very helpful for quick testing and finding the necessary radio settings.

It can also be used without any hardware, but then only to generate, edit and export radio register values.

SmartRF Studio 7 – What's New?

- New user interface
- Two operating modes
  - "Easy mode" with predefined register values and packet data
  - "Expert mode" with full control of the RF device
- New register view with read and write functions and full description of each register
- XML based configuration
- Script module (supports Perl)

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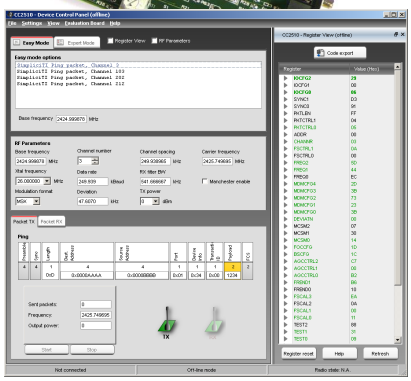
SmartRF Studio 7 is a major update from SmartRF Studio 6.x.x (and earlier). The tool has been redesigned from ground up, focusing on flexibility and ease of use. The most apparent change is the new look and feel, aiming at making more information available and presenting it in an intuitive and easily understandable way.

The tool now has two main operating modes: In "Easy Mode", the user can easily get started with their design by using predefined register values and packet engine configuration. In "Expert Mode", the user can fine tune all settings and is given more flexibility when configuring how the device should operate.

All of the device configuration and register settings are stored in XML files, making it possible to add custom configuration settings and to parse and reuse the files by external tools. The all new script extension is particularly useful for customers who want to automate some of the test functions found in SmartRF Studio.

SmartRF Studio 7 Features

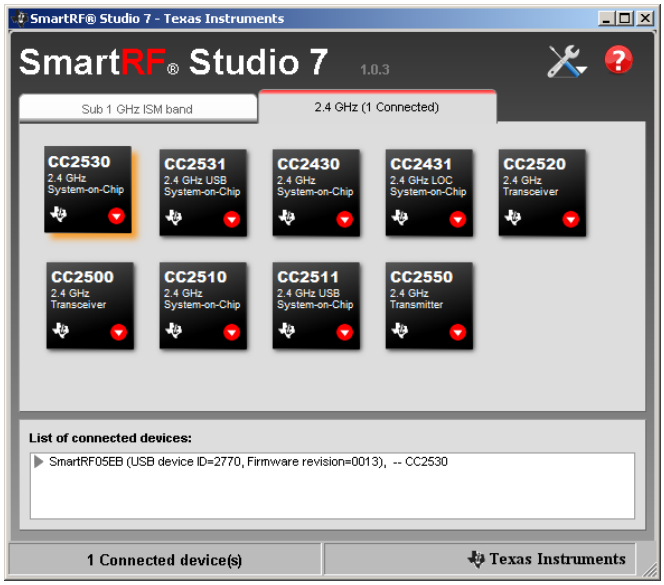
- Quick and simple performance testing
  - *Continuous TX for antenna testing and RF spectrum analysis*
  - *Continuous RX for radiation testing*
  - *Packet sending and receiving*
- Generate and export register values from common RF parameters
  - Frequency, data rate, modulation, output power, etc.
- Read and write individual registers
- Advanced remote control and configuration of the radio from the PC



TEXAS INSTRUMENTS

The main feature of SmartRF Studio 7 is that it has a control panel for direct access to the RF-IC's chip registers and packet engine features. It gives an overview of the many device specific features and provides full read and write access to the chip's radio registers.

SmartRF Studio 7 – Startup Window



TEXAS INSTRUMENTS

This is the startup window of SmartRF Studio 7.

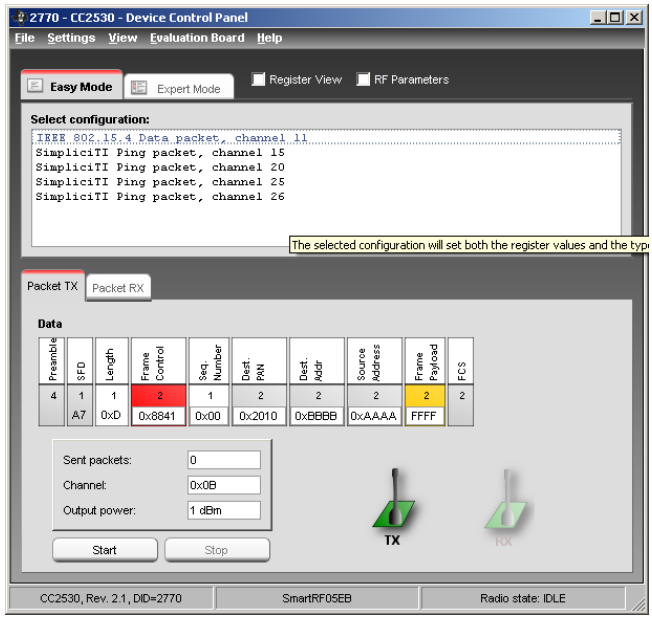
At the top, there are two tabs that lets you choose what product family you are working with: Either devices operating in the 2.4 GHz frequency band or devices in the sub-1 GHz band. The tab will show how many devices in each category are connected to the PC.

Each tab will have icons showing the supported devices. If there are any devices connected (either via a SmartRF Evaluation Board or a CC Debugger), the icon will be highlighted. If you double click one of the device icons, you will open the Device Control Panel for the device. The device control panel is either in online or offline mode. In online mode, you have direct access to the connected device, giving full control of the device. In offline mode, you can set the various RF parameters and export register values. More options will be available by right-clicking on the device icon.

If you connect a SmartRF Evaluation Board with a Evaluation Module (or a CC Debugger connected to a supported device), the board will appear in the list of connected devices. The corresponding radio device icon will also be highlighted. The list of connected devices will, including to show which radio is on the board, show details about the evaluation board – in particular the board's firmware revision. If you double click on the board in the list, and the firmware is not the most recent version, SmartRF Studio 7 will ask the user whether the firmware should be updated or not.

Note that the current version does not yet support older devices like CC1020, CC2400 and CC2420. These will be included shortly.

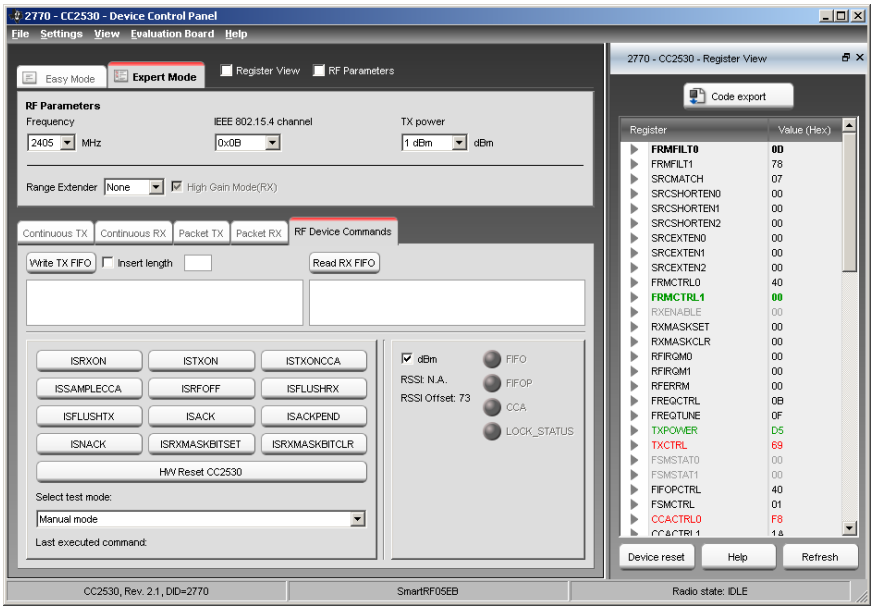
SmartRF Studio 7 – Device Control Panel



SmartRF Studio 7 has two main operating modes: Easy mode and Expert mode. In easy mode (default), the user can select protocol and default radio configuration from a list of predefined configurations. The protocol selection determines what kind of packets that should be sent from the radio when using the simple packet TX and RX test functions. The appropriate radio register values can be exported to an external user definable file by opening the “register view” and clicking the “Code export” button.

SmartRF Studio 7 has stored all configuration data and parameters in XML files. As a consequence, it is easy for users to add their own protocol definitions, packet types and associated RF parameters.

SmartRF Studio 7 – Device Control Panel



In expert mode, the user will get access to more advanced features and test functions for the device.

There are a number of test functions available:

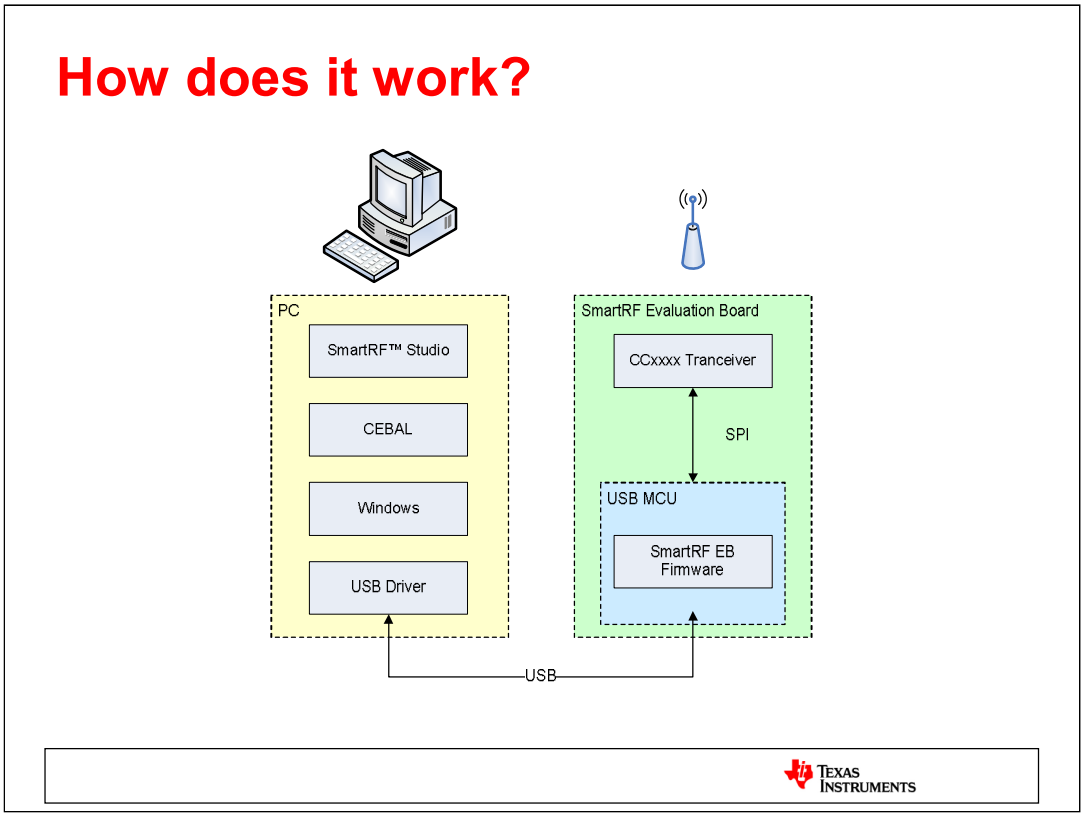
-Continuous TX for transmitting an un-modulated or modulated carrier. Also possible to set up frequency sweeps, which can be useful for measuring antenna bandwidth.

-Continuous RX for testing radiation in RX and for simple scanning of energy level on the given frequency.

-Send and transmit packets

-Send individual strobe commands (for advanced users)

In addition, the register view window will give an accurate representation of the register values currently on the chip. Color coding is used to identify the origin of the register value (reset value, typical/recommended setting, changed by user in RF parameter panel, changed by user in the register view or changed dynamically by the radio).



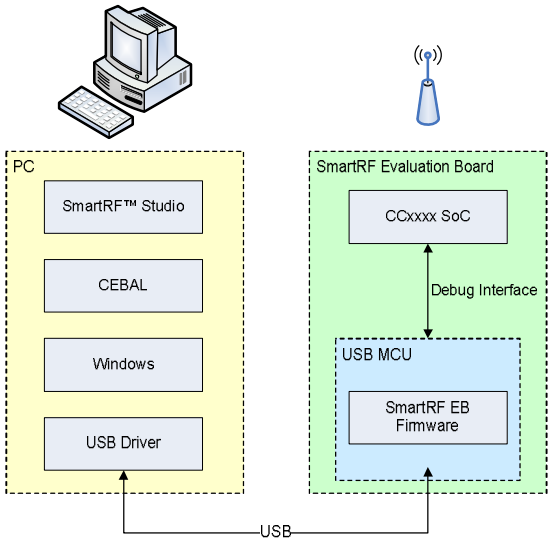
SmartRF Studio 7 communicate with the Evaluation Board over the USB interface via a library called CEBAL (Chipcon Evaluation Board Access Layer). This is a SW library developed to interface the USB driver and firmware running on the evaluation board, containing all the functions required to read/write data over the SPI interface between the USB MCU and the Transceiver or the debug interface in case of a System-on-Chip.

For proper operation of the applications using CEBAL, the board will need to have compatible firmware running on the USB MCU. If the firmware is out of date, SmartRF Studio 7 will propose that the user updates the firmware. The firmware update can be done directly in SmartRF Studio 7.

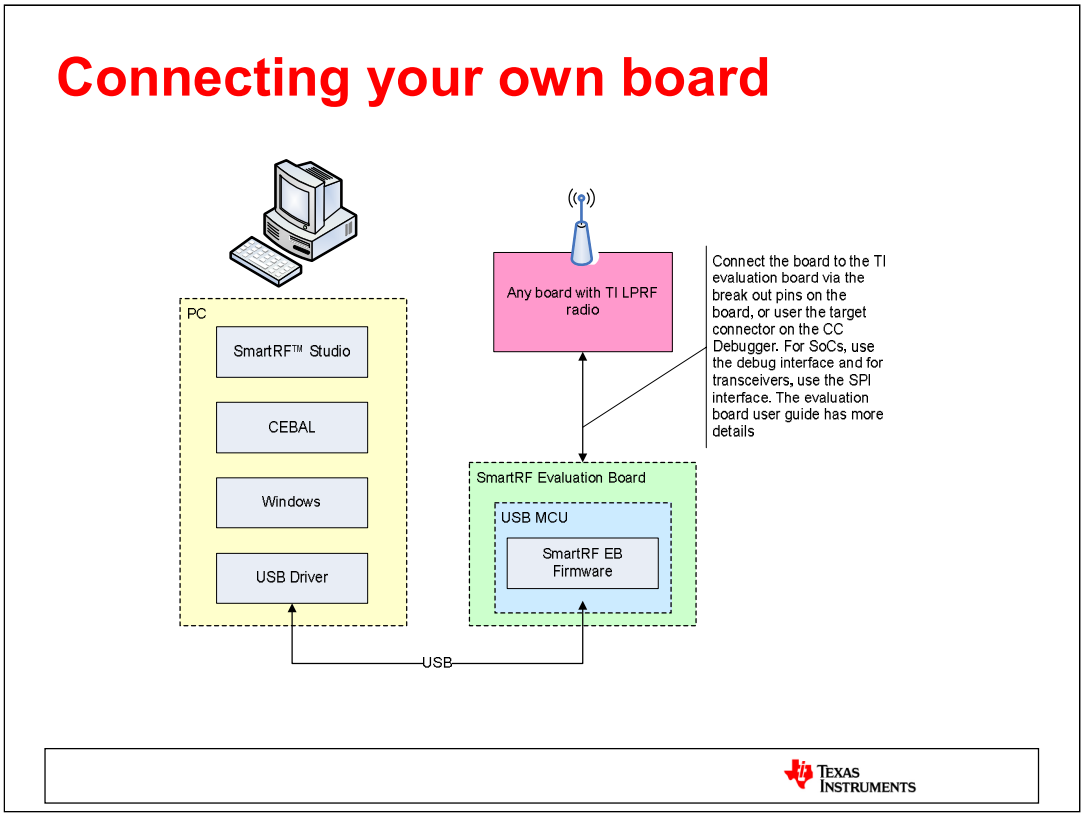
SmartRF Studio 7 will send requests to the USB MCU. The USB MCU will handle the request and apply the appropriate read/write commands on the SPI or debug interface.

The USB driver is a licensed driver delivered by Thesycon:
http://www.thesycon.de/eng/home.shtml

How does it work?



For the SoC we use the same SW library on the PC side and the same FW on the USB MCU. The difference is that the USB MCU will use the debug interface to read/write data of the SoC.



It is of course possible to connect your own hardware to the SmartRF Evaluation Board to test your own radio design with SmartRF Studio. Connect the board to the TI evaluation board via the break out pins on the board, or user the target connector on the CC Debugger. For SoCs, use the debug interface and for transceiver, use the SPI interface. Please make sure the boards are properly connected and that the voltage levels are correct – especially if you are not using level converters and the voltage level on your board is different from the voltage level on the EB board (usually 3.3 Volt). There is more information in SmartRF05EB User's Guide and CC Debugger User's Guide.

Thank you for your attention!

If you have questions, find more information on

www.ti.com/smartrfstudio

or visit the TI Low-Power RF Forum at

http://e2e.ti.com/support/low_power_rf/default.aspx

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