Release Note For the MACIE Acquisition Control Software

Version v5.3, December 21, 2022, Minor Release

- CR147: Non-critical bug in MSAC = log message "Halt button pressed. Acquisition will stop..." after acquisition triggering is timeout. This message should not be exist when triggering is timeout. Bug fixed.
- CR148: On manual command tab, addr auto-increment checkbox does not always reflect actual setting especially after some load files which contain the MACIE register setting for addr auto-increment is loaded. Bug fixed.
- CR158: Feature of providing run-time CDS result for fowler-sampling mode acquisition – MSAC. Feature added.
- CR159: Optional HxRG configuration when clicking Acquire button for acquisition. The acquisition function always performs HxRG configuration before reading out ramps in the early versions. In some testing cases, users require not to perform SIDECAR configuration in the Acquisition function. A checkbox of Auto HxRG Configuration is added on the Acquisition tab. When unchecking this checkbox, the software will not perform HxRG configuration in the acquisition function.
- CR161: The exposure time in the Fowler sampling mode reported in the FITS header is not updated after it is changed on the GUI. Bug Fixed.
  Note: Within each ramp, only the first frame contains the exposure information in its fits header. The following frames don't contain the exposure information in the fits header. It is for efficiency purpose.
- CR168: IDL HxRG feature of reading out reference output – MSAC. Feature added.
- CR172: Data loss when reading frames with a frames size slightly below or above typical powers of 2 – MAC on Linux. When using the USB interface on a Linux system, the return value from MACIE_AvailableScienceData function may be less than the true number of received and available bytes. This is due to a limitation in the internal buffer handling of the 3rd party USB driver. This occurs specifically if the image Size for the MACIE_ConfigureUSBScienceInterface() is larger than 2^20 = 1408576. So the solution for this issue is using MACIE_AvailableSicenceData function to check if some data is in the buffer, if yes, continue to call science data readout function to read the expected number of pixels. See the details in the Programming Guide document, section 3.32.
- CR173: New feature of image acquisition in IPC mode = MSAC. A GUI section for ASIC IPC mode configuration is added on the Manual Command tab. This section is controlled by a checkbox -

Enable HxRG Engineering Mode. Checking the checkbox will make the IPC configuration section be visible; upchecking the checkbox will make it invisible. After loading the SIDECAR firmware which supports the IPC operation, use this section to set the IPC mode and its parameters. Then it is ready to switch to Acquisition tab to capture the image ramps. Feature added

- CR175: Bug - Continue reading USB buffer till MACIE_ReadUSBScienceFrame function's input parameter timeout expired. In v5.2 or early versions, the software will stop reading USB buffer if the FT_ReadPipeEx returns FT_TIMEOUT. When the image size is not same as FT USB buffer size, especially when the image size is larger than the USB buffer size, FT_ReadPipeEx will possibly returns FT_TIMEOUT while waiting for ASIC science data (for example: in the drop frame boundary). In such cases, the software should continue FT_ReadPipeEx even if FT_Status=FT_TIMEOUT. The software should not stop the loop of FT_ReadPipeEx. Fixed in v5.3

Version v5.2, June 26, 2021, Minor Release

- CR129 Bug of MACIE library version number. In v5.1 release, the MACIE library version number was v5.0 which was wrong. Fixed.
- CR127 Bug of applying the exposure time in the fowler sampling mode. In v5.1, the FS Exp time was not counted properly. If the FS Exp time is set longer (for example 20s), the acquisition of the second group will fail. Fixed
- CR128: Bug of receiving extra data word when reading SIDECAR HxRG exposure ramps by calling MACIE_ReadGigeScienceData function. Fixed
- CR132 Bug of segmentation fault using MACIE_ReadUSBScienceFrame function. Fixed.
- CR131 Bug of MAC GUI takes long time to capture data that is not n*1024*1024 in size. MACIE_AvailableScienceData reports incorrectly. Fixed
- CR130 Bug of windows installer v5.1 doesn't show the right contents in the windows Start menu. Fixed
- CR137 Feature of USB dual pipe mode for MSAC GUI. Dual pipe mode was only added to the the MAC GUI and library. Add this feature to MSAC GUI in v5.2.

Version v5.1, February 12, 2021, Minor Release

This version is featured with Multi-MACIE and Multi-ASIC operation support. In addition, a few bugs related to the "non-standard size" image acquisition are fixed.

1) CR 118 Multi-MACIE and Multi-ASIC operation in MAC GUI and MACIE library: the following functions are upgraded.

- **MACIE FPGA Firmware:** The customized MACIE firmware for base version and operational version are provided per request. These MACIE FPGA firmware needs to be programmed into the MACIE cards using the MACIE Communication Tool.
- **Check Interfaces**: If more than one MACIE which are directly connected to PC are detected, the software will list all these detected MACIEs and their interfaces in a dialog window and prompt users to select one operation.
- **Get Available MACIEs and ASICs**: This version reports all the MACIEs which is connected to the master MACIE from the CheckInterfaces function. The maximum number of available MACIE cards is 4 with 2 ASICs per MACIE, or 8 with 1 ASIC per MACIE. This version reports the all the available ASICs which are powered on properly. The maximum number of ASICs is 8.
- **Image Acquisition**: This version supports the image acquisition from multi-ASICs and multi-MACIEs. By selecting the corresponding MACIEs and ASICs and the configuration for Multi-ASIC interface, the software will capture the images from muti-ASICs & multi-MACIEs. If the runtime-processing option is selected, the software will process data stream and save the images from different ASICs separately.
  NOTE:
  - Camlink interface is not supported for Multi-ASIC mode
  - In guide mode, it is recommended to uncheck the checkboxes "Auto Config Multi-ASIC FIFO" and "Auto Config Multi-ASIC FIFO"

- **MACIE Test Pattern**: In addition to the Port FIFO test pattern provided in the early versions, this version provides two ASIC FIFO Patterns for acquisition: 2xFIFO Patterns and 1xFIFO Patterns.

2) CR 123 MACIE Port FIFO test pattern with CamLink interface. In the early versions, the MACIE test pattern can only be read out through the USB and GigE interfaces. The CamLink interface doesn't work. In this version, the feature of Port FIFO test pattern acquisition through Camlink interface is provided.

3) CR 120: Bug Fixed for the USB Dual pipe mode on Linux platform: In the early versions, the USB Dual pipe only works on windows platform. It doesn't work on Linux. The software always uses single pipe both command and science data acquisition on Linux. This version fixed the bug and supports the USB Dual pipe mode for image acquisition on Linux platform.
4) CR 117 Bug Fixed for the missing science data: In the early versions, it shows the bug of missing science data if the ramp acquisition is configured for the non-standard size image (for example: 1000 x 1000, 900 x 900). The bug is related to the USB science interface configuration and acquisition function. Fixed in this version.
5) CR 119 Multi-ASICs synchronization: The capability of loading sync file for synchronizing the multiple ASICs is supported. If the sync file is provided in the Acquire_Config.ini file and the sync option is selected, the software will load the sync file to ASICs during the image acquisition.
~~5)~~6) CR 124 Bug fix for the MSAC GUI image acquisition in the fowler sampling mode. In the early versions, only the first image of the fowler sampling pair was captured and saved but the second

image was not captured. Fixed in v5.1

Version 5.0, February 10, 2020, Major Release

1) New versions of MACIE firmware for operating the SIDECAR and ACADIA:
   a) macie_acadia_CMOS_10_25_19_v1.2.bit
   b) macie_acadia_LVDS_10_25_19_v1.2.bit
   c) macie_sidecar_01_22_20_v1.8.bit
   d) macie_sidecar_CMOS_01_22_20_v1.8.bit
   e) macie_sidecar_LVDS_01_22_20_v1.8.bit

2) New feature of Manual Command - GUI:
   a) Reading/writing MACIE and ASCI registers with two tables which provide the capability of adding, removing, selecting, moving registers. In addition to the Single-Read and Single-Write functions, this version also provides the Read-All and Write-All functions to read/write all the registers in the table together. The registers with their read/written values can be saved to the file and reloaded to the GUI. The file name is listed in the mac.ini file.
   b) Reading MACIE Error counters and MACIE FIFO status.

3) New feature of Load Files - GUI:
   Configuring the MACIE and ASIC with a list of load files. The GUI provides the capability of adding any number of load files instead of the maximum of three files. It also provides the functions of removing, selecting and loading MACIE and ASIC configuration files with different options. The list of load files on the GUI can be saved to the mac.ini file and reloaded to the GUI.

4) New feature of changing GigE Timeout – GUI and MACIE library:
   Changing the timeout (default 200ms) on the GUI or calling MACIE API function MACIE_SetGigETimeout the GigE interface detection.

5) New feature of Guide Mode - GUI:
   By enabling the guide mode and manually writing guide mode parameters provided on the Acquisition tab, the software will process the science data for image and guide windows during the image acquisition. These parameters are saved in the Configure_Acquire.ini file.

6) New feature of Extra Pixels Per Frame – GUI:
   By configuring the extra number of pixels at end of each image, the software will process the science data for image data and throwing the extra pixels during the image acquisition.

7) New feature of USB Dual Pipe Mode – GUI and MACIE library:

Provide an option to configure the USB interface from single pipe mode to dual pipe mode so that register configuration and science data acquisition using two separate ports. This feature is particularly useful for the simultaneous operation of register configuration and science data acquisition.

8) Update of USB driver:
   Windows: v1.3.0.4
   Linux: v0.5.21

9) Bug fix for USB buffer optimization on Linux – MACIE library
   In the early version, the maximum of the USB buffer size is 8MB (framesize x nbuf) when calling MACIE_ConfigureUSBScienceInterface(handle, slctMACIEs, data_mode, framesize, nbuf). In this version, the USB buffer size is optimized based on the calculation of framesize x nbuf.

Version 4.0, October 20, 2018, Major Release

c) Release two set of MACIE FPGA firmware: macie_sidecar_10_04_18_v1.6 LVDS mode operation, and macie_sidecar_CMOS_10_02_18_v1.6.bit for CMOS mode operation.

d) Enhance GetUSBScienceFrame function and GetUSBScienceData function. When the USB driver reads the science data into its internal buffers, normally it reads the science data into the first buffer, and continues to read the data into the next buffer after the first buffer is full. But in certain cases, it does not wait for the first buffer being full, it moves to the next buffer as soon as the previous buffer is filled with some data. In the v4.0, the code improvement is made for handshaking with USB internal buffers when they are not full.

e) Incorporate all the features which were added in 3.2 and 3.3 minor versions to v4.0. In v3.2 and 3.3 minor versions, some of the features were only added to MAC or MSAC, windows or Linux. In this major release, MAC, MSAC and MACIE library for windows and Linux are compitable.

f) Modify the ConfigureUSBScienceInterface function to optimize the total USB data stream size. Instead of using the hard coded number of 1G, the software calculates the dwStreamingSize based on the input parameters (nBuffers and imgSize) and apply the USB driver.

Version 3.3.3, August 07, 2018, Minor Release

1) Update GetNextUSBImage function to handle the image buffers which are not full when capturing the image.
2) Add a new parameter of ResetPolarity in the config_acquire.ini file for ResetASIC function
3) Not uncheck the ASICs/MACIEs checkboxes if the GetAvailableASICs /MACIEs functions do not get the available ASICs.

Version 3.3.2, July 03, 2018, Minor Release

1) Modify the acquisition routine, not change all the DataFormat bits in the “Enable registers” for Camera Link, GigE, and USB when triggering a new acquisition. Instead, do a read - modify- write to change only the bits that are needed (like enable bit, and maybe the test pattern bits if doing a test pattern). The registers in question are:
   - h01c0, bit 4
   - h01d0, bit 4 – 6
   - h01e0, bit 4 – 6

This should allow running fast mode with the MAC, using the specific register load file (see attached)

2) Ensure that all functions are available on all tabs (like selection checkboxes, acquisition, power control, manual tab, etc.), even if no MACIE or no ASIC is available. Specifically, it allows reading or writing ASICs even if no ASIC has been detected.
3) Try to solve the issue that the application hangs whenever a dialog box is opened (like Browse, or close app)
4) Default installation directory should not be Program Files, but C:\
5) Support H1RG for MSAC software

Version 3.3.1, April 12, 2018, Minor Release

6) Fix the bug in MAC_Installer.exe (not MSAC_Installer.exe)
7) In GUI, report available MACIEs and ASICs starting 1 instead of 0
8) Update GetAvailableASICs function for checking ACADIA electronics.

Version 3.3, April 12, 2018, Major Release

9) Update the MACIE firmware to support telemetry measurement
10) Update MACIE Control Software (GUI) to support the generic Control electronics, like WFIRST ACAIDA
11) Fix the bugs in the Power control functions.

Version 3.2 March 28, 2018, Major Release

Update the GUI software as followings:

1) Resolve the Linux USB3 science data interface issue in v3.0. The image acquisition through USB interface on Linux is fully supported v3.2. Upon to this release, MACIE communication interfaces are supported as followings:

USB3: fast mode and slow mode operation; windows and Linux platform.
GigE: fast mode and slow mode operation; windows and Linux platform.
CameraLink: fast mode operation; windows and Linux platform.

2) Update the MIL Lite from version 9 to version 10.00 (buid 2564) for windows and build the release based on the update.
3) Update Ubuntu from v12.04 to v16.04 and Qt from v5.3.2 to v5.9 and build the release based on this update.

Version 3.1 March 19, 2018, Minor Release

Update the MACIE library with the new telemetry functions.

Version 3.0, Feb 21, 2018, Major Release:

Features:

Provide the USB3 interface for SIDECAR ASIC slow mode and fast mode operation on windows. Due to the limitation of the third party libraries for Linux USB3 driver, the USB3 interface only works for commanding on Linux, it did not work for image acquisition on Linux.

Version 2.0, Nov 9, 2017, Major Release:

Features:

Provide the GigE interface for SIDECAR ASIC slow mode and fast mode operation.

Version 1.0, May 27, 2017, Major Release:

Initial Release: The main feature of this release is providing camera link interface for the SIDECAR fast mode operation.