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Efficient Single Crystal Diffuse Neutron Scattering with Elastic Discrimination S. ROSENKRANZ, R. OSBORN, Argonne National Laboratory — Many new phenomena of technological importance are governed by complex disorder and nanoscale self-organization such as stripe formation, phase separation, dimerization. Coherent diffuse scattering from single crystals is the most powerful probe of such complex disorder as it probes both the local distortions around a point defect as well as the length scale and morphology of defect-defect correlations. There are however formidable technical difficulties both in obtaining reliable diffuse scattering data and in using it to construct models of defect structures. White-beam pulsed neutron instruments provide efficient access to the large volumes of reciprocal space that are required to model disorder accurately, but accomplish this without energy analysis so that static diffuse scattering is contaminated by vibrational and other dynamic processes in the sample. At present, there is no way to eliminate this inelastic signal without monochromating the incident or scattered beams, which results in a substantial loss of intensity. A proposed instrument, named Corelli, solves this problem by combining the high-efficiency of white-beam Laue diffraction with energy discrimination produced by the use of a statistical chopper. The limitations of this crosscorrelation method and the reasons for its effectiveness for energy discrimination will be discussed.

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