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Test of the Cross Correlation Method for Efficient Single Crystal Diffuse Neutron Scattering with Elastic Discrimination¹ STEPHAN ROSENKRANZ, JOHN PAUL CASTELLAN, RICH VITT, RAYMOND OSBORN, Argonne National Laboratory, RICK RIEDEL, MARIANO RUIZ-RODRIGUEZ, LOREN FUNK, Oak Ridge National Laboratory — Single crystal diffuse scattering provides a powerful probe of the complex disorder associated with many emergent phenomena of great interest. It provides a determination not only of the local distortions around a point defect but also of the length scale and morphology of short-range order on the nanoscale. However, obtaining accurate models of the local structure usually demands measurements over large volumes of reciprocal space with sufficiently high momentum and energy resolution. In order to overcome limitations of current instrumentation, we propose to utilize the cross-correlation method at pulsed neutron sources. This concept that combines the high efficiency of white-beam Laue diffraction for measuring large volumes of reciprocal space with energy discrimination produced by the use of a statistical chopper is currently being implemented in a dedicated instrument, *Corelli*, under construction at the Spallation Neutron Source. Here, we present our detailed investigation of the effectiveness of this method for measuring weak diffuse signals, based on full experiment simulations as well as actual measurements of the diffuse scattering from powder and single crystal samples obtained utilizing the cross correlation method on a prototype instrument.

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