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The Schwinger model: operator solutions and a genuine light-front treatment

We present a review of a few operator solutions of the Schwinger model found it the past along with a new solution obtained within the light-front field theory. In the former results, a few subtle points, related to the residual gauge invariance in the covariant gauge and to the choice of field variables, are identified and an improvement is suggested. Then a summary of the previous light-front attempts is given pointing out certain limitations of that scheme. In the second half of our contribution, we focus on the Schwinger model, formulated in terms of light front (LF) variables and restricted to the covariant (Feynman) gauge. A simple operator solution of the two components of the corresponding Dirac equation is found in terms of the free massless LF fermion field and the LF gauge field. The recently proposed quantization of two-dimensional massless LF fields proved very useful in constructing this operator solution. Axial anomaly is obtained as a consequence of the point-splitting regularization of the fermion current. The Schwinger mechanism and chiral symmetry is studied. Finally, possibilities to derive non-trivial vacuum structure in the LF Schwinger model, based on the residual large gauge transformations, are analyzed.

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