MATTER AND TECHNOLOGIES

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Radiation Reaction of a Laser-Accelerated Electron Beam with a Relativistic Laser Field

Radiation reaction is defined as the recoil force that a moving particle suffers due to the emission of electromagnetic radiation. The effect of radiation reaction has been intriguing physicists since 1906 starting with the seminal studies, for example, of Planck, Abraham, and Lorentz [1]. Several models have been derived since then to describe radiation reaction of electrons, for example, in a high-intensity laser field.

In the first section of the poster, different models of radiation reaction are described: Landau-Lifshitz (LL) equation of motion [2], the semiclassical approach by applying a correction factor on the radiation force of the LL equation [3] and, finally, a simple RR model that accounts for the QED effects. In the second part of the poster, we describe an experiment at the Rutherford Appleton Laboratory (RAL) that can test physics models of radiation reaction. The experiment is based on the recent work by Poder et al. [4] and Cole et al. [5], a laser-accelerated electron beam interacts with a high-intensity laser pulse. The energy loss of the electron beam due to the emission of high energy photons can be measured. The experimental setup is presented and discussed in detail.

References

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[2] L. Landau and E. Lifshitz, Course of Theoretical Physics: The Classical Theory of Fields, 3rd ed. Pergamon Press, 1971.

[3] J. G. Kirk et al., "Pair production in counter-propagating laser beams,"Plasma Phys. Control. Fusion, vol. 51, no. 8, p. 085008, 2009.

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Primary author: SALGADO, Felipe Cezar (Helmholtz Institute Jena)

Co-authors: Dr THOMAS, Alec (University of Michigan); Dr KETTLE, Brendan (Imperial College London); Dr RÖDEL, Christian (Jena); Mr HOLLATZ, Dominik (Helmholtz Institute Jena); Mr GERSTMAYR, Elias (Imperial College London); Dr SARRI, Gianluca (Queen's University Belfast); Mr SAMARIN, Guillermo Marrero (The Queen's University of Belfast); Mr HARSH, Harsh (Helmholtz Institute Jena); ZEPF, Matt (HIJ); BOURGEOIS, Nicolas (STFC Rutherford Appleton Laboratory); PATTATHIL, Rajeev (STFC Rutherford Appleton Laboratory); Dr MANGLES, Stuart (Imperial College London); Dr KATZIR, Yiftach (STFC Rutherford Appleton Laboratory)

Presenter: SALGADO, Felipe Cezar (Helmholtz Institute Jena)

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