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## **e4AWAKE: Next generation electron source for the Advanced Wakefield Experiment (AWAKE) at CERN**

*Monday, 19 September 2022 18:30 (20 minutes)*

Proton-driven plasma wakefield acceleration of electrons was first demonstrated in 2018 by the Advanced Wakefield Experiment (AWAKE) at CERN [1]. Following this achievement, AWAKE has developed the Run 2 research program, aimed at producing high-quality electron bunches reaching tens of GeV [2].

In the baseline Run 2 program, a one-meter gap is required between two plasmas to inject electron bunches generated by an RF-based source. The gap in plasma reduces wakefields by a factor of two, limiting acceleration, and the RF-based source does not allow for injection of electron bunches spaced by the plasma wavelength, limiting luminosity. It is therefore interesting to explore alternative injection schemes.

The e4AWAKE project aims to avoid both limitations by producing electron bunches inside the plasma, using a high-power laser impinging on a movable solid target, as proposed in Ref. [3]. The project can be developed and tested in parallel with the baseline Run 2 program. Parameters, simulations and design considerations for the e4AWAKE project will be discussed.

[1] E. Adli et al. (AWAKE Collaboration), *Nature* 561, 363–367 (2018)

[2] E. Gschwendtner et al. (AWAKE Collaboration), *Symmetry* 14(8), 1680 (2022)

[3] V. Khudiakov and A. Pukhov, *Phys. Rev. E* 105, 035201 (2022)

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