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The Analysis of Magnetite Nanoparticles Allowed to Warm through Superparamagnetic Transition DANIEL MCPHERSON, Brigham Young University — Magnetic nanoparticles (NPs) have a wide range of applications, from engineering to medicine. Understanding the properties of magnetic nanoparticles provides insight that enhance and expand their use. There are a number of computational methods that are employed to study magnetic NPs in order to determine their magnetic behavior in various field and temperature environments, such as the dynamics of the magnetic fluctuations throughout the superparamagnetic blocking transition. I will present on analysis of these magnetic dynamics for magnetite (Fe_3O_4) nanoparticles. These NPs have been previously characterized through: electron imaging and magnetonetry, x-ray magnetic circular dichroism (XMCD), and x-ray resonant magnetic scattering (XRMS). Here we are using coherent x-ray resonant magnetic scattering (C-XRMS) to access the dynamics of magnetic fluctuations. The data was collected at the SLAC synchrotron facility from assemblies of 11 nm magnetite NPs. In this experiment, series of C-XRMS speckle patterns are collected at subsequent times and cross-correlated, to follow the dynamics of fluctuations. I will compare two separate methods of correlation: the standard punctual photon correlation method, and a two-dimensional spatial correlation method using spatial features in the speckle patterns.

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