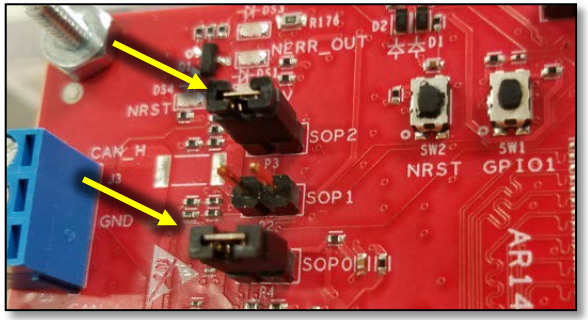
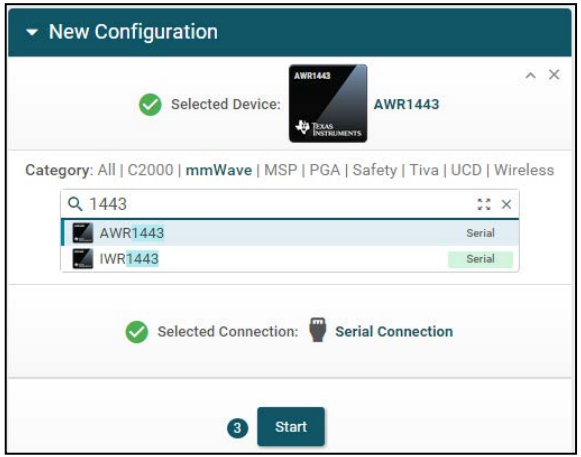
ADC Data Capture using Capture Demo and CCS Memory Browser IWR14xx/AWR14xx example

Document Version V1.00 0821

1.1 Flashing CCS debug firmware

1. Put the EVM in flashing mode by connecting jumpers on SOP0 and SOP2 as shown in the image.
2. Open the **UniFlash** tool
3. In the **New Configuration** section, locate and select the appropriate device (xWR14xx)
4. Click **Start** to proceed



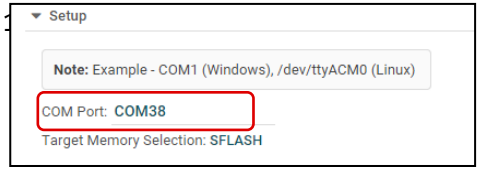


1.1 Flashing CCS debug firmware

5. In the **Program** tab, browse and locate the Radar SS and MSS images shown below:

Image	Location
Meta Image 1/RadarSS	C:\ti\mmwave_sdk_<ver>\firmware\radarss**xwr12xx_xwr14xx_radarss.bin**
Meta Image 2/MSS	C:\ti\mmwave_sdk_<ver>\packages\ti\utils\ccsdebug**xwr14xx_ccsdebug_mss.bin**

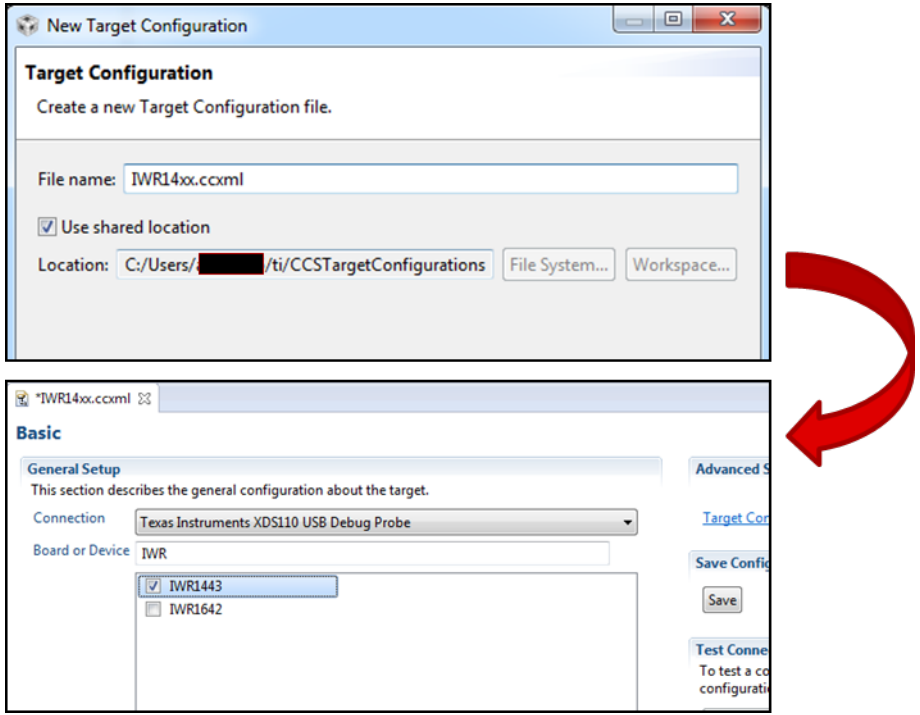
6. In the **Settings & Utilities** tab, fill the **COM Port** text box with the Application/User UART COM port number (**COM_{UART}**) noted earlier



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

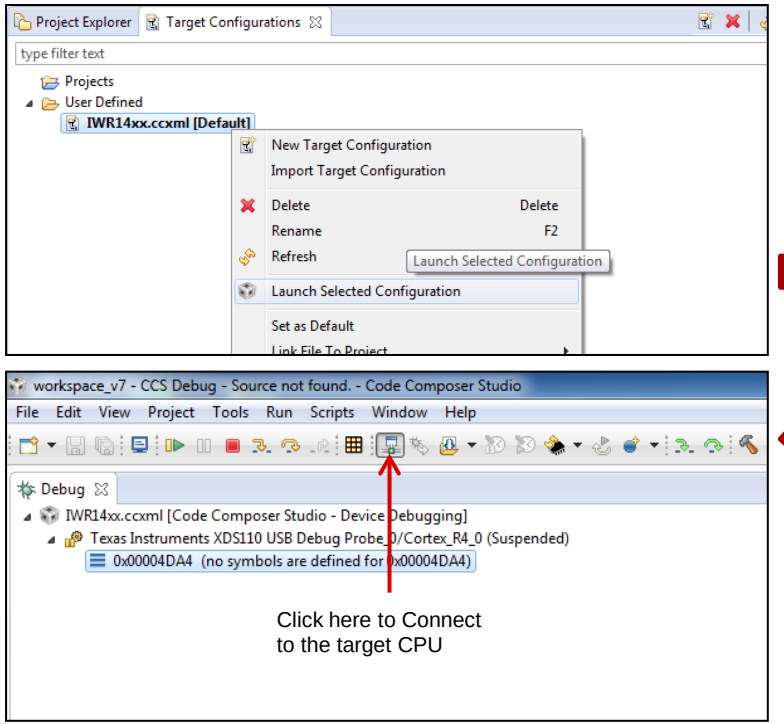
1.2 Connecting EVM to CCS

- To connect the Radar EVM to CCS, we need to create a target configuration
  - Go to File ► New ► New Target Configuration File
  - Name the target configuration accordingly and check the “Use shared location” checkbox. Press Finish
  - In the configuration editor window:
    - Select “Texas Instruments XDS110 USB Debug Probe” for **Connection**
    - Select **IWR1443** or **AWR1443** in the **Board or Device** list
    - Press the **Save** button to save the target configuration.
    - You can press the **Test Connection** button to check the connection with the board.



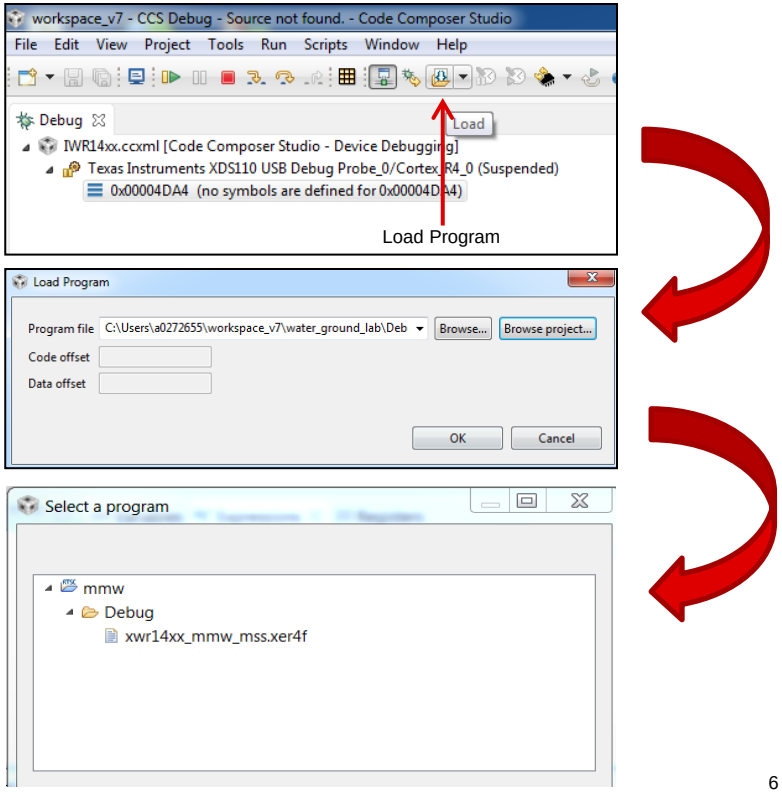
1.2 Connecting - continued

- Go to **View ► Target Configurations** to open the target configuration window.
- You should see your target configuration under **User Defined** configurations.
- Right click on the target configuration and select **Launch Select Configuration**.
- This will launch the target configuration in the debug window.
- Select the Texas Instruments XDS110 USB Debug probe and press the **Connect Target** button 



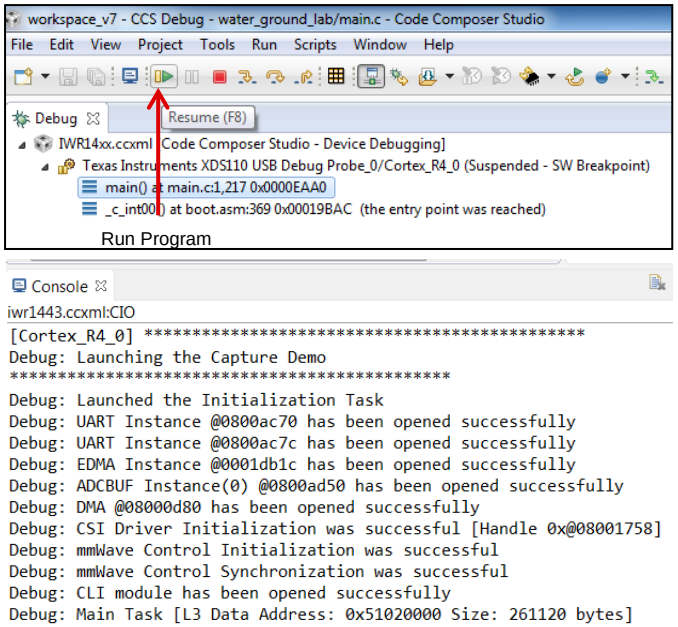
1.3 Loading the binary

- With the target connected, click on the **Load** button in the toolbar.
- In the **Load Program** dialog, press the **Browse Project** button .
- Select the **xwr14xx_capture_demo_mss.xer4f** found at **C:\ti\mmwave_sdk_01_00_00_05\packages\ti\demo\xwr14xx\capture**
- Press OK again in the **Load Program** dialog.



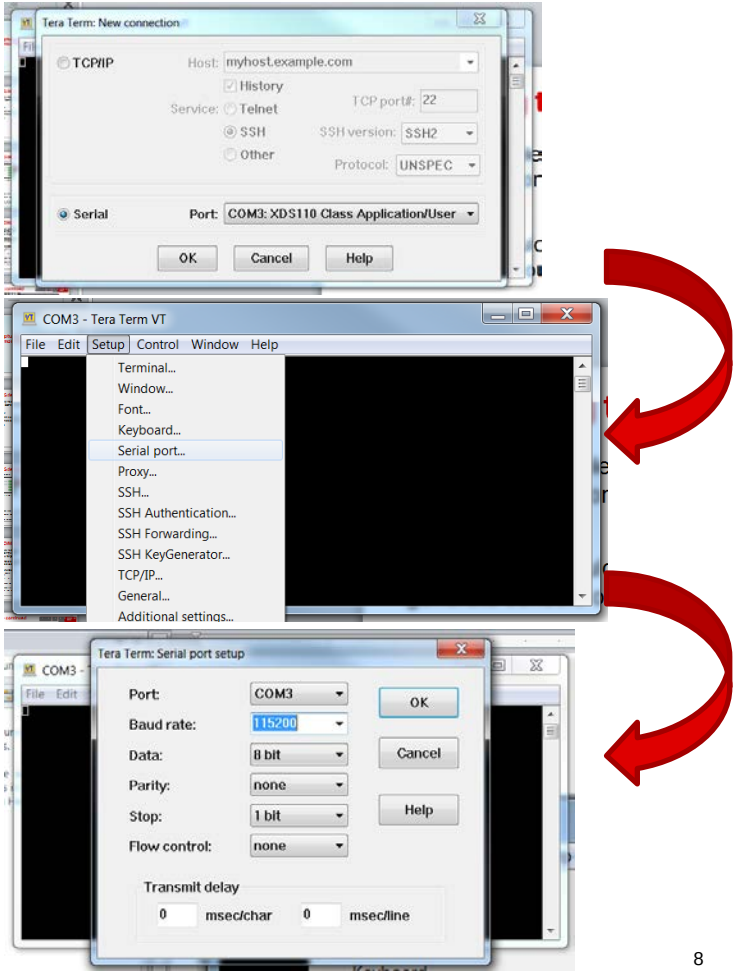
1.4 Running the binary

- With the executable loaded, press the Run/Resume button 
- The program should start executing and generate console output as shown.
- If everything goes fine, you should see the “CLI module has been opened successfully” message which indicates that the program is ready and waiting for the sensor configuration.



2.1 Setting up the console

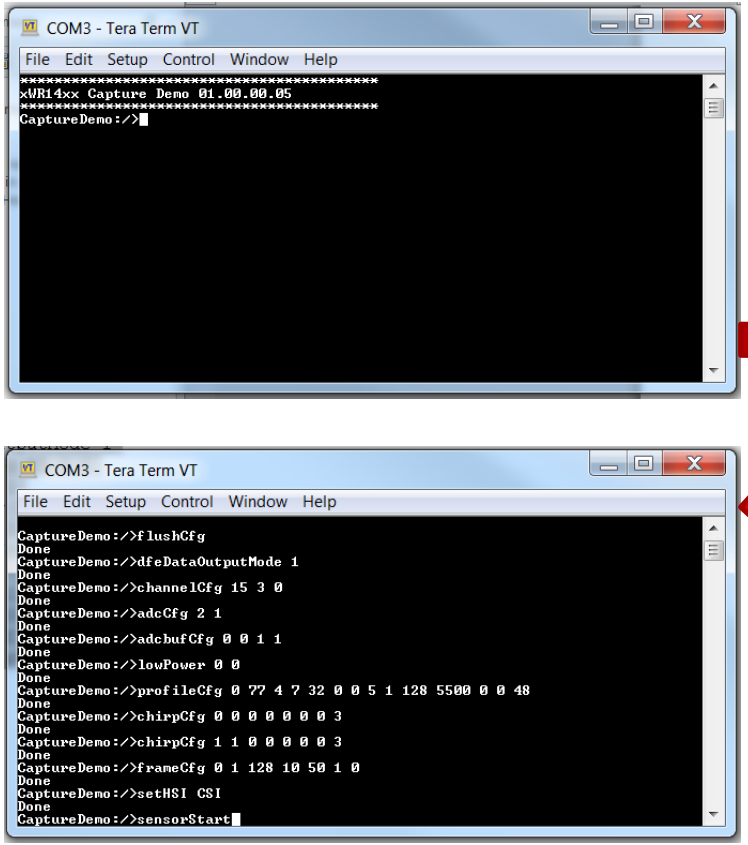
- Open up a Tera Term console window, select the **Serial** connection and choose the **Application/User** port
- Select the **Setup** tab and click the **Serial port** option
- Change the **Baud rate** to **115200** in the drop down menu and press **OK**



2.2 Sending the Config

- The **CaptureDemo** prompt should appear in the console window. If not, press enter to open the prompt.

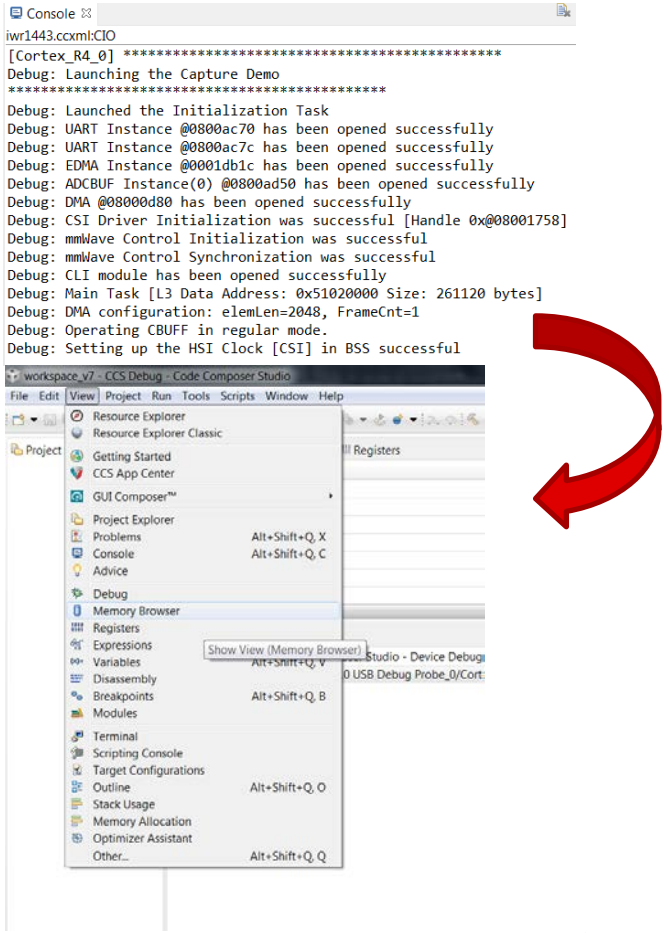
- Enter the desired configuration. For more information about the configuration parameters, consult the **SDK User's Guide** found at **C:\ti\mmwave_sdk_01_00_00_05\docs**



3.1 Opening the Memory Browser

- If the Config is successfully sent, the Console window should look like the following

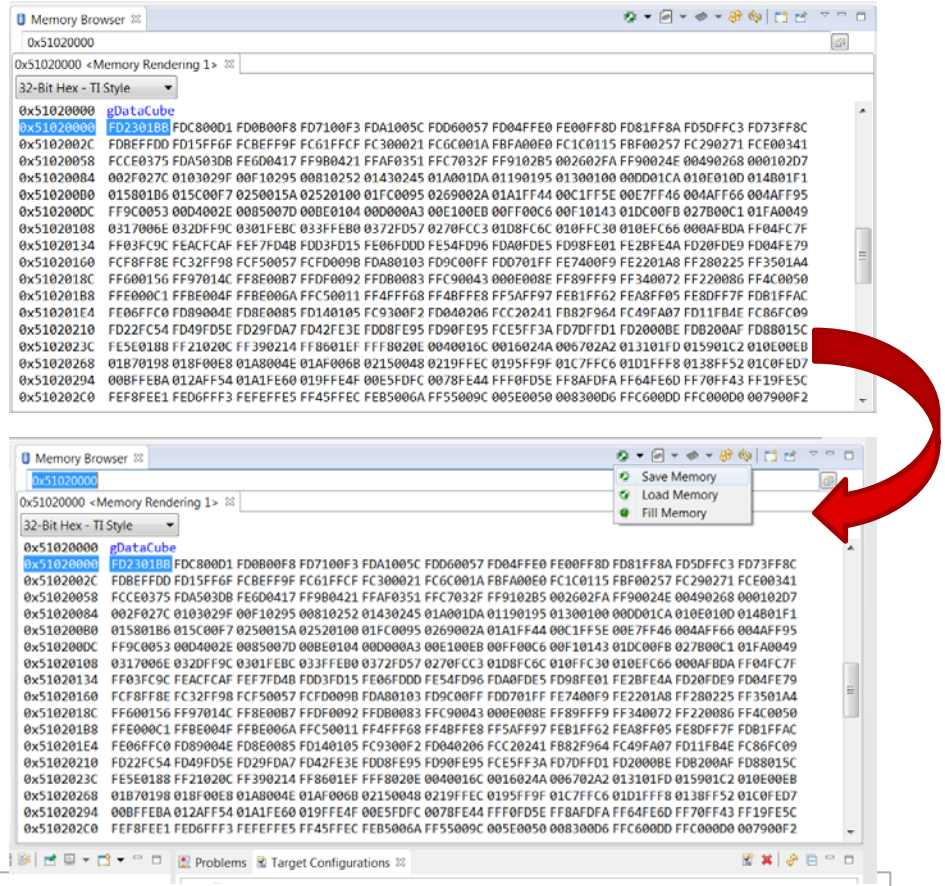
- Open the **Memory Browser** in the **View** tab of CCS to view the ADC contents



3.2 Viewing the ADC Contents

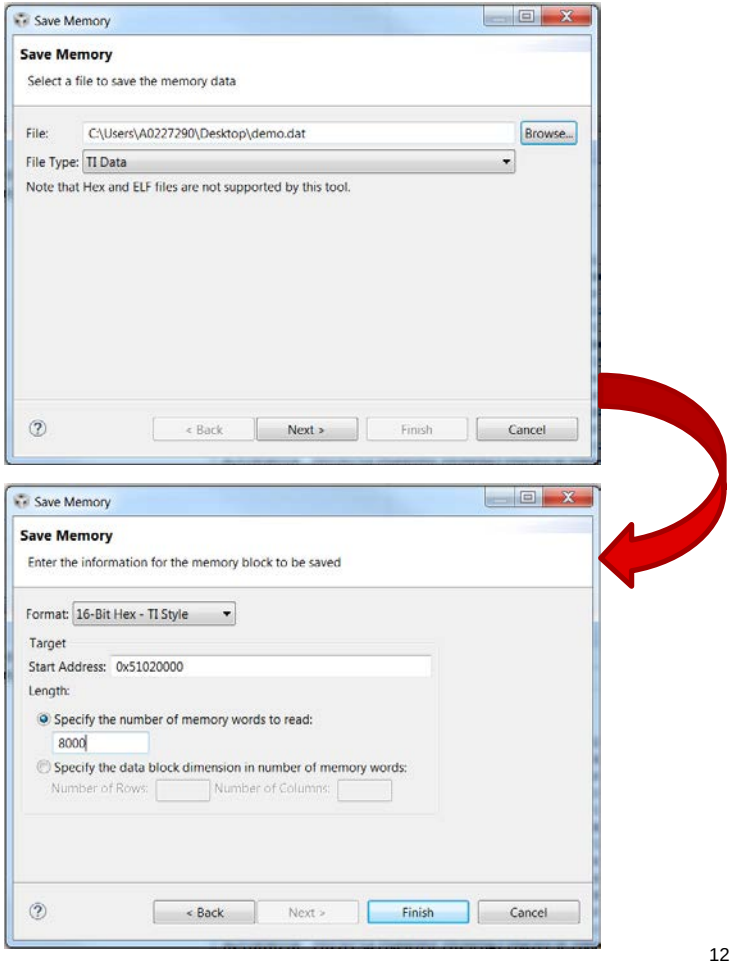
- In the **Memory Browser**, specify the memory address of **0x51020000** to view the ADC data

- Click the **Save Memory** option at the top right of the **Memory Browser** to save the ADC data for post processing



3.3 Saving ADC Data

- In the **Save Memory** menu, specify the path and file name of the file
- Save the file type as **TI Data** type and click **Next**
- In the next tab, specify the **Format** and choose a **Start Address** of 0x51020000
- Specify the number of memory words to read based on the chirp and frame configuration and click **Finish**
- The data is now available for post processing



3.3 Saving ADC Data Cont.

- The total size of the ADC data generated will be equal to:

  Num of ADC Samples * Num of RX Channels * Num of Frames * Num of Chirps * 4 Bytes Per Sample

  2 Bytes for Real Part
  2 Bytes for Imaginary Part

- For example:

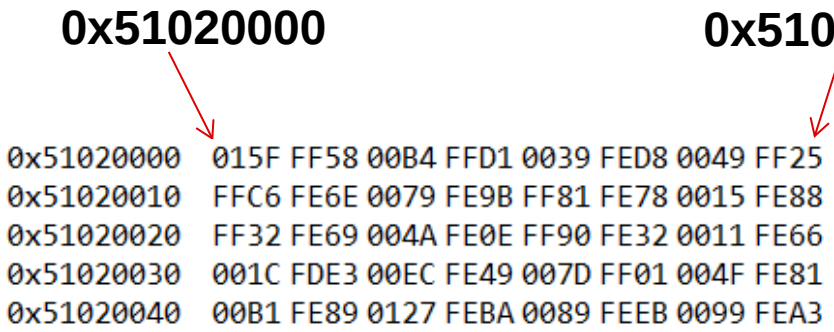
  256 Samples/chirp * 4 RX * 4 Frames * 4 Chirps * 4 Bytes Per Sample = **65536 Bytes**

  Assuming a 16-Bit Hex – TI Style Format, the number of specified words to save:

  65536 / 16 = **4096 Words**

3.4 L3 Buffer Format

- Data can be stored in interleaved or non-interleaved mode, as specified by the **adcbufCfg** command in the profile configuration
- Interleaved mode is recommended for xwr14xx devices and not available for xwr16xx devices
- In the Capture Demo, ADC data is copied to the L3 buffer, starting at address **0x51020000**
- For more detailed information about interleaving, consult the **AWR1xxx Data Path Programmer's Guide**



3.4 L3 Buffer Format Cont.

- When data is saved from the L3 buffer into a TI Data file, the format will be as shown below for **complex** data in **interleaved mode**

4 RX Complex

```
1651 9 51020000 0 6000 7
015F <---- RX0 Q(0)
FF58 <---- RX0 I(0)
00B4 <---- RX1 Q(0)
FFD1 <---- RX1 I(0)
0039 <---- RX2 Q(0)
FED8 <---- RX2 I(0)
0049 <---- RX3 Q(0)
FF25 <---- RX3 I(0)
FFC6 <---- RX0 Q(1)
FE6E <---- RX0 I(1)
0079 <---- RX1 Q(1)
FE9B <---- RX1 I(1)
FF81 <---- RX2 Q(1)
FE78 <---- RX2 I(1)
0015 <---- RX3 Q(1)
FE88 <---- RX3 I(1)
```

3 RX Complex

```
1651 9 51020000 0 6000 7
015F <---- RX0 Q(0)
FF58 <---- RX0 I(0)
00B4 <---- RX1 Q(0)
FFD1 <---- RX1 I(0)
0039 <---- RX2 Q(0)
FED8 <---- RX2 I(0)
0049 <---- RX0 Q(1)
FF25 <---- RX0 I(1)
FFC6 <---- RX1 Q(1)
FE6E <---- RX1 I(1)
0079 <---- RX2 Q(1)
FE9B <---- RX2 I(1)
```

2 RX Complex

```
1651 9 51020000 0 6000 7
015F <---- RX0 Q(0)
FF58 <---- RX0 I(0)
00B4 <---- RX1 Q(0)
FFD1 <---- RX1 I(0)
0039 <---- RX0 Q(1)
FED8 <---- RX0 I(1)
0049 <---- RX1 Q(1)
FF25 <---- RX1 I(1)
```

3.4 L3 Buffer Format Cont.

- When data is saved from the L3 buffer into a TI Data file, the format will be as shown below for **real** data in **interleaved mode**

4 RX Real

```
1651 9 51020000 0 6000 7
015F <---- RX0 (0)
FF58 <---- RX1 (0)
00B4 <---- RX2 (0)
FFD1 <---- RX3 (0)
0039 <---- RX0 (1)
FED8 <---- RX1 (1)
0049 <---- RX2 (1)
FF25 <---- RX3 (1)
```

3 RX Real

```
1651 9 51020000 0 6000 7
015F <---- RX0 (0)
FF58 <---- RX1 (0)
00B4 <---- RX2 (0)
FFD1 <---- RX0 (1)
0039 <---- RX1 (1)
FED8 <---- RX2 (1)
```

2 RX Real

```
1651 9 51020000 0 6000 7
015F <---- RX0 (0)
FF58 <---- RX1 (0)
00B4 <---- RX0 (1)
FFD1 <---- RX1 (1)
```