

Abstract Submitted
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Realization of a device-independent delayed-choice experiment using single photons¹ SHANG YU, YONG-NAN SUN, WEI LIU, ZHAO-DI LIU, ZHI-JIN KE, YI-TAO WANG, JIAN-SHUN TANG, CHUAN-FENG LI, GUANG-CAN GUO, CAS Key Laboratory of Quantum Information, University of Science and Technology of China — Wave-particle duality is one of the most intriguing features in quantum physics. A well-known gedanken experiment that provides evidence for this is the Wheeler’s delayed-choice experiment based on a Mach-Zehnder interferometer. Many different versions of delayed-choice experiments have been conducted with both classical and quantum detecting devices. A recent proposal suggests that the delayed-choice experiment can be considered in the perspective of device-independent causal model. In this experiment, we realize this modified version with a deterministic single-photon source. Through our results, we can examine that any two-dimensional nonretrocausal classical model can be excluded in a device-independent manner based on the violation of dimension witness inequality. Our experiment also exhibits the benefits of studying quantum theory from the perspective of casual model.

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