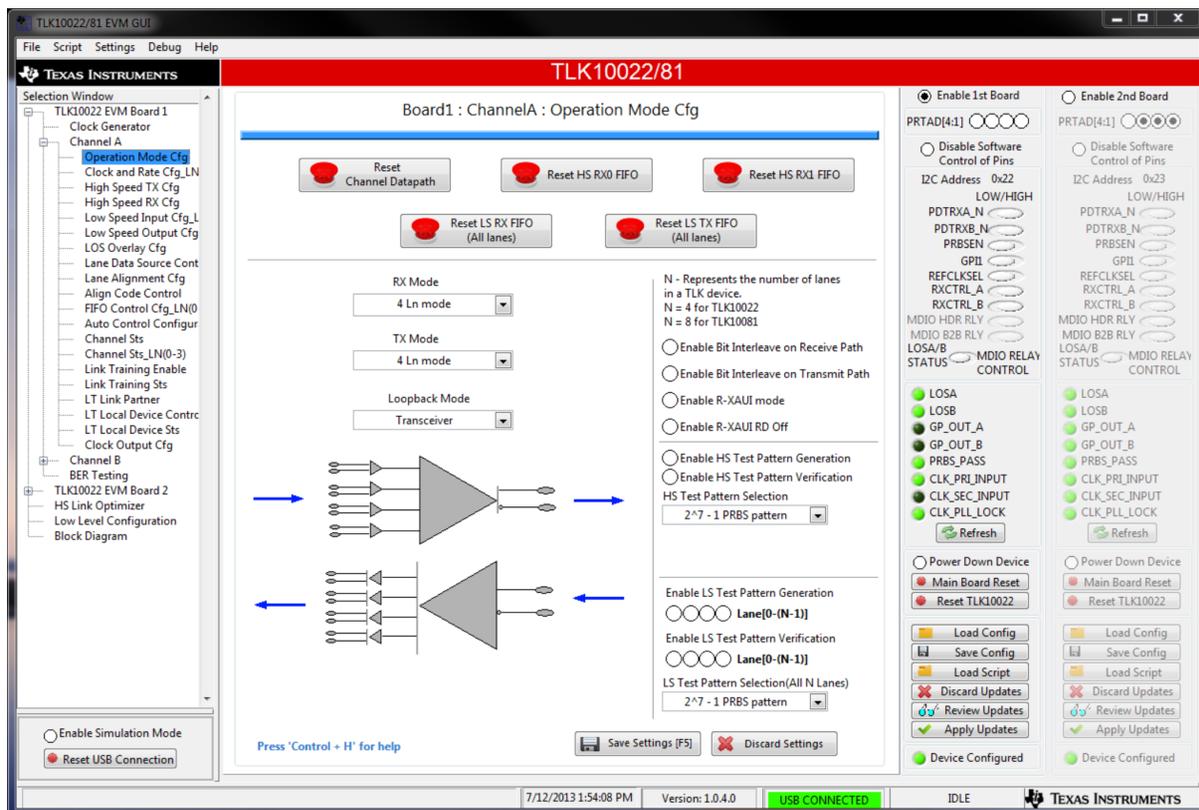


TLK10022 and TLK10081 Multi-Rate Lane Aggregator Evaluation Module (EVM) Graphical Users Interface (GUI)

This user's guide describes the usage and construction of the TLK10022 and TLK10081 (TLK10022/81) evaluation module (EVM) GUI. This document provides a basic overview of the different portions of the program.



WARNING

This equipment is intended for use in a laboratory test environment only. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to subpart J of part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user at own expense will be required to take whatever measures may be required to correct this interference.

Contents

1	Introduction	3
2	Getting Started	3
3	High Level TLK10022/81 Device Configuration	5
4	Low Level TLK10022/81 Device Configuration	13
5	BER Testing	14
6	High Speed Link Optimizer Tests	15
7	Python™ Scripting	19
8	GUI Status	23
9	Debug Options	24
10	Troubleshooting	24

List of Figures

1	TLK10022/81 EVM GUI Board 1 Window	4
2	TLK10022/81 EVM GUI Hierarchical Selection Window Tree	5
3	TLK10022/81 EVM GUI Software Control of I/O Pins and Main Reset.....	6
4	TLK10022/81 EVM GUI Operating Mode Configuration	7
5	TLK10022/81 EVM GUI High Level Review Updates	8
6	TLK10022/81 EVM GUI High Level Device Clock and Rate Configuration	9
7	TLK10022/81 EVM GUI High Level Device Status Windows.....	10
8	TLK10022/81 EVM GUI High Level Device Immediate Action Pushbuttons	11
9	TLK10022/81 EVM GUI High Level Device Load Script Selection Window	12
10	TLK10022/81 EVM GUI Low Level Device Configuration.....	14
11	TLK10022/81 EVM GUI High Level BER Testing	15
12	TLK10022/81 EVM GUI High Speed Link Optimizer Setup.....	16
13	TLK10022/81 EVM GUI High Speed Link Optimizer Setup.....	17
14	TLK10022/81 EVM GUI High Speed Link Optimizer Setup.....	18
15	TLK10022/81 EVM GUI High Speed Link Optimizer Sweep Results Matrix	18
16	TLK10022/81 EVM GUI High Speed Link Optimizer Test Control Buttons	19
17	TLK10022/81 EVM GUI Launching Python Scripting Editor	19
18	TLK10022/81 EVM GUI Blank Python Scripting Editor.....	20
19	TLK10022/81 EVM GUI Python Scripting Editor in Record Mode (Toggles Color).....	20
20	TLK10022/81 EVM GUI Recorded Script in Python Scripting Editor	21
21	TLK10022/81 EVM GUI Python Shell	22
22	Status Bar	23
23	TLK10022/81 EVM GUI Status Log Window	23

1 Introduction

TI's TLK10022/81 SERDES evaluation module (EVM) boards are controlled and configured with a custom-developed GUI created using the LabVIEW™ 2010 programming language by National Instruments.

High- and low-level manipulation of the registers is possible through this GUI as well as a variety of built-in test modes. Both channels of the device and every low-speed input/output lane in each channel is handled independently allowing maximum configurability of the device. Global Write register bits exist, allowing the register read/write commands to be applied to every channel, and lane, simultaneously to shorten the configuration time. However, these bits are not implemented in the GUI and the user should be aware that the configuration sequences in the GUI could be optimized for both time and redundancy for the particular use case when implementing the system.

The High Speed Transmit and Receive parameters can be swept through a nested loop of parameter combinations in the *HS Link Optimizer* portion of the GUI. The test results can be reviewed both visually and empirically through a saved test report with the results. Running the *Link Optimizer* saves the user time in determining the optimal combination of settings for the particular system or test setup.

Advanced functionality and debug capabilities are built into the GUI through the implementation of the Python™ scripting language. A recording of register read/write transactions can be recorded in real-time while the user is manually using the GUI in order to create a reusable and easily modified script for future work. These scripts can be modified by the user to include any supported Python 2.7 features including loops, file I/O, and command prompt user input.

2 Getting Started

Configure the EVM hardware and connect the USB Dongle to the PC before starting the TLK10022/81 EVM GUI. The first time the GUI is started, default settings and configuration files are created and saved into the working directory of the PC causing the GUI to take longer than normal to open.

The TLK10022/81 EVM implements TI's TCA6424 I²C-to-GPIO device to provide software control and status monitoring of the device's I/O pins. When the board is powered up and the GUI is run, the GUI first initializes the registers of the TCA6424 for their default values and issues a Main Board Reset, resetting the device. This ensures that the GUI and device register values are synchronized to their default values prior to configuration. When this reset occurs, the red reset LED on the EVM blinks momentarily and then the green LED relights when the reset operation is complete.

The GUI is designed to control up to two TLK10022 or TLK10081 EVMs when one is configured to accept the MDIO and I2C control signals from the first board that is connected to the USB port of the PC. Currently, this feature is not fully implemented and tested in both hardware and software. See future revisions of this document for additional information. Use Board 1 settings and registers when only one board is connected to the PC.

Both channels can be configured simultaneously using Channel A's settings as a reference. Selecting the TLK10022/81 EVM Board window from the *Selection Window* menu (Figure 1) allows selection whether or not to simultaneously configure both channels. After making a selection, click the **Save Settings [F5]** button at the bottom of the screen.

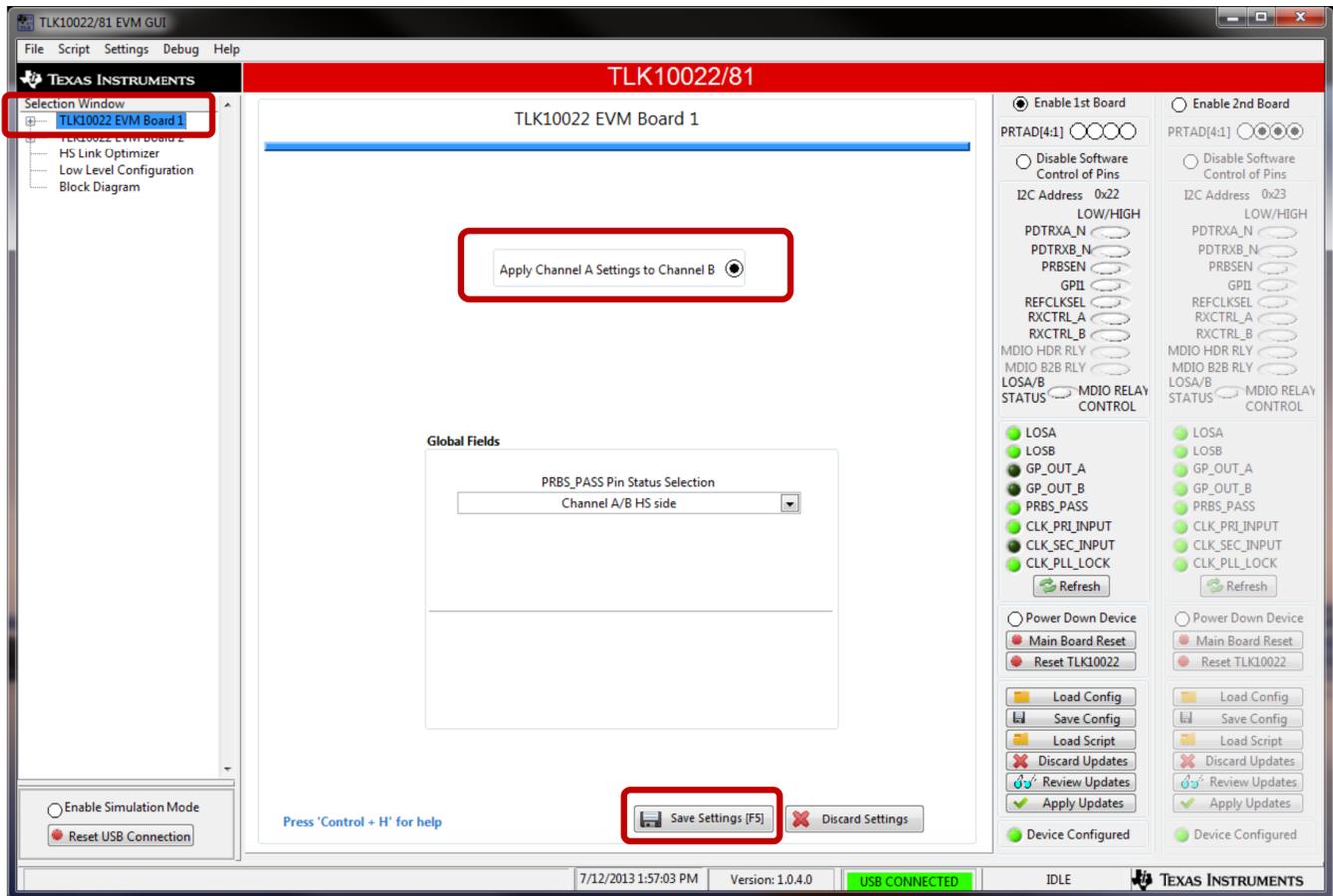


Figure 1. TLK10022/81 EVM GUI Board 1 Window

3 High Level TLK10022/81 Device Configuration

All of the TLK10022/81 control and status register fields have been grouped together based upon function and are accessed on an individual basis through the use of a *high-level* control. Expanding the Board Hierarchy in the GUI's *Selection Window* tree (Figure 2) displays the various channel and window windows. If both channels are chosen for simultaneous configuration, the GUI disables the selection windows for Channel B. The registers are written to the device individually, but the GUI allows the user to save time and adopts Channel A's settings into the GUI's register configuration array.

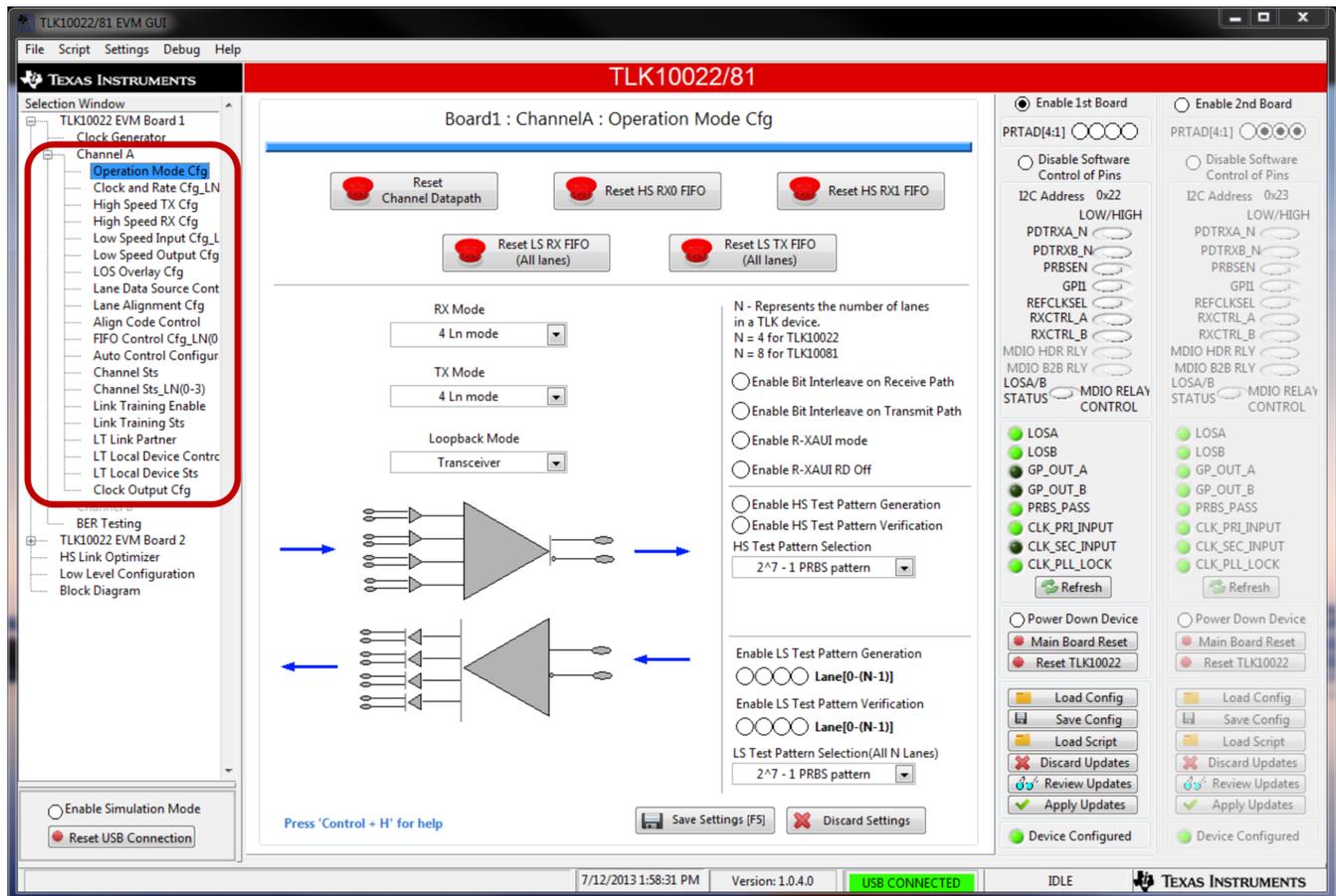


Figure 2. TLK10022/81 EVM GUI Hierarchical Selection Window Tree

Configuration of the External Control pins of the TLK10022/81 device through the GUI is performed through TI's TCA6424 onboard I²C-to-GPIO device. The TCA6424 is configured to control the high/low settings of the device from USB data sent to the board from the GUI. It is also possible to disable the software control and rely on manual settings of these signals. Monitoring external status pins is also possible through this method.

The GUI and the device settings on the board can be synchronized by initiating all reset signals from the GUI through the various buttons. If the reset button on the board itself was pressed, the GUI would not realize that the registers were reset and continue to display the previous register values. Pressing the **Main Board Reset** button (Figure 3) in the GUI is equivalent to pressing the reset pushbutton on the EVM board and has the added benefit of resetting the GUI's register settings to match the hardware default values applied to the TLK10022/81 device following a Main Reset.

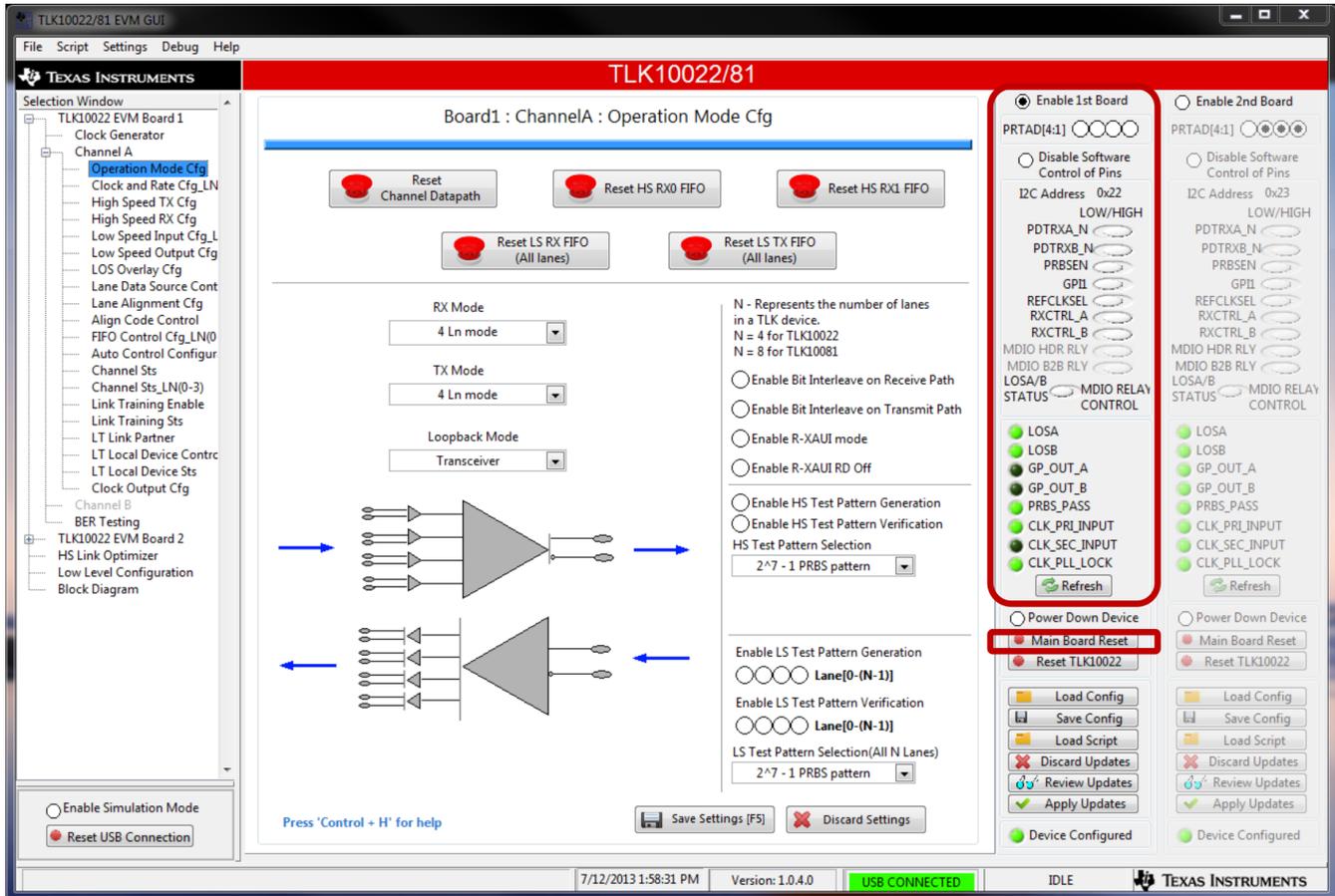


Figure 3. TLK10022/81 EVM GUI Software Control of I/O Pins and Main Reset

The TLK10022/81 register settings are configured from the high-level device configuration windows of the GUI. All of the settings of the TLK10022/81 can be modified from various portions of this tab broken out and grouped into individual windows according to their function.

It is recommended to configure the TLK10022/81 device by starting at the first window in the GUI's *Selection Window* and work down the tree, selecting and saving any settings changed to something other than default.

The first window (Figure 4) has a selection box that allows easy configuration for all of the various Operational Modes of the TLK10022/81 device. This is a hybrid control and will set all of the various control register bits required for proper operation in that mode.

The default PRTAD[4:1] setting for TLK10022/81 EVM board and GUI is 4b'0000. If the PRTAD[4:1] value is changed on the TLK10022/81 EVM Board using the dip switch settings, the value must also be entered into the GUI on the Front Panel above the Control pin settings. If there is a hardware/software mismatch, then register read/write operations will fail. The same is true for the I²C Address on the TCA6424. Clicking the 0x22 allows the selection of address 0x23.

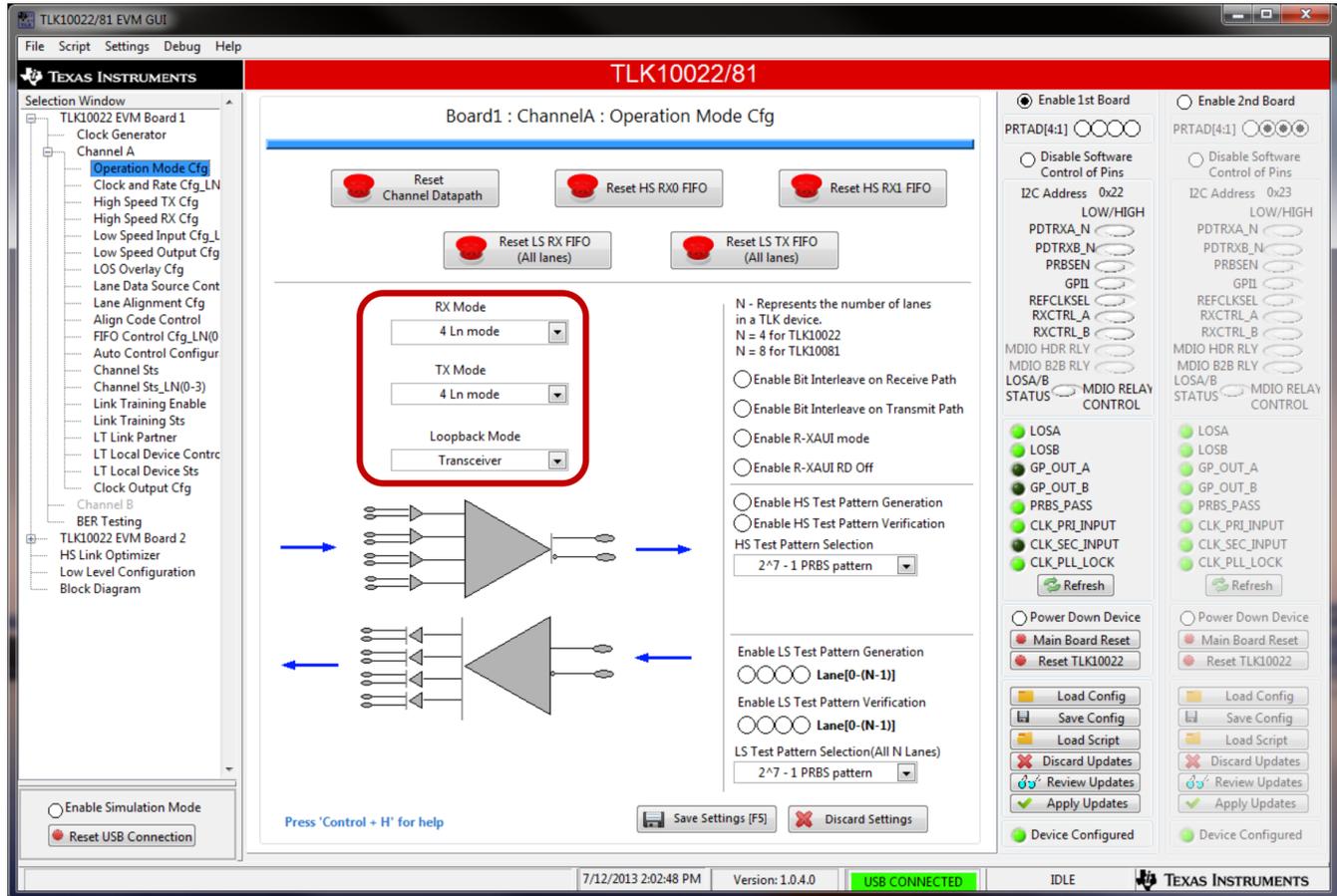


Figure 4. TLK10022/81 EVM GUI Operating Mode Configuration

When making changes to a particular control field in any of the high-level Control Windows, the value is stored into the GUI's register configuration array but is not immediately written to the device. When the settings have changed and the settings of the GUI do not match the actual register settings of the EVM device, the **Require Update?** light glows red, indicating that some setting has changed in the GUI memory and needs to be sent to the device. When the device settings match the GUI's memory the **Device Configured** light glows green indicating that the board is configured as displayed in the GUI.

To change the various register settings in the GUI Memory to a new value, simply find the particular parameter field in the various windows, select the new value, and click the **Save Settings** button. The change is discarded if the **Save** button is not clicked and the **Current Value** of the register is kept.

Saving all the values for the register fields in memory allows selection of the values for the device in any sequence chosen. The TLK10022/81 device settings and the newly-selected register values can be reviewed at any time by clicking the **Review Updates** button on the Front Panel of the GUI. This will bring up a window that shows the *Register Configuration Array* (Figure 5) and shows the current and new value for every register field. If the field has a new value, the status box for that array is shaded orange highlighting the changes to be applied to the TLK10022/81 device. To discard the changes in memory and keep the current settings, click the **Discard Updates** button to reset the new value fields with the current values.

Register values in other windows that are not relevant in the particular operation mode are disabled and become grayed out. This allows easy determination as to which register control fields are relevant for their mode and need to be configured.

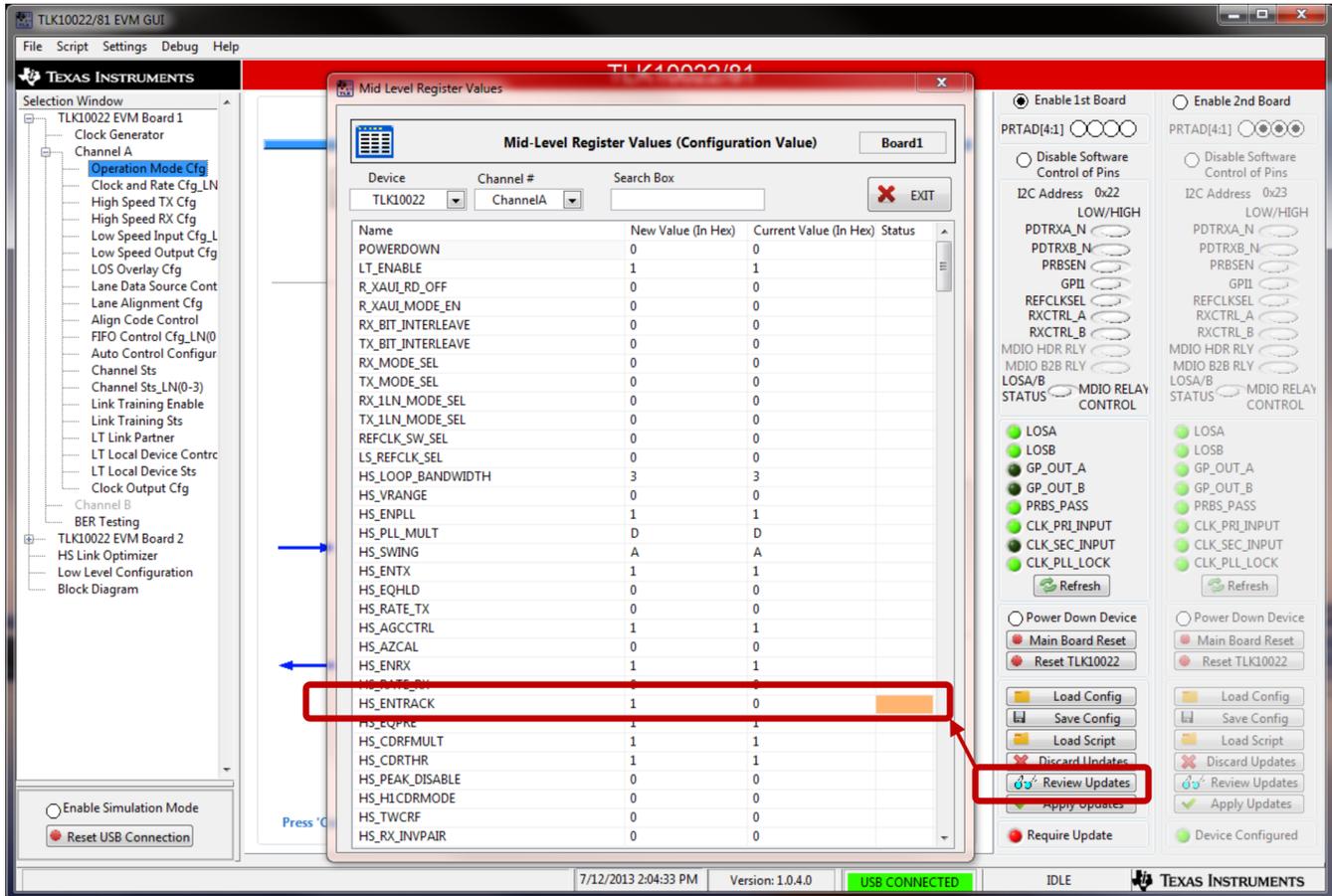


Figure 5. TLK10022/81 EVM GUI High Level Review Updates

After selecting the Operating Mode settings, select the *Clock and Rate Configuration* window (Figure 6) from the **Selection Window** tree. The reference clock selection and rate settings for each high speed channel and low speed lane can be configured based on the application.

Save any changes to the **Clock and Rate Configuration** window.

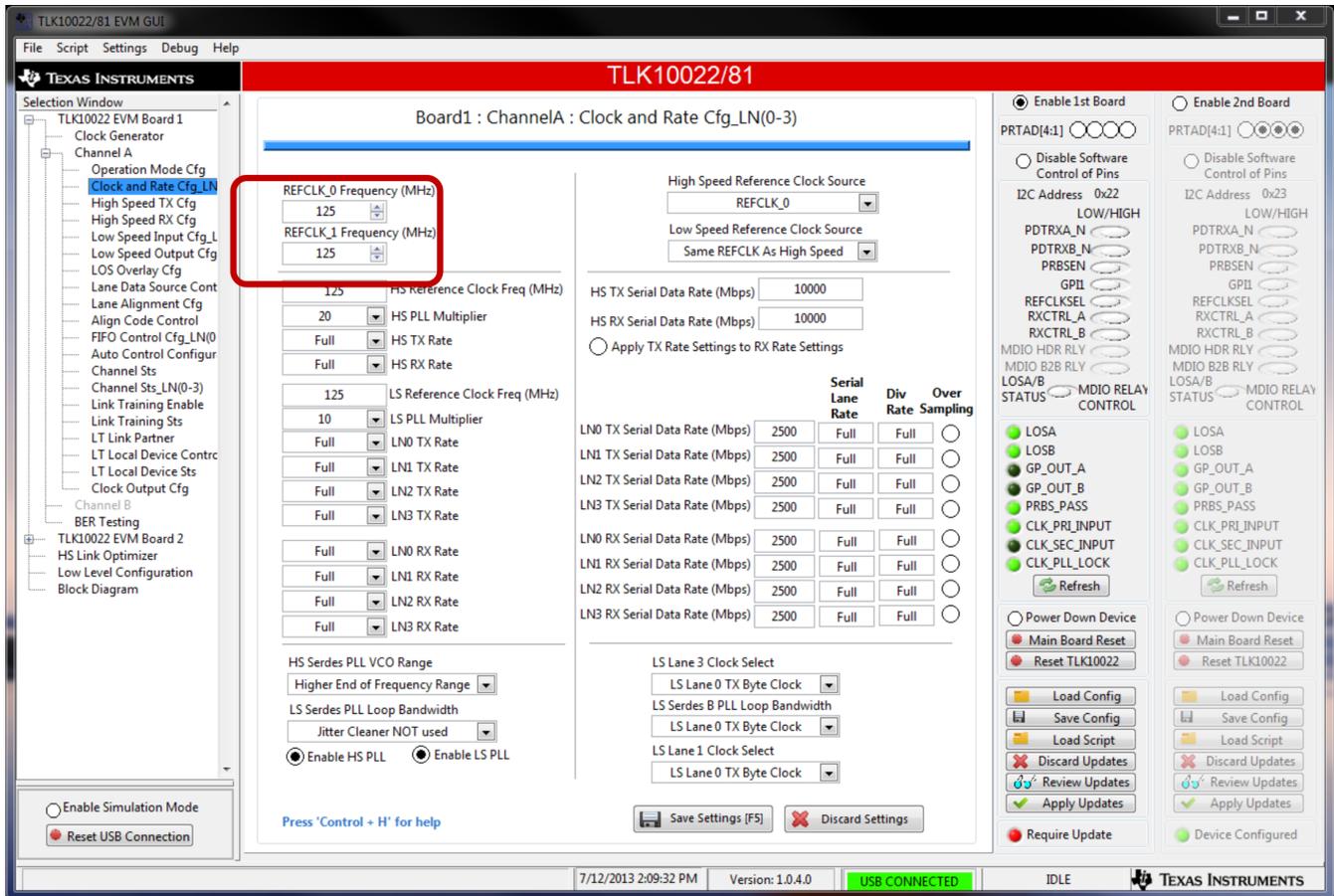


Figure 6. TLK10022/81 EVM GUI High Level Device Clock and Rate Configuration

Not all configuration windows will be displayed in this document. Work through the various windows making other necessary configuration settings.

Status Registers can be read at anytime from the various *Status* windows (Figure 7). Clicking the **Refresh** button located in the top right corner of the *Status* window causes all of the registers associated with that particular window to be read and the results to be displayed.

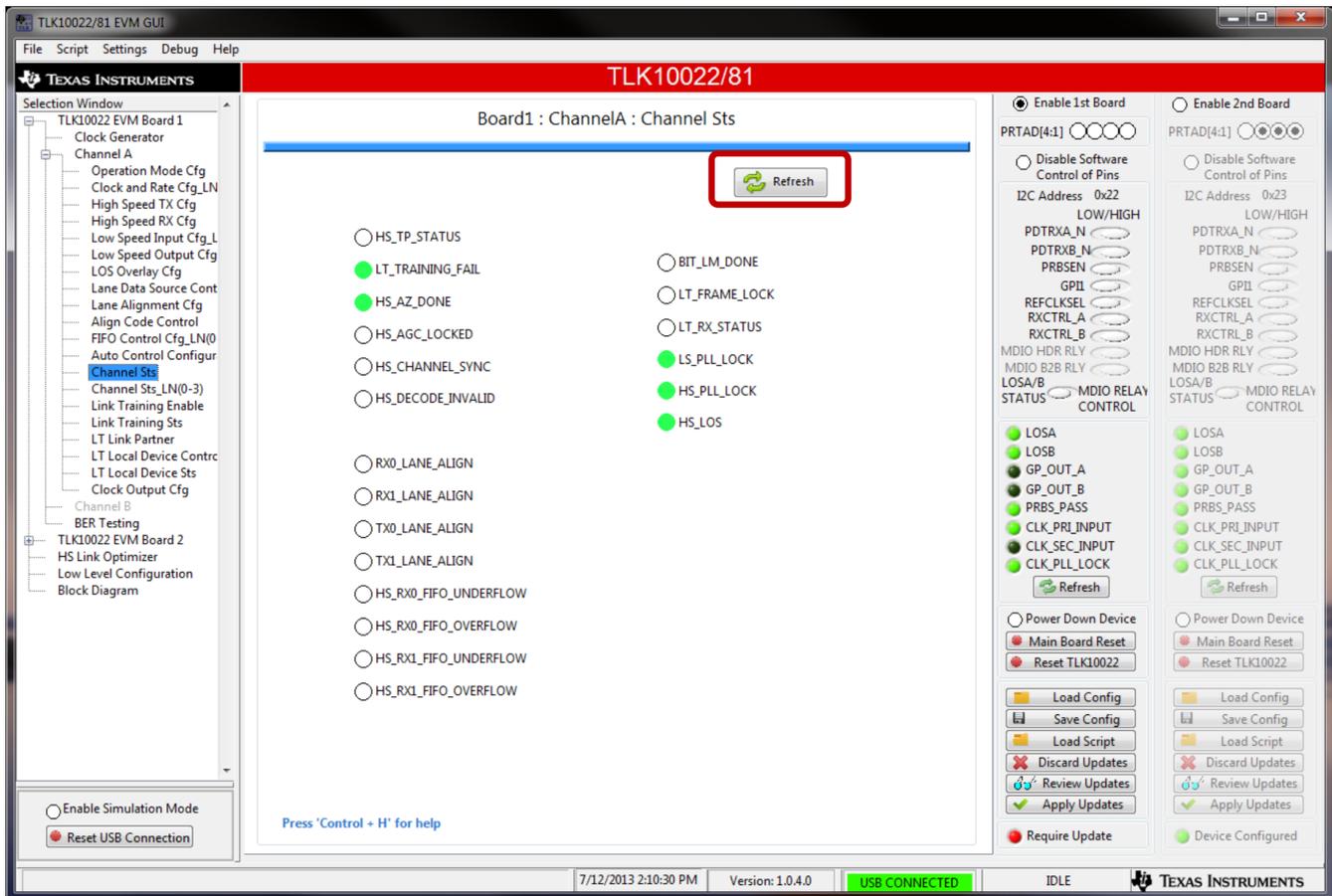


Figure 7. TLK10022/81 EVM GUI High Level Device Status Windows

The red pushbutton controls located on the various windows, such as the **Reset TLK10022/81 Channel Datapath** button on the *Operation Mode* window, cause an immediate write of that register. Depending on which button is pressed, the saved register values may or may not be affected and reset. The GUI only resets the saved values if the register values are reset in hardware based upon the action committed by that particular pushbutton.

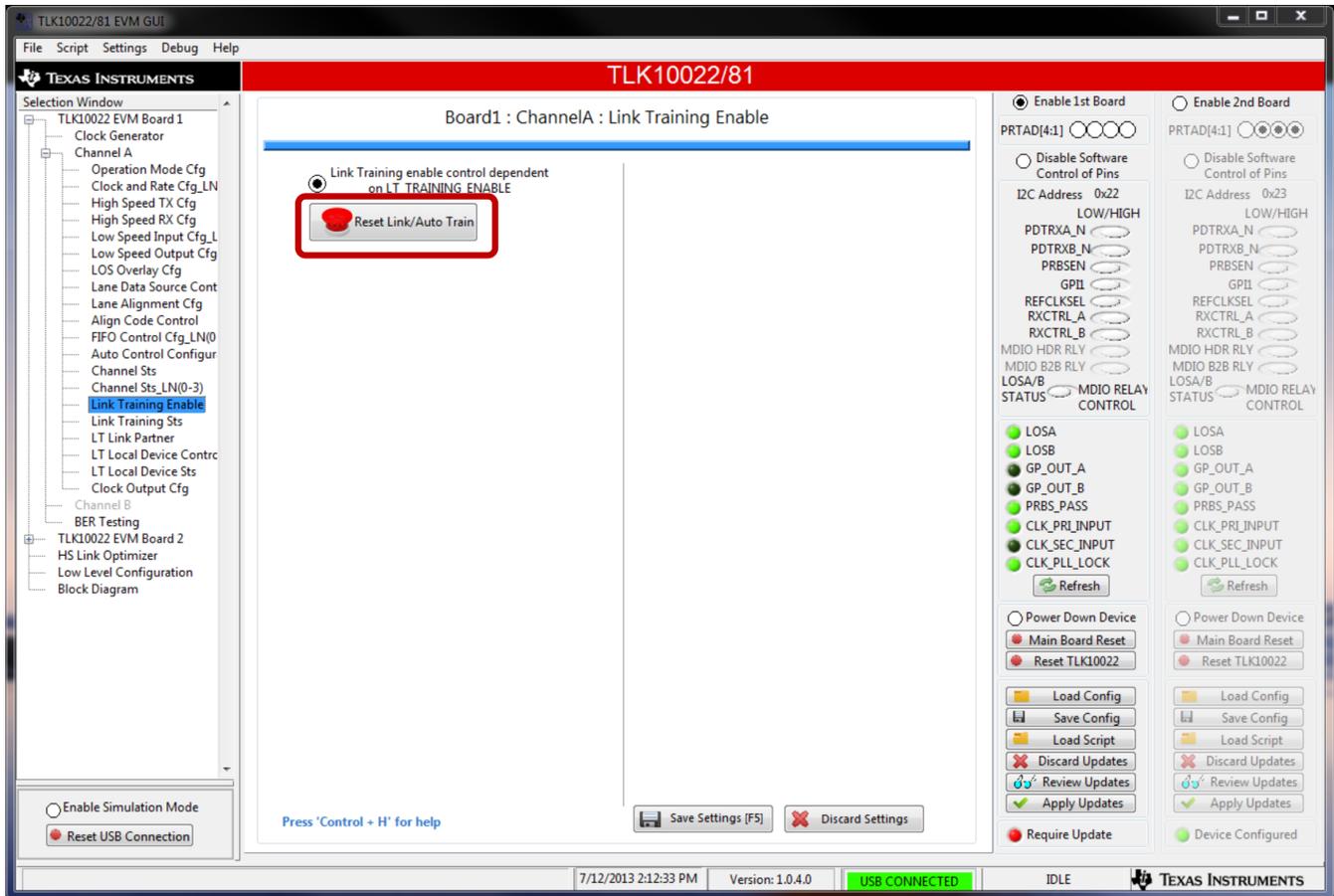


Figure 8. TLK10022/81 EVM GUI High Level Device Immediate Action Pushbuttons

After changing the various control fields and all settings are saved into the GUI's memory, apply the updated settings to the TLK10022/81. The TLK10022/81 EVM GUI configures the device based upon a text file script. This script can be modified and loaded for any various specific or optimized use case and prevents the GUI from having a single hard-coded provisioning sequence. By implementing the use of this script, the provisioning sequence can be easily modified and adjusted without requiring the creation and deployment of a full software revision. A general provisioning file has been created and loaded by default that configures all writable registers of the TLK10022/81 device, when executed.

Any script can be set as the default script by first selecting the script in the **Load Script** button on the front panel of the GUI and then right-clicking the button and selecting the **Set as Default** option. From this point forward, this script is the default script loaded and executed by the GUI. The default script can be reset or changed at any time, as desired. The *Choose Script File* dialog boxes are shown in [Figure 9](#).

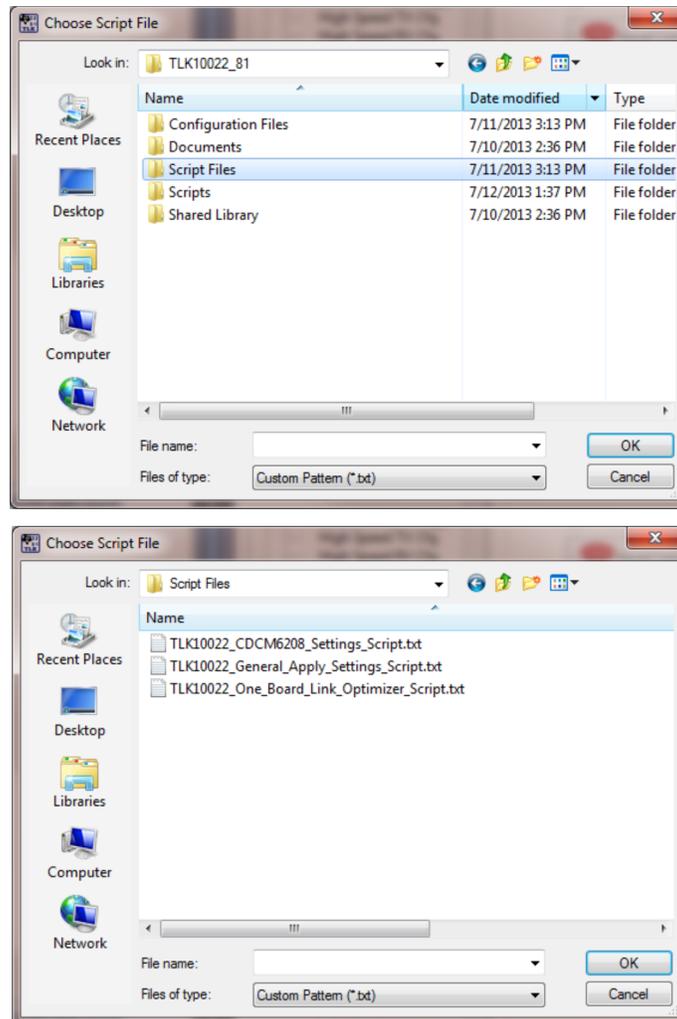


Figure 9. TLK10022/81 EVM GUI High Level Device Load Script Selection Window

Once the script is selected (no change is required if the default script is desired), click the **Apply Updates** button to execute the script. A popup window opens and displays the register read/writes in real time as they are applied to the TLK10022/81 device. The current executed command is displayed at the bottom of the window and the value of each register read and write is displayed in the window. The script can be stopped by pressing the **Abort** button.

A text file report of the *Apply Settings* script can be created to log all of the register read/write values that occurred during the script execution. This report can be useful when determining the values needed to be implemented in an FPGA or other system controller.

4 Low Level TLK10022/81 Device Configuration

Any register can be either read or written at any time through the use of the Low Level Configuration Window (Figure 10). There are three device types containing register stacks that may need modification. Similar to the GUI *Selection Window* tree, the various registers are grouped in an easily-expanded hierarchal tree, allowing quick navigation to the registers of interest.

The primary device that the user will need to read/write registers is the TLK10022/81. Expanding the TLK10022/81 in the tree shows *Board1* and *Board2* options. Select the appropriate board number that the TLK10022/81 is located and expand that to show the Global and Channel Specific registers. All registers are handled individually for maximum configurability.

Navigate to the desired register and click the register name in the tree. This loads the bit-specific register information into the *Register Data* window and shows the last read/write value of the register in both hex and bit format. The names of the bits are also displayed for easier reference. The *Register Description* box displays the description information from the TLK10022/81 datasheet for the chosen register, helping to understand the significance of a particular register bit value without having a copy of the datasheet.

To read a register value, simply click the register to read and then click the **Read Reg** button. The new value is returned.

To write a register with a new value, click the register name to load the register information into the *Register Data* window. Click the individual bit fields to change the new values from 1 to 0 or vice versa. A check mark indicates a 1 value and an open box indicates a 0 value. The HEX value of the register is automatically updated. Click the **Write Reg** button to write the new value to the TLK10022/81 register. Retyping the HEX value directly into the *Write Data* field also writes the value to the register when the **Write Reg** button is pressed and the individual bit fields are updated for the specific HEX value.

If a chosen register has the *Write Reg* information disabled and grayed out, then that register is read only.

The GUI knows the register communication protocol of all the different registers and writes to the register in the required mode. If a TCA6424 register is read or written, the GUI executes that transaction using the I2C protocol. The TLK10022/81 registers are MDIO Clause 45 Protocol, and the Spartan-6 registers (if using the legacy TLK10002 EVM FPGA Daughter Board) are MDIO Clause 22 protocol.

Also, the PHY and device address information is used from the various input fields associated with the various board address controls. It is important to ensure that the PRTAD[4:1] address is set appropriately for the boards, and the I²C address also matches the addresses set in hardware. The EVM board ships with PRTAD[4:1] = 4'b0000 and the I²C Address for the TCA6424 = 0x22.

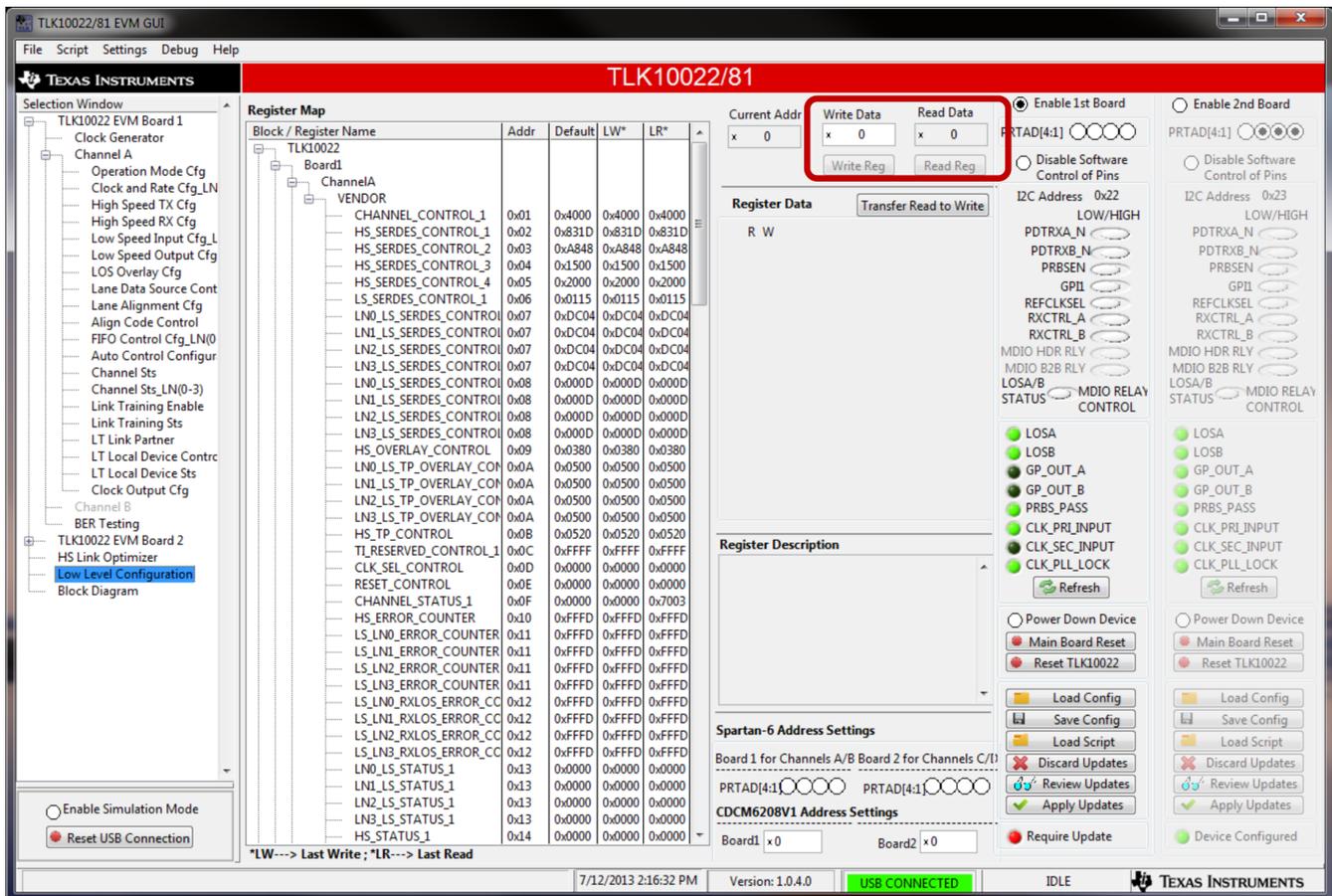


Figure 10. TLK10022/81 EVM GUI Low Level Device Configuration

5 BER Testing

The *BER Testing* portion of the GUI can be used after configuring the desired TLK10022/81 settings and applying them to the device. When selecting the *BER Testing* window from the Selection Window tree (Figure 11), a page is displayed for running BER tests with any of the supported internal test patterns. The generation/verification enables bits as well as the test patterns must be configured during the initial device configuration and this window only reads and displays the error counter results. Pressing the **Read Counter** button under the *SINGLE READ* title performs a single read of all the error counters. Note that the error counters are cleared on read and the first read should be discarded because it contains a value set prior to the start of the test. Reading an error counter twice initially is always recommended.

A cumulative BER test can be performed by pressing the **Run Test** button under the *AUTO READ* title. This reads all error counters in sequence and continues to read the error counters in a loop until the **Stop** button is pressed. Note that when the error counters stop being read at the end of the loop when the **Stop** button is pressed. If the test does not stop immediately when the **Stop** button is pressed, wait a short time to allow for the current loop to complete before the test is allowed to stop.

During the *AUTO READ* test, the *Current Count* of error values are displayed for the current read, and any errors are added to the *Cumulative Count*. Reset the *Cumulative Count* at any time by pressing the **Reset Cumulative** button under the *AUTO READ* title.

If bit errors are present, or the user would like to observe how different TX or RX settings affect the bit error rate, the left portion of the window allows access to all TX and RX parametric settings such as TX Swing, Pre-emphasis, and RX Equalization. Any adjustment of these controls will cause the GUI to apply the updated value in almost real time to the device. At the end of every error count read loop the GUI checks to see if any of the register control settings have been changed and the GUI applies writes the new values to the TLK10022/81 device before returning to the error count loop. All low- and high-speed TX/RX channels and lanes can be selected for control by using the *Transmitter Configuration* and *Receiver Configuration* selection boxes.

The results of the BER tests can be output to the *PRBS_PASS* LED on the TLK10022/81 EVM board by use of the *Pin Selection* box located at the top right corner of this window.

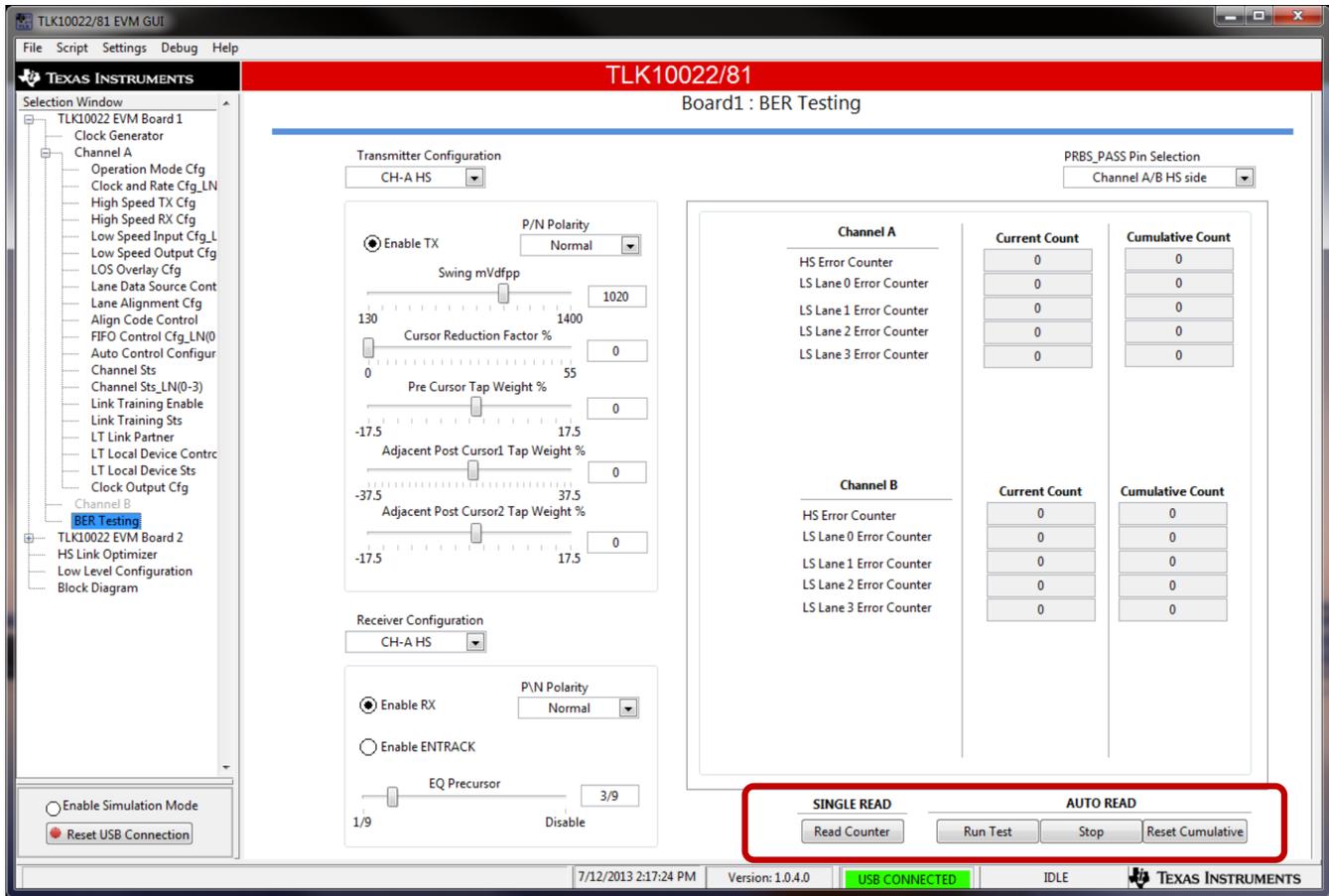


Figure 11. TLK10022/81 EVM GUI High Level BER Testing

6 High Speed Link Optimizer Tests

Once the TLK10022/81 device registers and settings are applied to the device, switching over to the *High Speed Link Optimizer* tab of the GUI provides some enhanced BER optimization tests allowing for quick evaluation of the health of the channel and what combination of parameter values yields the lowest bit error rate. This portion of the GUI is more applicable when operating modes that do not implement link training as part of their initialization sequence.

It is possible to optimize a link that contains two different devices on two different boards as in a real system and not serial loop back test normally found in a lab test environment. Currently additional testing and verification of the TLK10022/81 EVM board and GUI is needed to support the two-board solution for this feature of the GUI. Look for future revisions of this document for additional information on how to configure the hardware and software for a two-board setup.

Up to four individual sweeps can be run simultaneously allowing for the entire device to be optimized concurrently. Each of the four sweep setups has an enable check box in the *Set Up* tab to enable that sweep for testing. Not selecting irrelevant sweeps uses fewer PC resources.

Select the *No. of Parameters* from the selection box; up to 6. Notice that if less than 6 parameters are selected, the extra parameters are disabled and grayed out. The board number and channel number are required to ensure the proper board and device's parameters are swept in the two-board test setup. Once a parameter is used by a sweep, it is grayed out as an option for additional sweeps.

For each parameter swept, select the board number, channel, and parameter name. The start and stop values for those parameters are chosen with an associated step size. A step size of 1 sweeps every value; a step size of 2 sweeps every other value, etc. If a non-linear step or alternate order of the parameter values is desired, the sequence of values can be input in the form of a comma-separated list in any particular order. Match the syntax of the selected parameter fields in order to ensure the parameter is set properly. Do not include spaces in the comma-separated list. If a comma-separated list is used, the *Start*, *Stop*, and *Step* fields are ignored.

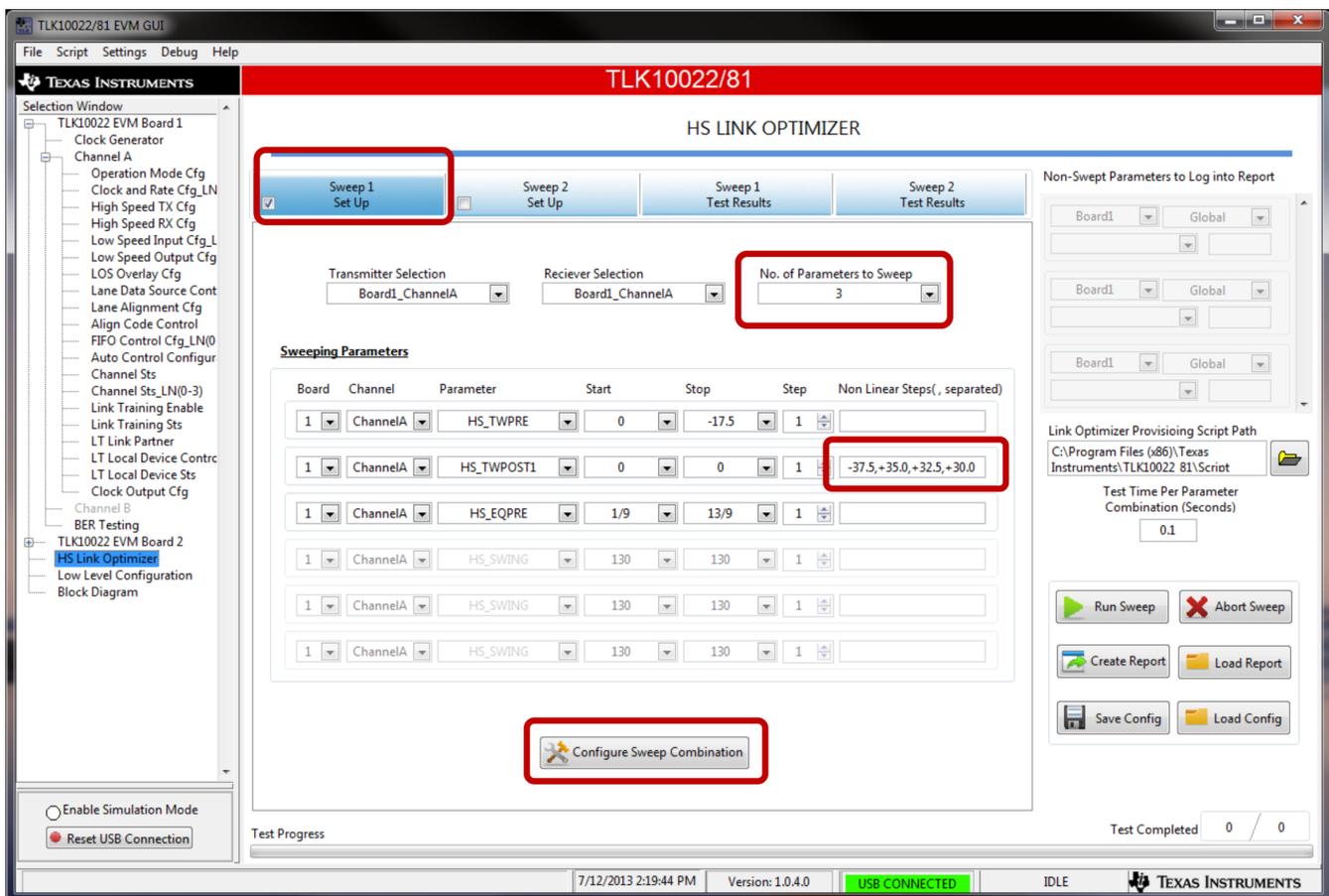


Figure 12. TLK10022/81 EVM GUI High Speed Link Optimizer Setup

Once all the sweeping parameters are configured, the user needs to press the **Configure Sweep Combination** button to create the parameter sweep sequence. Pressing this button opens a new window (Figure 13) that displays the sweep sequence with each combination having its own checkbox. Determine if any of the particular combinations are unnecessary and uncheck the individual fields to exclude them from the sweep. Once those final selections are made, pressing the **Save** button saves the test sweep array to memory and the test is ready to begin.

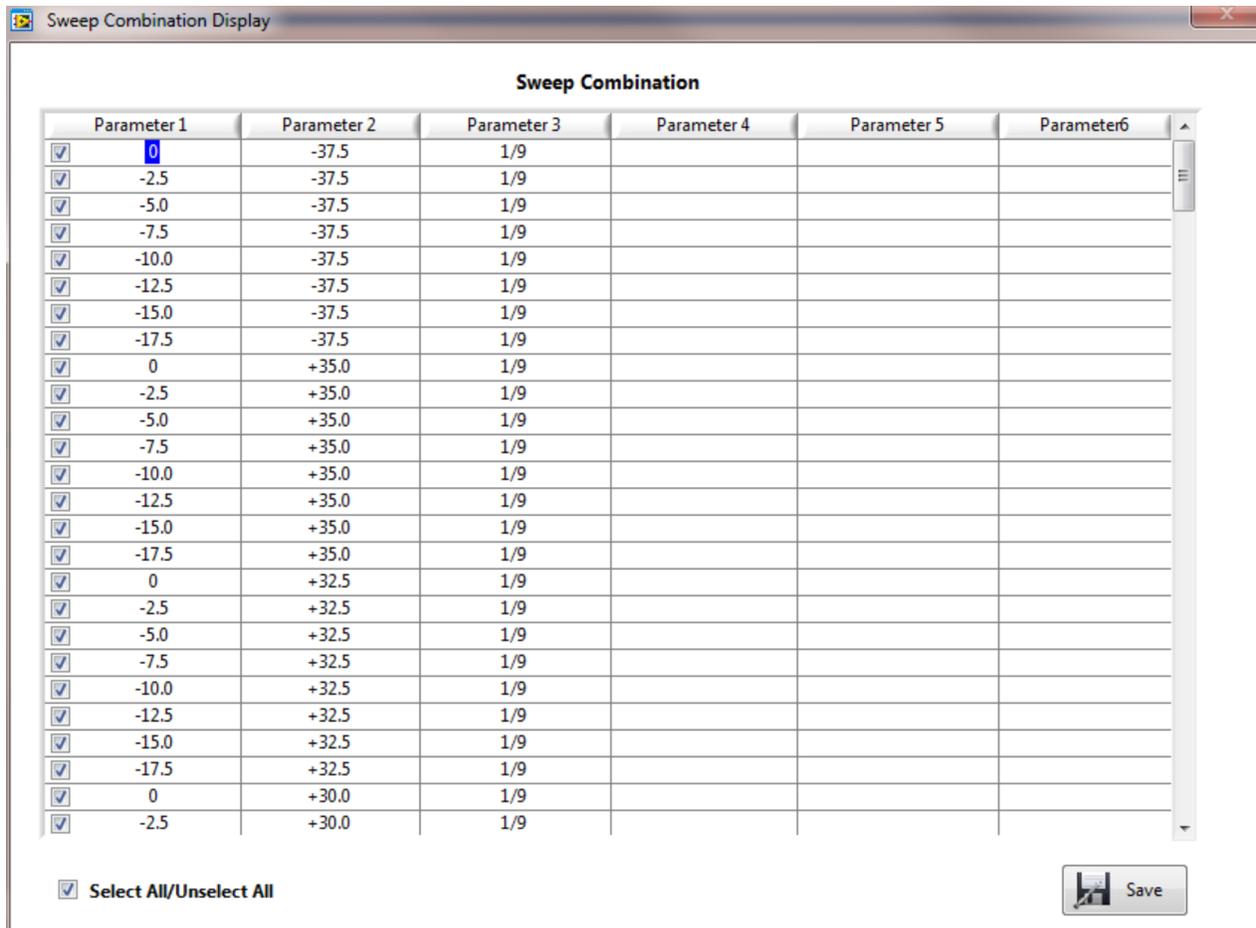


Figure 13. TLK10022/81 EVM GUI High Speed Link Optimizer Setup

The *Link Optimizer* is similar to the *Apply Settings* portion of the GUI and is executed with a script. There are two versions of the *Link Optimizer* script provided with the GUI; one for a single-board setup, and the other for a two-board setup. The two-board script is loaded by default and while it can be used in a single board setup, the test time takes twice as long because the GUI is trying to configure an entire second board when the second board does not exist. To change the script, click the folder button next to the *Link Optimizer Provisioning Script Path* box and select the single-board script. To set this as the default script, right click the folder button and select the **Set Current File as Default Script**. It should also be noted that the scripts configure every channel of the device independently, no matter what channels are implemented. If the channels to be optimized are known, a version of the script can be created that only configures the channels of concern to further reduce and optimize test time.

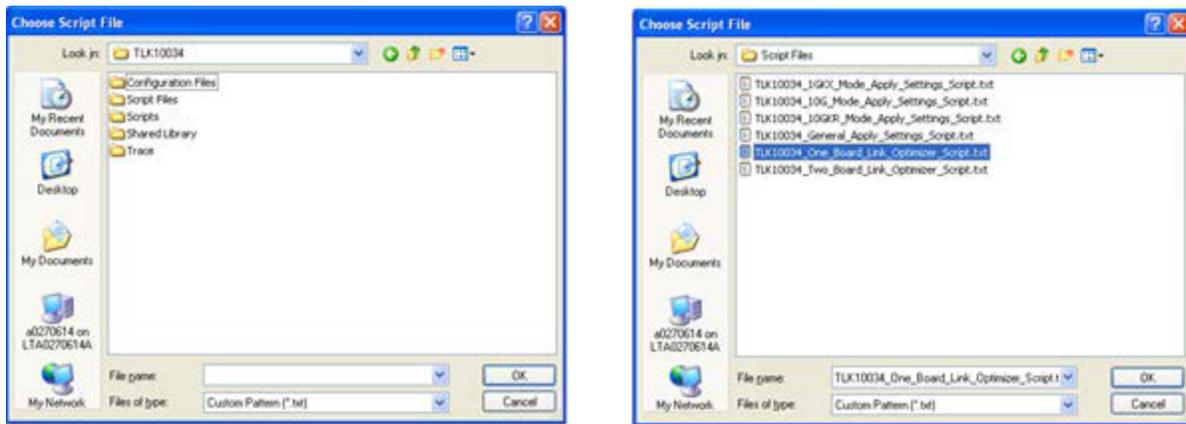


Figure 14. TLK10022/81 EVM GUI High Speed Link Optimizer Setup

After the user loads the desired script, pressing the **Run Sweep** button starts the test. When this button is pressed, the GUI takes the first set of parameter values in the configuration array and changes those values in the GUI's Register Configuration Memory. The GUI then executes the script responsible for provisioning the device, reading the error counters to clear them, waiting for the amount of test time entered for the BER test, and then rereading the error counters to obtain the BER count. Next the GUI stores the BER values into memory and processes the results. In the *Sweep Test Results* tab, there is an individual square pixel generated for each parameter combination in a matrix-of-matrix's configuration (Figure 15). The square is colored green if there are zero bit errors, yellow if there are bit errors but the maximum value of the error counter was not exceeded, and red if the maximum error count was achieved in the counter. Clicking on a square displays the parameter information for that test as well as the number of bit errors.

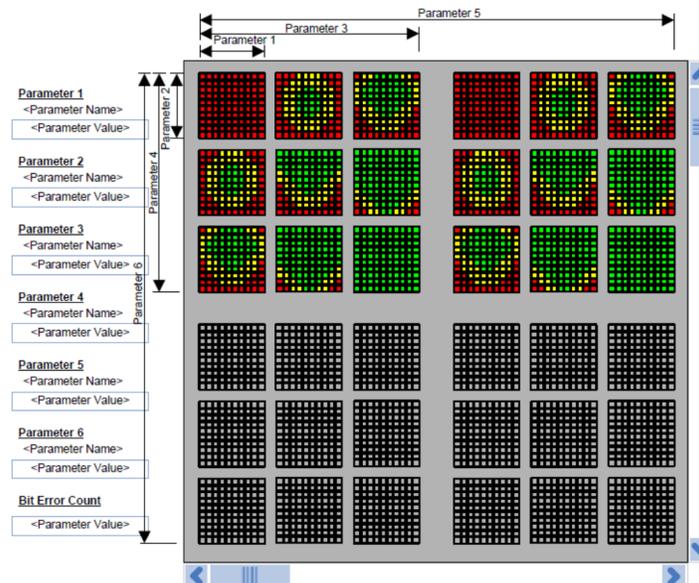


Figure 15. TLK10022/81 EVM GUI High Speed Link Optimizer Sweep Results Matrix

The sweep can be aborted at any time by pressing the **Abort Sweep** button. This does not discard any test data already collected, but stops the remaining portion of the test configurations from running.

At the completion of the test, the test results can be written to a data file for further analysis or archiving. Pressing the **Create Report** button writes the data to a .csv file. Additional parameters that were not swept as part of the test can be included in the report by entering those values in the top right corner of the *Link Optimizer* window (Figure 16). This information is for manual entry only and not linked to the memory array.

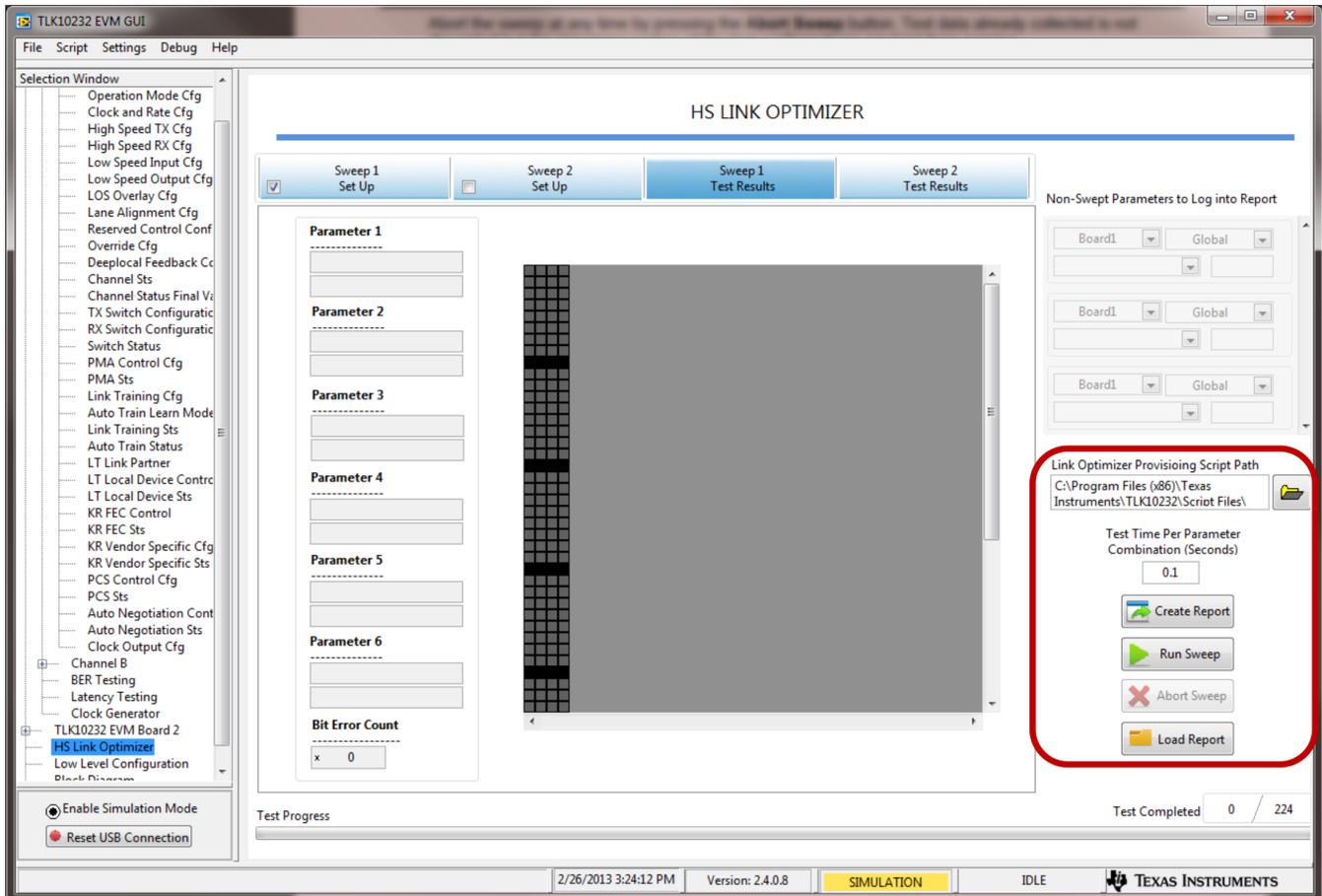


Figure 16. TLK10022/81 EVM GUI High Speed Link Optimizer Test Control Buttons

7 Python™ Scripting

Advanced operation and control of the TLK10022/81 device can be performed by using the linked Python Scripting Editor. Register read/writes can be logged into a script while registers are read and written either manually through the low level, or through other areas of the GUI where registers are read or written. These scripts can be modified, written by the user, or enhanced with loops, file I/O and command-prompt entry if the advanced register control not found in the GUI is needed. All aspects of the Python programming language supported in Version 2.7 can be implemented to the Python scripts. Specifics aspects of the Python programming language are not discussed in this document.

Open a Python Script Editor to record a macro script by clicking the *Script* menu option and then selecting the *Launch Window* option (Figure 17).

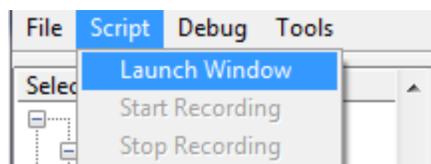


Figure 17. TLK10022/81 EVM GUI Launching Python Scripting Editor

A blank Python editor window opens ([Figure 18](#)).

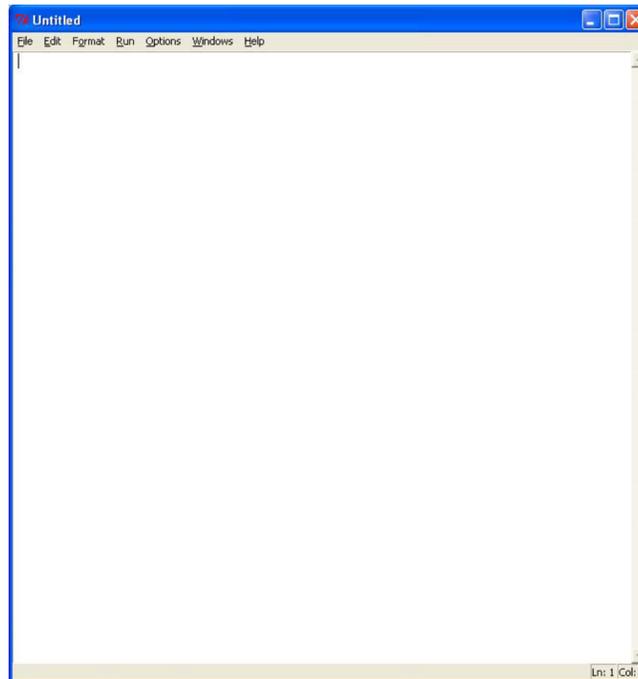


Figure 18. TLK10022/81 EVM GUI Blank Python Scripting Editor

Open the TLK10022/81 GUI and click the *Script* menu option again and select *Start Recording*. The header information will be added to the Python Editor window and the color of the window starts to blink between white and green to indicate that it is in a recording mode ([Figure 19](#)). All register read and write transactions from this point forward are logged in the Python Editor window.

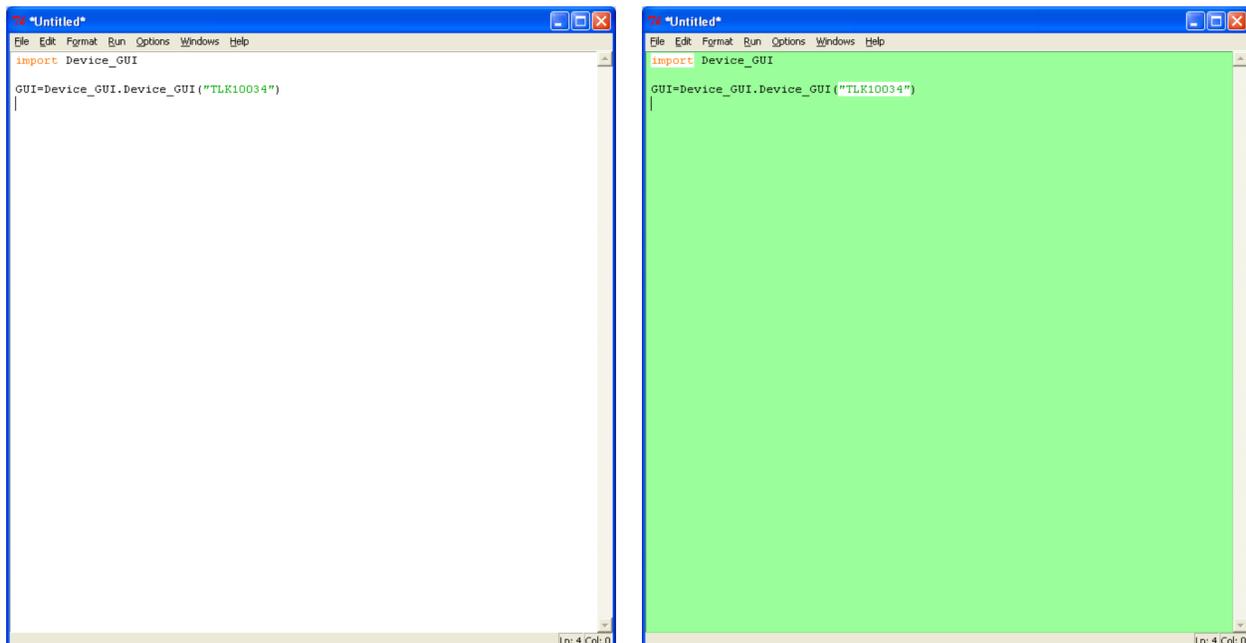
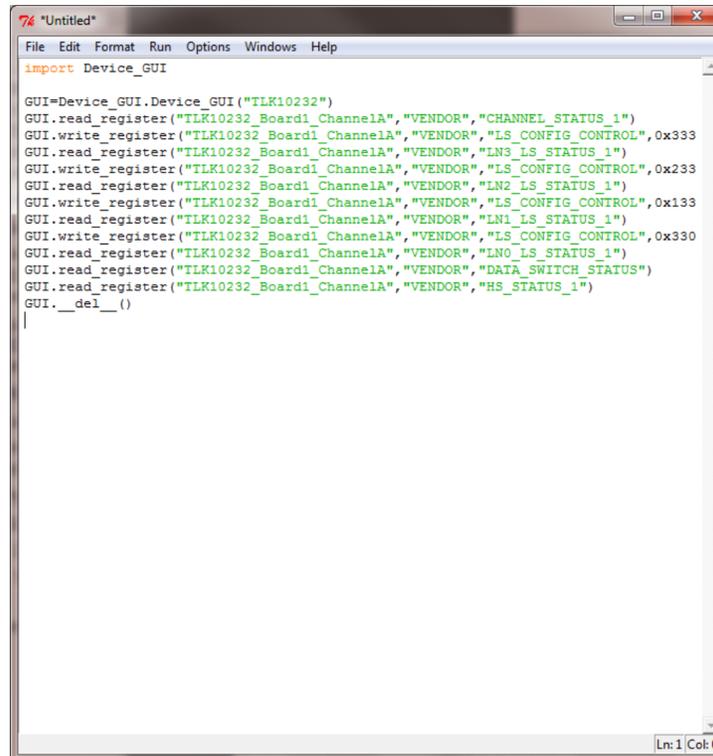


Figure 19. TLK10022/81 EVM GUI Python Scripting Editor in Record Mode (Toggles Color)

Stop a recording by clicking the *Script* menu option and then select *Stop Recording* to stop the recording feature and close out the script. Restart the recording at any time and additional read/write transactions are added to the same script.

The script can be rerun as-is by saving the Python script with the .py extension and selecting *Run Module* from the *Run* Menu in the Python Editor. The output of the script run is open in the shell window. It displays *Script completed successfully* indicating that the execution is complete. If the user would like to add variables to assign and display read values, or write values directly from the script, or add looping structures, these features can be added by the user, saved and then the module can be re-run.

It is recommended that advanced users create small Python scripts of commonly used tasks to create a library of macros to enhance their evaluation of the device and reduce their test time.



```

import Device_GUI

GUI=Device_GUI.Device_GUI("TLK10232")
GUI.read_register("TLK10232_Board1_ChannelA","VENDOR","CHANNEL_STATUS_1")
GUI.write_register("TLK10232_Board1_ChannelA","VENDOR","LS_CONFIG_CONTROL",0x333)
GUI.read_register("TLK10232_Board1_ChannelA","VENDOR","LN3_LS_STATUS_1")
GUI.write_register("TLK10232_Board1_ChannelA","VENDOR","LS_CONFIG_CONTROL",0x233)
GUI.read_register("TLK10232_Board1_ChannelA","VENDOR","LN2_LS_STATUS_1")
GUI.write_register("TLK10232_Board1_ChannelA","VENDOR","LS_CONFIG_CONTROL",0x133)
GUI.read_register("TLK10232_Board1_ChannelA","VENDOR","LN1_LS_STATUS_1")
GUI.write_register("TLK10232_Board1_ChannelA","VENDOR","LS_CONFIG_CONTROL",0x330)
GUI.read_register("TLK10232_Board1_ChannelA","VENDOR","LN0_LS_STATUS_1")
GUI.read_register("TLK10232_Board1_ChannelA","VENDOR","DATA_SWITCH_STATUS")
GUI.read_register("TLK10232_Board1_ChannelA","VENDOR","HS_STATUS_1")
GUI.__del__()
  
```

Figure 20. TLK10022/81 EVM GUI Recorded Script in Python Scripting Editor



```

Python Shell
File Edit Shell Debug Options Windows Help
Python 2.7.2 (default, Jun 12 2011, 15:08:59) [MSC v.1500 32 bit (Intel)] on win
32
Type "copyright", "credits" or "license()" for more information.
>>> ----- RESTART -----
>>>
Script completed successfully
>>> |
Ln: 6 Col: 4

```

Figure 21. TLK10022/81 EVM GUI Python Shell

8 GUI Status

Check the status of the GUI by double-clicking the Status bar (highlighted with red rectangle in Figure 22) at any time.

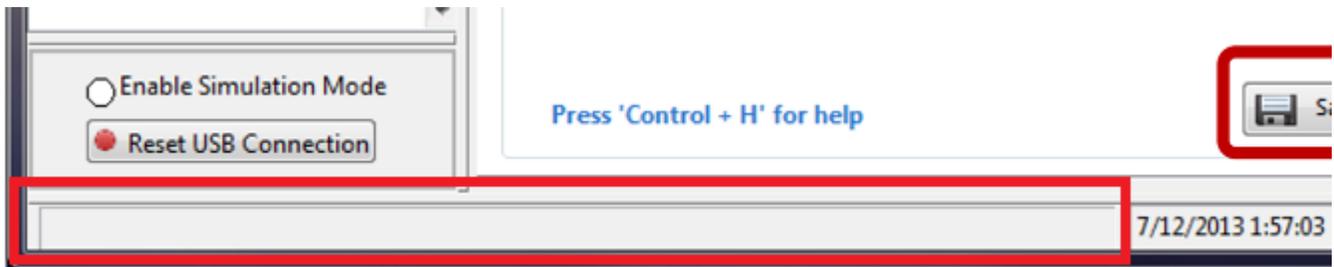


Figure 22. Status Bar

A *Status Log* window opens showing recent operations performed on the GUI. This window is useful for testing or debug.

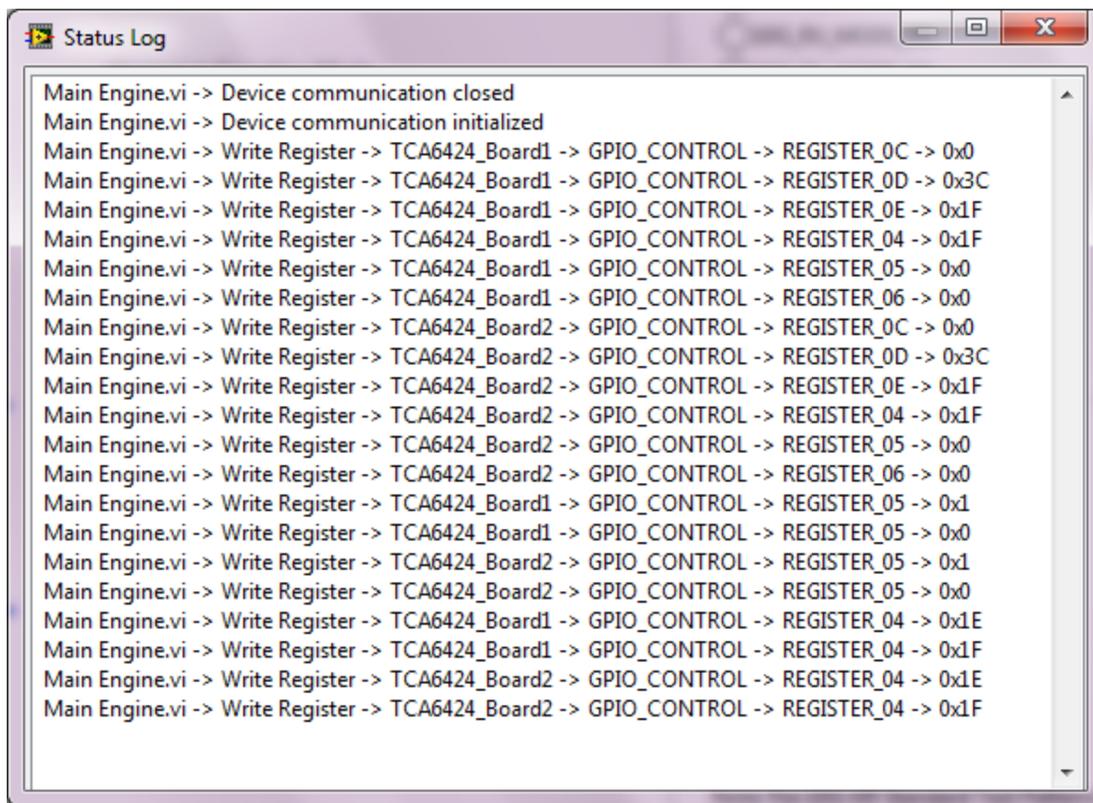
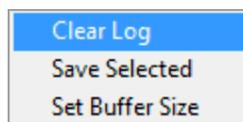


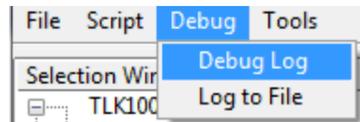
Figure 23. TLK10022/81 EVM GUI Status Log Window

This window has menu options for clearing the status log, saving the status log to a file, or setting the buffer limit which holds recent actions and operations done on GUI. Use this option by right-clicking the window.



9 Debug Options

There are a few debug options available that will help in testing and debugging the GUI functionality. These options are available through menu options in the GUI.



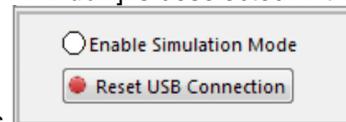
Debug Log: On selecting this option, the Status Log Window will log all the necessary operations that are needed for testing or debugging the device. It will list all the functionalities and actions done while performing a specific operation. Deselecting this option will log only the general operation done by GUI.

Log to File: On selecting this option, GUI starts logging the operations into a file. (It logs all the data that is recorded in the *Status Log* window). Maximum size of file is 10KB. If the file size reaches the maximum, a new file is created. These files can be found inside the *Trace* folder under the *Application* folder.

10 Troubleshooting

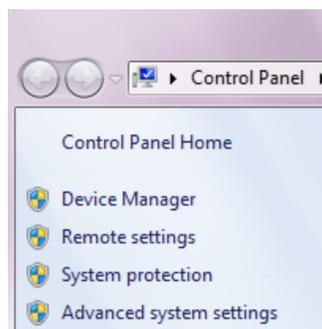
1. Pressing *Control + h* opens a help window. Hover the mouse over the target control and find the description on the help window.
2. If the GUI doesn't properly read or write a register,
 - (a) Check if the *Enable Simulation Mode* [below *Selection Window*] is deselected. If this control is

enabled, the GUI will be running on simulation values.

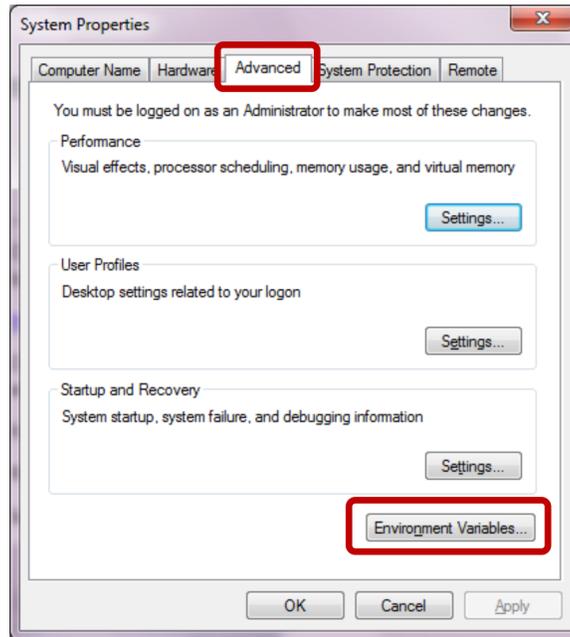


- (b) Check if the GUI status shows . If it shows , follow the above procedure. If it shows , plug-in the USB device properly and press *Reset USB Connection* or restart the GUI.

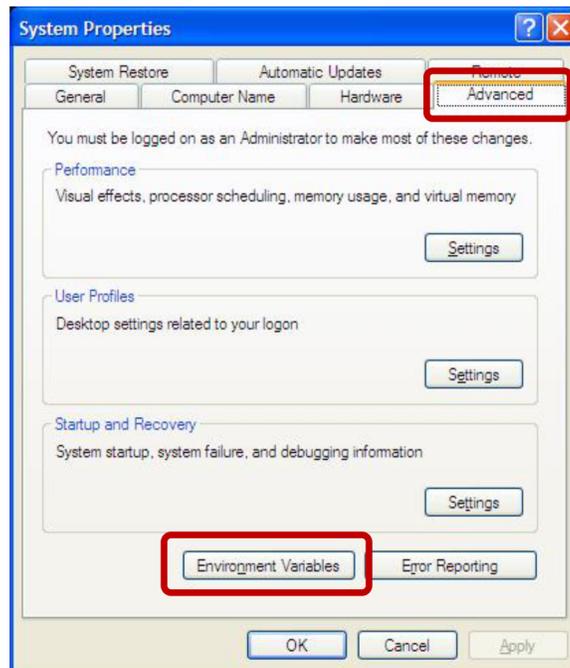
3. Error with Python Scripting. If the Python window is not launched after pressing the menu option *Launch Window*:
 - Check if Python 2.7 is installed on the PC. If not, download and install Python 2.7 from the following location:
<http://www.python.org/download/releases/2.7/>
 - Check if Python is added to environment variable. If not, use the following procedure to add Python to the environment variable:
 - Right-click *My Computer* and select *Properties*.
 - For the Windows® 7 Operating System, select *Advanced system settings* from the options available.



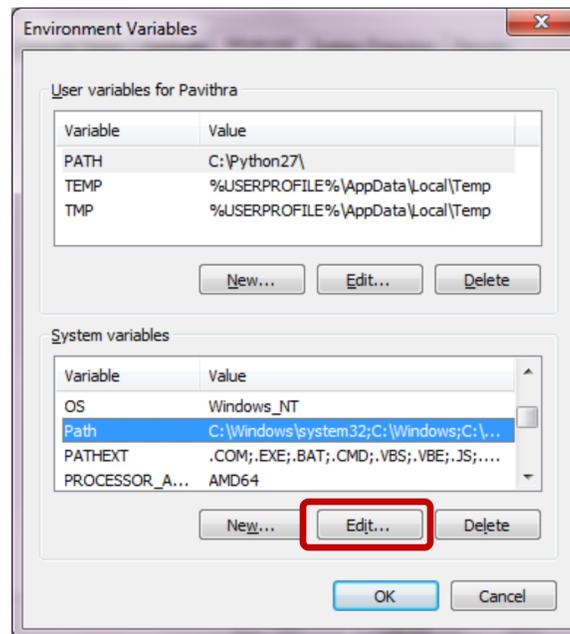
This opens a window as shown below. Press *Environment Variables*.



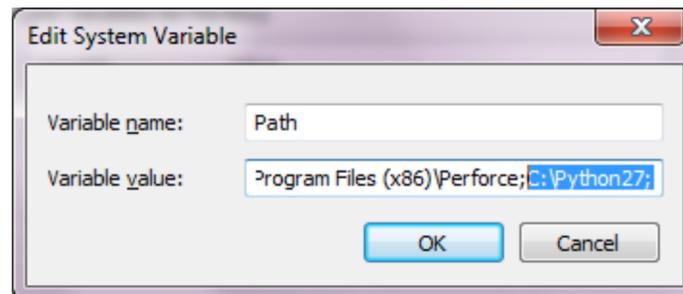
For the Windows XP Operating System, select the *Advanced* tab and press *Environment Variables*.



- Select *Path* from *System variables* and press the **Edit...** button.



- Add 'C:\Python27;' at the end of *Variable value* and Press the **OK** button



EVALUATION BOARD/KIT/MODULE (EVM) ADDITIONAL TERMS

Texas Instruments (TI) provides the enclosed Evaluation Board/Kit/Module (EVM) under the following conditions:

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please visit www.ti.com/esh or contact TI.

No license is granted under any patent right or other intellectual property right of TI covering or relating to any machine, process, or combination in which such TI products or services might be or are used. TI currently deals with a variety of customers for products, and therefore our arrangement with the user is not exclusive. TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein.

REGULATORY COMPLIANCE INFORMATION

As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

General Statement for EVMs including a radio

User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

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

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

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.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

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

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). 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.

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.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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.

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.

【Important Notice for Users of EVMs for RF Products in Japan】

This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product 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 this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

Texas Instruments Japan Limited
(address) 24-1, Nishi-Shinjuku 6 chome, Shinjuku-ku, Tokyo, Japan

<http://www.tij.co.jp>

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】

本開発キットは技術基準適合証明を受けておりません。

本製品のご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
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。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。

上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。

日本テキサス・インスツルメンツ株式会社
東京都新宿区西新宿6丁目24番1号
西新宿三井ビル

<http://www.tij.co.jp>

EVALUATION BOARD/KIT/MODULE (EVM) WARNINGS, RESTRICTIONS AND DISCLAIMERS

For Feasibility Evaluation Only, in Laboratory/Development Environments. Unless otherwise indicated, this EVM is not a finished electrical equipment and not intended for consumer use. It is intended solely for use for preliminary feasibility evaluation in laboratory/development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. It should not be used as all or part of a finished end product.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure 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.
3. Since the EVM is not a completed product, it may not meet all applicable regulatory and safety compliance standards (such as UL, CSA, VDE, CE, RoHS and WEEE) which may normally be associated with similar items. You assume full responsibility to determine and/or assure compliance with any such standards and related certifications as may be applicable. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

Certain Instructions. It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please 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 result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM User's 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, some circuit components may have case temperatures greater than 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

Agreement to Defend, Indemnify and Hold Harmless. You agree to defend, indemnify and hold TI, its licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of or in connection with any use of the EVM that is not in accordance with the terms of the agreement. This obligation shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if the EVM fails to perform as described or expected.

Safety-Critical or Life-Critical Applications. If you intend to evaluate the components for possible use in safety critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, such as devices which are classified as FDA Class III or similar classification, then you must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2013, Texas Instruments Incorporated

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com