Using the analyzer.

To use the analyzer, it will need to be translated into the beam and rotated to the correct position. The analyzer is a beam splitter, one of the spin states goes straight through, and the other one is reflected from the analyzer. Unfortunately the analyzer is not curved nor is it long enough, so the beam that transmits through the analyzer is often contaminated with beam that misses the analyzer completely. That is why we concentrate on the beam being reflected from the analyzer. For the optimal orientation of the analyzer with respect to the beam that is to be analyzed, there should be an angle θ_0 equal to 0.6 degrees between the two. To determine this angle use:

$$\theta_0 \text{ (deg)} = (X_R - X_T)/38.6.$$

X_R is the position channel for the beam being reflected by the analyzer, and X_T is that of the beam going through the analyzer, which is also that of the beam being analyzed. It follows that there should be a difference of 23 channels on the detector in order to get an angle equal to 0.6 degrees.

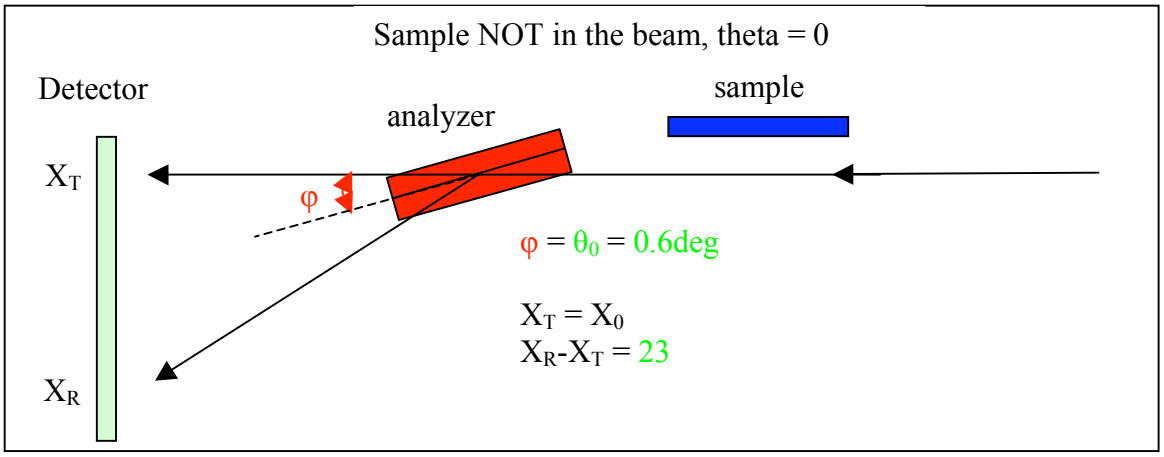
To move the analyzer in the beam:
Type “analyzer”
Select “p”
Type “in”
Type “0” for the mirror angle θ. This angle θ refers to that of the sample with the incident beam. When analyzing the direct beam, the sample angle $\theta = 0$.

The analyzer will then automatically rotate a total angle equal to:

$$\varphi := 2\theta + \theta_0.$$

As the default it will use a value of 0.6 deg for θ_0, which is the desired value. Additionally the analyzer will translate to a value that is calculated based on the provided value theta. Normally this will put the analyzer in the right position, but it can be wise to do some fine tuning. When $\theta = 0$ (analyzing the direct beam, $T_A = 0$mm), when the analyzer is moved “out”, $T_A = -14$mm.

To move the analyzer out of the beam:
Type “analyzer”
Select “p”
Type “out”



Fine tuning of the analyzer position:

If you see a reflection you should first adjust the rotation of the analyzer. Using the equation above you can determine how far off from 0.6 degrees you are and then determine how much to change φ. Then:

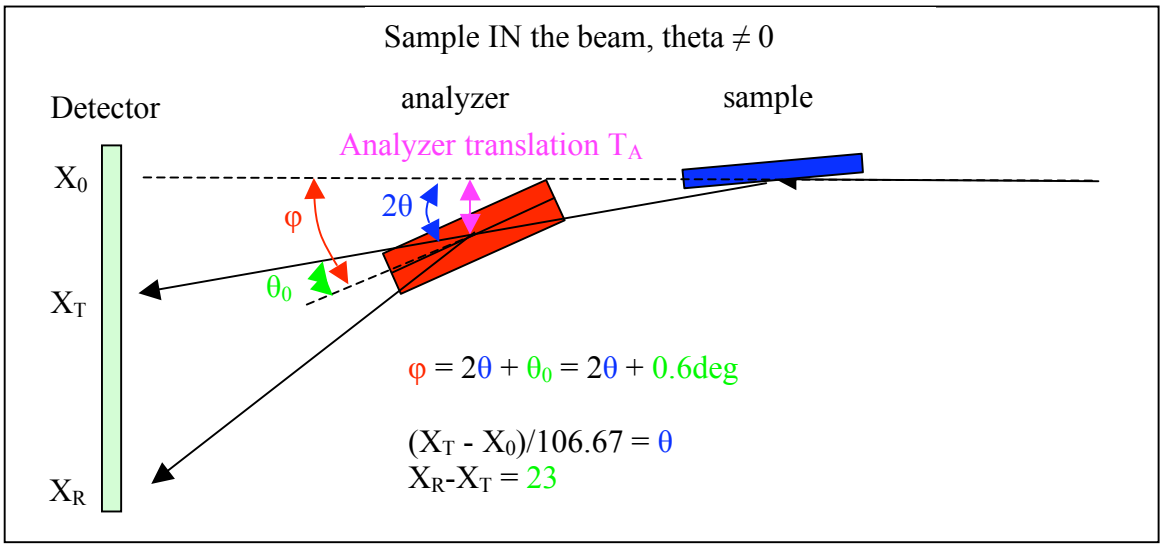
Type "analyzer"
Select "d" (for diagnostics)
Select "r" (for rotate)
Type in the new value of φ

Now that the analyzer has the right angle, you will want to maximize the intensity of the reflection (at channel X_R) by translating the analyzer. Do this while looking at the spin up (ypt 1). To translate:

Type "analyzer"
Select "d" (for diagnostics)
Select "t" (for translate)
Type in the new value for the translation T_A.

For each value of T_A record the intensity of the beam reflected by the analyzer by integrating over a fixed number of channels. The position X_R will also change with T_A, but that doesn't matter as long as you keep determining the intensity over a fixed number of channels there the peak is. In other words the number of channels you integrate over stays fixed, but the exact channels change.

When you have found the value of T_A with the highest intensity, translate back to this position. Now check again the value of the analyzer angle θ_0, if it is 23 channels (0.6deg). If not, again change the angle φ as above until this is the case.



Recalibrating the default the analyzer positions (INSTRUMENT PERSONEL ONLY):

After the fine tuning is done for one or more values of the sample angle, a systematic offset for the optimal values of φ or T_A might be found, compared to the default settings calculated based on a given value of the sample angle θ.

To change the default values for the rotation (i.e. recalibrate the absolute angle of the mirror), leave the analyzer in the position as optimized for a certain angle θ. Then:

Type "analyzer"
Select "c" (for calibrate current mirror angle)
Type in the true sample angle θ

To change the default value for the translation, translate to the optimal position for the analyzer for analyzing the direct beam (without the sample). On the caliper close to the analyzer, press on "zero", in order to redefine this zero value.
OR, if optimized with a sample at various angles plot T_A versus tan(2θ), which should be a straight line. Solve for the parameters D and T_{A0} in

$$T_A = D * \tan(2\theta) + T_{A0}$$

D should be around 790mm, Ideally $T_{A0} = 0$.

Translate the mirror to T_{A0} and press "zero" button on the caliper.

Type "analyzer"
Select "o" (for changing other parameters)
Keep pressing return until the line starting with : STOA DIST ?
Type in the value of parameter D
Keep pressing return until you get the menu again.