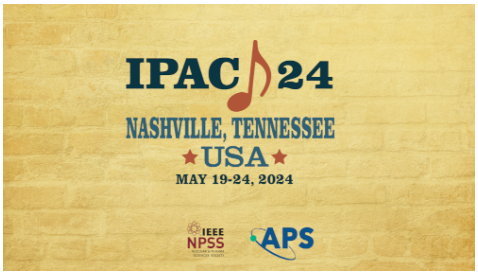

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High-intensity pulse propagation in multi-GeV laser plasma accelerator stages

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

Due to their compactness, laser-plasma accelerators are a promising approach to future energy frontier electron accelerators. To reach multi-GeV energies in a single accelerator stage, the high-intensity drive laser pulse must be kept focused over several tens of centimeters through a sufficiently low density plasma. Without an external guiding mechanism, the laser will diffract reducing the laser intensity, which in turn limits acceleration to ˜1 cm. Optically generated plasma channels have recently gained attention as a promising method to keep high-intensity laser pulses tightly focused over the meter scale [1,2]. Understanding how the laser pulse evolves in the spatial and temporal domain during propagation is critical for high energy gain, and maintaining high bunch quality. We present experimental results investigating drive laser propagation in optically formed plasma channels at the BELLA PW laser. We demonstrate conditions under which the channel can be tailored to match the drive laser focus at plasma densities suitable for multi-GeV accelerators.

Footnotes

[1] A. Picksley et al., Phys. Rev. E 102, 053201 (2020)
[2] L. Feder et al., Phys. Rev. Research 2, 043173 (2020)

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