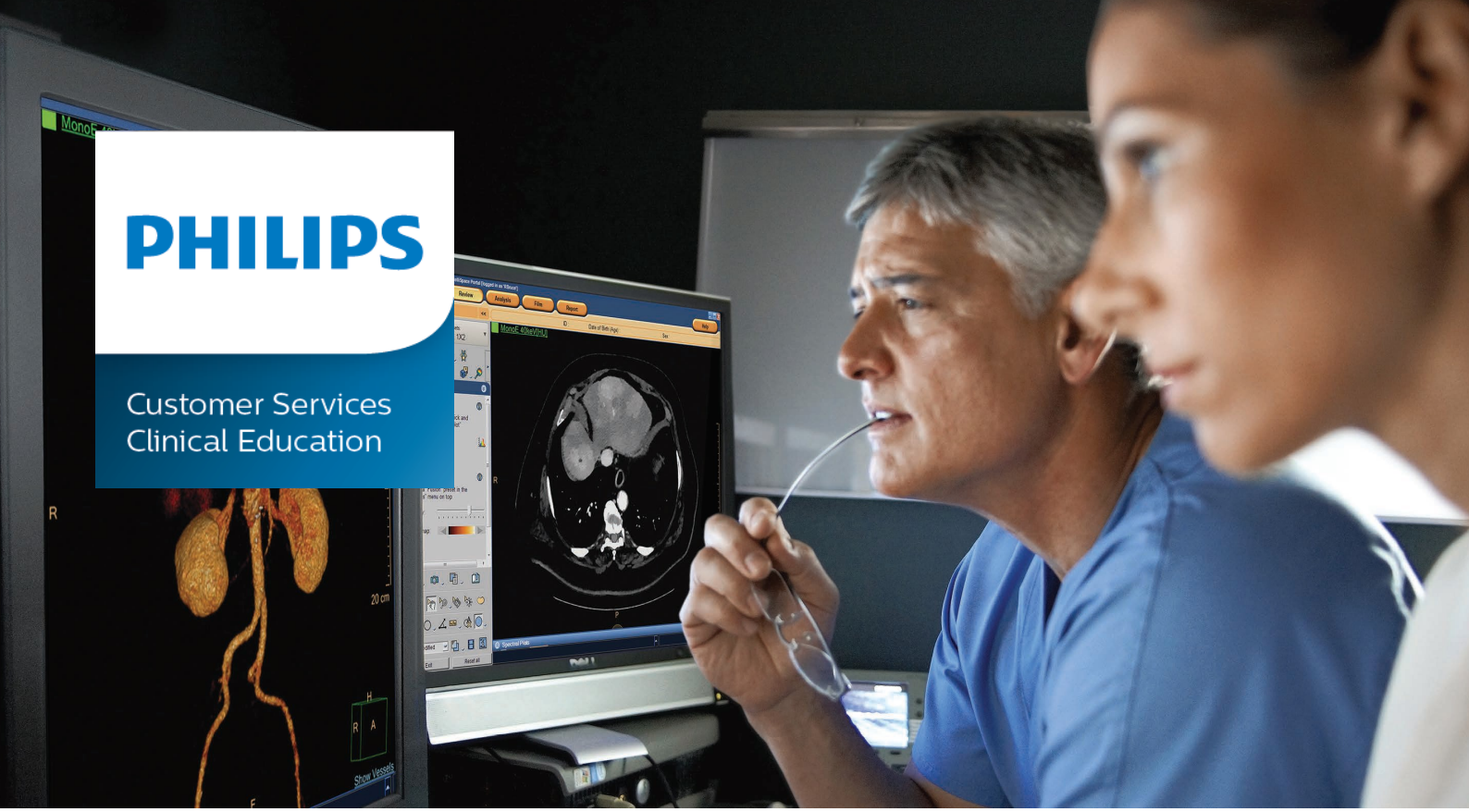


MR Diffusion

FiberTrak

IntelliSpace Portal

MR Applications

Quick Step Guides

Application

This postprocessing function provides an additional step in the **Diffusion** package, and is meant to visualize diffusion tensor data in the form of white matter tracts in Diffusion studies. Visualization of fibers can be used to visualize the white matter structure in the brain. Together with other forms of MRI data it can give a more complete diagnosis.

Before you begin

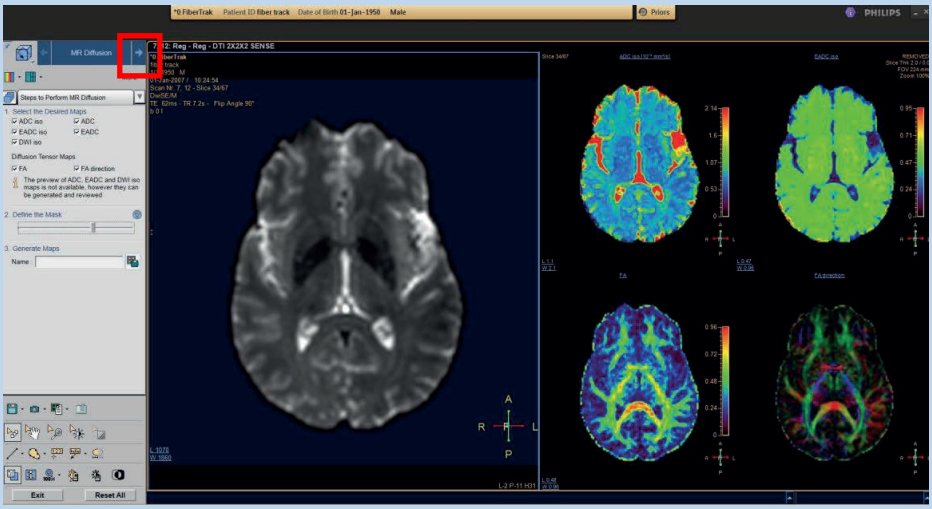
A valid series for the **FiberTrak** step of Diffusion package is a Diffusion Tensor series containing at least 6 diffusion directions and a minimum of 2 b-values. The MR FiberTrak step of the MR Diffusion package has a default layout of a main viewport with three reference viewports to the right, and a toolbar, and task guidance panels to the left. The large viewport contains a view of the selected dataset as a combination of three orthogonal slices. Rotating, panning and zooming this view allows viewing of white matter tracts from all angles.

Similar to all packages on the IntelliSpace portal, also the MR FiberTrak step provides a task guidance panel in the left part of the screen. The task guidance panel provides the following steps:

- Select Underlay & Overlay
- Track Fiber Bundle
- Save Fiber Bundles

Workflow

Select a Diffusion study from the patient directory and click on:



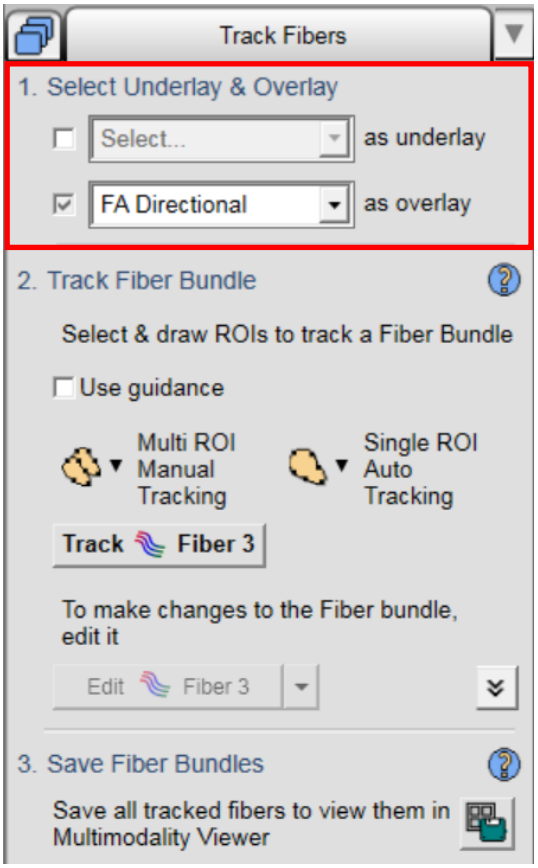
The MR Diffuisons application opens and selects the required series automatically. Click on the right arrow in the title area "MR Diffuison" to access the "MR FiberTrak" stage of the tool.

Alignment tools:
Depending on the preset the layers in the main viewport will align automatically.

Show layers:
Select one of the icons to show or hide the corresponding layer in the main viewport

Select an Underlay or Overlay

If desired, select an Overlay or Underlay for anatomical details or fiber directions.



1. To select an underlay, select the Checkbox next to the file selection in the **Task Guidance Window**.

   ➔ A list of existing series will appear.

2. Select a series from the list or **select Anatomical Series** at the top of the list. In case you decide for an anatomical series this series will automatically be co- registered with the diffusion series.

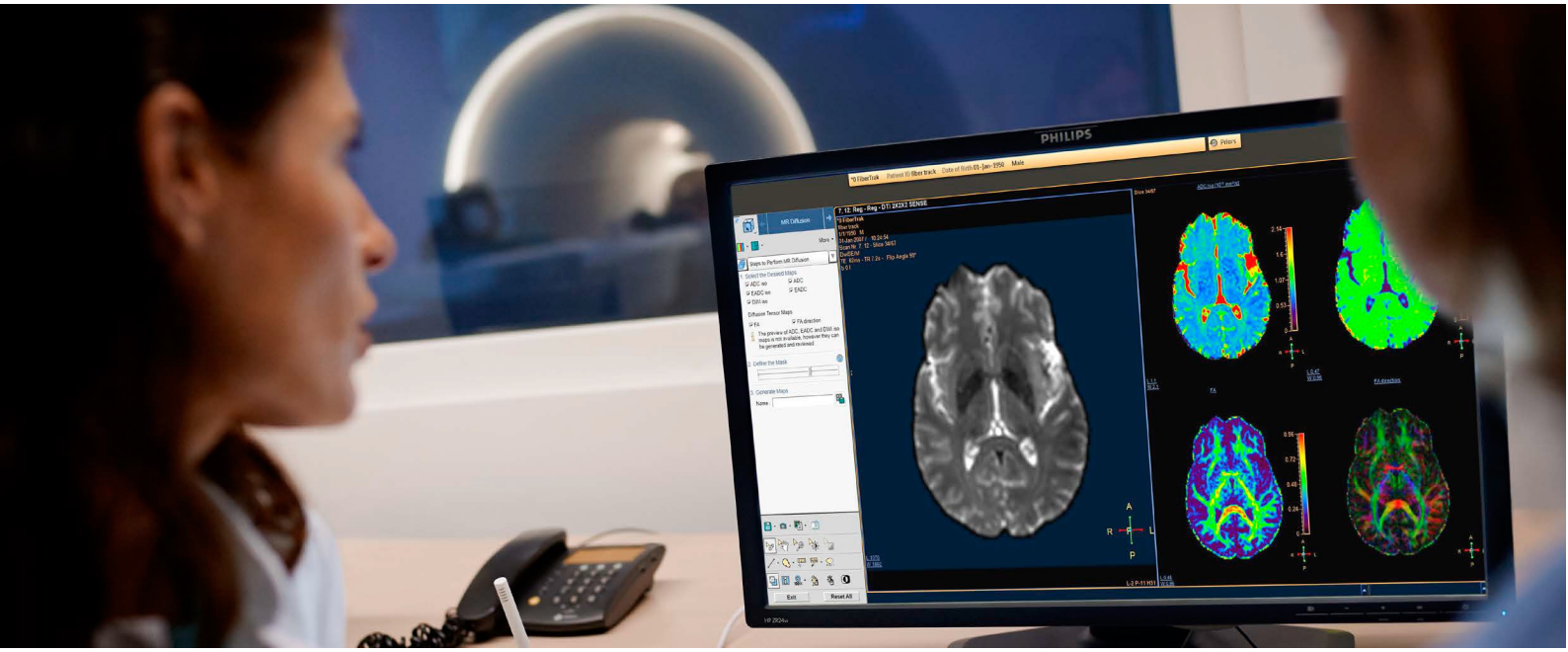
   ➔If an underlay is used, this provides additional anatomical details on the layers in the main viewport.

3. To select an **Overlay**, select the check box next to the overlay selection in the Task Guidance Window.

4. Select an Overlay from the list or select FA direction.

   ➔FA-direction overlay: In a direction overview the colors used indicate the **direction of diffusion**:

   - **Blue**: Head and Feet
   - **Green**: anterior and posterior
   - **Red**: right and left

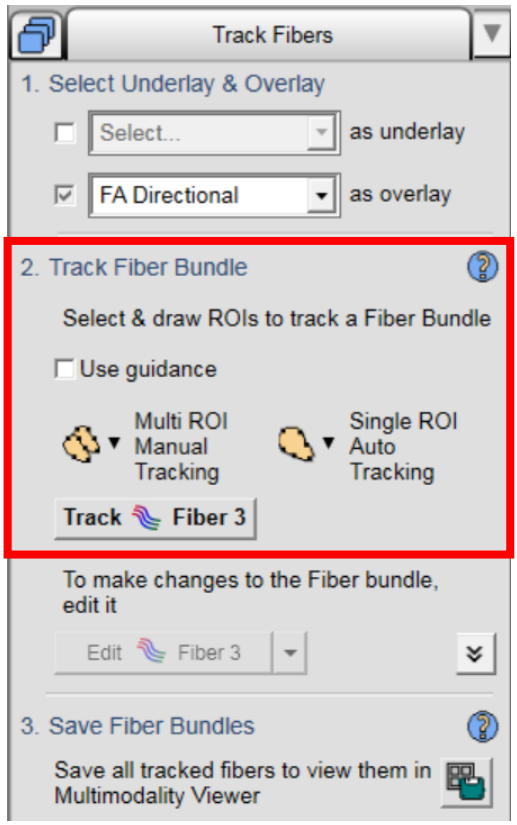


How to track a Fiber Bundle

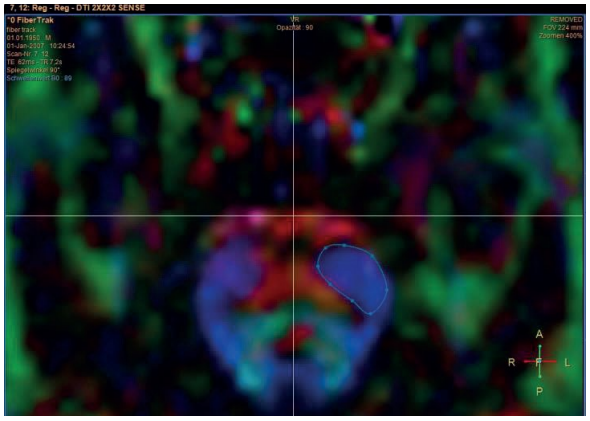
In this step of the FiberTrak process, ROIs can be drawn on the main viewport. For easier localization and identification of frequently occurring fiber bundles a guide window (**Use Guidance**) is optionally available.

To track a fiber bundle, scroll to the layer position at where you want to draw your first ROI. The position of a layer can also be viewed with the 3 reference views on the right hand side of the main viewport. Use the interactive plane tool or the colored lines within the reference views. To select a predefined orientation, please use the alignment tool.

When the correct position of the fiber bundle is displayed, activate the ROI tool in the Task Guidance Window **(Single– or Multi-ROI).** If the desired ROI tool type is not available, click on the drop down arrow next to the tool to select one of the following ROI tools:

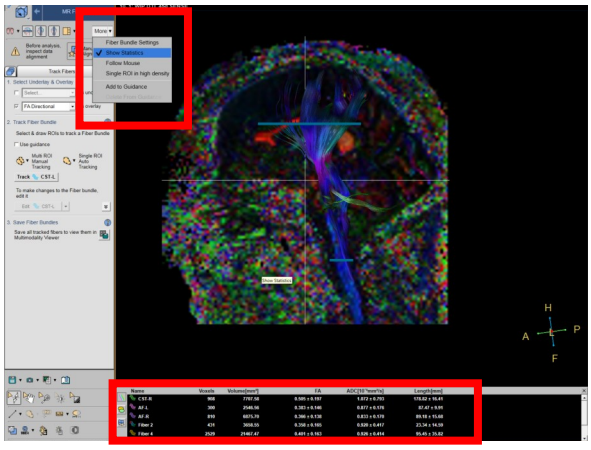


Now draw an ROI around the fiber bundle . Place the seed points or the contour on the edges of the fiber bundle. Close the ROI by double-clicking the left mouse button. If desired, correct the contours by moving the cursor over the drawn contour. Correct the seed points if necessary.



Depending on the characteristics of the tracked fiber bundle and the selected segmentation type (Singel– or Multi-ROI), one or more ROIs can be drawn on the image series. Scroll along the course of the fiber bundle and draw additional ROI if desired (only available in Multi-ROI mode).

Note: Remember that multiple ROIs should always be drawn in the same orientation (transversal, sagittal, coronal) as tracking of the fiber bundle may fail if done otherwise.Once all ROIs are drawn, calculate the marked fiber bundle by clicking on the "**Track**" button in the Task Guidance.



The tracked fiber bundle will now become visible in the main viewport. By selecting the „**More**“ option from the Task Guidance, the **Fiber Statistics** including parameters such as **ADC, volume and length** can be displayed below the main viewport.

Exclude Fibers from a segmented Fiber Bundle

Specific fibers may be excluded from a tracked Fiber Bundles:

1. Select the fiber bundle from in the Task Guidance window and select **Edit or right click** on the fiber bundle and select **Edit**
2. Manipulate the layers in the main display area until the location of the fibers that need to be excluded becomes visible.
3. Select an **ROI tool** from the Task Guidance Window.
4. Draw an ROI around the specific fibers that need to be excluded from the volume. Double click to fnish.
5. Right-click on the ROI and and select **Exclude** from the context menu.
6. Click on **Track** in the Task Guidance window to track the fiber bundle and to apply the changes.

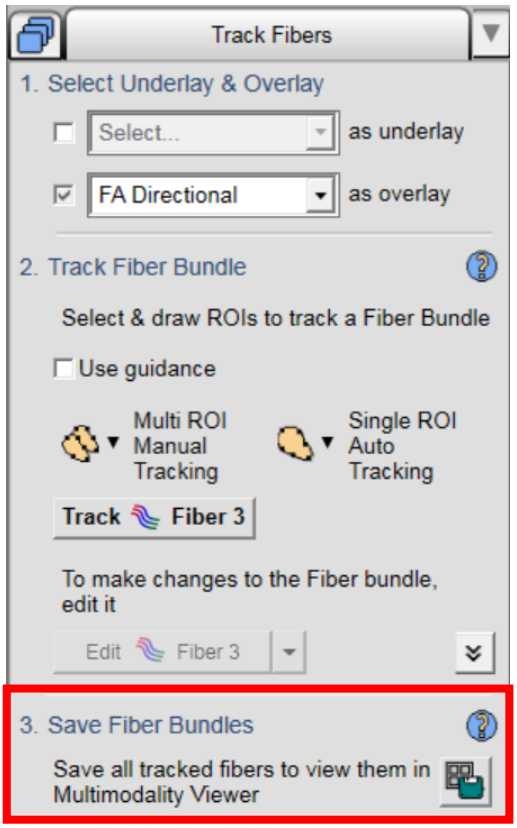
➔ All fibers in the new ROI will be excluded from the tracked Fiber bundles.

Save the Fiber Bundle(s)

In this step of the FiberTrak process, fiber bundles can saved for viewing in the MultiModality Viewer.

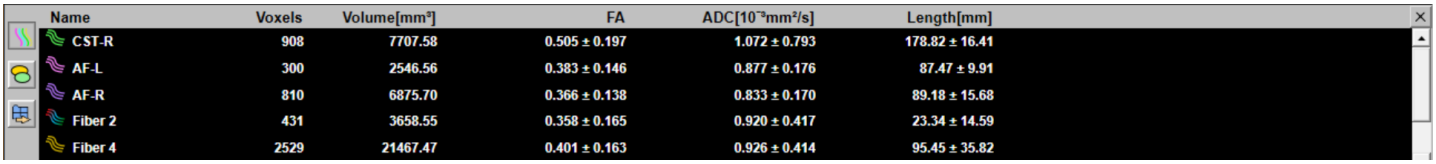
Please note that only the fiber bundles, but not the anatomical underlay will be saved to the patient directory.

To view the combined datasets, please use the object manager in the MultiModality Viewer (see the next page). Click on **Save Fiber Bundles**.

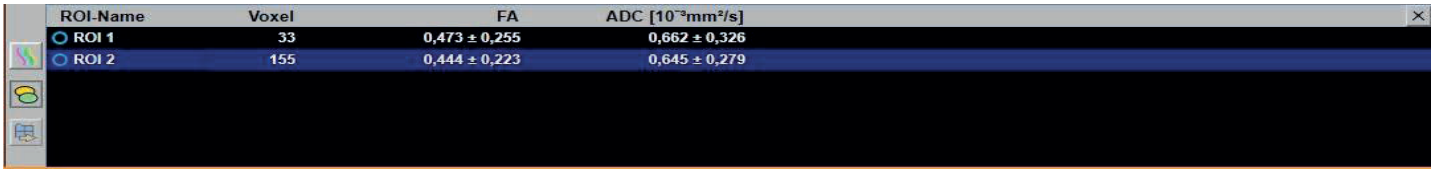


Fiber and ROI statistics

Remember: The context menu "**More**" displays the fiber and ROI statistics at the bottom of the main window. Here, besides the access to the most important parameters, you will find the option to export the values.

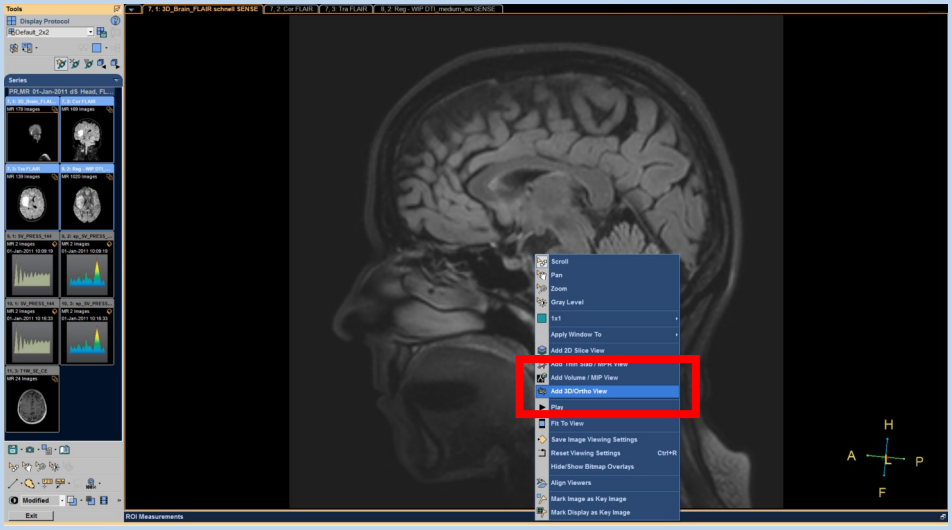


Name	Voxels	Volume[mm³]	FA	ADC[10⁻³mm²/s]	Length[mm]
CST-R	908	7707.58	0.505 ± 0.197	1.072 ± 0.793	178.82 ± 16.41
AF-L	300	2546.56	0.383 ± 0.146	0.877 ± 0.176	87.47 ± 9.91
AF-R	810	6875.70	0.366 ± 0.138	0.833 ± 0.170	89.18 ± 15.68
Fiber 2	431	3658.55	0.358 ± 0.165	0.920 ± 0.417	23.34 ± 14.59
Fiber 4	2529	21467.47	0.401 ± 0.163	0.926 ± 0.414	95.45 ± 35.82



ROI-Name	Voxel	FA	ADC [10⁻³mm²/s]
ROI 1	33	0,473 ± 0,255	0,662 ± 0,326
ROI 2	155	0,444 ± 0,223	0,645 ± 0,279

Image Fusion in MultiModality Viewer



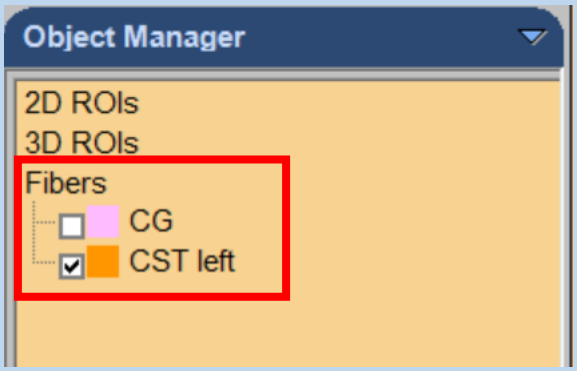
Select the **1x1 layout** from the the upper menu bar of the MM viewer and load a anatomical series (typically high-resolution) into the main viewport.

Then open the context menu by right clicking on the image in the main viewport and select **Add 3D OrthoView.**

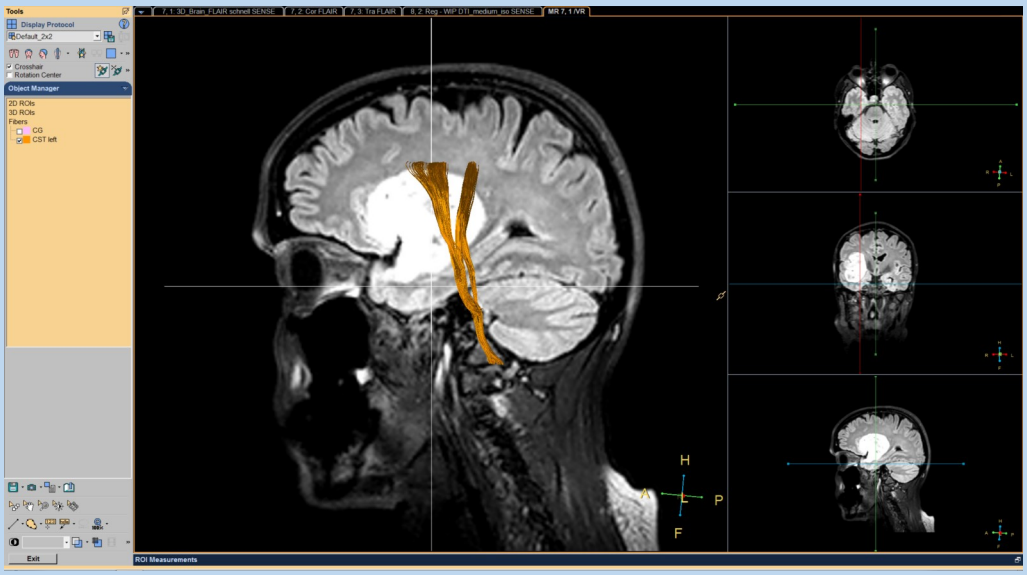
The MM-Viewer now creates a Multiplanar view of the anatomical Series with 3 reference pictures on the right picture border.

Click on the **Serial** tab in the Task Guidance and select Object Manager from the drop down menu.

Image Fusion in MultiModality Viewer



To add one or more fiber bundles to the image series, check or uncheck the corresponding checkboxes.



A fused image series will be crated. If desired, use the batch functionality from the dropdown menu to create a derived series.

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