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The relativistic time-dependent Aharonov-Bohm effect and the topology of the electromagnetic vacuum ATHANASIOS PETRIDIS, ZACHARY KERTZMAN, Drake University — The Aharonov-Bohm (A-B) effect reveals some topological properties of the vacuum. In particular, it is connected to the fundamental homotopy group of the gauge group. For the effect to exist, the latter must be non-trivial. Therefore, in the case of electromagnetic interactions the experimental verification of the A-B effect can be a test of the vacuum topology of the Standard Model since, in this model, the electromagnetic-sector gauge group is irregularly embedded in the electroweak one. The magnetic, relativistic time-dependent A-B effect is studied by developing numerical solutions to the minimally-coupled Dirac equation. The contributions of a magnetic potential associated with an infinitely-long solenoid and of possible, residual, dipole fields are evaluated. It is shown that time-dependent interferometry signals exhibit a characteristic non-monotonic behavior as functions of the field strength allowing for a clear isolation of the A-B effect.

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