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Calibration of a Larmor clock for tunneling time experiments

JESUS RAMOS, SHREYAS POTNIS, DAVID SPIERINGS, SAPEHR EBADI, AEPHRAIM STEINBERG, Univ of Toronto — How much time does it take for a particle to tunnel? This has been a controversial question since the early times of quantum mechanics. The debate stems mainly from the inability to measure time directly. One proposal to measure the tunnelling time is the Larmor clock, in which the spin degree of freedom of the tunneling particle is used as a clock. This clock only “ticks” inside the forbidden region due to the precession of the spin about a magnetic field localized within the barrier. Here, we report the calibration of a Larmor clock to measure tunneling times of a 87 Rb Bose Einstein condensate. We use the Zeeman sublevels of the ground-state $F=2$ manifold and Raman beams for the implementation of a Larmor clock. Experimental progress towards measuring the tunneling time and the challenges involved in this measurement will also be discussed.

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