

ADVANCED VACUUM LASER ACCELERATOR PROSPECT

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A whole new Vacuum Laser Accelerator (VLA) scheme^{1,2,3} is described in many aspects in this paper. Our currently on going experiment at ATF-BNL is based on the simulation ATF-BNL's experimental parameters. With the CO₂ laser intensity $a_0=0.9$, a portion of a 20MeV electron beam can be accelerated up to 1MeV. The energy spread expands to 10^{-2} from original 10^{-3} , which could be measured and distinguished by ATF-BNL's spectrometer. We are also proposing to use extremely strong laser at JLF/NIF-LLNL. With the laser intensity $a_0>20,30$, or even 100, the electrons can be accelerated to GeV in centimeters. The physics explanation of this new VLA scheme is that there exists a subluminal phase velocity region in a focused laser beam. It gives chances to let free electrons match the acceleration phase and get continuous acceleration. This will be the first time experiment of a real VLA. The design of the experiment is presented in this paper as well.

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