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Magnetic Speckle Images: A Cross-Correlation Study JOSEPH NELSON, KARINE CHESNEL, Brigham Young University — Ferromagnetism has intrigued scientists since ancient times, and within the last few years, new methods have been developed to study the properties and behavior of thin ferromagnetic films. Soft X-Ray Resonant Magnetic Scattering (SXRMS) has been used to detect spatial and temporal variations in the microscopic magnetic domain of such films on the scale of ∼100nm. Coherent X-ray beams are projected through (or reflected off of) a sample, creating an interference speckle pattern in the reciprocal space, analogous to a Fourier Transform of the microscopic domain pattern. Speckles, or areas of high and low local intensity within these images are unique to the microscopic configuration of the magnetic domains. Thus, the magnetic memory, or extent to which a material will return to its original magnetic configuration, can be measured using quantitative cross-correlation of SXRMS images. In our analysis, we used Matlab to perform such cross-correlation procedures. We will discuss the methods of calculating the correlation coefficient ? between pairs of images (represented in matrix form), our optimization procedure, as well as data representing the cross-correlation of a Cobalt-Platinum sample measured at 20K. Inferences will be drawn regarding the magnetic memory of the sample.

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