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Physics Opportunities at a Lepton Collider in the Fully Nonperturbative QED Regime

Wednesday, 18 September 2019 16:00 (20 minutes)

The presentation will discuss physics questions associated with a novel type of lepton collider, which exploits strong-field quantum effects [i]. In particular, the proposed collider mitigates beamstrahlung energy losses by utilizing highly compressed lepton bunches, which are shorter than the average photon emission length. It is therefore fundamentally different from existing designs for future high-luminosity lepton colliders such as CLIC and ILC, which minimize beamstrahlung energy losses for fixed luminosity by using flat and elongated bunches. This design raises the possibility of creating a gamma-gamma collider without Compton backscattering, relying instead on hard synchrotron radiation to generate the photons. This new approach depends on aspects of radiation in background fields in the strongly quantum regime that are poorly understood today. The presentation will address the extent to which physics models in this extreme high-field regime could be tested in the near- and mid-term by strong field QED experiments colliding high energy electrons with intense laser fields.

[i] V. Yakimenko et al. On the Prospect of Studying Nonperturbative QED with Beam-Beam Collisions, Phys. Rev. Lett. 122, 190404 (2019)

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