



The Abdus Salam
International Centre for Theoretical Physics



**FIFTH STIG LUNDQVIST CONFERENCE ON THE
ADVANCING FRONTIERS OF CONDENSED MATTER PHYSICS
11 - 15 July 2011**

**Z₂ TOPOLOGICAL INVARIANT FOR BAND INSULATORS AND NON-ABELIAN
BERRY, ÅÖS CONNECTION**

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ABSTRACT:

We introduce a new expression for the Z_2 topological invariant of band insulators using non-Abelian Berry, ÅÖs connection. Our expression can identify the topological nature of a general band insulator without any of the gauge fixing problems that plague the concrete implementation of previous invariants. The new expression can be derived from the "partner switching" of the Wannier function center during time reversal pumping and is thus equivalent to the Z_2 topological invariant proposed by Kane and Mele. Using the new expression, we have recalculated the Z_2 topological index for several topological insulator material systems and obtained consistent results with the previous studies.