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Dynamical generation and detection of a single-electron Gaussian wave packet SUNGGUEN RYU, Korea Advanced Institute of Science and Technology, MASAYA KATAOKA, National Physical Laboratory, United Kingdom, HEUNG-SUN SIM, Korea Advanced Institute of Science and Technology — A quantum-dot pump, formed by dynamic potential barriers of gigahertz operation, is an on-demand single-electron source with the unique property of emitting a hot electron above Fermi-level. In order to utilize the pump in fermion version of optics and related quantum processing, it is crucial to generate an electron in a prescribed form of wave function. We propose how to pump an electron Gaussian wave packet using a quantum-dot pump of realistic parameters.[1] In the pumping process, an electron occupies a coherent state in the pump, with the help of strong magnetic confinement. It is emitted out of the pump into a Gaussian wave packet when the Landauer-Buttiker traversal time of the electron for tunneling through the potential barrier is much smaller than the passage time of the coherent state. We also demonstrate that the measurement of the energy and time distribution of the Gaussian packet is possible, with a resolution reaching the Heisenberg minimal uncertainty $\hbar/2$.

[1]Sungguen Ryu, M. Kataoka, and H.-S. Sim, Phys. Rev. Lett. **117**, 146802 (2016)

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