Part 1. Single Crystal laue camera

In this exercise we will build a *very* simple Laue camera and scatter neutrons on a single crystal in 4 steps.

Step 1 Start a new file and add a source

Open a new template instrument file as you have done before. (In the GUI CTRL-N)

Insert a source component: Source_simple. I should have the following parameters (or similar): - radius=0.05 - dist=5 - focus_xw=0.02 - focus_yh=0.05 - lambda0=2 - dlambda=1.9

Place the source component at the origin: AT(0,0,0) RELATIVE Origin

Step 2. Add a guide

We will now add a 20 m long straight neutron guide, and place it 5m downstream of the source. It should have m=1 coatings and be just big enough to capture the radiation from the source. I.e. `w1=0.02, h1=0.05, w2=0.02, h2=0.05, l=20, m=1`

Step 3. Add a sample

In this case the sample is a standard sample - namely a ruby single crystal: COMPONENT single_crystal = Single_crystal(reflections="Al2O3_sapphire.lau", yheight=0.05, radius=0.01, mosaic=1, delta_d_d=1e-4, az=4.757, ay=0, az=0, bx=2.3785, by=0, bz=-3.364, cx=0, cy=12.9877, cz=0, p_transmit=0.1) AT (0, 0, 21) RELATIVE PREVIOUS

As you now know the ax,ay, ..., cz - parameters specify the crystal's unit cell vector in the coordinate system defined by the crystal AT-position.

Step 4. Add a monitor to see the scattering

Add the ideal Laue camera monitor covering 4 pi: PSD_monitor_4PI. Fpr instance set a radius of 1 m, and give it 200x200 pixels. Remember to also specify a filename - otherwise you will get no output data.

Run your simulation

You may now try your Laue camera out - you ought to see something like the images below. It is probably a good idea to increase the statistics of your run to something like 10^7 neutron rays (the ncount).

Remember that if you press L the monitor will be displayed on a log scale, to avoid being overwhelmed by the direct beam signal.

An obvious way to avoid the direct beam is to include a beamstop by adding COMPONENT beamstop = Beamstop(xwidth=0.025,yheight=0.055) AT(0,0,0.1) RELATIVE PREVIOUS immediately after the sample.

Play around with the example instrument.

- Add an Arm-component before the sample to allow a rotation around the Y-axis and set the sample RELATIVE to that. Does that change your scattering pattern? If not you might want to check that your monitor does not rotate with the sample.
- Add more sample rotations to emulate an Eulerian cradle. (Y,X,Y) rotations.
- Change the crystal to for instance Al. COMPONENT single_crystal = Single_crystal(reflections="Al.lau", yheight=0.05, radius=0.01, mosaic=1, delta_d_d=1e-4, az=4.0495, ay=0, ax=0, bx=4.0495, by=0, bz=0, cx=0, cy=4.0495, cz=0, p_transmit=0.1) AT (0, 0, 0) RELATIVE PREVIOUS
- Replace the Single crystal with a Powder - and does that make sense?