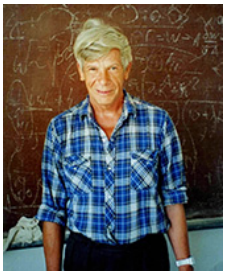

Contribution ID: **140** Type: **not specified**

On the Landau-Khalatnikov-Fradkin transformation in QED

Thursday, 13 October 2022 14:30 (25 minutes)

The Landau-Khalatnikov-Fradkin (LKF) transformation is a
powerful and elegant transformation allowing to study the gauge dependence of the propagator of charged particles interacting with gauge fields. With the help of this transformation, we derive a non-perturbative identity between massless propagators in two different gauges. In the case of quenched three-dimensional QED, from the LKF identity, assuming the finiteness of the perturbative expansion, we
state that, exactly in d=3, all odd perturbative coefficients, starting with the third order one, should be zero in any gauge. To check the result, we calculate the three- and four-loop corrections to the massless fermion propagator. The three-loop correction is finite and gauge invariant but, however, the four-loop one has singularities except in the Feynman gauge where it is also finite. These results explicitly show an absence of the finiteness of the perturbative expansion in quenched three-dimensional QED. Moreover, up to four loops, gauge-dependent terms are completely determined by lower order ones in agreement with the LKF transformation.

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Session Classification: Section B

Track Classification: Section B: Quantum field theory methods in elementary particle physics