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Using Fluctuation Microscopy to Detect The Medium Range Order in Disordered Materials D. KUMAR, Graduate Student at Arizona State University, M. TREACY, Arizona State University, I. MCNULTY, M. DEJONGE, L. FAN, Advanced Photon Source, Argonne National Lab, D. PATERSON, Australian Synchotron Source, M. GIBSON, Director, Advanced Photon Source, Argonne National Lab — In this poster we present some results from our X-ray and optical fluctuation microscopy studies of disordered materials. Fluctuation microscopy is sensitive to any medium range order present in amorphous and disordered materials, and obtains this sensitivity by examining the spatial fluctuations in coherent diffraction scattering. The method derives this sensitivity because the normalized variance depends on pair-pair correlation functions and hence can be used to detect the subtle structural correlations. We are exploring two variations of the fluctuation microscopy idea. One promising approach, for varying the resolution function within the same scan, is to use an elliptical (or rectangular) probe-forming aperture. The idea is that diffraction data along the narrow slit direction corresponds to low-resolution (*i.e.* large sample volumes), whereas diffraction data along the wide slit direction corresponds to high-resolution data (*i.e.* small sample volumes). The (admittedly simplistic) idea is that all sampling resolutions between these two extrema can be found by tracing the diffraction data along the azimuthal angle corresponding to the desired aperture width. This approach may eliminate the need for taking a series of scans at different probe.

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