Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Spin- and Valley-Polarized Transport across Line Defects in Monolayer MoS_2[1] ARTEM PULKIN, OLEG YAZYEV, Institute of Theoretical Physics, Ecole Polytechnique Fédérale de Lausanne (EPFL), CH-1015 Lausanne, Switzerland — We address ballistic transmission of charge carriers across ordered line defects in monolayer transition metal dichalcogenides. Our study reveals the presence of a transport gap driven by spin-orbit interactions, spin and valley filtering, both stemming from a simple picture of spin and momentum conservation, as well as the electron-hole asymmetry of charge-carrier transmission. Electronic transport properties of experimentally observed ordered line defects in monolayer MoS_2, in particular the vacancy lines and inversion domain boundaries, are further investigated using first-principles Green's function methodology. Our calculations demonstrate the possibility of achieving nearly complete spin polarization of charge carriers in nanoelectronic devices based on engineered periodic line defects in monolayer transition metal dichalcogenides, thus suggesting a novel practical scheme for all-electric control of spin transport.

[1]We acknowledge support from ERC project "TopoMat" (grant No. 306504) and the Swiss NSF (grant No. PP00P2_133552).

Artem I
Institute of Theoretical Physics, Ecole Polytechnique Fédérale de Lausanne (EPFL), CH-1015 Lausanne, Switz

Date submitted: 04 Nov 2015 Electronic form version 1.4