natural kinematical variables (we refer to the special frame) $k_0^2 - k_3^2$, $\mathbf{k_\perp^2}$, where k_0 is the energy of the excitation, and k_3 and $\mathbf{k}_\perp$ are its momentum projections onto the common direction (chosen as axis **3**) of $\mathbf{E}$ and $\mathbf{B}$ and onto the transverse plane, respectively. All massive excitations, i.e. the ones with nonzero rest energy $k_0|_{\mathbf{k}=0} \neq 0$, are lost in this limit. Within this framework the problem of photon propagation in a constant background, where $\mathfrak{F}$ and $\mathfrak{G}$ are both nonzero, was first studied by Plebański [1], who appealed to a rather general nonlinear Lagrangian independent of the field-derivatives. Among other results, he wrote certain conditions, which the Lagrangian should satisfy lest it might contradict the causal propagation of small-amplitude electromagnetic waves. More recently, Novello *et al.* [2] observed an interesting possibility that in the infrared limit the constant background field may be geometrized to be represented by an equivalent metric. The present authors, too, payed attention to the infrared limit by proving recently [3] the convexity property of the Lagrangian as a function of the both variables $\mathfrak{F}$ and $\mathfrak{G}$ in the point $\mathfrak{G} = 0$, basing on causality and unitarity requirements.

To adequately consider the linearized problem of small vacuum excitations the knowledge of the infrared limit is not sufficient, and one is obliged to appeal to the second-rank polarization tensor as a function of arbitrary 4-momentum k_μ not restricted to any mass shell, i.e. with arbitrary virtuality k^2. (To consider the problem beyond the linear approximation higher-rank polarization tensors should be taken also at arbitrary values of all the four momentum components). The needed polarization operator was first studied by Batalin and Shabad [4] (see also the book [5]), who found the general covariant structure and eigenvector expansion (the diagonal form) of the polarization operator and photon Green function in the constant field with the both invariants $\mathfrak{F}$ and $\mathfrak{G}$, taken nonzero simultaneously, that follows exclusively from the Lorentz- gauge- and charge-invariance and parity conservation of Quantum Electrodynamics (QED). They also calculated the polarization operator as an electron-positron loop in the external field of arbitrary strength. Such one-loop calculations were repeated by Bayer *et al.* and Urrutia [6]. The latter author also studied in more detail the useful further approximation of small external field and zero virtuality, and observed some features, which, as a matter of fact, are independent of this approximation, as well as of the one-loop approximation itself. One-loop polarization operator was revisited in [7] and, under simplifying kinematical conditions, was separately calculated in [8].

The ardor of investigators towards the study of light propagation in the field that contains