The Radio Tool serves as a control panel for direct access to the radio, and can be used for both the radio frequency (RF) evaluation and for certification purposes. This guide describes how to have the tool work seamlessly on Texas Instruments™ evaluation platforms such as the BoosterPack™ plus FTDI emulation board for CC3120 devices, and the LaunchPad™ for CC3220 devices.

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1 Introduction

The SimpleLink™ MCU portfolio offers a single development environment that delivers flexible hardware, software and tool options for customers developing wired and wireless applications. With 100 percent code reuse across host MCUs, Wi-Fi®, Bluetooth® low energy, Sub-1GHz devices and more, choose the MCU or connectivity standard that fits your design. A one-time investment with the SimpleLink software development kit (SDK) allows you to reuse often, opening the door to create unlimited applications. For more information, visit www.ti.com/simplelink.

The main use of the Radio Tool is to serve as a control panel for direct access to the radio. The tool can be used for the radio frequency (RF) evaluation, and for certification purposes (such as FCC, ETSI, Telec, and so on). The tool is expected to work seamlessly on TI evaluation platforms: BoosterPack™ plus FTDI emulation board for CC3120 devices, and LaunchPad™ for CC3220 devices. If customers want to use the tool on their final platform, refer to Section 10. The I/O levels of these lines should be kept at VBAT level (the same voltage that powers the CC3120 and CC3220 devices).

2 Features

- Connection
  - CC3120 through the SPI
  - CC3120 through the UART
  - CC3220 through the UART
- Acquires MAC address
- Acquires firmware information
- TX – Transmission testing
  - Continuous
  - Packetized
  - Carrier Wave (CW)
- RX – Receiver testing
  - Statistics
  - Rate histogram
  - RSSI histogram

3 Prerequisites

3.1 Software Downloads

- SimpleLink Wi-Fi Radio Testing Tool
- Microsoft .NET Framework 4.6.1

3.2 Hardware

- 1× CC3120 BoosterPack Plug-In Module (CC3120BOOST)
- 1× CC31XX Emulation BoosterPack Module (CC31XXEMUBOOST)
- 1× CC3220 LaunchPad with CC3220R, CC3220S, or CC3220SF
- 1× Micro-USB Cable
- 1× WLAN Tester and RF Equipment (for example, spectrum analyzer)

See the latest complete list of supported SimpleLink hardware at CC3120 Release Notes and CC3220 Release Notes.

4 Radio Tool Installation Directory

The installation process is made straightforward by following the steps. The default installation location is C:\TI\CC3120_CC3220_RadioTool_<version>, but users can change it to anywhere they want.

Table 1 lists the file directory structure after installation.

<table>
<thead>
<tr>
<th>Folder Name</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>RadioToolApplication</td>
<td>The Radio Tool GUI application (RadioToolGUI.exe), Radio Tool CLI application (RadioToolCLI.exe), and three precompiled DLL files (CC3120LibSPI.dll, CC3120LibUART.dll, CC3220Lib.dll).</td>
</tr>
<tr>
<td>RadioToolApplication_Source</td>
<td>The Radio Tool application source for development. Use Visual Studio to open the file CC3x20_RadioTool.sln.</td>
</tr>
<tr>
<td>CC3220BoardApplication_Binary</td>
<td>CC3220 MCU images. Use these images with Uniflash to flash an MCU image onto the device. See Section 6.</td>
</tr>
<tr>
<td>CC3220BoardApplication_Source</td>
<td>CC3220 MCU image source for development. Place the radiotool folder under the CC3220 SDK example directory, and use Code Composer Studio™ (CCS) to open the project in the CCS folder inside.</td>
</tr>
</tbody>
</table>
5 Hardware Connections

5.1 CC3120BOOST Plus CC31XXEMUBOOST

Figure 1 shows how to mount the CC3120BOOST on top of the CC31XXEMUBOOST. Ensure P1.1 of both boards is aligned with each other, as indicated by the white arrows on the boards.

Connect the RF connector (J2 or J3) to a WLAN tester/RF equipment for measurements. Ensure the RF connection to the instrument is made before powering on the boards, so that the right load impedance is provided during power on.

![Figure 1. CC3120BOOST Mounted on Top of CC31XXEMUBOOST](image)

To power the platforms, connect the J6 port of CC31XXEMUBOOST to the Windows® PC using a micro USB cable, as shown in Figure 2. If the drivers are properly installed as mentioned during the SDK installation, the PC should recognize and list the connected device in the Device Manager, shown in Figure 3. For details on driver and SDK installation, refer to SimpleLink™ Wi-Fi® and Internet of Things CC3120 Software Getting Started Guide.
The RF path to J3 (Murata RF switch) is always present. To use J2 (uFL) for RF measurements, disconnect the path to the onboard antenna, and enable the path to the J2 connector.

5.1.1 Using the UART Interface

The emulation board enumerates the UART ports on the PC, as shown in Figure 3. Keep a record of the third port number, because it is needed later on for connection.

5.1.2 Using the SPI

The SPI does not require users to choose a specific COM port. Simply select the CC3120 SPI option in the tool to start the connection. However, with SPI connection, only one CC3120 can be connected to a PC at the same time, because the Radio Tool cannot determine which CC3120 device to connect to if multiple CC3120 devices are present. For large volume testing, TI recommends using the CC3120 UART.
5.2 **CC3220-LAUNCHXL**

Connect the RF connector (J18 or J24) to a WLAN tester/RF equipment for measurements, and the USB connector on the CC3220 LaunchPad to the PC. Ensure the RF connection to the instrument is made before powering on the board, so that the correct load impedance is provided during power on.

The RF path to J24 (Murata RF switch) is the default. If users want to use J18 (uFL) for RF measurements, they must disconnect the J24 path and enable the J18 path.

The LaunchPad enumerates COM ports in the Device Manager on the PC, as shown in Figure 4. Keep a record of the Application/User UART port number, because it is needed later for the connection.

![Figure 4. XDS Connection Ports for CC3220](image)

6 **Flashing the Board**

The devices must be flashed with the correct ServicePack to operate this tool correctly. Every Radio Tool release has a corresponding ServicePack and SDK version. For the complete list, visit the CC3120 and CC3220 Radio Tool Wiki.

If using the CC3220 device, the Radio Tool application must be flashed in addition to the ServicePack. The precompiled application binary is in the CC3220BoardApplication Binary folder.

For instructions on flashing the devices, refer to the Image Creator Guide for details.

7 **Running the RadioTool GUI**

The GUI tool provides a user-friendly interface for using the Radio Tool.

7.1 **Set Up Tab and General Information**

Users have three types of devices for connection:

- **CC3120 SPI**
  
  This is not recommended to use because it is limited to connecting to one CC3120 board with this protocol. If more than one CC3120 is present, CC3120 UART is the recommended connection.

- **CC3120 UART**

- **CC3220 UART**

With the UART connection type selected, users can pick from a list of known COM port and baud rates. Click on the blue spinning arrows on the right to refresh the list if the COM port does not appear.

Upon a successful connection, the Details box on the left provides detailed device information on the connected device (see Figure 5). Before proceeding ensure the board is flashed with a desired image version.

FW Ver. (or Firmware version), is arranged as follows: `<NWPversion>.<FWversion>.<PHYversion>`

The CC3220 App Ver. information is applies only to CC3220, and indicates the radio tool application version flashed onto the device.

The only supported baud rate now is 115200.
7.2 GUI TX Testing

Table 2 lists the three types of TX testing that are supported.

Table 2. TX Testing

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packetized</td>
<td>Each packet is sent one at a time from the application MCU to the network processor. A large delay between packets exists in this mode. This mode is generally used for RF evaluation.</td>
</tr>
<tr>
<td>Continuous</td>
<td>This is a test mode where the network processor sends packets back to back in an internal loop, without the intervention of the host MCU. The delay between packets is typically very small, and hence useful for FCC/ETSI certification purposes where high-duty cycle is required. This mode is used only for emission certification.</td>
</tr>
<tr>
<td>Carrier Wave (CW)</td>
<td>In this mode the device transmits an unmodulated RF tone. The frequencies can be selected in 312.5-KHz steps. The power output with tone 0 is very low. If higher RF power is desired use tone numbers other than 0.</td>
</tr>
</tbody>
</table>

Some fields are disabled or enabled, depending on the testing type users run. For example, the Amount parameter is disabled only when the Continuous testing type is selected.
Table 3 lists parameter explanations.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range (inclusive)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel</td>
<td>[1, 13]</td>
<td>802.11 2.4-GHz band Wi-Fi® channels. 14 is not supported.</td>
</tr>
<tr>
<td>Power level</td>
<td>[0 to 15]</td>
<td>0 is the maximum power, and 15 is the minimum power.</td>
</tr>
<tr>
<td>Tone</td>
<td>[-25, 25]</td>
<td>CW only. 0 is tone at center frequency. A value N between and within the range [-25, 25] means tone at offset N*312.5 kHz.</td>
</tr>
<tr>
<td>Rate</td>
<td></td>
<td>802.11 PHY data rate. Supported:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• DSSS: 1 Mbps, 2 Mbps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• CCK: 5.5Mbps, 11Mbps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• OFDM: 6/9/12/18/24/36/48/54 Mbps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• MCS 0-7</td>
</tr>
<tr>
<td>Preamble</td>
<td>[Long, Short]</td>
<td>802.11b preamble</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFDM preamble is automatically configured by the device when OFDM rates are selected.</td>
</tr>
<tr>
<td>Data pattern</td>
<td></td>
<td>Data pattern in the data field. Supported:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• All 0: 0x00, 0x00, 0x00…</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• All 1: 0xFF, 0xFF, 0xFF…</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Incremental</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Decremental</td>
</tr>
<tr>
<td>Size</td>
<td>[24, 1400]</td>
<td>Packet size in bytes</td>
</tr>
<tr>
<td>Delay</td>
<td>[100 to 1,000,000]</td>
<td>Delay of transmission in milliseconds (ms)</td>
</tr>
<tr>
<td>Amount</td>
<td>[0 to 1,000,000]</td>
<td>Number of packets to transmit. A value of 0 indicates infinite number of packets.</td>
</tr>
<tr>
<td>Override CCA</td>
<td></td>
<td>Enable this field for CCA (Clear Channel Assessment) override if the Wi-Fi environment is too congested to have a reliable periodic transmission.</td>
</tr>
<tr>
<td>CCA threshold</td>
<td></td>
<td>The channel is considered occupied when the signal strength is above this setting. Supported:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• –88 dBm (MIN)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• –78 dBm (LOW)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• –68 dBm (DEFAULT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• –58 dBm (MED)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• –48 dBm (HIGH)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• –38 dBm (MAX)</td>
</tr>
<tr>
<td>Enable ACKs</td>
<td></td>
<td>Enable ACKs</td>
</tr>
<tr>
<td>Destination MAC address</td>
<td></td>
<td>Destination MAC address in packets</td>
</tr>
<tr>
<td>Country</td>
<td></td>
<td>Set device country code. Supported: US, EU, JP.</td>
</tr>
</tbody>
</table>
7.3 GUI RX Testing

RX testing is used for gathering Wi-Fi statistics in the air within a specified channel.

**Duration:** Statistics gathering time can be specified with a fixed duration, or 0 to make the testing time indefinite, until the user presses the STOP button. Statistics are gathered automatically whenever the RX testing is stopped. However, users may choose to gather the statistics any time before RX testing ends by clicking the Get Statistics button. Table 4 lists fields explanations.

Table 4. Fields Explanation

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>Valid packets</td>
</tr>
<tr>
<td>Addr Mismatch</td>
<td>Packets with address mismatch</td>
</tr>
<tr>
<td>FCS Error</td>
<td>Frame Check Sequence error</td>
</tr>
<tr>
<td>Mang frame</td>
<td>Average RSSI in management frames</td>
</tr>
<tr>
<td>DataCtrl frame</td>
<td>Average RSSI in Data Control frames</td>
</tr>
</tbody>
</table>
Figure 7 lists the RadioTool GUI in the RX Tab.

![RadioTool GUI in RX Tab](image-url)
Figure 8. RadioTool GUI in RX Tab With Running in Progress
Figure 9 shows gathered statistics. Rates and RSSIs are displayed as percentages.
Users may also click on the Show Graph buttons to show a bar graph representation of rates or RSSI.

**Figure 10** shows the RSSI histogram graph in amounts.

![RSSI Histogram Graph in Amount](image)

**Figure 10. RSSI Histogram Graph in Amount**

**Figure 11** shows the rate histogram graph in percentages.

![Rate Histogram Graph in Percentage](image)

**Figure 11. Rate Histogram Graph in Percentage**
8 CLI Version

The CLI tool provides a traditional command line version of the Radio Tool. This version is especially useful when performing large-scale automated testings. The RadioToolCLI.exe application is in the RadioToolApplication directory. Use CMD or batch files to execute the commands.

RadioToolCLI [-h|--help] [-i|--info]

Options:
Miscellaneous:
-h, --help Shows this message
-i, --info Shows RadioToolCLI and radio tool library version and information.
-v increase debug message verbosity

Device Connection:
-X, --target=TARGET The TARGET testing device. 0:CC3120 SPI, 1:CC3120 UART, 2:CC3220 UART. REQUIRED. Range: [0, 2]. Default: 1
-P, --port=VALUE The port number of the target testing platform. Required for UART connections. Range: [0, 255].
-B, --baud_rate=BAUD RATE The BAUD RATE of the target COM port. Required for UART connections. Range: [0, Int32.MaxValue].
-M, --mac Returns the MAC address
-F, --firmware Returns the firmware version and CC3220 application version (if applicable) in the following order:

Common for TX and RX:
-t, --duration=DURATION RX/TX Testing DURATION in seconds for -T and -R options. Range: [1, 65535]. Default: 1
-c, --channel=CHANNEL RX/TX Testing CHANNEL for -T and -R options. Range: [1, 13]. Default: 1

TX (Transmission):
-t, --tx TX testing for Continuous or Packetized.
-z, --tx_type=TX_TYPE TX Testing TX_TYPE. 1:Continuous, 2:Packetized, 3: CW. 'tone_offset' option can be used if and only if CW is chosen. Range: [1, 3]. Default: 1.
-w, --power=POWER TX POWER attenuation for Continuous and Packetized testing. 0 being the maximum power and 15 being the minimum power. Range: [0, 15]. Default: 0
-f, --tone_offset=TONE_OFFSET TX TONE_OFFSET for CW testing only. A value of N means tone at offset N*312.5kHz. Range: [-25, 25]. Default: 0
-m, --rate, --modulation=MODULATION TX Testing rate (with the corresponding MODULATION). Range: [1, 20]. Default: 1 (1Mbps DSSS).
1: 1 Mbps (DSSS)
2: 2 Mbps (DSSS)
3: 5.5 Mbps (CCK)
4: 11 Mbps (CCK)
5: NOT SUPPORTED
6: 6 Mbps (OFDM)
7: 9 Mbps (OFDM)
8: 12 Mbps (OFDM)
9: 18 Mbps (OFDM)
10: 24 Mbps (OFDM)
11: 36 Mbps (OFDM)
12: 48 Mbps (OFDM)
13: 54 Mbps (OFDM)
14: MCS 0
15: MCS 1
16: MCS 2
17: MCS 3
18: MCS 4
19: MCS 5
20: MCS 6
21: MCS 7

-e, --preamble VALUE   TX preamble for 802.11 rates ONLY. Long:0, Short:
1: Default: Long

-r, --pattern VALUE    TX data pattern. See the following for the
complete list. Default: 0 (All 0)
0: All 0
1: All 1
2: Incremental
3: Decremental

-l, --packet_size SIZE TX Testing packet SIZE. Range: [24, 1400]. Default: 1400

-g, --delay VALUE    TX delay in between packets in milliseconds.
Packetized TX only. Range:[100, 1,000,000]. Default: 100

-n, --amount VALUE   TX maximum number of packets. Continuous & Packetized only. Range:[0, 1,000,000]. 0 for
infinite amount. Default: 0

-o, --cca_override   TX CCA override enable. Default: non-overriding.

-s, --cca_threshold VALUE TX CCA threshold value. The channel is considered as occupied when signal strength is
above this setting. Default: 2 (-68dBm)
0: MIN (-88dBm) 1: LOW (-78dBm) 2: DEFAULT (-68dBm) 3: MED (-58dBm) 4: HIGH (-48dBm)
5: MAX (-38dBm)

-k, --enable_acks TX ACKs enabling. Default: disabled.

-a, --dest_mac MAC   TX destination MAC address WITHOUT colons. For example, if the MAC address is
Default: 01:23:45:67:89:AB

-y, --country_code VALUE TX Country Code in two ASCII characters.
Letters will be converted to upper case. Options: US, EU, JP. Default: US

RX (Reception):
-R, --rx RX testing and retrieves statistics. The
statistics will be shown as:
1st line:<# valid packets>, <# FCS error packets>, <#address mismatch packets>
2nd line: <Average RSSI in management frame>, <Average RSSI in other frames>
3rd line:
RSSI histogram. <greater than -48dBm>, <-48dBm to -55dBm>, <-56dBm to -63dBm>, <-64dBm to -71dBm>, <-72dBm to -79dBm>, <less than -79dBm>  

Rate histogram, lowest to highest.  
The list order is identical to the rate/modulation option.

-4th line:
5th line: Timestamps in micro-seconds: Starting time, Stats collecting time, Elapse
-d, --report_period=N RX statistics reporting period, every N seconds.
-p, --report_percent Report RX histogram in percentage format. If not set, default is in amount of packets.

The following are example commands:
::Show the help page
RadioToolCLI.exe -h

::Show the help page
RadioToolCLI.exe --help

::Show the help page
RadioToolCLI.exe /h

::Show the Firmware version and MAC address of CC3120 via UART
RadioToolCLI.exe -X1 -P7 -B115200 -F

::TX Continuous ::CC3120 via SPI ::channel 1 ::1Mbps DSSS ::max power ::packet size 1400bytes ::destination MAC address 01:23:45:67:89:AB ::infinite amount of packets ::long preamble ::all 0 pattern ::1 second testing time
RadioToolCLI.exe -X0 -T

::TX Continuous ::CC3120 via UART ::channel 1 ::54Mbps OFDM ::max power ::packet size 1400bytes ::destination MAC address 01:23:45:67:89:AB ::infinite amount of packets ::long preamble ::all 0 pattern ::10 seconds testing time
RadioToolCLI.exe -X1 -P7 -B115200 -T -z1 -c1 -m13 -w0 -l1400 -a 0123456789AB -n0 -e0 -r0 -t10

::TX Packetized ::CC3220 via UART ::channel 1 ::1Mbps DSSS ::max power ::packet size 512bytes ::destination MAC address EE:EE:EE:EE:0E:EE ::100ms delay ::long preamble ::incremental pattern
RadioToolCLI.exe -X2 -P7 -B115200 -T -z2 -c1 -m1 -w0 -l1512 -a EEEEEEEE0EEE -n0 -e0 -r1 -t10

::TX CW ::CC3120 via SPI ::channel 6 ::1Mbps DSSS ::-10 OFFSET (-3.125MHz)
RadioToolCLI.exe -X0 -T -z3 -c6 -m1 -f -10 -t10

::TX CW ::CC3120 via UART ::channel 6 ::show as amount of packets ::20 seconds testing time ::only report statistics at the end

::RX ::CC3120 via UART ::channel 6 ::show as number of packets ::20 seconds testing time ::only report statistics at the end

::sample output
693, 64, 0
-64, -64
128, 128, 211, 10, 2, 158, 184
492, 492, 2, 9, 0, 190, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
171504, 20212985, 20041481
RX Finished: SUCCESS

::RX ::CC3120 via UART ::channel 11 ::show as percentage ::5 seconds testing time ::report statistics every 1 second ::verbose
RadioToolCLI.exe --target=1 --port 7 /baud_rate 115200 -c11 /R -d=1 /t=5 -v
::sample output
Connecting...
Connected
RX Testing Started
RX Testing Started. The program will last 5 second(s) and report every 1 second(s).
54, 1, 0
-52, 0
31, 31, 0, 21, 0, 0, 2
2, 2, 0, 0, 0, 52, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
174708, 1227552, 1052844
113, 3, 0
-59, -79
48, 48, 1, 36, 0, 3, 25
25, 25, 0, 3, 5, 85, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
1227567, 2222249, 994682
63, 1, 0
-54, 0
29, 29, 0, 30, 0, 0, 4
4, 4, 0, 0, 0, 59, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
2222264, 3236292, 1014028
77, 2, 0
-57, -54
33, 33, 1, 31, 5, 0, 7
7, 7, 0, 0, 0, 67, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
3236306, 4250366, 1014060
82, 3, 0
-55, -79
35, 35, 0, 33, 0, 8, 6
6, 6, 2, 1, 5, 68, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
4250381, 5264337, 1013956
RX Finished: SUCCESS
9 Insertion Loss Calibration

The TX power levels and RX sensitivity numbers quoted in the data sheet are at the device RF pin. Additional losses due to onboard filter, PCB trace, connectors, and cables used to connect to the external equipment should be accounted for separately by adding their insertion losses.

On the TI EVMs the onboard filter insertion loss is typically 1 dB (maximum of 1.35 dB), the PCB trace plus RF connector loss is approximately 0.4 dB. These losses must be accounted for while evaluating the performance. If the user has a different filter or a different trace on their PCB they must measure their insertion loss separately. The insertion loss of the cable used to connect the EVM to the external equipment can be measured using a network analyzer.

10 Hardware Connections on Non-TI EVMs

To use the Radio Tool on platforms other than TI EVMs, the interface signals from the emulation board can be wired to the corresponding pins on the custom platform. The signal voltage level from the emulation board LaunchPad is 3.3 V, and the VCC level is 3.3 V. This VCC can also be used to power the CC3120 and CC3220 devices on the custom platform. Make sure the I/O voltage levels between the emulation board and the device on the EVM are the same.

Table 5. Connections for CC31XXEMUBOOST to a Custom CC3120 Platform (UART Connection)

<table>
<thead>
<tr>
<th>Signal Name</th>
<th>CC3120 Pin</th>
<th>CC31XXEMUBOOST Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vcc</td>
<td>P1.1</td>
<td>P1.1</td>
</tr>
<tr>
<td>UART1_TX</td>
<td>55</td>
<td>P1.3</td>
</tr>
<tr>
<td>UART1_RX</td>
<td>57</td>
<td>P1.4</td>
</tr>
<tr>
<td>UART1_CTS</td>
<td>61</td>
<td>P4.4</td>
</tr>
<tr>
<td>UART1_RTS</td>
<td>50</td>
<td>P4.5</td>
</tr>
<tr>
<td>GND</td>
<td></td>
<td>P2.1</td>
</tr>
<tr>
<td>nHIB</td>
<td>2</td>
<td>P1.5</td>
</tr>
</tbody>
</table>

Table 6. Connections for CC31XXEMUBOOST to a Custom CC3120 Platform (SPI Connection)

<table>
<thead>
<tr>
<th>Signal Name</th>
<th>CC3120 Pin</th>
<th>CC31XXEMUBOOST Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vcc</td>
<td>P1.1</td>
<td>P1.1</td>
</tr>
<tr>
<td>SPI_CLK</td>
<td>5</td>
<td>P1.7</td>
</tr>
<tr>
<td>SPI_MOSI</td>
<td>6</td>
<td>P2.6</td>
</tr>
<tr>
<td>SPI_MISO</td>
<td>7</td>
<td>P2.7</td>
</tr>
<tr>
<td>SPI_CSn</td>
<td>8</td>
<td>P2.3</td>
</tr>
<tr>
<td>IRQ</td>
<td>15</td>
<td>P2.2</td>
</tr>
<tr>
<td>GND</td>
<td></td>
<td>P2.1</td>
</tr>
<tr>
<td>nHIB</td>
<td>2</td>
<td>P1.5</td>
</tr>
</tbody>
</table>

Table 7. Connections from CC3220-LAUNCHXL to a Custom CC3220 Platform

<table>
<thead>
<tr>
<th>Signal Name</th>
<th>CC3220 Pin</th>
<th>CC3220-LAUNCHXL Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vcc</td>
<td></td>
<td>J12 pin 2 (remove J12 jumper)</td>
</tr>
<tr>
<td>UART1_TX</td>
<td>55</td>
<td>J7 pin 3 (remove J7 jumper)</td>
</tr>
<tr>
<td>UART1_RX</td>
<td>57</td>
<td>J6 pin 3 (remove J6 jumper)</td>
</tr>
<tr>
<td>GND</td>
<td></td>
<td>P2.1</td>
</tr>
</tbody>
</table>
11 Source Code for Developers

11.1 RadioTool Application Sources
Source codes of the Radio Tool are in the RadioToolApplication_Source directory of the installation location. Users need the following:
- Visual Studio 2015 (minimum)
- Full-featured IAR Workbench for ARM (check SDK release notes for the proper IAR version to use)
- Code Composer Studio (CCS)

11.2 CC3220 Application Source
The CC3220 onboard application source is in the CC32xxBoardApplication_Source directory. Simply copy this source into the example folder of the CC3220 SDK. Use CCS or IAR to open the project workspace.
<table>
<thead>
<tr>
<th>Date</th>
<th>Revision</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>February 2017</td>
<td>SWRU471*</td>
<td>Initial release</td>
</tr>
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</table>
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