LIFE SCIENCE MASS SPECTROMETRY

SCiLS™ Lab 2024b – What's New?

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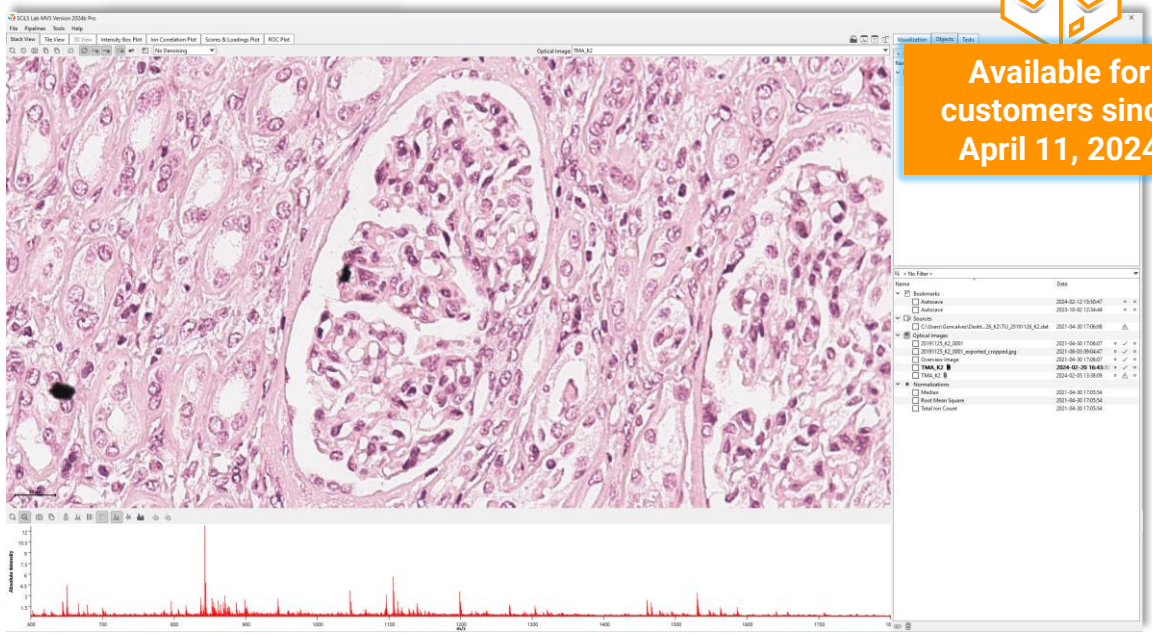
01 *High-resolution optical images:*
Microscope images at full resolution

02 *Optical image co-registration:*
Improved image co-registration workflow

03 *T-ReX Feature finding:*
Feature finding during manual data import

04 *Multiple other feature enhancements:*
Various other improvements and changes



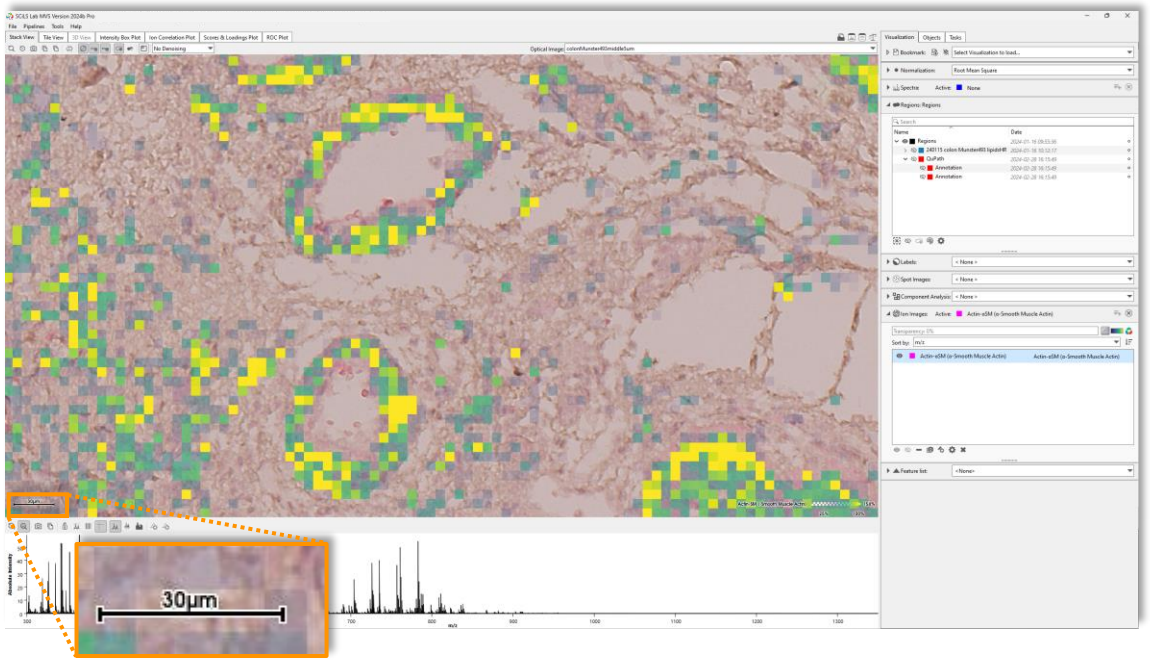
Available for customers since April 11, 2024

01

High-resolution optical images

High-resolution optical images: **High-resolution optical images in SCiLS™ Lab Stack View**

- SCiLS Lab supports rendering optical images in Stack View at full resolution
- Import high-resolution optical images using
  - SCiLS Lab optical image import
  - QuPath-to-SCiLS export plugin
  - SCiLS Exchange Format (SEF) files
  - SCiLS API
- Whole-slide *brightfield* imaging data in file formats supported by the OpenSlide library are compatible
  - ***NOTE:*** *whole-slide fluorescence data is not supported*



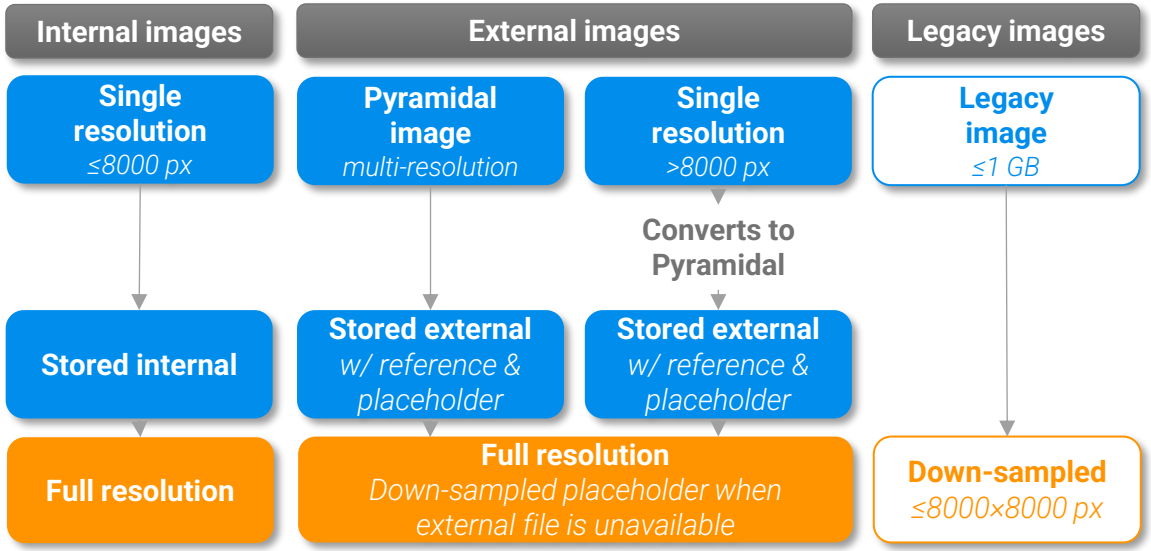
Data formats supported by the OpenSlide library			
Data format / vendor	**Extensions**	**Data format / vendor**	**Extensions**
Aperio	.svs, .tif	**Philips**	.tiff
DICOM	.dcm	**Sakura**	.svslide
Hamamatsu	.vms, .vmu, .ndpi	**Trestle**	.tif
Leica	.scn	**Ventana**	.bif, .tif
MIRAX	.mrxs	**Generic tiled TIFF**	.tif

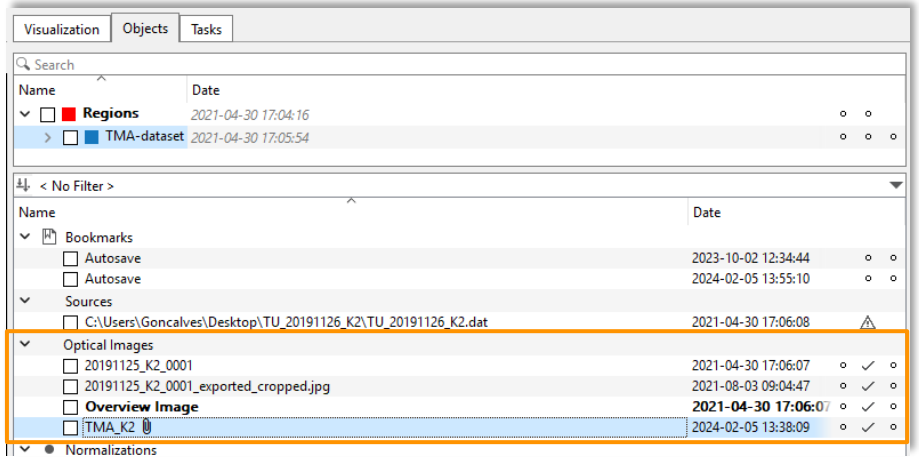
High-resolution optical images: **Optical image storage in SCiLS™ Lab**

- Optical image handling has fundamentally changed in SCiLS Lab 2024b

- Previously, optical images were
  - Stored in the .slx file
  - Maximum file size of 1 GB
  - Down-sampled to max. 8000×8000 pixels
  - Rendered as down-sampled image in Stack View

- Now, data sets can contain
  - Legacy images
  - Internal images
  - External images





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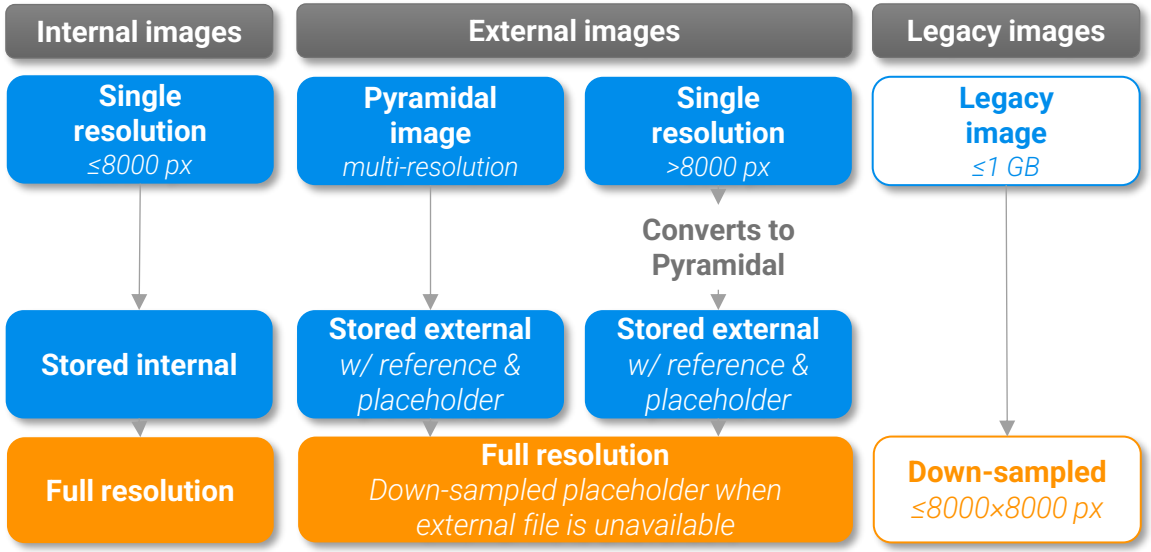
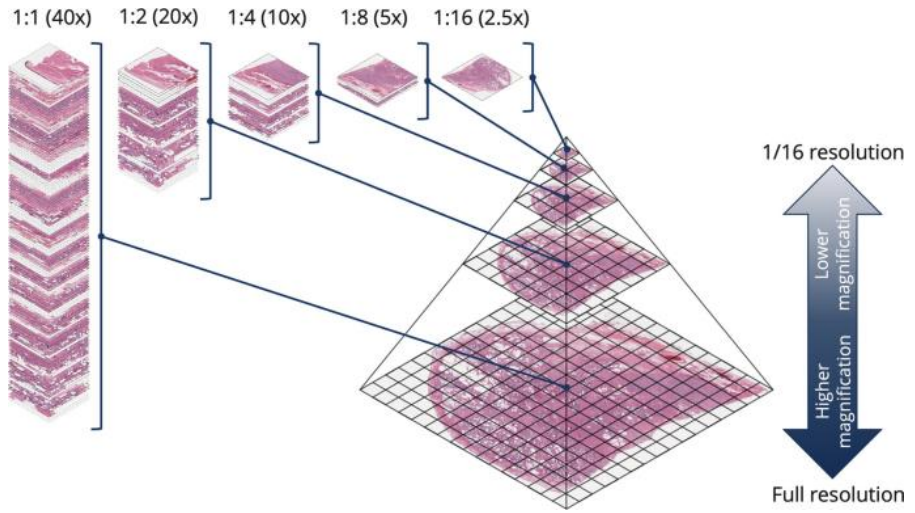
  - Internal images
  - External images

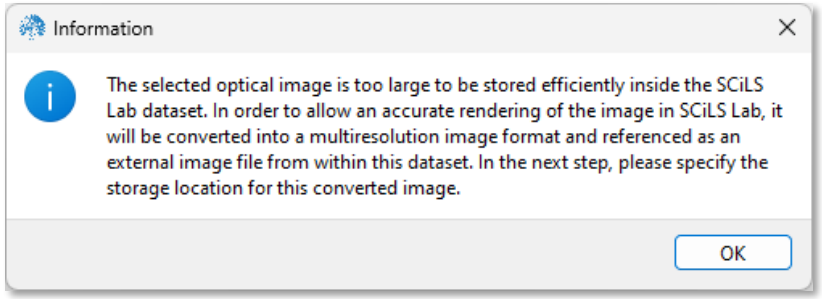
- Objects tab displays optical image information
  - Internal/Legacy or matching image found at path: ✓
  - Path inaccessible or non-matching image found: ⚠

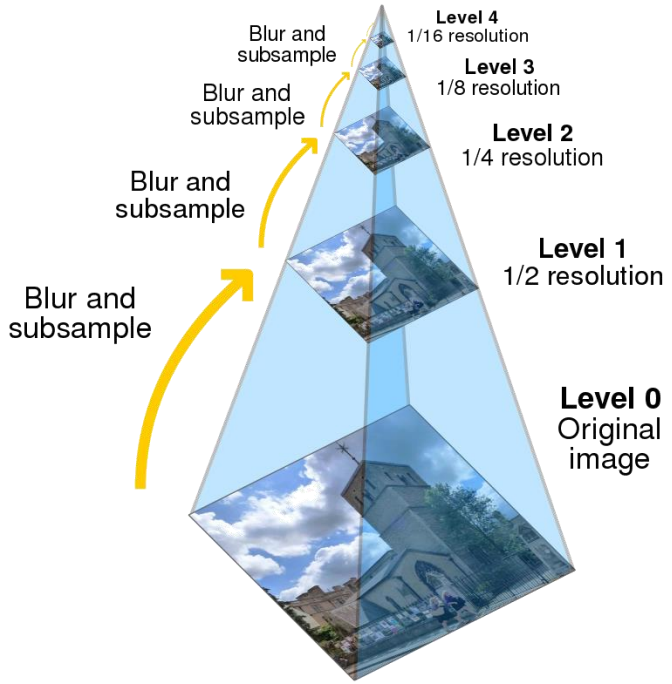




High-resolution optical images: **Optical image storage in SCiLS™ Lab**

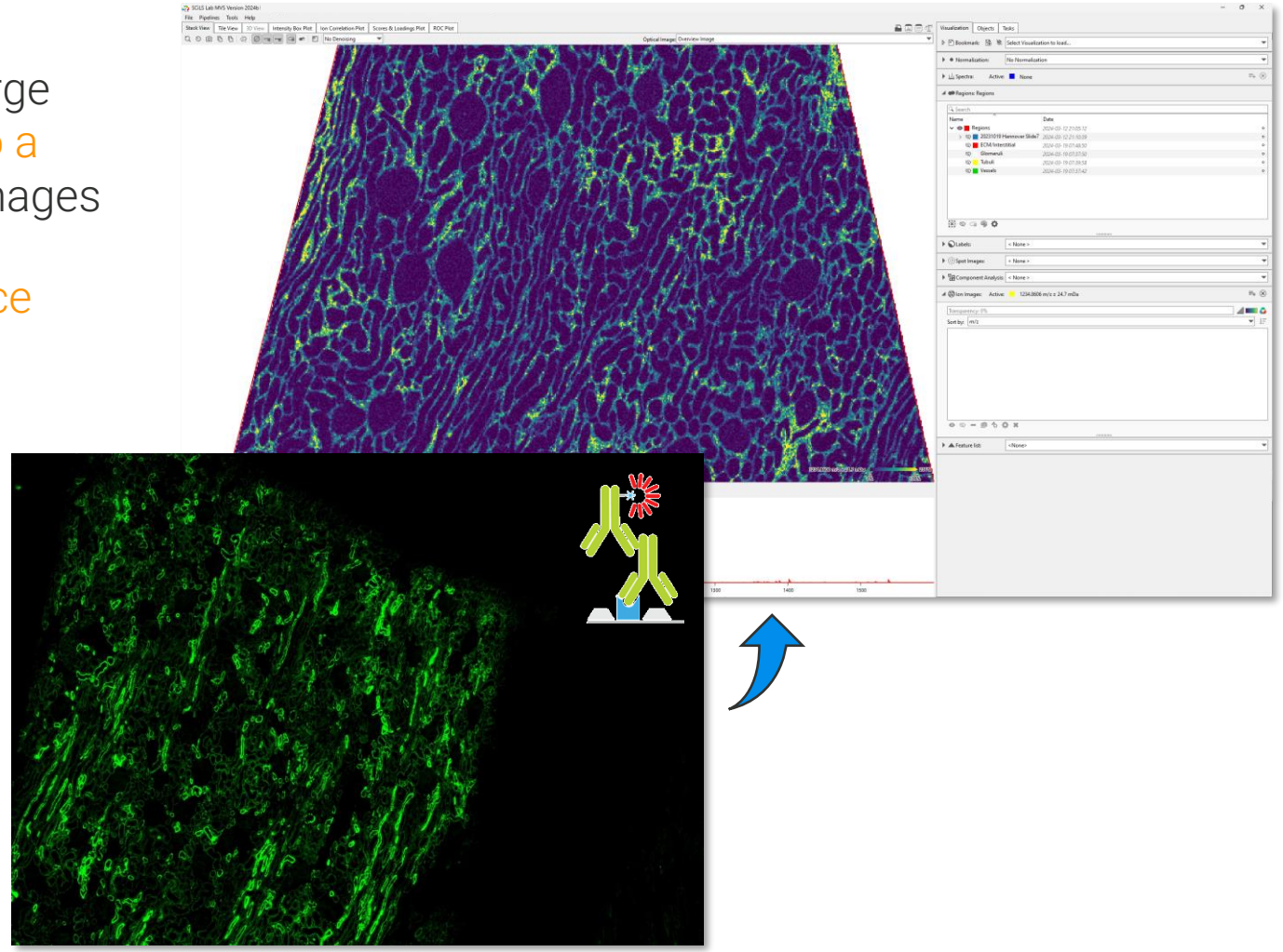
- To facilitate high-resolution rendering for large “flat” images, these images are converted to a pyramidal format and treated as External images





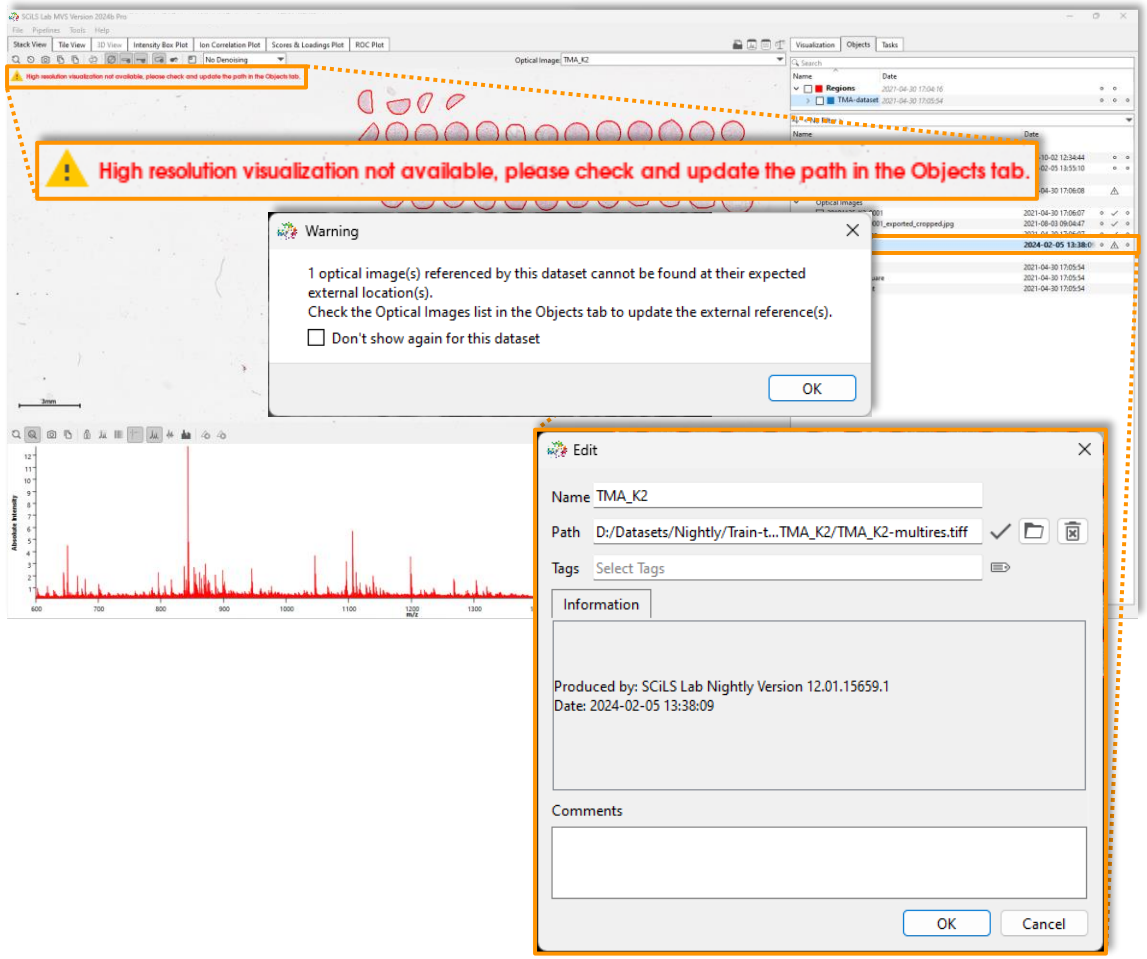
High-resolution optical images: **Optical image storage in SCiLS™ Lab**

- To facilitate high-resolution rendering for large “flat” images, these images are converted to a pyramidal format and treated as External images
- Allows importing pre-processed fluorescence microscopy images into SCiLS Lab



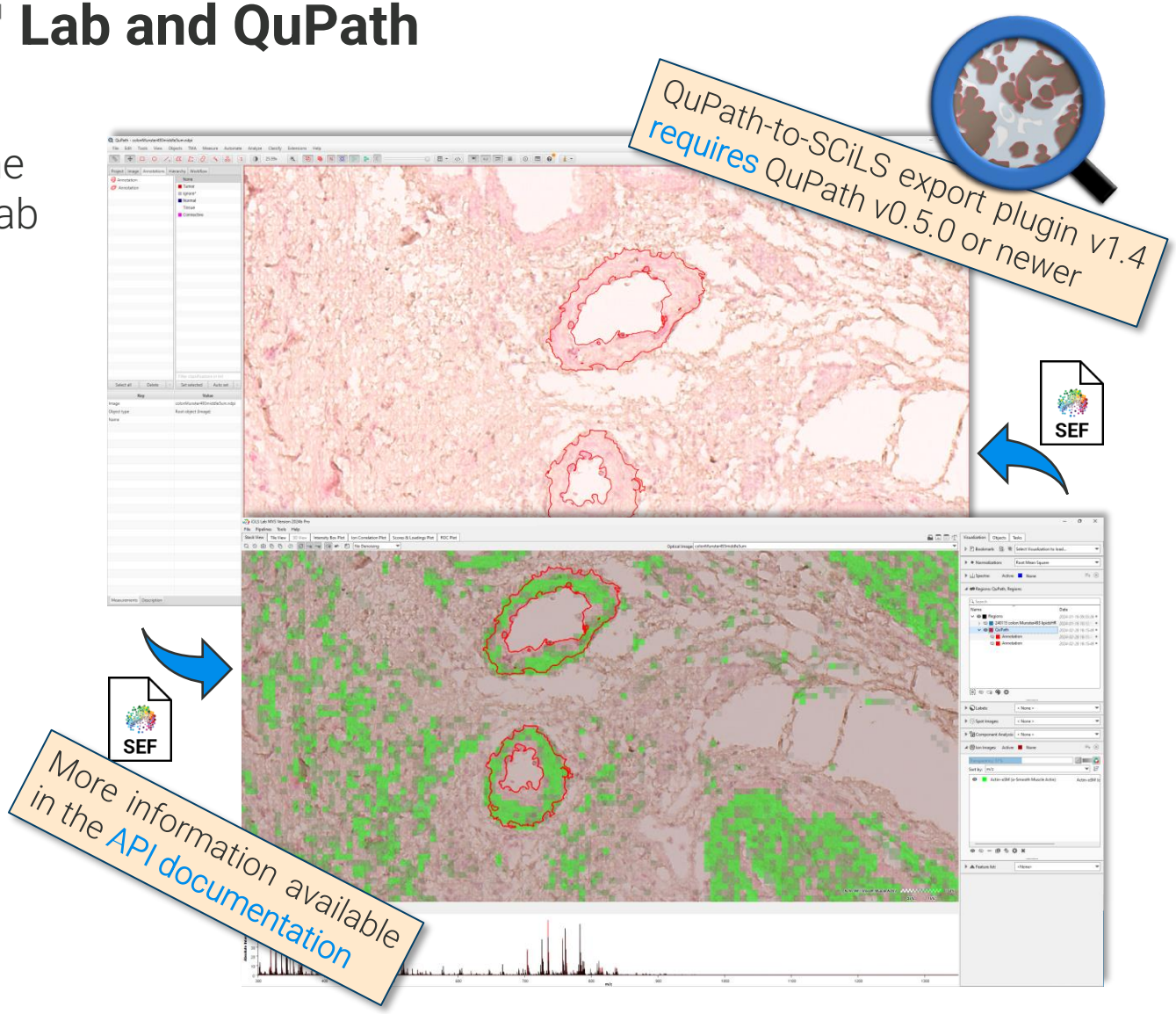
High-resolution optical images: **Updating external image locations in the Objects tab**

- In case external image files are re-located the external file references will need updating
  - Warning upon opening SCiLS Lab data set
  - High-resolution rendering unavailable for affected external images, placeholder image is shown
- Objects tab displays optical image information
  - Internal/Legacy or matching image found at path: ✓
  - Path inaccessible or non-matching image found: ⚠
- The "Edit" properties dialog can be used to:
  - Update path to external image
  - Remove the external file reference
    - External image files unaffected
    - Placeholder image unaffected
    - Cannot be undone



High-resolution optical images: **Improved integration between SCiLS™ Lab and QuPath**

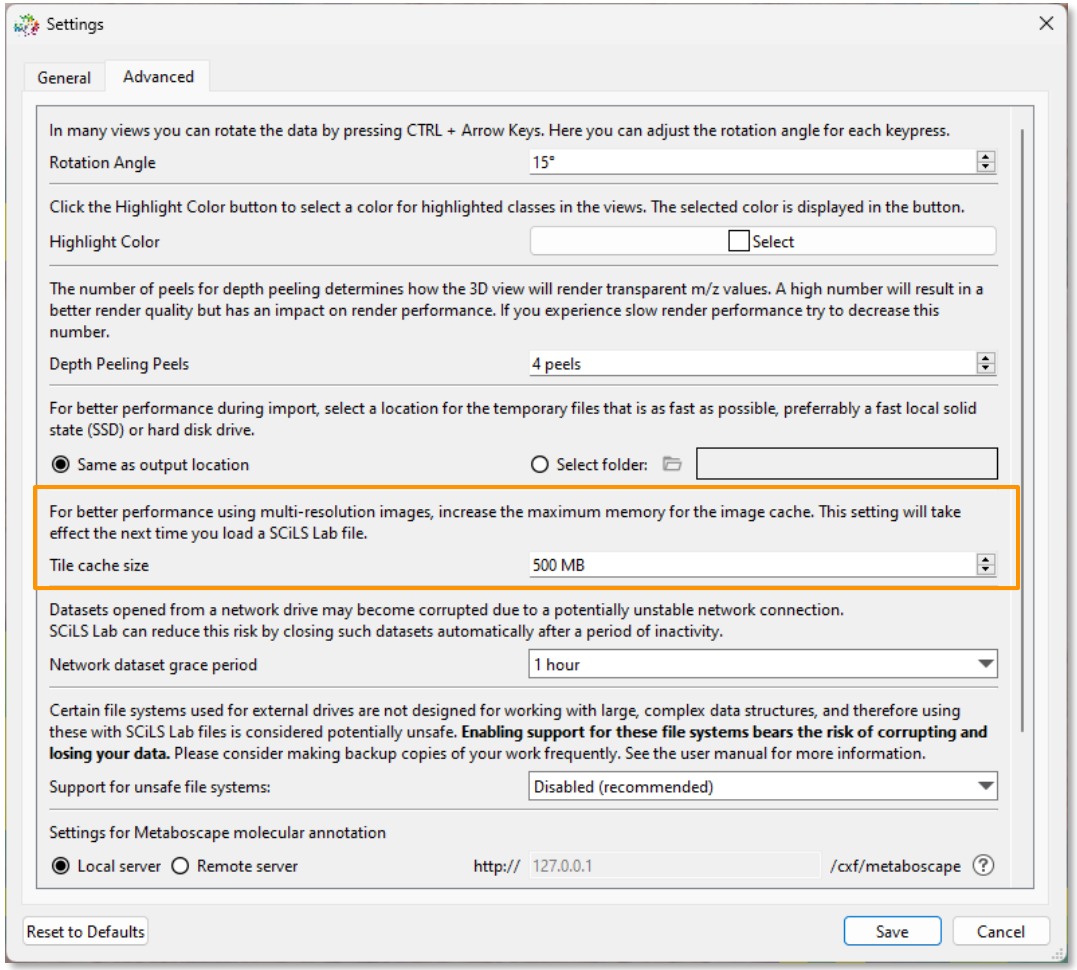
- The **QuPath-to-SCiLS export plugin** facilitates the transport of region annotations between SCiLS Lab and QuPath
- Plugin v1.4 transports external optical image references between SCiLS Lab and QuPath
- SCiLS Lab and QuPath access the same external optical image to avoid data duplication
- A reference to an external optical image can be added to the updated **SCiLS Exchange Format**



High-resolution optical images:: **SCiLS™ Lab performance high-resolution optical image rendering**

- Whole-slide imaging data is read from disk and is not fully loaded into memory. When navigating through an image, the image tiles that were “visited” are temporarily stored, or cached, in memory to revisit them more efficiently later

- To enhance the user experience and improve the performance of viewing high resolution optical images in SCiLS Lab, the Tile Cache Size can be increased on the *Advanced* tab of **File>SCiLS Lab Settings**

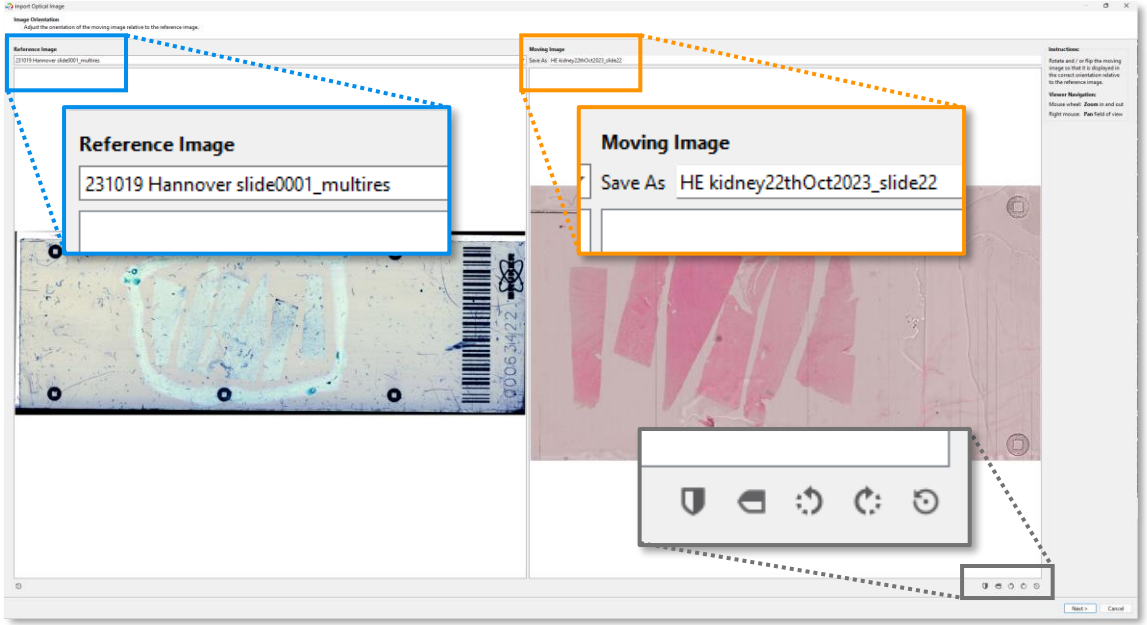


02

Optical image co-registration

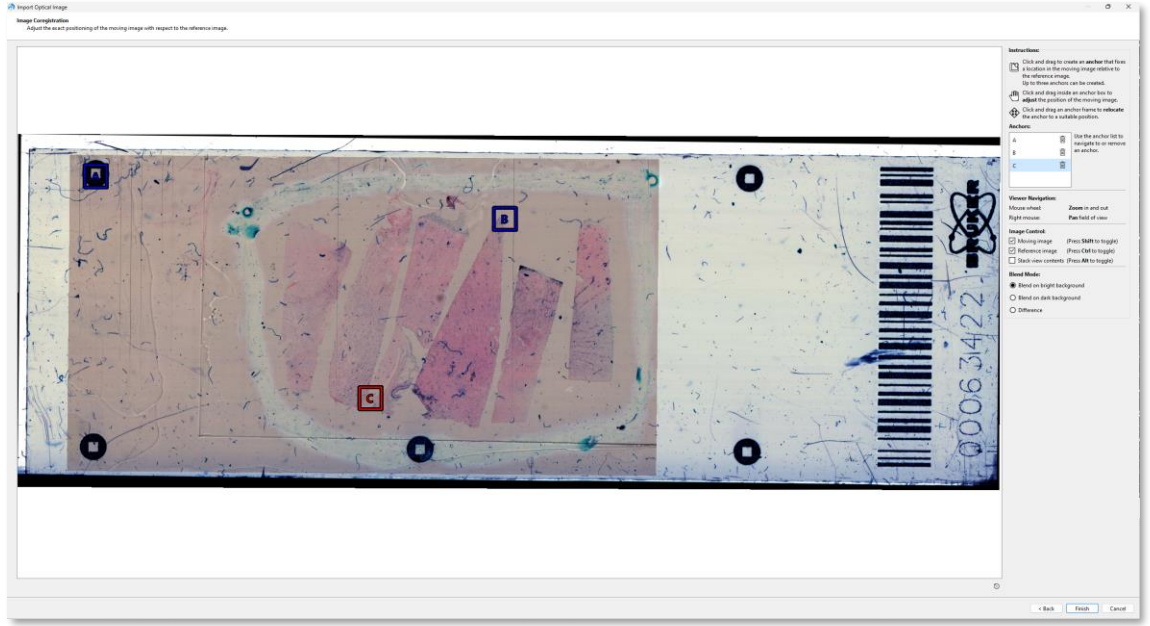
Optical image co-registration: **Improved image co-registration workflow**

- To accommodate working with high-resolution optical images, SCiLS™ Lab has a new two-step and interactive image co-registration module
- Access the new image registration module via **File > Import > Optical Image (Co-Register new image)**
- Select the image you want to co-register to the MALDI Imaging data, this is the **Moving image**
- In the registration wizard, select the **Reference image**, which is already present in the data set
- Use the Image Orientation step to match the orientation of the moving image to the reference image



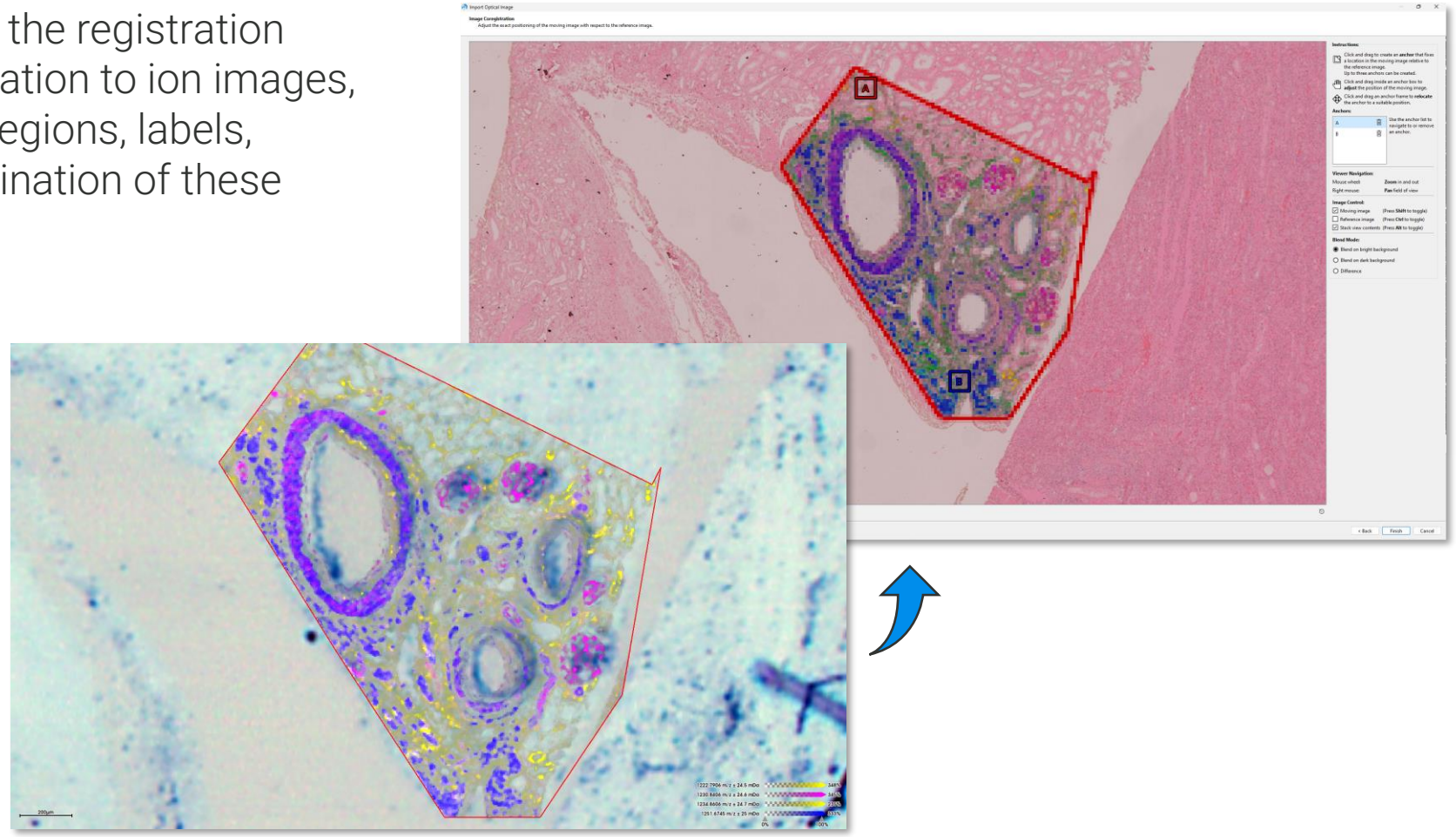
Optical image co-registration: **Improved image co-registration workflow**

- Following Image Orientation, continue to the Image Co-registration, which is based on **anchors** to adjust the moving image
  - 1 anchor – adjust position
  - 2 anchors – adjust rotation and scaling
  - 3 anchors – compensate for shearing artefacts
- The detailed registration is interactive and immediately displays the result of the input actions
- Anchor operations
  - Create by clicking in the registration window
  - Move to adjust the moving image position
  - Relocate (click on the teachbox border and drag)
  - Delete to undo image transformation



Optical image co-registration: **Improved image co-registration workflow**

- Display Stack View content in the registration window to allow direct registration to ion images, component analysis results, regions, labels, external images, or any combination of these

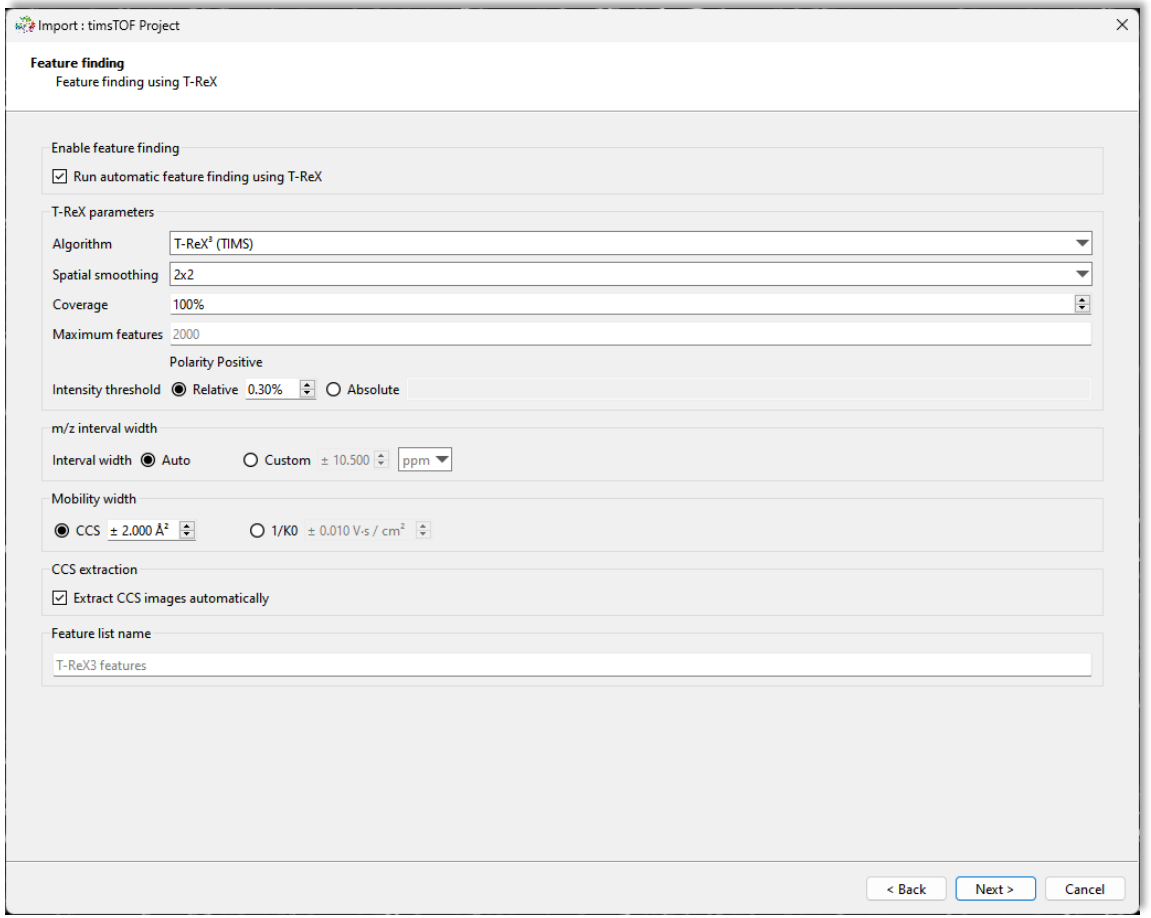


03

T-ReX® Feature Finding

T-ReX® Feature Finding:
Feature Finding upon manual import of data

- During the manual import of timsTOF fleX and/or centroided MRMS data into SCiLS™ Lab, T-ReX Feature Finding can be enabled to run during the import procedure
  - T-ReX^2 for MRMS and QTOF data
  - T-ReX^3 for TIMS data
- For CCS-enabled timsTOF fleX data, the CCS extraction can also be enabled to run during data import
- Parameters and results are identical to operating the Feature Finding tool in SCiLS Lab



04

Multiple feature enhancements

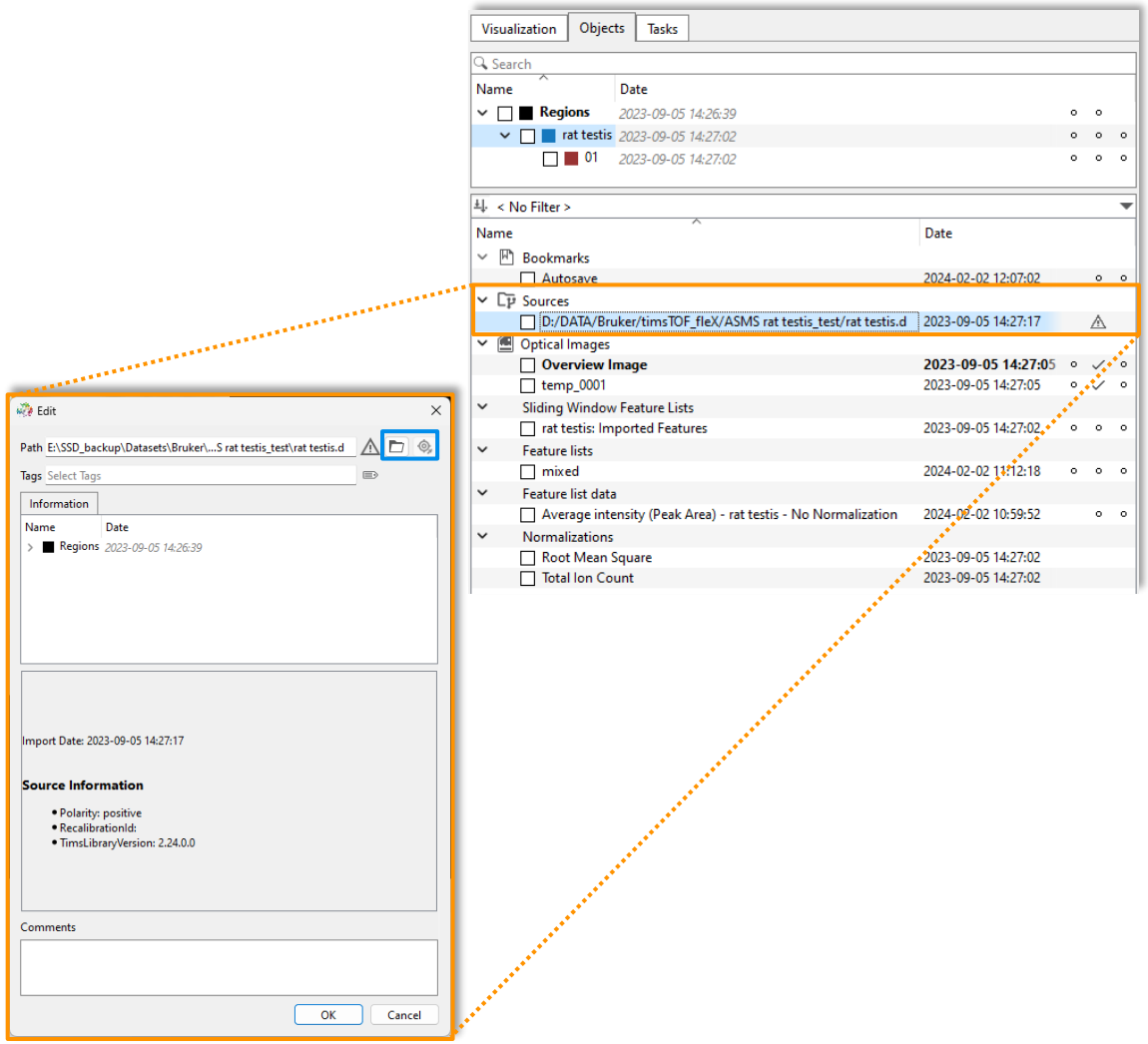
Multiple feature enhancements: **Changed mouse & keyboard interactions in Stack View**

- The mouse and keyboard interactions to navigate in Stack View have been updated

Move mouse	Left button	Right button	Middle/3rd button
No key	Select regions	Pan the image	Pan the image
SHIFT	Select regions	Rotate the image (Stack View)	Pan the image
CTRL	Toggle region selection	Pan the image	Pan the image
ALT	Intersect selected regions	Pan the image	Pan the image

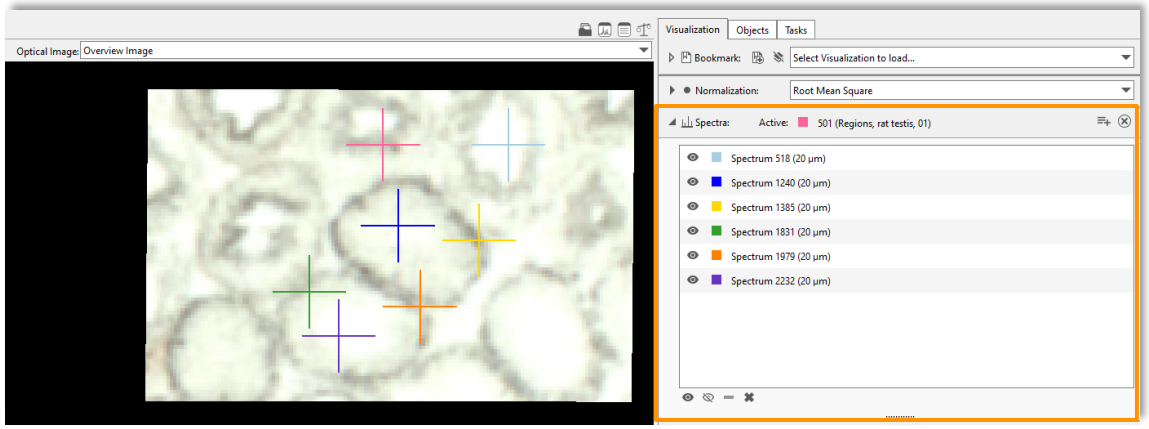
Multiple feature enhancements: **Improvements of the Objects tab functionality**

- Display of data sources has been moved from File Properties to Objects tab
- Accessibility of source data is shown in Objects tab
  - Accessible: ✓
  - Inaccessible: ⚠
- Update path to the source data set via the “Edit” properties
- For timsTOF fleX data, a change in the active calibration of the source data is shown: ⓘ
- The calibration file active at the time of importing the source data into SCiLS Lab can be exported



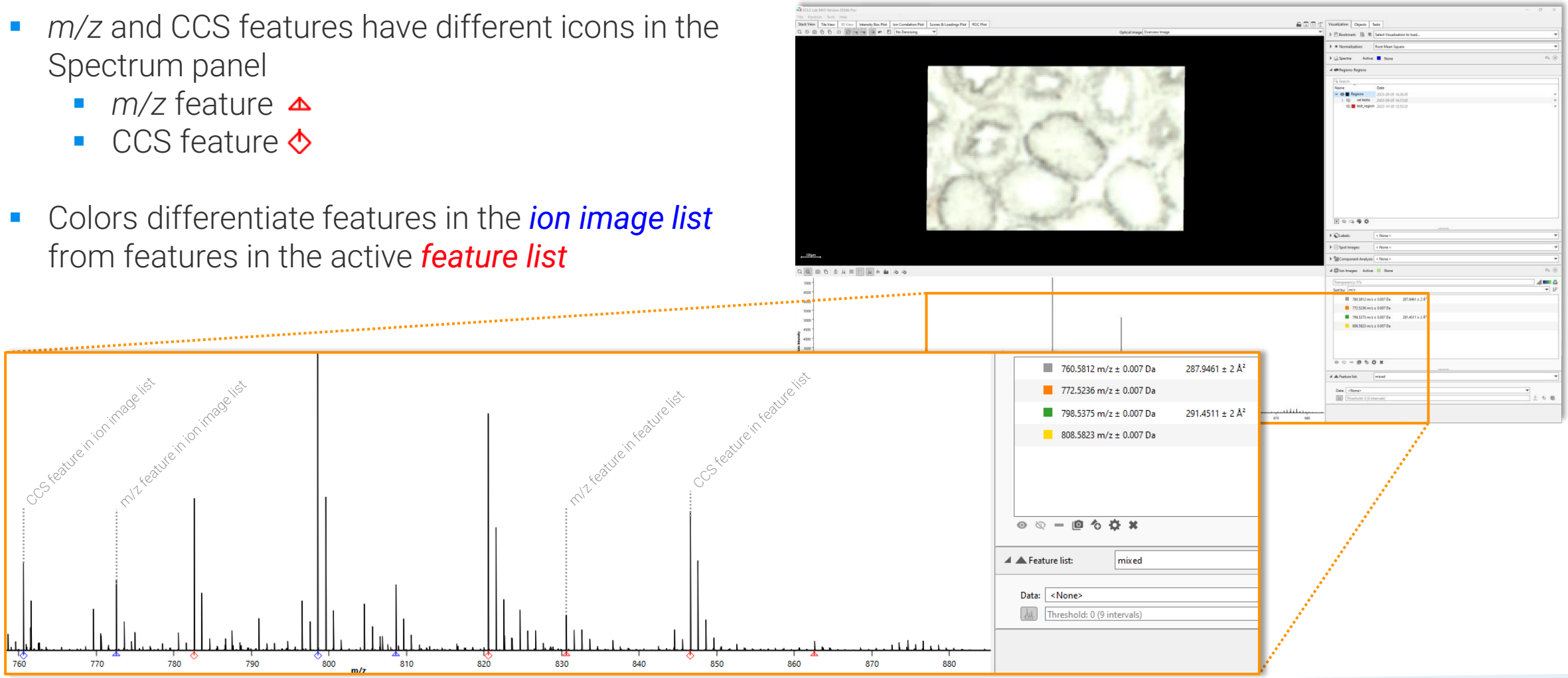
Multiple feature enhancements: **Improved single spectrum viewing**

- Displaying single spectra has been improved to work like displaying ion images
- Select a single spectrum with a single click
- Add single spectra to the Spectra list by using ***Alt + click***



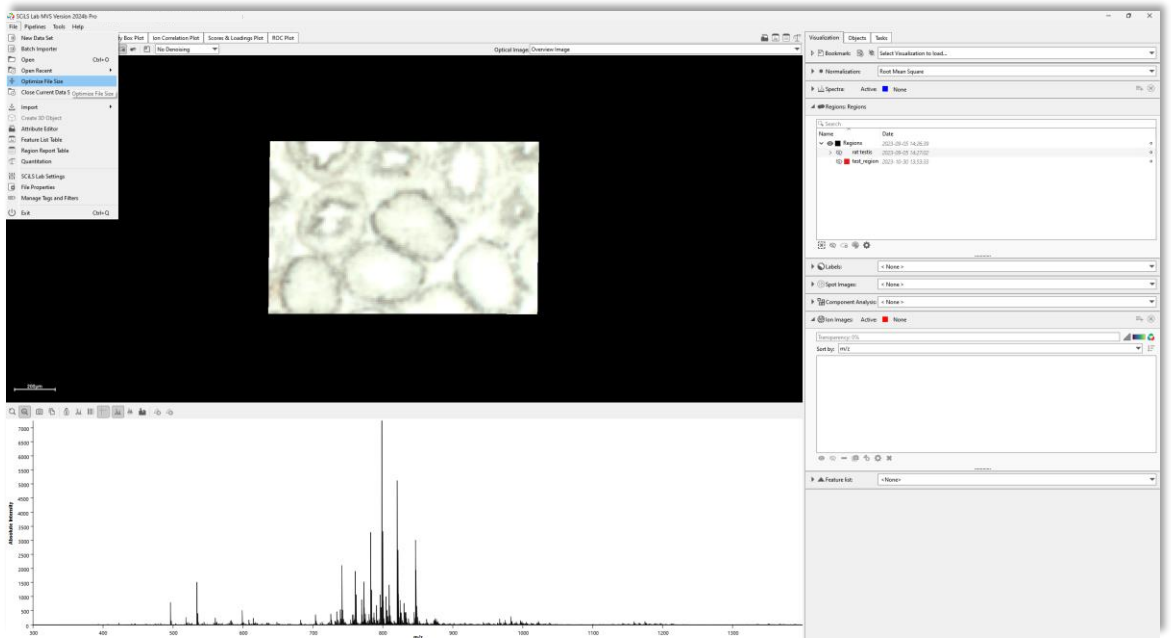
Multiple feature enhancements: **Spectrum plotter differentiates *m/z* and CCS features**

- *m/z* and CCS features have different icons in the Spectrum panel
  - *m/z* feature
  - CCS feature
- Colors differentiate features in the *ion image list* from features in the active *feature list*



Multiple feature enhancements: **Optimize SCiLS™ Lab file size**

- Over time, the .slx file of a SCiLS Lab data set can accumulate redundant information, putting a burden on storage space
  - *For example, unused extracted CCS images*
- ***File > Optimize file size*** will clean up the SCiLS Lab data set and remove redundant information, saving disk space

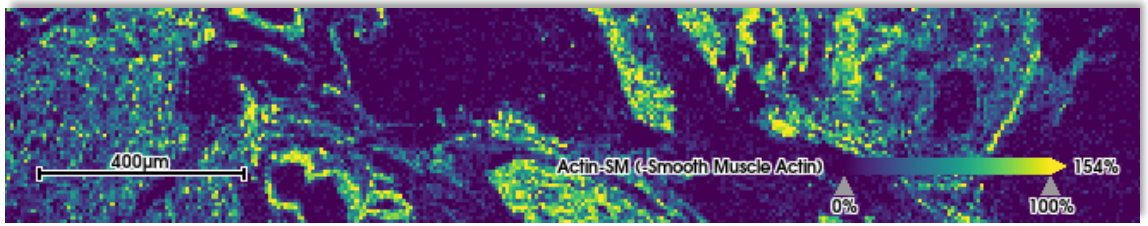


	Data set 1	Data set 2
Number of pixels	66925	66925
.slx size after import	319 MB	94 MB
# CCS features after import	873	0
# CCS features after feature filtering	10	10
.slx size after feature filtering	319 MB	100 MB
.slx size after “optimize file size”	98 MB	100 MB

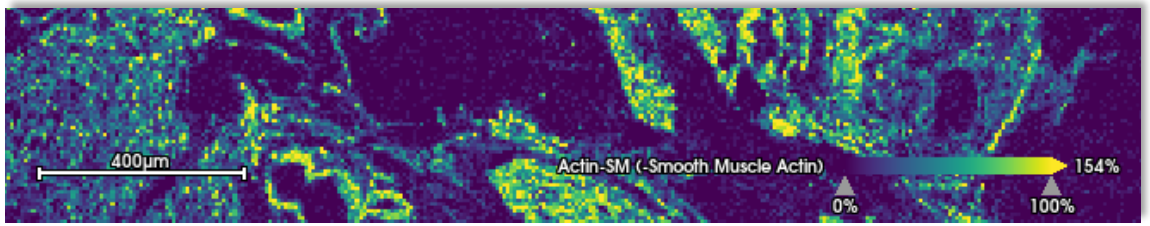
Multiple feature enhancements: **Improved Stack View readability**

- To enhance the readability of the ion information, scale bar, color bar and error messages in Stack View, a thin text outline has been introduced

- The color and outline are dependent on the Background Color setting that can be adjusted via ***File > SCiLS Lab settings***



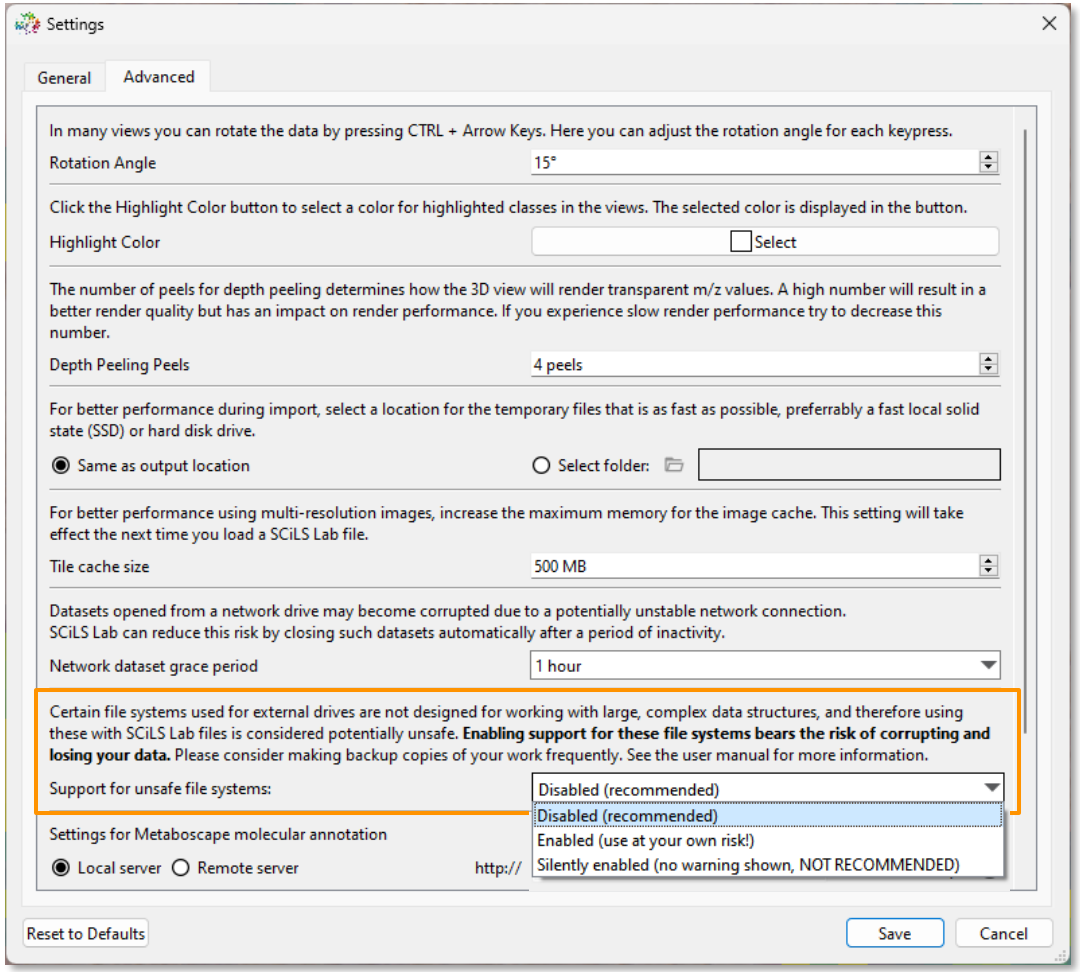
Background Color: White



Background Color: Black/Gradient

Multiple feature enhancements: **Prevent loading data from unsafe file systems**

- After several customer cases involving irreparable .slx file corruption on external drives, the use of certain file systems (incl. exFAT) has been deemed unsafe
- Opening SCiLS™ Lab files from unsafe file systems, or storing new SCiLS Lab files on unsafe file systems using the Importer is therefore disabled by default
- Through ***File > Settings*** users can enable reading and writing to unsafe file systems, at the risk of causing irreparable damage to their data



Multiple feature enhancements: **Prevent loading data from unsafe file systems using the API**

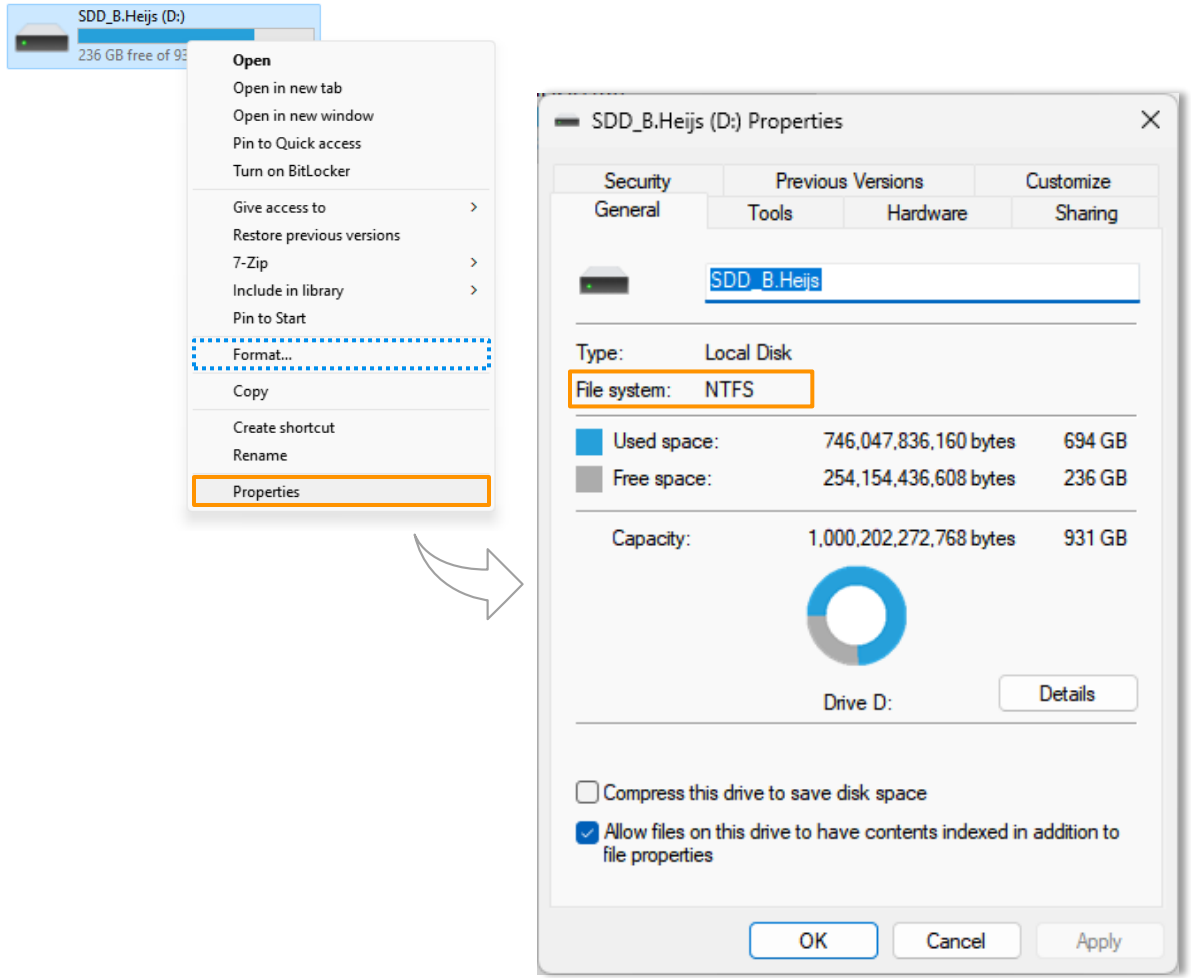
- Similar to SCiLS™ Lab, the SCiLS API, by default, can no longer access files that are stored on unsafe file systems.

- Although not recommended, users can override this restriction when creating a new API session.
  - R client:
    - **SCiLSLabOpenLocalSession()**
      - Set "**overrideFilesystemCheck**" to **TRUE**
  - Python client:
    - **LocalSession()**
      - Set "**override_filesystem_check**" to **TRUE**

Multiple feature enhancements: **Prevent loading data from unsafe file systems**

- To check the current file system of a storage device, ***This computer > right-click drive > Properties***

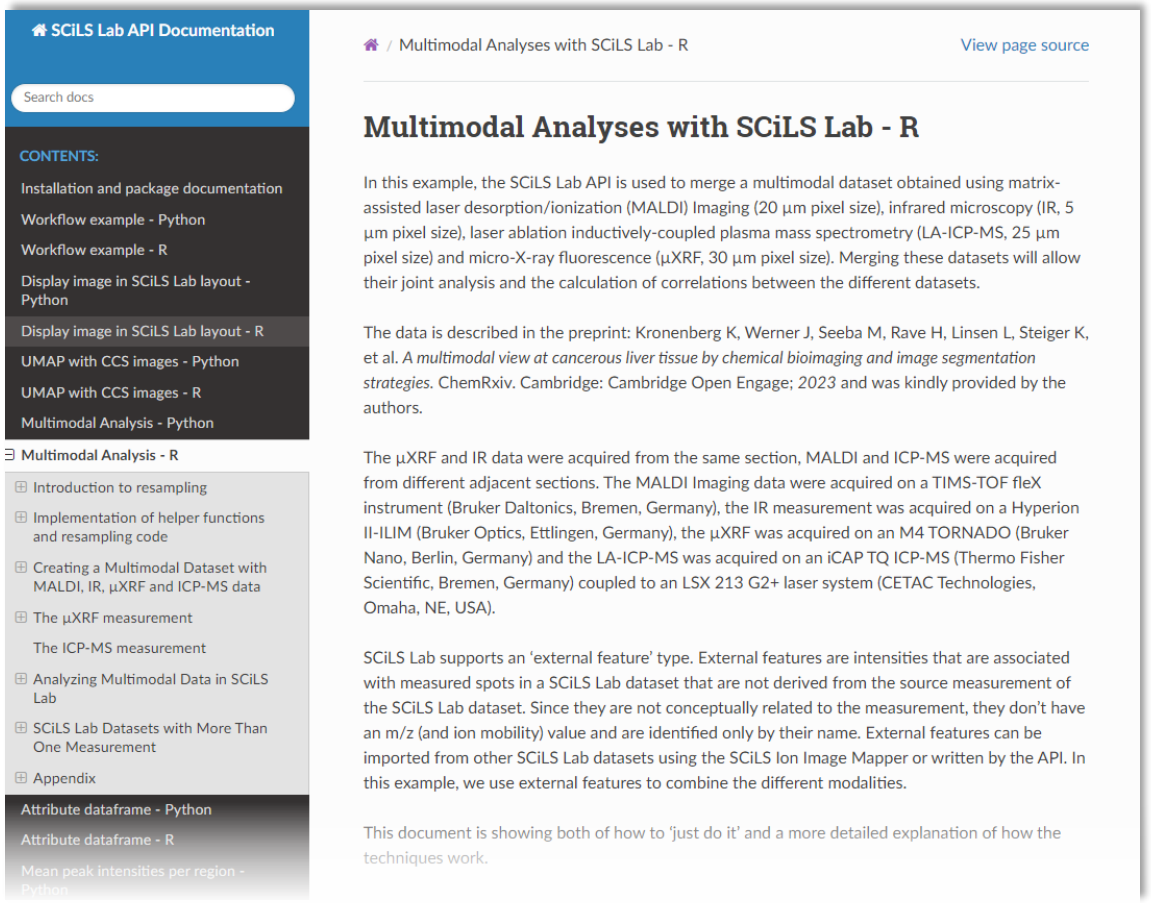
- To change an unsafe file system, select "**Format…**" and choose a file system considered safe
  - *For example, NTFS*
  - ***NOTE:*** *Formatting a drive erases all its content. Create a backup before taking this action!*



05
SCiLS API improvements

Multiple feature enhancements: **Multi-modal imaging integration using the SCiLS™ API**

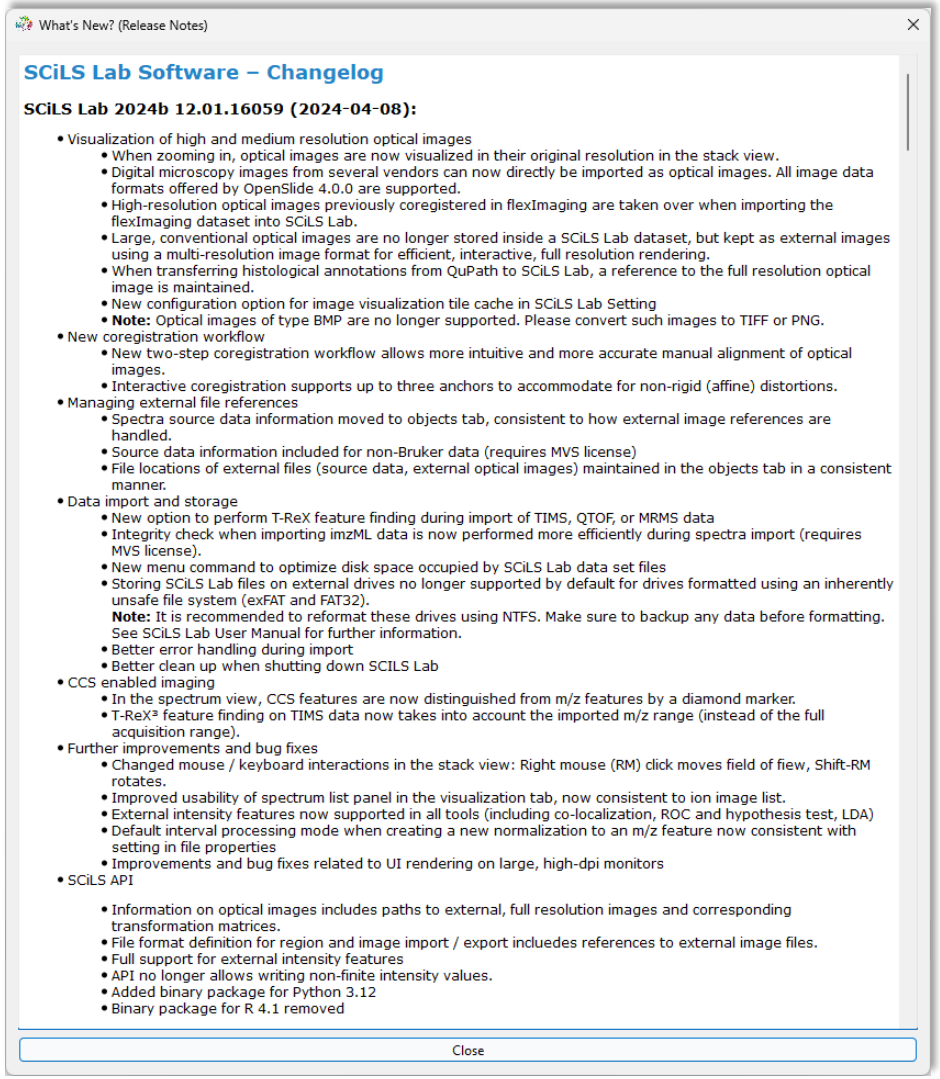
- The introduction of External Features in SCiLS 2024a creates new possibilities for the analysis of multi-modal imaging data in SCiLS Lab
- From SCiLS 2024b onwards, the SCiLS API can write External Features into a data set, which allows users to write any image into a data set
- For joint analysis, images should be co-registered and re-sampled to the SCiLS Lab coordinate system
- **Example scripts for R and Python**, as well as detailed explanations on re-sampling strategies are provided in the SCiLS API documentation

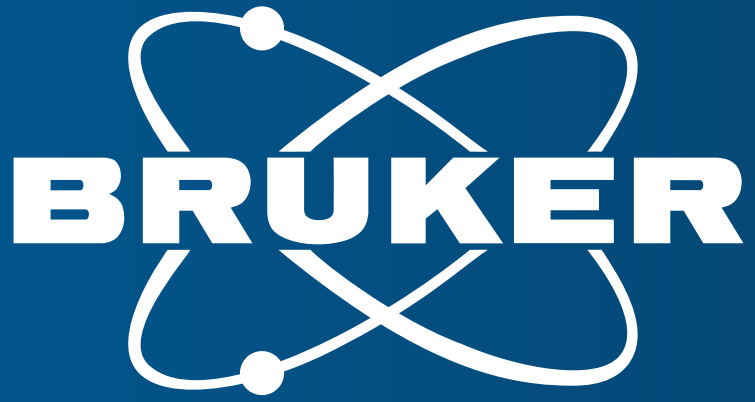


SCiLS™ Lab 2024b Changelog

Open changelog in SCiLS Lab:

- ***Help > What's New***, or
- ***Ctrl + B***





Innovation with Integrity