Photon Photon Scattering in High Intensity Interactions

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The development of lasers capable of intensities in the range of 10^{20}-10^{23} Wcm^{-2} allows significant fraction of the critical Schwinger field of QED $E_S \sim 10^{18} Vm^{-1}$ to be reached in experiments or even exceeded in the rest frame of relativistic electrons, with the field strength paramterised by $\chi=\gamma E/E_S$, where γ is the Lorentz factor. Photon-Photon Scattering has been predicted to be directly accessible for multiple interacting laser fields [1,2,3] with >1 scattered photon being observable.

Verifying this kind of behaviour in the laboratory is extraordinarily challenging in the presence of $>10^{20}$ primarly photons. Scattering due to single electrons and multiple scattering from experimental boundaries can be a significant or even dominant background. We present firwt experimental concepts to mitigate the background and detector concepts to select the scattered signal from any background and evaluate the current status.

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