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Quantum reflection of Bose-Einstein condensates from nanopillars T.A. PASQUINI, MIT, M. SABA, Y. SHIN, G. JO, C. CHRISTENSEN, S. WILL, D.E. PRITCHARD, W. KETTERLE — We observed quantum reflection of Bose-Einstein condensates from a square array of silicon pillars 50 nm in diameter and spaced at 500 nm at probabilities of up to 67%. For normal incident velocities of 2.5-26 mm/s observations were in good agreement with theoretical calculations based on single atoms interacting with the Casimir potential of a reduced density surface. At low velocities (0.5-2.5 mm/s), we observe that the reflection probability saturates, remaining near an average 55% rather than increasing to unity. We provide a simple model that quantitatively predicts the saturation behavior for the reflection of a condensate by including a mean field interactions into the single atom theory. Additionally, we observe coherent excitations of the reflected condensate and incoherent s-wave scattering due to the collision between the incident and reflected condensate.

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