SOFTWARE

Educational Training Guide

NMI ParaVision 360 + PMOD Workflow Basics

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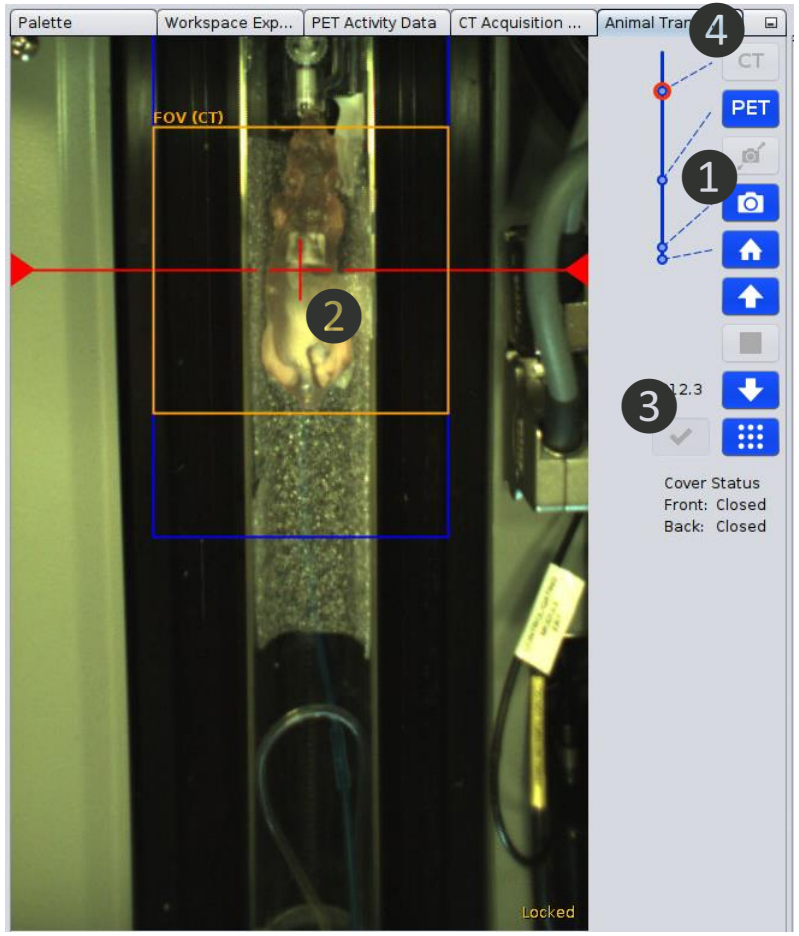
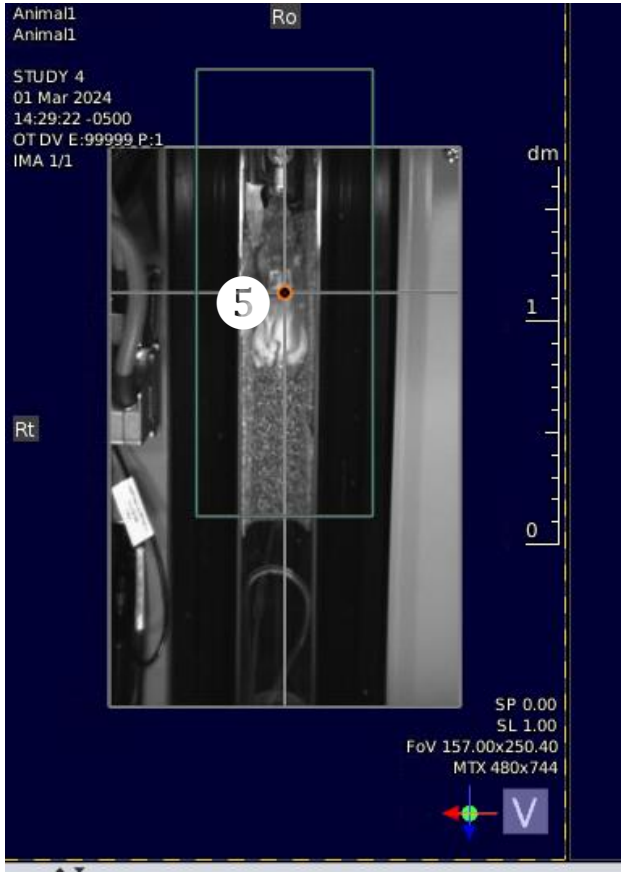
PET/CT & PET/MR: Animal Transport System Workflow

PET/MR & PET/CT
Animal Transport System (ATS)* Workflows





1. **Camera.** After placing the animal in the cradle set the ATS to camera.
2. **Position.** Move the crosshair to the center of your target object, noting the boundaries of the FOV(s) displayed.
3. **Set** the position for transport. **Tip: Set the position for each subject and study.**
4. **Select the Modality.** Select the modality button to drive the transport to PET, CT or MR.
5. **ATS Reference** box may be adjusted to move transport during study.

**For systems equipped with the ATS only.*

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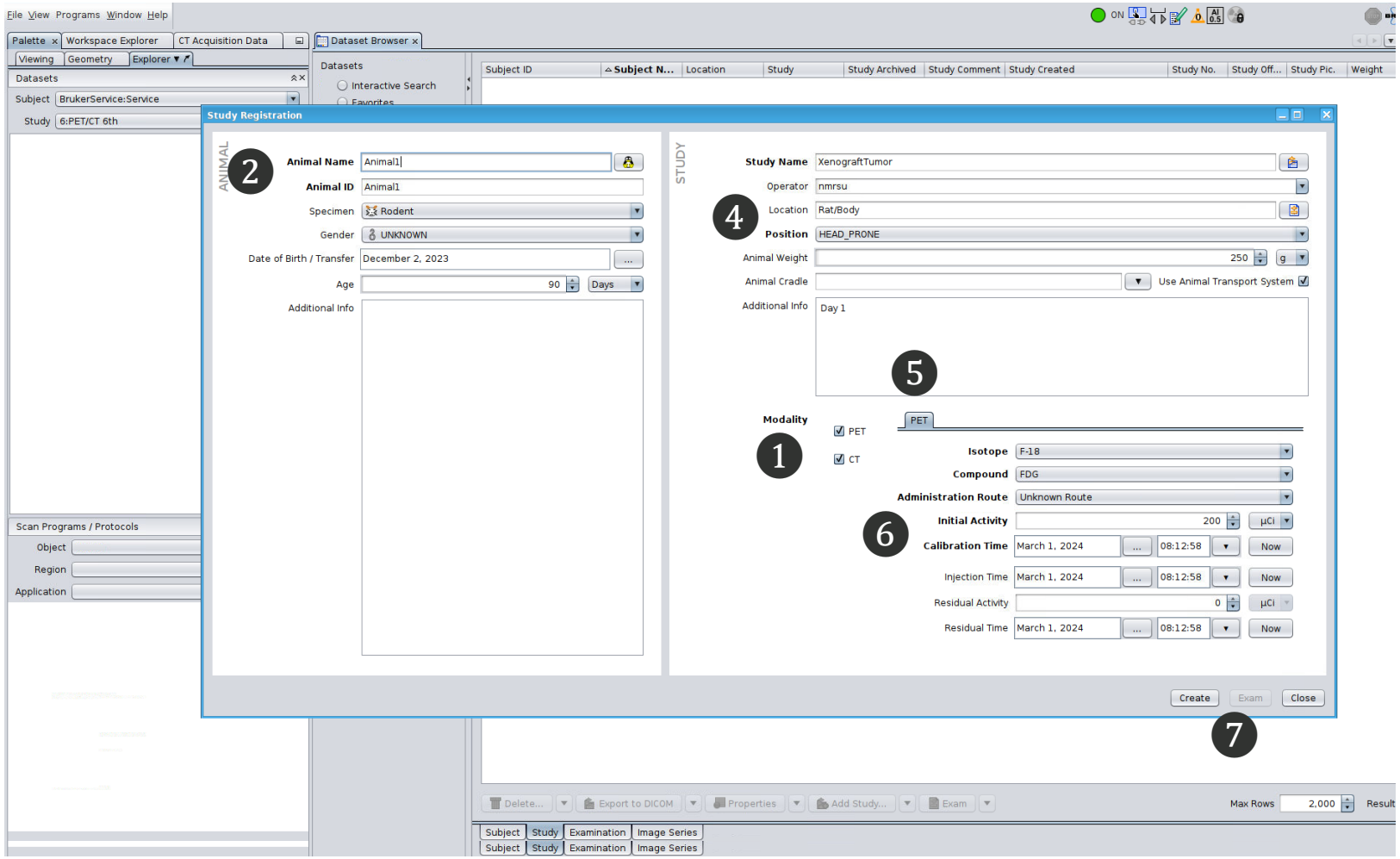
PET/CT & PET/MR: ParaVision 360 Study Workflows

PET/CT & PET/MR: ParaVision 360 Study Workflows
Key Menus

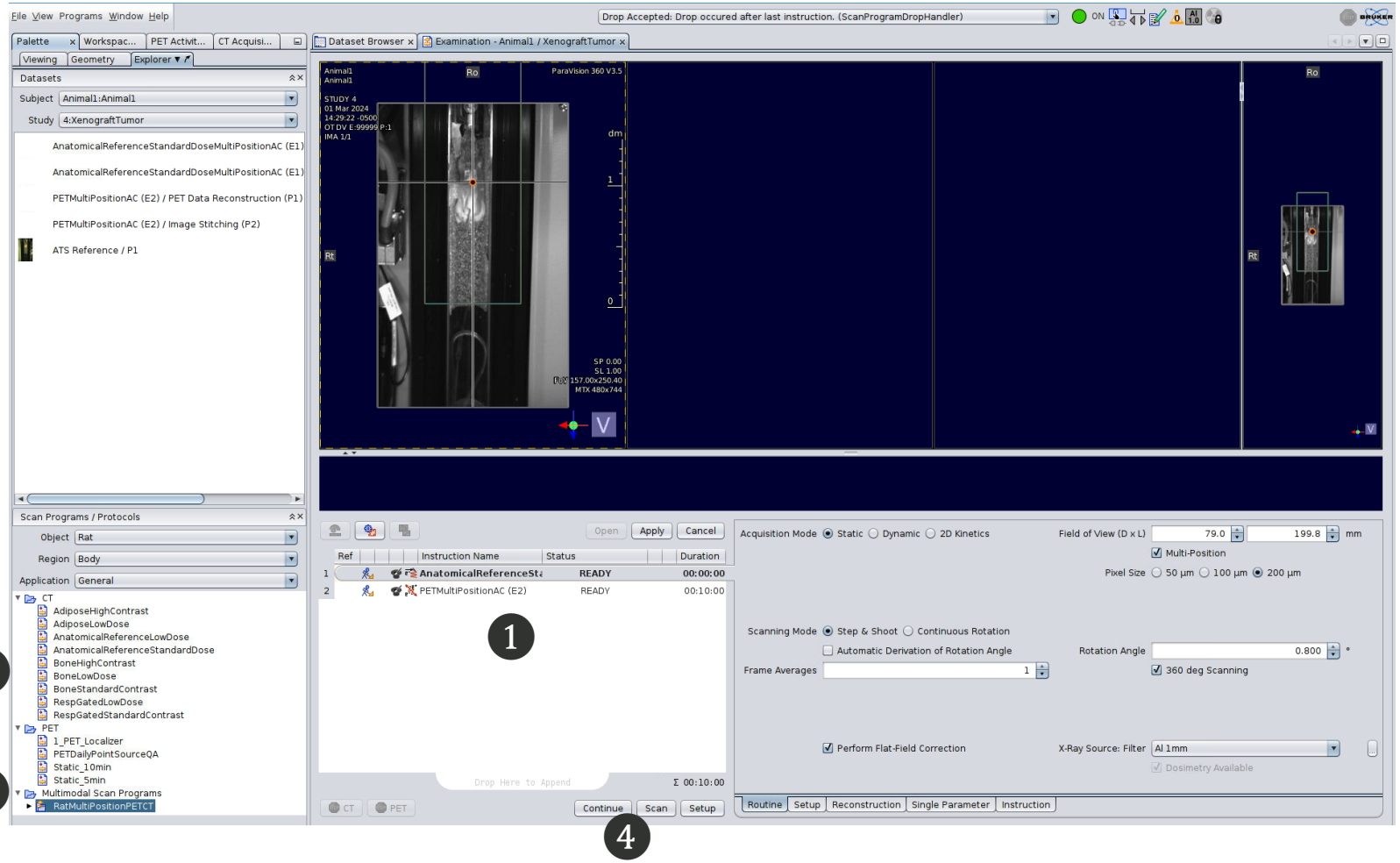
1. **Study Registration.** The process for entering study registration details (intended for a single animal at a single time point).
2. **Protocols & Multimodal Scan Programs.** Multimodal Scan Programs are predefined (or customized) PET + CT (or MR) scans programs with predefined scan protocol order, processing (stitching, attenuation correction, etc.).
3. **Palette.** Most centralized location for Scan Programs, Image Fusion, and Dataset Filtering. **Tip: Return to Palette for access to functions in central location.**
4. **Dataset Browser.** Location for accessing/searching data with search menus, DICOM export, and other study management tools.

PET/CT & PET/MR: ParaVision 360 Study Workflows
1. Study Registration



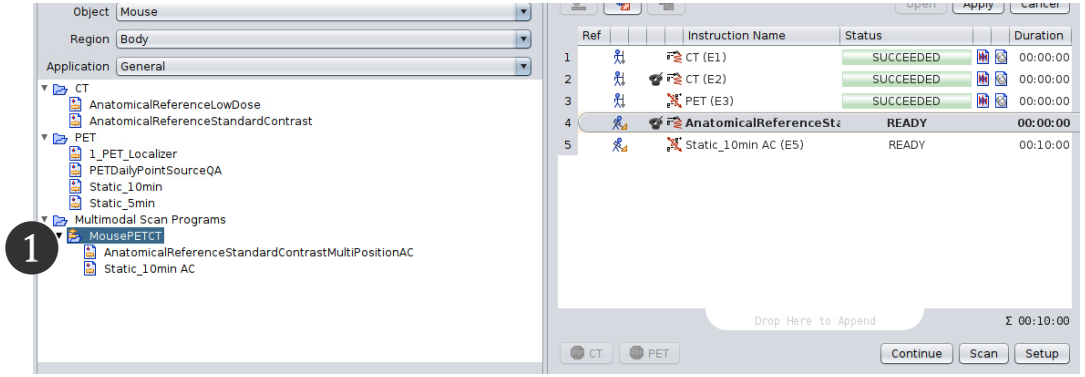
1. **Modality.** Check the PET and CT or MR modality boxes. **Tip: required to be set before setting other parameters.**
2. **Animal.** Enter the Animal Name & Animal ID.
3. **Study Name.** Enter a Study Name.
4. **Select the Location.** Select the Location defines the scan program and protocols for your acquisitions.
5. **Additional Info.** Enter additional information (e.g. study day in a series). **Tip: This variable is useful when sorting data in a PMOD.**
6. **Isotope/Compound/Activity.** Enter the activity and calibration time.
7. **Create, Exam.** Select Create and Exam to initiate a study.

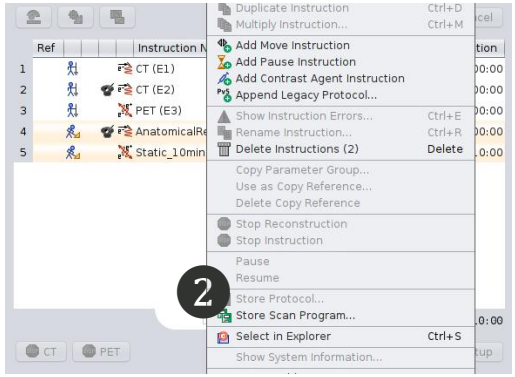
PET/CT & PET/MR: ParaVision 360 Study Workflows
2. Protocols & Multimodal Scan Programs

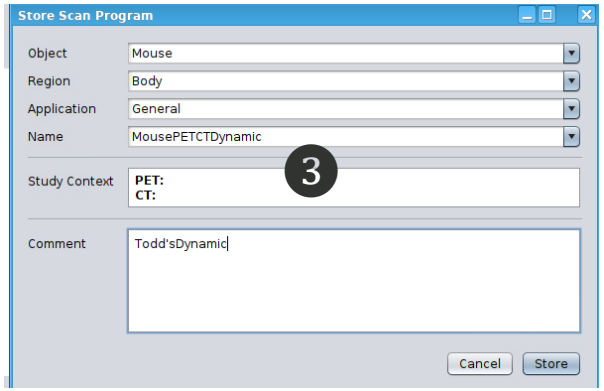


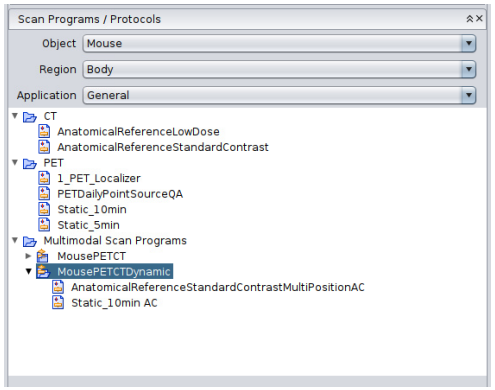
1. **Instruction Card.** Scan Programs & Protocols can be drag and dropped to the instruction queue for acquisitions.
2. **Multimodal Scan Programs** are found under Palette > Explorer. These are Interleafed PET & CT or MR scan protocols with pre-optimized with predefined AC processing.
3. **Protocols.** Individual PET, CT or MR scan protocols that can be added to the instructions. **Tip: Always perform the PET Daily QA workflow at the beginning of the day. Include the CT protocol that will be used to allow for CT warmup & flat-fielding.**
4. **Continue.** Select Continue to initiate scans.

PET/CT & PET/MR: ParaVision 360 Study Workflows
2. Custom Multimodal Scan Programs





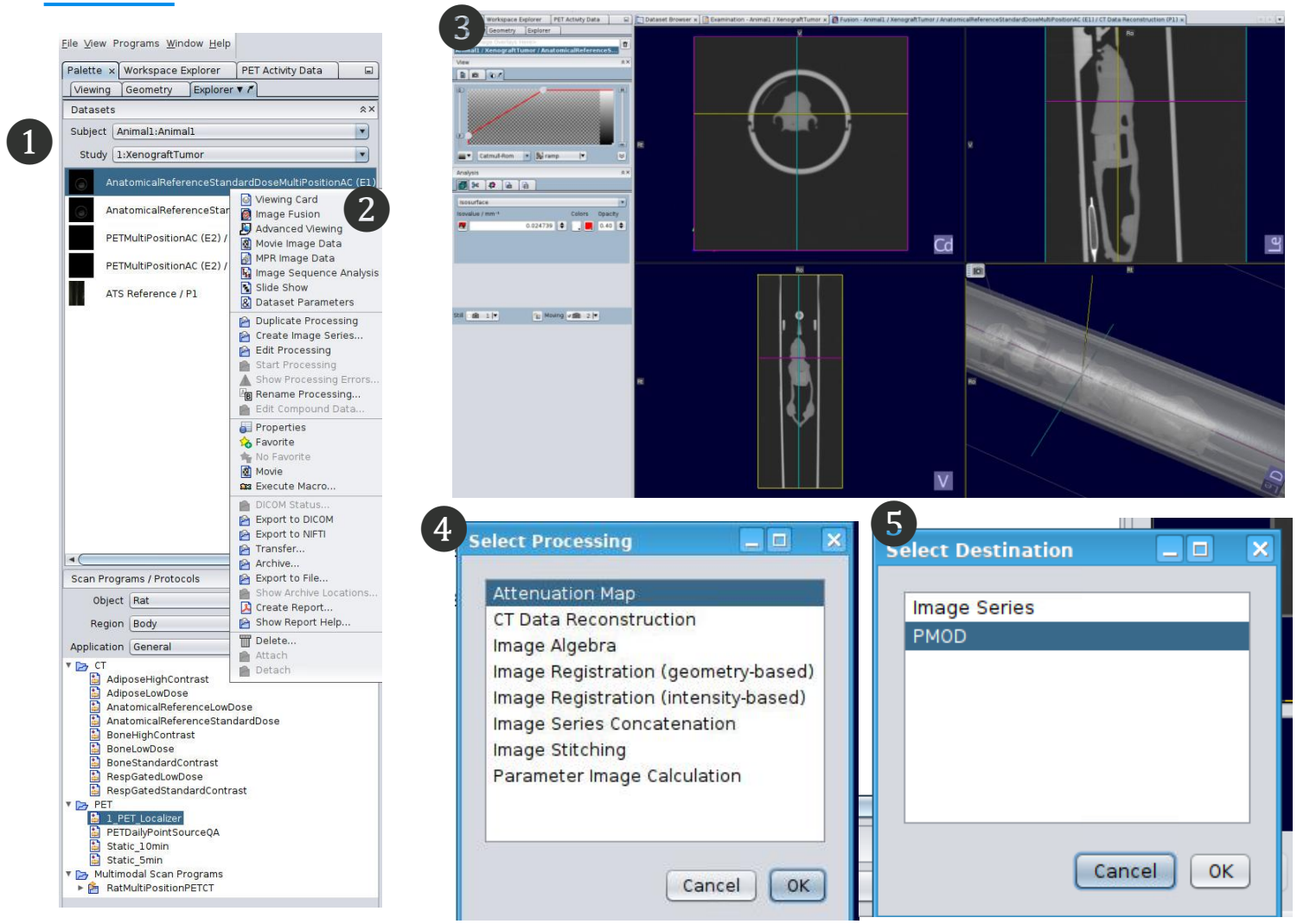




1. **Create a Custom Multimodal Scan Program.** Drag and existing multimodal scan program to the instruction card and modify the parameters as desired.
2. **Store Scan Program.** Highlight the modified multimodal scan program components and right click. select **Store Scan Program**.
3. **Store Scan Program Details.** Define the Object, Region, and Application in the menu. Enter a custom name. Add comments. Select Store. The custom multimodal scan program now appears in the protocol selection.

Caution! Please do not Overwrite Existing Scan Programs

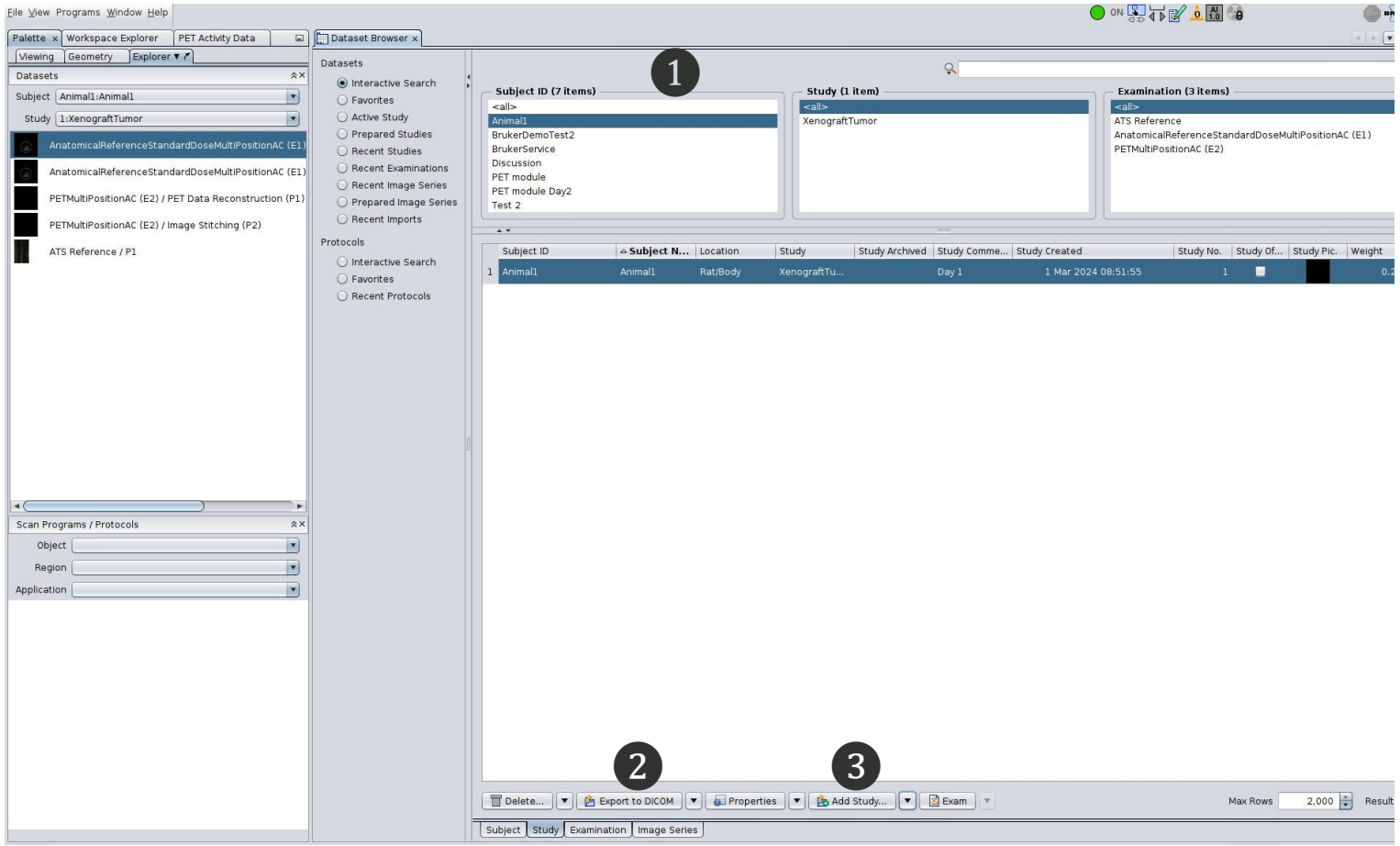
PET/CT & PET/MR: ParaVision 360 Study Workflows
3. Palette



1. **Datasets.** Datasets for the active study are found under Palette > Explorer. Thumbnails for images appear after reconstruction.

2. **Right Click** on image thumbnails for common processing tools such as: 3. **Image Fusion**, 4. **Create Image Series**, and 5. **Export to DICOM**.

PET/CT & PET/MR: ParaVision 360 Study Workflows
4. Database Browser



1. **Database Browser.** Use database browser to filter data by Subject and Study.

2. **Export to DICOM.** Select Export to DICOM or PMOD server.

3. Select **Add Study** to initiate to add a new study registration in preparation for your next study in a longitudinal time series. Modify the Study Name and Additional Info.

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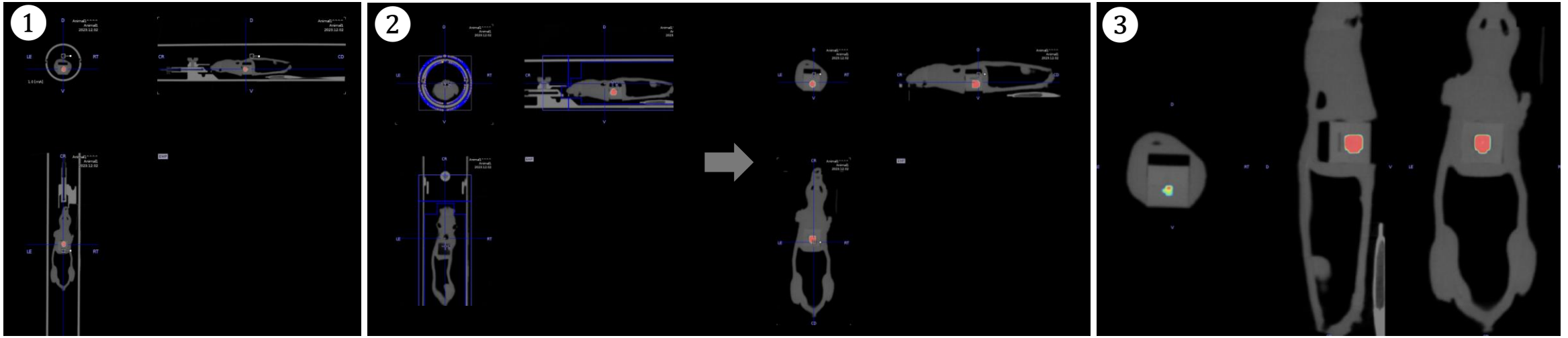
PMOD Multimodal Image Fusion & Display Workflows

PET/MR & PET/CT: PMOD Multimodal Image Fusion & Display Workflow Basics

1. **Multimodal Image Fusion.** Workflow for fusion of PET data to CT or MR data.

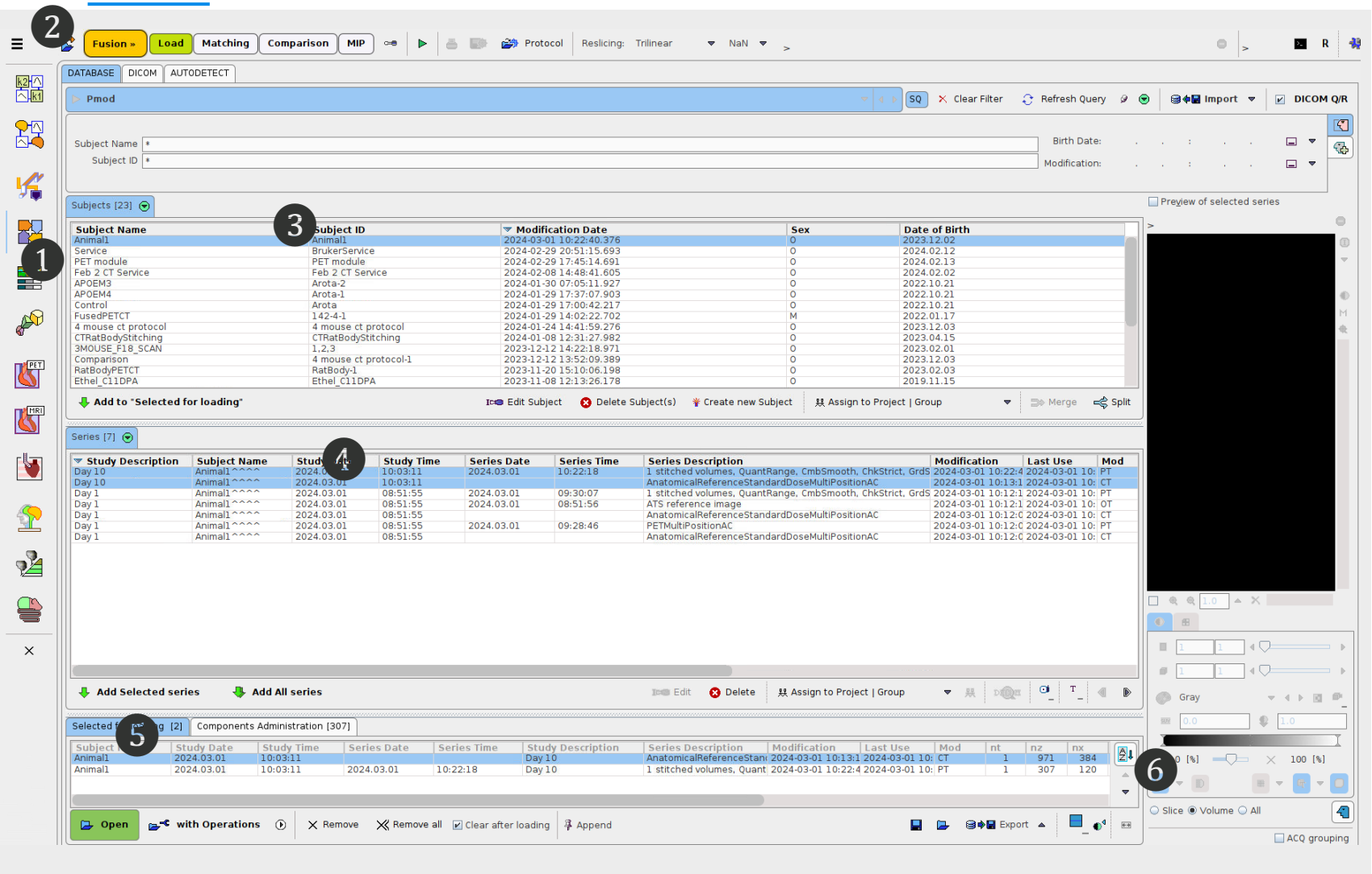
2. **Multimodal Image Masking.** Process for subtraction of hardware components in CT image.

3. **Multimodal Image Display.** Workflow for Image Capture of Linear and/or MIP image display.



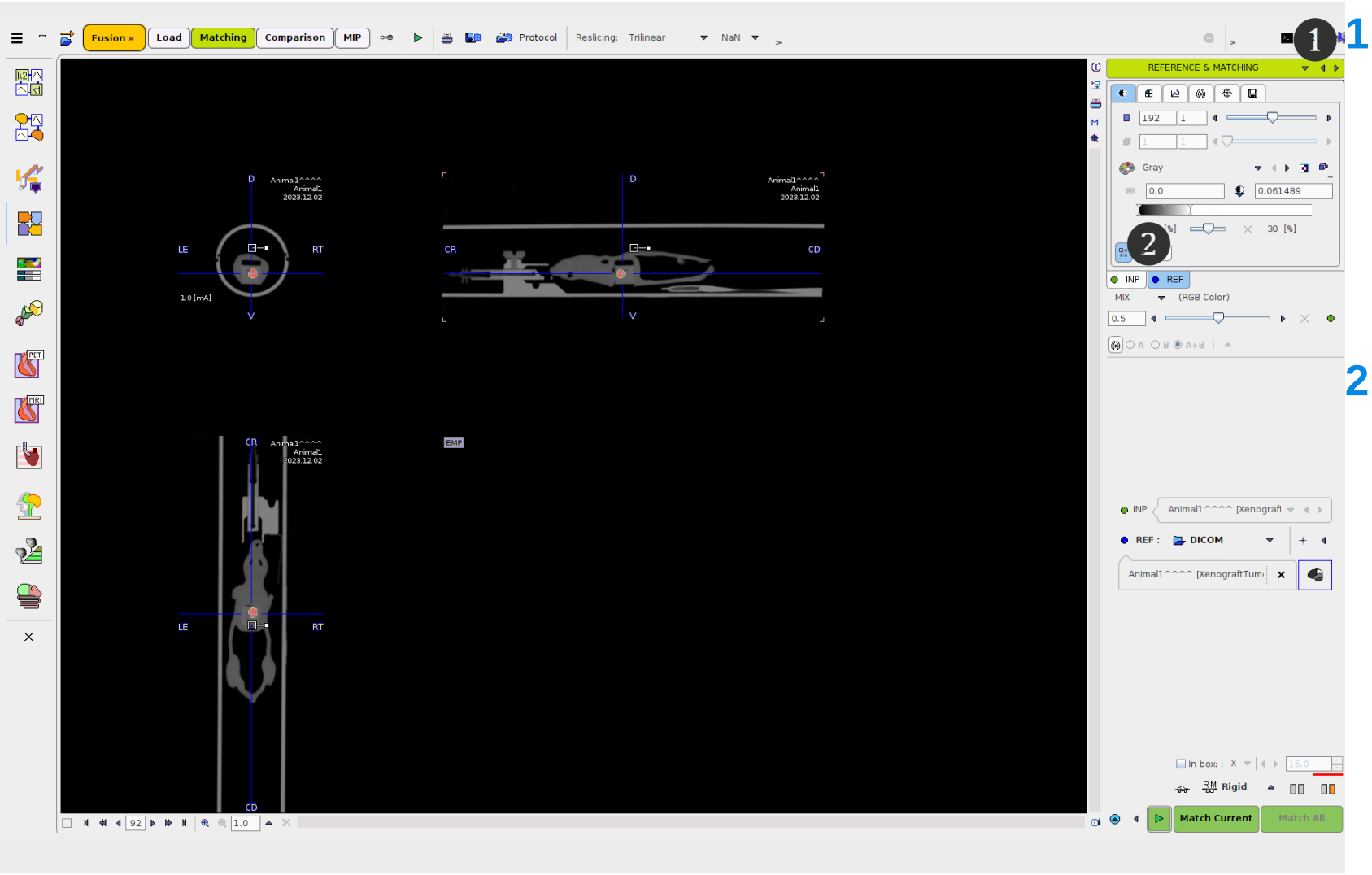
Tip: Begin by referencing the "PMOD File Management & Starting Reference For Bruker PET Data" to configure default application menus for simple workflows.

PET/MR & PET/CT: PMOD Multimodal Image Fusion & Display
1. Multimodal Image Fusion



1. **PMOD PFUS.** Open the PMOD PFUS module.
2. Select **“Load Select Data”** button to access the database.
3. Select the **Subject Name** from the menu (in this Example Animal 1).
4. Highlight a PET/CT or PET/MR in the **Series menu. Tip: “additional info” study registration helps identify specific studies for the subject (e.g. Day1 and Day10) in PMOD.**
5. **Select Add Selected series**.
6. Set the Anatomical (CT or 3D MR) to the top and PET (PT) to bottom in the menu before opening using the arrow key at right.

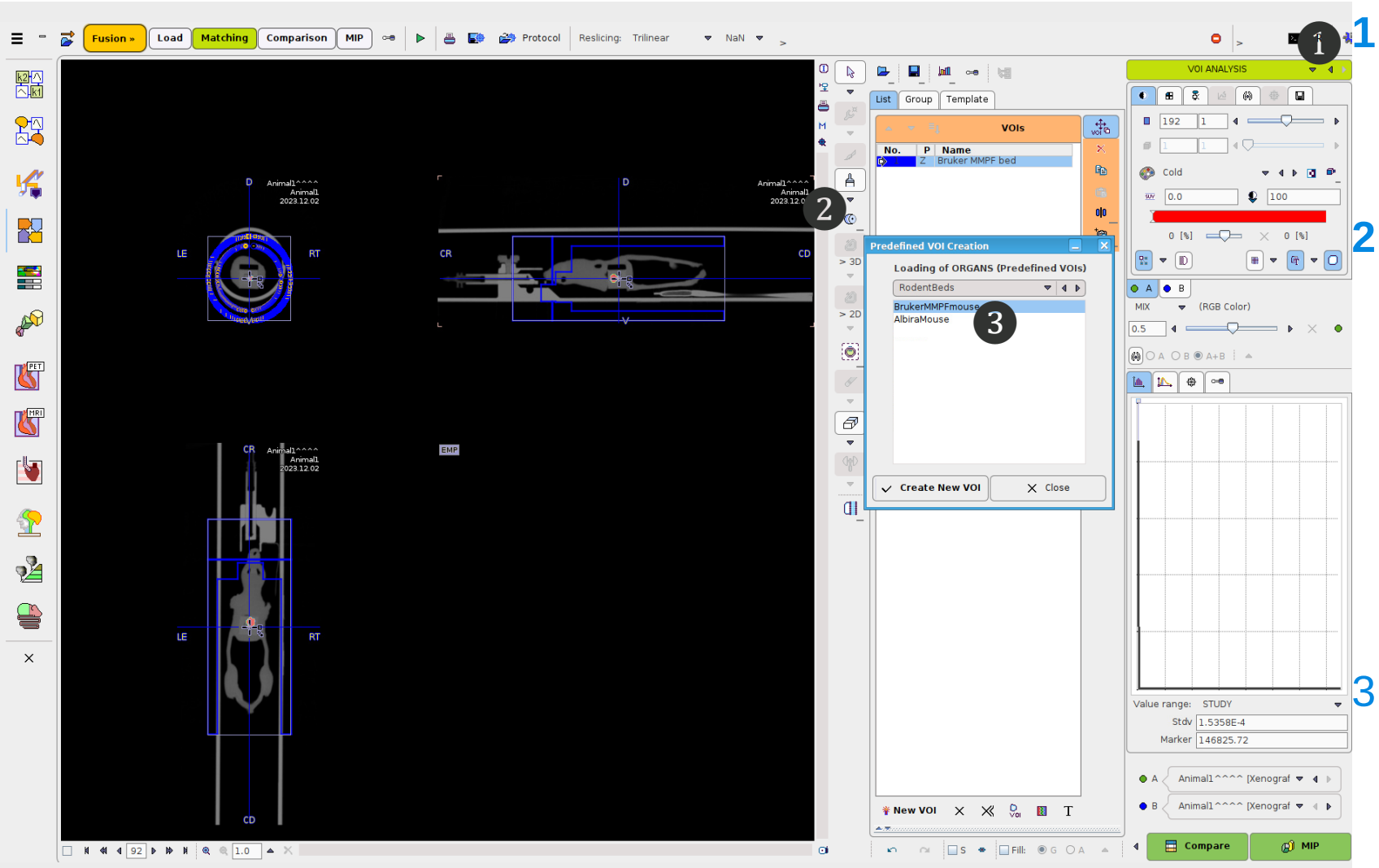
PET/MR & PET/CT: PMOD Multimodal Imaging Fusion & Display
2. Multimodal Image Fusion



1. **Reference & Matching.** Select Reference & Matching in the pull-down menu to display PET fused to the CT (or MR).

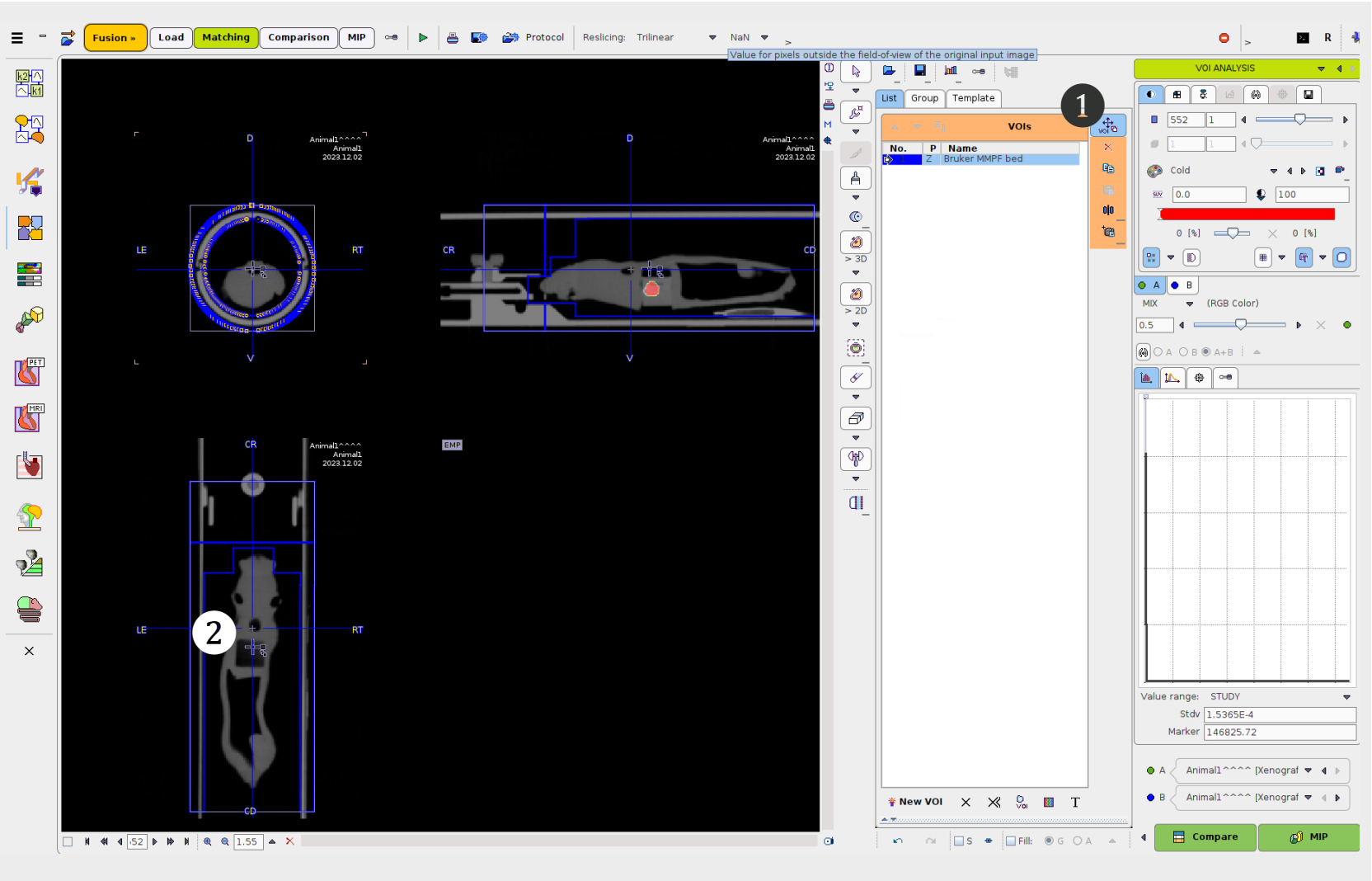
2. **INP & REF.** Toggle between INP & REF tabs for image controls for the PET & CT (or 3D MR) Respectively. Adjust image display as desired.

PET/MR & PET/CT: PMOD Multimodal Imaging Fusion & Display
2. Multimodal Image Masking



1. **VOI Analysis.** Select **VOI ANALYSIS** in the pull-down menu.
2. **Create Regular VOI.** Place the orthogonal crosshairs in the image center. To create a VOI based on the Bruker MMPF cradle, first select **Create Regular VOI > Organs (Predefined VOI).**
3. Select **Rodent Beds > Bruker MMPF Mouse.**

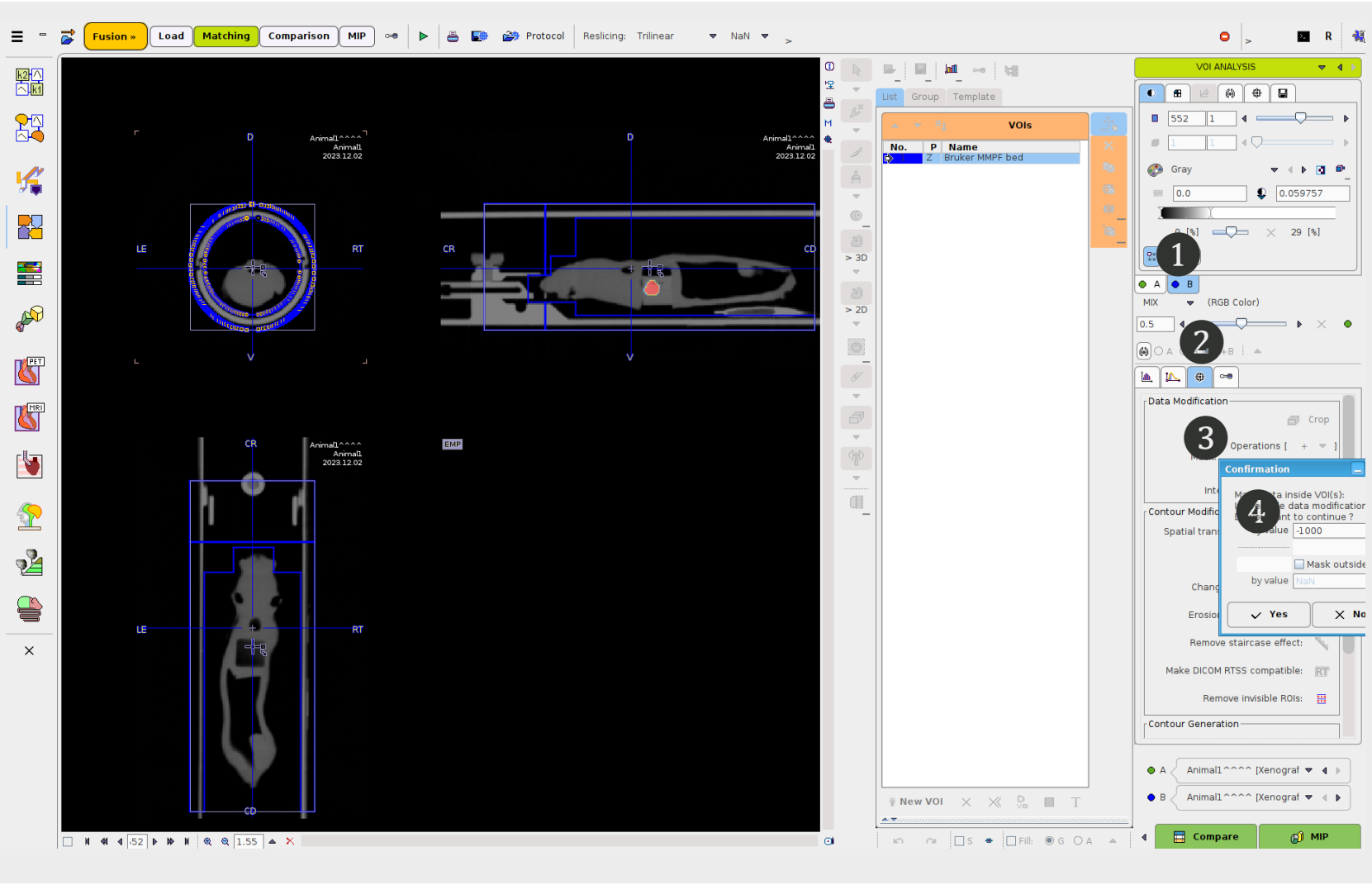
PET/MR & PET/CT: PMOD Multimodal Imaging Fusion & Display
2. Multimodal Image Masking



1. **Operation on Entire VOI.** Select the **Operation on Entire VOI** button.

2. **Drag the VOI at the crosshair to align with the cradle.**

PET/MR & PET/CT: PMOD Multimodal Imaging Fusion & Display
2. Multimodal Image Masking



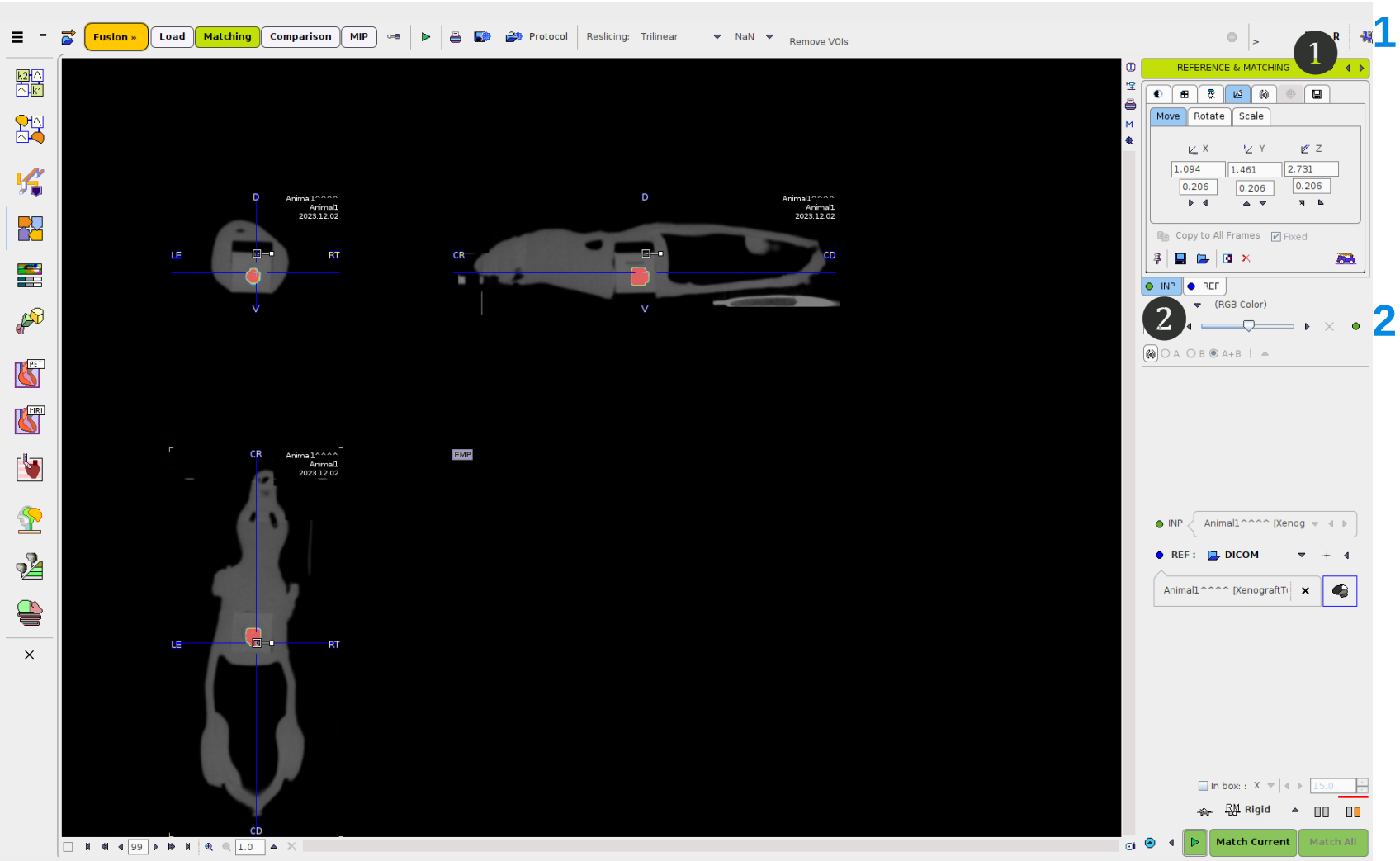
1. **Tab B.** Select Tab B to set the current active working image data to the CT (or 3D MR) data.

2. **Masking Tab.** Select the **“Masking…”** tab.

3. **Mask In.** Select the “Mask voxels inside selected VOI(s)” button.

4. For Hounsfield calibrated CT enter “-1000” in the dialogue, and select yes.

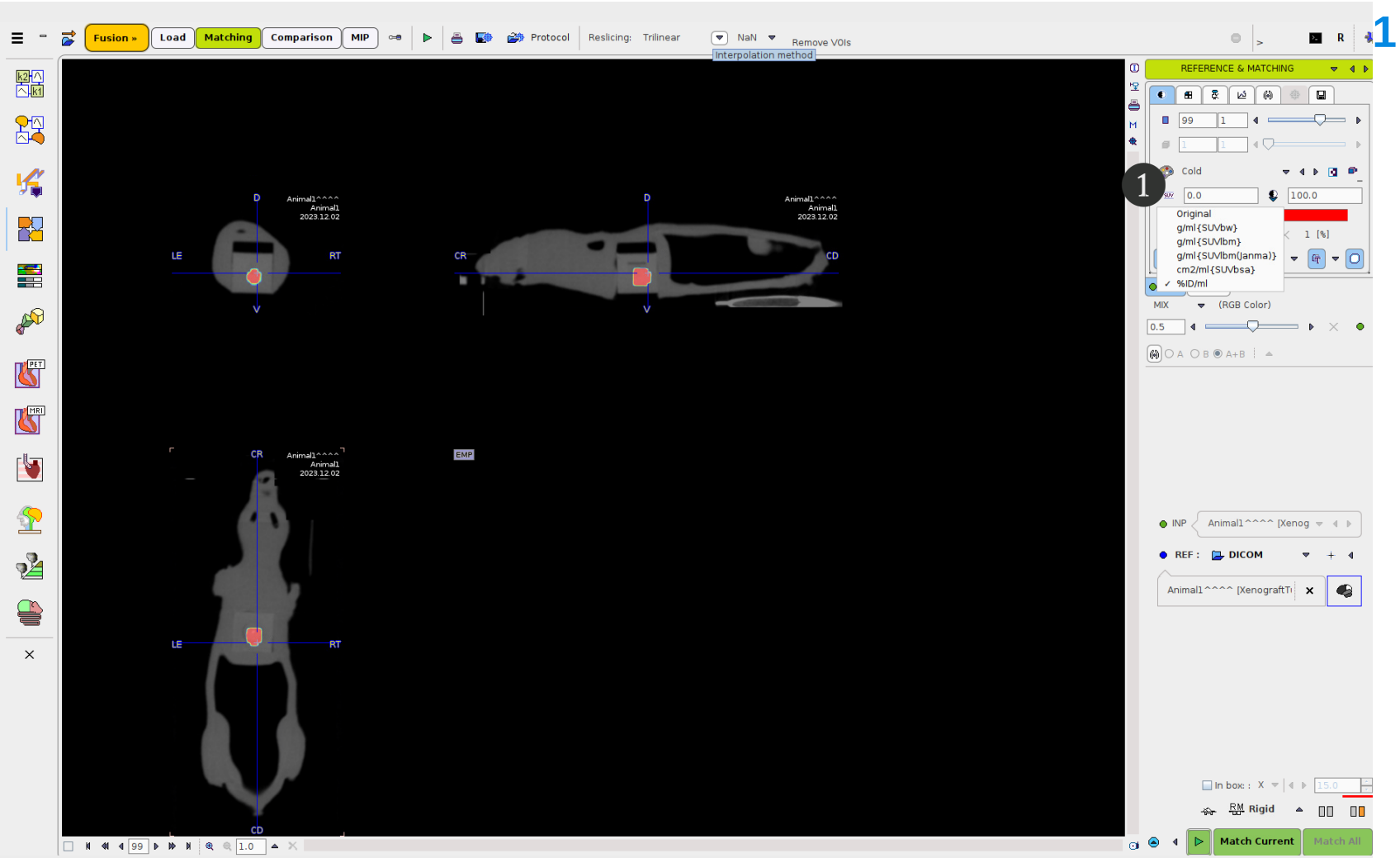
PET/MR & PET/CT: PMOD Multimodal Imaging Fusion & Display
3. Multimodal Image Display



1. **Reference & Matching.** Select in the pull-down menu to display PET fused to the CT (or MR).

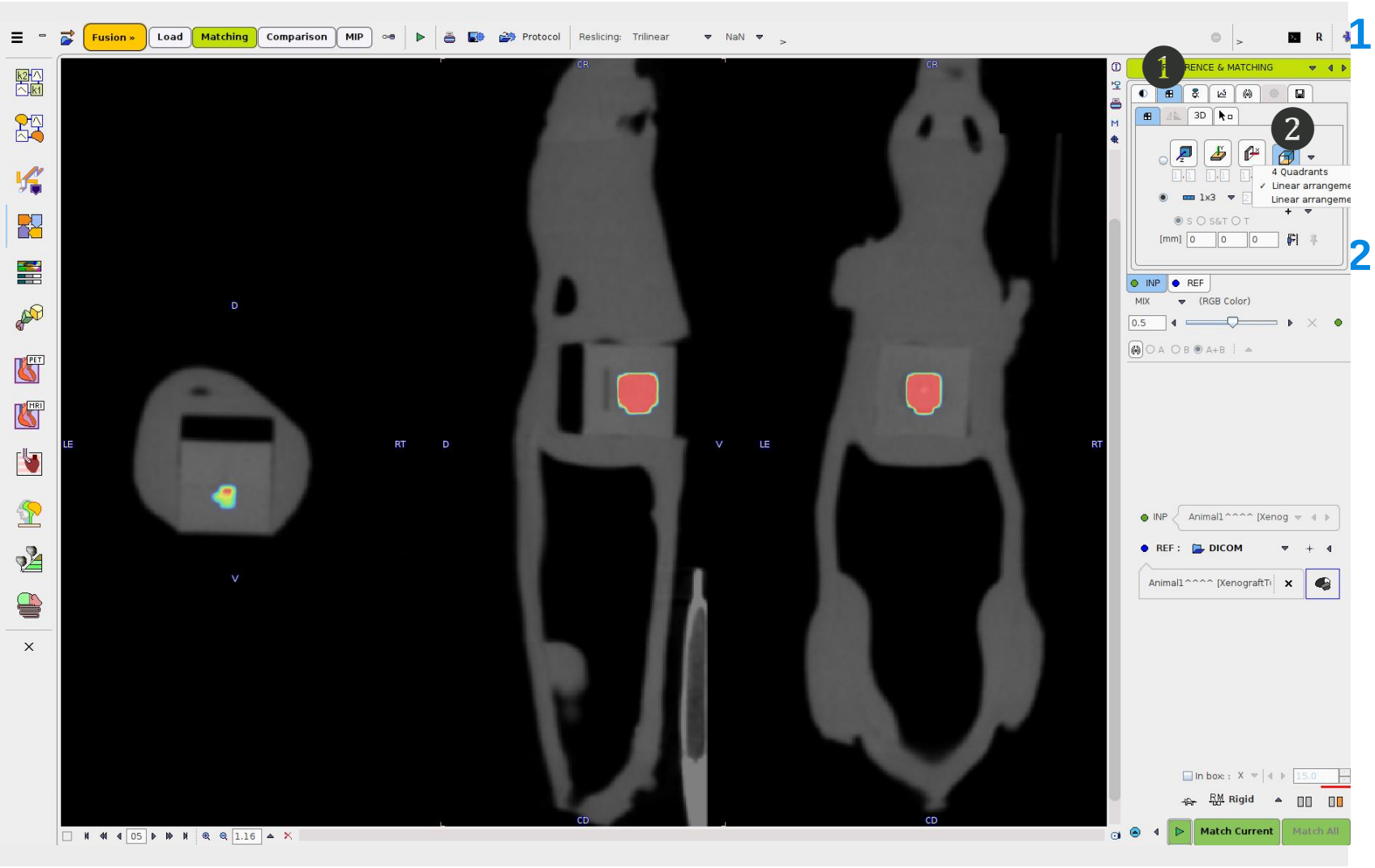
2. **INP & REF.** Toggle between the tabs to adjust contrast for the PET & CT (or 3D MR) images as desired.

PET/MR & PET/CT: PMOD Multimodal Imaging Fusion & Display
3. Multimodal Image Display



1. **SUV.** If not already predefined in the PFUS application menu, select the unit for display. This is often %ID/ml.

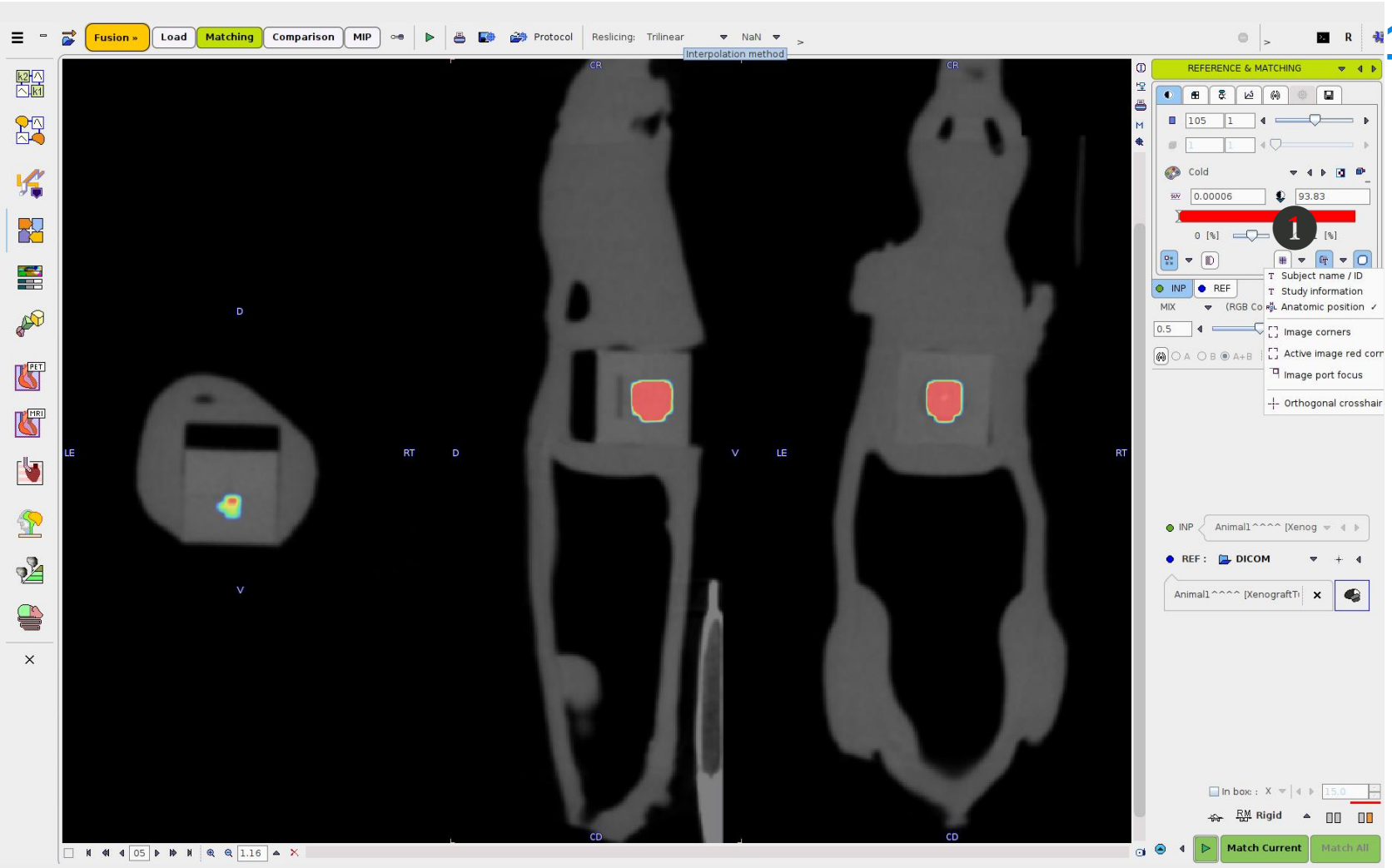
PET/MR & PET/CT: PMOD Multimodal Imaging Fusion & Display
3. Multimodal Image Display



1. **Image Display Layouts.** Select the **Image Display Layout** tab.

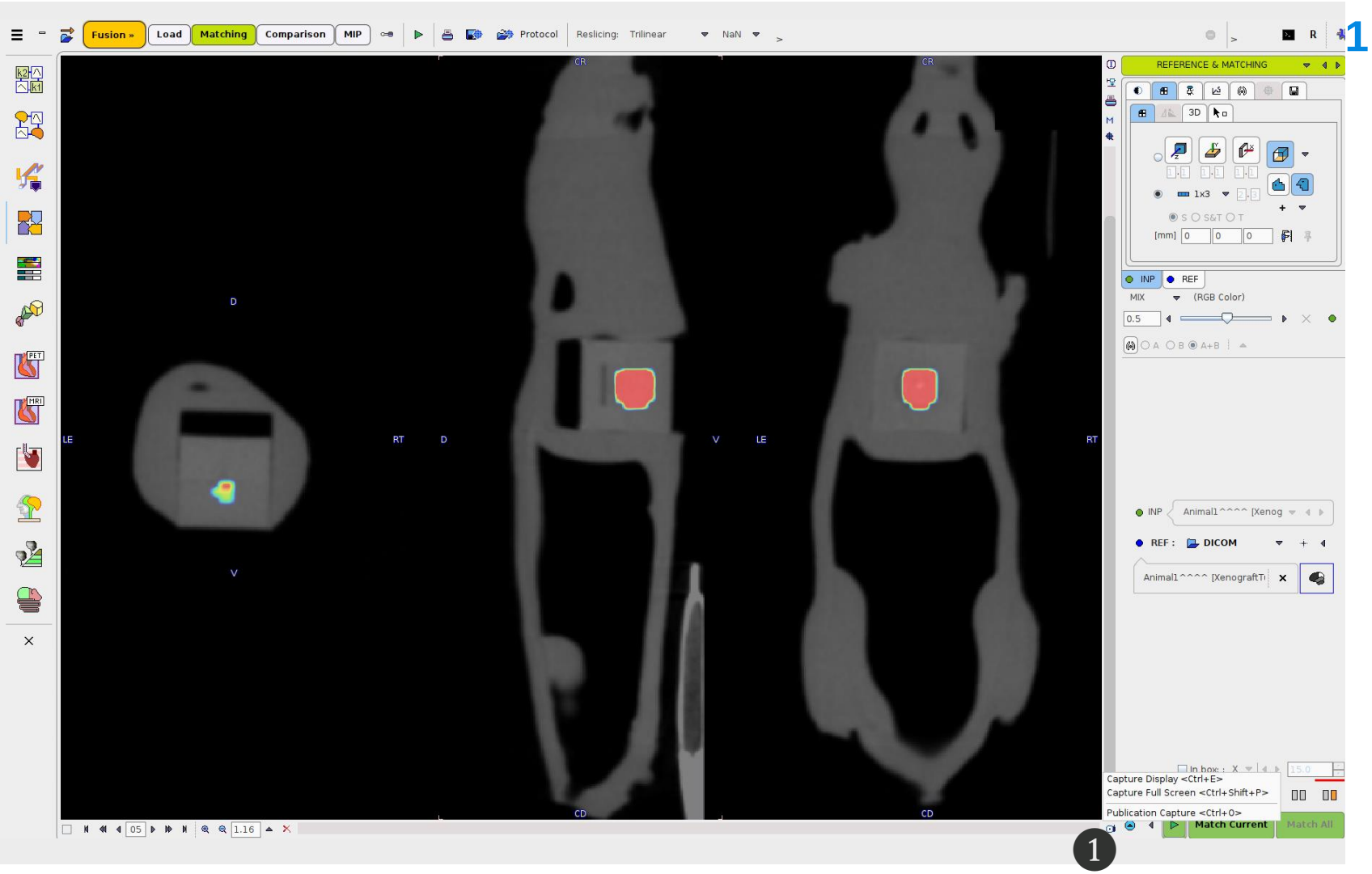
2. **Linear Arrangement.** Select the **Linear arrangement** display selection, common for display in figures.

PET/MR & PET/CT: PMOD Multimodal Imaging Fusion & Display
3. Multimodal Image Display



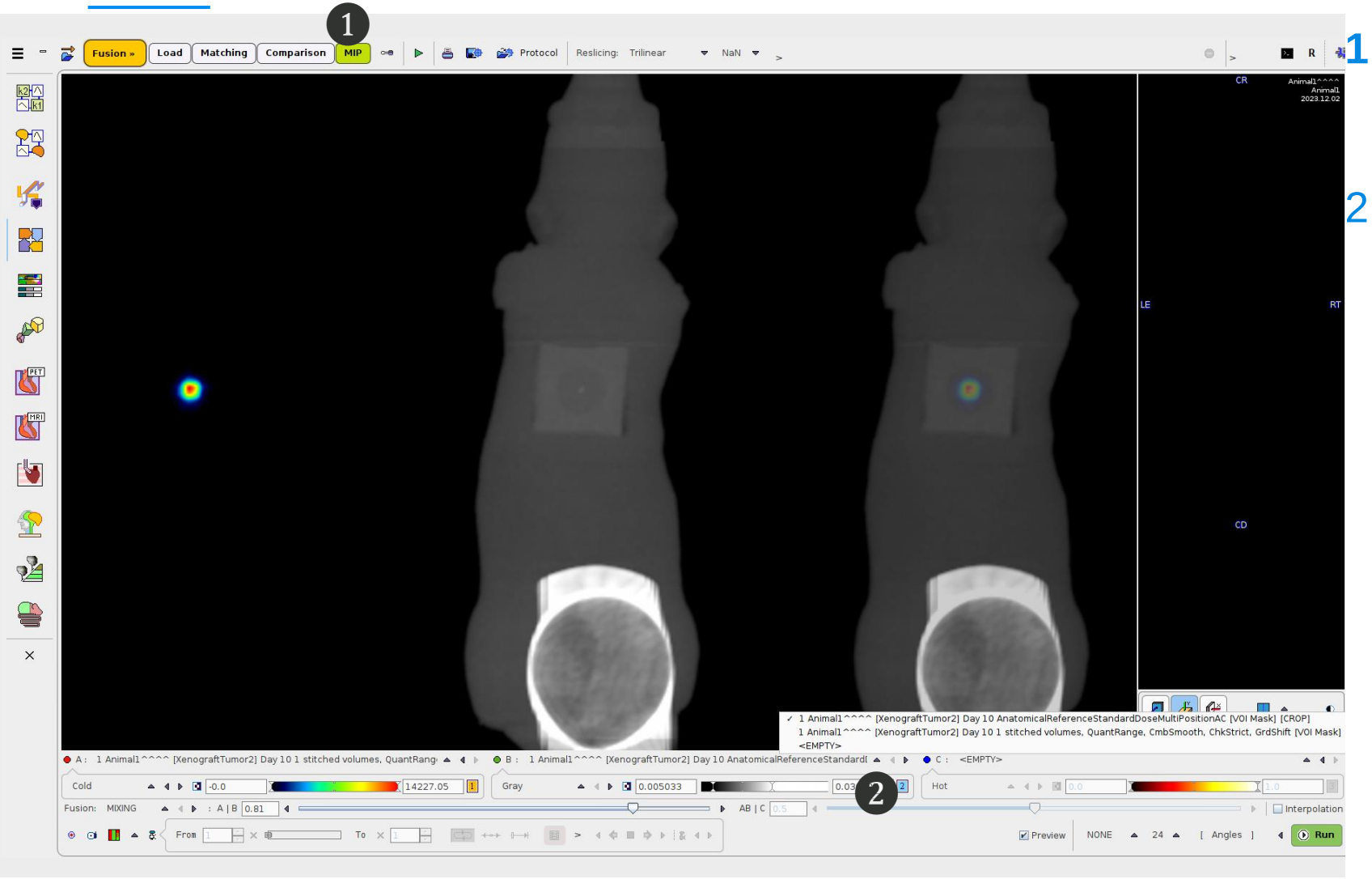
1. **Image Annotation and overlay elements.** Select the Image and overlay elements menu to add or remove elements to the display.

PET/MR & PET/CT: PMOD Multimodal Imaging Fusion & Display
3. Multimodal Image Display



1. **Capture Image Display.** Select the **Capture Image Display** button, and select the Publication Capture button.

PET/MR & PET/CT: PMOD Multimodal Imaging Fusion & Display
3. Multimodal Image Display



1. **MIP.** Select the **MIP** tab at top.

2. Set the left image to PET and right image to MR or CT using the pulldown menus. Adjust he contrast and display as described and compete the image capture.

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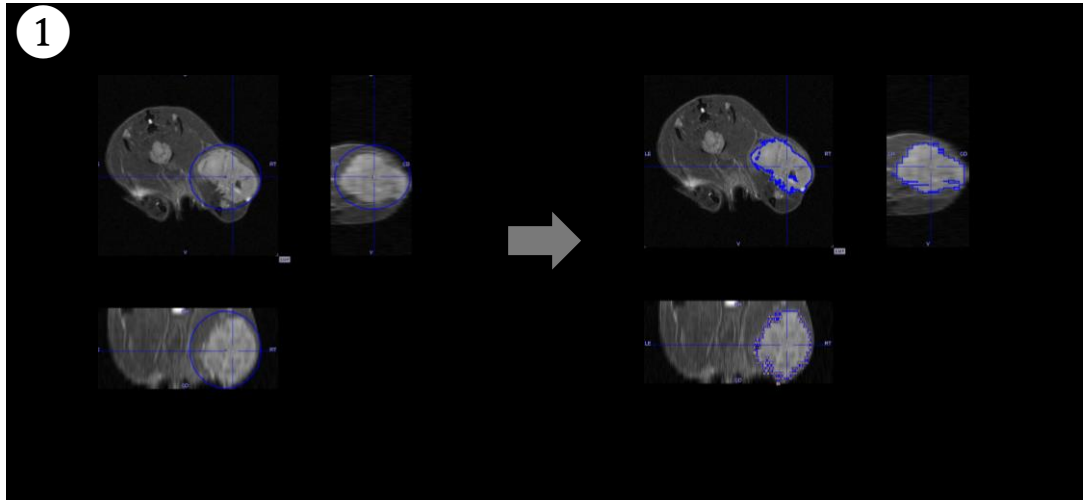
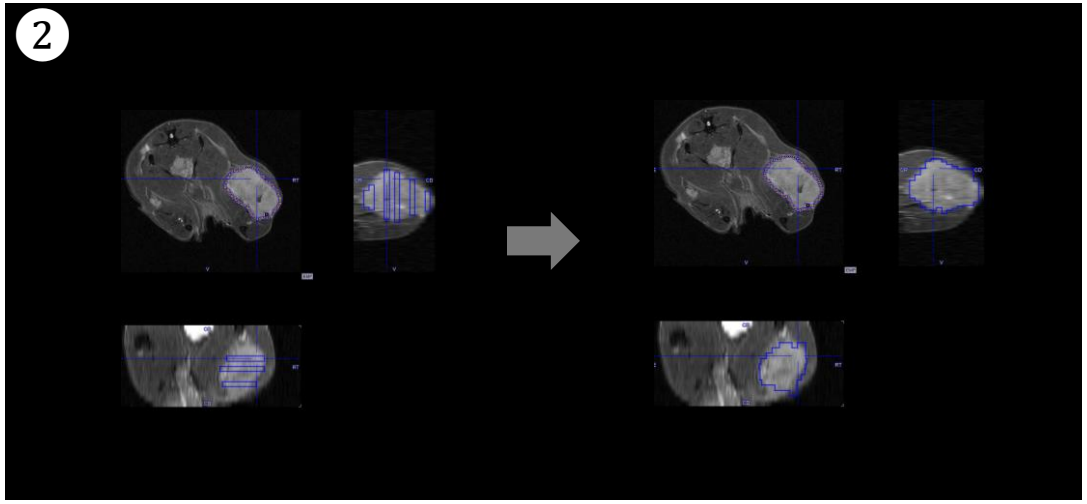
PET/MR & PET/CT Software Workflows: PMOD VOI Basic Workflows

PET/MR & PET/CT: PMOD VOIs Basics
VOIs by Iso-Contouring and Contour Interpretation

1. **VOIs** & Iso-Contouring by Region Growing

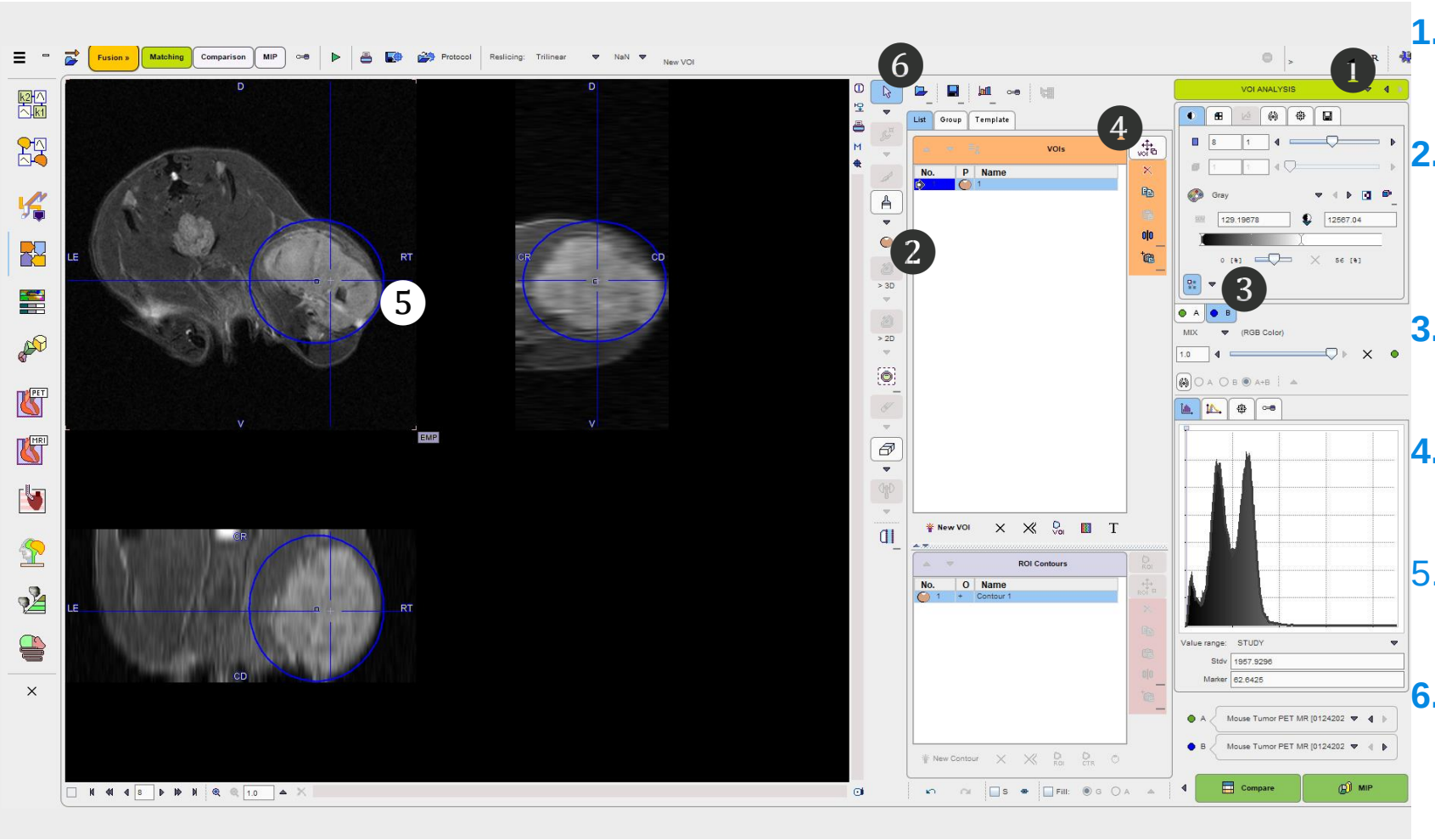
2. **VOIs** & Freehand with Contour Interpretation





Study data (courtesy Virginia Tech) was acquired in a BioSpec 9.4 MRI with a PET Insert Si103 and analyzed using PMOD v4.4

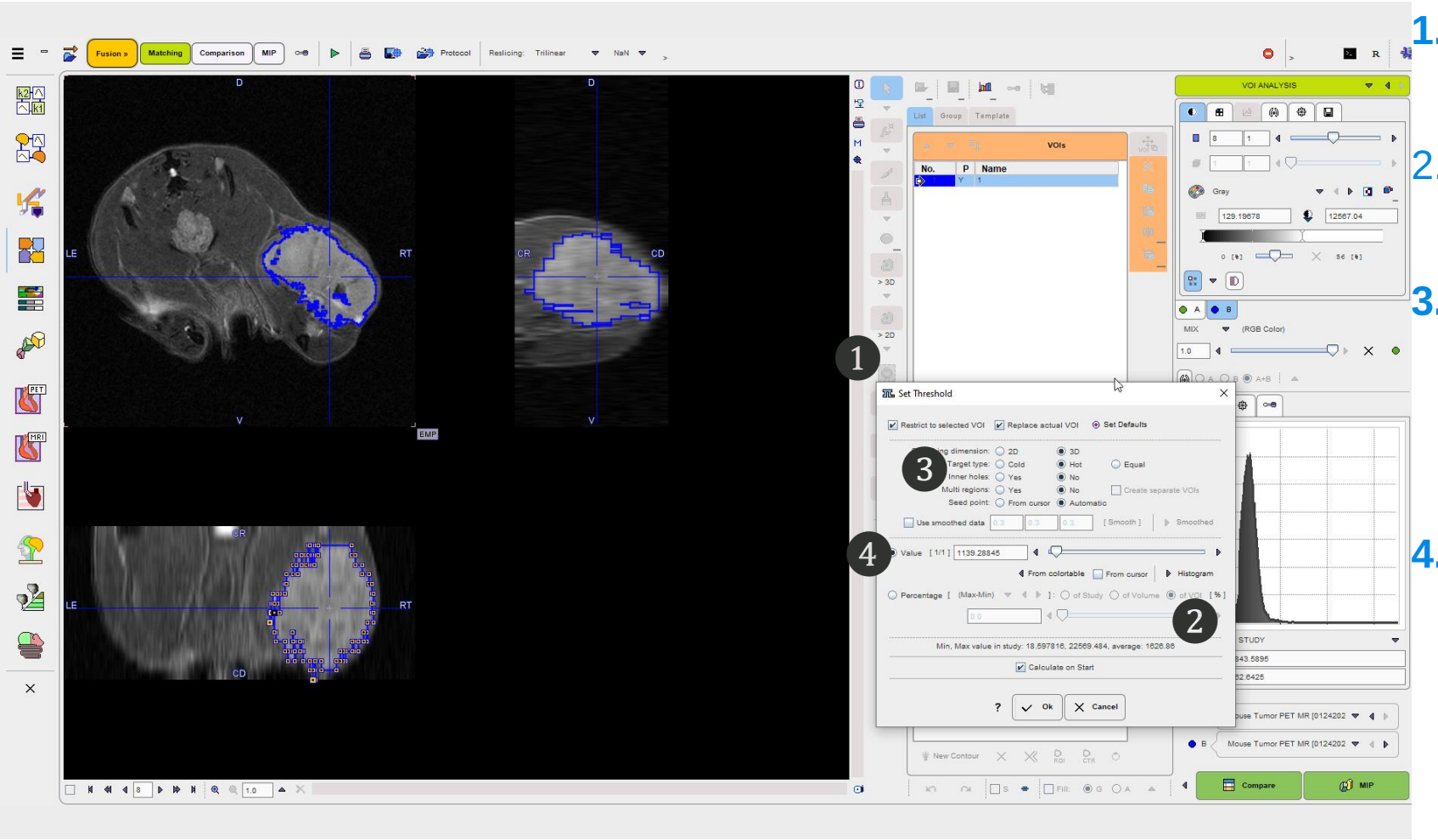
PET/MR & PET/CT: PMOD Multimodal Imaging Fusion & Display
1. PMOD PFUS VOIs & Iso-Contouring by Region Growing



1. **VOI ANALYSIS.** Select in the pull-down menu to access VOI tools.
2. **Tab B.** Select to set the current active working image to the CT or MR reference data.
3. **Create regular VOI.** Select and choose SPHERE.
4. **Operation on Entire VOI.** Select the Operation on Entire VOI button.
5. Adjust the location and boundaries of the sphere to outside the tumor margins.
6. **Save VOI.** Tip: If additional studies will be analyzed, it may be useful to save the sphere VOI to the database for recall.

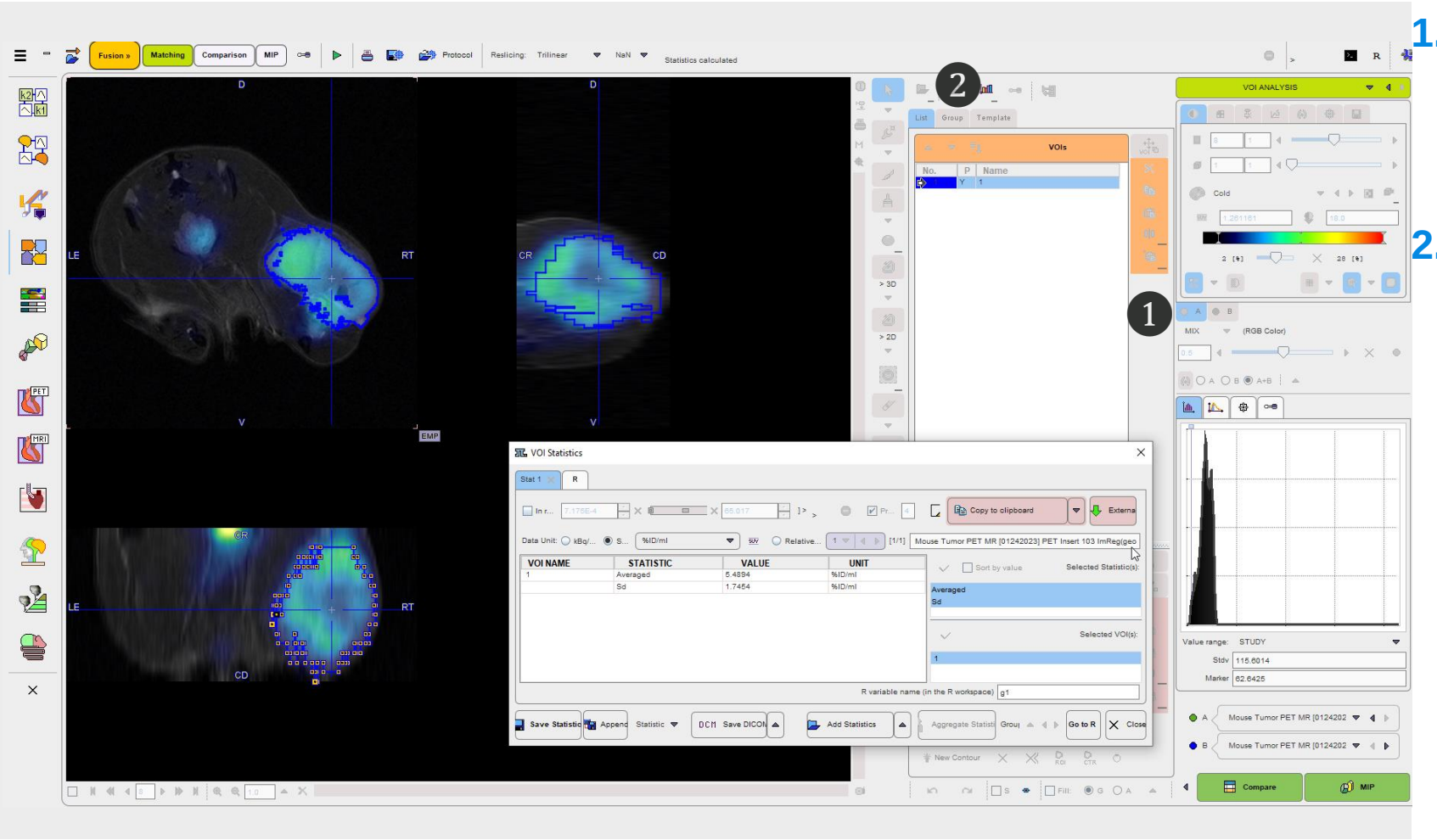
Tip: The Iso-Contouring By Region Growing VOI method is suitable with targets with well defined anatomical or PET signal boundaries

PET/MR & PET/CT: PMOD Multimodal Imaging Fusion & Display
1. PMOD PFUS VOIs & Iso-Contouring by Region Growing



1. **Iso-contouring by Region Growing.** Select in the VOI tools menu.
2. Check the Percentage “**of VOI**” selection.
3. **Check the “Hot” target type for e.g. PET signal, and “Cold” target type for negative contrast tissues (e.g. CT lung contrast).**
4. **Set Threshold.** Set the thresholding boundaries value and select OK. Tip: Where Iso-contouring by Region Growing is applied directly to the PET image, users most often use a defined %ID/mL (e.g. 10%) value to threshold all data for consistency.

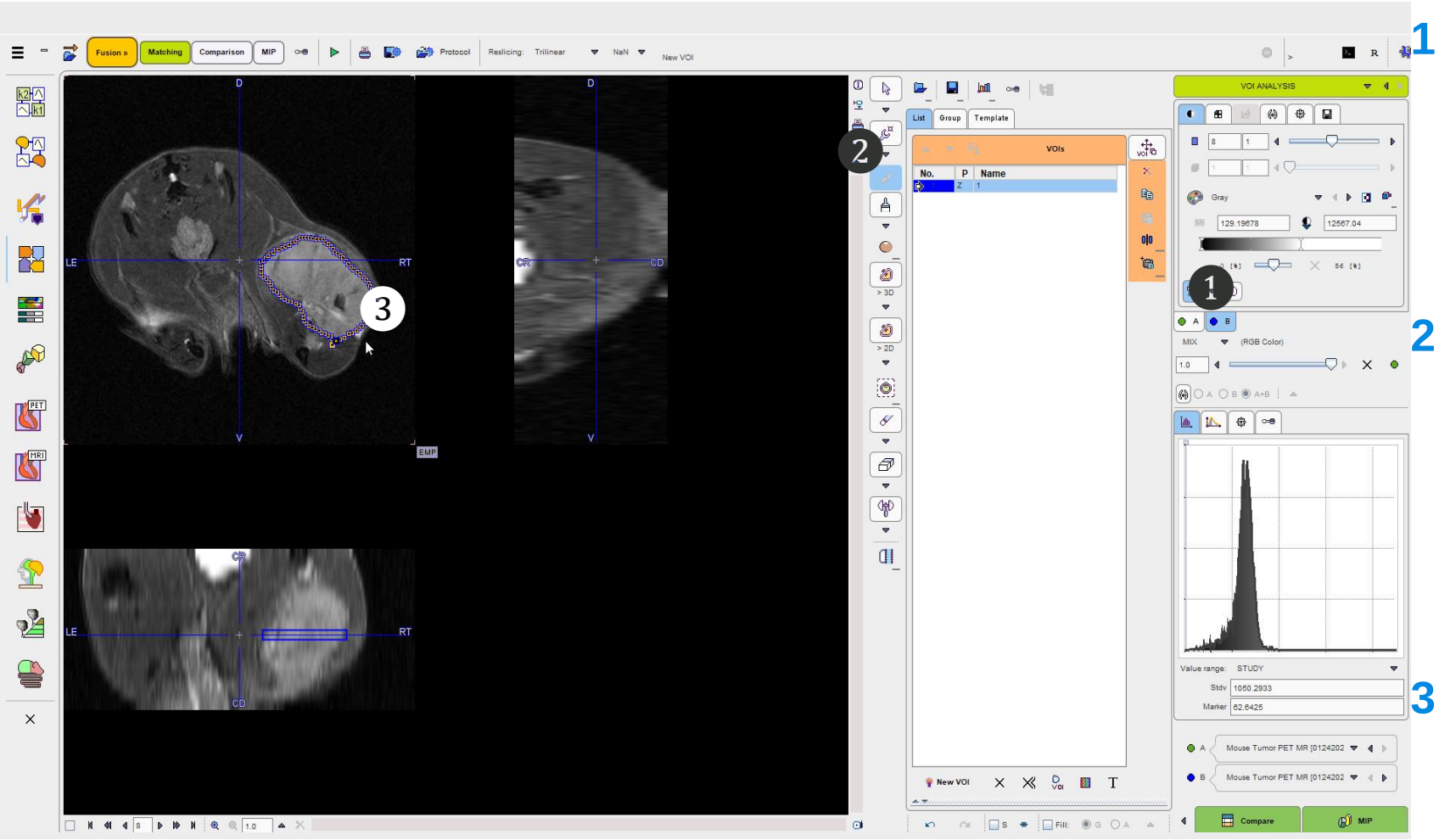
PET/MR & PET/CT: PMOD Multimodal Imaging Fusion & Display
1. PMOD PFUS VOIs & Iso-Contouring by Region Growing



1. **Tab A.** Select Tab A to set the active image to the PET input data.

2. **VOI Statistics.** Select the VOI Statistics button to view VOI statistic. Tip: Choose “Selected Statistics” or “Default Statistics” when prompted to view your predefined subset of statistics or an interactive menu of statistics respectively.

PET/MR & PET/CT: PMOD Multimodal Imaging Fusion & Display
2. PMOD PFUS VOI & Freehand with Contour Interpretation

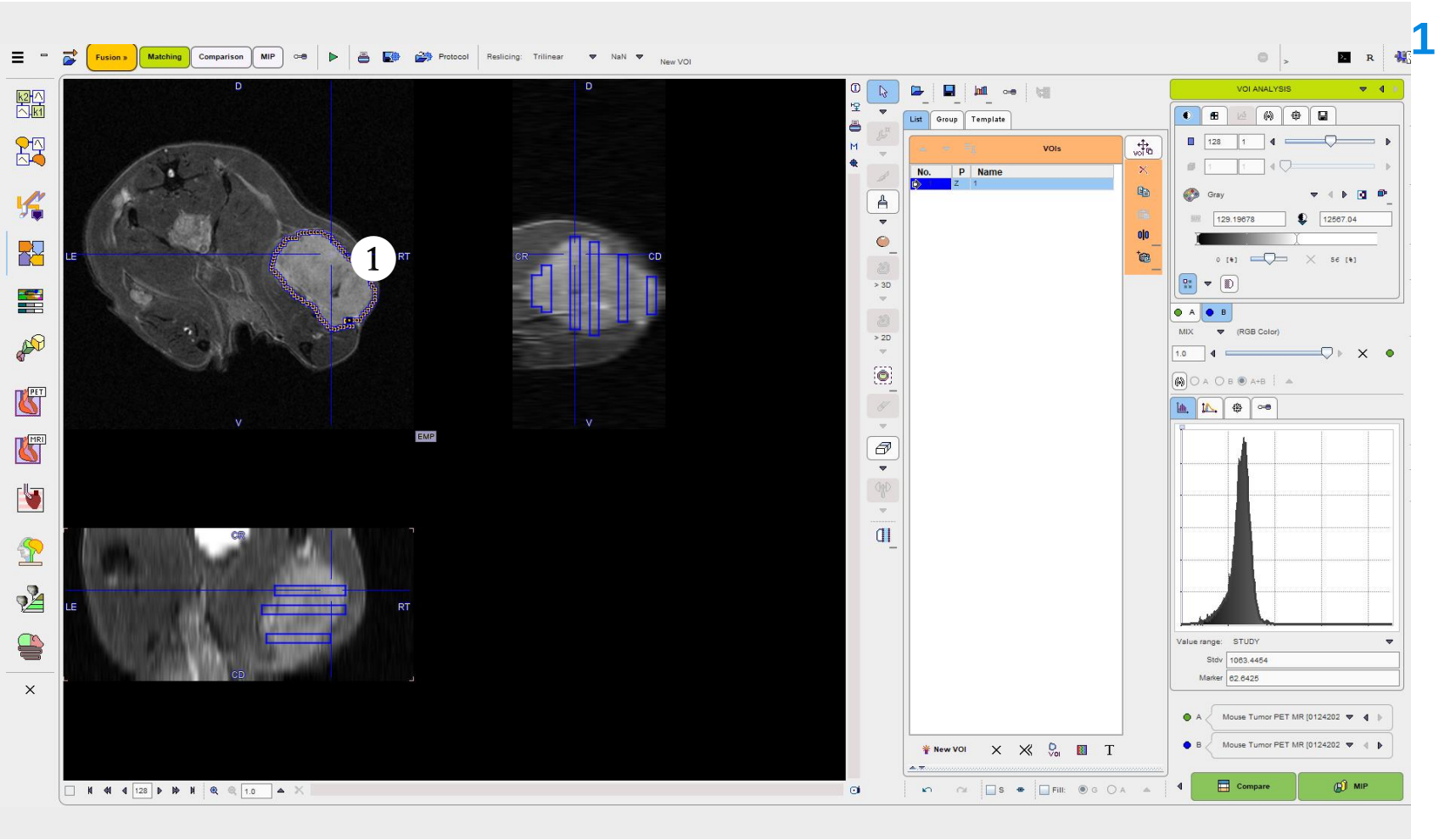


1. **Tab B.** Select Tab B to set the active working image to CT or MR reference data.

2. **Draw Polygon with Dense Vertices.** Select the Draw Polygon with Dense Vertices button.

3. **VOI.** Tracer the ROI boundaries on a selected slice.

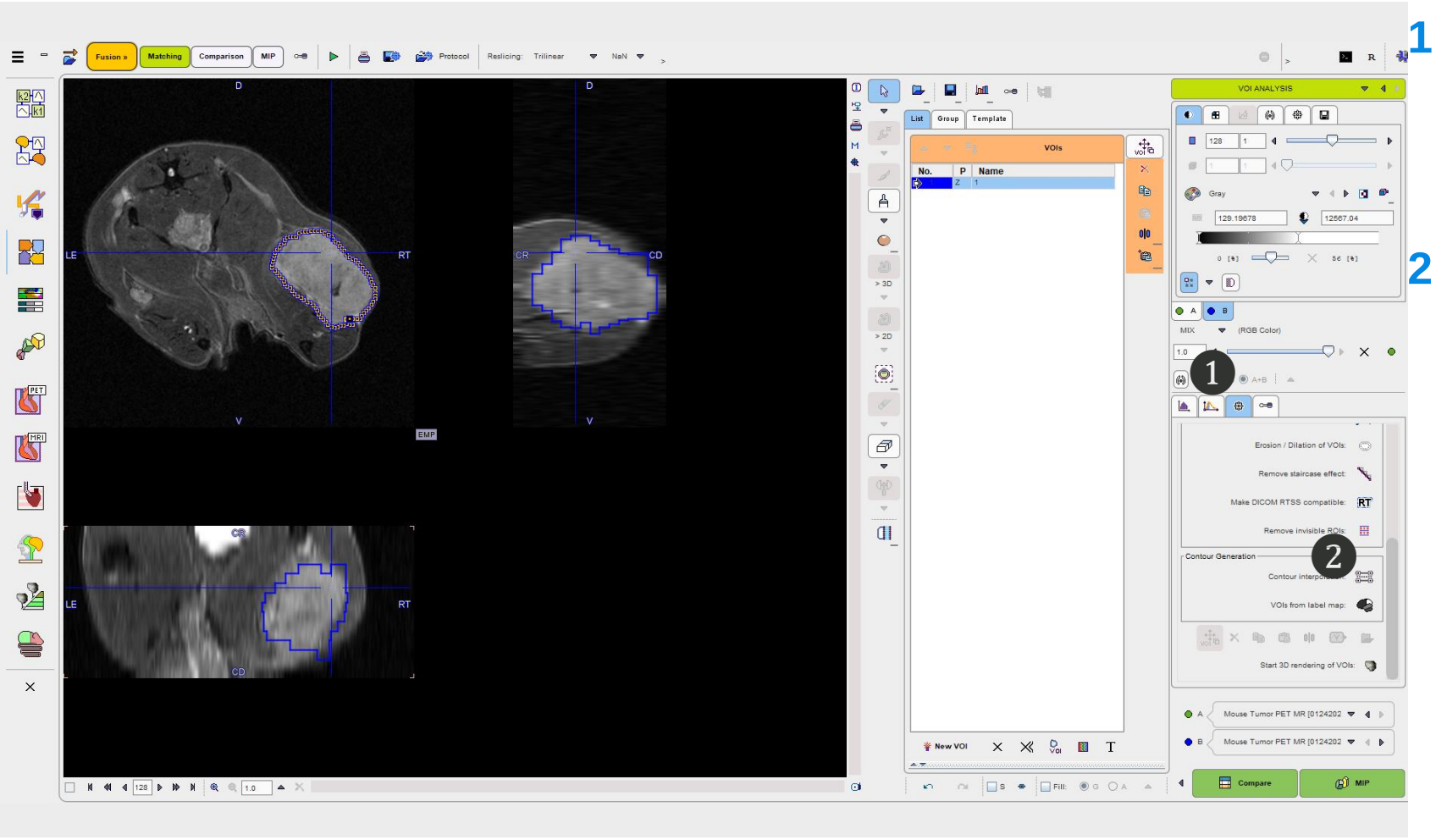
PET/MR & PET/CT: PMOD Multimodal Imaging Fusion & Display
2. PMOD PFUS VOI & Freehand with Contour Interpretation



1. **VOI.** Trace the ROI boundaries on additional non-contiguous slices. Slices must be draw in a single axis only.

Tip: The Freehand with Region Growing VOI method is useful for targets with faint boundaries.

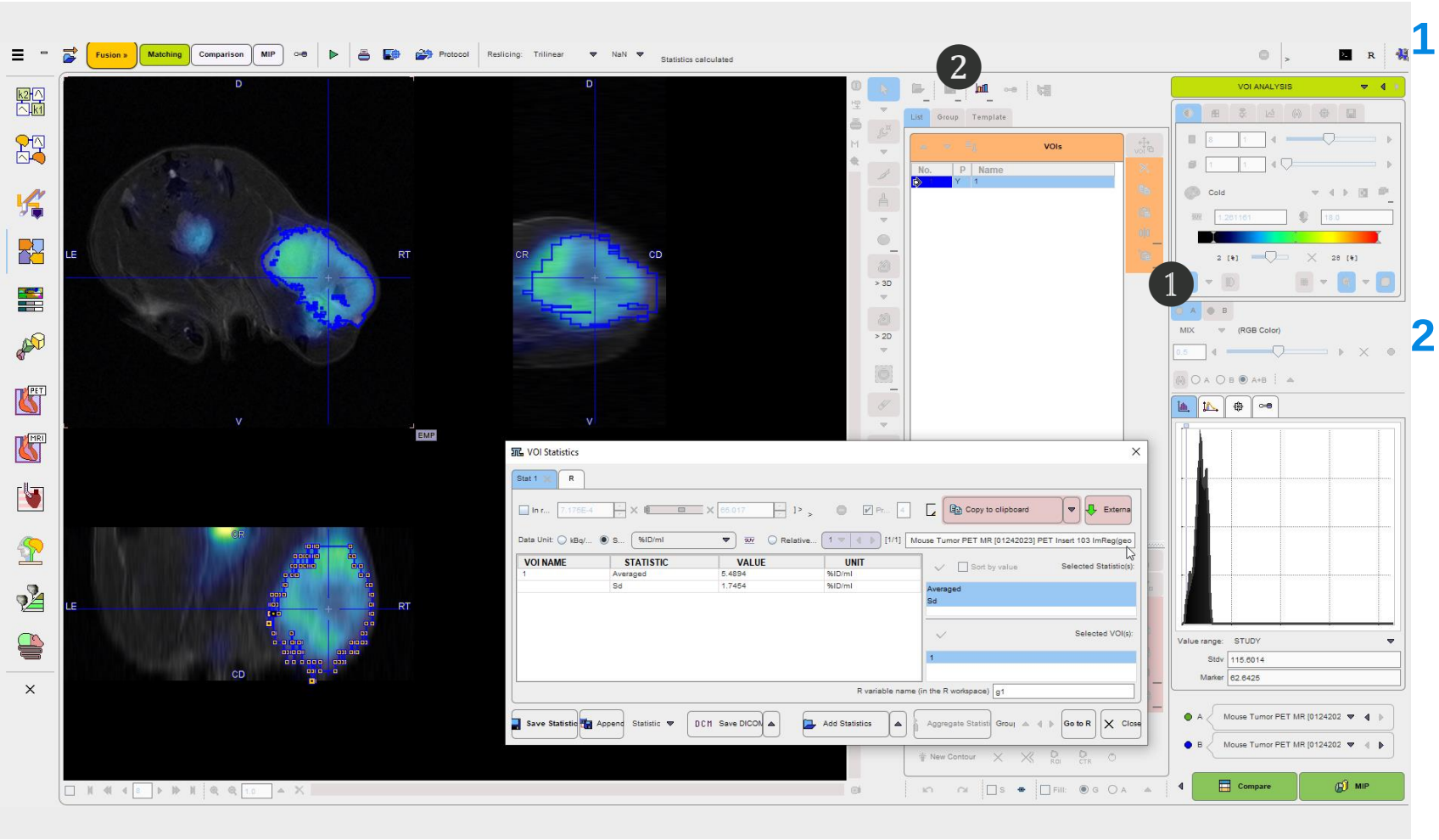
PET/MR & PET/CT: PMOD Multimodal Imaging Fusion & Display
2. PMOD PFUS VOI & Freehand with Contour Interpretation



1. **Masking Tab.** Select the **“Masking…”** tab.

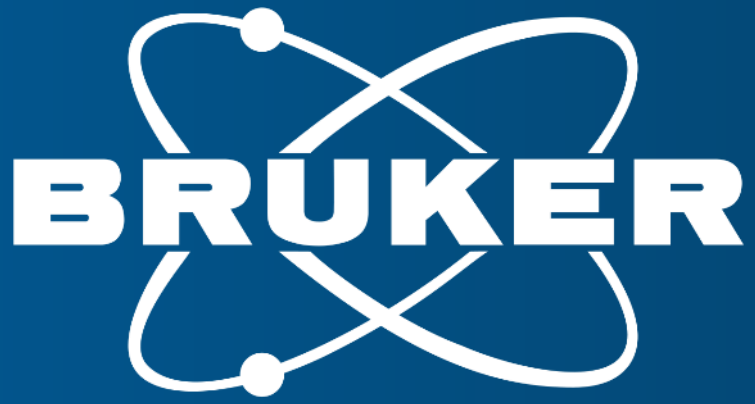
2. **Contour Interpolation.** Select the **Contour Interpolation** button to full the non-contiguous spaces.

PET/MR & PET/CT: PMOD Multimodal Imaging Fusion & Display
2. PMOD PFUS VOI & Freehand with Contour Interpretation



1. **Tab A.** Select Tab A to set the active image to the PET input data.

2. **VOI Statistics.** Select the VOI Statistics button to view VOI statistic.



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