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Quantum simulation of Dirac tachyons with trapped ions via quantum measurement TONY LEE, ITAMP/Harvard, UNAI ALVAREZ-RODRIGUEZ , University of Basque Country, XIAO-HANG CHENG, Shanghai University, LUCAS LAMATA, University of Basque Country, RAJIBUL ISLAM, Harvard, ENRIQUE SOLANO, University of Basque Country — It has been predicted that particles with imaginary mass, called tachyons, would be able to travel faster than the speed of light. So far, there has not been any experimental evidence for tachyons in either natural or engineered systems. Here, we describe how to experimentally realize Dirac tachyons with trapped ions: quantum measurement on a Dirac particle causes it to have an imaginary mass so that it travels faster than the effective speed of light in the system. We show that a Dirac tachyon must have spinor-motion entanglement in order to be superluminal. We also show that it exhibits significantly more Klein tunneling than a normal Dirac particle. We provide example experimental numbers and show that our scheme is feasible using current technology.

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