

# Seminar on Condensed Matter Theory

Group of Theoretical Physics at the Department of Condensed Matter Physics of Charles University has a pleasure to invite you to attend the seminar

**on 13 October 2022 at 13:00**

at Faculty of Mathematics and Physics of Charles University, Ke Karlovu 5, 121 16 Praha 2

**Seminar room F052**



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## Formation of spin-polarized current in antiferromagnetic polymer spintronic field-effect transistor

We have theoretically investigated the feasibility of constructing a spintronic field-effect transistor with the active channel made of a polymer chain with the antiferromagnetic coupling oriented in the source-to-drain direction. We found two different device function regimes controlling the on-chain spin-charge carrier density by tuning the gate voltage. At higher charge carrier densities, the source-drain current linearly increases with decreasing the charge carrier densities. In this regime, no polymer spin-polarized current is observed. Upon reaching a critical gate voltage, the current decreases with decreasing charge densities. It is accompanied by the formation of the spin-polarized current, generated by an on-chain process, which can be related to spin-charge spatial distribution symmetry breaking caused either by an application of the source-to-drain voltage (higher spin polarization near the drain), or the breakdown of the Peierls dimerization near chain ends. Numerical simulation of the transistor characteristics suggests that the design of a polymer spintronic field-effect transistor is in principle feasible.

