

# ADC12DJ3200EVMCVAL With Alpha Data Xilinx® Kintex Ultrascale Space Development Kit



Jim Seton

## ABSTRACT

This user's guide describes the functionality, hardware, operation, and software instructions to interface the Texas Instruments ADC12DJ3200EVMCVAL with the Alpha Data ADA-SDEV-Kit1&2 development boards, which contain a XQRKU060, a space grade Xilinx® Kintex® UltraScale™ field-programmable gate array (FPGA).

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## 1 Trademarks

UltraScale™ is a trademark of Xilinx Incorporated.

Xilinx®, AlphaData ADA-SDEV-KIT1&2®, Vivado®, space grade Xilinx®, Kintex®, are registered trademarks of Xilinx Incorporated.

Microsoft® and Windows® are registered trademarks of Microsoft Corporation.

All other trademarks are the property of their respective owners.

## 2 Introduction

This design is developed for the Alpha Data System Development Kit (SDEV) to interface with the ADC12DJ3200EVMCVL using JMODE0. This design uses custom TI JESD204B IP, which implements both JESD204B Base IP and JESD204B PHY IP to get JESD204B data from the ADC12DJ3200QML-SP device at 6.2 GSPS in single-device mode with 12.4 Gbps data lane rate. The reference design implements a transport layer that collects 40 samples from the 8 lanes (as depicted in the JMODE0 table of the data sheet). The samples are captured using the Xilinx Internal Logic Analyzer (ILA) tool and offloaded to a PC where the results can be displayed using the TI *High-Speed Data Converter Pro GUI*.

## 3 Functionality

The AlphaData SDEV has a standard FMC+ connector that provides an interface between this board and the TI JESD204B ADC12DJ3200CEVMCVL. For communicating, the AlphaData SDEV uses JTAG to acquire and receive data using a host PC. The industry-standard JTAG connector is used for configuring the FPGA using the Vivado® Design Suite, a design tool by Xilinx. The firmware designed for this integration only supports JMODE0 at 6.2 GSPS single ADC. Future firmware will support all modes of this ADC.

## 4 Required Hardware

### 4.1 AlphaData ADA-SDEV-KIT1&2®

The ADA-SDEV-KIT1&2 includes the ADM-SDEV-BASE/XCKU060-AD01360 Evaluation board which contains a Xilinx XQRKU060-CNA1509 FPGA and the ADM-SDEV-CFG1-AD01361 USB interface board. For more information regarding these boards, see the [AlphaData](#) website.

### 4.2 TI ADC12DJ3200CVAL Evaluation Module

The [ADC12DJ3200EVMCVAL](#) contains a space grade [ADC12DJ3200QML-SP](#) which can operate as either a 6.4 GSPS single 12-bit ADC or 3.2 GSPS dual 12-bit ADC. For more information regarding this board and ADC, see the [ADC12DJ3200EVMCVAL](#) and [ADC12DJ3200QML-SP](#) product pages.

### 4.3 Test Equipment

- Low-noise RF signal generator. Recommendations:
  - HP 8644B, Rohde & Schwarz SMA100A, or equivalent
- Bandpass filters for desired analog input. Recommendations:
  - Trilithic 5VH-series Tunable BPF, K&L BT-series Tunable BPF, TTE KC6 or KC7-series Fixed BPF
- Signal path cables, SMA or BNC with BNC-SMA adapters
- 5 VDC 3-A power supply
- Corsair CX 650 power supply or equivalent

## 5 Required Software

### 5.1 HSDC Pro GUI

Download the latest version of the HSDC Pro GUI ([slwc107x.zip](#)) to a local directory on a host PC. This is found on the TI website by entering “HIGH SPEED DATA CONVERTER PRO GUI INSTALLER” in the search parameter window at [www.ti.com](#).

Unzipping the software package generates a folder called *High Speed Data Converter Pro - Installer vx.xx.exe*, where x.xx is the version number. Run this program to start the installation.

Follow the on-screen instructions during installation.

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#### Note

If an older version of the GUI has already been installed, make sure to uninstall it before loading a newer version.

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Click on the **Install** button. A new window opens. Click the **Next** button.

Accept the License Agreement. Click on **Next** to start the installation. After the installer has finished, click on the **Next** button one last time.

The installation is now complete. The GUI executable and associated files will reside in the following directory.

```
C:\Program Files (x86)\Texas Instruments\High Speed Data Converter Pro
```

When new TI high-speed data converter EVMs or JESD204B interface modes become available that are not currently supported by the latest release of HSDC Pro GUI, the HSDCProv\_xpax\_Patch\_setup executable, available on the TI website under the High-Speed Data Converter Pro (HSDCP) Software product folder (<http://www.ti.com/tool/dataconverterpro-sw>), will allow the user to add these to the GUI device list. After the patch has been downloaded, follow the on-screen instructions to run the patch. The software displays the files that will be added. After running the patch, open HSDC Pro and the new parts and modes will appear in the ADC and DAC device drop-down selection box. The patch is always specific to a core GUI version and will not work for a GUI version for which the patch was not explicitly created.

#### 5.1.1 Xilinx® Vivado® Design Suite

The Vivado Design Suite by Xilinx, is required to load firmware to the FPGA and extract captured data from the FPGA. See the Vivado Design Suite on Xilinx.com: <https://www.xilinx.com/products/design-tools/vivado> for more details. The latest build that supports this integration is Vivado 2019.1.

## 5.2 ADC12DJ3200EVM-CVAL GUI

This section provides the steps to download and begin using the ADC12DJ3200EVM-CVAL GUI.

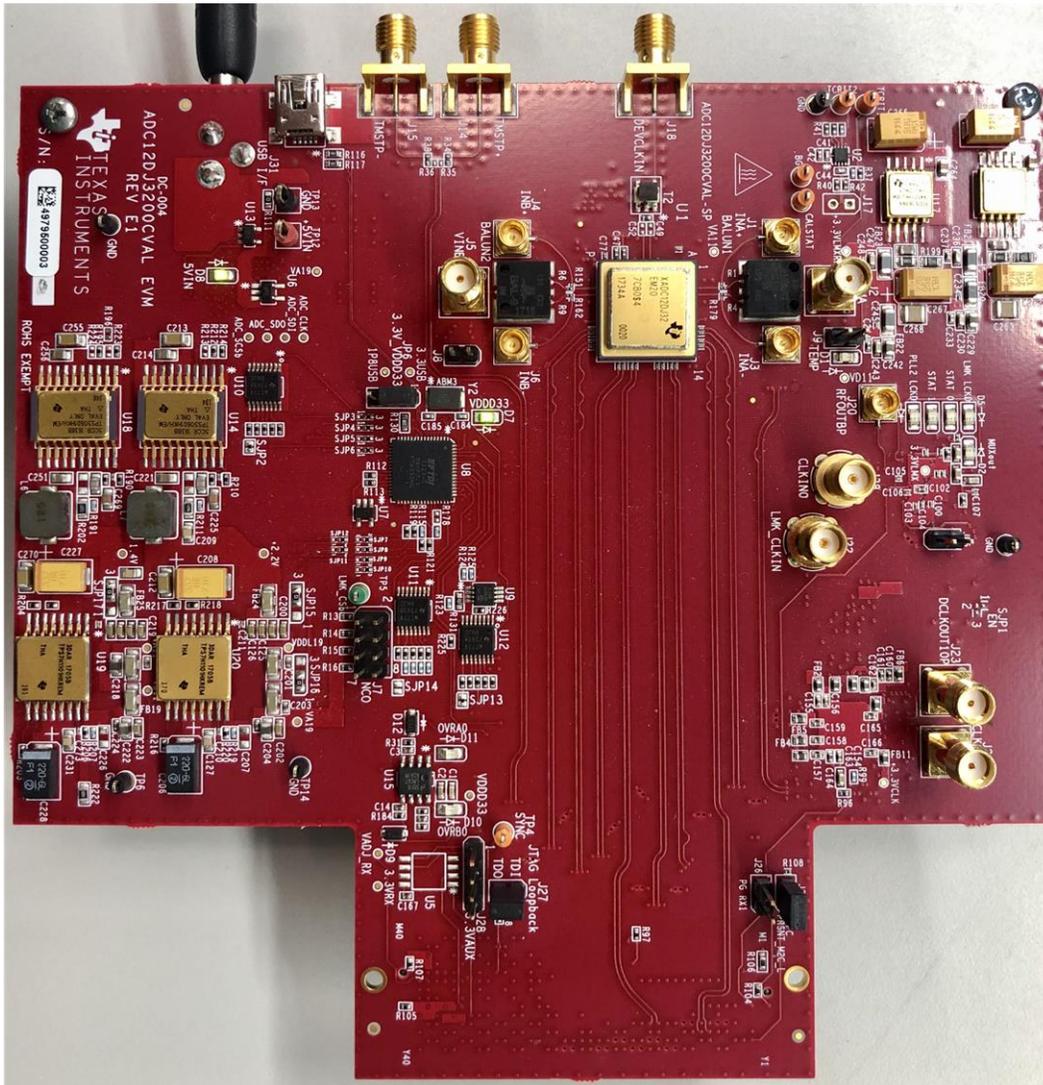
1. Download the configuration GUI software from the EVM tool folder at [ADC12DJ3200EVMCVAL](#).
2. Extract files from the .zip file
3. Run the executable file (setup.exe), and follow the instructions
4. Download the zipped file called "Alpha\_Data\_ADC12DJ3200\_Demo" from this same location. This file contains the required FPGA bit file and ADC GUI configuration files
5. Copy the files to the following new directory: "C:\AlphaData\_ADC12DJ3200\_Demo". The directory structure is critical and should look as illustrated in [Figure 5-1](#).

Name	Date modified	Type	Size
 GUI Utility Version 1.0	5/7/2020 1:54 PM	File folder	
 Waveform-Dumps	5/7/2020 1:54 PM	File folder	
 alpha-data-GUI-config.cfg	10/11/2019 8:27 PM	CFG File	4 KB
 alpha-data-samples.bit	4/24/2020 12:33 PM	BIT File	23,560 KB
 alpha-data-samples.ltx	4/24/2020 12:36 PM	LTX File	466 KB
 capture_new.txt	4/24/2020 3:32 PM	Text Document	1 KB
 FMC-ADC12DJ3200-CVAL.bin	4/23/2019 1:53 PM	BIN File	1 KB
 setup_new.txt	4/24/2020 2:34 PM	Text Document	3 KB
 Xilinx-AlphaData-ADC12DJ3200QML-interop-video-pdf-version.pdf	5/7/2020 3:54 PM	Adobe Acrobat D...	1,446 KB

**Figure 5-1. Required File Structure**

## 6 Hardware Setup

This section provides directions and illustrations for setting up the hardware.



**Figure 6-1. ADC12DJ3200EVM Board**

By default, the FMC+ interface EEPROM on the ADC12DJ3200EVM is installed. Without this part, the FMC3\_VADJ voltage for the FPGA bank that drives the JESD204B SYNC will be set to 0 V, thus preventing the SYNC signal from working. Using the ADC manual SYNC is a work around for this. U5 (24C65T-I/SM from Microchip) is programmed with the provided .bin file called "FMC-ADC12DJ3200-CVAL.bin". This .bin file uses address 0x53 which is required for the FMC+ slot on the Alpha Data board and will set the FMC3\_VADJ to 1.8 V after power up. With the EEPROM installed and programmed properly, after power up, test point TP3 on the Alpha Data board should be at 1.8 V.

1. Connect the Alpha Data board with ADC12DJ3200 CVAL EVM. Use the FMC+ connector (J3) to connect the ADC EVM.
2. Connect the output power cable from the CX 650 power supply to the Alpha Data board as [Figure 6-2](#) shows:



**Figure 6-2. Output Power Cable Connection**

3. Connect the JTAG cable between the PC and the JTAG port on the USB daughter board.

4. Connect a USB cable between USB daughter board and the PC, see [Figure 6-3](#).



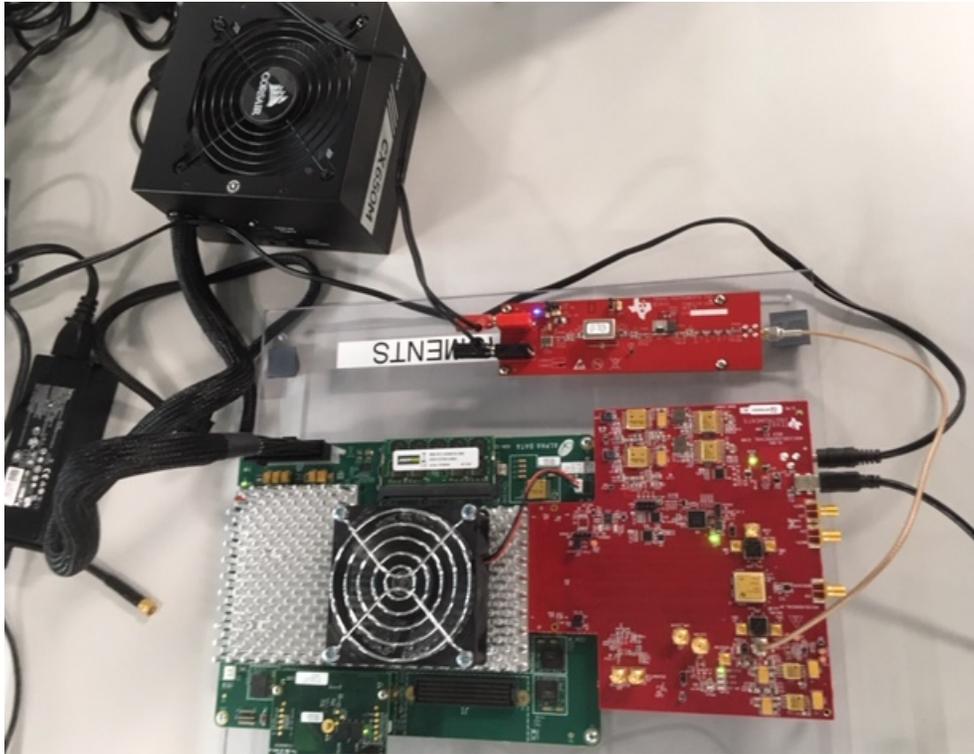
**Figure 6-3. JTAG and USB Cable Connections**

5. Connect a USB cable between the ADC12DJ3200EVM (J31) and the PC. Connect the 5-V power supply that can source a minimum of 3 A to J37 on the ADC12DJ3200EVM. TP12 (+5 V) and TP13 (GND) provide another option for connecting to 5 V.
6. Connect a RF analog input source to J2 (VINA) of the ADC12DJ3200EVM. This guide uses a 70-MHz source at 0 dBm from a TI TSW2700EVM.
7. Turn on the Alpha Data board. The power switch is near the power input cable.



**Figure 6-4. Alpha Data Board Power Switch**

8. [Figure 6-5](#) illustrates the setup.



**Figure 6-5. Alpha Data Board With ADC12DJ3200 CVAL EVM Setup**

## 7 Alpha-Data ADC12DJ3200EVMCVAl Start-up Instructions

This chapter provides descriptions to program the ADC12DJ3200EVM, program the FPGA, setup the ADC12DJ3200EVM for manual SYNC operation, capture the data with the FPGA, then view the captured data with the HSDC Pro GUI.

### 7.1 Configure the ADC EVM

Use the following steps to configure the ADC EVM.

1. Open ADC12DJ3200EVM-CVAL GUI, choose Fclk = 3100MHz and select JMODE0 (equivalent to 6.2 GSPS ADC sample rate and 12.4Gbps lane rate) in the EVM tab.
2. Click “Program Clocks and ADC”. On the ADC EVM, verify PLL1 LCKD LED turns on. This will indicate the LMK04828 PLL1 is locked to the onboard 100-MHz VCXO.
3. Figure 7-1 illustrates the GUI.

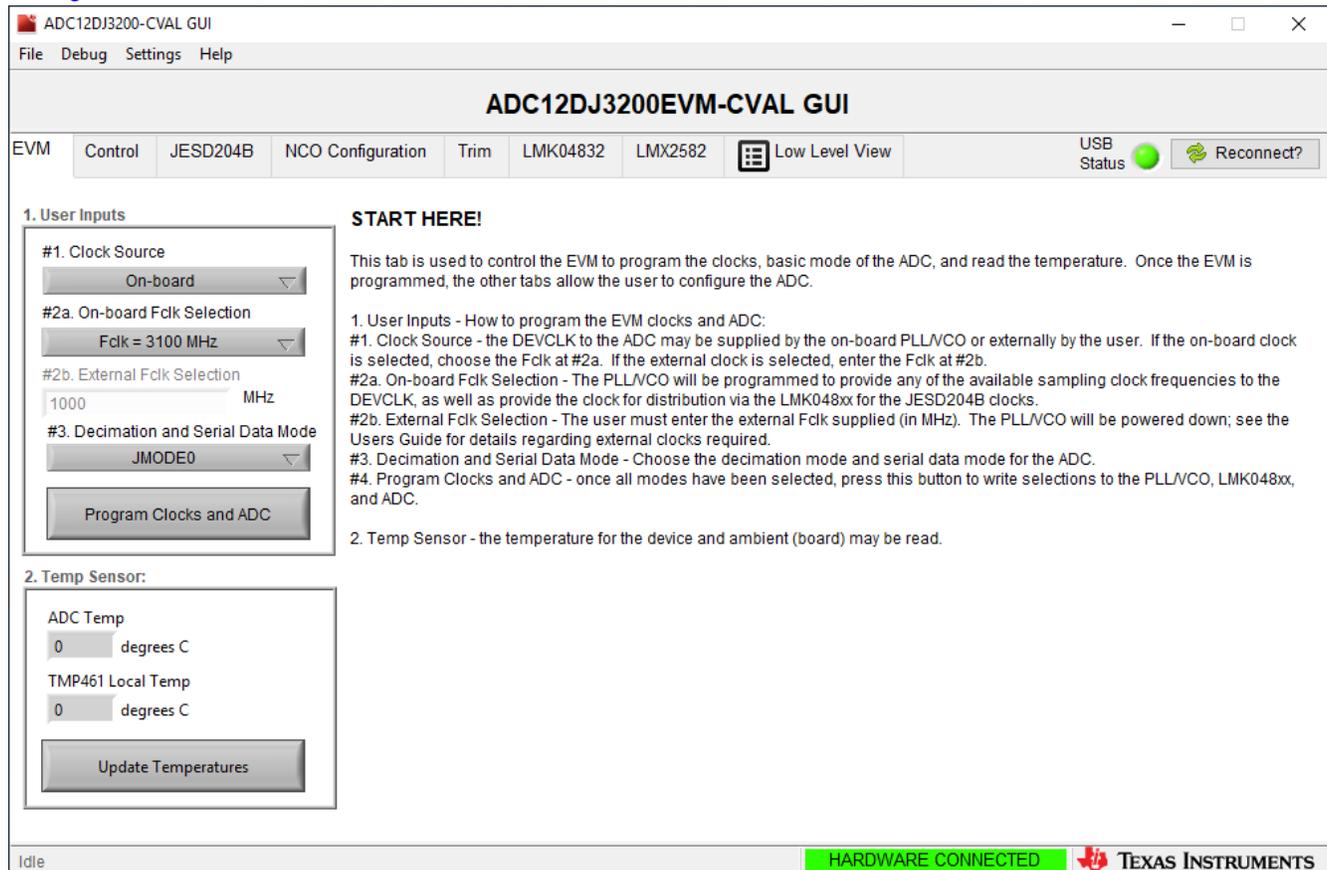


Figure 7-1. ADC12DJ3200EVM-CVAL GUI

4. By default, the FMC+ interface EEPROM on the ADC12DJ3200EVM is installed and programmed. Please go to section 7.2.1. If using a board without this EEPROM, do the following steps:



## 7.2 Manual SYNC Operation of the ADC12DJ3200EVM

This section provides details on the manual SYNC operation of the ADC12DJ3200EVM.

1. In the ADC12DJ3200EVM-CVAL GUI, click on the JESD204B tab as [Figure 7-3](#) shows.

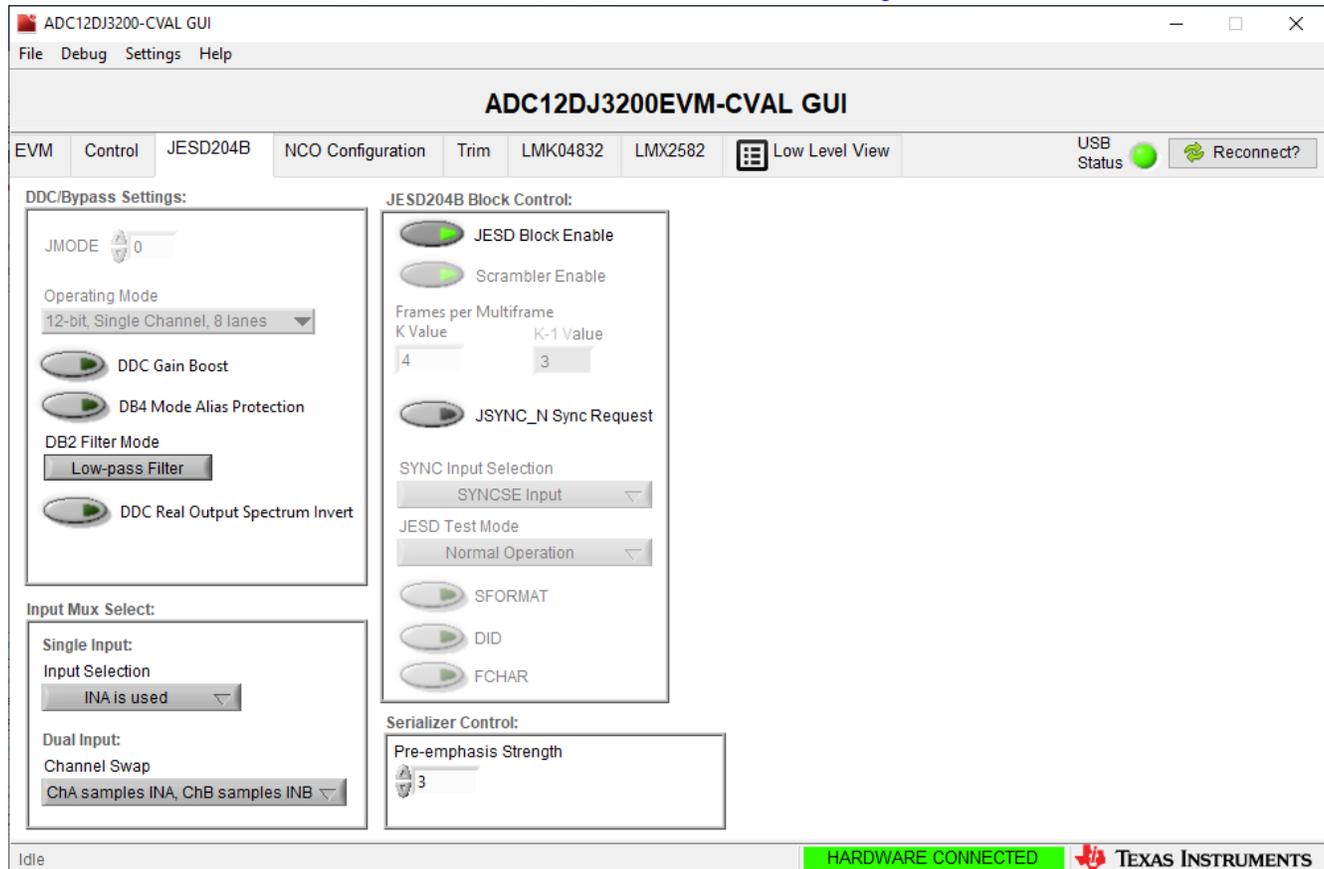
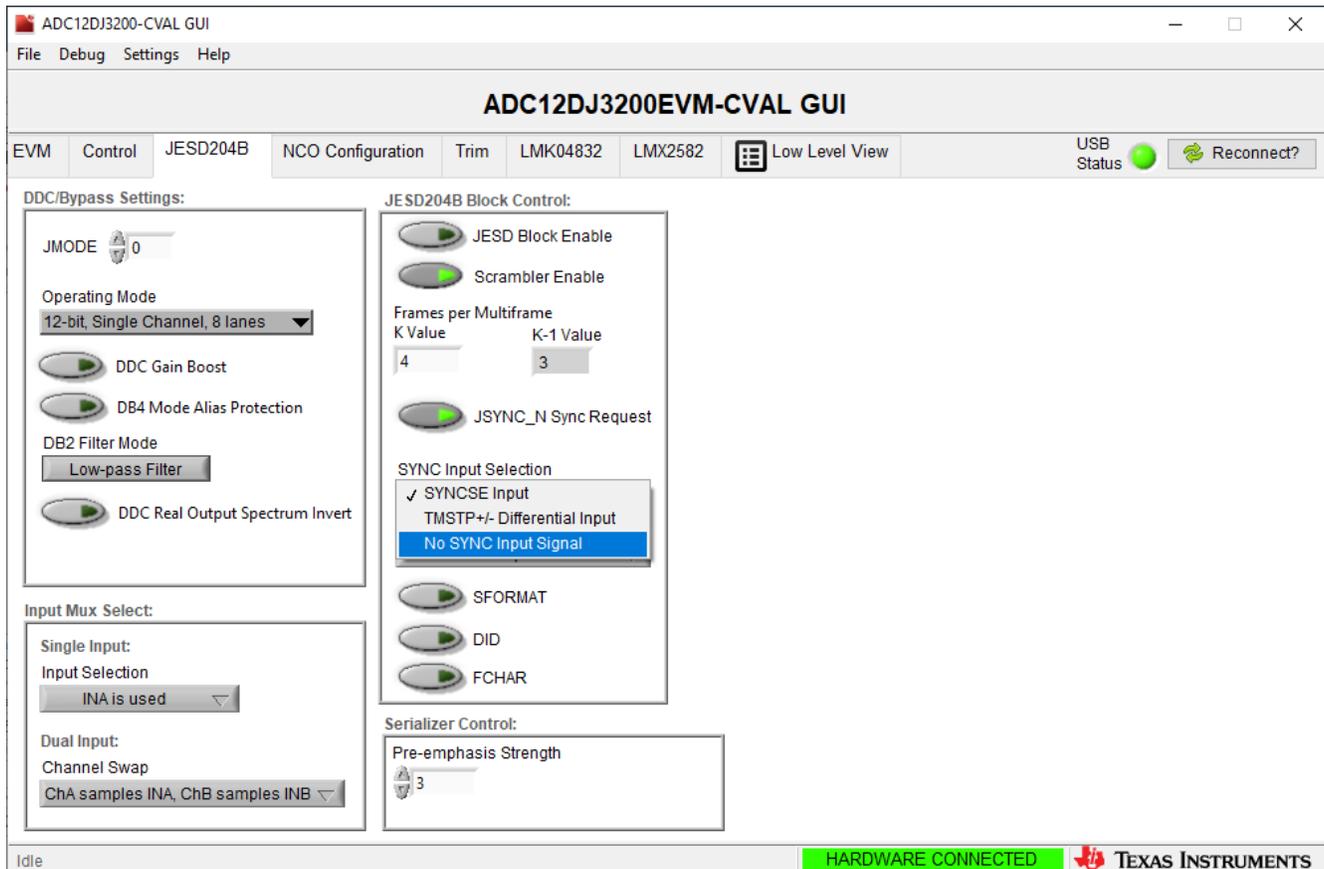


Figure 7-3. JESD204B Tab

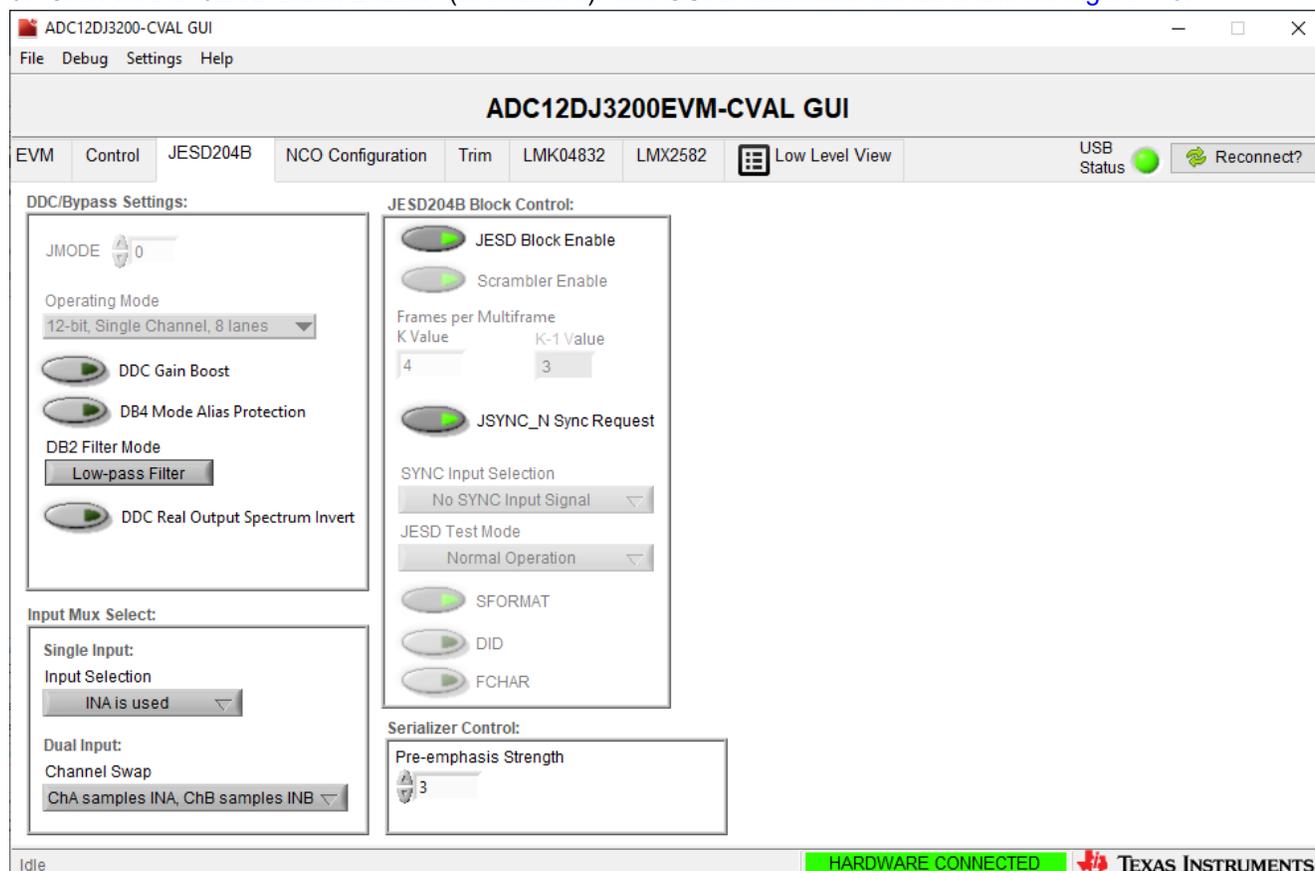
## 2. Implement the following steps (in order):

- Click on the "JESD Block Enable" to disable it (the green arrow should not be lit).
- Click on the SFORMAT button (to enable it). The FPGA firmware is using unsigned data and a K value of 4.
- Click the JSYNC\_N Sync\_Request button (it should be enabled or 'lit').
- Select "No SYNC Input Signal" from the SYNC Input Selection drop-down menu.



**Figure 7-4. Setting ADC to use Software SYNC**

3. Click on the “JESD Block Enable” (to enable it). The GUI should look now as shown in [Figure 7-5](#).

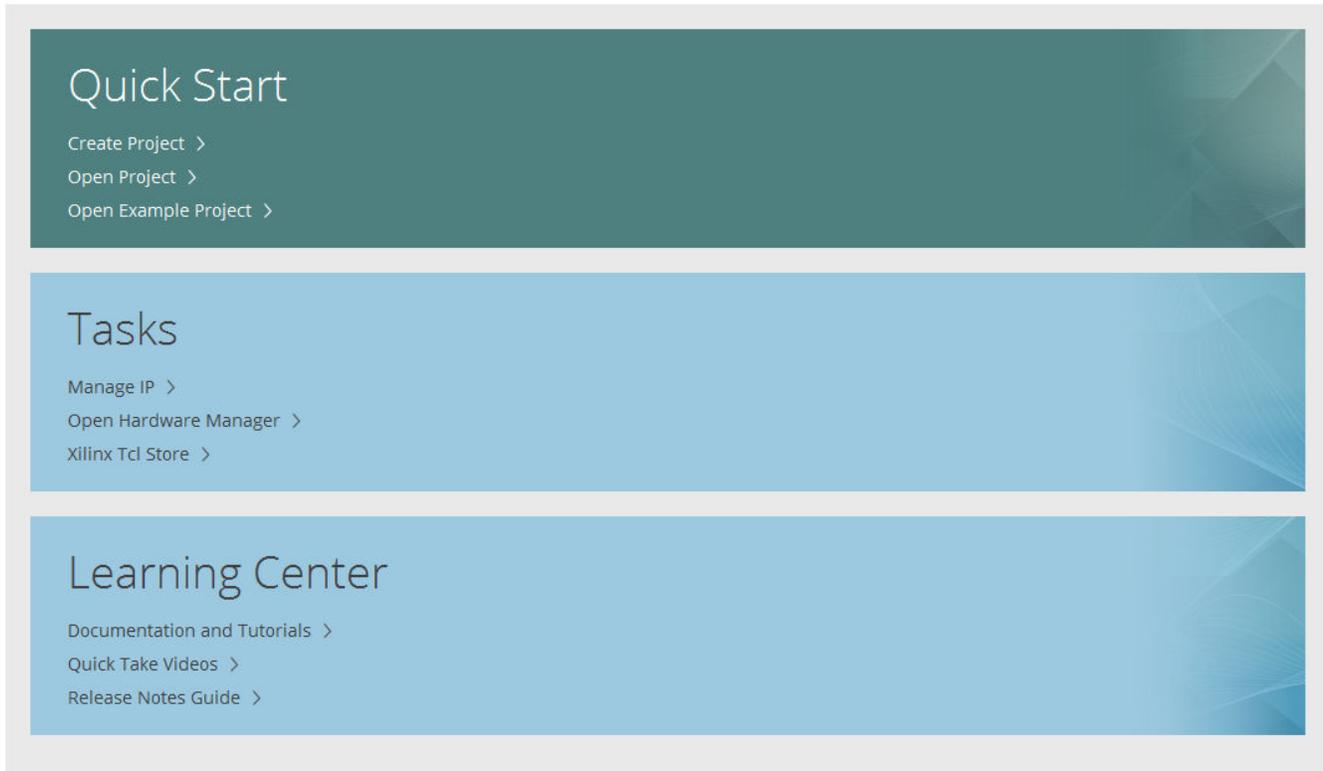


**Figure 7-5. SYNC is now set low Inside the ADC**

### 7.2.1 Programming the FPGA

This section provides instructions for programming the FPGA.

Launch *Vivado 2019.1* and open the *Hardware Manager*.



**Figure 7-6. Vivado® Main Menu**

### Select “Open Target”.

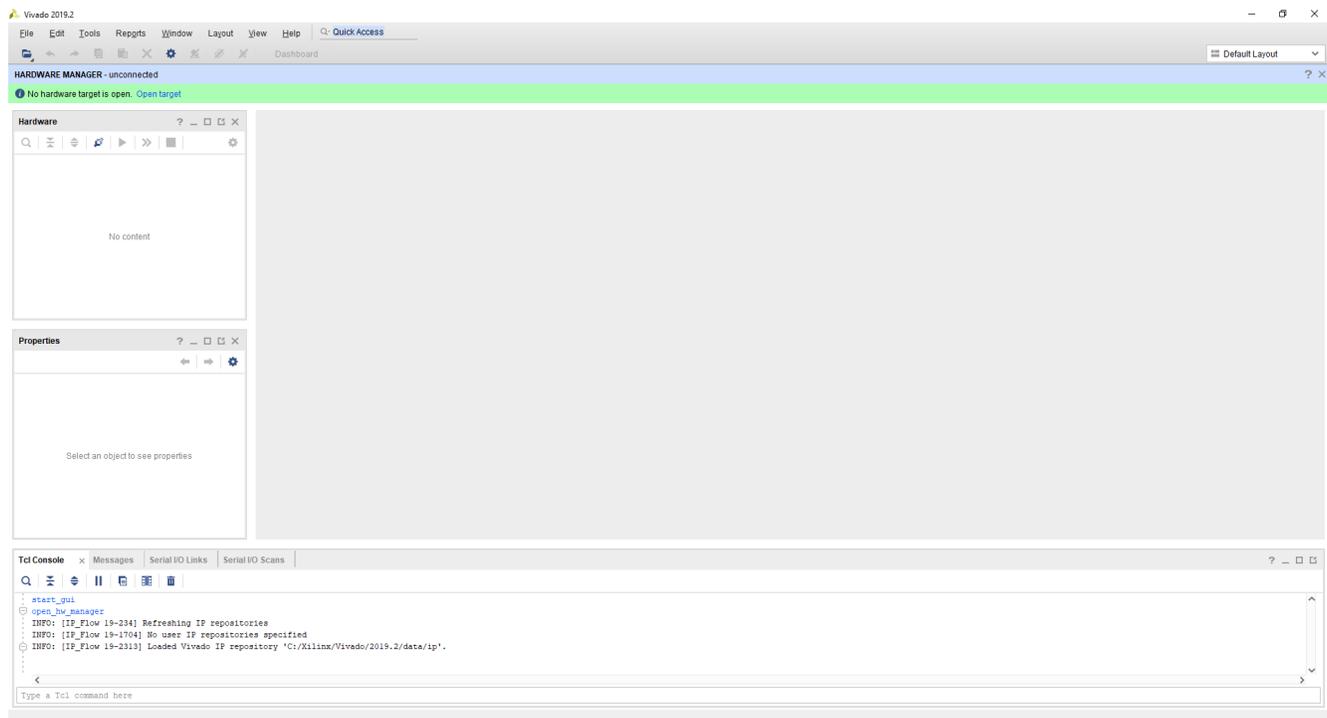


Figure 7-7. Open Target

### Select “Auto Connect”

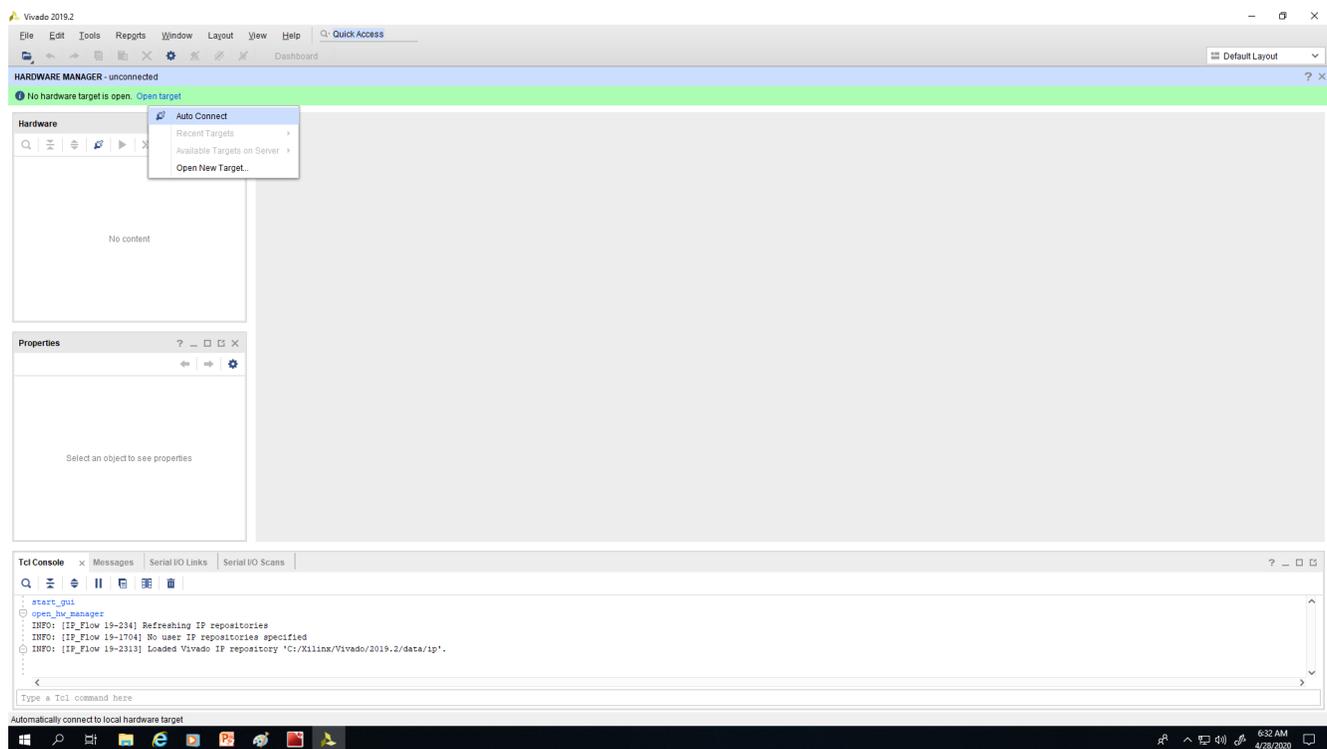
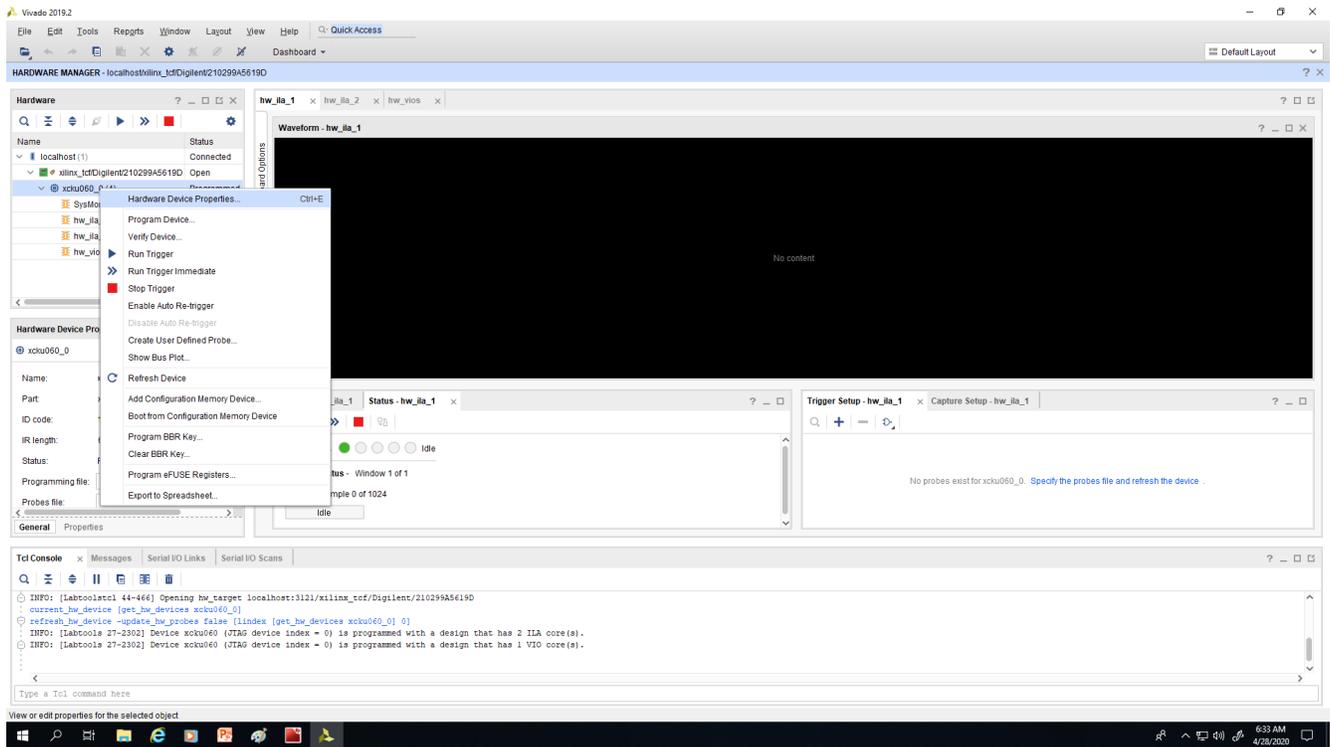


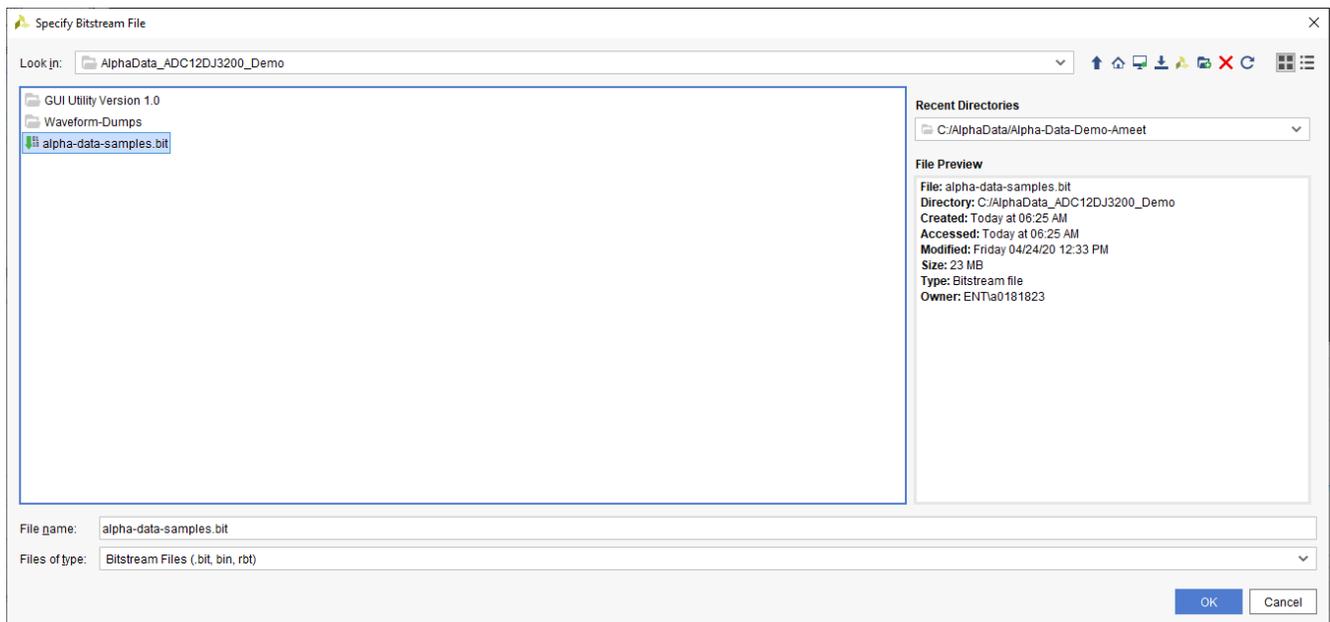
Figure 7-8. Auto Connect

Right click on the xcku060... device and select “Program”.



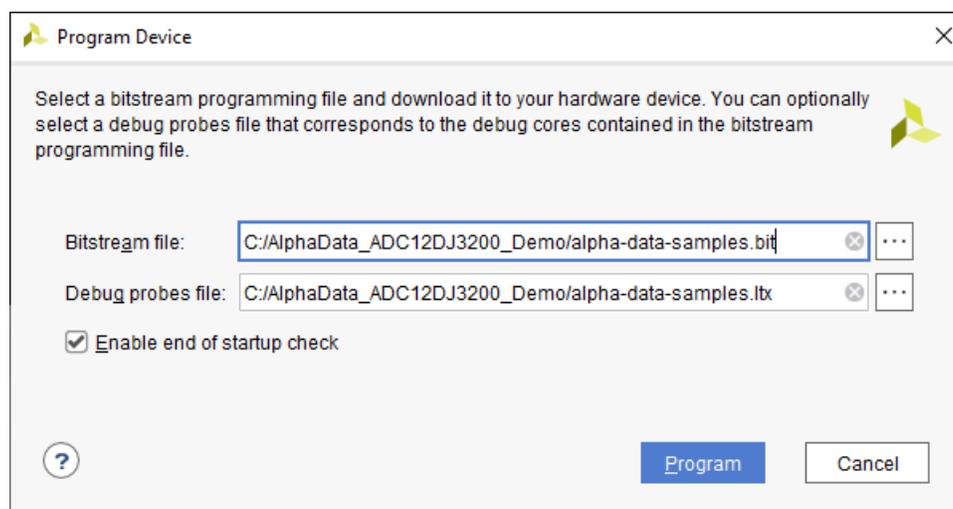
**Figure 7-9. Select Device**

Navigate to C:\AlphaData\_ADC12DJ3200\_Demo and select the file “alpha-data-samples.bit”.



**Figure 7-10. Navigate to bit File Location**

Click the *Program* button to complete the FPGA configuration with the bitfile.



**Figure 7-11. Program Device With the bit File**

In the Vivado TCL console, execute the following:

- `cd c:/AlphaData_ADC12DJ3200_Demo`
- `source setup_new.txt`

Switch back to the ADC12DJ3200EVM-CVAL GUI.

Navigate to the JESD204B tab and click on the JSYNC\_N Sync Request button (it should now be off, as [Figure 7-12](#) shows).

Switch back to the Vivado setup.

In the Vivado TCL console, execute the following:

```
cd c:/AlphaData_ADC12DJ3200_Demo
source capture_new.txt
```

The FPGA will now be doing continuous captures of the ADC data.

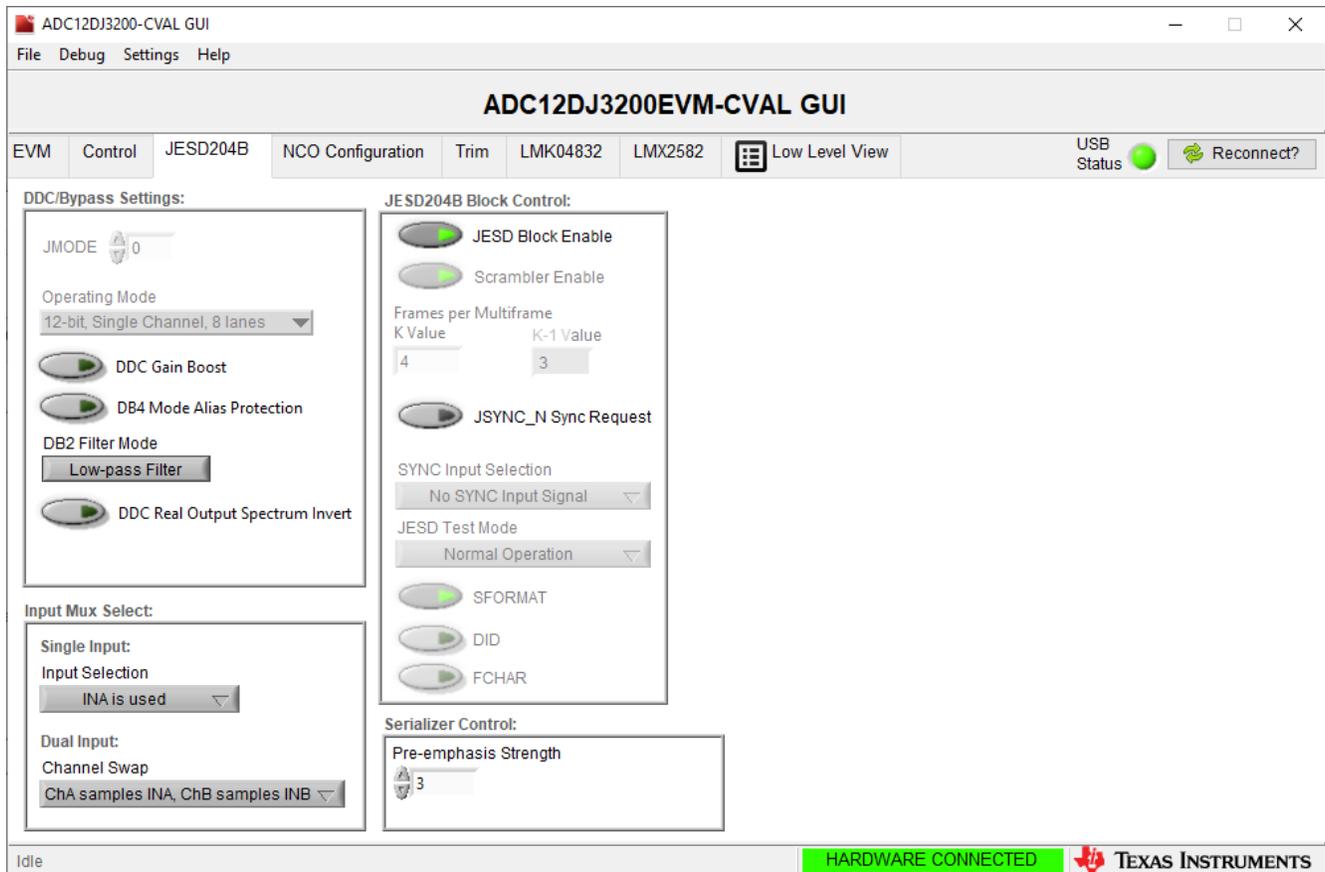


Figure 7-12. Send SYNC High to ADC

### 7.3 Viewing the Captured Data With High-Speed Data Converter Pro GUI

This section provides instructions for viewing the captured data with the HSDC Pro GUI.

Open the HSDC Pro GUI and click 'OK' on the box that pops up. The HSDC Pro GUI is primarily used as a display tool. It is not collecting data, so there is no board to connect to.

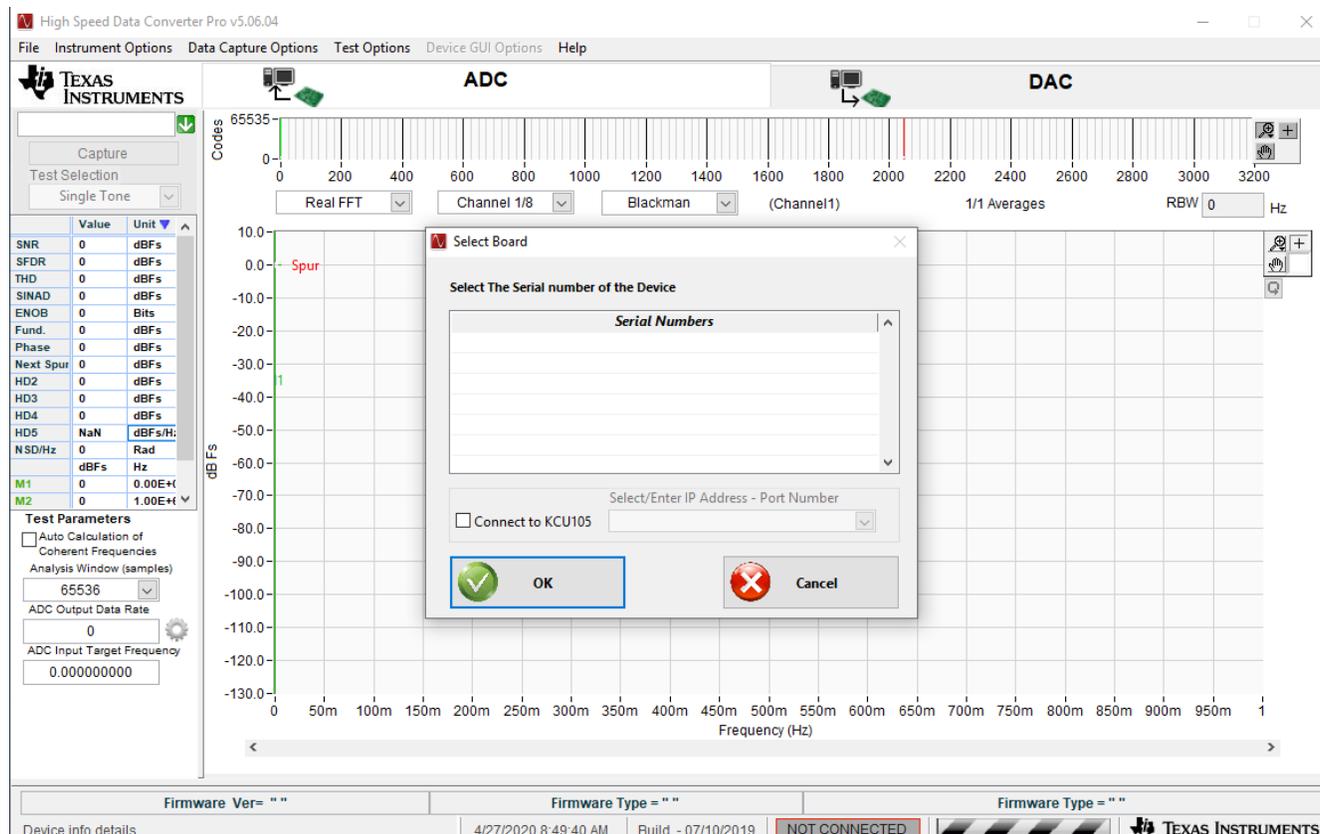


Figure 7-13. HSDC PRO GUI

Set the ADC Output Data Rate to the appropriate number (6.2G in this case) in the ADC Output Data rate box in the lower left of the GUI.

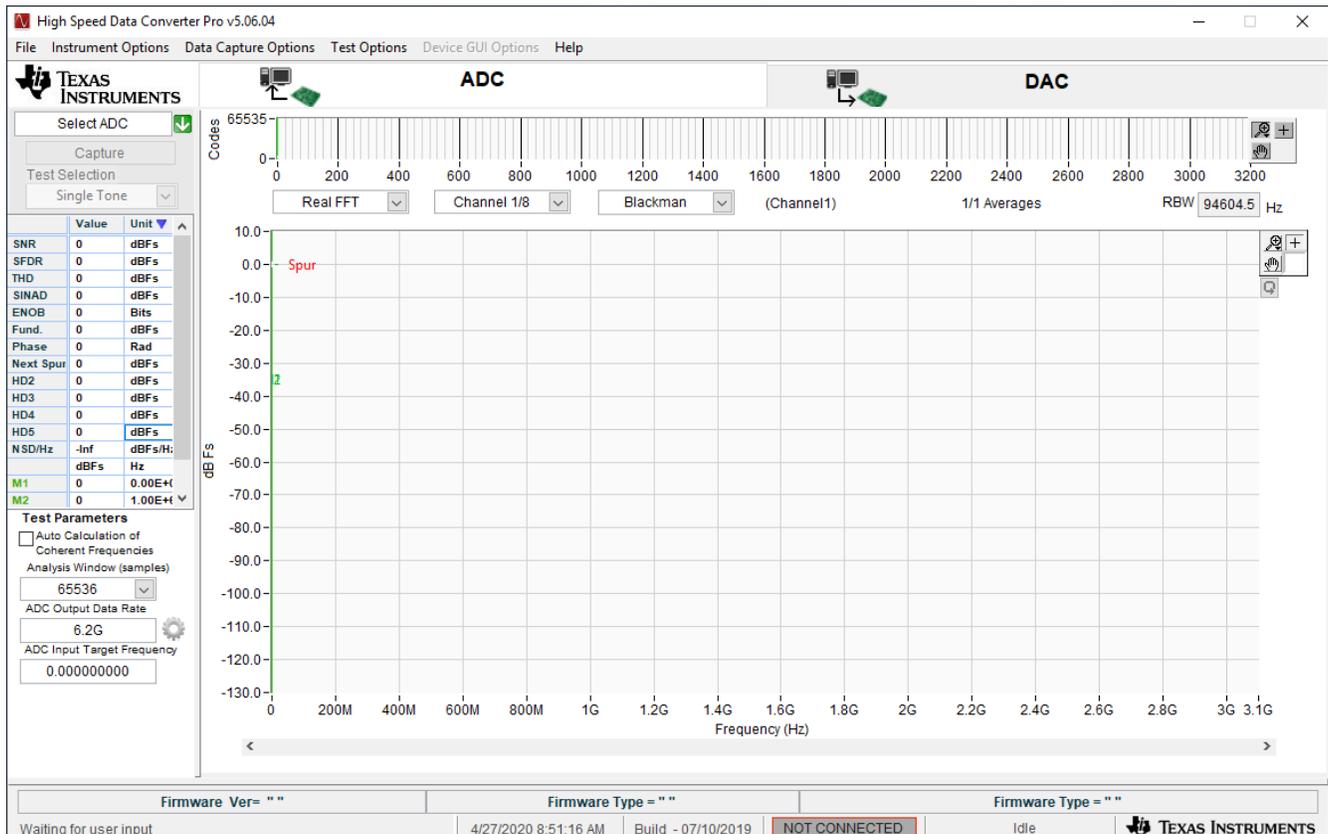
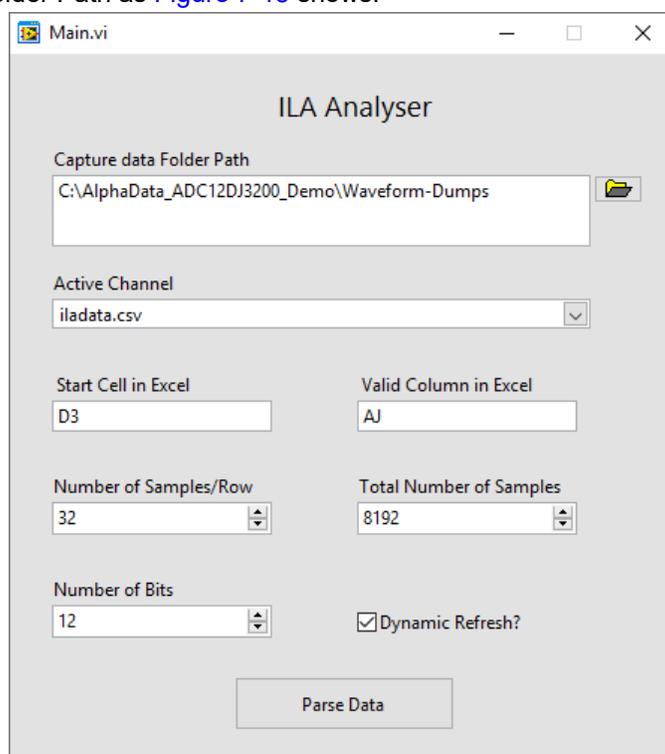


Figure 7-14. Enter ADC Sampling Rate

Open a Microsoft® Windows® file browser and carry out the following:

- Navigate to C:\AlphaData\_ADC12DJ3200\_Demo\GUI Utility Version 1.0
- Launch “ILA Analyser”
- Set the Capture data Folder Path as [Figure 7-15](#) shows.



**Figure 7-15. ILA Analyser**

- Fill in the rest of the values
- With Dynamic Refresh selected, the analyzer will do continuous captures. Unselecting this box will only do a one time capture. This should be selected.

---

#### Note

Use the Active Channel drop-down to explicitly select the iladata.csv file (even if it is displayed by default). Otherwise, the tool may show error symbols on the rest of the fields (as it has not parsed the file yet to map the fields to its internal parameters).

---

Click on "Parse Data". Go back to the HSDC Pro GUI. The GUI will now be displaying continuous captures from the ADC12DJ3200CVALEVM.

Contact TI for more support regarding the FPGA firmware and more available modes of operation for this demo.

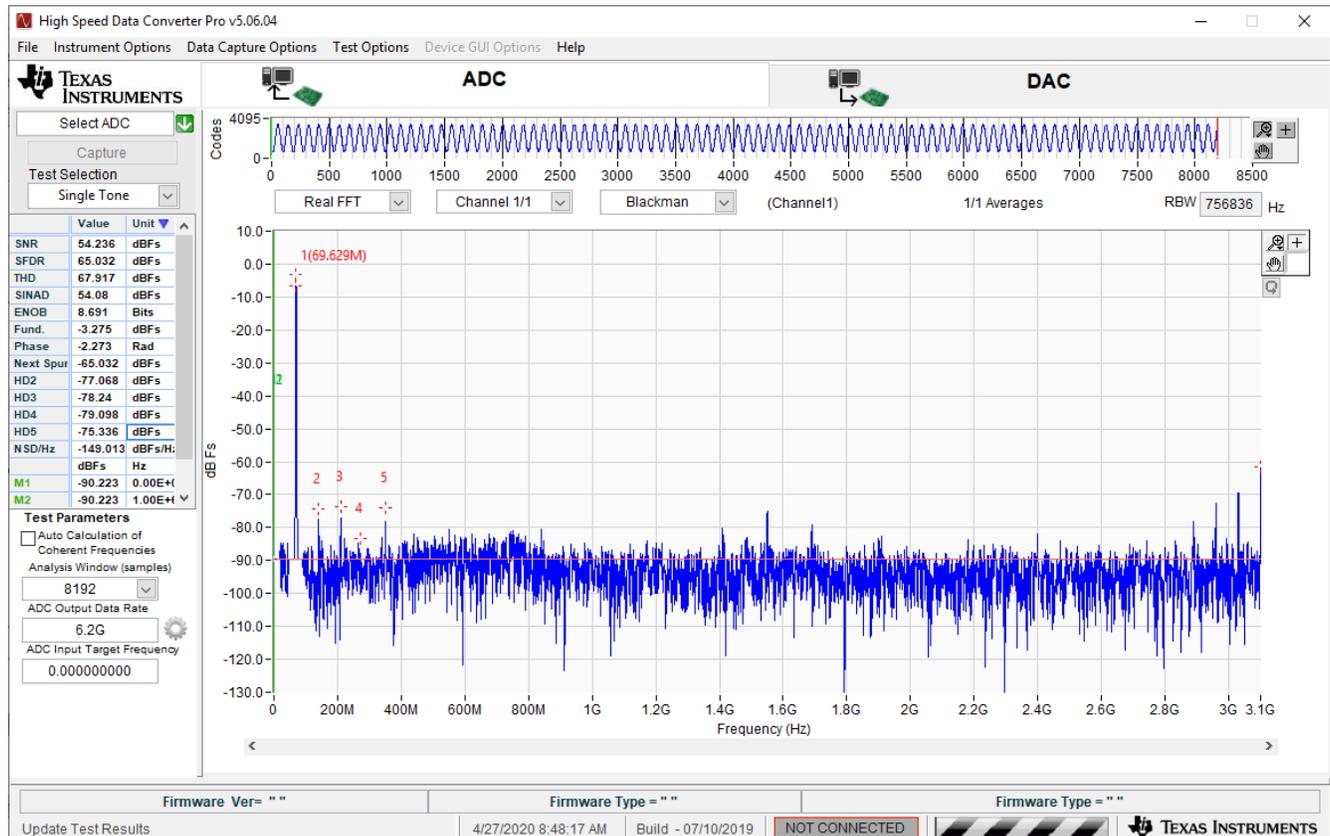


Figure 7-16. HSDC Pro Captured Data

## 8 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision * (May 2020) to Revision A (October 2020)	Page
Deleted R97 text, box and arrow from <a href="#">Figure 6-1</a> .....	7
Deleted the Caution Note from the <i>Hardware Setup</i> section.....	7
Changed text in the <i>Hardware Setup</i> section From: "U5 (24C65T-I/SM from Microchip) can be installed on the EVM and programmed" To: "U5 (24C65T-I/SM from Microchip) is programmed".....	7

## STANDARD TERMS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an "EVM" or "EVMs") to the User ("User") in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.
  - 1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductors products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM ("Software") shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms that accompany such Software
  - 1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.
2. *Limited Warranty and Related Remedies/Disclaimers:*
  - 2.1 These terms do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.
  - 2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for a nonconforming EVM if (a) the nonconformity was caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.
  - 2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

### **WARNING**

**Evaluation Kits are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems.**

**User shall operate the Evaluation Kit within TI's recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI's recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI's instructions for electrical ratings of interface circuits such as input, output and electrical loads.**

**NOTE:**

**EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGRADATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.**

### 3 Regulatory Notices:

#### 3.1 United States

##### 3.1.1 Notice applicable to EVMs not FCC-Approved:

**FCC NOTICE:** This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

##### 3.1.2 For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:

#### **CAUTION**

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

#### **FCC Interference Statement for Class A EVM devices**

*NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.*

#### **FCC Interference Statement for Class B EVM devices**

*NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:*

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

#### 3.2 Canada

##### 3.2.1 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247

#### **Concerning EVMs Including Radio Transmitters:**

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

#### **Concernant les EVMs avec appareils radio:**

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

#### **Concerning EVMs Including Detachable Antennas:**

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

### Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

#### 3.3 Japan

3.3.1 *Notice for EVMs delivered in Japan:* Please see [http://www.tij.co.jp/lstds/ti\\_ja/general/eStore/notice\\_01.page](http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_01.page) 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。  
[http://www.tij.co.jp/lstds/ti\\_ja/general/eStore/notice\\_01.page](http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_01.page)

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

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3.3.3 *Notice for EVMs for Power Line Communication:* Please see [http://www.tij.co.jp/lstds/ti\\_ja/general/eStore/notice\\_02.page](http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_02.page)  
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#### 3.4 European Union

3.4.1 *For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive):*

This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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4. *EVM Use Restrictions and Warnings:*
    - 4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.
    - 4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.
    - 4.3 *Safety-Related Warnings and Restrictions:*
      - 4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.
      - 4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.
    - 4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.
  5. *Accuracy of Information:* To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.
  6. *Disclaimers:*
    - 6.1 EXCEPT AS SET FORTH ABOVE, EVMS AND ANY MATERIALS PROVIDED WITH THE EVM (INCLUDING, BUT NOT LIMITED TO, REFERENCE DESIGNS AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY EPIDEMIC FAILURE WARRANTY OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.
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8.1 *General Limitations.* IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS OR THE USE OF THE EVMS , REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN TWELVE (12) MONTHS AFTER THE EVENT THAT GAVE RISE TO THE CAUSE OF ACTION HAS OCCURRED.

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9. *Return Policy.* Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

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