Contribution ID: **205** Type: **Oral contribution**

Probing strong-field QED in beam-plasma collisions

Thursday, 21 September 2023 09:00 (35 minutes)

Recent progress in laser and accelerator technology opens new possibilities to investigate the largely unexplored strong-field quantum electrodynamics (SFQED) regime where electron-positron pairs can be created directly from light-vacuum fluctuations. When a high charge, ultra-relativistic electron beam collides with a solid density plasma, the beam self-fields are reflected, partly or fully, depending on the beam shape and can exceed the Schwinger critical field in the beam rest frame thus triggering SFQED processes as nonlinear inverse Compton scattering and nonlinear Breit-Wheeler electron positron pair creation. We report on this new concept to probe SFQED using a single electron beam and show that copious amount of positron can be created from this interaction [Commun Phys 6, 141 (2023)]. This setup can achieve conditions similar to those envisioned in beam-beam collisions, but in a simpler and more controllable way owing to the automatic overlap of the beam and driving fields. This scheme also eases the way to precision studies of SFQED as the observables are cleaner than in the electron-laser collision case. We will report on the study of the beam self-field reflection depending on the beam shape and plasma density, and study the SFQED observables resulting from this ultrafast interaction.

Primary authors: MATHERON, Aimé (LOA, ENSTA Paris, CNRS, Ecole Polytechnique, Institut Polytechnique de Paris, 91762 Palaiseau, France); CLAVERIA, Pablo San Miguel (LOA, ENSTA Paris, CNRS, Ecole Polytechnique, Institut Polytechnique de Paris, 91762 Palaiseau, France)

Co-authors: KNETSCH, Alexander (LOA, ENSTA Paris, CNRS, Ecole Polytechnique, Institut Polytechnique de Paris, 91762 Palaiseau, France); SHEA, Brendan O (SLAC National Accelerator Laboratory, Menlo Park, CA 94025, USA); KEITEL, Christoph H. (MaxPlanck-Institut für Kernphysik, Saupfercheckweg 1, D-69117 Heidelberg, Germany); STOREY, Doug (SLAC National Accelerator Laboratory, Menlo Park, CA 94025, USA); FIUZA, Frederico (SLAC National Accelerator Laboratory, Menlo Park, CA 94025, USA); EKERFELT, Henrik (SLAC National Accelerator Laboratory, Menlo Park, CA 94025, USA); PETERSON, J. Ryan (SLAC National Accelerator Laboratory, Menlo Park, CA 94025, USA); GREMILLET, Laurent (CEA, DAM, DIF, 91297 Arpajon, France); HOGAN, Mark J. (SLAC National Accelerator Laboratory, Menlo Park, CA 94025, USA); TAMBURINI, Matteo (MaxPlanck--Institut für Kernphysik, Saupfercheckweg 1, D-69117 Heidelberg, Germany); GILLJOHANN, Max F. (LOA, ENSTA Paris, CNRS, Ecole Polytechnique, Institut Polytechnique de Paris, 91762 Palaiseau, France); LITOS, Mike (Department of Physics, Center for Integrated Plasma Studies, University of Colorado Boulder, Boulder, CO 80309, USA.); ARINIELLO, Robert (Department of Physics, Center for Integrated Plasma Studies, University of Colorado Boulder, Boulder, CO 80309, USA); MONTEFIORI, Samuele (MaxPlanck-Institut für Kernphysik, Saupfercheckweg 1, D-69117 Heidelberg, Germany.); GESSNER, Spencer (SLAC National Accelerator Laboratory, Menlo Park, CA 94025, USA); CORDE, Sébastien (LOA, ENSTA Paris, CNRS, Ecole Polytechnique, Institut Polytechnique de Paris, 91762 Palaiseau, France); ZAKHAROVA, Viktoriia (LOA, ENSTA Paris, CNRS, Ecole Polytechnique, Institut Polytechnique de Paris, 91762 Palaiseau, France); DAVOINE, Xavier (CEA, DAM, DIF, 91297 Arpajon, France); XU, Xinlu (SLAC National Accelerator Laboratory, Menlo Park, CA 94025, USA); WU, Yipeng (University of California Los Angeles, Los Angeles, CA 90095, USA); MANKOVSKA, Yuliia (LOA, ENSTA Paris, CNRS, Ecole Polytechnique, Institut Polytechnique de Paris, 91762 Palaiseau, France); NIE, Zan (University of California Los Angeles, Los Angeles, CA 90095, USA)

Presenter: MATHERON, Aimé (LOA, ENSTA Paris, CNRS, Ecole Polytechnique, Institut Polytechnique de Paris, 91762 Palaiseau, France)

Session Classification: Plenary session

Track Classification: Invited