Experimental Report for Beamtime SC-5122

Nevertheless, we were limited to use animal instead of human samples the beam time was a great success. We were able to scan seven brainslices including mouse, macaw, berber monkey. We used spatial resolutions of 20µmx20µm and in one case of 5µmx5µm. This resulted to in between 1 million and 5million exposures per sample, depending on scanned the sample area.

A typical 2D exposure was 5ms in length with a beamsize of 10x10µm for the 20µm spatial reolution and looks like this.

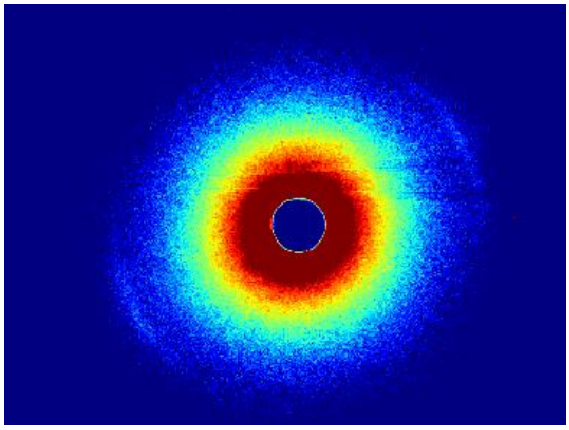

Figure 1: typical 2D SAXS pattern of myelinated tissue. The two arcs arise from the orientation of myelinated nerve fibres within the illuminates volume

After all the measurements are done we reduce the data mainly in two ways either a radial average or an azimuthal average over the q range of the main arcs from myelin. The radially averaged I(q) vs q curves are used to map the q position of the main myelin peak and map differences in the layer spacings of the myelin sheath like so.

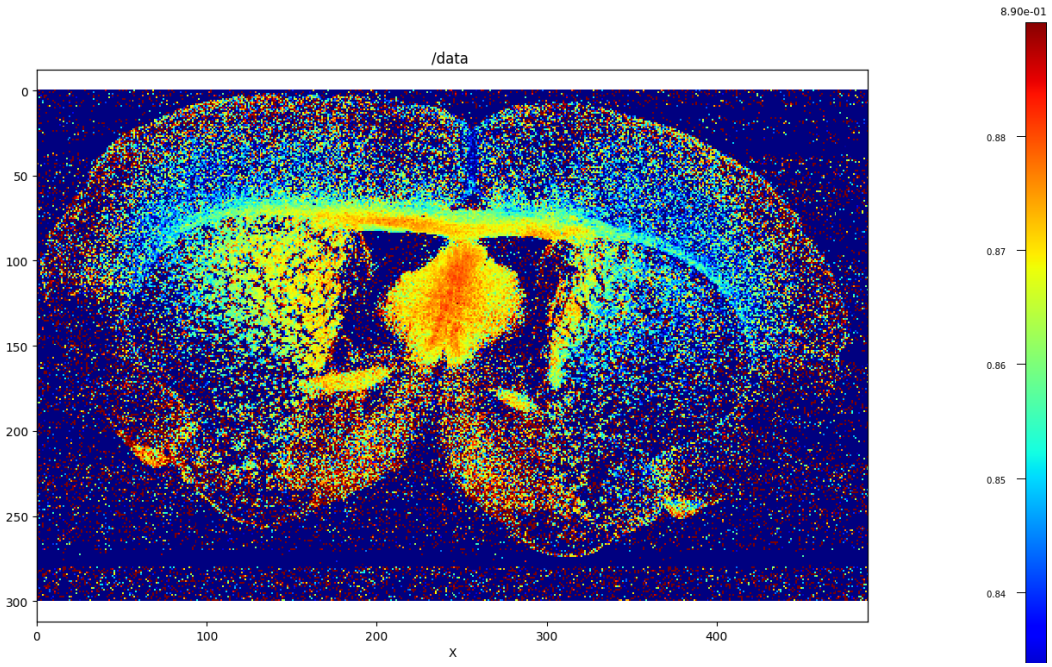

Figure 2: map of q vectors for the main myelin peak position of a mouse brain slice each pixel is one measurement

The azimuthal averages from 7 different tilting angles (Fig.3 and Fig4 show two examples) are used to determine the orientation of the myelin within each voxel in 3D.

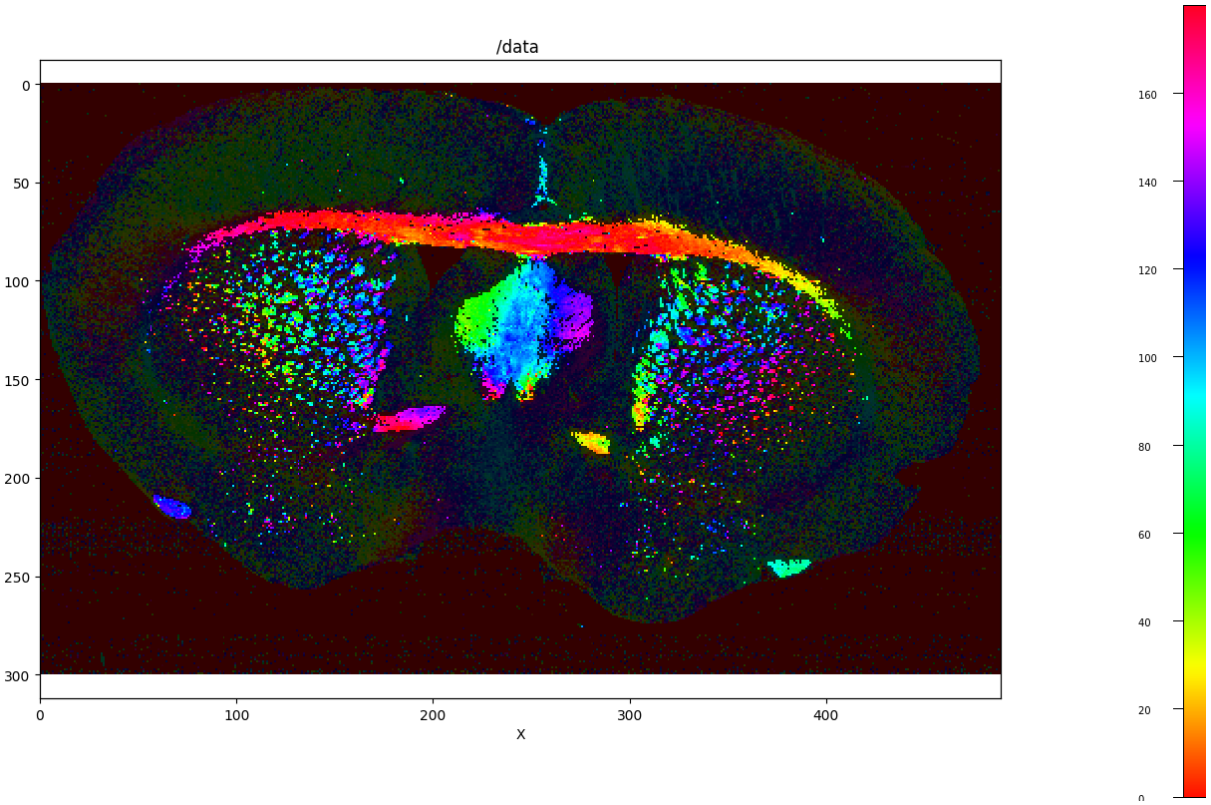

Figure 3: Orientation map at tilt 0° orientation is colorcoded 0° is horizontal tilt rotation axis is 90°

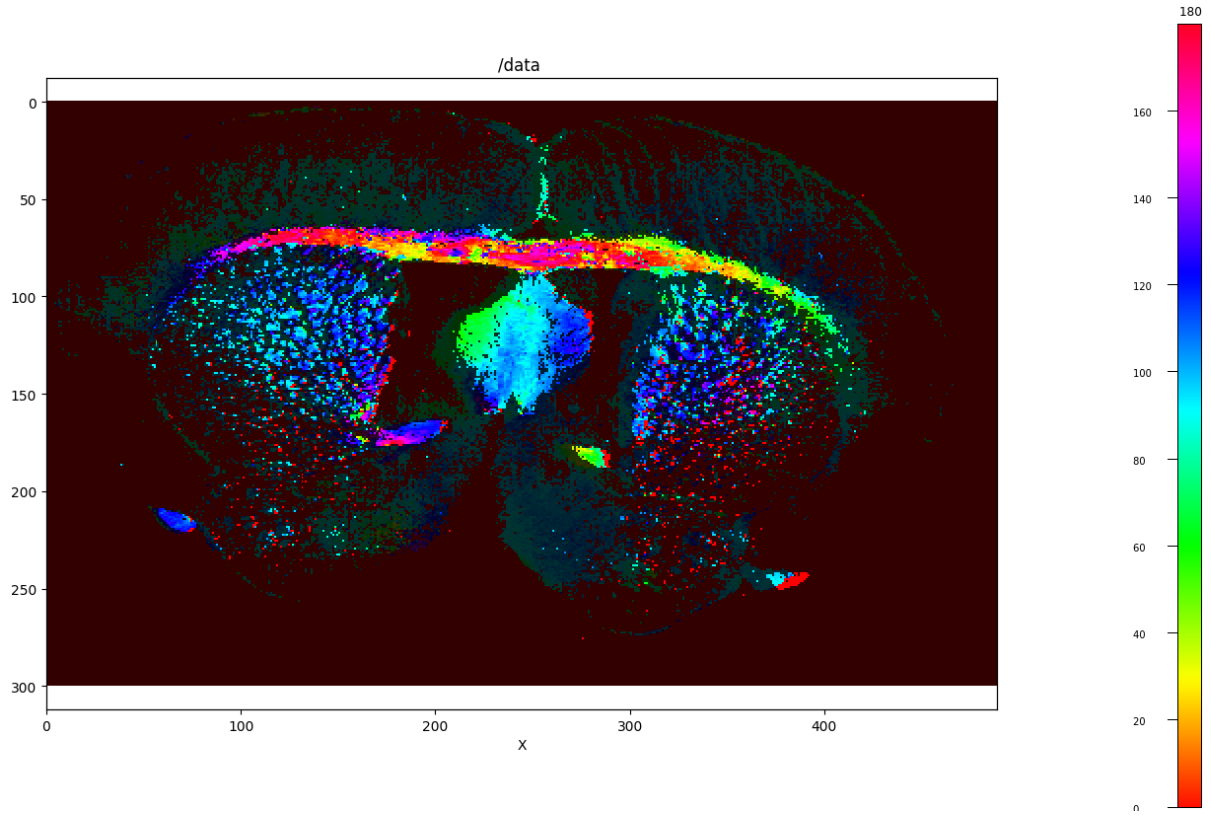

Figure 4: Orientation map at tilt 45° orientation is colorcoded 0° is horizontal tilt rotation axis is 90°

Here is such a reconstructed orientation map in 3D from another mouse sample.

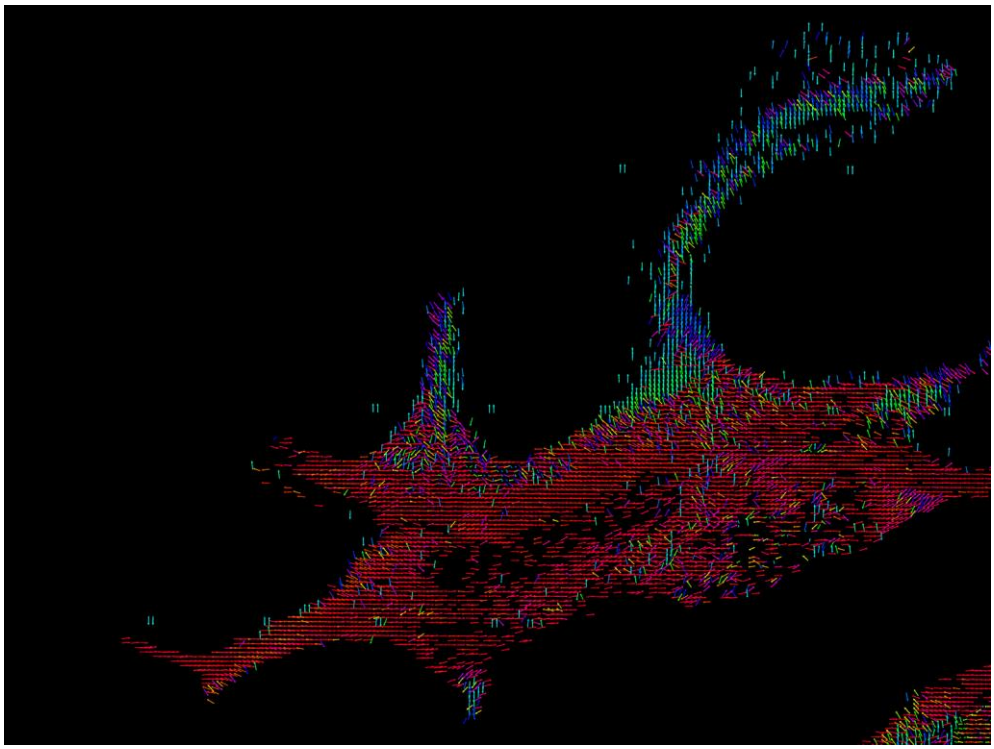

Figure 5: 3D orientation map reconstraucted from seven maps under different tilt angles