Coherent Magnetic Scattering at the ALS

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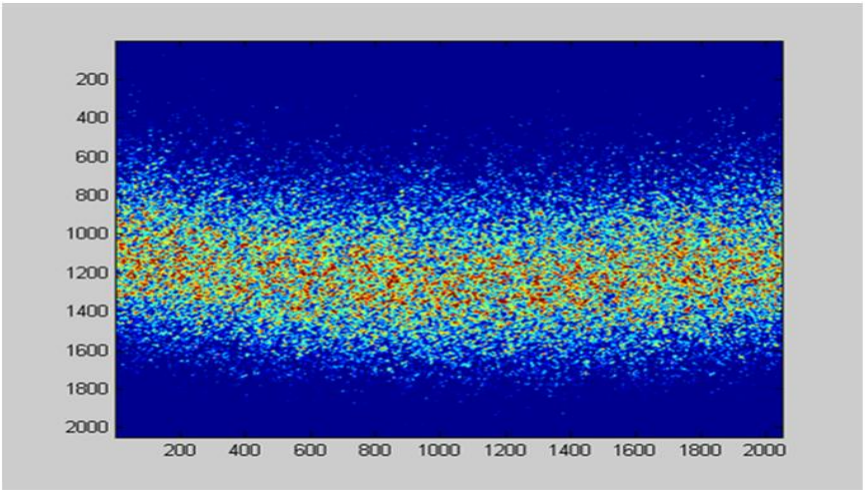
The development of Resonant Magnetic Scattering (XRMS) in the soft X-ray range provides increasing opportunities to image magnetic domains [1], as well as study magnetic order and reversal processes in nanostructures [2,3]. A new endstation dedicated to XRMS studies with the specific use of coherent light has been installed at the Advanced Light Source (ALS), Berkeley and commissioned in early 2004. This new setup includes a cryogenic sample holder, a scattering chamber with 2-dimentionnal detector and an octopolar electromagnet that allows to apply an in-situ magnetic field in any direction. XRMS measurment can be performed either in transmission or reflection geometry. Besides the chemical selectivity, this scattering technique gives the possibility to penetrate thin layer in depth and study the magnetic ordering at the nanoscopic scale. Furthermore, the polarization sensibility and the ability to rotate the magnetic field allow to discriminate different components of the magnetization. The use of coherent light and 2D detection provides remarkable speckle patterns (see Figure below) that are related to the local magnetic topology. Moreover, the evolution of the speckle pattern can be monitored in time, in order to study slow dynamic effects in correlation with different parameters like temperature and applied magnetic field. First measurments have already been performed on different kind of systems, as manganites, thin magetic film with perpendicular exchange bias and superparamagnetic nanoparticles [4]. First results obtained on Co and Fe3O4 nanoparticle assemblies [5] will be presented, showing in complementary way scattering results with incoherent and coherent light, as well as the evolution of the speckle pattern under different conditions.



References

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