Interplay Between Photon Emission and Trident in a Non-Perturbative Regime $\alpha\chi^{2/3} \gtrsim 1$

E S Sozinov[1], A A Mironov[1,2], A M Fedotov[1], E N Nerush[3], and I Yu Kostyukov[3]

[1] *Theoretical Nuclear Physics, National Research Nuclear University (MEPhI), 31, Kashirskoe Shosse, Moscow, Russia*

[2] *Theoretical department, Prokhorov General Physics Institute of RAS, 38, Vavilov St., Moscow, Russia*

[3] *Department of Ultrafast Processes, Institute of Applied Physics, Russian Academy of Sciences, 46, Ulyanov St., Nizhny Novgorod, Russia*

Contact Email: e.s.sozinov@gmail.com

Ritus-Narozhny conjecture predicts that radiative corrections in a strong constant crossed field scale as $g = \alpha\chi^{2/3}$, where $\chi = (e/m^3)\sqrt{-(Fp)^2}$. This implies a perturbation theory breakdown and the necessity of at least partial resummation of radiative corrections for $g \gtrsim 1$.

For the photon emission with accounting for vacuum polarization, bubble-type corrections at $g \gtrsim 1$ the formation length τ_{form} becomes of the order of the photon decay length τ_{decay}, and both real and imaginary parts of the polarization operator are of the same order. The latter means that the photons are violently unstable. However, unitarity requires to consider transitions only to stable final states.

By utilizing a simple scalar model which mimics the bubble-type corrections to the photon emission and trident process in a CCF we illustrate a proper way to account for the final photon and/or electron states under such conditions.

In scalar QED, we calculate the probability for the dressed photon emission in a CCF in a regime when the photon is stable, *i.e.* for $\chi_\gamma \ll 1$. We also consider the resummed mass operator [1] and conclude that its imaginary part includes exclusively either the photon emission for $\chi_\gamma \ll 1$ or the trident process for $\chi_\gamma \gg 1$. We argue that consideration of the photon emission alone is meaningless at $\chi_\gamma \gtrsim 1$.

References

[1] A Mironov, S Meuren and A Fedotov, Phys. Rev. D **102**, 053005 (2020)