Neutron and X-ray Scattering of Quantum Materials

PHYS-640

Week 4 exercises

1: Critical magnetic scattering of MnF_2

Perform the data analysis for the McStas simulation performed last week (Task 6). If you didn't manage to get the simulation to run, you can find a data set on Moodle.

(a) Plot the q-scan at the lowest and highest temperature of your scan in the same plot. What do you notice?

(b) Fit a Guassian function to describe the peak profile at each temperature. You might have to fix the position to $H = 1$ for temperatures close to the transition in order to get meaningful fits.

(c) Plot the integrated intensities as a function of temperature. Fit the intensities close to the transition to the function $I(T) = I_0(T - T_C)^{2\beta} + C$, where I_0, T_C, β and C are all free parameters. Plot the fit on top of the data points. What is the transition temperature?

(d) Plot the peak widths as a function of temperature. How can we explain the behavior?