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| **Student project at European Spallation Source Data Management and Software Centre** |  |

**Optimization of neutron guides for very long wavelengths that counteract the vertical aberrations from gravity**

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| No correction | Prism correction system | With correction |

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| Supervisor | ? | Code difficulty | ★★★☆☆ |
| Co supervisor | Mads.Bertelsen@ess.eu | Physics difficulty | ★★★★☆ |

DESCRIPTION

Neutron scattering is an investigative technique that examines matter at the atomic scale, particularly the distances between atoms in crystals. This process involves placing a sample in a neutron beam. By analysing the scattering patterns of these neutrons, researchers can infer the sample's properties. Instruments used in these experiments are highly specialized for various types of samples and scattering methods. The European Spallation Source, nearing completion in Lund, Sweden, houses 15 such instruments. Each of these instruments have a separate guide that transport neutrons from the source to the sample using neutron mirrors. Recent focus on neutron sources that emit neutrons with larger wavelength, and thus slower neutrons, necessitates new ways of handling the influence of gravity. The Python package guide\_bot is available for optimization of guides, but lack guide elements that counteract the influence of gravity on the beams.

In this project the automatic guide optimizer guide\_bot would be expanded with a guide element that inserts correcting prisms into the guide. With this new element a range of guides could be optimized and compared, investigating in what situations such a system is an advantage compared to more conventional approaches.

REQUIREMENTS

Experience with the programming language Python (C is a benefit as well)

Some experience with condensed matter physics