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Quantum Erasure and Nonlocality in Electronic Mach-Zehnder Interferometers[1] KICHEON KANG, Department of Physics, Chonnam National University, Gwang-Ju 500-757 — We propose a possible realization of solid-state quantum eraser in which electrons are injected into a mesoscopic conductor in the quantum Hall regime [1]. The conductor is composed of a two-path interferometer, an electronic analog of the optical Mach-Zehnder interferometer, and a quantum point contact detector electrostatically coupled to the interferometer. The Coulomb interaction between the interferometer and the detector induces a phase shift that enables the entanglement and the *which-path* detection. While the interference of the average output current at the interferometer is suppressed by the which-path information, the which-path information is erased and the hidden coherence reappears in the cross-correlation measurement between the interferometer and the detector output leads. We also investigate a modified setup in which the detector is replaced by a two-path interferometer. We show that the distinguishability of the path and the visibility of joint detection can be controlled in a continuous manner and satisfy a complementarity relation for the entangled electrons. Further, we show that this geometry can be used to test the Bell's inequality. [1] K. Kang, quant-ph/0607031.

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