Information for Paper ID 9368

Paper Information:

Paper Title:	Conductance in a Nanoribbon of Topologically Insulating MoS2 in the 1T' Phase
Student Contest:	No
Affiliation Type:	Academia
Keywords:	Ballistic conductance, k. p Hamiltonian, nanoribbons, subbands, topological insulators (TIs), topologically protected edge states
Abstract:	The use of new materials with advanced properties has become mandatory to meet the needs for higher electronics performance at reduced power. Topological insulators (TIs) possess highly conductive topologically protected edge states which are insensitive to scattering and thus suitable for energy-efficient highspeed devices. Here,we evaluate the subband structure in a narrow nanoribbon of 1T molybdenumdisulphide using an effective k·p Hamiltonian. Highly conductive topologically protected edge modes whose energies lie within the bulk band gap are investigated on equal footing with traditional electron and hole subbands. Due to the interaction between the edge modes at opposite sides, a small gap in their linear spectrum opens up in a narrow nanoribbon. This gap is shown to sharply increase with the perpendicular out-of-plane electric field, in contrast to the behavior in a wide nanoribbon with negligible edge modes' interaction. This increase leads to a rapid decrease in the ballistic nanoribbon conductance and current with the electric field, which can be used for designing molybdenum disulphide nanoribbon-based current switches.
Track ID:	18
Track Name:	TEDbrief special edition (ESSDERC)
Final Decision:	Accept as Lecture
Session Name:	Device Modelling (2020 TEDbrief special edition) (Lecture)