Abstract Submitted
for the NWS15 Meeting of
The American Physical Society

Spectral analysis of resonant X-ray scattering for quantitative measurement of ordering in organic matter BRIAN COLLINS, Washington State University — The nano-to-mesoscale structure of carbon-based materials is of interest in diverse fields such as organic electronics, directed nanostructures, biomimetic materials, and even biological tissues. However, measurement of such structure is particularly difficult due to the materials' radiation sensitivity, low contrast with traditional probes, and low degree of crystallinity. Recent developments in resonant (or 'anomalous') X-ray techniques utilizing unique electronic transitions in the molecules have demonstrated exquisite sensitivity to ordering in these materials. Due to the complex interactions involved in these measurements, however, results have been limited to qualitative interpretations. Here we demonstrate the extraction of quantitative information on the nano-to-mesoscale structure of organic thin films utilizing spectral analysis of resonant, polarized x-ray scattering experiments across an absorption edge. We demonstrate reciprocal space mapping techniques that minimize exposure, a proper yet simple scattering model beyond the Born Approximation, and analysis methods to separate multiple sources of scattering to achieve robust, quantitative measurement of molecular composition and conformation within domains and nanostructures.

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Date submitted: 09 Apr 2015 Electronic form version 1.4