How to use TeraStitcher and NeuronStitcher

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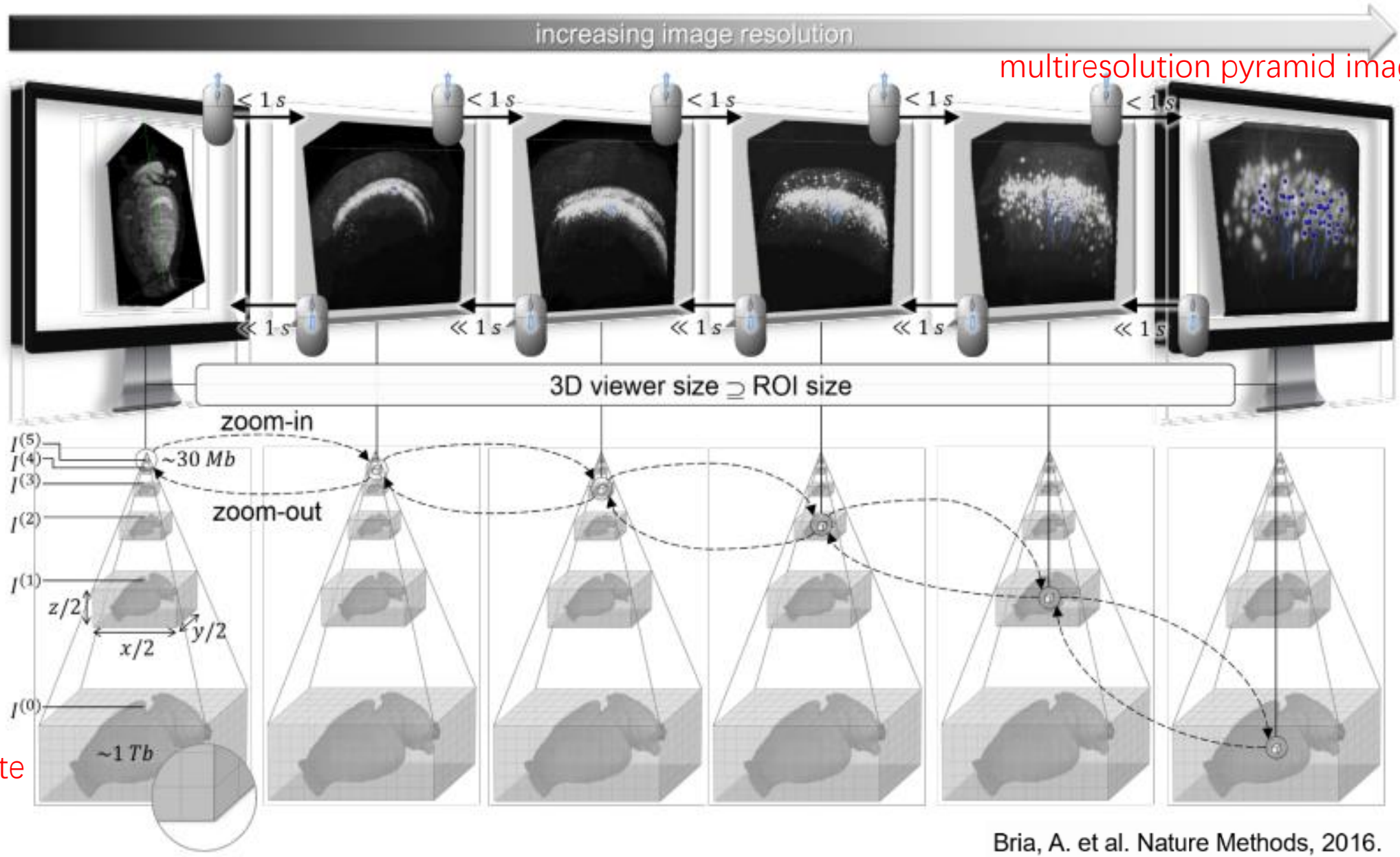
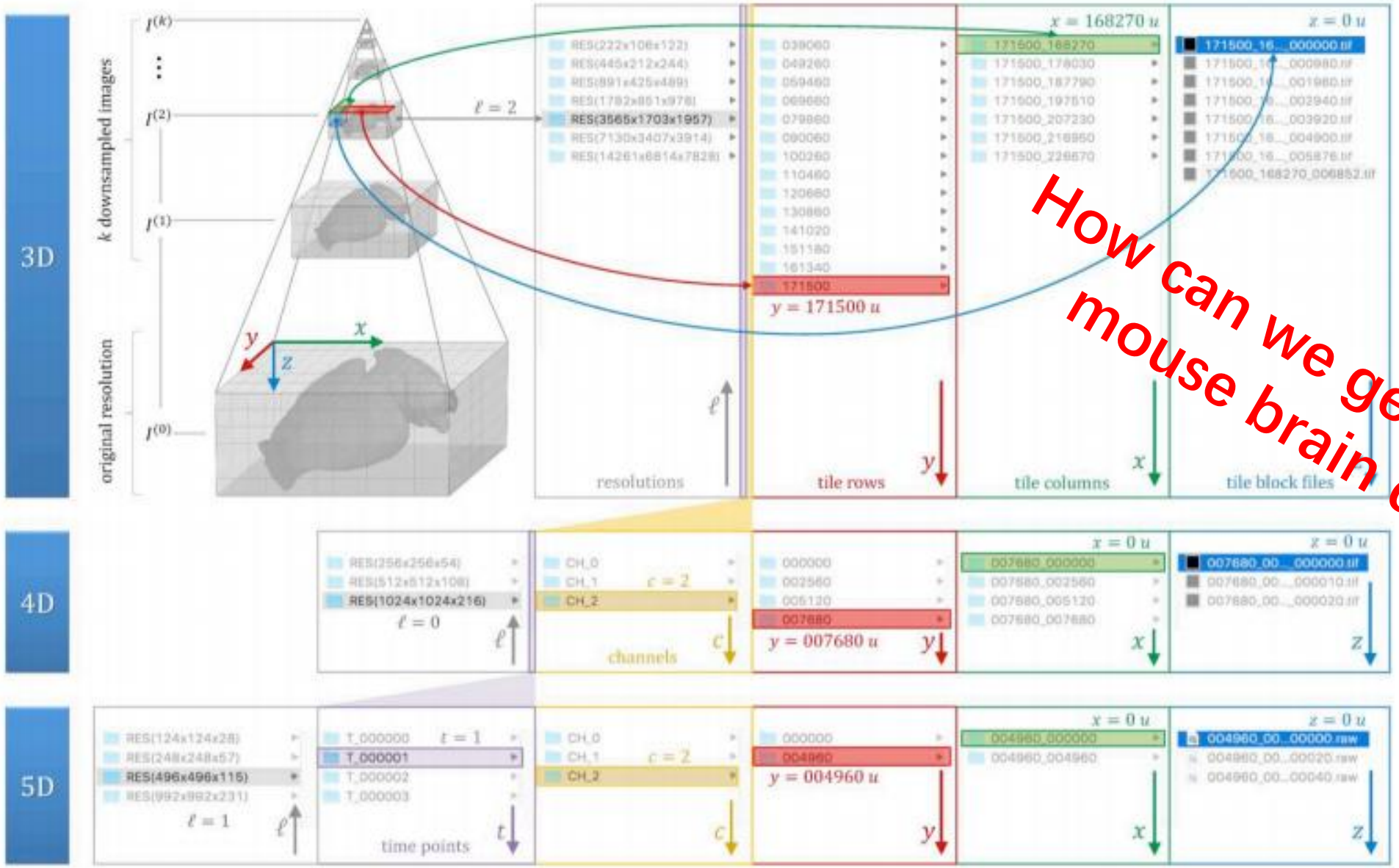
Vaa3D-TeraFly: Architecture



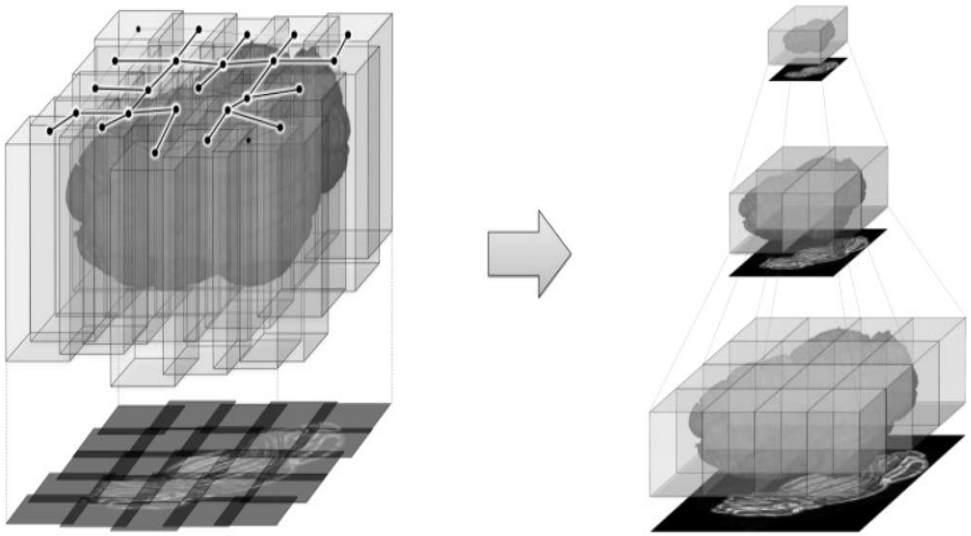
1 terabyte

Bria, A. et al. Nature Methods, 2016.

Vaa3D-TeraFly : Schema of 3D - 5D Formats

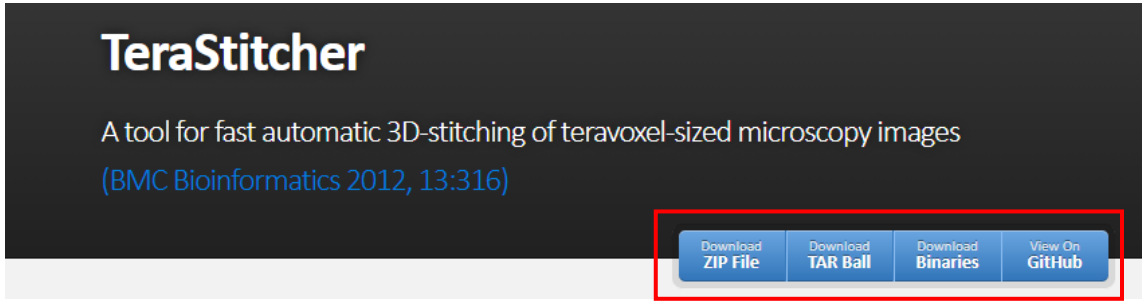


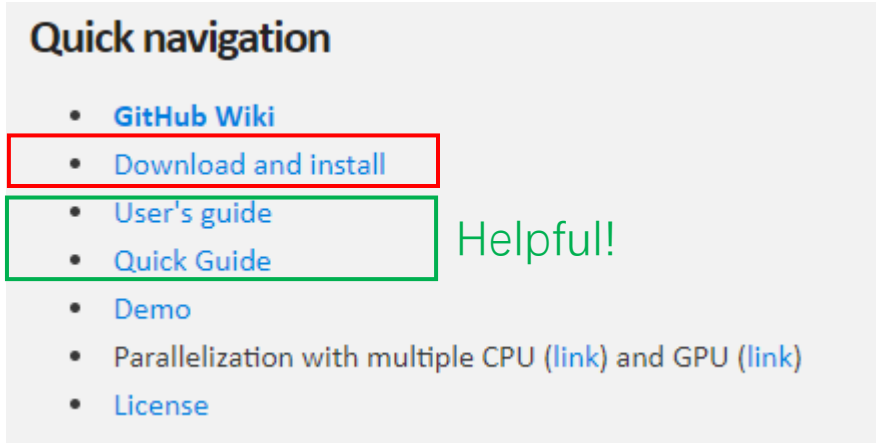
TeraStitcher: Introduction



Bria A, Iannello G (2012) TeraStitcher—a tool for fast automatic 3D-stitching of teravoxel-sized microscopy images. BMC Bioinform 13:316

https://abria.github.io/TeraStitcher/



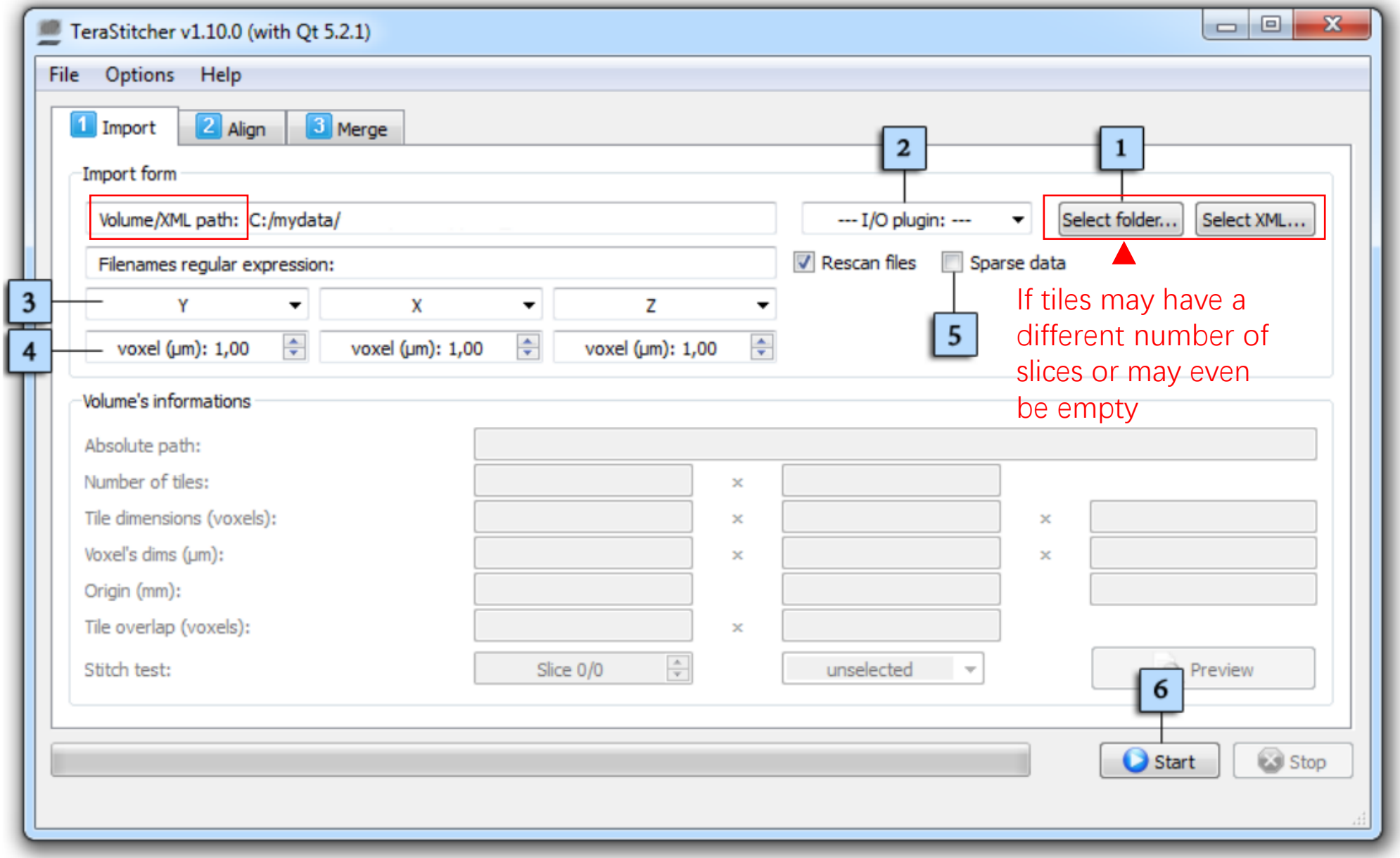


TeraStitcher is a powerful software tool designed to **stitch** very large datasets corresponding to 3D volumes acquired with a wide range of acquisition systems.

Step 1: Import the RUI

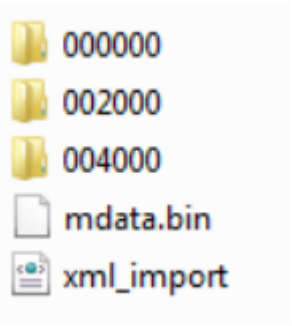
RUI: the Raw Unstitched Image

1.1 Direct import of RUI

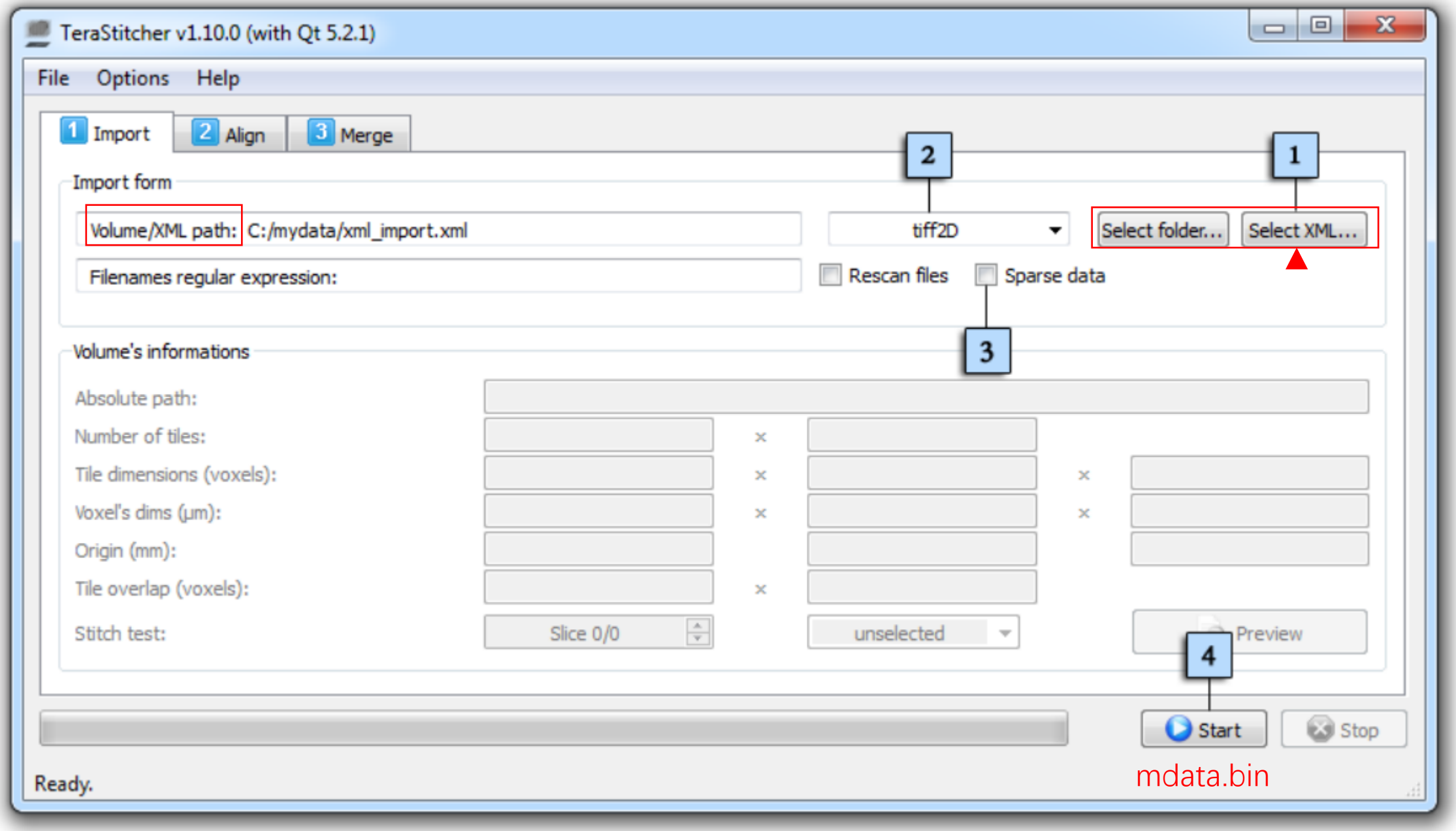


If tiles may have a different number of slices or may even be empty

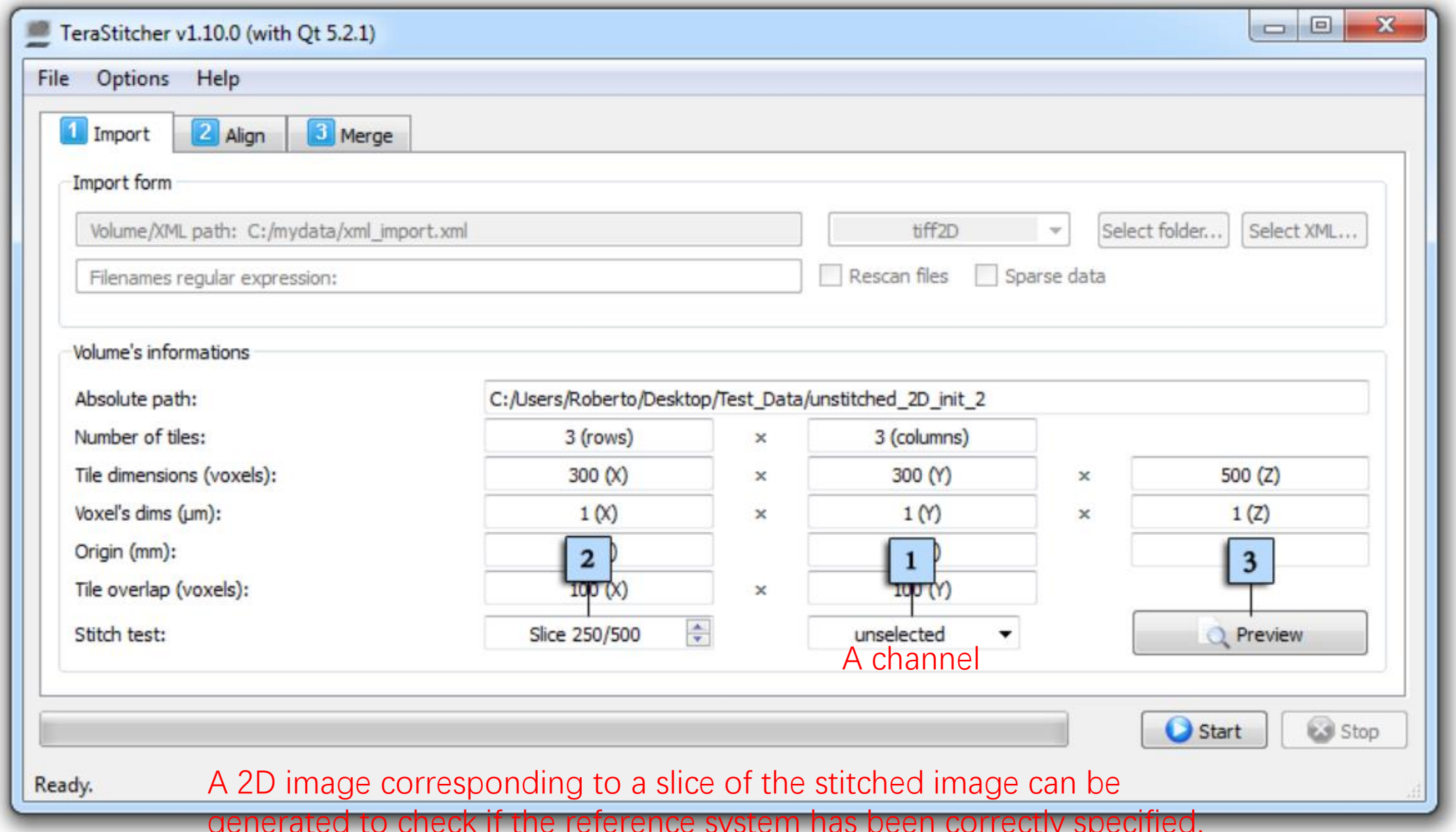
An xml file must be generated that is compliant with what TeraStitcher expects.



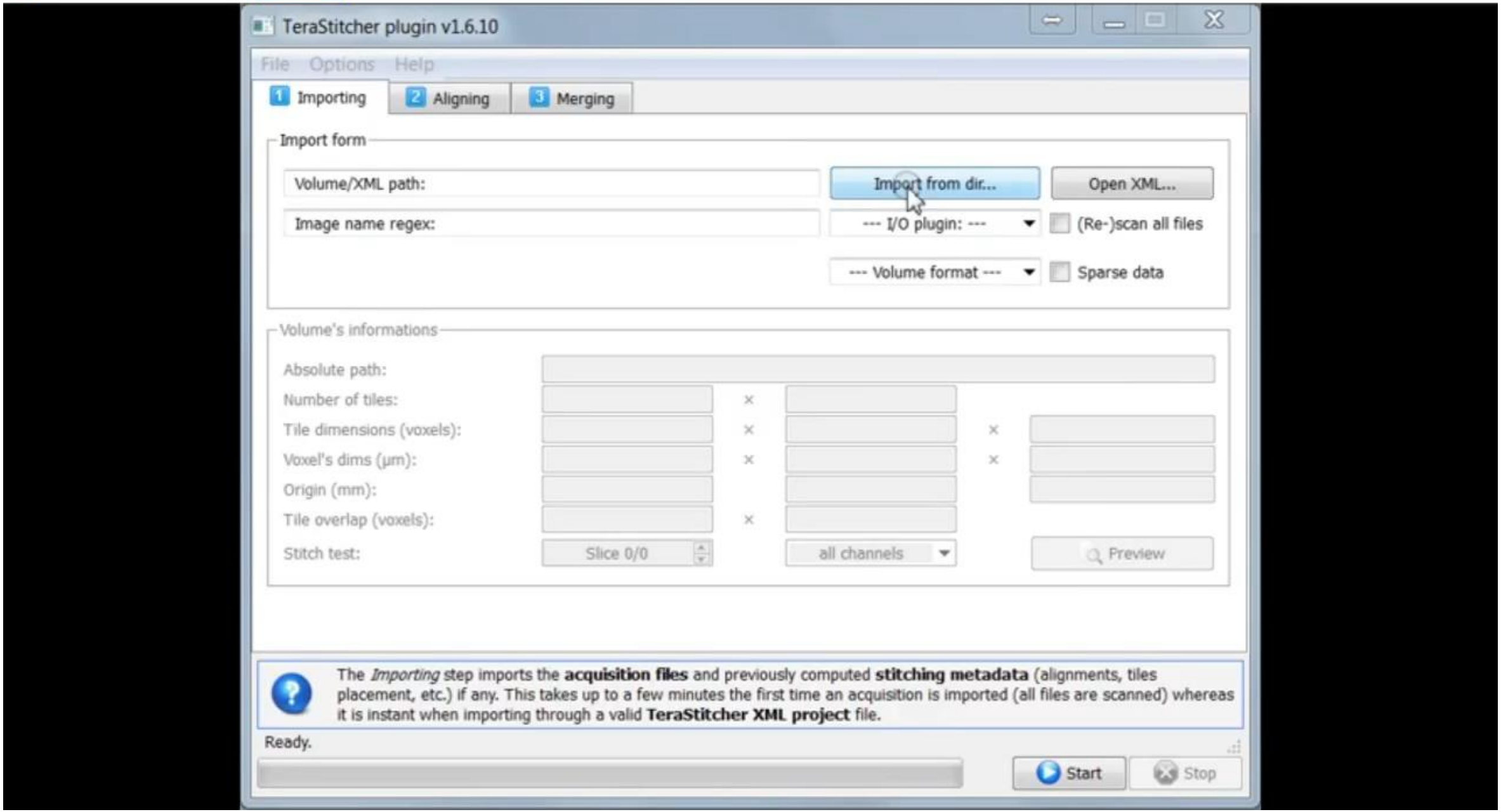
1.2 Import using an externally generated xml import file



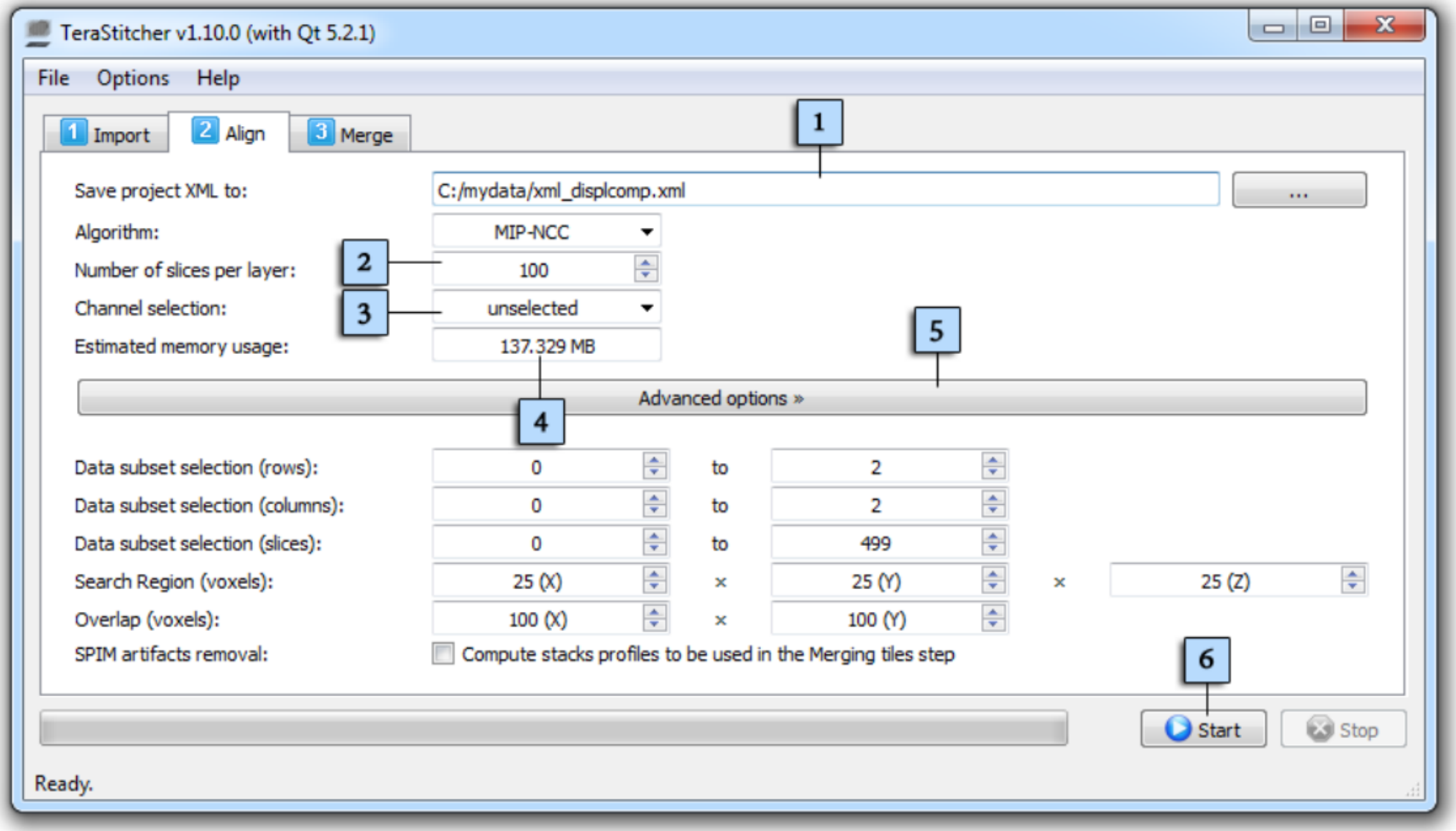
1.3 Generation of a preview image

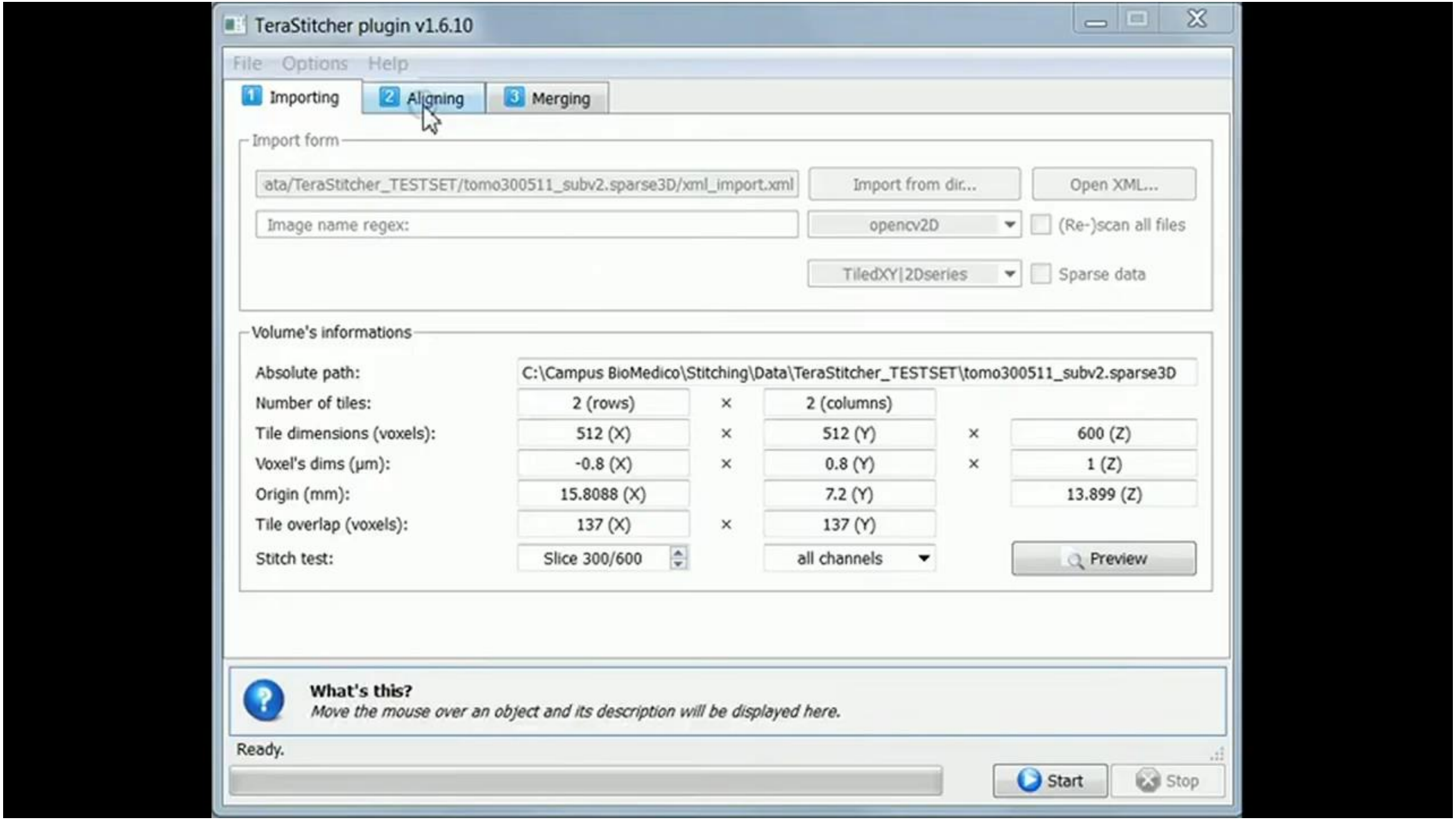


A 2D image corresponding to a slice of the stitched image can be generated to check if the reference system has been correctly specified.

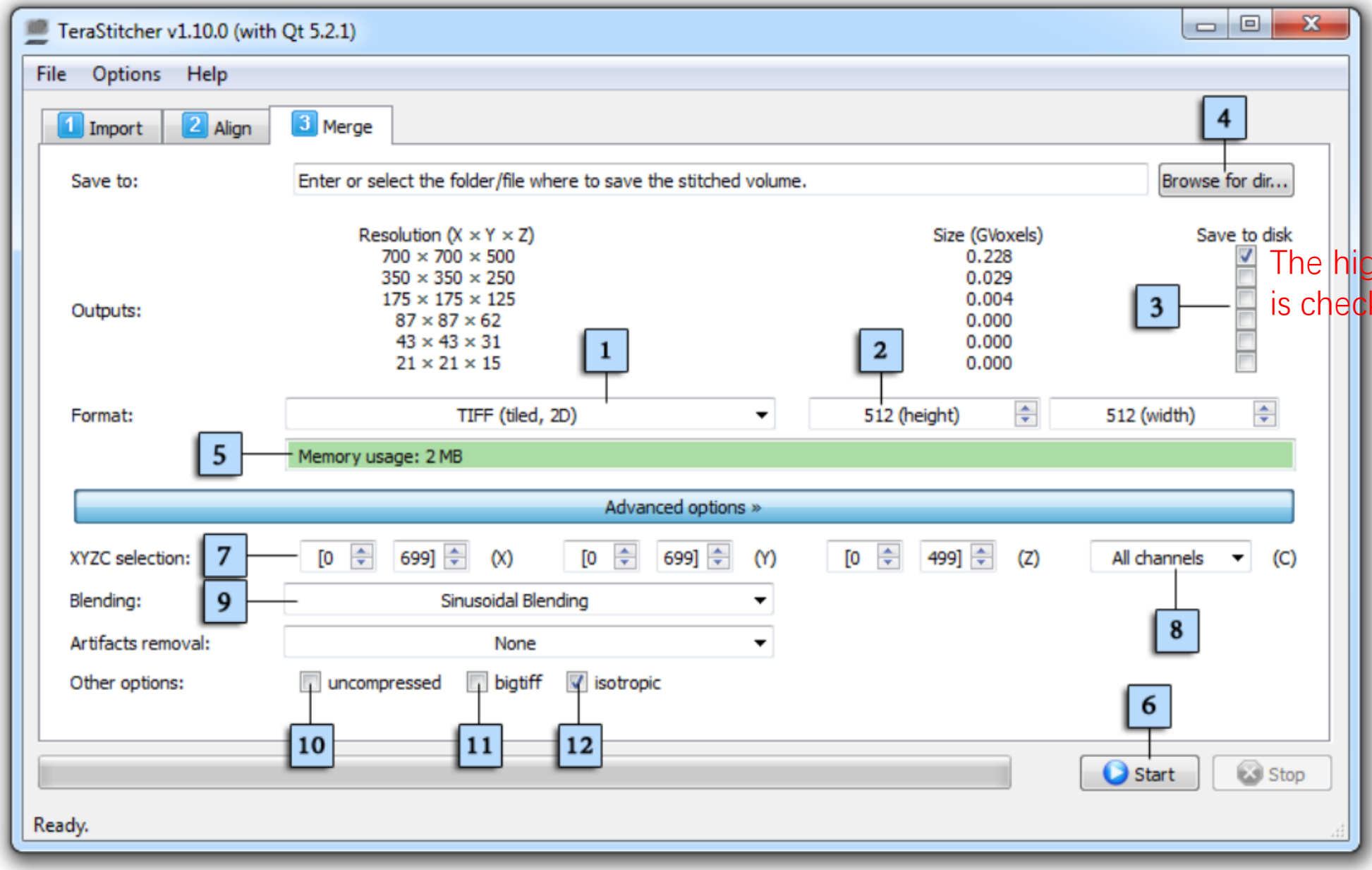

Google Chrome isn't your default browser
Set as default
TeraStitcher plugin v1.6.10
File
Options
Help
1 Importing
2 Aligning
3 Merging
Import form
Volume/XML path:
Import from dir...
Open XML...
Image name regex:
--- I/O plugin: ---
(Re-)scan all files
--- Volume format ---
Sparse data
Volume's informations
Absolute path:
Number of tiles:
Tile dimensions (voxels):
Voxel's dims (µm):
Origin (mm):
Tile overlap (voxels):
Stitch test:
Slice 0/0
all channels
Preview
The Importing step imports the acquisition files and previously computed stitching metadata (alignments, tiles placement, etc.) if any. This takes up to a few minutes the first time an acquisition is imported (all files are scanned) whereas it is instant when importing through a valid TeraStitcher XML project file.
Ready.
Start
Stop

Step 2: Compute the corrected alignments

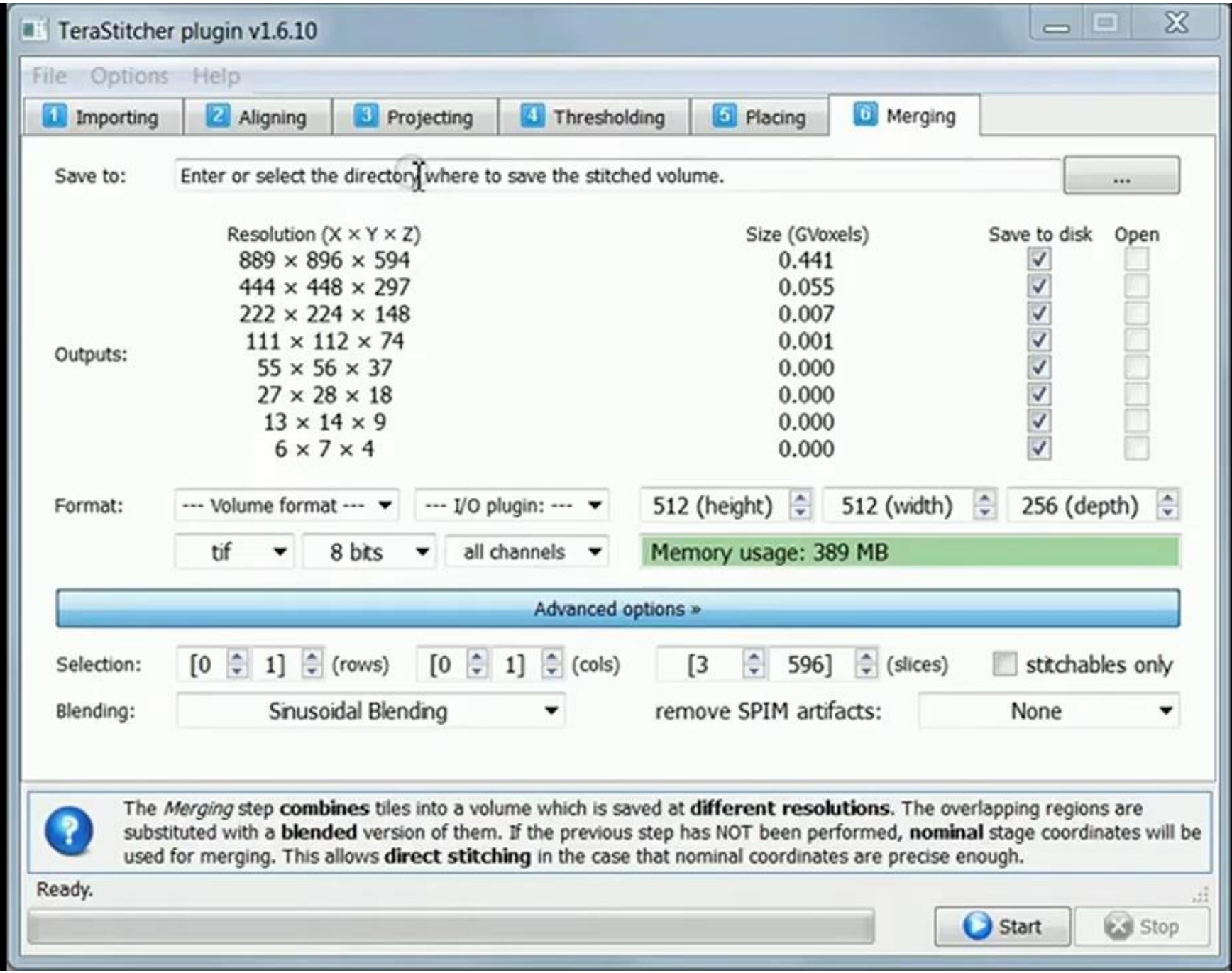


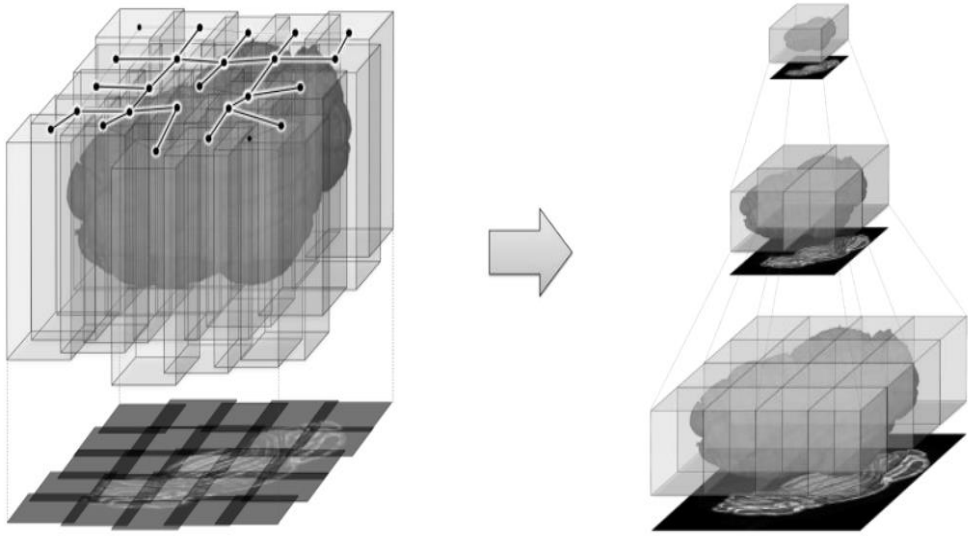

TeraStitcher plugin v1.6.10
File Options Help
1 Importing
2 Aligning
3 Merging
Import form
ata/TeraStitcher_TESTSET/tomo300511_subv2.sparse3D/xml_import.xml
Import from dir...
Open XML...
Image name regex:
opencv2D
(Re-)scan all files
TiledXY|2Dseries
Sparse data
Volume's informations
Absolute path:
C:\Campus BioMedico\Stitching\Data\TeraStitcher_TESTSET\tomo300511_subv2.sparse3D
Number of tiles:
2 (rows)
×
2 (columns)
Tile dimensions (voxels):
512 (X)
×
512 (Y)
×
600 (Z)
Voxel's dims (µm):
-0.8 (X)
×
0.8 (Y)
×
1 (Z)
Origin (mm):
15.8088 (X)
7.2 (Y)
13.899 (Z)
Tile overlap (voxels):
137 (X)
×
137 (Y)
Stitch test:
Slice 300/600
all channels
Preview
What's this?
Move the mouse over an object and its description will be displayed here.
Ready.
Start
Stop

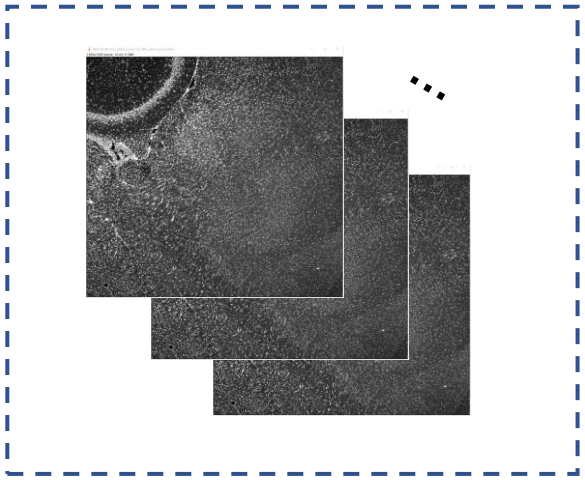
Step 3: Generate a stitched image



The highest resolution is checked by default.


TeraStitcher plugin v1.6.10
File Options Help
1 Importing
2 Aligning
3 Projecting
4 Thresholding
5 Placing
6 Merging
Save to:
Enter or select the directory where to save the stitched volume.
...
Outputs:
Resolution (X × Y × Z)
Size (GVoxels)
Save to disk
Open
889 × 896 × 594 0.441
444 × 448 × 297 0.055
222 × 224 × 148 0.007
111 × 112 × 74 0.001
55 × 56 × 37 0.000
27 × 28 × 18 0.000
13 × 14 × 9 0.000
6 × 7 × 4 0.000
Format:
--- Volume format ---
--- I/O plugin: ---
512 (height)
512 (width)
256 (depth)
tif
8 bits
all channels
Memory usage: 389 MB
Advanced options »
Selection:
[0 1] (rows)
[0 1] (cols)
[3 596] (slices)
stitchables only
Blending:
Sinusoidal Blending
remove SPIM artifacts:
None
The Merging step combines tiles into a volume which is saved at different resolutions. The overlapping regions are substituted with a blended version of them. If the previous step has NOT been performed, nominal stage coordinates will be used for merging. This allows direct stitching in the case that nominal coordinates are precise enough.
Ready.
Start
Stop





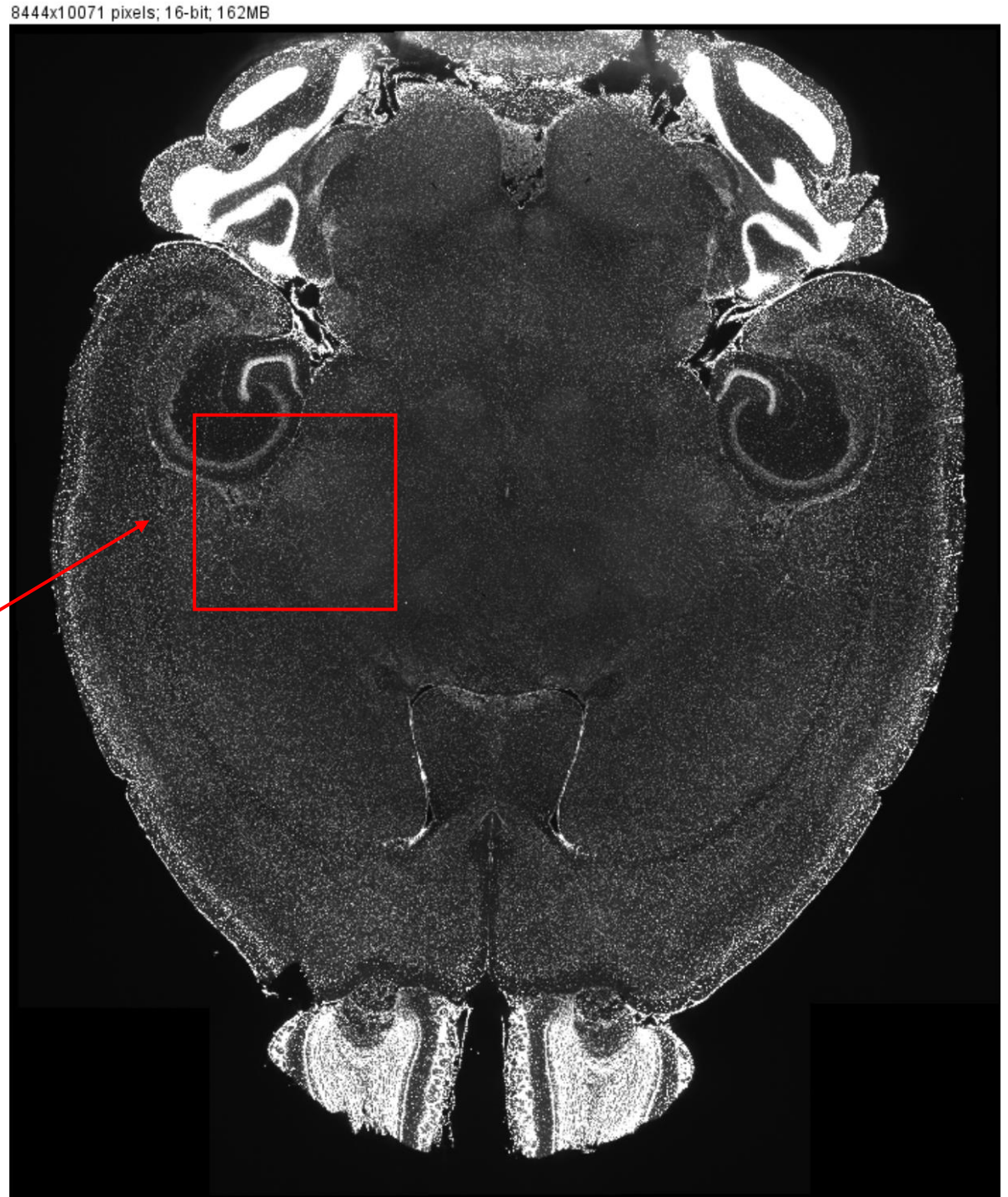
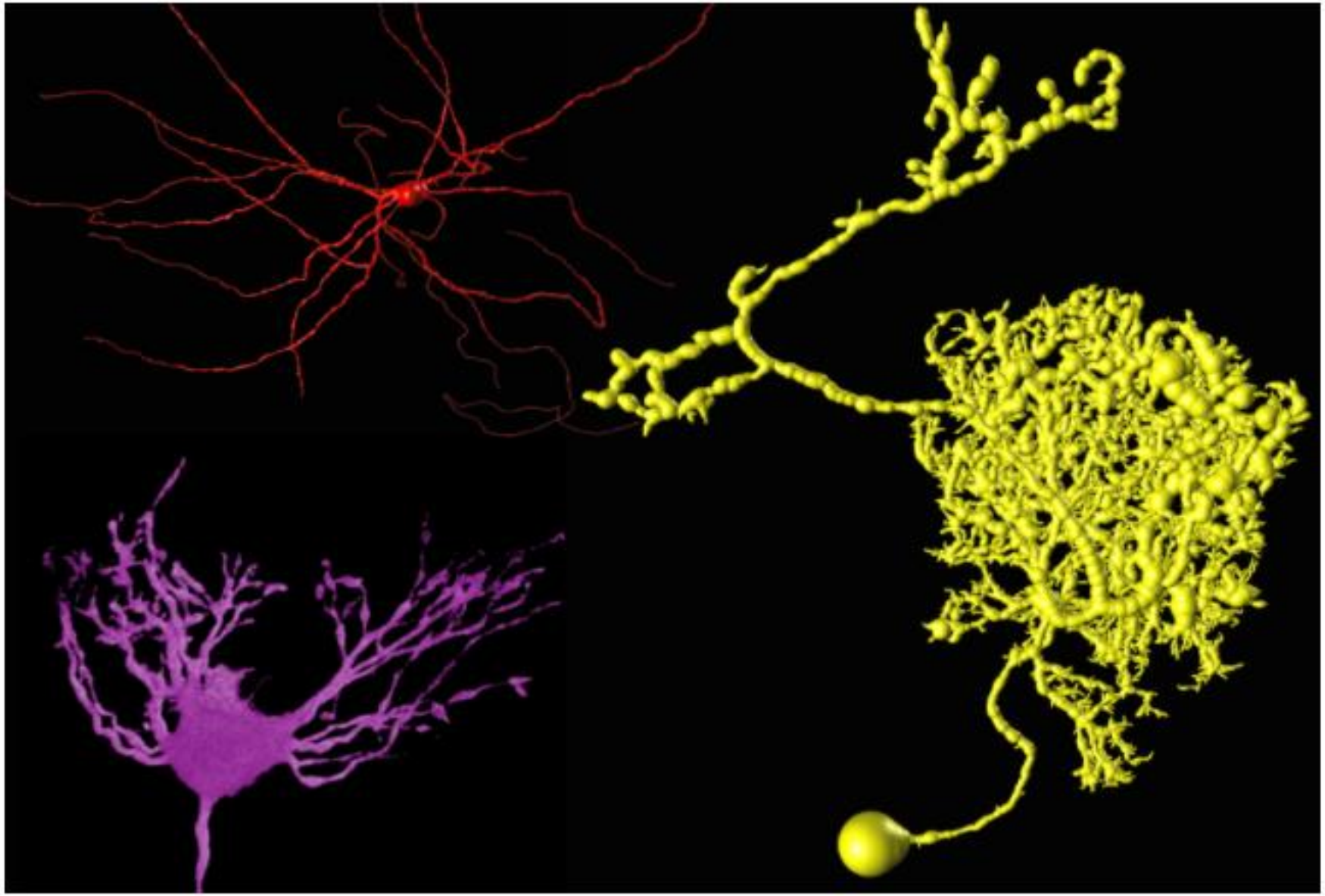


Image stacks are a set of overlapping tiles logically arranged according to a 2D regular matrix along X-Y dimensions.

NeuronStitcher

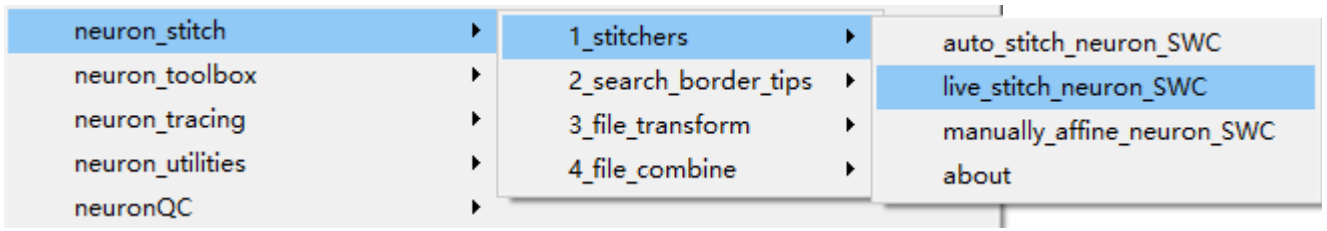


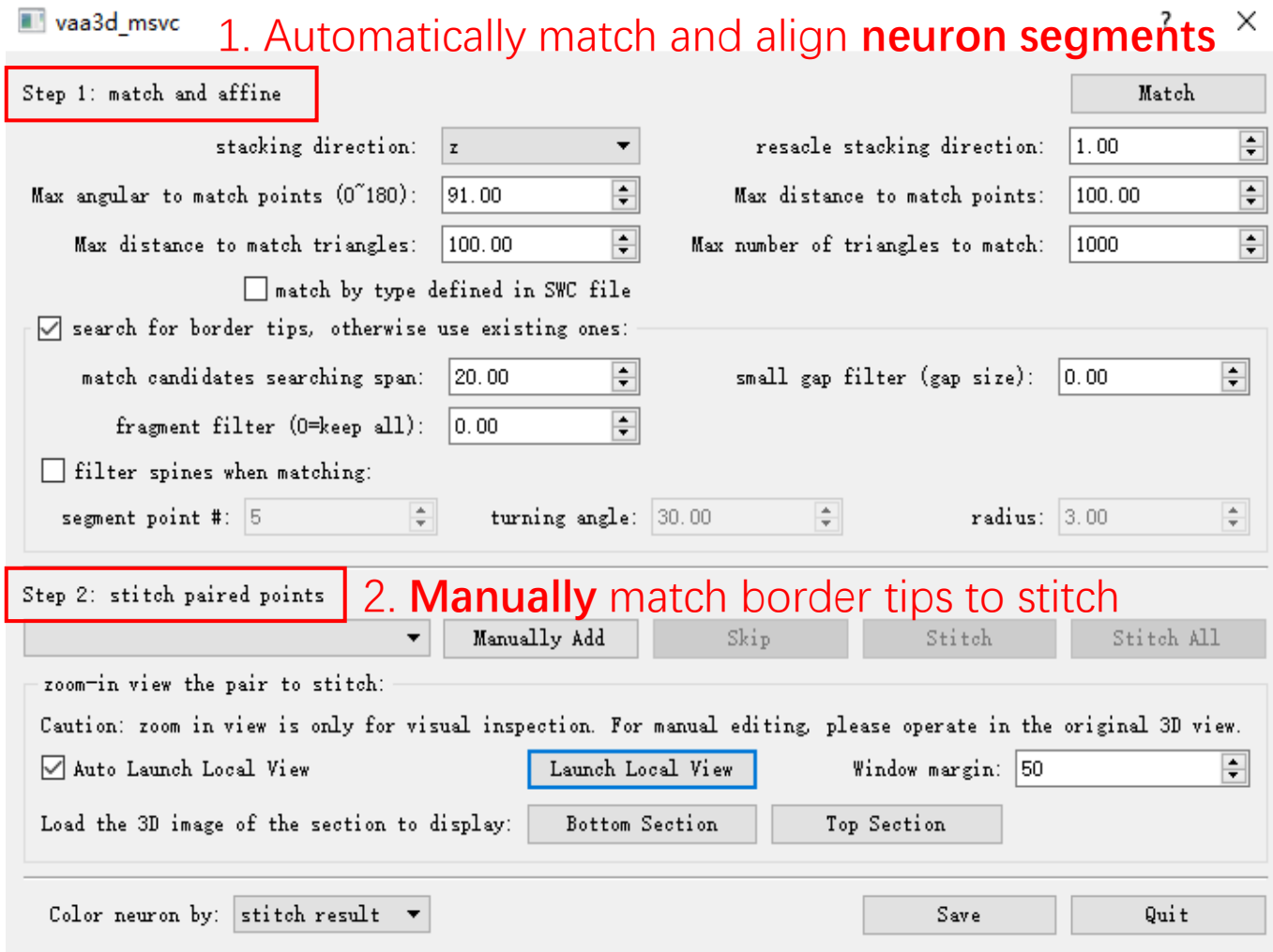
Big picture:
NeuronStitcher can reconstruct entire neurons from multiple sections of brain tissue.

The framework matches separated dendritic or axonal **branches**

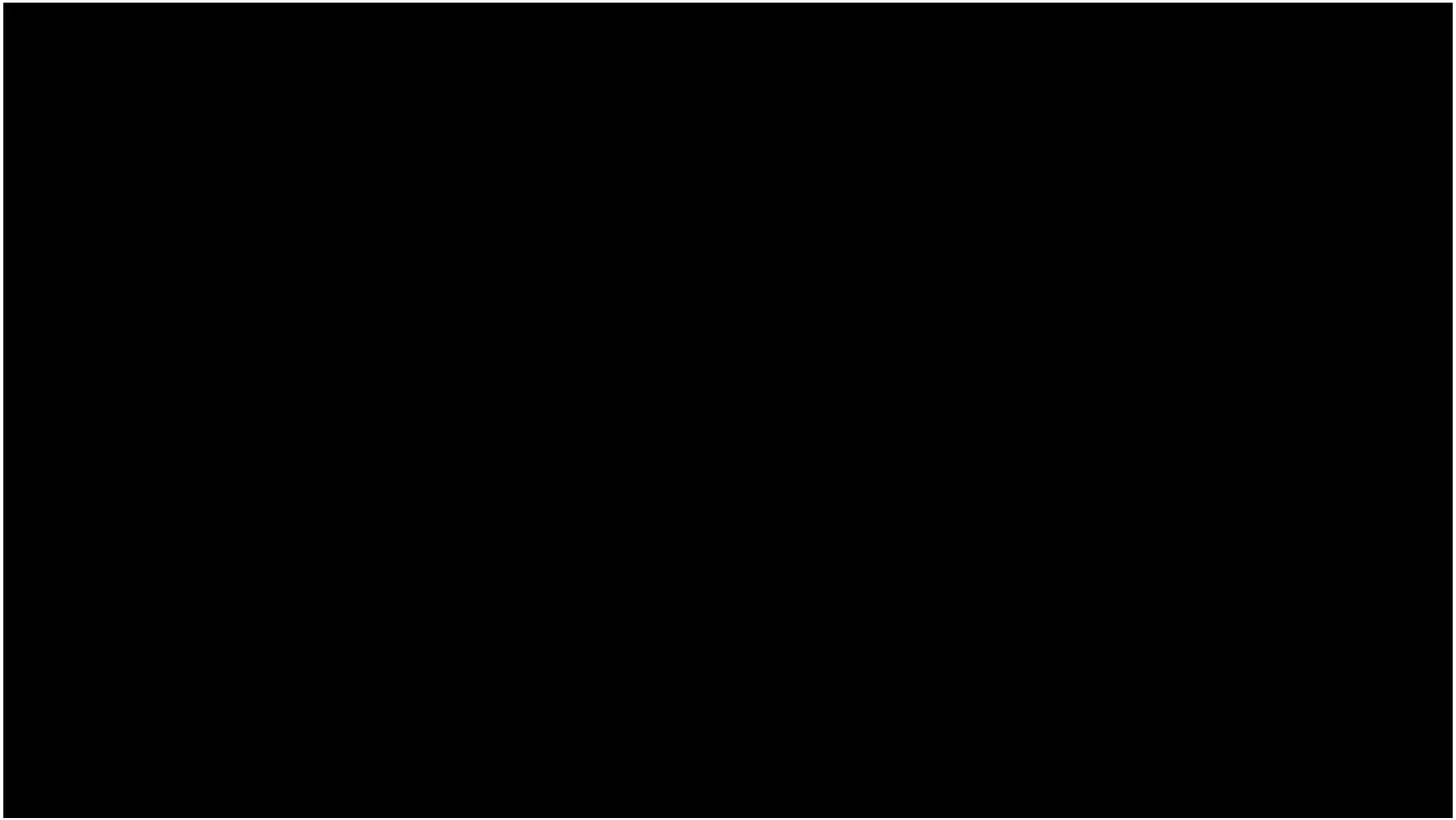
H. Chen, D. M. Iascone, N. M. da Costa, E. S. Lein, T. Liu, and H. Peng, "Fast Assembling of Neuron Fragments in Serial 3D Sections," *Nat. Methods*.

live_stitch_neuron_SWC **Interface:**

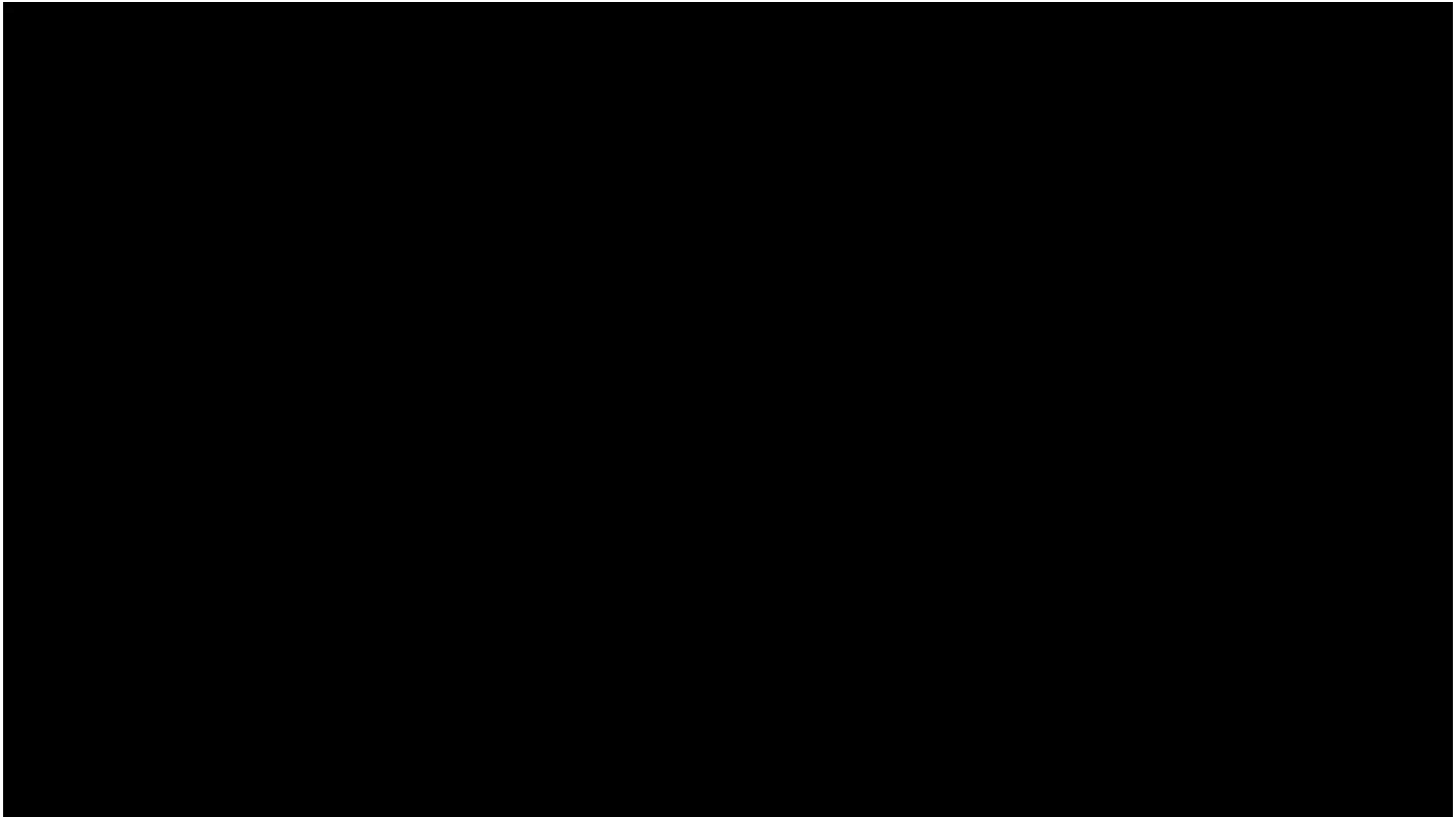


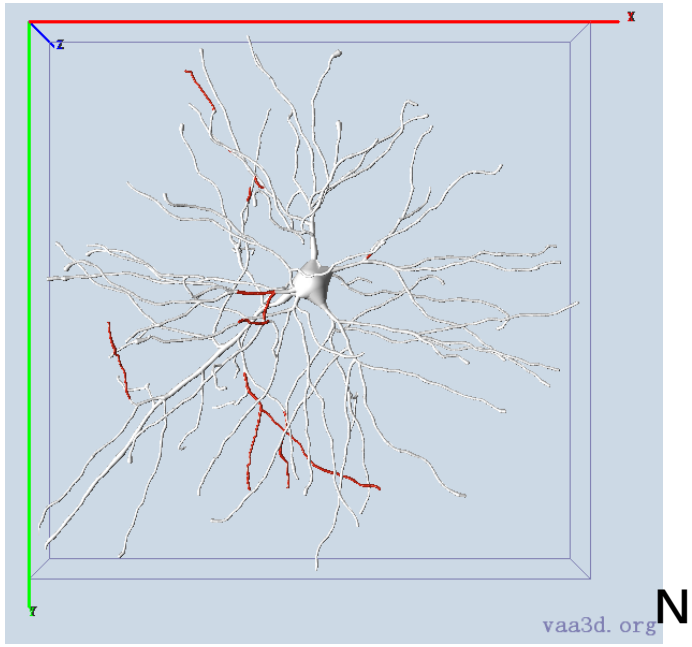


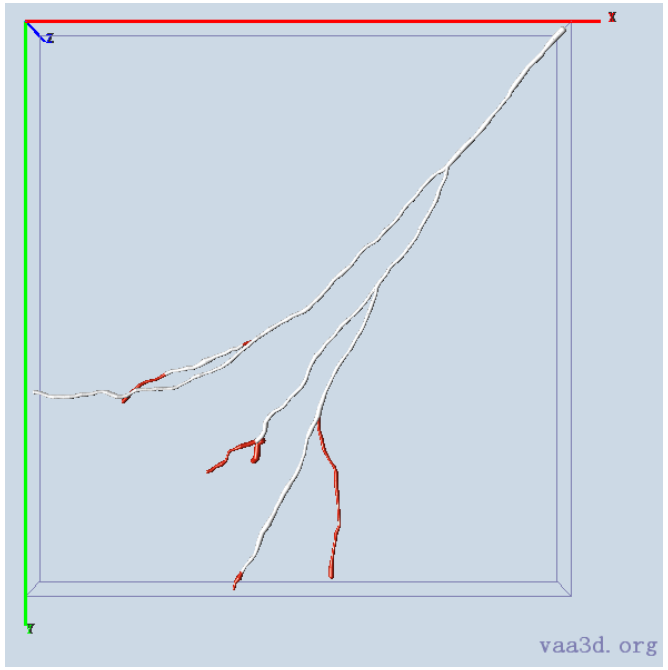
Demo video 1: step 1: **Automatic Match and Align**



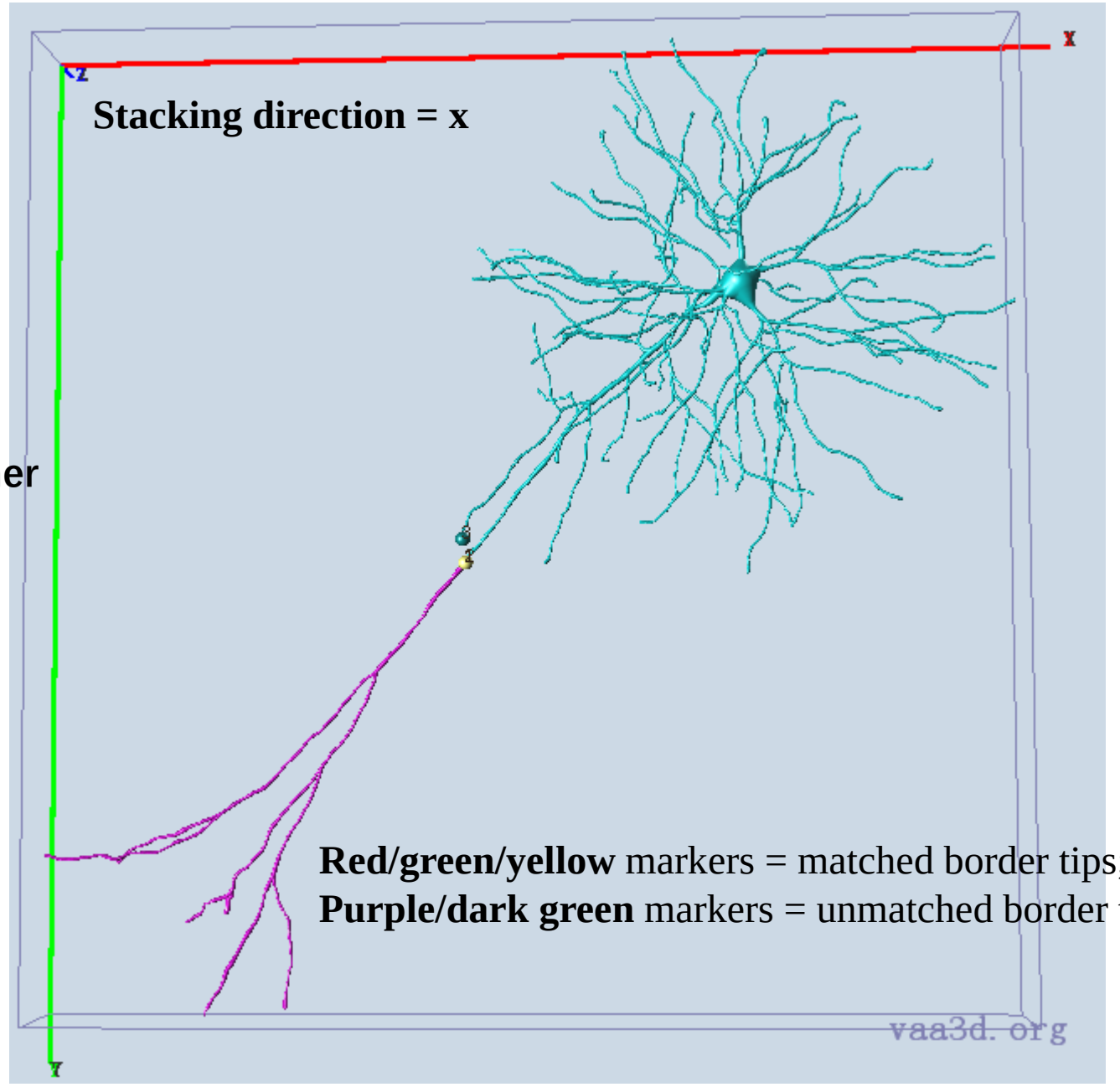
Demo video 2: step 2: **Manually Correct Matching Result**







NeuronStitcher



Thank you!