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Operation regimes of a dielectric laser accelerator

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ABSTRACT

We investigate three operation regimes in dielectric laser driven accelerators: maximum efficiency, maximum charge, and maximum loaded gradient. We demonstrate, using a self-consistent approach, that loaded gradients of the order of 1 to 6 [GV/m], efficiencies of 20% to 80%, and electrons flux of 10^{14} [el/s] are feasible, without significant concerns regarding damage threshold fluence. The latter imposes that the total charge per squared wavelength is constant (a total of 10^6 per μm^2). We conceive this configuration as a zero-order design that should be considered for the road map of future accelerators.