COLLOQUIUM

Advanced Structure – and Plasma-Based Accelerators

Gennady Shvets

The University of Texas at Austin

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4:00 p.m. (coffee @ 3:30)

The push towards higher accelerating gradients inevitably points towards higher frequencies and, ultimately, towards laser-driven accelerator schemes. In this talk I will review several advanced accelerator concepts that offer potentially large accelerating gradients and, consequently, enable much more compact accelerating structures. First, I will discuss recent experimental and theoretical progress in laser wakefield acceleration in the plasma that resulted in the demonstration of 2 GeV monochromatic acceleration of electrons at the Texas Petawatt Center. The physics of electron injection into and acceleration by the plasma "bubble" moving with the speed close to the speed of light will be discussed. I will then discuss a recently emerged concept of direct laser acceleration that employs a laser pulse co-propagating with relativistic electrons executing a betatron oscillation inside the plasma bubble. Finally, I will discuss a new structure-based laser-driven surface wave accelerator based on silicon carbide (SiC) that employs a polaritonic material with a negative dielectric permittivity at the wavelength of the carbon dioxide laser.

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