ID contributo: **286** Tipo: **Oral contribution**

Plasma afterglow light dynamics and measurement technics of a plasma accelerator plasma source

mercoledì 20 settembre 2023 17:25 (20 minuti)

We present an experimental and simulated investigation of helium plasma glow light dynamics and its application to the physical measurements of a plasma wakefield accelerator (PWFA) plasma source. We model the plasma formation with a split-step Fourier optical propagation code and a particle-in-cell (PIC) code. We then simulate the plasma expansion dynamics using a plasma fluid code. Using a combination of analytical reasoning and simulations, we develop a simple model to estimate the photon emission density from the plasma based on the initial plasma density and temperature. Our findings indicate that electron-induced collisional excitations dominate the light emission process over electron-ion recombination. We also introduce an innovative experimental technique that enables a machine vision gigabit Ethernet (GigE) camera to resolve nanosecond-scale temporal dynamics of the plasma source. This is cost-effective method is well suited high-radiation settings like PWFA experimental environments. We find good agreement between experimental data and simulations. Further, we demonstrate that a PWFA-like plasma source's integrated peak plasma light density, a common measurement in PWFA experiments, can be written in an analytical form dominated by the electron-neutral collisional excitation in the light emission process.

Autore principale: LEE, Valentina (University of Colorado, Boulder)

Coautore: ARINIELLO, Robert (Department of Physics, Center for Integrated Plasma Studies, University of Colorado Boulder, Boulder, CO 80309, USA); DOSS, Christopher (University of Colorado Boulder); HANSEL, Claire (University of Colorado, Boulder); LITOS, Mike (Department of Physics, Center for Integrated Plasma Studies, University of Colorado Boulder, Boulder, CO 80309, USA.)

Relatore: LEE, Valentina (University of Colorado, Boulder)

Classifica Sessioni: WG8: Plasma sources and related diagnostics

Classificazione della track: WG8: Plasma sources and related diagnostics