

QUANTUM REFLECTION OF BOSE-EINSTEIN CONDENSATES FROM SEMICONDUCTOR SURFACES

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We will consider how room-temperature semiconductor surfaces can be used to manipulate atoms cooled to nK temperatures. At such low temperatures, quantum-mechanical reflection can shield the atoms from the disruptive influence of the surface [1-3]. By considering recent experiments performed at MIT on Bose-Einstein condensates [1, 2], we will show that inter-atomic interactions and the aspect ratio of the condensate both strongly affect the reflection process when the incident velocity is very low (below approximately 2 mm/s) [3]. We will also consider how surfaces that are patterned on nanometer and micrometer scales can be used to increase the reflection probability, as in recent experiments [2], and control the shape of the reflected atom cloud [4].

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[2] T.A. Pasquini, M. Saba, G. Jo, Y. Shin, W. Ketterle, D.E. Pritchard, T.A. Savas, and N. Mulders, *Phys. Rev. Lett.* **97**, 093201 (2006)

[3] R.G. Scott, A.M. Martin, T.M. Fromhold, and F.W. Sheard, *Phys. Rev. Lett.* **95**, 073201 (2005)

[4] T.E. Judd, R.G. Scott, A.M. Martin, and T.M. Fromhold, to be published.