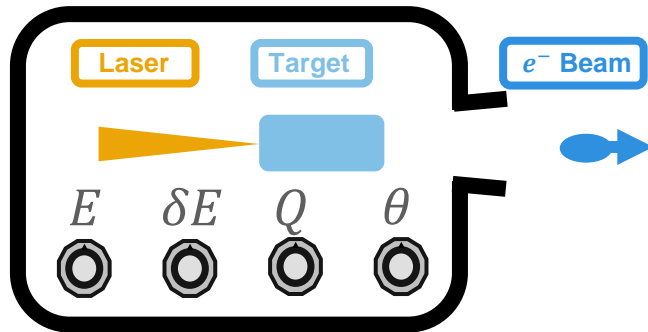


# A Novel Gas Target for Laser Wakefield Acceleration of Electrons

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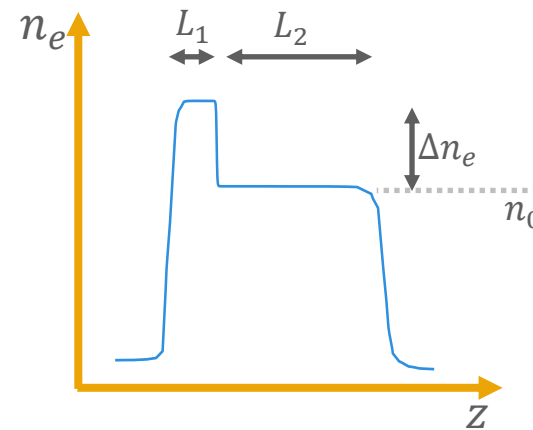
## Ideal Target



The ideal laser-target system provides reproducible, tunable beams at high-repetition rates ( $>10$  Hz):

- Energy –  $E$
- Energy Spread –  $\Delta E$
- Charge –  $Q$
- Emittance –  $\theta$

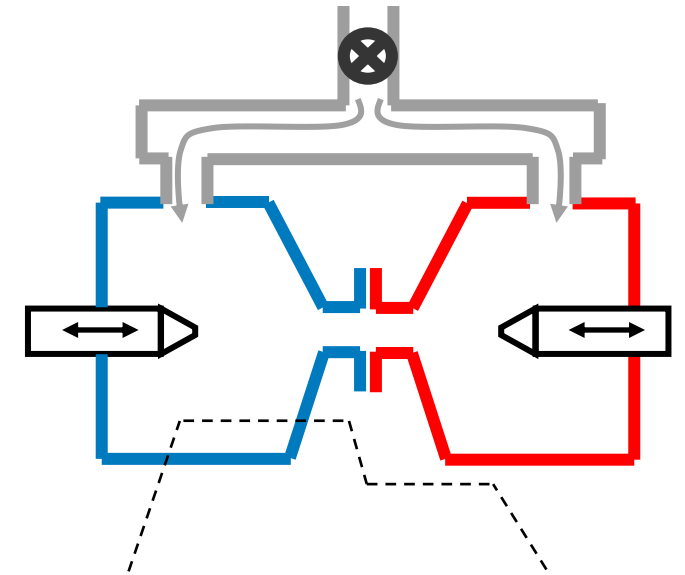
## Tunable Profile



Reliable and tunable injection by density down-ramp scheme [23].

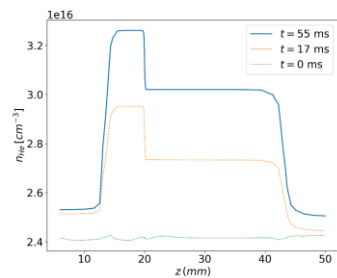
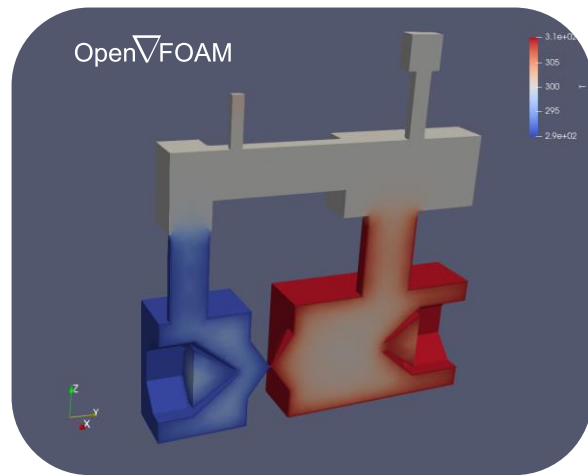
- Density step controls beam charge
- Length of the 2nd plateau controls beam energy
- Baseline density matched to laser parameters

## Two Cell Target

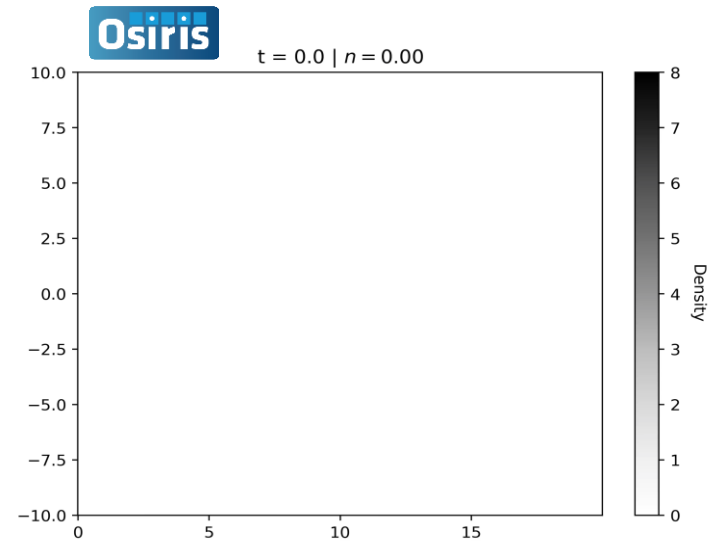


- Fixed pressure
- 2 chambers with imposed temperature upon the walls
- 2 movable cylinders for effective length control

## Validate Design



## Optimize Profile



Bayesian  
Optimization  
[24]

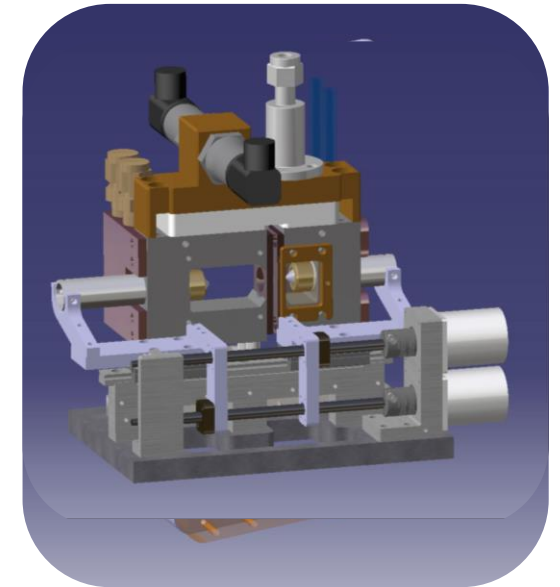
Non-Linear problems

Sample-efficient

Multiple-objective

Incorporates uncertainty

## Experimental Demonstration



Vacuum chamber and target

- Temperature and gas injection control testing

Thank you for you attention!

Questions?