

# Beam dump - hybrid scheme

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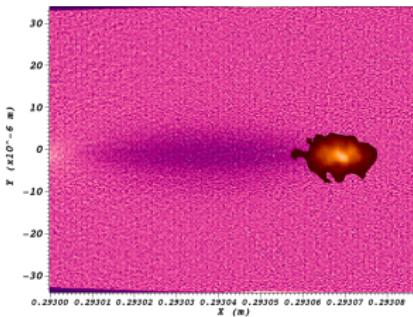
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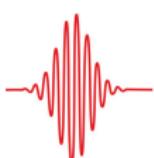
- Passive dump ( $n_p = n_b$ )



Saturation ( $\sim 30$  cm)



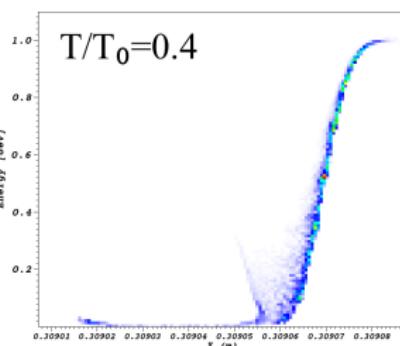
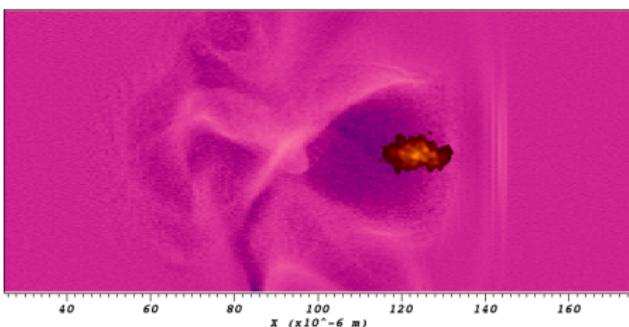
- Laser pulse



- Active dump



Full dump ( $\sim$  a few cm)



- EuPRAXIA beam

- 30 pC
  - 1 GeV
  - RMS energy spread  $\sigma_E/E = 1\%$
  - Expand bunch
- $$\left. \begin{aligned} \sigma_x = 0.3\mu m &\rightarrow 5\mu m \\ \sigma_x = 0.3\mu m &\rightarrow 5\mu m \end{aligned} \right\} \Rightarrow n_b \sim 10^{18} \text{ cm}^{-3}$$

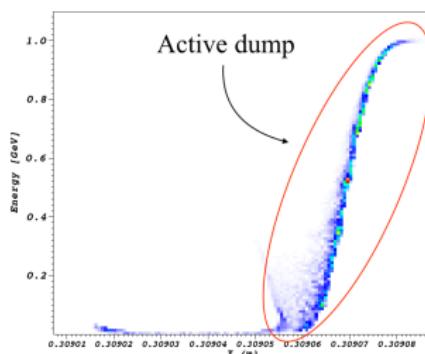
- EPOCH
  - ▶ Simulation 1: Initial bunch + passive dump → saturation → export bunch data
  - ▶ Simulation 2: Import bunch data → saturated bunch + active dump

- Need to find optimal

- ▶ Initial conditions
  - $\sigma_x, \sigma_y$
  - $n_p/n_b$
- ▶ Simulation parameters vs. computational cost
  - Grid resolution
  - Number of macro-particles
- ▶ Active dump scheme - laser parameters
  - $t(\text{laser})$  - Introduce at saturation?
  - Distance from bunch
  - Pulse length
  - Intensity
  - Laser ramp

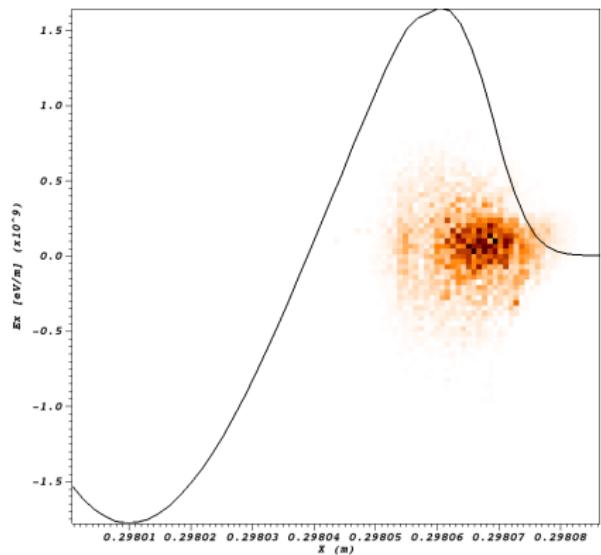
- Multiple active dumps

- ▶ Consecutive low intensity lasers

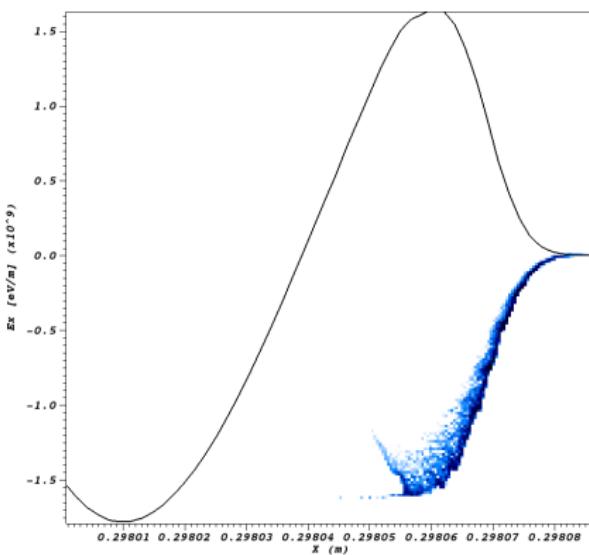


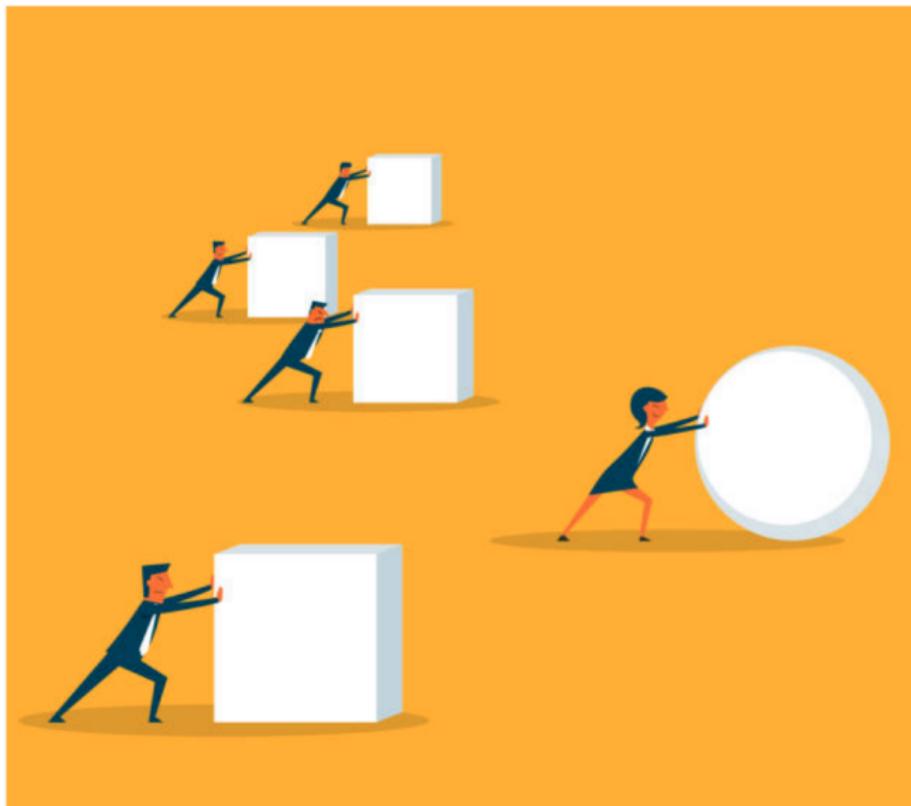
- Quasilinear  $n_p = n_b = 9.5 \times 10^{22}$

►  $E_x$  and bunch distribution



►  $E_x$  and energy distribution





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<sup>1</sup>Figure reference: <https://www.gettyimages.co.uk>