Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Strong Correlation effects to Topological Quantum Phase Transitions in Three-Dimensions ADRIANO AMARICCI, CNR-IOM, MASSIMO CAPONE, International School for Advanced Studies, JAN BUDICH, University of Innsbruck, Austria, GIORGIO SANGIOVANNI, BJOERN TRAUZETTEL, University of Wuerzburg, Germany — Topological Insulating phases of three dimensions are classified in terms of four Z_2 global invariants. In the non-interacting case the Topological Quantum Phase Transition (TQPT), *i.e.* the sudden change of such invariants, occurs through the continuous closure of the energy gap as long as the symmetries protecting the Topological phase are preserved. However, the recent progress in engineering or predict Topological Insulating states in heavy-elements compounds, pushed the attention to the effects of large electronic interaction. Here we show that strongly correlated 3-dimensional Topological Insulators are characterized by a substantially different physics with respect to their non-interacting counterpart. Our study shows that the TQPT to the Strong Topological Insulator is dominated by the presence of a Quantum Critical Point, the end of a first-order topological transition. In addition we show that the conventional paradigm of a continuous TQPT breaks down for strong enough correlation, through to a discontinuous transition without closure of the spectral gap.

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Date submitted: 06 Nov 2015 Electronic form version 1.4