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Optimization of laser coupling into optically field ionized plasma channels for laser-plasma acceleration

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Laser-plasma accelerators (LPAs) can have high acceleration gradients on the order of 100 GeV/m. The high acceleration gradients of LPAs offer the possibility of powering future colliders at the TeV range and reducing the size of particle accelerators at present energy levels. LPAs need tightly focused, high intensity laser pulses and require guiding structures to maintain the laser focus over the optimum acceleration length. It is necessary to match the parameters of the guiding structure and the laser pulse to couple the maximum laser energy into the guiding structure. Optically field ionized (OFI) plasma channels are a guiding structure capable of matching the parameters of the petawatt (PW) laser facility at the Berkeley Lab Laser Accelerator (BELLA) Center [1, 2]. We will present results on the optimization of laser coupling into OFI plasma channels on BELLA PW. We will also discuss how optimization of laser coupling relates to upcoming staging experiments on BELLA PW.

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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Primary author: STACKHOUSE, Josh (Lawrence Berkeley National Laboratory)

Co-authors: PICKSLEY, Alex (Lawrence Berkeley National Laboratory); GONSALVES, Anthony (Lawrence Berkeley National Laboratory); GEDDES, Cameron (Lawrence Berkeley National Laboratory); SCHROEDER, Carl (Lawrence Berkeley National Laboratory); BENEDETTI, Carlo (Lawrence Berkeley National Laboratory); ESAREY, Eric (Lawrence Berkeley National Laboratory); TSAI, Hai-En (Lawrence Berkeley National Laboratory); VAN

TILBORG, Jeroen (Lawrence Berkeley National Laboratory); NAKAMURA, Kei (Lawrence Berkeley National Laboratory)

Presenter: STACKHOUSE, Josh (Lawrence Berkeley National Laboratory)

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