Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Geometric theory of magnetic breakdown ARIS ALEXANDRADINATA, LEONID GLAZMAN, Yale University — We complete the theory of magnetic breakdown in solids to include the geometric Berry phase. Our theory describes the spectrum of Bloch electrons where the semiclassical approximation breaks down – specifically, where bands approach each other near a topological intersection, as well as at saddle-point dispersions where the semiclassical velocity of a Bloch wave packet vanishes. In these situations, the energy levels of Bloch electrons are determined by generalized Bohr-Sommerfeld quantization conditions which incorporate both quantum tunneling and Berry phase. Specific case studies are discussed for inter-band breakdown that arises in tilted Dirac fermions, and for intra-band breakdown on the surface of topological crystalline insulators.

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Date submitted: 10 Nov 2016 Electronic form version 1.4