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Tunneling Time of a Bose-Einstein condensate in a 1D atomic waveguide DAVID SPIERINGS, RAMON RAMOS, ISABELLE RACICOT, AEPHRAIM STEINBERG, University of Toronto — We report on measurements of the tunneling time of Bose-condensed Rubidium atoms in a one-dimensional system, tunneling through a 1-micron optical barrier. By localizing a pseudo-magnetic field inside the barrier and using the spin precession of the atoms to 'clock' the time it takes for the atoms to pass through the classically forbidden region, we implement a Larmor measurement, as envisioned by Baz, Rybanchenko, and Buttiker [1,2,3,4]. In the limit that this measurement is 'weak' (in the sense of Aharonov, Albert, and Vaidman), we are able to disentangle the back-action of the measurement from the inherent tunneling time. We measure a tunneling time of 0.62(7) milliseconds through our barrier. Our results show good agreement with theory and shed light onto this long-standing problem. [1] Baz', A. Lifetime of Intermediate States. *Sov. J. Nucl. Phys.* 4, 182 (1966)._[2] Rybachenko, V. Time of Penetration of a Particle through a Potential Barrier. *Sov. J. Nucl. Phys.* 5, 635 (1967). [_3] Büttiker, M. Larmor precession and the traversal time for tunneling. *Phys. Rev. B* 27, 6178–6188 (1983). [4] Steinberg, A. M. Time and history in quantum tunneling. *Superlattices and Microstructures*, *23*(3–4), 823–832. (1998). http://doi.org/10.1006/spmi.1997.0543

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