From Eye to Insight

Viventis Deep Microscope Control Software

Release Notes for Viventis Deep Microscope Control Software Version 3.0.3

Leica Microsystems CMS GmbH
Am Friedensplatz 3
D-68165 Mannheim, Germany

Release Documentation for Viventis Deep Microscope Control Software 3.0.3

This document describes the 3.0.3 release of the Viventis Deep Microscope Control Software for image acquisition for advanced 3D imaging research.

Please read this document before installing a copy of this software.

All reasonable steps have been taken to ensure that this publication is correct and complete. Should any user be in doubt about any detail, clarification may be sought from Leica Microsystems CMS GmbH, or their accredited representatives. The information in this document is subject to change without notice and should not be construed, as a commitment by Leica Microsystems CMS GmbH. Leica Microsystems CMS GmbH accepts no responsibility for any errors that may appear in this document.

Date: May 13th, 2026 applying to version number 3.0.3

Contents

1. Compatible Microscopes and Technical Requirements

1.1 Compatible Microscopes and Hardware Requirements

The Viventis Deep Microscope Control Software 3.0.3 is a release for the Viventis Deep platform. Accordingly, the Viventis Deep Microscope Control Software is not compatible with any other microscope platform from Leica Microsystems CMS GmbH, i.e., Viventis SCAPE. All Leica-supplied CUDA workstations for the Viventis Deep platform meet the minimum PC requirements of the Viventis Deep Microscope Control Software 3.0.3 control software. Furthermore, for offline processing and anaylsis we recommend Leica-supplied CUDA workstations for compatibility and product security reasons, too.

Automatic settings import and conversion from previous versions of Viventis Deep Microscope Control Software at application startup is supported from version 2.0.0.5

1.2 Operating System Requirements

Viventis Deep software 3.0.3 is a genuine 64-bit program and runs on Windows 11 64bit.

1.3 Product Performance and Security Recommendations

For optimal performance and the safety of the product, Leica Microsystems CMS GmbH strongly recommends the installation of/upgrade to Viventis Deep software 3.0.3 for systems of the Viventis Deep platform. Furthermore, Leica recommends the installation of all available security updates and hotfixes for Microsoft Windows. Please check regularly on our Product Security web page to get the latest news regarding product security vulnerabilities and mitigation strategies (if applicable). If you need further information or are not sure about security fixes suggested by a system component manufacturer, please get in touch with us.

2. Viventis Deep 3.0.3 Software Release

Viventis Deep Software 3.0.3 is a new release version introducing new functionalities and bug fixes.

3. Recommendations

For optimal performance and the safety of the product, we strongly recommend the installation of/upgrade to Viventis Deep Software 3.0.3 for all systems of the Viventis Deep platform.

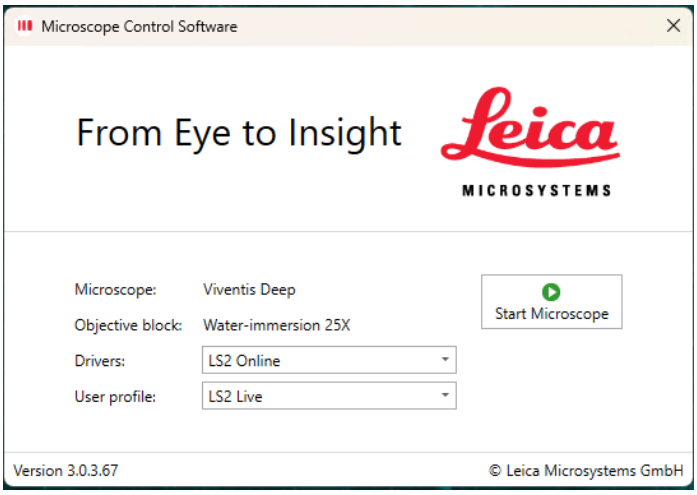
Upgrades from older versions to 3.0.3 need to be done by either of the following paths:

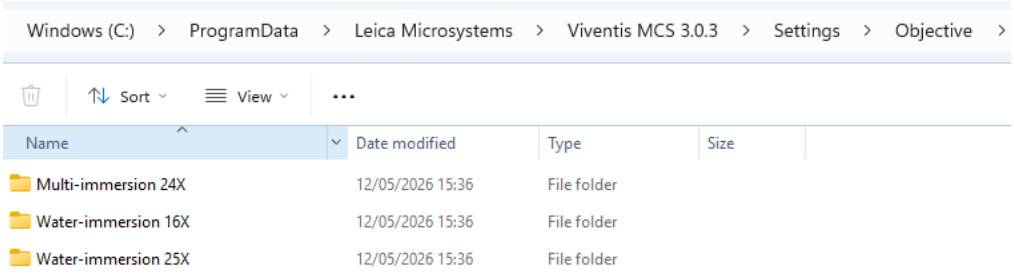
1. Updates from versions older than 2.0.0.5 must be done manually.
2. Updates from version 2.0.0.5 and newer can be done automatically. After installation of a new version, the software will automatically import settings from the older version during the first start.

4. New Functionalities

- Software support for objective block exchange:

  - Objective block selection is displayed at startup and objective block-specific settings are added in a dedicated folder.



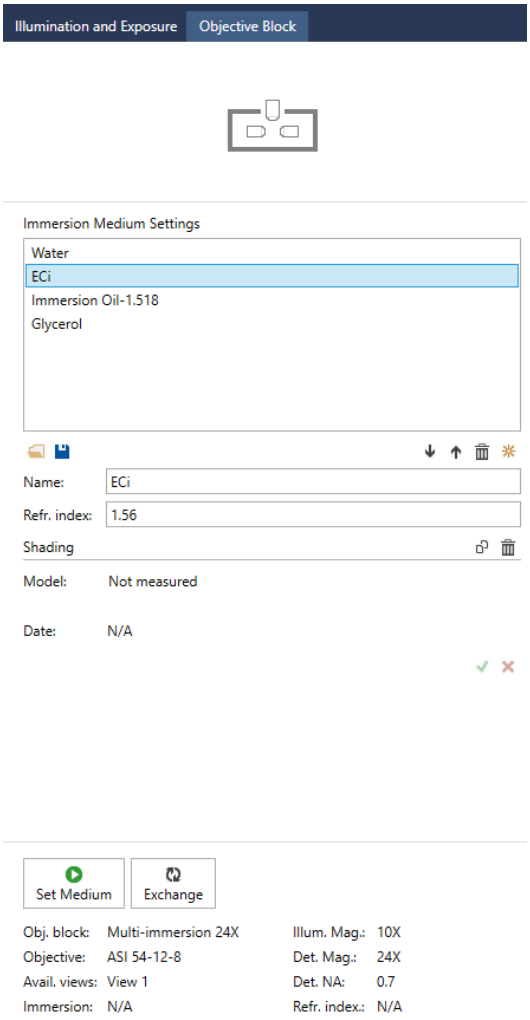


  - Wizard to exchange objective blocks:

    The wizard guides users through the objective block exchange process, simplifying the procedure and helping to ensure that objective block changes are performed correctly, consistently, and in a way that avoids potential system damage. Enabling users to exchange all objective blocks offered with Viventis Deep by themselves.

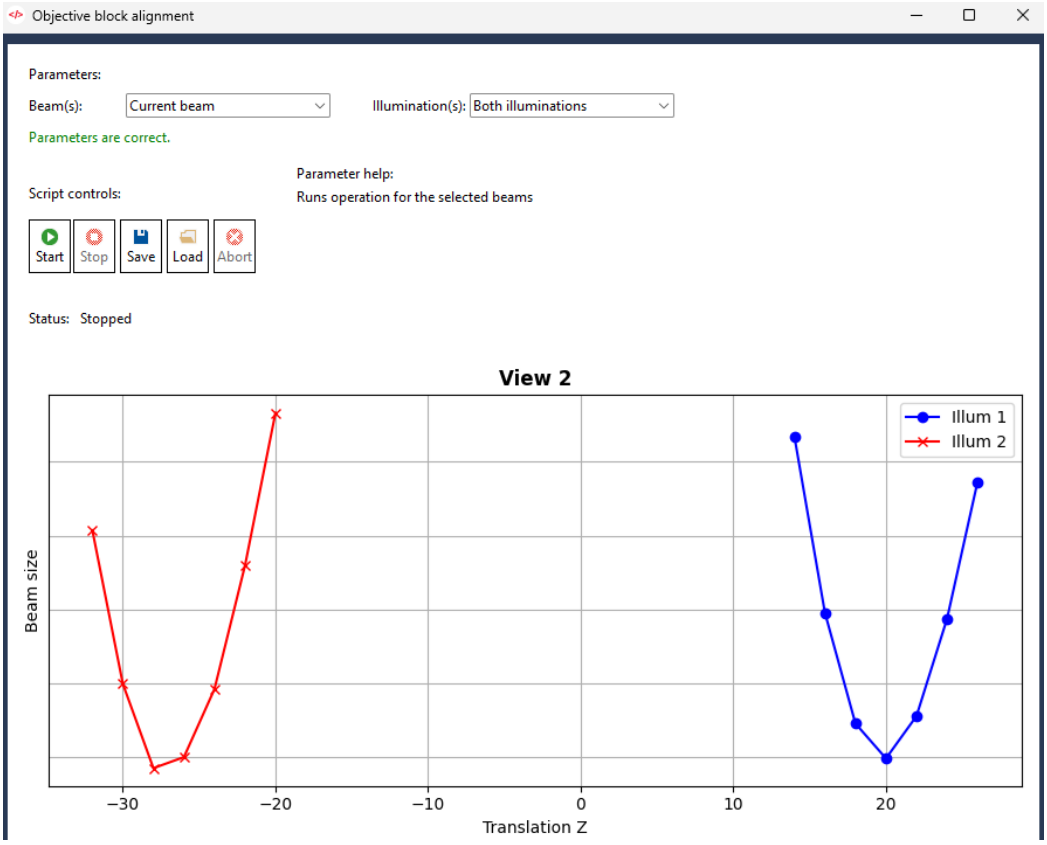
  - Immersion medium selection tab is added in the software for the cleared sample block.

    Please note: different immersion media due to RI changes affect the magnification and objective alignment.

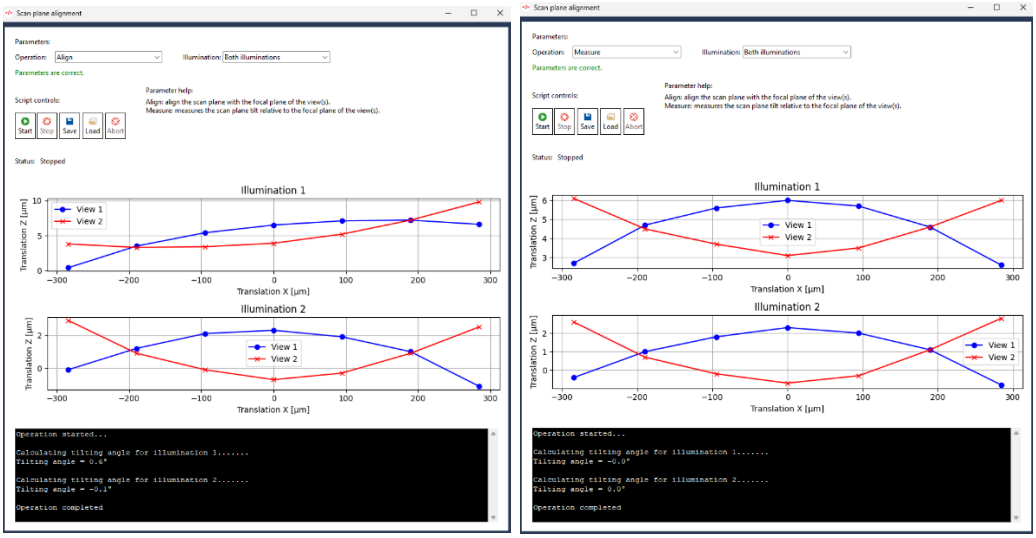


- Steps to improve objective alignment:
  - Added menu to update the objective alignment associated with the current immersion medium from the current illumination alignment.
  - Display of objective alignment associated with current immersion medium in the illumination module tab.

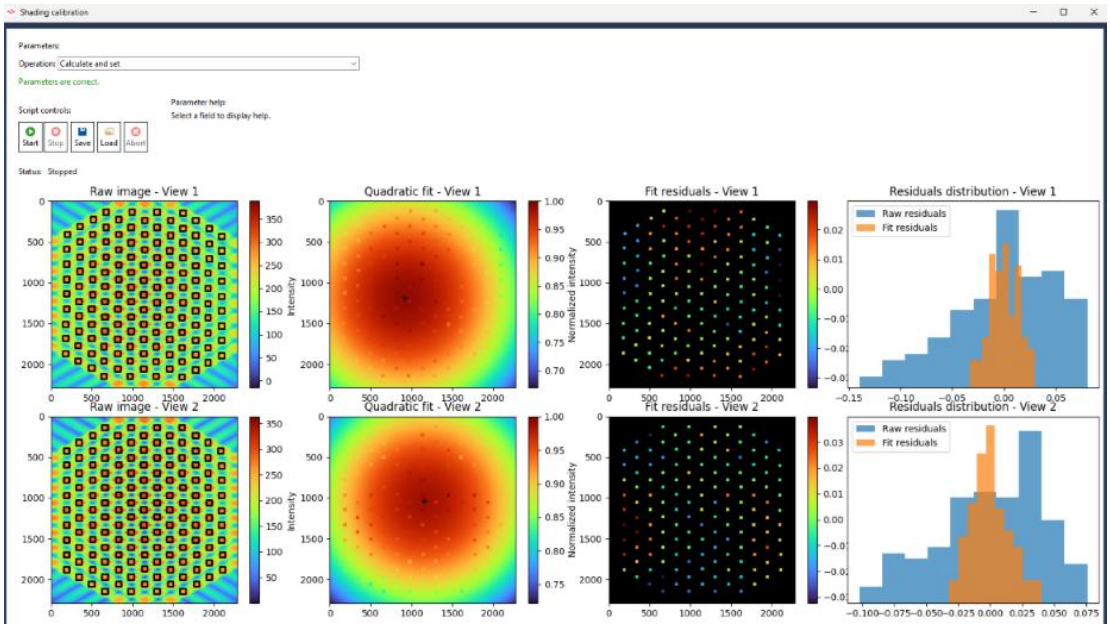
- Objective block alignment
  - The "Objective block alignment" script enables alignment of an objective block. It aligns both rotations and translation and saves the values in the corresponding settings. These values are refractive-index dependent.



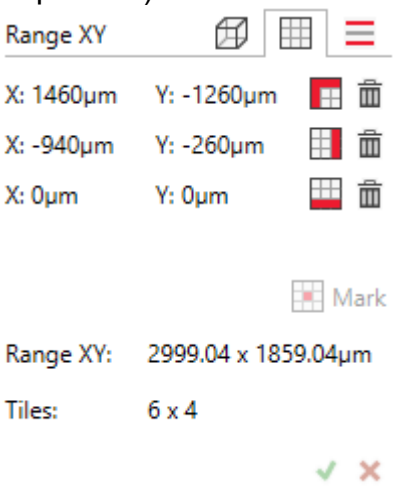
  - The "Scan plane alignment" script enables alignment of the scan plane of the beams. It also enables the measurement of the applied correction and the measurement of the angle between the focal planes of the 2 views. This values are refractive-index independent.



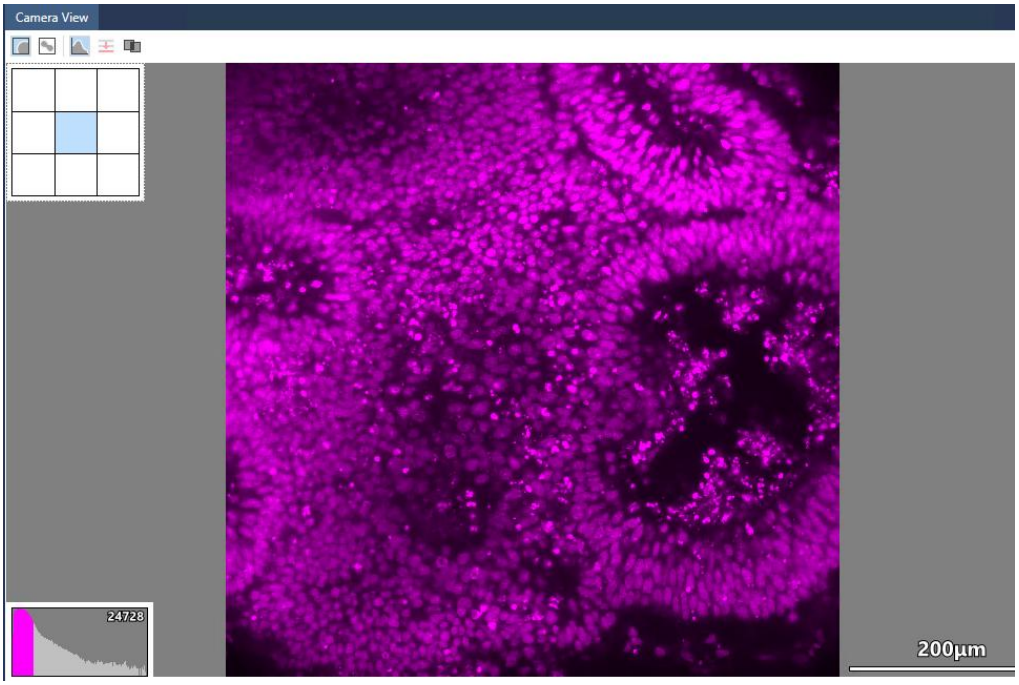
- The "Shading correction" script enables correction of the shading effect (also known as vignetting) over the FOV



- New tile-scan functionality
  - New "Range XY" tab to define the range of positions in the XY plane (tile acquisition):

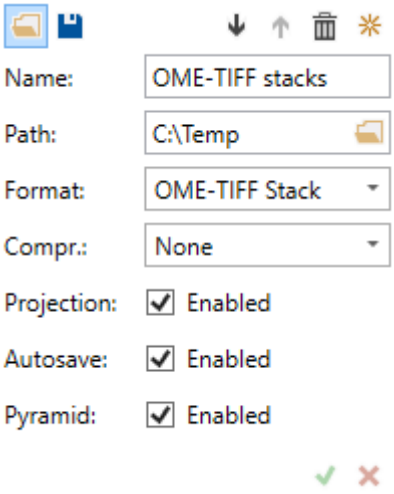


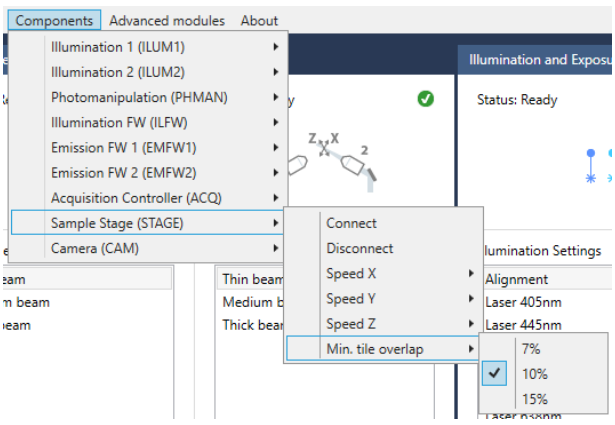
  - Tiles are acquired in snake order (zig-zag) to minimize stage movements.
    - Acquiring tiles in snake order reduces stage travel between adjacent positions, making acquisition faster, smoother, and less mechanically stressful.
  - The software acquires multiple tiles for each position based on range XY when defined. Tiles can be visualized and navigated using a minimap in the image viewer.



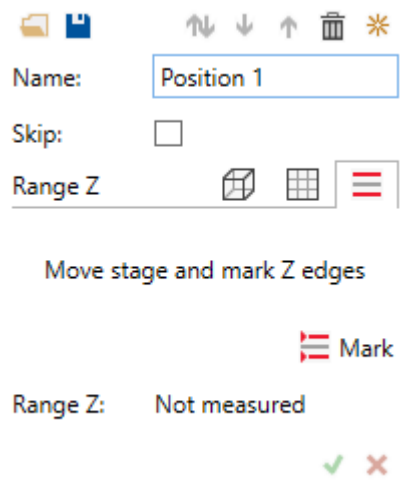
- New toolbar with buttons for tile display mode and full image display mode (left side buttons). The image is observed as entire if ‘Pyramid’ is enabled during acquisition.

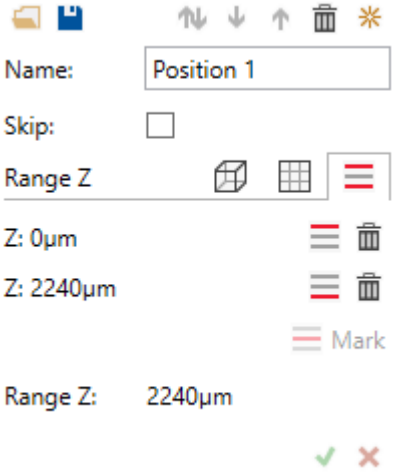
- Possibility to define the minimum overlap between tiles:



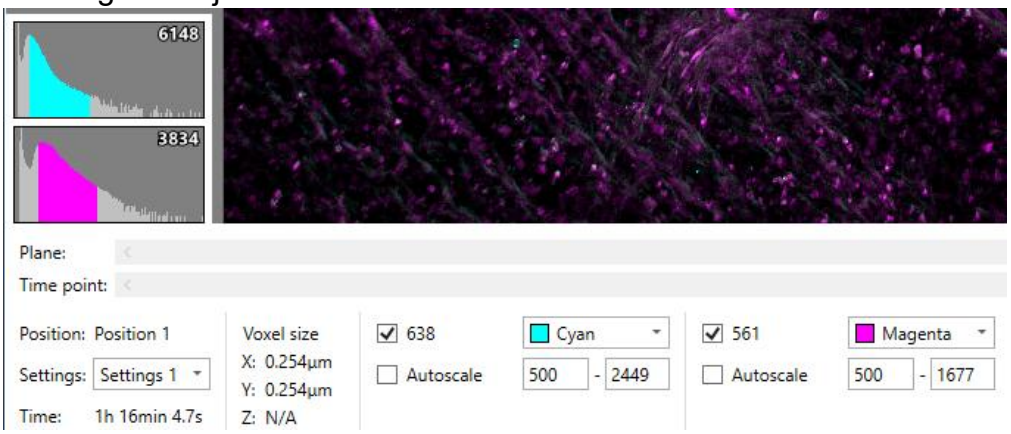


- New way to define Z coordinate of a position:
  - It is now possible to define positions Z-coordinate in a dedicated editor tab by marking the edges of the sample. The Z position will always be in the middle of the marked range.

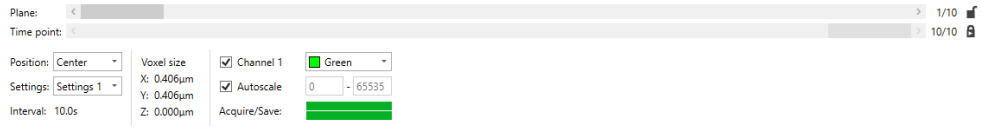




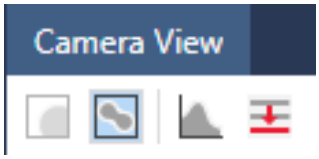
- New interactable histogram on top of image viewer:
  - Displayable from context menu.
  - Y axis can be displayed in log scale.
  - Clicking will adjust max threshold



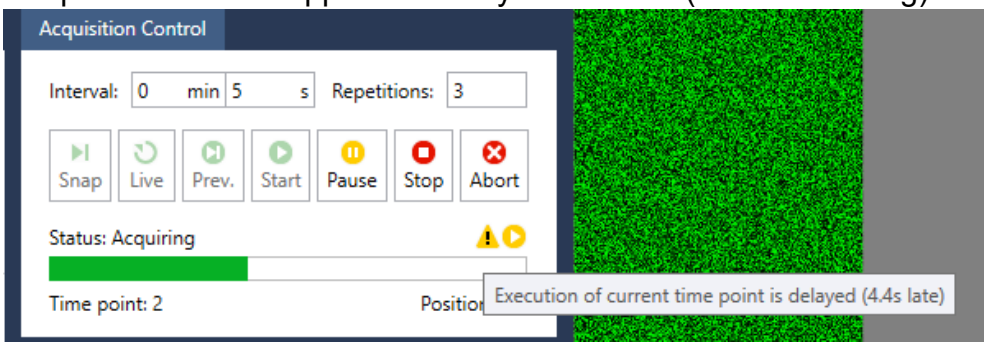
  - Added retrospective image browsing to inspect time points, settings and positions.
  - Added buttons to follow latest imaged plane and time point.



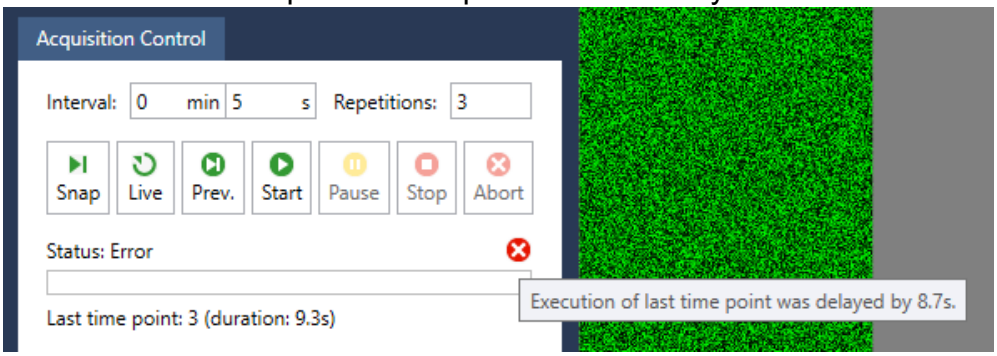
  - Added toolbar with buttons for histogram and maximum intensity projection (when available) (right side buttons).



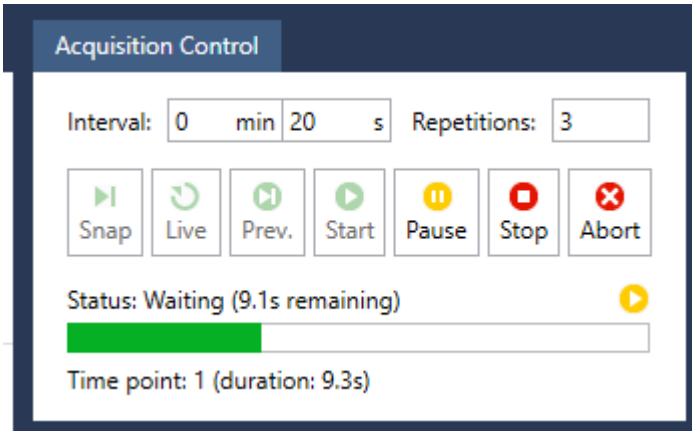
- Added delay and duration of time point
  - Acquisition is not stopped if a delay is detected (show a warning):



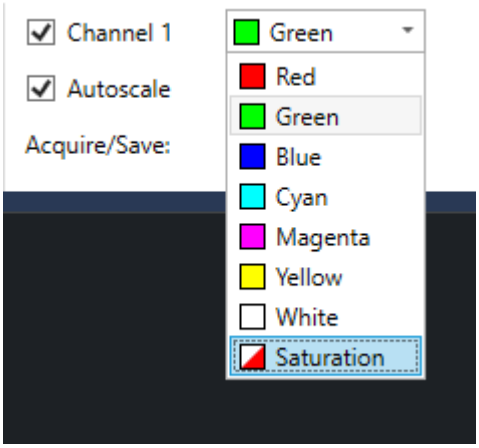
  - Error is shown if acquisition completes with a delay:



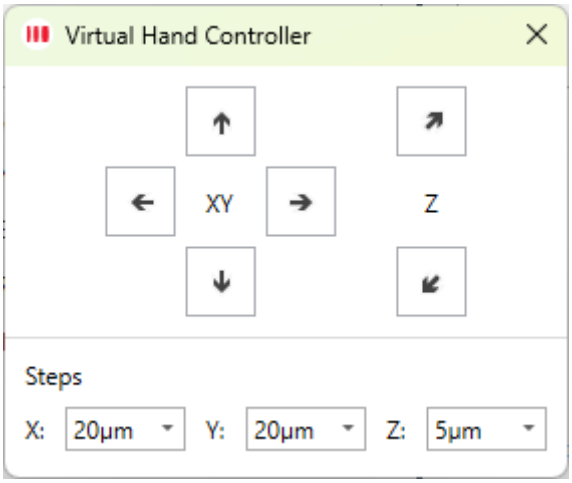
  - Duration of last time point is shown:



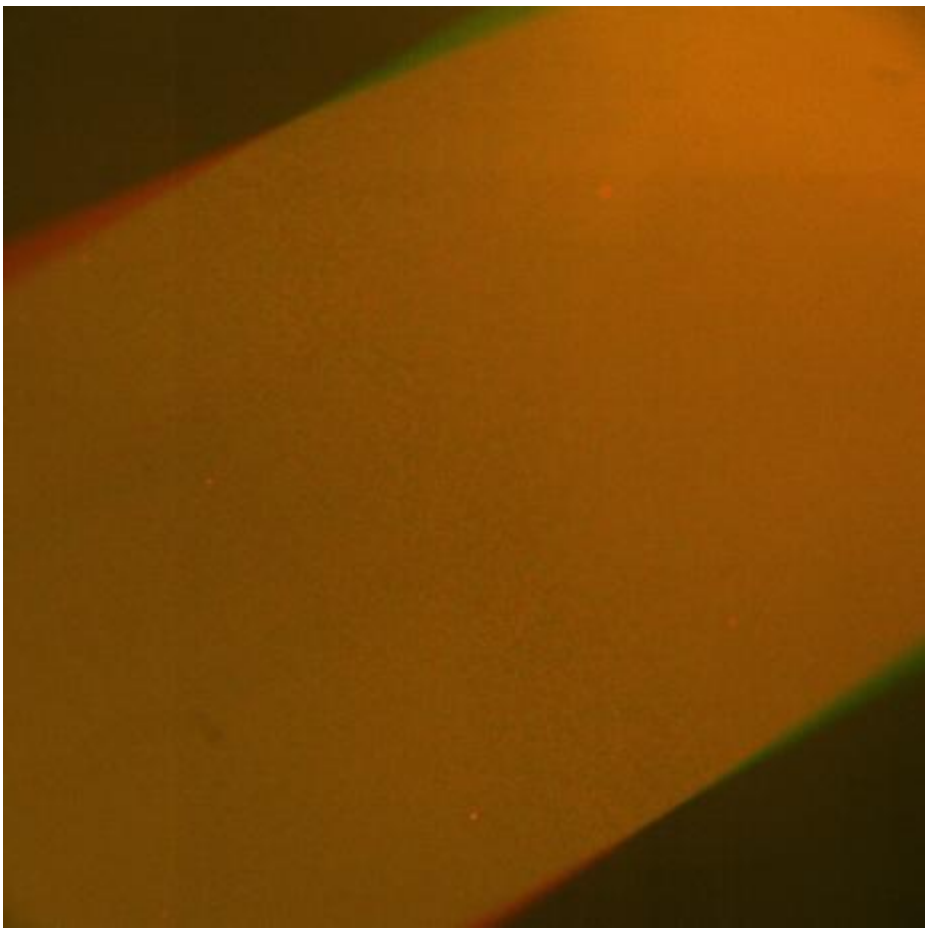
- New saturation color lookup table (white with red when value is maximum: 65535)



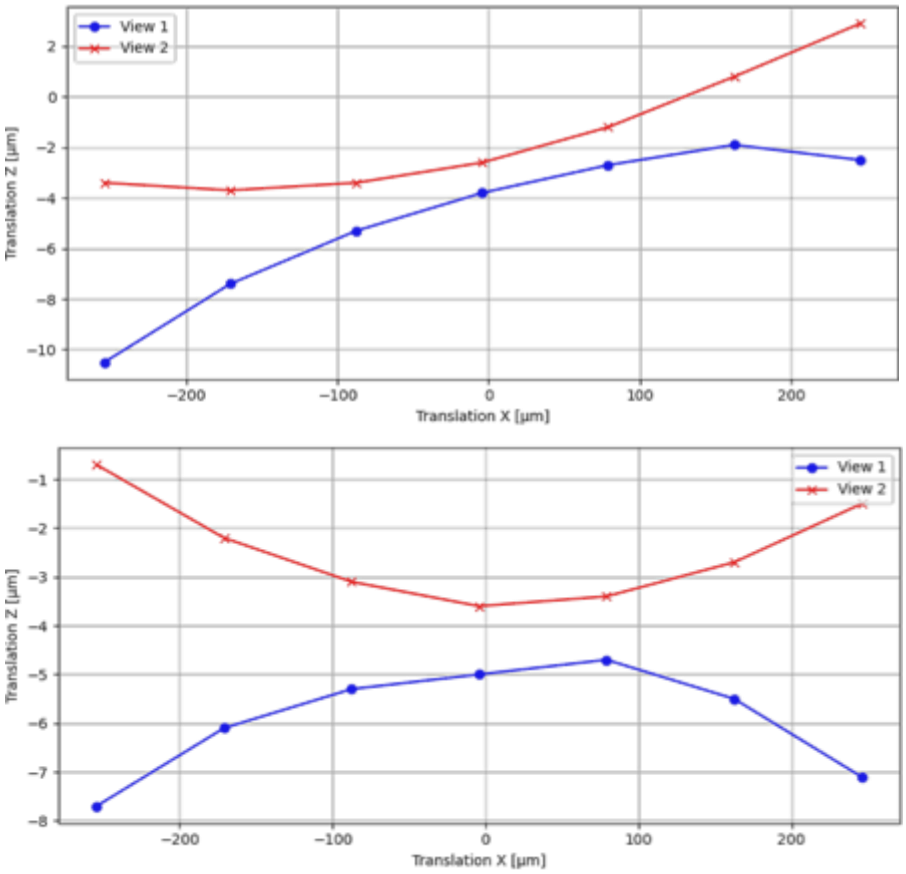
- Virtual hand controller window added that can move the stage by clicking on arrows buttons (also work with keyboard). The step size of the move can be defined.



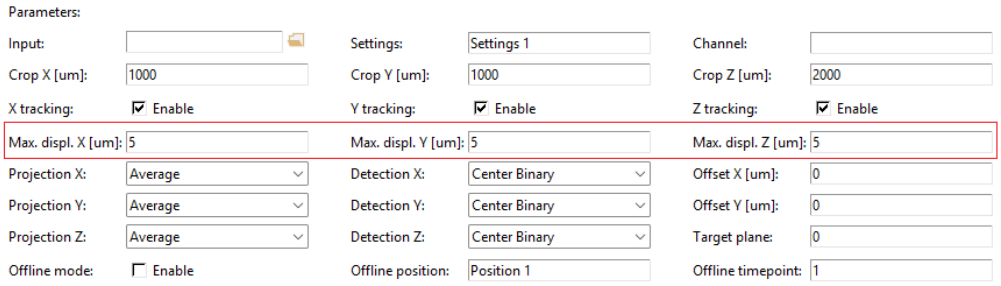
- Correction factors added:
    - Added correction factor for translation-rotation coupling in ACQ_Component of Microscope settings. This factor corrects for the additional rotation induced by scanner 2 when translating the beam along X (since scanner 2 is not at the focal plane of the scan lens). The red and green lightsheets in the picture are the uncorrected and the corrected ones, respectively.



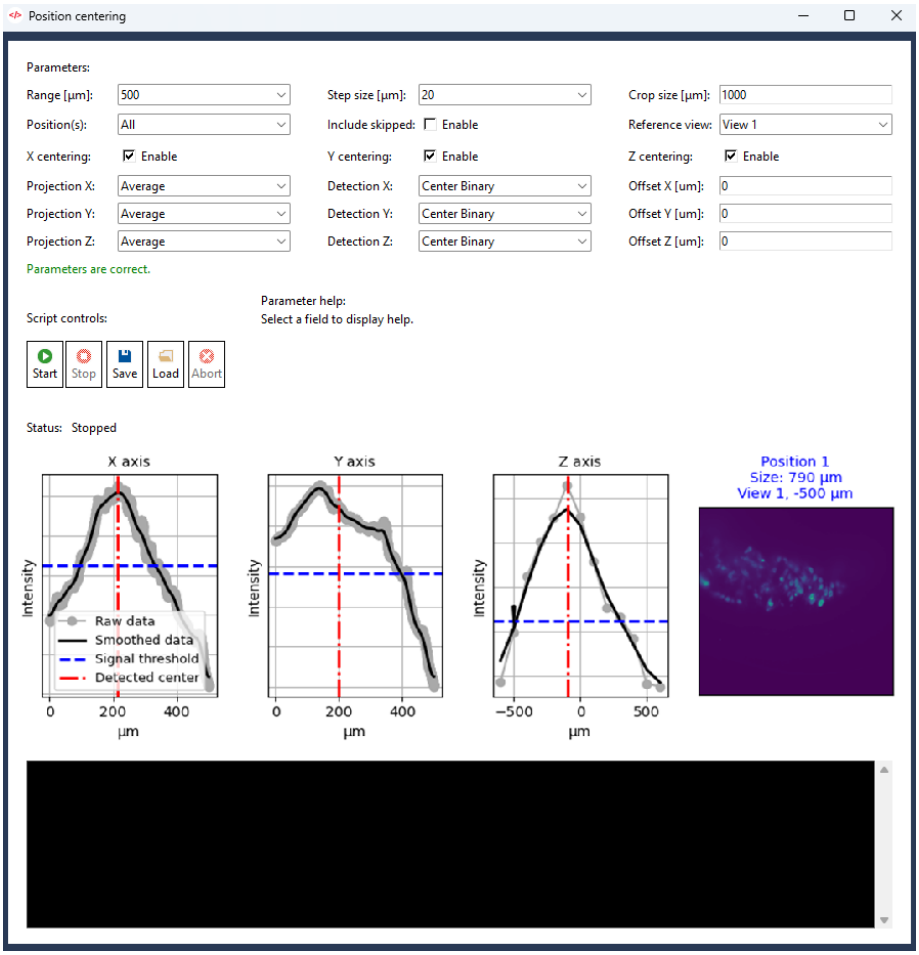
    - Correction factors added for scan plane tilts in ACQ_Objective of Objective settings. These factors enable alignment of the scan planes of each illumination with the cameras' imaging planes . The pictures show the uncorrected (i.e. tilted) and corrected (i.e. horizontal) planes. The fact that the imaging planes are curved is due to the field curvature of the detection objectives.

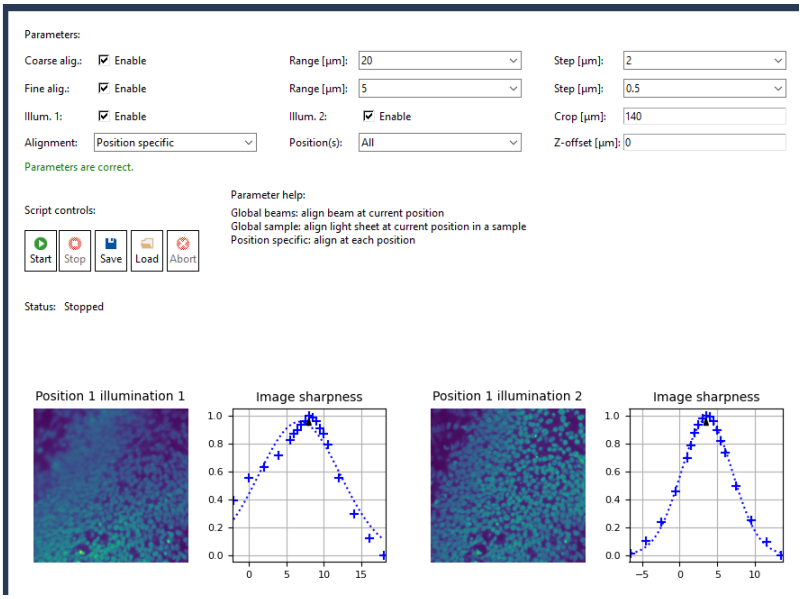


- Object tracking improvements:
  - The "object tracking" script allows to set a maximum allowed displacement between time-points for the 3 axes. This is useful when the displacement of the tracked target between time-points is large.



- Centering positions functionality:
  - The “Position Centering” script centers the sample within the field of view, using object tracking features and allowing the user to define a range and step size for the stack used during centering.



- Lighsheet alignment (on sample)
  - The "Lightsheet alignment (on sample)" script aligns the lighsheet position along the Z axis to the focal plane using image of the sample. It is usable only with single view objective blocks.
  - 

5. Solved Issues / Solved Restrictions

- Fix for acquisition controller not disconnecting properly:

  Any disconnection from the acquisition controller, whether triggered manually or caused by an error, could previously not be recovered. Reconnection is now supported.

- Handling of error when image buffer is full:

  Interrupt acquisition and display an error message when image buffer is full instead of crashing.

- Fix for decreasing camera offset not updating image size:

  Decreasing the camera offset manually or from advanced module would previously not update the image size of each view - leading to unexpected behavior.

- In microscope alignment and calibration, camera offsets are reset when user stops the script:

  If an error occurred during alignment, the camera offsets could enter an invalid state, preventing the alignment script from being executed again. The previous offset values are now restored whenever the script stops, either manually or due to an error.

- Fix for crash when starting application without photomanipulation component:

  Starting the application while the settings of photomanipulation is missing would result previously in a crash.

- Fix for missing error reporting in the time-lapse controller initialization:

  Previously, some errors occurring during time-lapse execution were not properly detected or reported.

- Fix for error when DeviceSettings is undefined in acquisition settings.

  In case of wrong settings file, software will crash.

- Fix for position alignment for snap and live acquisition:

  Position-specific alignment was not considered in snap and live modes.

- Check signature of Python interpreter executable to ensure security.

- Fix for crash when receiving invalid JSON command:

  Fix crash when receiving invalid JSON command from external control (such as PyMCS library)

- Fix for application not closing properly when closed during startup:

  When application closed while it's starting up it will not properly close devices and some threads might remain active in background.

- Fix for premature stopping of stage movement:

  During communication with the SmarAct positioning system controller, some messages were incorrectly interpreted as movement completion events, even though the stage was still moving. As a result, acquisition could be triggered prematurely while the stage remained in motion.

- Fix for TIFF writing when transitioning to BigTIFF format (no random pixels at the top of plane close to 405):

  TIFF files were not written in the BigTIFF format, which is required for files exceeding the 4 GB size limit of standard TIFF. When this limit was reached and an automatic transition to BigTIFF occurred, image artifacts could be produced.

- Fix for overlay not overlapping properly in image viewer:

  Correcting the overlay positioning improves visualization accuracy, enhances usability of the image viewer, and ensures that displayed overlay information corresponds correctly to the underlying image data.

- Photomanipulation images are now valid ome.tiff (openable with ImageJ):

  Previously, the software wrote simple TIFF files, which were more difficult to manage. Files are now saved as OME-TIFF and include embedded metadata.

- Maximum projection images are now valid ome.tiff (openable with ImageJ):

  Previously, the software wrote simple TIFF files, which were more difficult to manage. Files are now saved as OME-TIFF and include embedded metadata.

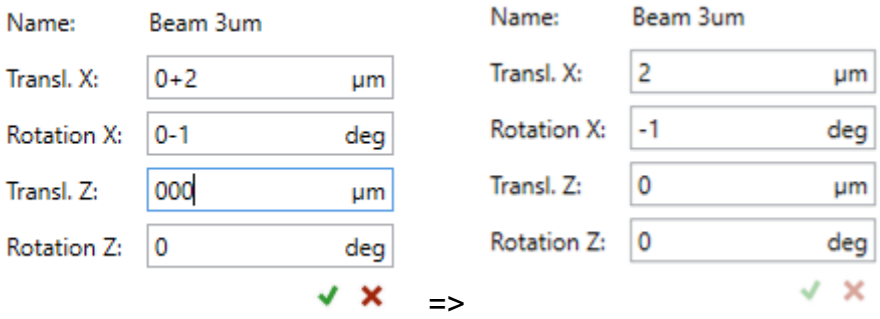
- Fix for crash when advanced module is already opened:

  If advanced module was already open before the software started, the application would crash during startup.

- Photomanipulation tab was displayed when it was unavailable:

  Hiding the tab when the feature is unavailable improves usability by presenting only relevant and accessible functionality, resulting in a clearer and more consistent user experience.

- Fix for inconsistent numeric validation:
  Some numeric fields compatible with arithmetic computation were not replaced by the result once saved.



- Fix for crash when editing the Z-stack parameters:

  An invalid Z-stack range parsing issue could cause the application to crash.

- Fix for text hidden behind text box icon:

  In text boxes containing embedded icons, overly long text could appear behind the icon. The overflowing text is now hidden and can be accessed using the keyboard arrow keys.

- Fix for text box resizing for long text:

  Text boxes containing overly long text could resize unexpectedly, causing display issues in the software. The overflowing text is now hidden and can be accessed using the keyboard arrow keys.

- Fix for switch of view when moving photomanipulation area in image viewer:

  Clicking in the image viewer allows switching between views, while the photomanipulation region is moved by dragging. Previously, initiating a drag could unintentionally switch the view.

- Fix for invalid position computation from image viewer:

  It is possible to set the coordinates of a position from the image viewer, but the calculation was not working correctly.

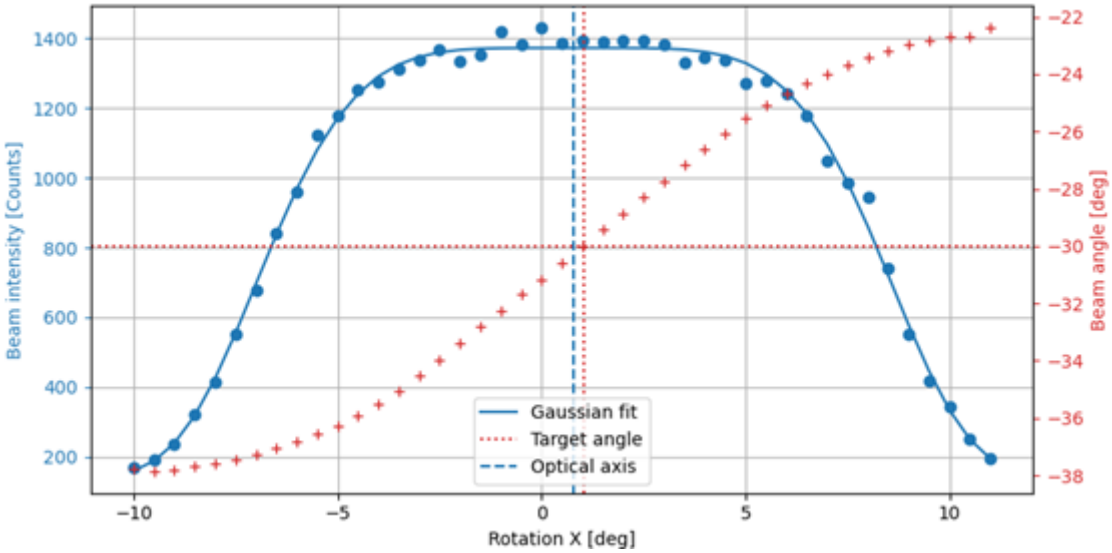
- Changes in "Object tracking":

  The position is now updated only if the new coordinates do not exceed the stage range.

  The center of the detected object is calculated after subtracting the threshold to the thresholded projection, in order to remove the bias coming from the background.

- Added management of window closing not to raise an error when closing the window while an operation is still running.

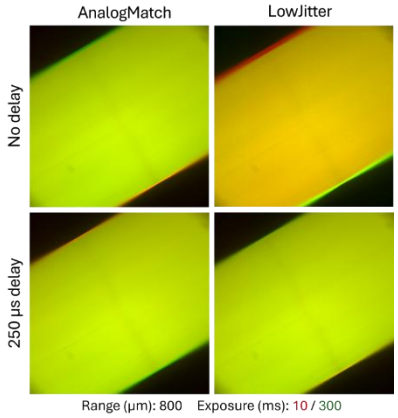
- In microscope calibration, use the beam intensity for locating the illumination optical axis:



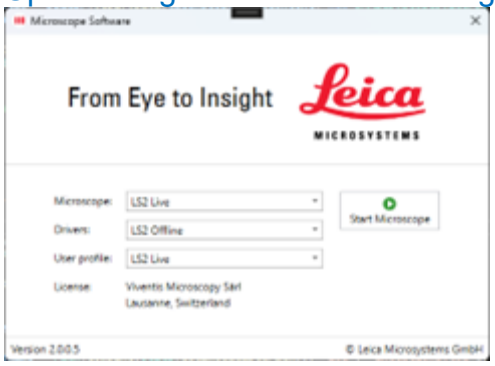
Use the beam intensity for locating the optical axis of the illumination objective. The decay of beam intensity when positioned to the edges of objective back aperture is more reliable in locating the aperture position.

- Improved laser trigger timing to reduce edge intensity artifacts:

During beam scanning, the laser is triggered ON (respectively, OFF) with a delay to accommodate for the acceleration (respectively, deceleration) of the scanners at the beginning (respectively, end) of the scan. This mitigates the shift and the intensity peak at the extremities of the scanned region for both the tunings of the scanners.



- Updated logo to Leica's and change icon colors:



- Bypassed driver communication in Move commands:

  FilterWheelDevice skips sending a move command to the driver if filter wheel is already at the correct position.

- Extended MAC6000FilterWheel driver hardware response timeout to 10s:

  At very low frequency a response may take several seconds. This change avoids timeout errors.

- Increased range of photomanipulation scanner offset from +-10um to +-20um.
- In environment control, add gas concentration regular expression settings and manual COM port settings.
- Added manual COM port settings to SerialFilterWheel driver.
- Scanner factors of illumination module are now ignored (set from acquisition controller).

  Avoid duplicating values that are intended to be identical.

- Added a menu to calculate scanner base offsets for photomanipulation:

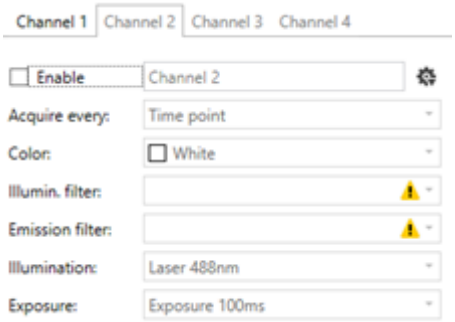
  Base offsets for each illumination include a menu to calculate them, this functionality is now also available in photomanipulation.

- Updated validation of names to work with file system.

  Some files are generated based on settings names (positions, configuration profiles, etc.). These names are now validated to ensure they do not contain characters that are invalid in file names.

- Improved validation of acquisition settings:

  Acquisition settings now include improved validation, with warnings that explain why a parameter is invalid.

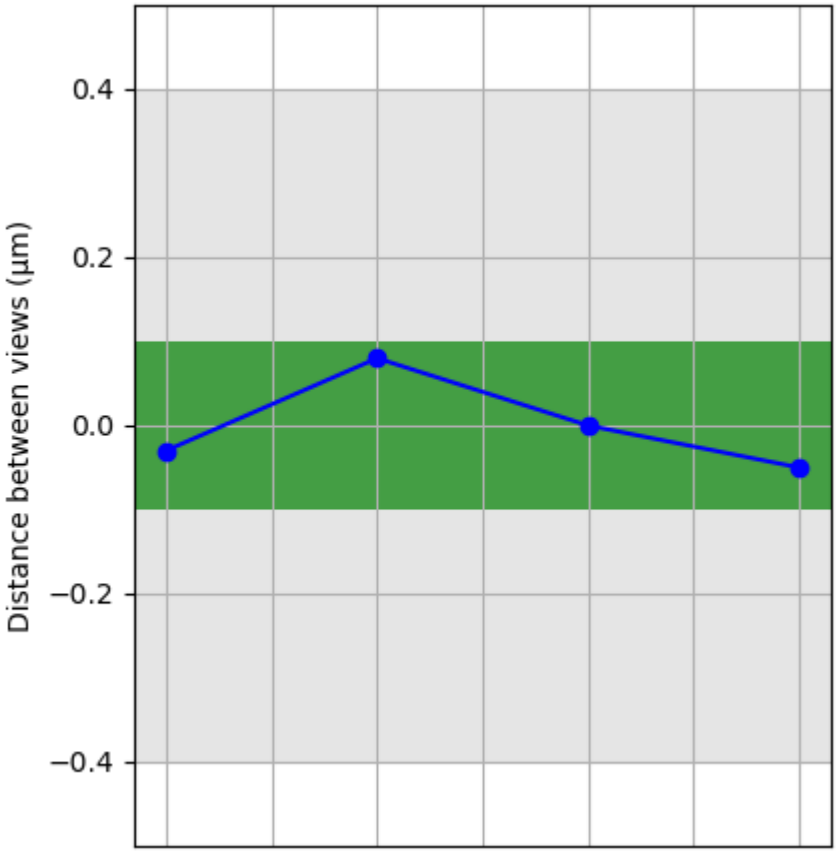


- Improved efficiency when moving through planes in image viewer:

  Reduced delays during image browsing, enable now smoother interaction with large datasets

- Added temperature tolerance indicators to align and center views:

  In the "Align and center views" operation of "Microscope alignment" added two gray bands to indicate the tolerance expected with temperature fluctuations over time.



- Improved management for images without stacks in object tracking:

  In object tracking, added management of images containing no stack by raising an error, skipping the image analysis, and continue to next position/time-point.

- In object tracking, changed the default value for the settings to "Settings 1".
- Directory and file name patterns are no longer options of storage:

  To improve predictability in the structure of generated images, the flexibility to customize naming patterns for directories and files has been removed.

- Maximum intensity projection is now stored inside optional data folder ("XXX_Optional/MaxZ"):

  The software now generates increasing amounts of optional derived data (i.e., data that can be computed from raw data). This data is now stored in a dedicated location, making it easy to remove when storage space is needed.

- Pause after position occurs after all position-related tasks (including photomanipulation) are completed:

  The pause after position was previously applied before photomanipulation, meaning the position had not actually been fully completed.

- Increased no response timeout of Hamamatsu camera driver from 5s to 20s:
- Application is now installed in program files directory and data are stored in program data directory.

  For security reasons, the software is now installed in the ProgramFiles directory, which requires administrator privileges for access. Shared settings are now stored in the ProgramData directory.

- JSON commands are no longer accepted if client is not authenticated:

  For security reasons, the software now requires valid authentication for incoming JSON commands to ensure they are not accepted from unauthorized users.

- Removed photomanipulation auto-trigger option in acquisition settings:

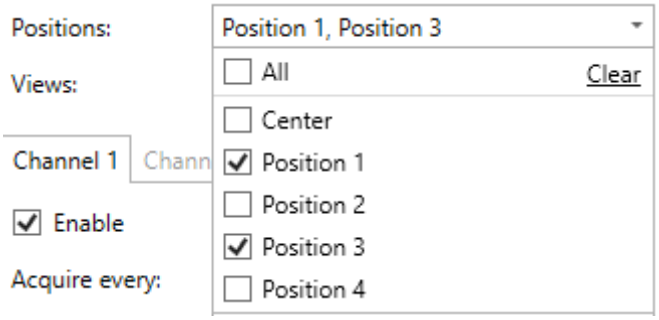
  Photomanipulation is automatically triggered if photomanipulation enabled for a position and time point.

- Automatically disconnect when an unrecoverable error occurs in a device.
- Improve speed of aborting time-lapse (almost instantaneous):

  Previously, a user abort would wait for the current stack acquisition to finish before stopping. It now stops immediately.

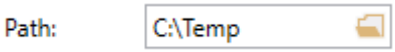
- When channel autoscale is enabled, display which scaling is used instead of manual scaling values.
- Changed position selection in acquisition settings to dropdown with checkboxes:

  Editing a position previously required using a dedicated text-based language, which made the process tedious. It is now done through a dedicated UI element that enables easier editing.

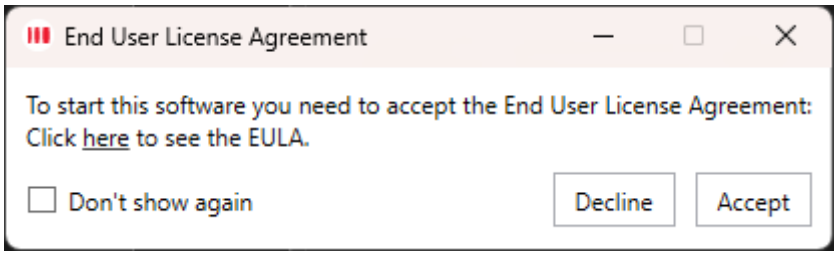


- Changed path selection input to file dialog.

  Previously, selecting a path required manual entry. It is now done via a button that opens a directory selection dialog.



- Added End User License Agreement at startup.
  The EULA is displayed in a separate window and the user must accept it to continue.



- Added option to acquire full field of view in exposure settings (will automatically adjust based on magnification).
- Auto-import settings from previous software versions.
- Integrated PyMCS inside MCS (no separate installation required).
- Added compression with Zstandard for OME-TIFF files.
- "Fused views" functionality was removed from advanced module and moved to post-processing software.
- Advances modules, when started without terminal, all messages are logged on files:

  Previously, errors and displayed messages were not logged, this has now been fixed so they are properly recorded.

- Advanced modules can be launched without terminal (with pythonw.exe):

  Previously, starting an advanced module would open a terminal alongside the GUI. This no longer occurs when the interpreter uses pythonw.exe.

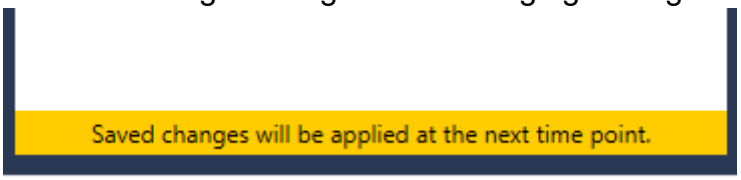
- Added position-specific Z-Stacks range where the number of planes is derived from position's range Z:

  It is now possible for positions to have different numbers of planes when a Z-range is defined for the position.

- Added support for pyramids (writing/reading) allowing display of full mosaic in image viewer:

  Tiled images can now be displayed using estimated stitching when pyramids are available. Without pyramids, displaying large images would be limited by available computing resources.

- Now edition of settings will not affect the current time point execution:
  - Added warning message when changing settings during time-lapse.

  - Prevent the edition of some settings while time-lapse is running.
  - Added "Never" option when acquiring a channel every nth time points to disable it while the time-lapse is running.
  - User settings may be marked as required (from JSON file), preventing renaming and deletion at all time.

- Display time stamp in image viewer and store it in ome metadata:

  The acquisition time for each time point, relative to the start of the experiment, is now stored as metadata.

- Add coordinates in ome metadata:

  The stage coordinates at the time of acquisition for each position are now stored in the metadata, enabling features such as later tile stitching.

- Documentation of the JSON commands API:

  The JSON command API is now documented in a file located in the application directory.

- Documentation of the JSON settings:

  The JSON settings are now documented in a file located in the application directory.

- Photomanipulation at multiple positions and multiple time points is now allowed:

  Photomanipulation can now be performed at multiple positions and multiple times points.

- In environment control, add menu option to reset learned flow of CO2 and O2 concentration in environment control. There is also a warning when starting the flow regulation if the flow is unexpectedly high:

  The learned flow can become biased if for example, there's no flow for a long time. To recover, it needs also a long time, however by resetting the flow, it becomes easy to learn new valid flow.

- Settings summary added:
  A user readable text file is available in the experiment folder when an acquisition is performed. This file contains all the settings used in the current acquisition.

- Add notice file for open-source libraries.

  A notice file now provides information about the open-source libraries used and where to find their associated licenses.

6. Open Issues / Restrictions

The following list enumerates the known, unresolved anomalies of Viventis Deep Microscope Control Software 3.0.3.

No known open issues.