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Charge transport in adiabatically driven ratchets - Waveform and phase dependence - THORSTEN MÜLLER, Solid State Physics, University Duisburg-Essen, Lotharstr. 1, 47048 Duisburg, Germany, ALIDA WÜRTZ, Atmel Germany GmbH, Theresienstr. 2, 74072 Heilbronn, Germany, AXEL LORKE, Solid State Physics, University Duisburg-Essen, Lotharstr. 1, 47048 Duisburg, Germany, DIRK REUTER, ANDREAS D. WIECK, Applied Solid State Physics, Ruhr-University Bochum, Universitätsstr. 150, 44780 Bochum, Germany — We report on the adiabatic pumping of electrons in a driven lateral superlattice (LSL) with broken symmetry. The device is fabricated from a two-dimensional electron gas (2DEG), located 54.8nm below the surface in a GaAs/Al_xGa_{1-x}As heterostructure, grown by molecular beam epitaxy. The LSL is realized by two transducer gates, each comprising 75 stripes of 160 nm width and 1 μm period. The gates are interlaced off center by two thirds of the period and can thus induce a ratchet-like potential modulation in the 2DEG when appropriately biased. When the transducer is driven by two identical but phase-shifted ac signals, a lateral pumping current $I(\phi)$ results, which strongly depends on both the phase shift ϕ and the wave form $V(t)$. Surprisingly, we find that for different periodic signals, the phase dependence $I(\phi)$ closely resembles $V(t)$. A simple model of adiabatic pumping in 2DEGs is presented, which can reproduce our experimental findings. Possible applications for waveform sampling are discussed.

Axel Lorke
Solid State Physics, University Duisburg-Essen, Lotharstr. 1, 47048 Duisburg, Germany

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