Abstract Submitted
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Strong fields and QED as function of the g-factor[1] JOHANN RAFELSKI, LANCE LABUN, Department of Physics, The University of Arizona — Precision QED experiments (muon $g-2$ and Lamb shift) require understanding of QED with arbitrary gyromagnetic ratio $g > 2$. We will first show that the need to have a renormalizable theory requires for $g > 2$ reformulation in terms of Klein-Gordon-Pauli (KGP) equation. Using KGP, we obtain the nonperturbative effective action of QED within Schwinger proper time method in arbitrarily strong quasi-constant external electromagnetic fields as a function of g. The expression is divergent for $|g| > 2$, given the magnetic instability of the vacuum due to the lowest Landau orbit eigenenergy having an indefinite value in strong magnetic fields. The spectrum of Landau eigenvalues for KGP in a magnetic field is an exact periodic function of g, no states are disappearing from the spectrum. This periodicity allows to establish a generalized form of the effective action valid for all g. We show the presence of a cusp at the periodic points $g = \ldots -6, -2, 2, 6 \ldots$. Consequently, the QED beta function and parts of light-by-light scattering differ from perturbative computation near to $g = 2$ and an asymptotically free domain of g for QED arises. We further show that only for $g = (2N + 1)$ there is exact correspondence of a field-dependent quasi-temperature and the Unruh Temperature.

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