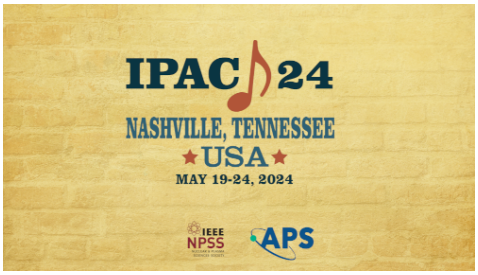

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Design and optimization of structured metal plasma targets using a CFD code for laser wakefield acceleration

Monday, 20 May 2024 16:00 (2 hours)

Laser Wakefield Acceleration (LWFA) can generate a high-energetic electron beam in a short accelerating distance of several cm, which is advantageous for the development of an compact accelerator. The LWFA using metal targets is highly influenced by the field ionization process of metal atoms (or ions) due to the high intensity of main laser. Titanium produces a large amount of ionized electrons near the optical axis due to localized peak intensity followed by breaking the wake cavity. However, this nature of ionization process of titanium can apply to the intense ionization injection into the wake cavity formed by the aluminum plasma. Our group suggested a structured metal plasma target using aluminum with a thin titanium layer and investigated the performance of the controlled injection depending on the location and thickness of titanium layer in the aluminum plasma [1].
In this paper, a structured plasma target is designed and optimized using a CFD code to realize the desired profile of metal plasma ablated by a laser. The performance of laser electron acceleration obtained by PIC simulation was presented for different profile of metal plasma targets designed using a CFD code.

Footnotes

[1] H. W. Lee et. al., "Control of Electron Injection in LWFA with a Laser-ablated Aluminum Plasma by inserting a thin-layer of different metal", presented in IPAC 2023.

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Primary author: LEE, Hyeon Woo (Korea University Sejong Campus)

Co-authors: SHIN, Sang Yun (Chung-Ang University); PARK, Seong Hee (Korea University Sejong Campus)

Presenter: LEE, Hyeon Woo (Korea University Sejong Campus)

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