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A plasma-based acceleration method suitable for non-relativistic muons

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The past years have seen a growing interest in plasma-based accelerator technology since it provides a route to more compact, ecological yet powerful accelerators. However, even well-established acceleration techniques are only effective with particles traveling at speeds close to the speed of light (relativistic particles), leading to the exclusion of heavier particles, e.g. muons from the acceleration process.
Recently, cutting-edge methods for shaping the spatio-temporal spectrum of electromagnetic wave-packets that produce pulses with variable group velocities have been devised [1]. These pulses can propagate with subluminal group velocities, making them suitable candidates to drive acceleration wakes for slower particles. Furthermore, if carefully crafted, they can also increase their group velocity while propagating [2].
In this work, we present the ongoing research on a plasma-based acceleration method for non-relativistic particles using pulses with increasing subluminal group velocities as drivers. The method suggested has been first studied analytically and then tested using 2D particle-in-cell simulations with the code OSIRIS [3].

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[3] R.A. Fonseca et al., Phys. Plasmas Control. Fusion 55, 124011 (2013).

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