Pulsing normal and collective counter-currents driven by the Hall voltage in a mesa junction of the sliding charge density wave under a quantized magnetic field

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Remnant pockets of carriers left over after formation of a charge density wave (CDW) could be brought to a current-carrying state at quantized Landau Levels. The generated Hall voltage polarizes and puts to sliding the flexible CDW background. The screening from the CDW allows for a so strong redistribution of normal electrons density under the action of the Lorentz force alone, that an integer filling of the lowest Landau level might be reached at one edge at the expense of the full depletion at another edge of the Hall bar. With the Hall field exceeding the sliding threshold, the regime of exactly compensated collective and normal counter-currents develops in the open-circuit direction across the bar. The annihilation of the two currents proceeds via a regular sequence of phase slips which are the space-time vortices of the CDW phase around the enforced nodes of the CDW amplitude. The resulting spontaneous generation of coherent high ~GHz frequency signals was detected by observations of multiple Shapiro steps. This picture results from experiments on micron-sized Hall bars in crystals of NbSe3 prepared by means of focused ion beams [1]. The interpretation is confirmed and illustrated by a numerical solution of equations coupling normal and collective subsystems and the electrostatic potential [1,2].

[1] A.P. Orlov, A.A. Sinchenko, P.Monceau, S. Brazovskii and Yu.I. Latyshev.

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[2] S. Brazovskii, Physica B, **460**, 236 (2015).

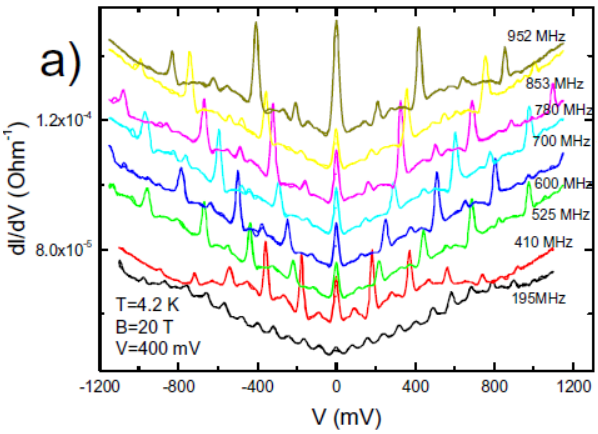

Figure 1 : Spontaneous generation of coherent high frequency periodic pulses measured here at the field 20T via Shapiro steps seen in the voltage dependence of the conductance.