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Macroscopic Quantum Tunneling of Bose-Einstein Condensates: Quantum Fluctuations, Entanglement, and Dynamics[1] DIEGO ALCALA, JOSEPH GLICK, LINCOLN D. CARR, Colorado School of Mines — The quantum escape problem is famous in the context of quasi-bound states and chemical and nuclear reactions. We address three outstanding questions in this form of quantum tunneling. (1) How are tunneling rates modified by many-body effects, in particular beyond the mean field? (2) What is the role of higher order quantum effects like entanglement and correlations? (3) What is the dynamics of the escape process? To this end we study both repulsive and attractive Bose-Einstein condensates via matrix-product state methods for entangled dynamics. We find that entanglement is maximized when about half the particles have escaped. We find preliminary evidence that the time derivative of number fluctuations serves as an entanglement witness.

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Diego Alcala
Colorado School of Mines

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