

# Keysight U4305A / U4305B Protocol Exerciser for PCI Express Gen3

Version 8.76

March 31, 2015

- Software Version 8.76.017
- Internal Build 8.76.46.17
- FPGA Versions 7.38 (Exerciser image) , 5.7 (PTC image)
- Firmware version 0.9
- Platform Version 1.10.1016 (Release)
- Package GUID 577FF5F3-88AD-4554-AA14-0DA2696D1117
- AgtUSBManager Version 3.8
- Update GUI Version 3.0
- Branch `ati_pcie_integration_exerciser_gen3_nvme_rel8.76`

## Overview

PCIe 3.0 exerciser can help you validate your device whether it is a server or an add-in card. The emulated personality is easily switched through software for either a root complex or an end point. It has support for PCIe, MRIOV, SRIOV protocols. [www.keysight.com/find/pci-express](http://www.keysight.com/find/pci-express)

## Current OSes supported

Windows XP 32/64, Windows 7 32/64

## Important usage notes

Refer to Help for details on how to install and use this package.

1. If you have USB Device(s) (U4305A / U4305B) attached to your system but only one or none of them receives a valid module number (module numbers on the U4305A / U4305B devices are 10001, 10002 etc.), this might be due to one of the following reasons:
  - a. The USB Device(s) has been plugged in for the first time after rebooting the host controller PC and another USB Device or module was already locked by a session. Please close all existing sessions and update the module numbers. Now run Start->Programs->Keysight SPT->Tools->Diagnostics and hit the button 'Update Module Numbers'.
  - b. If you are working on a system with Windows XP SP2 this might be a problem with the loopback addresses. This has been fixed by Microsoft in the patch KB893066. You can download the patch at the Microsoft site <http://www.microsoft.com/downloads/>
2. If your USB controller supports USB2.0 make sure that you use the delivered (or corresponding) USB2.0 cable only.
3. Release 7.3(E2960B Gen2 Exerciser) & Release 8.x (U4305A / U4305B Gen3 Exerciser) cannot exist on same machine.
4. If you don't see modules after updating Firmware then restart AgtN2XUSBManagerService & AgtN2XResourceManager.
5. Windows 7 support
  - a. Run the installer exe in Administrator Mode
  - b. User Account control Settings should be "Never notify"
6. The location of the OpenE script has been changed from 'C:\AgilentPciExpress' to <Exerciser Install Folder>\8.x Release\Samples\PCIe Port.
7. PTC works at x1 link-width. Higher lanes might be required to be physically masked for DUTs with higher link-widths.
8. It is observed that error message "Failed to generate pkgIndex.tcl for dir \lib\KeysightN2X" gets displayed in case installation/un-installation steps were not done in the proper sequence. In such cases, please do the following:
  - a. Open "Add or Remove Programs" (Windows XP) or "Programs and Features" (Windows 7) from Control Panel and uninstall the following products:
    - Keysight SPT Platform
    - Keysight SPT Tcl/Tk 8.3.4 with Extras
    - Keysight SPT PCIE Exerciser Gen3(8.76 Release)
  - b. Install the Keysight SPT PCIE Exerciser Gen3 software again.
9. Added the ability to uninstall licenses for Keysight internal processes. Keysight recommends that the following should not be performed on a customer unit unless directed to do so by a Keysight support engineer. Licenses can be uninstalled using the License install dialog in the Exerciser GUI and also through the API using the following procedure:
  - a. Open the Exerciser and open a new session and add the port of the Exerciser for which the licenses need to be cleared.
  - b. Open the License install dialog using the File > Software Packages menu option.
  - c. Enter the key DADADADA-DADADADA in the 'Enter License Key' text box. The value of the 'Select Package' dropdown is not used and can be left as it is.
  - d. Click Apply. The message "The license...was successfully installed" will be shown. All the licenses have been now removed.
  - e. Close the Exerciser GUI and also close the session and reopen the Exerciser and session to verify.
  - f. Please note that this removes all licenses on the Exerciser board. Use this option with caution.
  - g. The above procedure can also be done using the API 'SWPackageInstall'. Here is the Tcl syntax:  
AgtInvoke AgtSptCommon SWPackageInstall 1 "U4305A-EX3" "DADADADA-DADADADA"
10. Added the U4305A-000 license. This license is available for Keysight U4305A demo units only. The U4305A-000 license key needs to be generated using the Keysight internal license generator and installed using the API. The following is the Tcl syntax:

```
AgtInvoke AgtSptCommon SWPackageInstall 1 "U4305A-000" "<<License Key>>"
```

11. Exerciser drivers are now copied on to the installation folder during installation. They are located in the folder 'C:\Program Files (x86)\Keysight\SPT\PCIExerciserGen3\8.76 Release\Drivers' in Windows 7 64 bit and in 'C:\Program Files\Keysight\SPT\PCIExerciserGen3\8.76 Release\Drivers' in Windows XP/7 32 bit. To install the driver, copy the appropriate driver to any folder in the SUT and start 'dpinst.exe' found in the copied folder. Please follow the on screen instructions and the driver will be installed.
12. Installation of drivers may fail on some Windows XP systems. This may be because of some root certificates not being present on the system. The root certificates need to be downloaded and installed in order to fix this. Here are the steps:
  - a. Open the following link <http://www.verisign.com/support/roots.html>.
  - b. Download the Verisign Root Package 'roots.zip' from the above website.
  - c. Extract the zip file and open the folder "VeriSign Root Certificates\Generation 5 (G5) PCA\".
  - d. This folder will contain the file "VeriSign Class 3 Public Primary Certification Authority - G5.cer". Right click and select "Install Certificate". Follow the onscreen instructions. Please select the default settings and ignore the warnings which are displayed.
  - e. Now try installing the required drivers.
13. PCIe Reset Assert/ De-Assert functionality is not working. Invoking the API PCIeResetAssertDeAssert will have no effect.

### Software version history

#### SW 8.76

##### Exerciser

- L1 Sub-state with six test-cases.
- NVMe test cases for Conformance Test Specs 1.1b.
- Updated version information dialog including board revision, firmware version and CPLD version.
- Import and play TLPs from Protocol Analyzer.
- Tcl sample for using Protocol Analyzer and Gen3 Exerciser in sample script.

#### SW 8.75

##### Exerciser

NVM Express Conformance test bug fixes:

- 1.2 Set Get Features: Test was failing on devices which did not support Volatile Write Cache because the test was not checking if the feature is supported or not.
- 1.6 Format: Test was failing for some devices as the test was not waiting long enough for the Format command to finish.
- 4.9 Interrupt Mask Set: Test was failing on some devices as MSI was setup without MME (Multiple Message Enable) and a value of 1 was used for Interrupt Vector which is not valid in this scenario.
- 4.12 Shutdown Notification: Test was failing on some devices because the test was not waiting long enough for the value of CSTS.SHST to change before issuing a controller reset.

#### SW 8.74

##### Exerciser

- NVMe Endpoint emulation.
- M.2 (x2) support.
- MSI-X, AER capability support in Exerciser configuration space.
- Initialize NVMe using script from NVMe Tab.
- Python support (Python sample scripts).

- API Logging.
- SGL Support.

### **SW 8.73**

#### **Exerciser**

Changes for NVMe Conformance Test-Cases in Host mode

- The framing message packets now contain the test case number as per conformance specification in the vendor defined field.
- Correct namespace Id is now used with commands.
- Get Feature command is executed only for mandatory feature IDs in test case 1.2 Set/Get Features.
- Test case 5.6 Media Error doesn't proceed further if Identify command fails.
- Timeout of the NVMe format test is changed. Now the delay is of .1 second per 1 GB.

#### **PTC**

PTC Bug Fixes

- ECRC error was not being inserted when ECRC license is not installed in PTC mode.
- WIT 331247: BadECRC Test (PTC) causes unexpected exception & error.

### **SW 8.72**

#### **Exerciser**

- NVMe Conformance Test-Cases in Host mode.
- DLLP arbitrary insertion, DLLP CRC Error insertion.
- SRIOV interrupt test support.
- DUT Configuration Space Explorer Enabled for PCIe, PM, AER capabilities.
- RAS Fault Injection Product Option for Reduced Featured Exerciser Software.
- DEMO License (Keysight Internal Use Only).

### **SW 8.70**

#### **Exerciser**

- Support for NVMe RC/Host Mode (Licensed).

### **SW 8.63**

#### **Exerciser**

Exerciser Bug Fixes

- SAD00455772: Reading back VF BARs in SRIOV Mode always return zero
- SAD00455773: Hot Reset & Disabled test-cases fails at Gen2 Speed
- SAD00455774: Exerciser shows Data Memory Mis-compare if LDW in packet is other than F
- SAD00455775: PCI-Port does not work after server reboot until exerciser is power cycled.

#### **PTC**

PTC Bug Fixes

- SAD00455776: LTR timing issue in test cases LTR\_ENABLED\_CLEARED LTR\_NON\_DO\_STATE

## SW 8.62

### Exerciser

#### Exerciser Bug Fixes

- SAD00453600: Decoder Issue - In System Port API doesn't return correct BAR status in case of 64 bit BAR configuration.
- SAD00453602: Send immediate - Broken functionality in SW 8.61.
- SAD00452967: Gen3 exerciser 8.61.005 shows error during add port and can't connect.
- SAD00453888: PCIe Port does not able to acquire the lock if BAR0 is 64bit wide and has size > 1G.
- SAD00453887: Gen3 Exerciser does not set the correct value of de-emphasis in TS OS at Gen2 speed.
- SAD00453926: PCI-Port Lock in case sudden link down.

### PTC

#### PTC Bug Fixes

- SAD00452712: Modification of Equalization Coefficient and Equalization Preset tests according to revised PTC test-specs rev 0.9.
- SAD00452713: Clear Error Status registers after running the Reserved\_Bits\_In\_TS test.
- SAD00452714: Error in final test-results of FLR and LTR test-cases when DUT is a Switch.
- SAD00453028: PTCIII Test L1\_FOR\_D3\_STATE failing for customer DUT.
- SAD00453902: LTR Test Cases updates as per revised test-spec rev 1.0
- SAD00453903: Link-Up issue in Equalization test-cases

## SW 8.61

### Exerciser

#### Exerciser Bug Fixes

- Algorithmic payload generation/checker (New Functionality), New API's added ExerciserChannelFunctionGet & ExerciserChannelFunctionSet, along with Enum EPCIEExerciserHwChannelStatus (for further details refer online help) for accessing this functionality.

### PTC

#### PTC Bug Fixes

- SAD00451804 Equalization Test-Cases : PTC should verify that DUT has reflected back the requested Presets and Coefficients within 500ns
- SAD00451805 Link-Upconfig test is failing for some Gen2 DUT which reports only 2.5 GT/s link speed capability in the TS1 ordered sets.
- SAD00451806 PTC is not able to parse all the Extended PCIe Capabilities present in the DUT.
- SAD00451807 Printing the Error Status Register values in the log file for debugging help.

## SW 8.6

### Exerciser

- Gen3 support for MRIOV (New Product Option)
- Gen3 Support for SRIOV (New Product Option)
- Active participation in equalization stages (Maintenance update)

- NAK counter for Transmitter (Maintenance update)
- Exerciser Bug Fixes
  - SAD00450505: Exerciser unable to correctly mark start-end of TLP on x1 link width.
  - SAD00448665: Can't Install on Japanese Windows 7 x64 Professional
  - SAD00447622: AgtPCIEExerciser PerformanceCounterStatusRead API for PCIE\_PERFORMANCECOUNTERSTATUS\_INTERVAL\_LEN returns wrong value
  - SAD00449198: Exerciser does not floats Electrical Idle on unused lanes
  - SAD00425578: FDW byte of Default packet is different from the Memory Read packet in the Templates
  - SAD00448344: LTSSM test case `Exerciser Initiates Down Configuration` broken on Gen3 speed
  - SAD00448440: PTC3 General Setting's windows, the resolution default on some PC were such that one could not see all the available options.
  - SAD00450396: LTSSM test case 'Gen1->Gen2 (Fail) ->Gen1' and 'Gen2->Gen3 (Fail) -> Gen2 fails with Gen3 AMD card.

## PTC

- Separate category for Gen2 PTC test cases & new Gen3PTC test cases
- Test cases will not try Linkup on higher Link-widths
- EQ, FLT, LTR Test cases: Removed LinkUp/LinkDown code which was not required to fix some of the rare issues, unable to reproduce easily.
- Support for multi-function devices added for ASPM\_L1 & L1\_for\_D3 test cases.
- PTC Bug Fixes
  - SAD00450043: ASPM\_L1 & L1\_for\_D3 Test cases failing for NVIDIA DUT
  - SAD00450047: DLL\_05\_02\_17 and TXN test-cases failing for Gen1 Devices
  - SAD00450046: PTC3 requires some other licenses
  - SAD00447832: PTC not available in offline mode
  - SAD00448432: LTR test-cases: test-case fails with the message `LTR message not received when LTR is enabled`
  - SAD00448433: ECRC third sub-test is repeatedly failing for all DUTs
  - SAD00448434: DLL related test-cases failing randomly
  - SAD00448435: Equalization Coefficient test-case: Last sub-test - ambiguity in PTC specs
  - SAD00448436: Equalization Coefficient test-case: sub-test 28, 31 - These sub-tests are failing for some DUTs
  - SAD00448437: Equalization test-cases - preserving the last test results and test-cases logs typo mistake
  - SAD00448438: Loopback from Configuration is failing for all speeds for many devices
  - SAD00448441: Test: DLL\_05\_02\_17 produced a yellow caution result
  - SAD00448444: Test cases should run on configures speed and check speed for Equalization test

## SW 8.5

- PTC (Protocol Test Compliance) functionality added
- Exerciser Bug Fixes
  - SAD00423891: Sometimes unable to add Exerciser port. One port is not adding and giving error pop up `Unknown capability`.
  - SAD00446792: AgtPCIEExerciser SiStatusGet API not working as expected
  - SAD00444201: Exerciser stuck in Link Init/Link Active on restart of server
  - SAD00444202: MRIOV - VL flow control Issue
  - SAD00446382: If the Exerciser driver is not installed on system under test (Wind2008 server), while going to D3 hot, Exerciser doesnot complete Configcycle
  - SAD00447345: Exerciser sometime updating the NPdata credit incorrectly

#### **SW 8.4**

- Additional LTSSM test cases.
- Separate data memory compare for each function.
- Support for pattern matchers.
- Support for different transceiver (Tx) settings at Gen 1, Gen 2, Gen 3 speeds.

#### **SW 8.3**

- Power management support - L0s, L1.
- ECRC error detection and injection.
- Single Root I/O Virtualization software license for PCIe 5Gbps.
- Five functions for use with MRIOV, SRIOV and PCIe Gen 3.
- PCIe port access using memory cycles .
- Windows 7 (for Enterprise & Professional 64 bit OS).

#### **SW 8.2**

- MRIOV Gen2 Exerciser.
- PCI Express Gen3 Exerciser.

#### **SW 8.1**

- PCI Express Gen3 LTSSM Tester.
- Windows XP, 7 support (for Enterprise & Professional 32bit OS only).