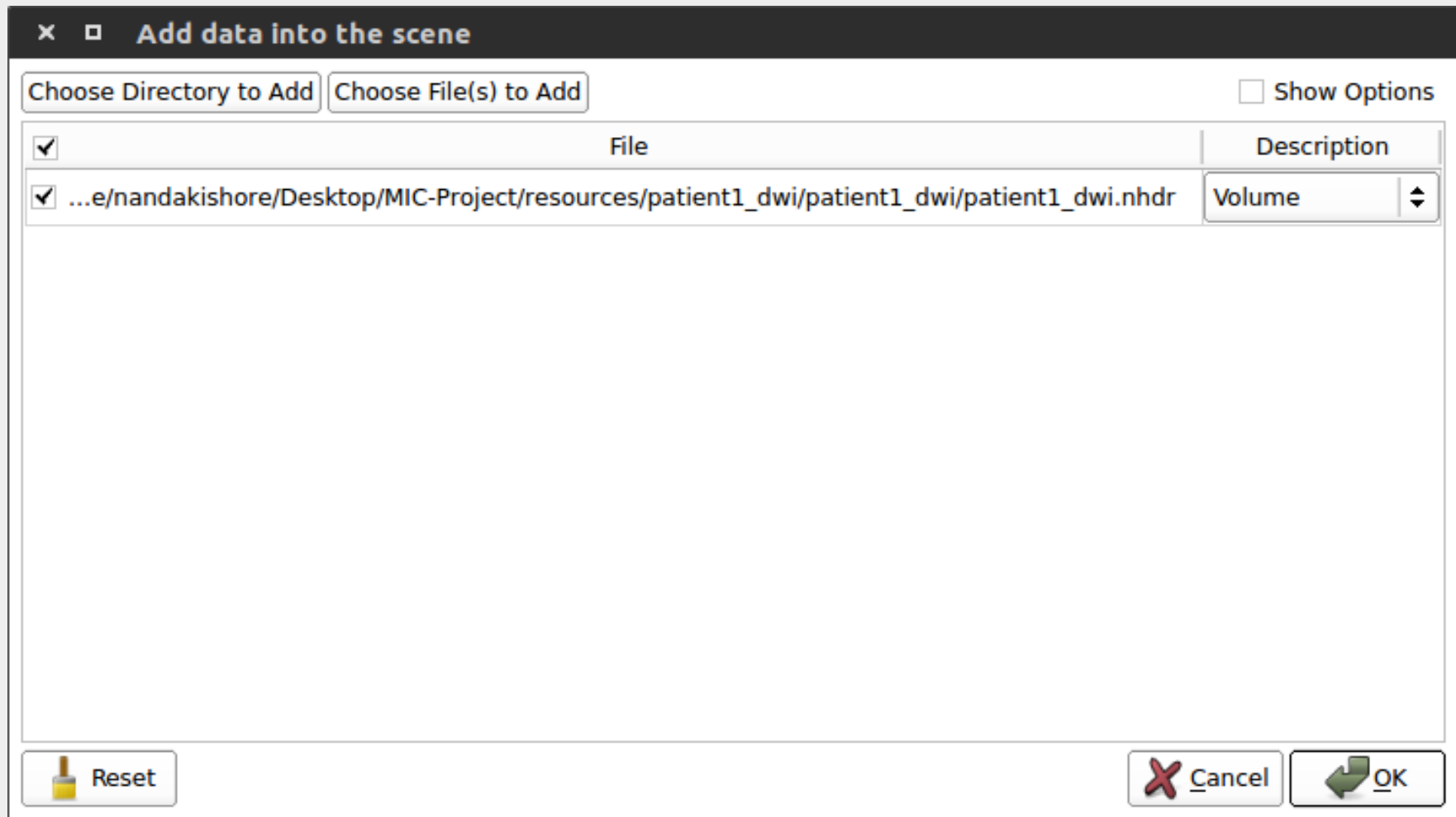


DTI Tractography for Neurosurgery

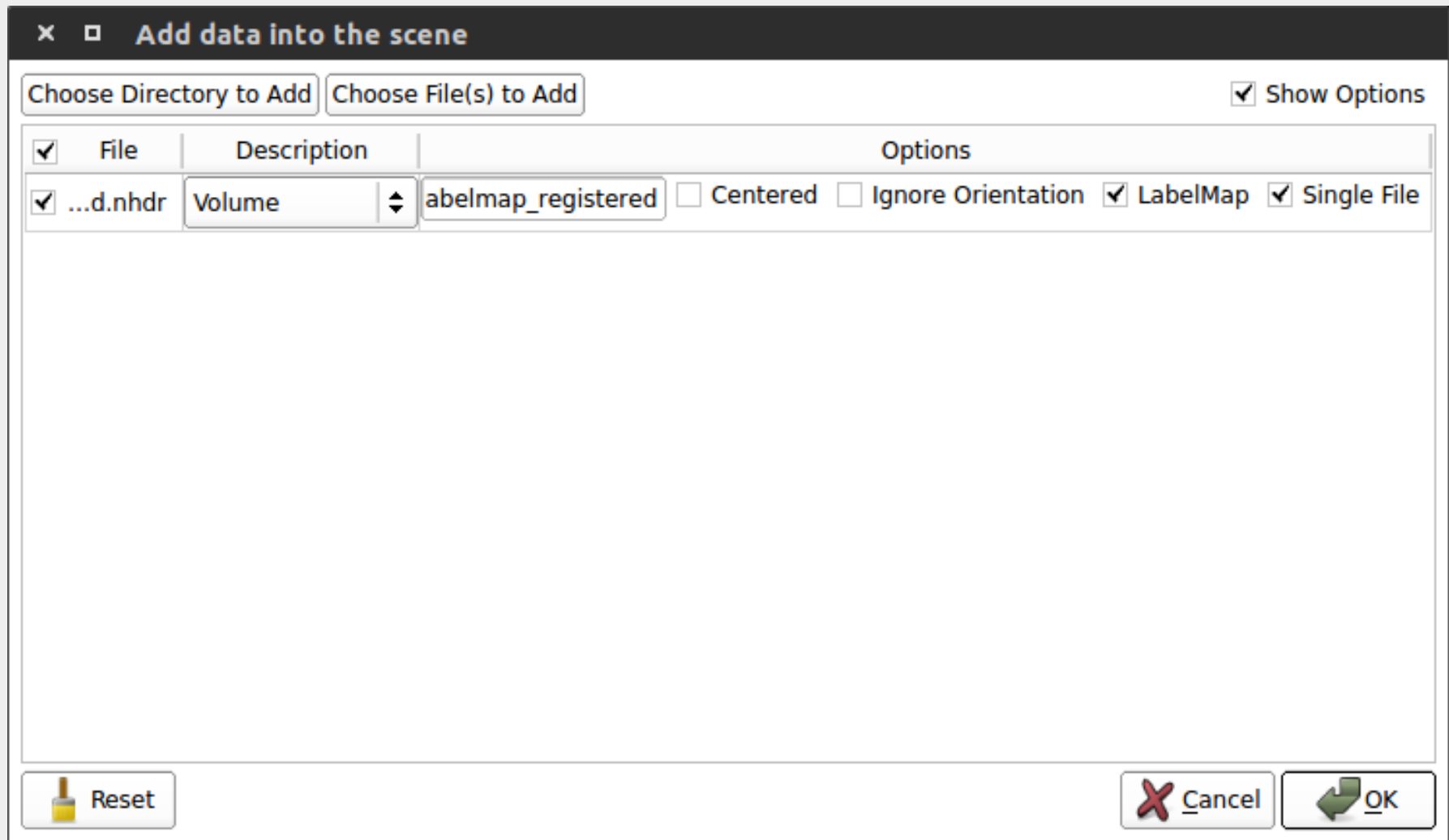
Steps to Perform Tractography using 3D Slicer –

- **Step 1** – Load the DWI Image into 3D Slicer –

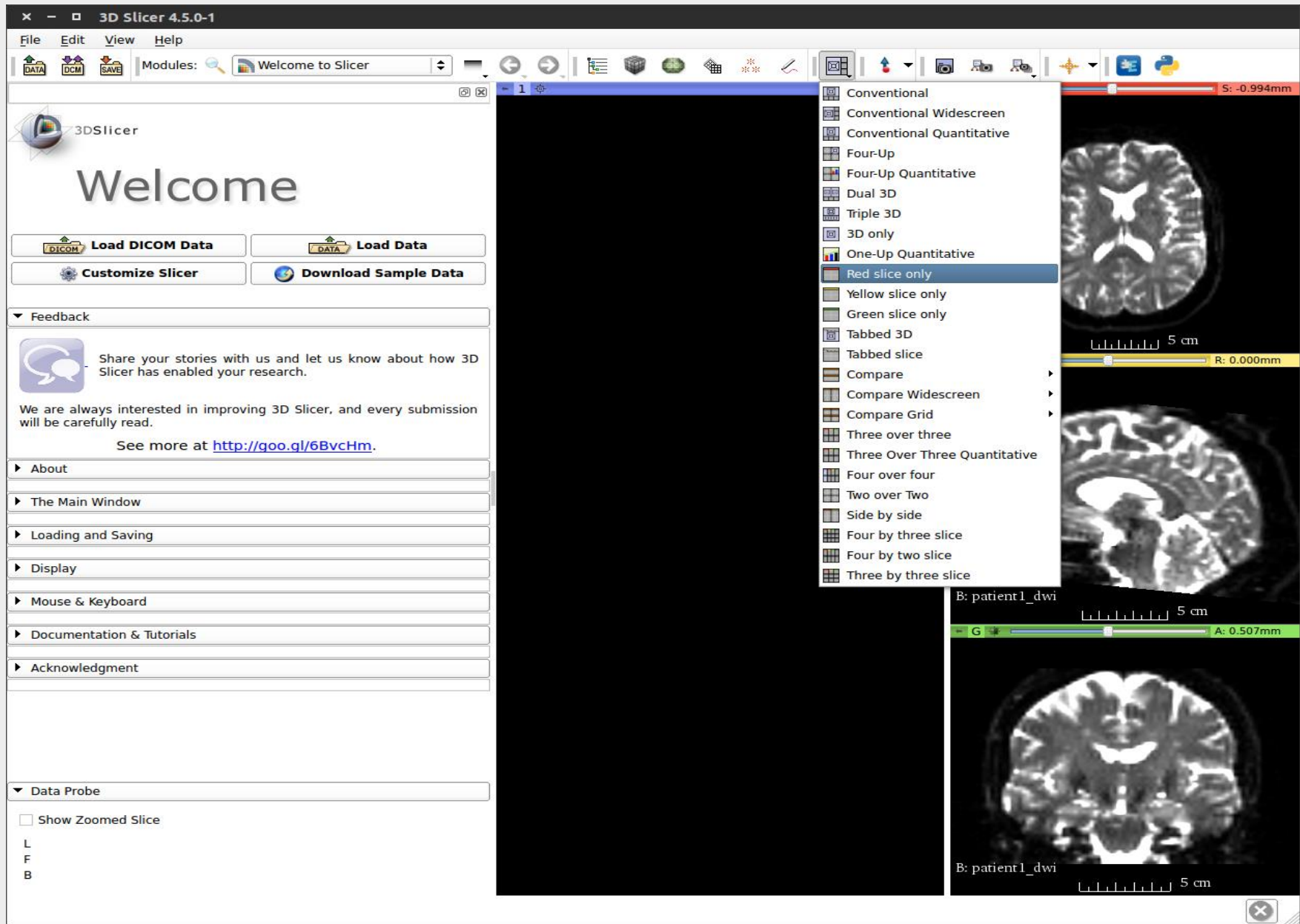


- **Step 2** – Load the Label Map Image into 3D Slicer –

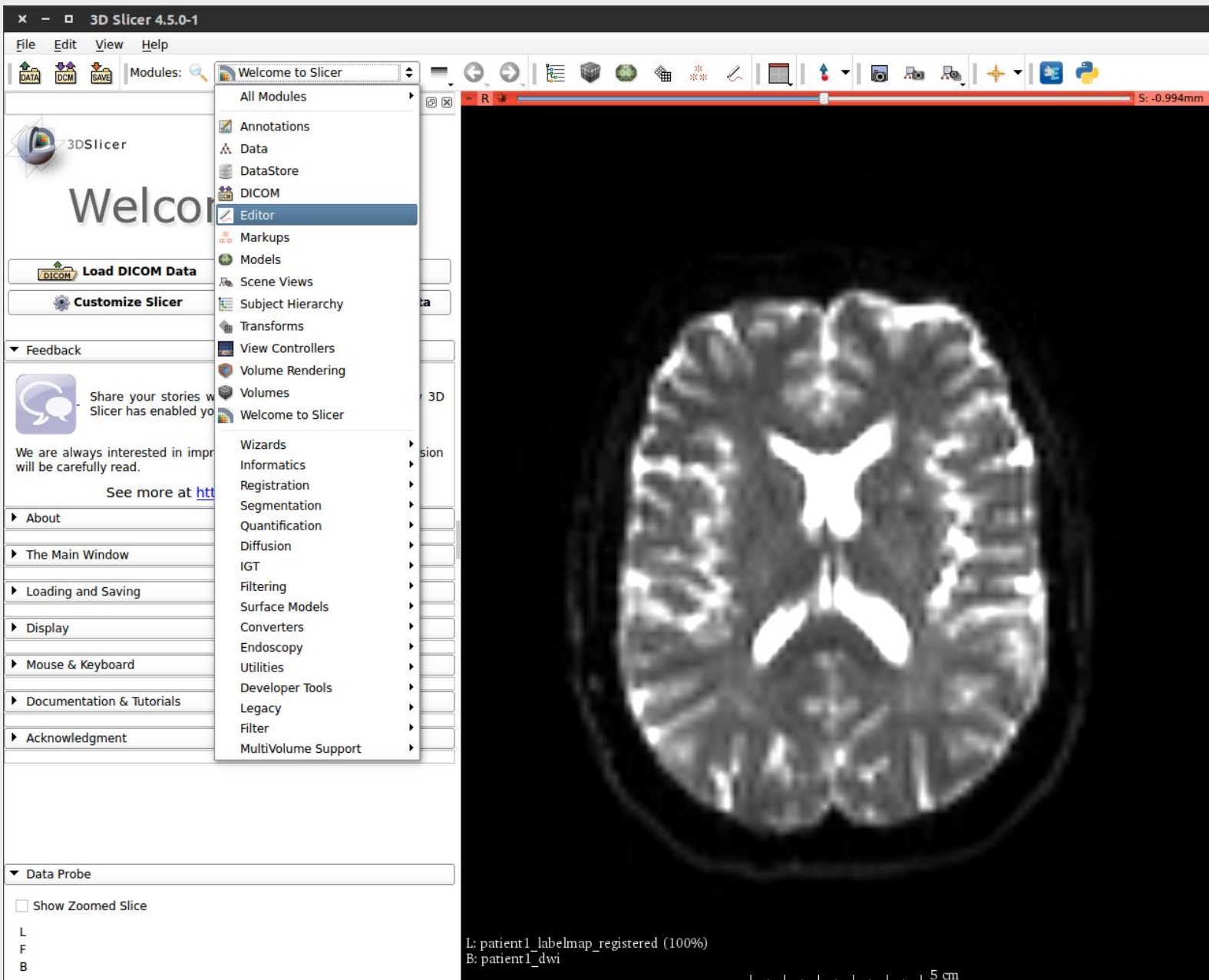
Click on “Show Options” for additional options. Check against the “Label Map” to let Slicer know that we are importing a Label Map image.



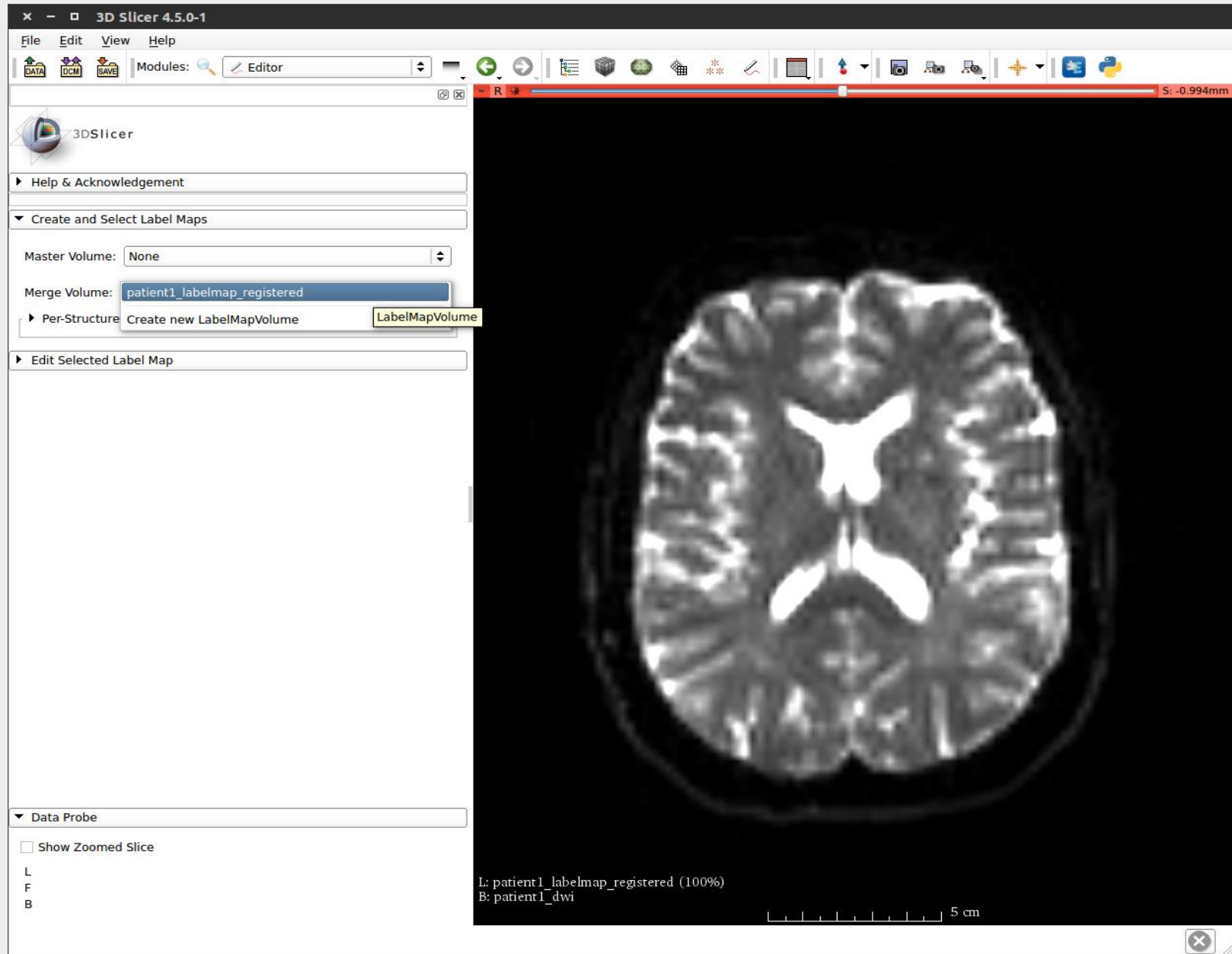
- **Step 3** – Click on Layout section and select “Red Slice Only” –



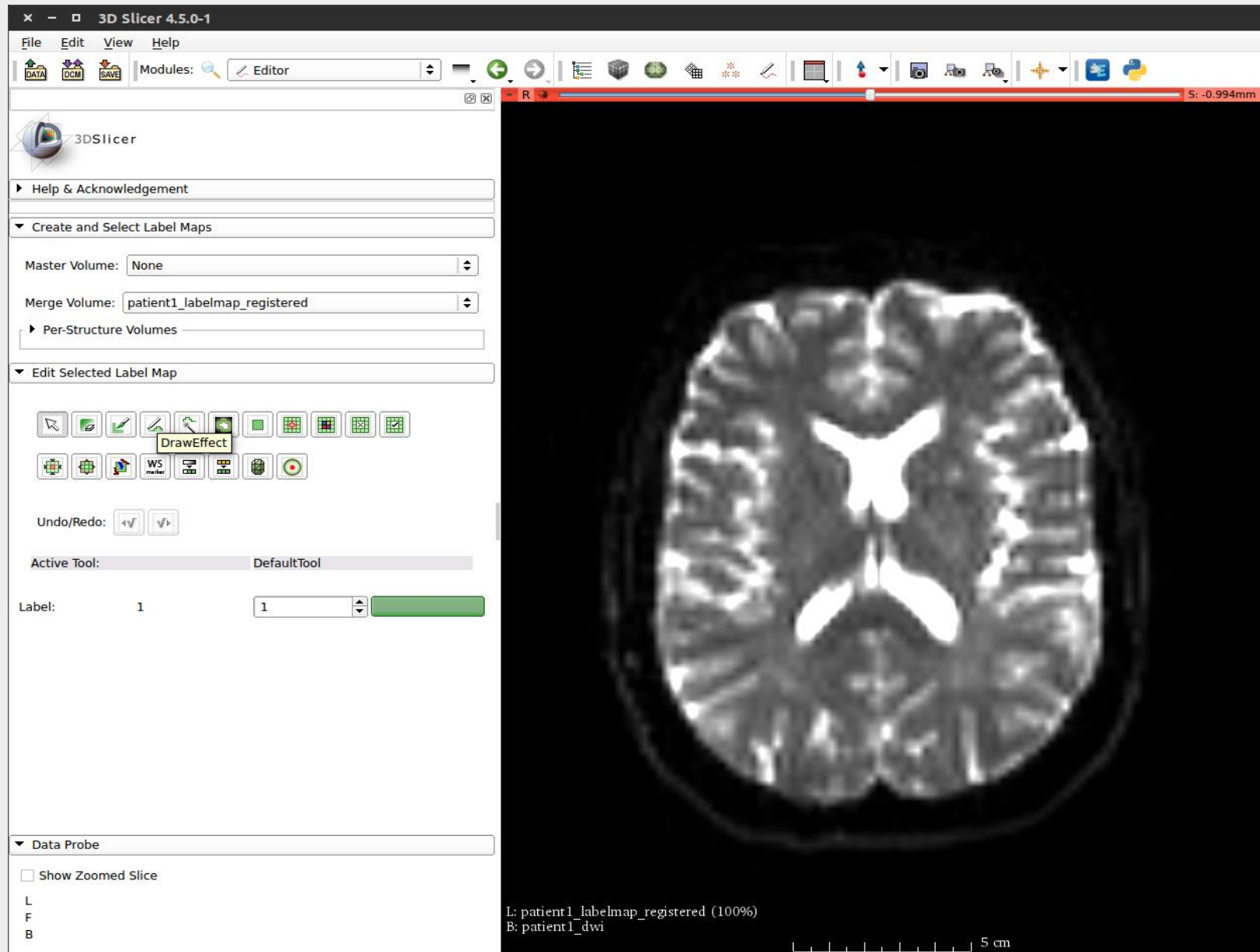
- **Step 4** – Let us now define label maps which behave as seed points for the Tractography process. Select “Editor” Module from the Modules dropdown –



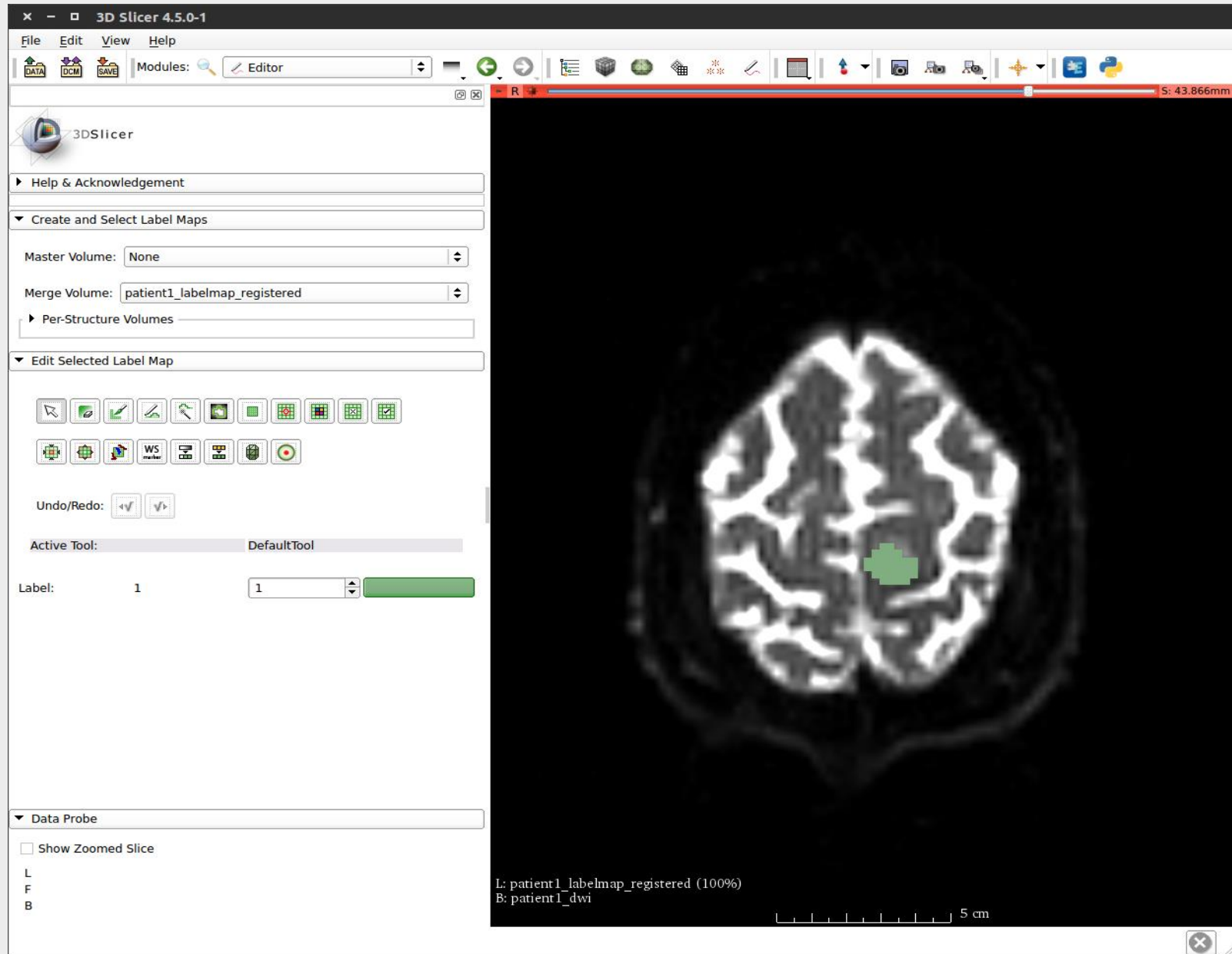
- **Step 5** – Once in the “Editor” Module, Select the Label Map volume loaded in Step 2 –



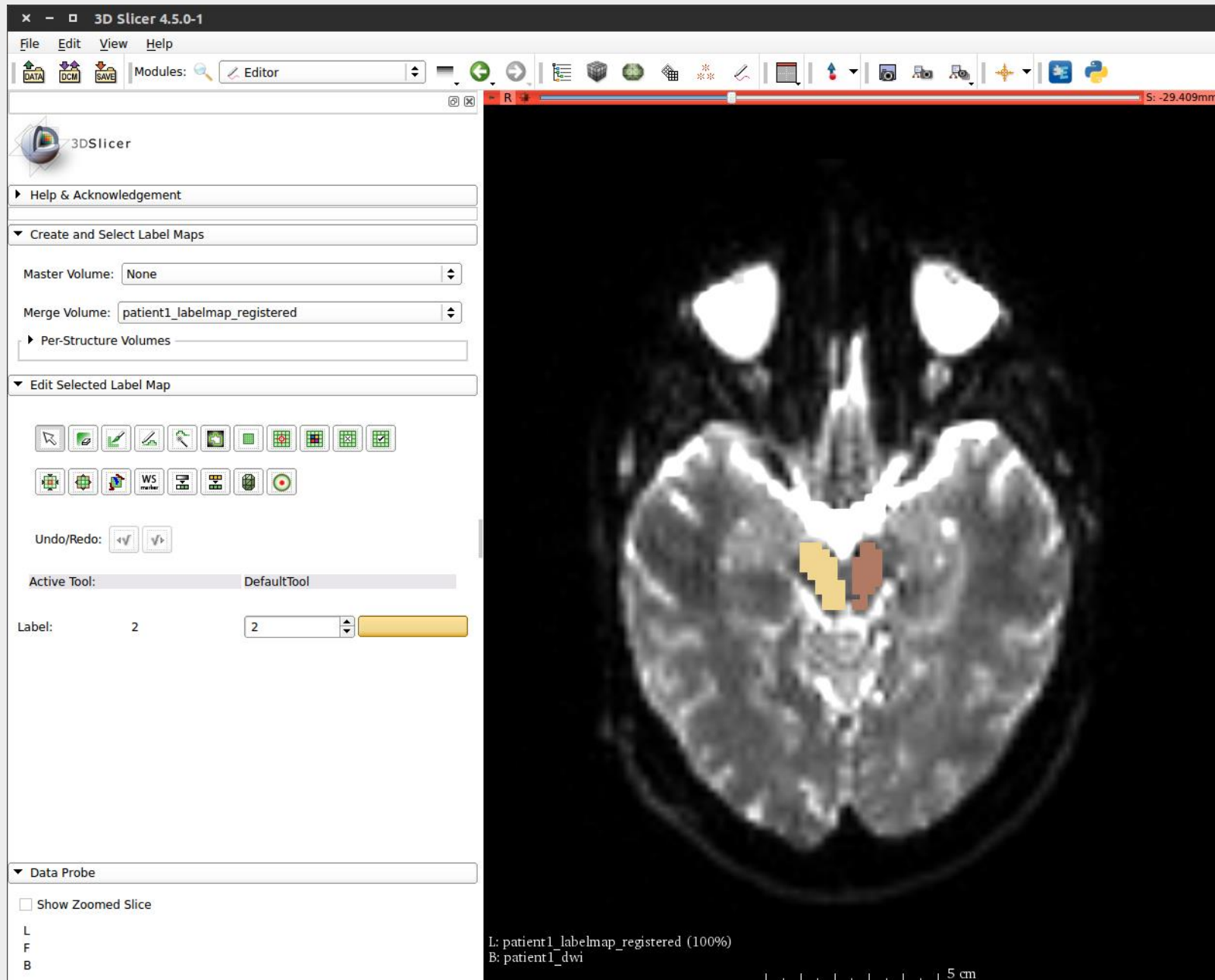
- **Step 6** – Next step is to Edit the “Label Map” volume – Select the “DrawEffect” tool from the available options.



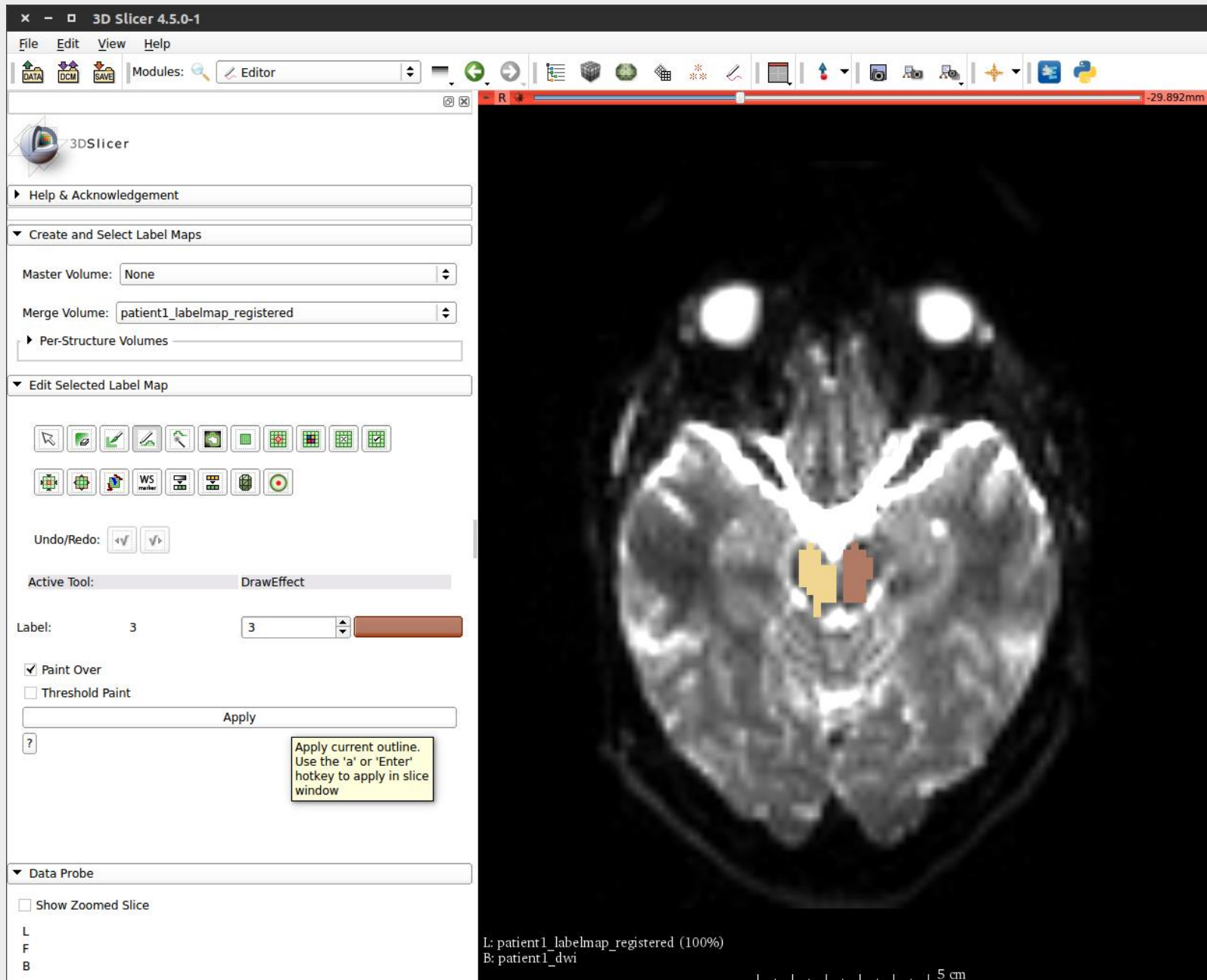
- **Step 7** – Draw around the tumor region and press “Enter” to save the drawing. Repeat this step for 3 adjacent slices. Image below shows the tumor labelled as 1 with its corresponding color.



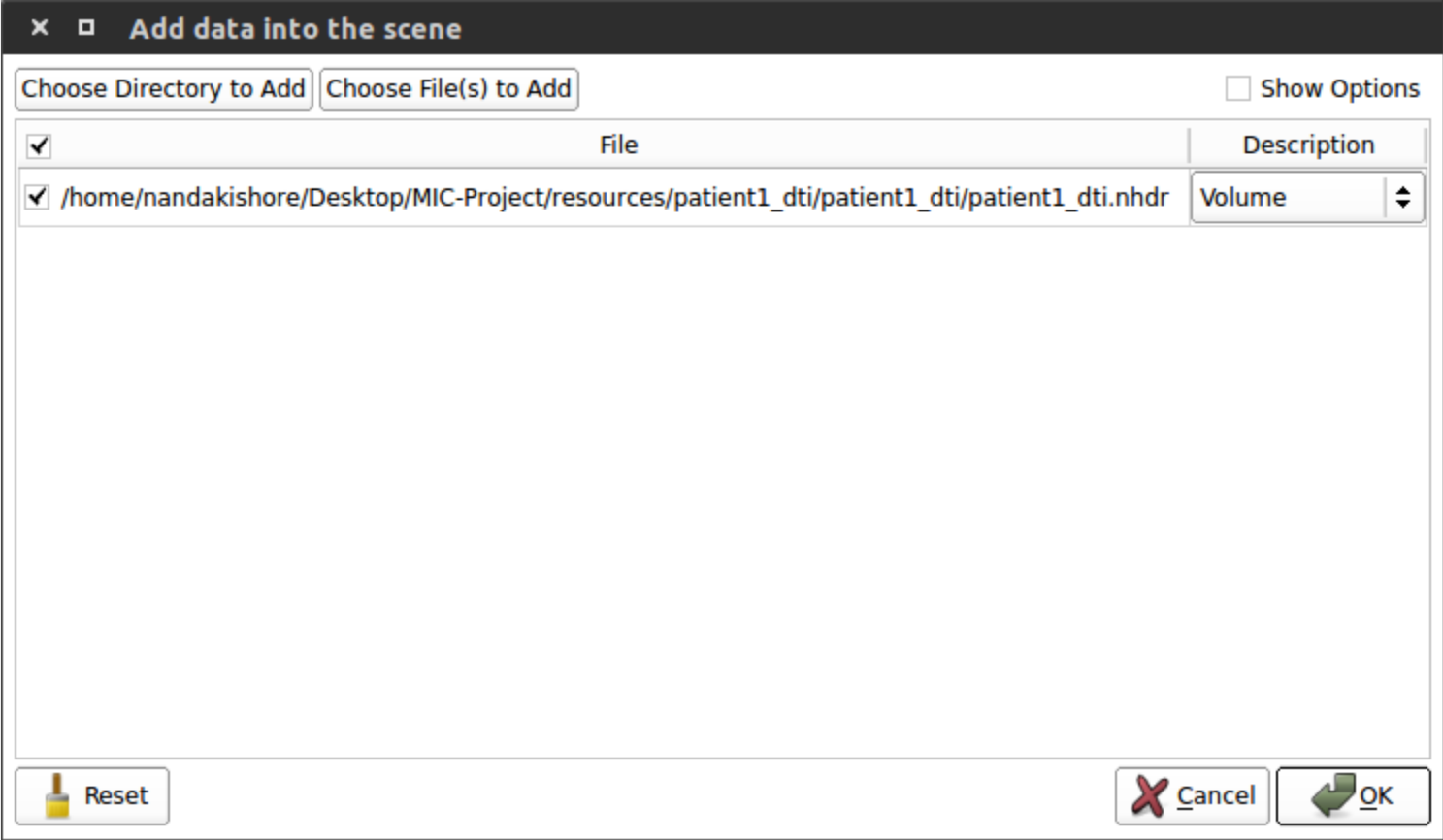
- Similar to **Step 7**, choose a different label and draw around the left corticospinal tract region, repeat the step for three slices –



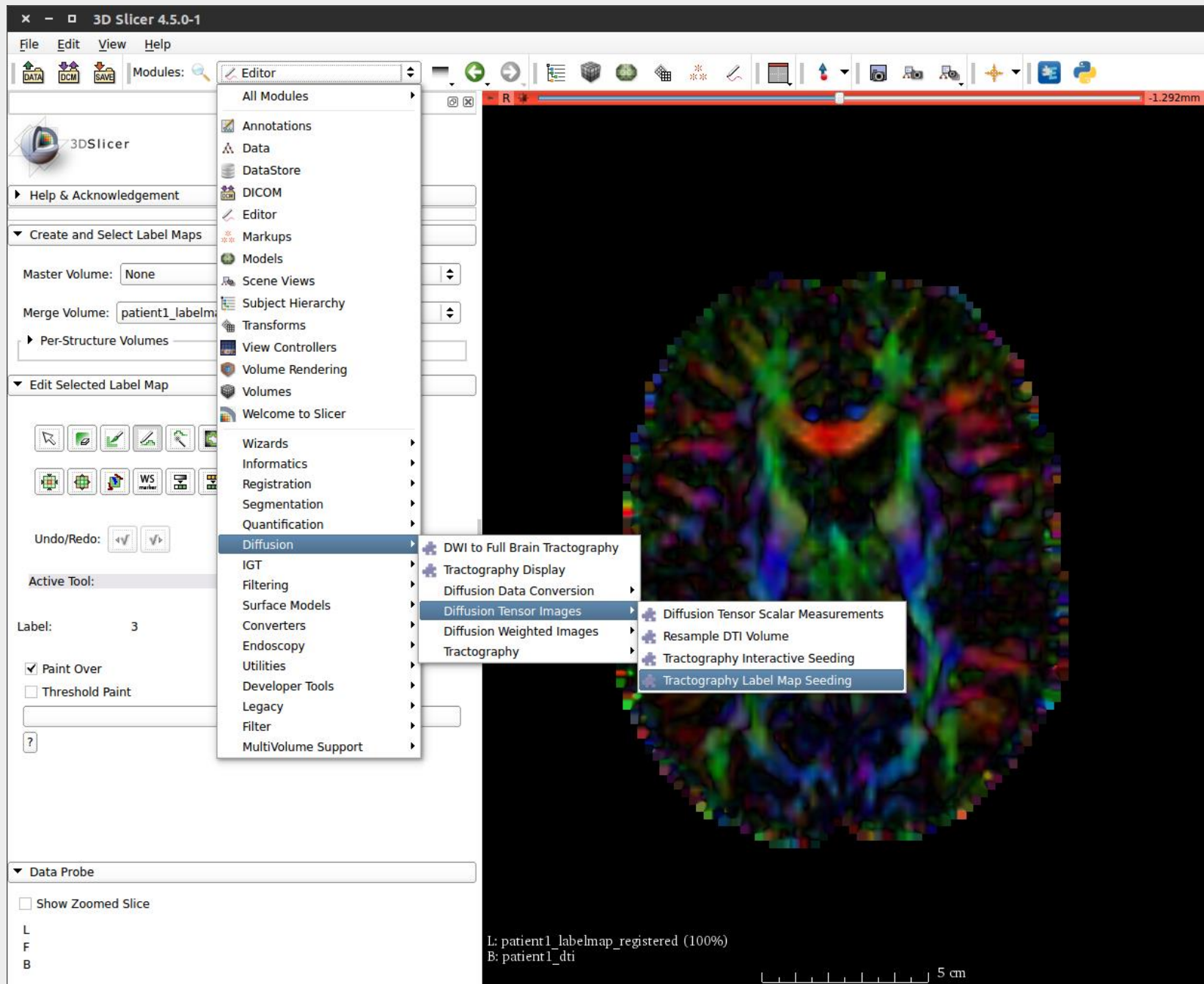
- Similar to **Step 7**, choose a different label and draw around the right corticospinal tract region, repeat the step for three slices and click on “apply” –



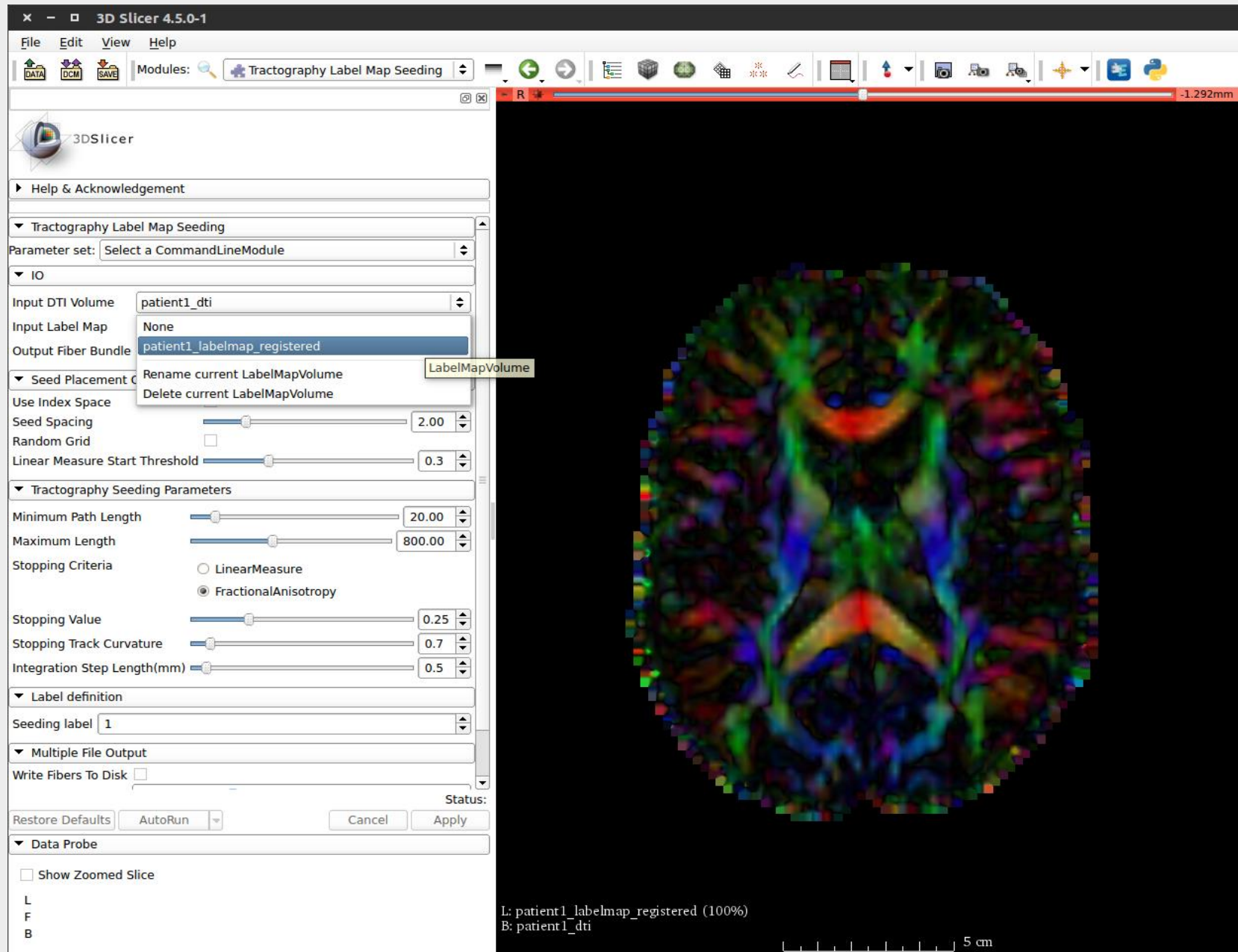
- **Step 8** – Load DTI Volume into 3D Slicer –



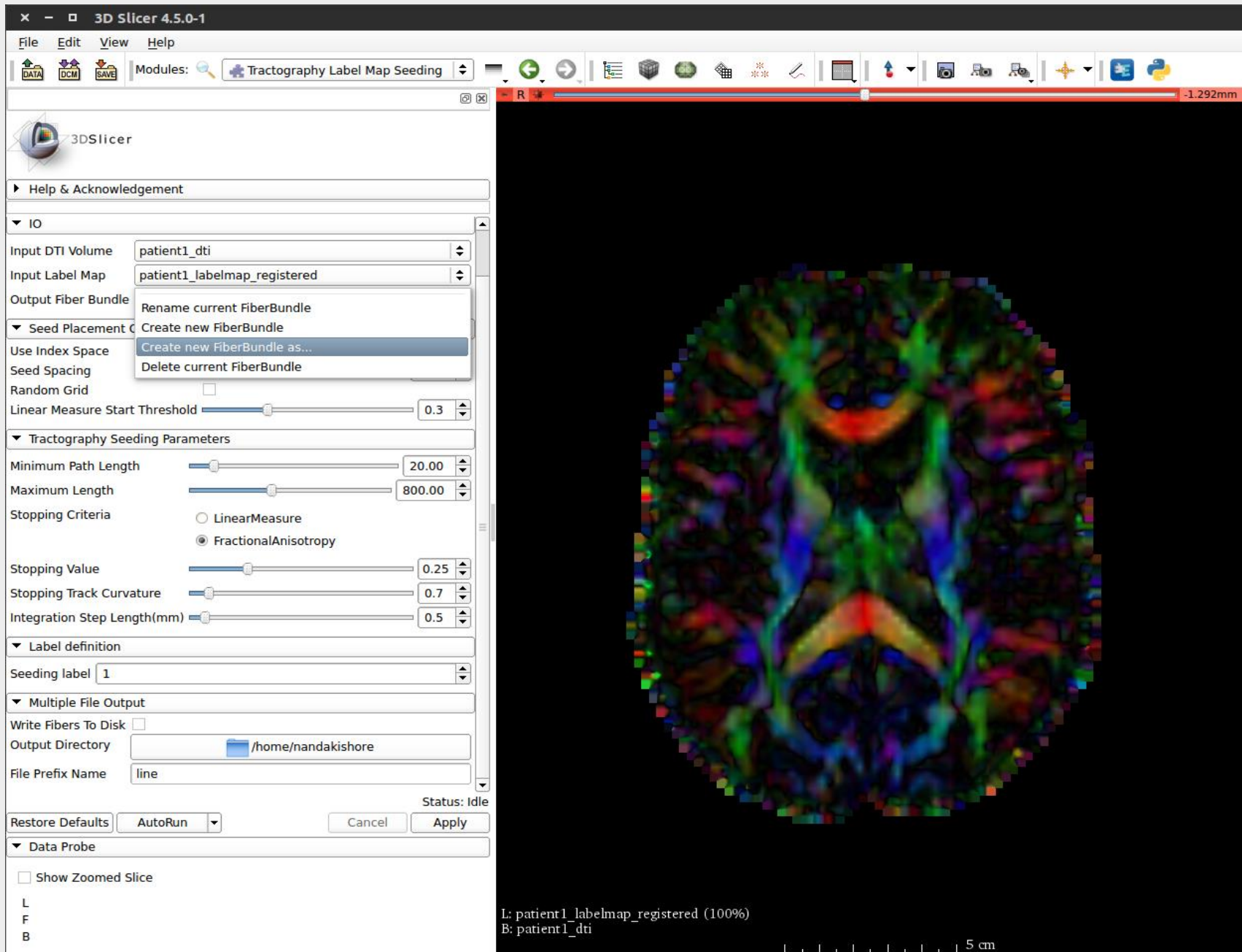
- **Step 9** – Select “Tractography Label Map Seeding” from the “Diffusion” module. The module hierarchy is as shown in the image below -



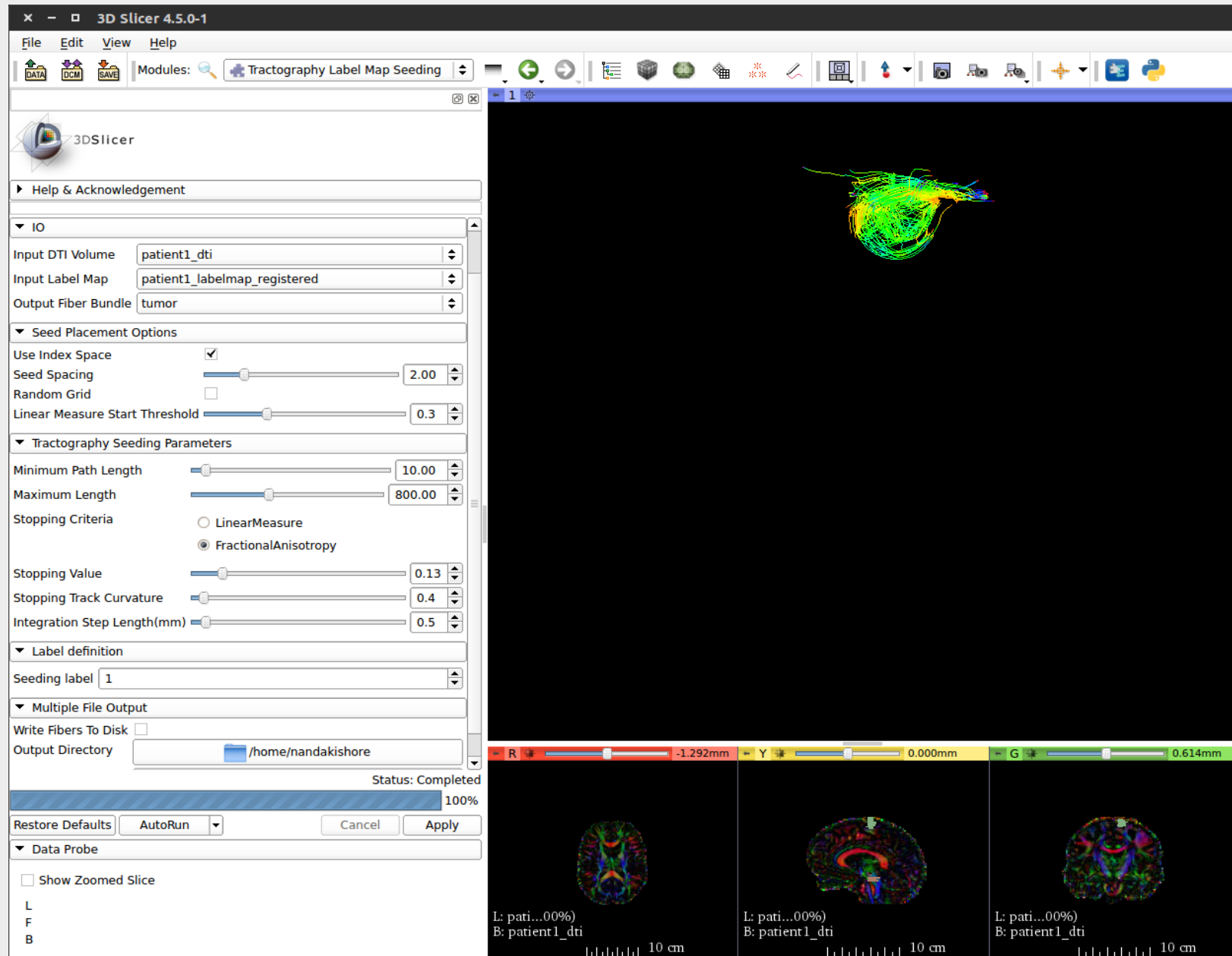
- **Step 10** – Set Inputs to initiate Tractography with Label Map seeding – “Input DTI Volume” – Select the loaded DTI Volume. “Input Label Map” – Label Map volume which we created in **Step 7**



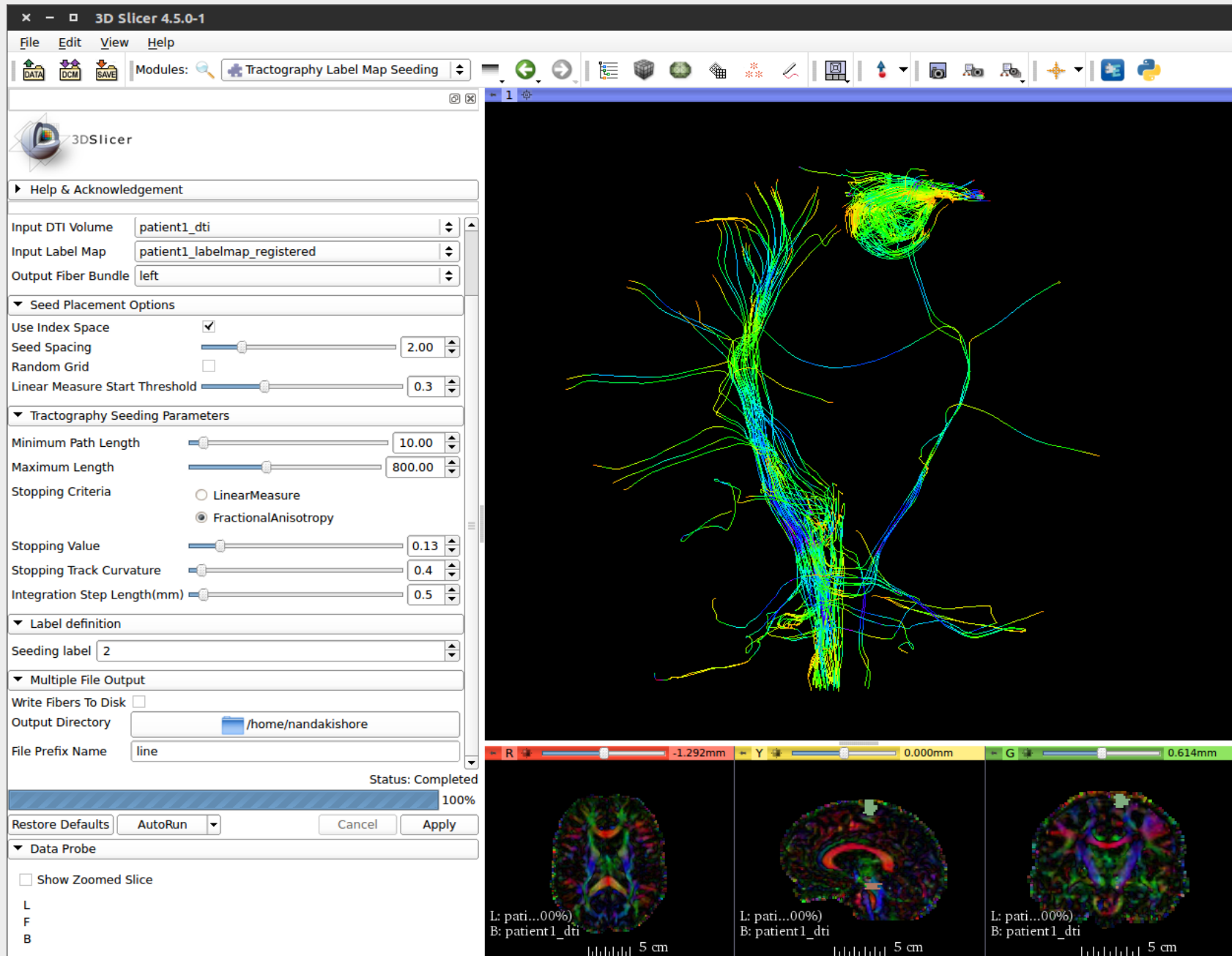
- **Step 11** – Create a New bundle to save the Tractography results. Select the “create new bundle as” option and give a name of your choice. Let us call it “tumor” fiber.



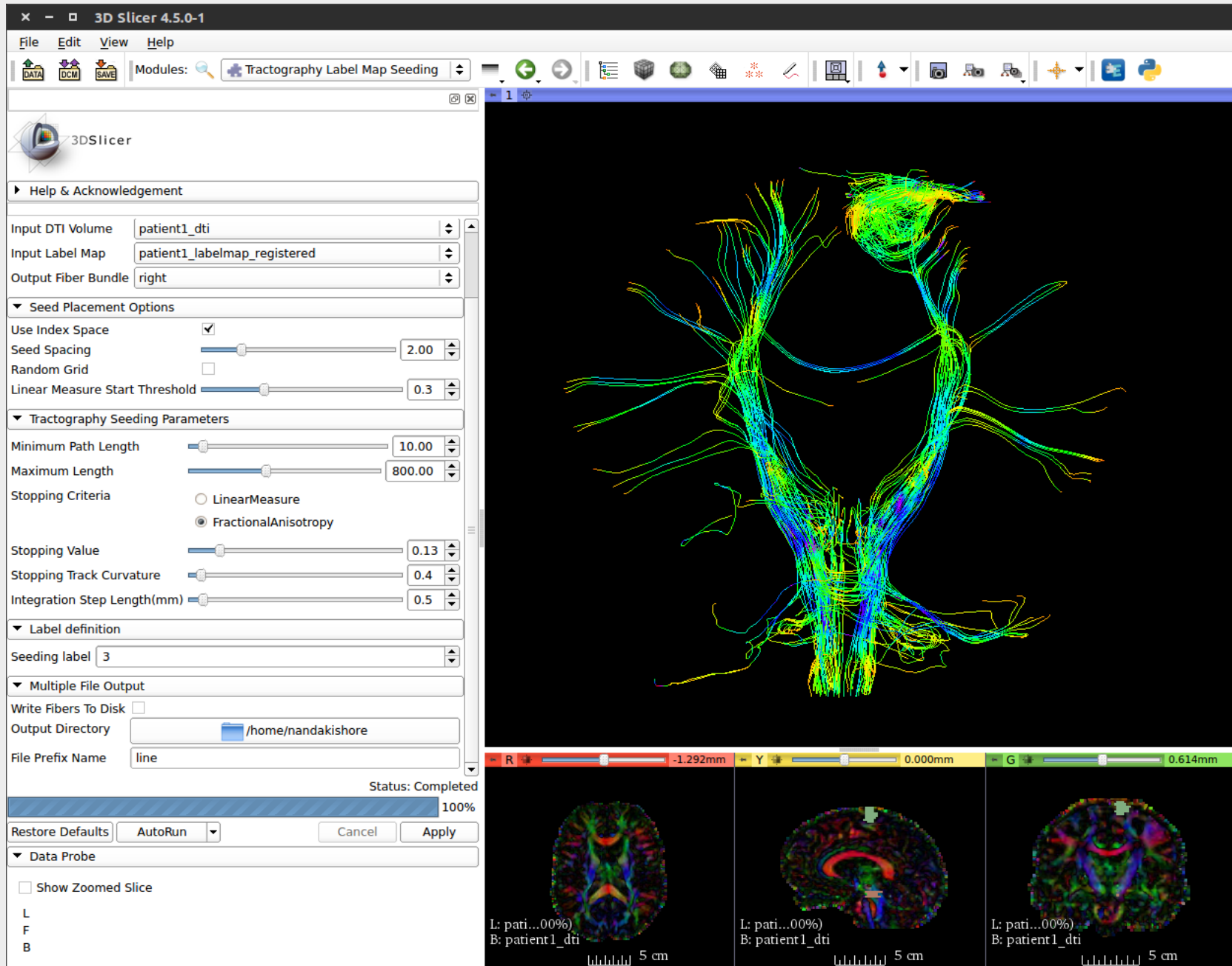
- **Step 12** – Set the Tractography Seeding Parameters, select Label = 1 for tracking fibers around the tumor. Click on Apply. Tractography results will be displayed on the 3D View (Switch to 3D View to view the output).



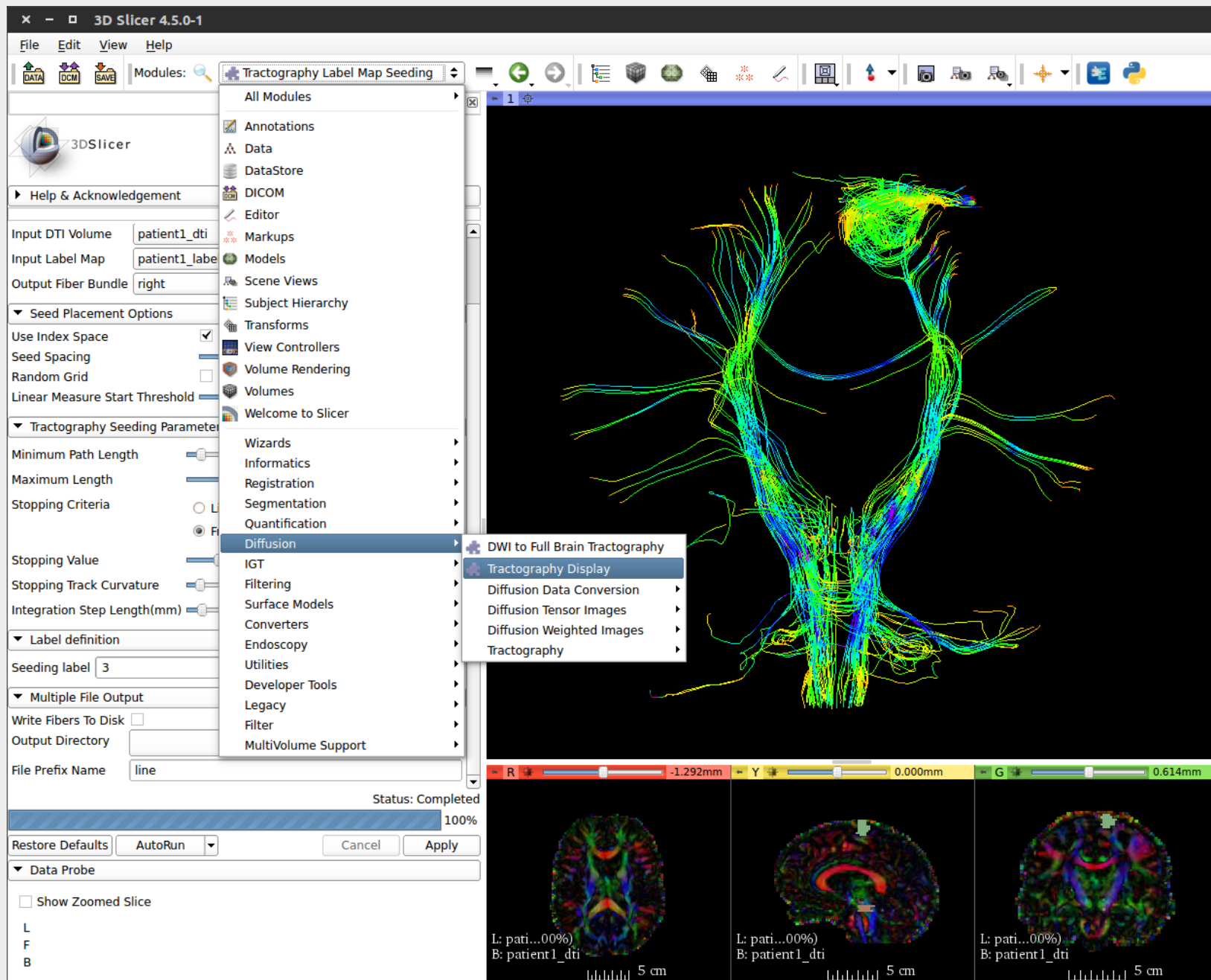
- Step 13** – Define a new Output Fiber Bundle and name it as “left” corticospinal tract. Select “Seeding Label” value as 2 for tracking fibers through the left corticospinal tract. Click on Apply. Tractography results will be displayed on the 3D View.



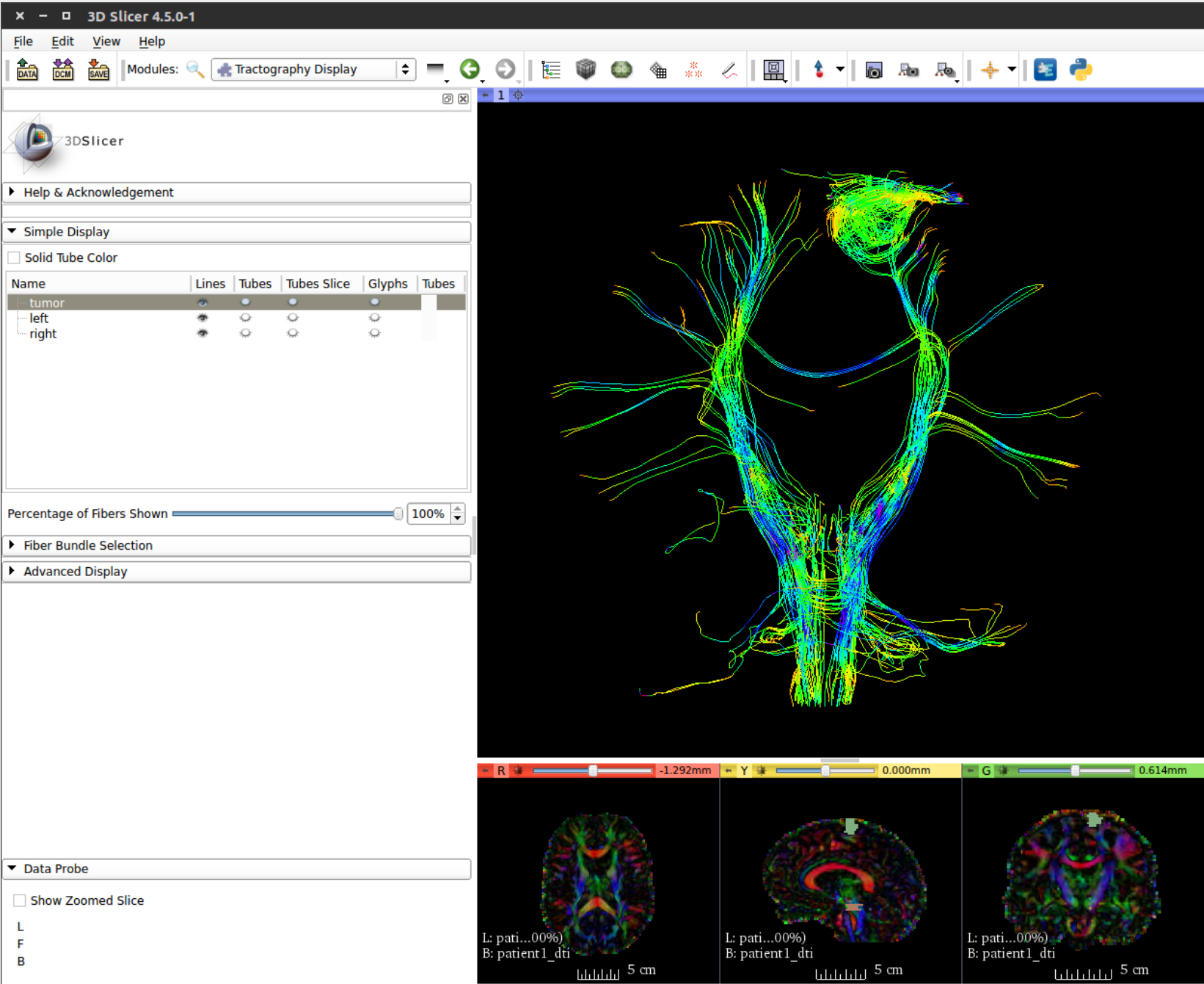
- **Step 14** – Define a new Output Fiber Bundle and name it as “right” corticospinal tract. Select “Seeding Label” value as 3 for tracking fibers through the right corticospinal tract. Click on Apply. Tractography results will be displayed on the 3D View.



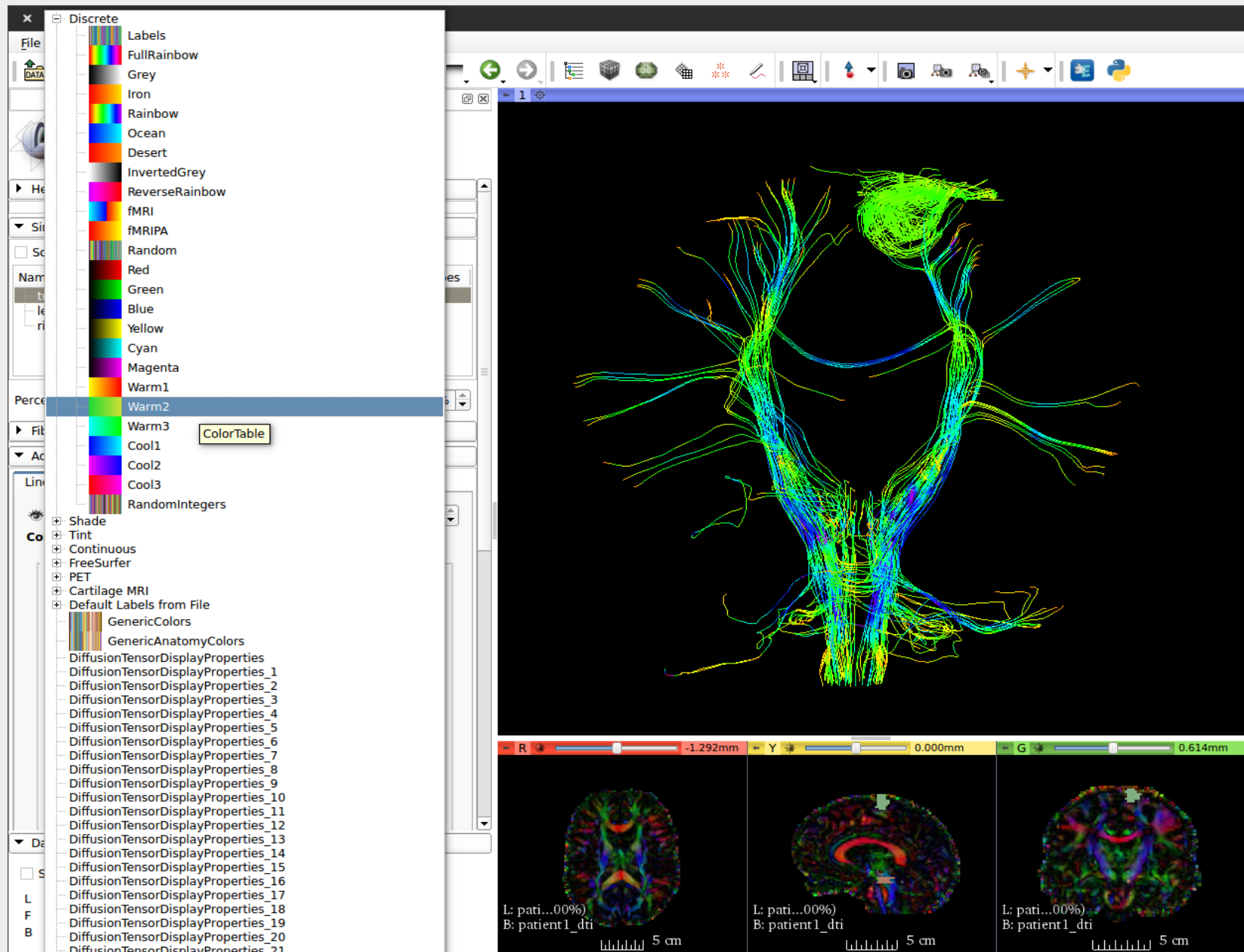
- **Step 15** – Select “Tractography Display” under the “Diffusion” Module as shown below –



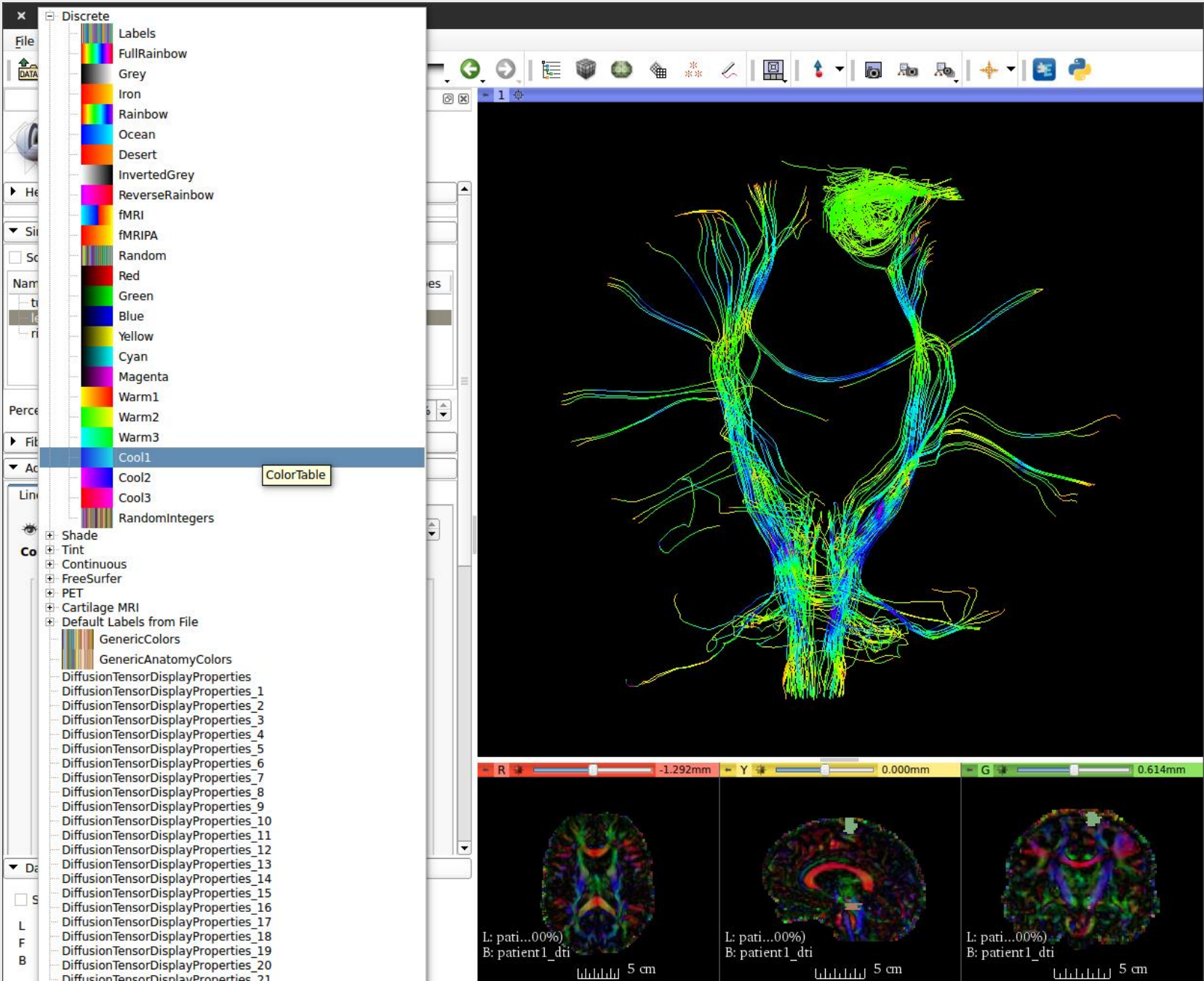
- **Step 16** – Fibers saved in the Tractography process will appear under the “Tractography Display” page as shown in the below screenshot –



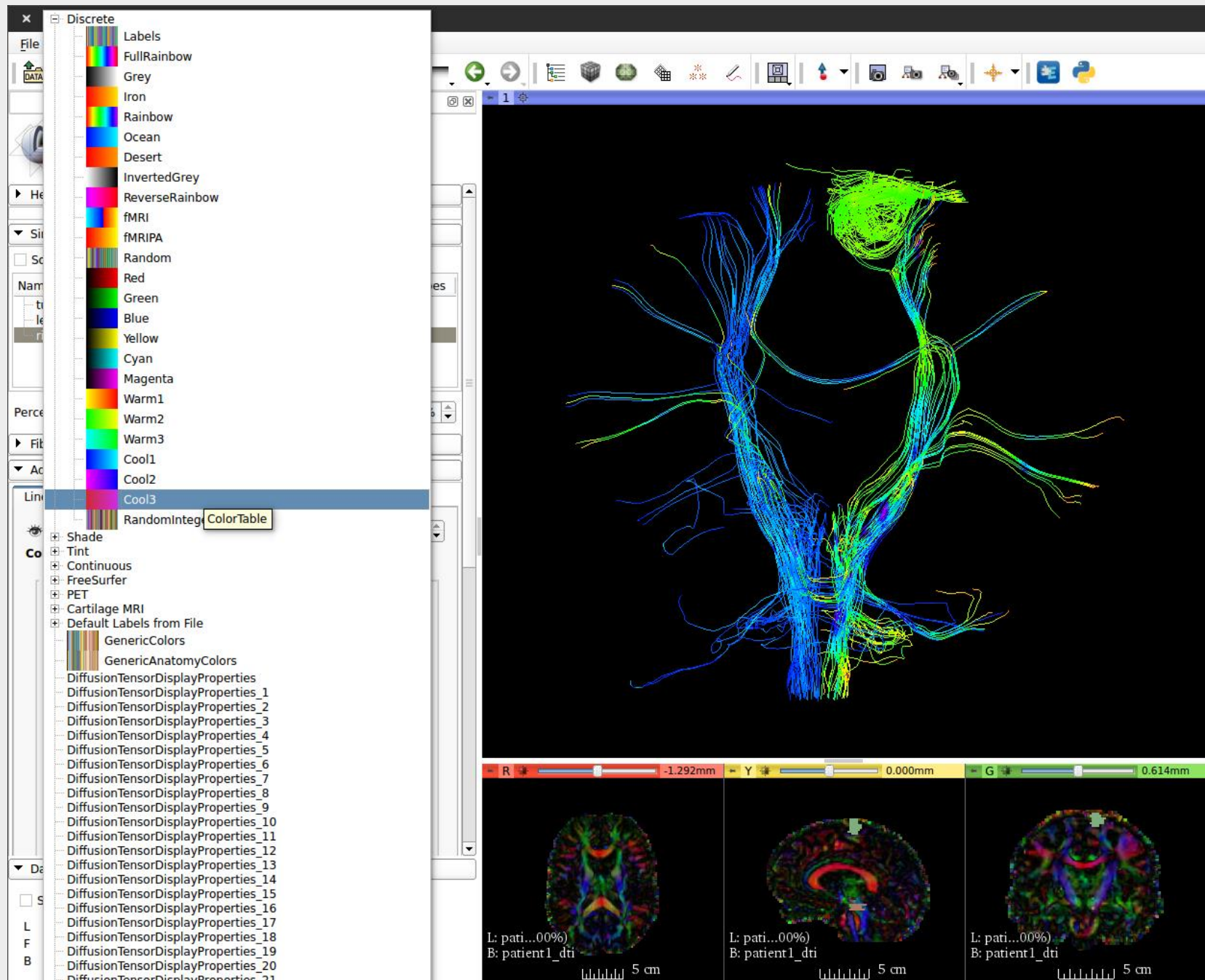
- **Step 17** – Now we have performed fiber tracking for 3 regions – Tumor, Left and Right Corticospinal Tract. In order to distinguish between fibers associated with different regions, let us define different fiber colors for each region. Click on the “Advanced Display” dropdown and click on the default value - “rainbow” to enter the list of color shades available as shown in the figure below –



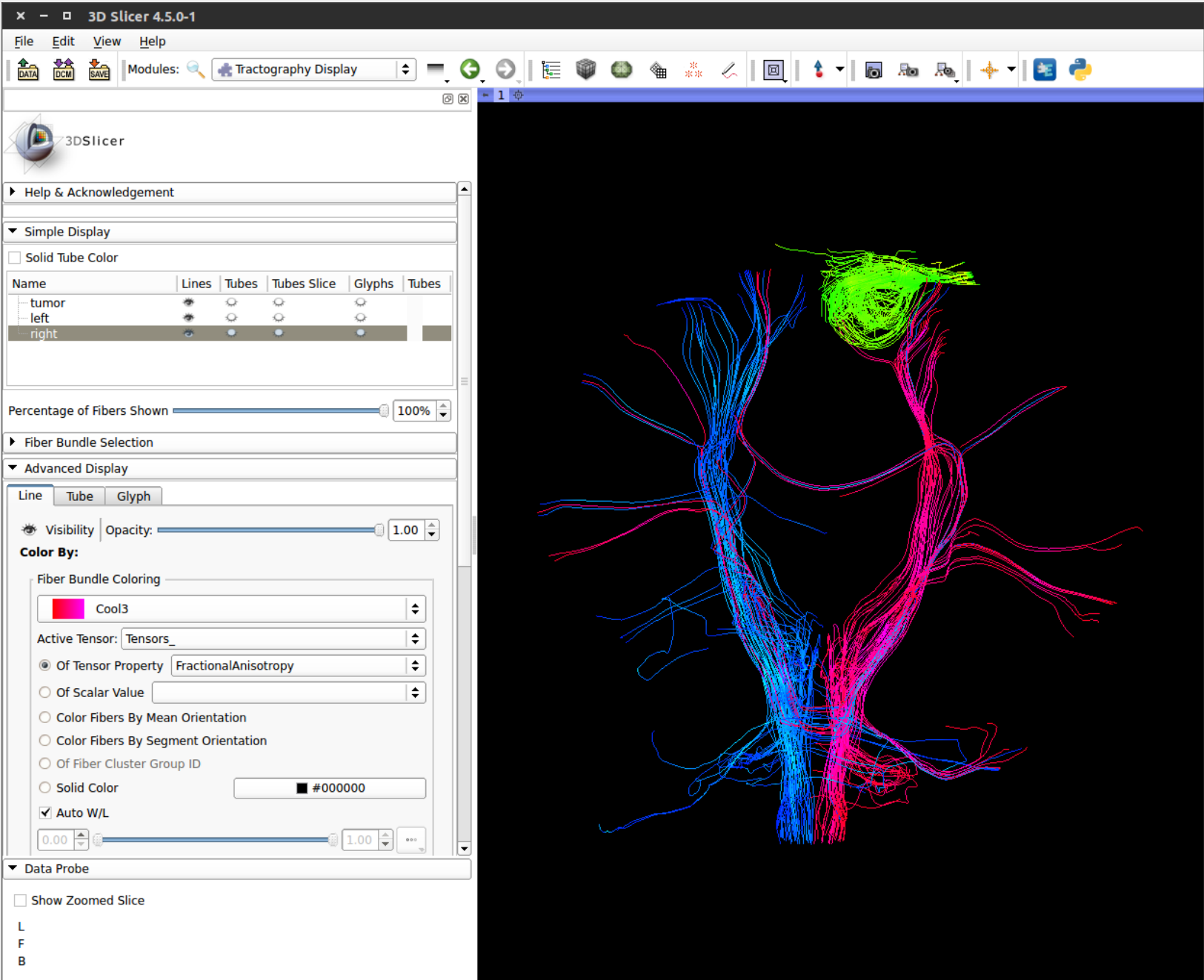
- Step 17 – Similarly select different “color shade” for left corticospinal fiber bundle – “Cool1” for left corticospinal tract fibers.



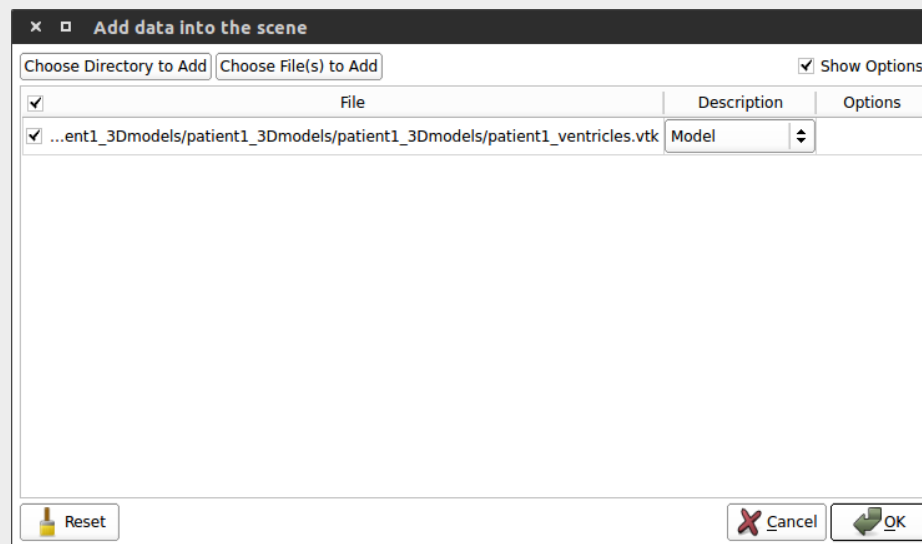
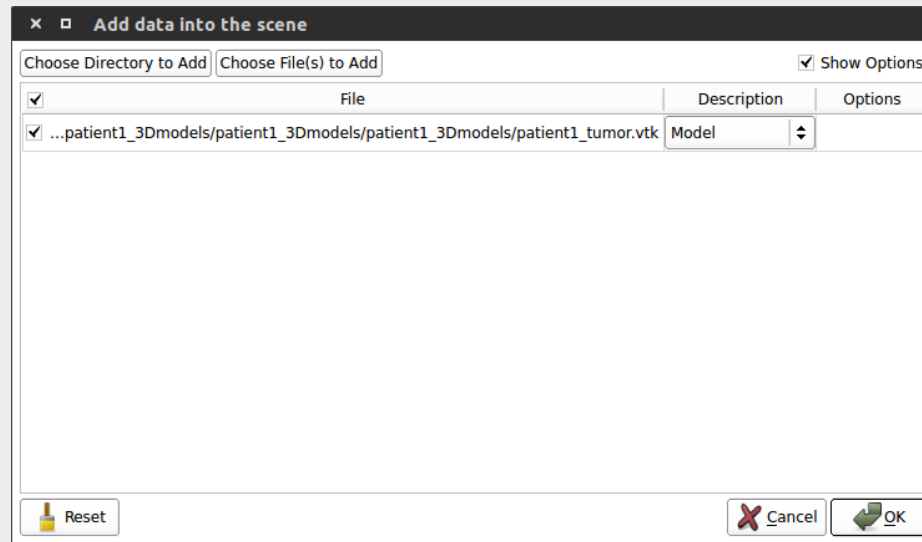
- **Step 17** – Similar to Step 16, select different “color shade” for right corticospinal fiber bundle – “Cool3” for right corticospinal tract fibers.



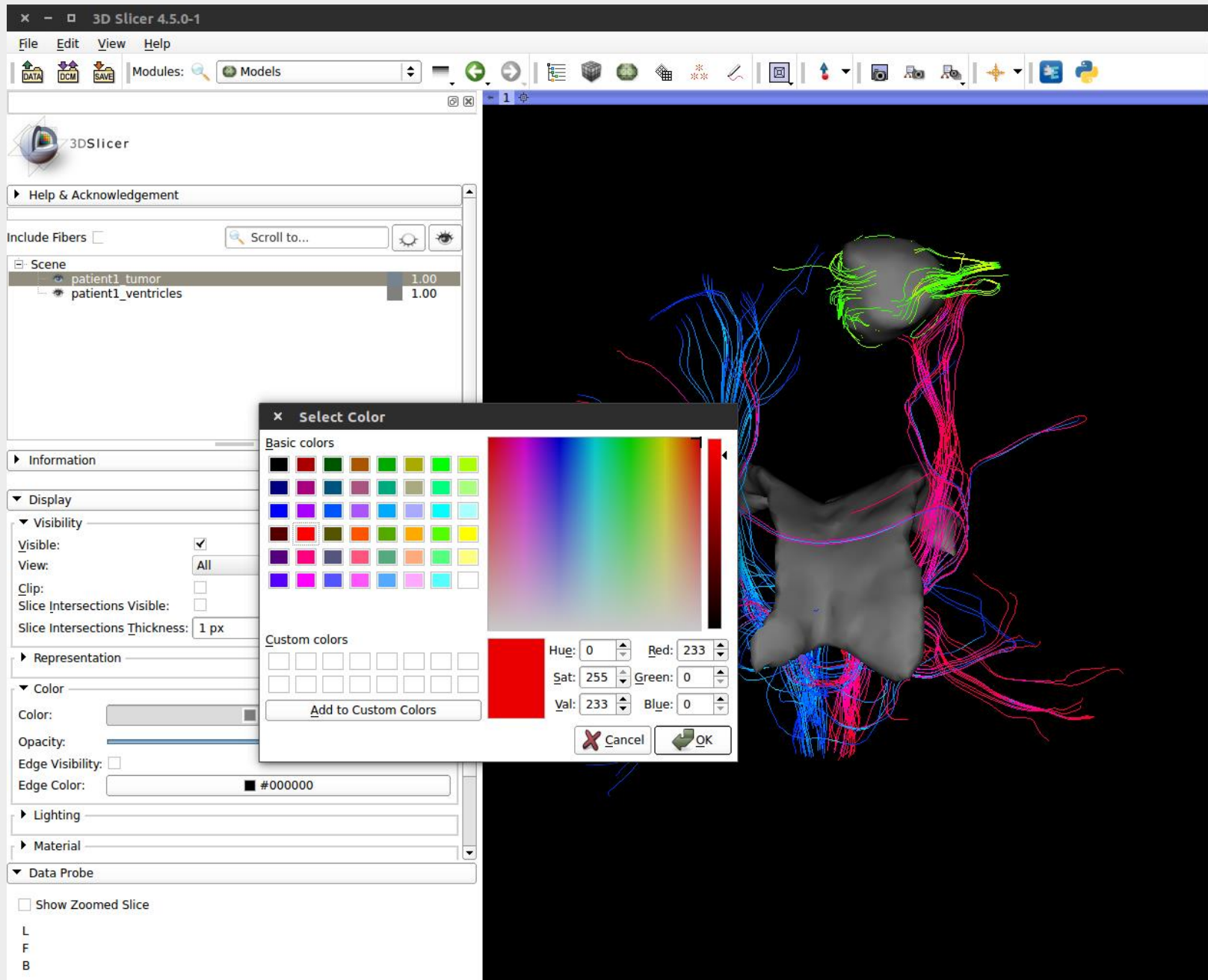
- Outcome of Steps 16 and 17 –



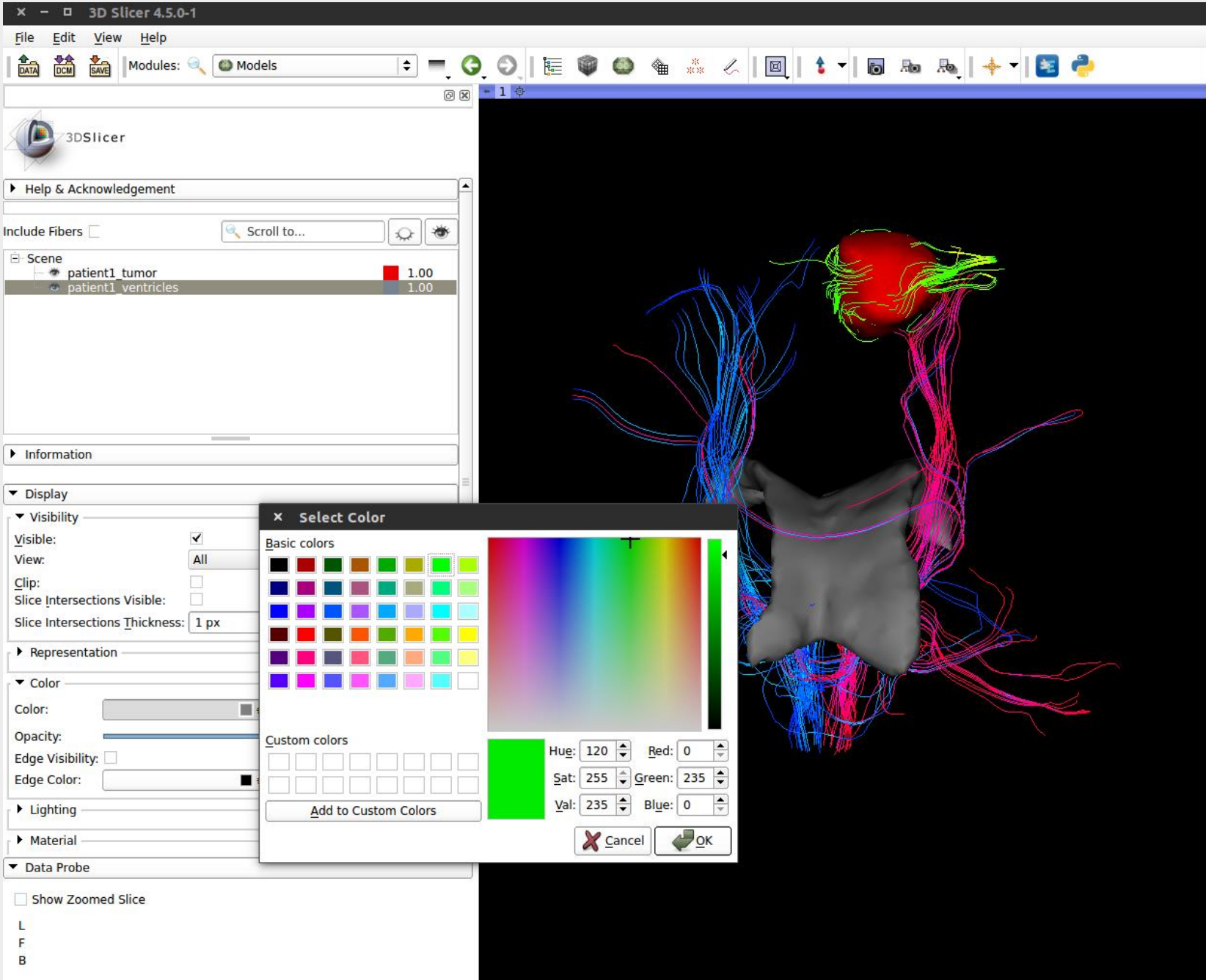
- **Step 18** – Import the Tumor and Ventricles segmentation models in to 3D Slicer –



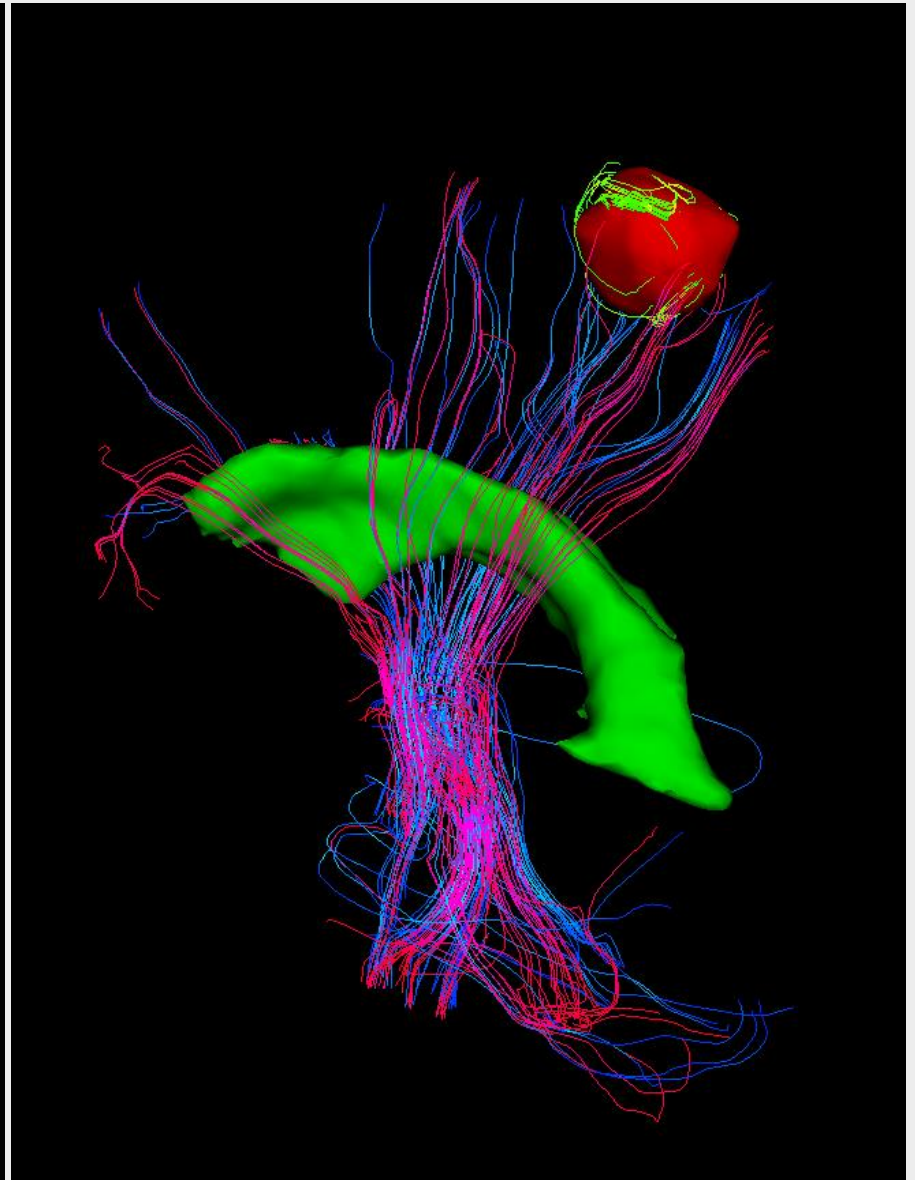
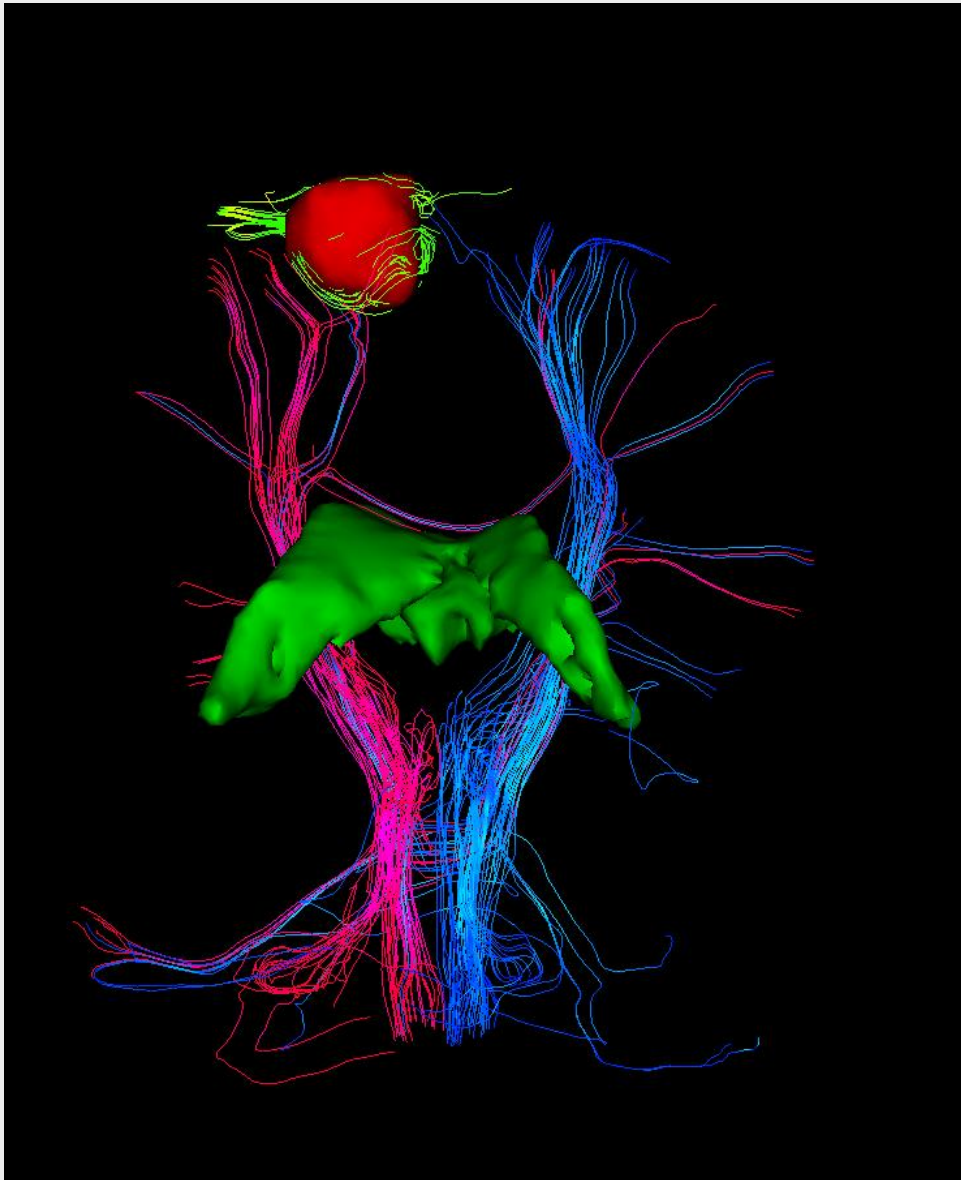
- **Step 19** – Let us now define different colors for tumor and ventricles segmentation. Go to “Models” module, click on “color” under Display menu. This will pop up a color palette. Choose the desired color for tumor –



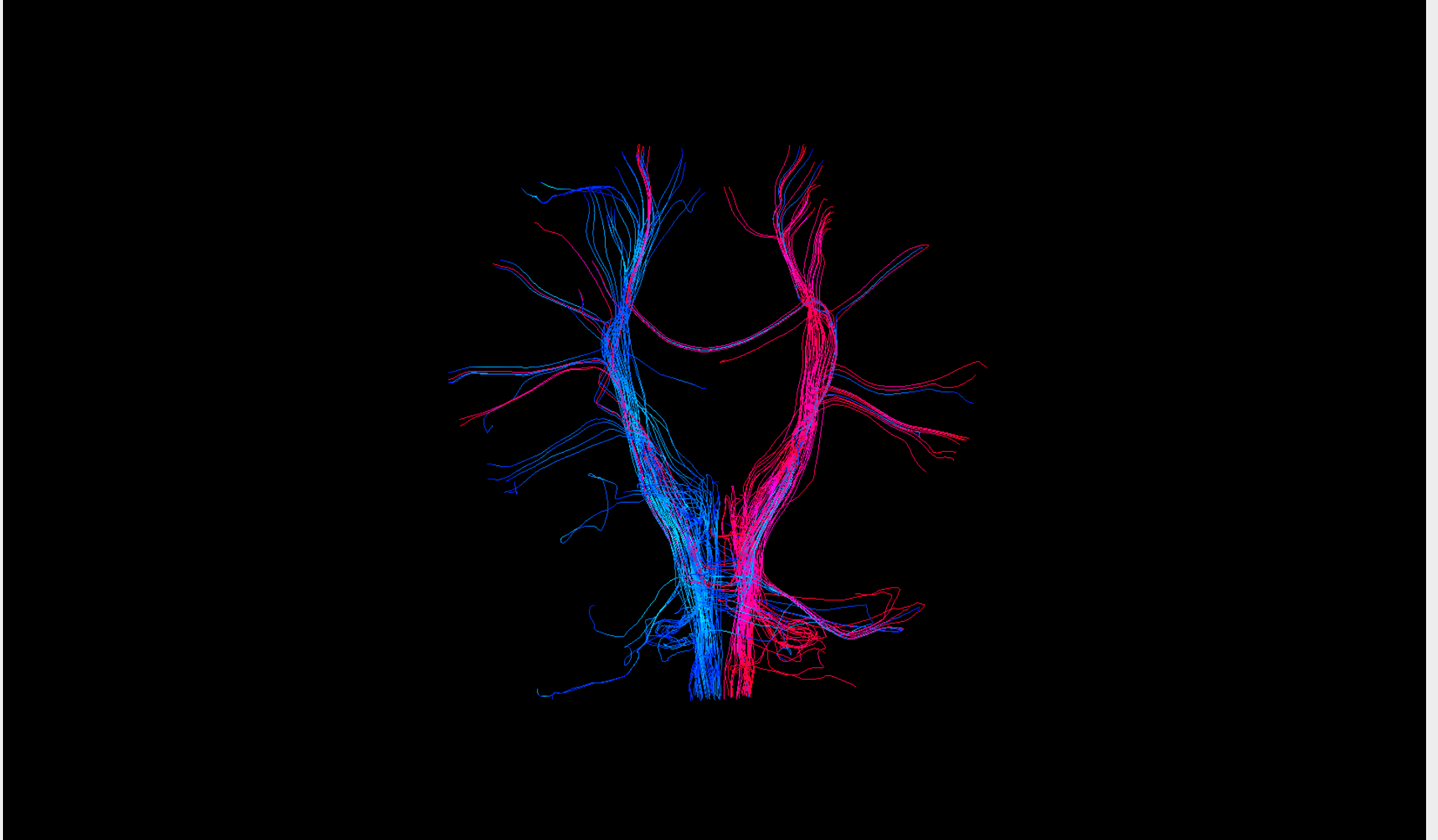
- **Step 20** – Choose the desired color for ventricles –



Final Result – Fiber Pathways along with the Segmented Tumor region and Ventricles -



Fiber Pathways obtained for the Corticospinal Tract is as shown in the figure below –



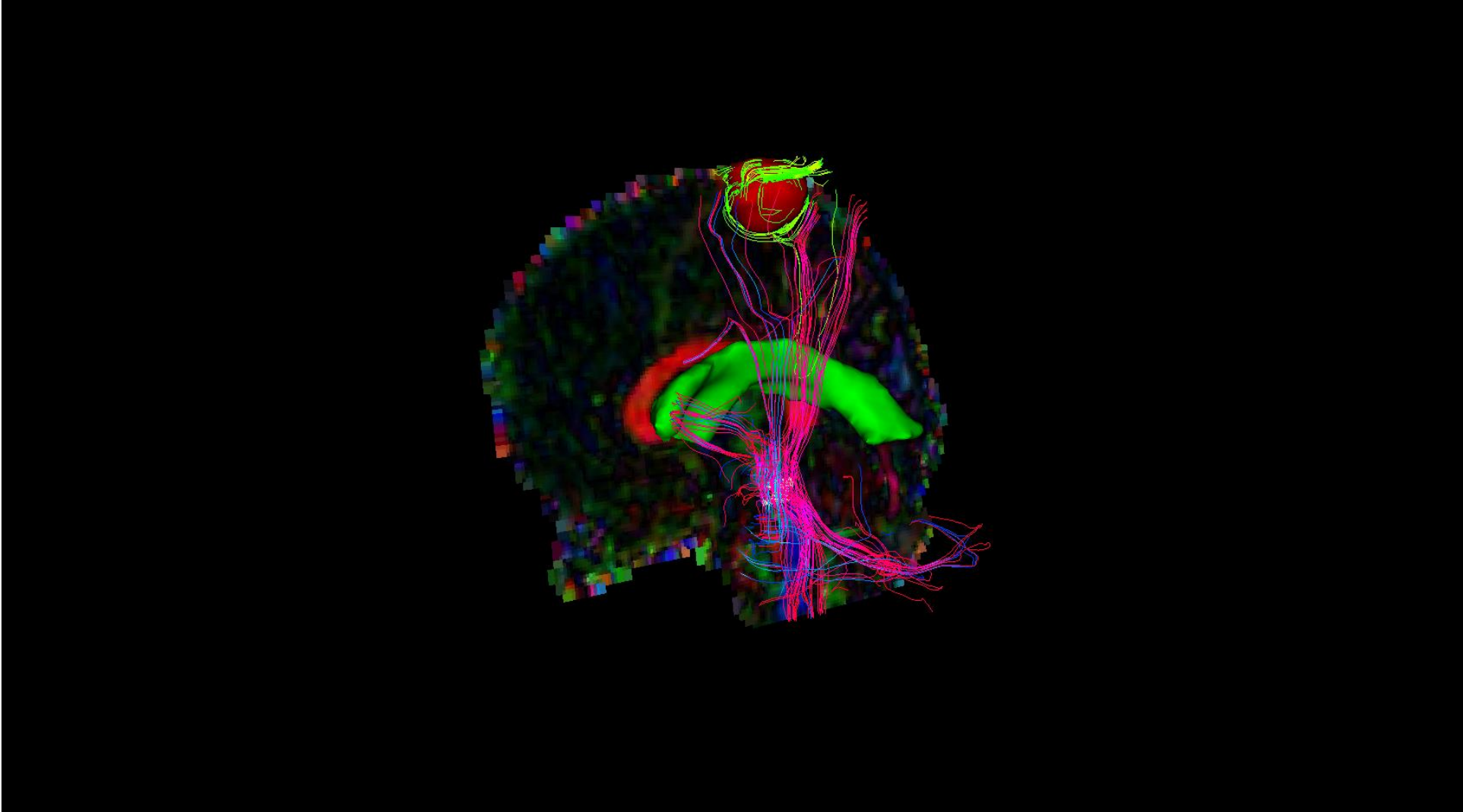
Pink and Blue Fiber pathways correspond to right and left corticospinal tract respectively.

Corticospinal Tract Fiber Pathways along with the presence of tumor region appear as shown in the figure below –



In the above figure – The Red Blob indicates the tumor region.

Different Sagittal Views – Right Plane



Left Plane –

