Quantum Reflection as an Observable Quantum Vacuum Signature

M Valialshchikov[1,2], F Karbstein[2,3,4], and D Seipt[1,2,3]

[1] *Institute of Optics and Quantum Electronics, Friedrich-Schiller-Universität Jena, Max-Wien-Platz 1, 07743, Jena, Germany. Contact Phone: +49 3641 947-201*

[2] *Helmholtz Institut Jena, Fröbelstieg 3, 07743, Jena, Germany. Contact Phone: +49 3641 947-601*

[3] *GSI Helmholtzzentrum für Schwerionenforschung GmbH, Planckstrasse 1, 64291, Darmstadt, Germany. Contact Phone: +49 6159-71-0*

[4] *Theoretisch-Physikalisches Institut, Friedrich-Schiller-Universität Jena, Max-Wien-Platz 1, 07743, Jena, Germany. Contact Phone: +49 3641 947-101*

Contact Email: maksim.valialshchikov@uni-jena.de

Modern laser and detector technologies allow to propose and perform first photon-photon scattering experiments with real on-shell photons. However, for currently available technologies, the expected light-by-light signal is weak (only a few photons), especially compared to the huge laser background. Therefore, it is crucial to identify prospective scenarios for potential experimental measurement and provide quantitative estimates for them. Quantum reflection might be an interesting quantum vacuum signature due to the good separation of signal from background [1]. Using a linear Maxwell solver to describe the evolution of background fields [2] and the vacuum emission picture to calculate the signal [3], we provide numerical estimates of quantum reflection on dipole waves and other field configurations.

References

[1] H Gies, F Karbstein and N Seegert, New J. Phys. **15**, 083002 (2013); arXiv:1305.2320 (2013)

[2] A Blinne, H Gies, F Karbstein, C Kohlfürst and M Zepf, Phys. Rev. D **99**, 016006 (2019); arXiv:1811.08895 (2018)

[3] F Karbstein and R Shaisultanov, Phys. Rev. D **91**, 113002 (2015); arXiv:1412.6050 (2014)