

**REFLECTION OF COLD ATOMS FROM MAGNETIC THIN FILM ATOM
MIRROR: FROM ATOM OPTICS TO MEASUREMENT OF
SHORT RANGE FORCES**

Ashok Mohapatra

Department of Physics

Durham University, South Road, Durham, DH1 3LE, United Kingdom

We report on the experiment in which ferromagnetic thin films were used to reflect the cold atoms released from a magneto-optical trap. The magnetic thin films were made of cobalt with thicknesses between 20 nm and 300 nm. The magnetic domains in these thin films have a periodic structure with the spatial period of the order of thickness of the film. The magnetic field above such thin film decreases exponentially with a length scale comparable to the domain size. Thus, the neutral atoms reflect from these thin films from distances comparable to the thicknesses of the films, resulting in the modification of the reflectivity due to the competition between the repulsive magnetic force and the attractive short range forces such as the van der Waals and the Casimir-Polder forces. In our experiment, the van der Waals interaction of the Rubidium atom with cobalt surface was measured with an accuracy of 15%.