Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Profile retrieval using Spin-Echo Resolved Grazing Incidence Scattering combined with dynamical scattering theory[1] RANA ASHKAR, Physics Department, Indiana University Bloomington, ROGER PYNN, Physics Department, Indiana University Bloomington and Neutron Science Directorate, Oak Ridge National Laboratory — Spin-echo Resolved Grazing Incidence Scattering (SERGIS) is a novel neutron scattering technique that provides lateral and in-depth characterization of density correlations in thin films and at interfaces. The method can be used to study the self-assembly of materials in a periodic array of nano-channels such as a diffraction grating. Since scattering from such periodic structures is dominated by dynamical effects that are not accounted for in approximate scattering theories, we developed a dynamical theory (DT) model, based on a Parratt formalism, and tested it on SERGIS data collected from a set of nanostructured gratings with different profiles in various scattering geometries. The model shows good agreement with all the data sets obtained so far. We found that the SERGIS technique is very sensitive to slight variations in the scattering geometry and the sample profile and the DT calculations accurately reproduce this sensitivity. This is a very promising step in combining a neutron scattering technique with an exact theory to retrieve profile information of periodic samples with unknown structures and to probe the morphology of self-assemblies in periodic nano-confinements.

[1]This work was supported by the Department of Energy through its Office of Basic Energy Sciences, Division of Material Science and Engineering (Grant No. DE-FG02-09ER46279).

Rana Ashkar
Physics Department, Indiana University Bloomington

Date submitted: 23 Nov 2011 Electronic form version 1.4