Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Dirac Fermions without bulk backscattering in rhombohedral topological insulators[1] CARLOS MERA ACOSTA, MATHEUS LIMA, LEANDRO SEIXAS, ANTÔNIO DA SILVA, ADALBERTO FAZZIO, Instituto de Física, Universidade de São Paulo, CP 66318, 05315-970, São Paulo, SP, Brazil — The realization of a spintronic device using topological insulators is not trivial, because there are inherent difficulties in achieving the surface transport regime. The majority of 3D topological insulators materials (3DTI) despite of support helical metallic surface states on an insulating bulk, forming topological Dirac fermions protected by the time-reversal symmetry, exhibit electronic scattering channels due to the presence of residual continuous bulk states near the Dirac-point. From ab initio calculations, we studied the microscopic origin of the continuous bulk states in rhombohedral topological insulators materials with the space group $D^5_{3d}(R\bar{3}m)$, showing that it is possible to understand the emergence of residual continuous bulk states near the Dirac-point into a six bands effective model, where the breaking of the R_3 symmetry beyond the Γ point has an important role in the hybridization of the p_x, p_y and p_z atomic orbitals. Within these model, the mechanisms known to eliminate the bulk scattering, for instance: the stacking faults (SF), electric field and alloy, generated the similar effect in the effective states of the 3DTI. Finally, we show how the surface electronic transport is modified by perturbations of bulk with SF.

[1]We would like to thank the financial support by Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP).

Carlos Mera
Univ de Sao Paulo

Date submitted: 14 Nov 2014 Electronic form version 1.4