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Project towards CO₂-laser-driven wake-field accelerator with external injection

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The project will explore a large (e.g. psec or 0.5 mm) length of “bubble” in CO₂-laser driven plasma wake-field accelerator. Injecting of an external high quality electron bunch with duration ~ 10 fsec synchronized with the “bubble” would allow us to accelerate high quality electron beams with energy stability and spread reaching towards $1E-4$. We rely on CO₂-laser power upgrades that are in progress at BNL. We present our considerations for visible diagnostics, plasma source with ramp-up and ramp-down density profiles and the electron bunch compressor to 10 fsec with emittance preservation.

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