

**COHERENT REFLECTION OF SLOW METASTABLE RARE GAS ATOMS
FROM A SOLID SURFACE**

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In this talk we review our experimental investigation on quantum reflection. First, using laser cooled metastable neon atoms, we observe atomic reflection from a silicon plate at low incident velocity (1mm/s to 3cm/s) [1]. Then the silicon surface is nano-fabricated to reduce the effective surface density, and we observe highly enhanced reflection from this surface [2]. Using this fabrication technique, a reflection grating is made. We observe, besides specular reflection, first order diffractions, which show the reflected atomic wave is indeed coherent. The technique is farther extended to demonstrate a reflection type atom holography [3]. The experiment is also performed using lighter atom, helium, and the same reflectivity is obtained at higher incident velocity, as predicted [4].

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[2] F. Shimizu and J. Fujita, J. Phys. Soc. Jpn., 71, 5(2002).

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[4] H. Oberst et. al., Phys. Rev. A, 71, 052901 (2005)