Oral presentation

New improvements at the elastic diffuse scattering spectrometer CORELLI in Oak Ridge

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CORELLI is a unique instrument designed for measuring diffuse scattering from neutrons with a white beam. This feature enables the utilization of a statistical chopper with energy discrimination, facilitating the separation of the elastic from the total scattering signal. Moreover, CORELLI boasts unparalleled out-of-plane detector coverage, an exceptional neutron flux, and extensive reciprocal space coverage capabilities, thereby enabling highly detailed magnetic and structure refinements. Recent studies include the utilization of diffuse scattering data in investigations of quantum materials with the help of analysis through machine learning [1] and for the understanding of the magnetic correlations in spin-glass transitions [2]. Moreover, the instrument has been part of studies where the neutrons are used as a comparative and complementary source of information alongside X-rays data [3,4].

In recent years, considerable effort has been dedicated to instrumentation and analysis developments. The expanded sample environment will soon accommodate capabilities such as a 14 and 8 Tesla magnet alongside a new set-up for high-pressure studies. From an analytical perspective, a comprehensive and quantitative reduction analysis tools have been developed. Instrumentation improvements and enhancement in detector calibration positioning ensure reliable collection of diffuse and diffraction data, while an analysis tool aims to eliminate unnecessary background stemming from the sample environment.

[1] Samarakoon, A., Tennant, D. A., Ye, F., Zhang, Q & Grigera, S. A. (2022). *Commun. Mater.*, **3**, 84

[2] Roth, N., Ye, F., May, A. F., Chakoumakos, B. C. & Iversen, B. B. (2019). *Phys. Rev. B*, **100**, 144404

[3] Støckler, K. A. H., Roth, N., Grønbech, T. B. E. & Iversen, B. B. (2022). *IUCrJ*, **9**, 523-532

[4] Schmidt, E. M., Neder, R. B., Martin, J. D., Minelli, A., Lemée, M.-H. & Goodwin, A. L. (2023). *Acta Cryst. B*, **79**, 138-147

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