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Laser-Particle collider for high-energy high-intensity physics studies

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The studies of laser-plasma interactions are entering a new regime where the physics of relativistic plasmas is strongly affected by strong-field quantum electrodynamics processes, including hard photon emission and electron-positron pair production. This coupling of quantum emission processes and relativistic collective particle dynamics can result in dramatically new plasma physics phenomena, such as the generation of dense electron-positron pair plasma from near vacuum, complete laser energy absorption or the stopping of an ultra-relativistic electron beam. It is understood that the magnitude of all these phenomena depends on the electromagnetic field configuration. The collision of several phase-matched laser pulses has been identified theoretically as a way to maximize the strength of optical electromagnetic fields achievable at high-intensity laser facilities. This has paved the way for several experimental proposals aimed at both fundamental studies of matter at extreme conditions and the creation of particle and radiation sources. We report here on a systematic analysis of different regimes and opportunities achievable with the concept of multiple colliding laser pulses, for both current and upcoming laser facilities. Several distinct regimes are revealed to be within reach of multi-petawatt laser facilities.

Is this abstract from experiment?

No

Name of experiment and experimental site

N/A

Is the speaker for that presentation defined?

Yes

Details

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Internet talk

Yes

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