复旦大学物理系物质科学报告

Physics Department Colloquium

A self-interfering clock as a “which path” witness

(原子芯片上的自相干时钟和路径见证)

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Abstract

In Einstein's general theory of relativity, time depends locally on gravity; in standard quantum theory, time is global—all clocks “tick” uniformly. We demonstrate a new tool for investigating time in the overlap of these two theories: a self-interfering clock, comprising two atomic spin states. We prepare the clock in a spatial superposition of quantum wave packets, which evolve coherently along two paths into a stable interference pattern. If we make the clock wave packets “tick” at different rates, to simulate a gravitational time lag, the clock time along each path yields “which path” information, degrading the pattern's visibility. By contrast, in standard interferometry, time cannot yield “which path” information. This proof-of-principle experiment may have implications for the study of time and general relativity and their impact on fundamental effects such as decoherence and the emergence of a classical world.

Time： 2:00pm, Tuesday, 2015.10.20

Location： Physics Building, Room 221B

(Cookies and coffee are served from 1:30 pm)