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Type: **Talk (20 min + 5 min discussion)**

## **Analysis of the noise limit in neutron dark field data**

*Monday, 4 December 2023 15:00 (25 minutes)*

Neutron grating interferometry (nGI) allows simultaneous access to spatially resolved information about the attenuation, phase shift, and ultra-small-angle scattering (DFI) of neutrons in a sample by generating an interference pattern and analyzing the influence of the sample on the pattern.

Scattering decreases the visibility of the interference pattern. We can extract quantitative information about the scatterer by analyzing the visibility at different correlation lengths. However, the visibility may be reduced close to zero for strongly scattering samples. At the same time, the Poisson noise inherent in neutron detection generates a variation in the measured signal. The evaluation algorithm interprets this variation as finite visibility, limiting the minimum visibility accessible.

In our contribution, we will show how noise determines, dependent on neutron statistics, the minimum visibility. We will further show how these results may be used together with the reference visibility of the nGI setup to define a dynamic range of the DFI. Knowledge about the dynamic range allows one to plan measurement times more precisely.

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