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Standing Friedel waves[1] JUN-QIANG LU, CNMS, Oak Ridge National Laboratory, Oak Ridge, TN 37831, X.-G. ZHANG, CNMS & CSMD, Oak Ridge National Laboratory, Oak Ridge, TN 37831, SOKRATEST. PANTELIDES, Department of Physics and Astronomy, Vanderbilt University, Nashville, TN 37235, and MSTD, Oak Ridge National Laboratory, Oak Ridge, TN 37831 — The electron density around defects in a metal is known to exhibit Friedel oscillations. Here, we report simulations that demonstrate a dynamic analogue of the static Friedel oscillation in nanoscale devices. We use a spot gate capacitively coupled to a nanowire or a two-dimensional electron gas, a setup that can be implemented with a sharp STM tip. The application of an AC voltage generates a dynamic standing Friedel wave (SFW), near the spot gate and edges and boundaries. The SFW wave length is controlled by the AC frequency and the device's Fermi velocity, whereby the latter can be measured. The SFW amplitude exhibits resonant behavior at AC frequencies that are related to eigenenergy spacings in the device, allowing their direct measurement. Spin-polarized SFW may be generated in a graphene nanoribbon.

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