Beam dump - hybrid scheme

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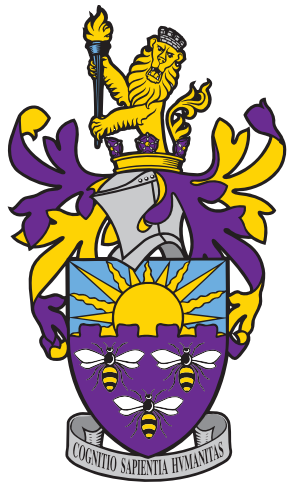
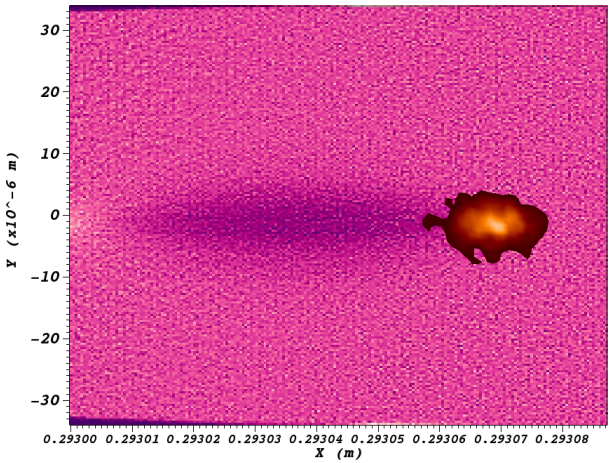
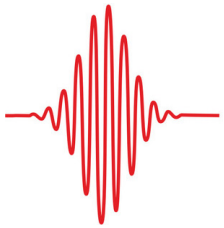


Hybrid scheme - Outline

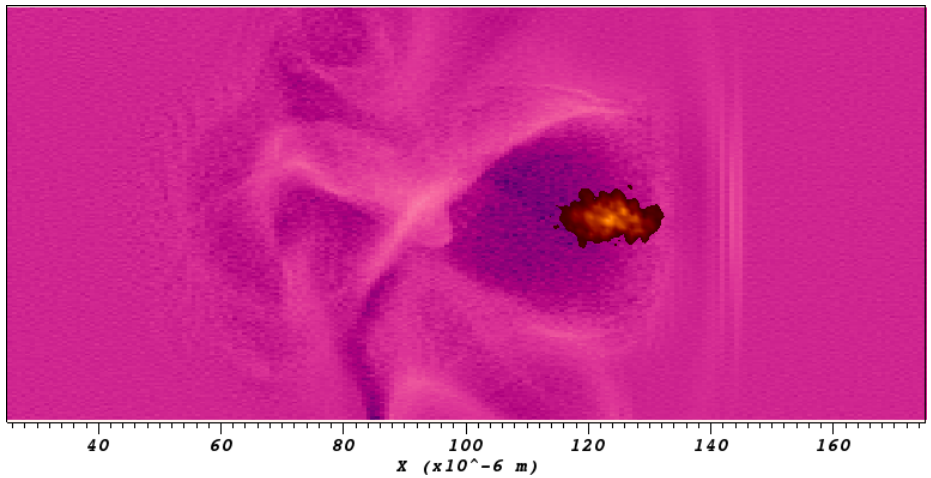
- Passive dump ($n_p = n_b$)
  ↓
  Saturation ($\sim$ 30 cm)

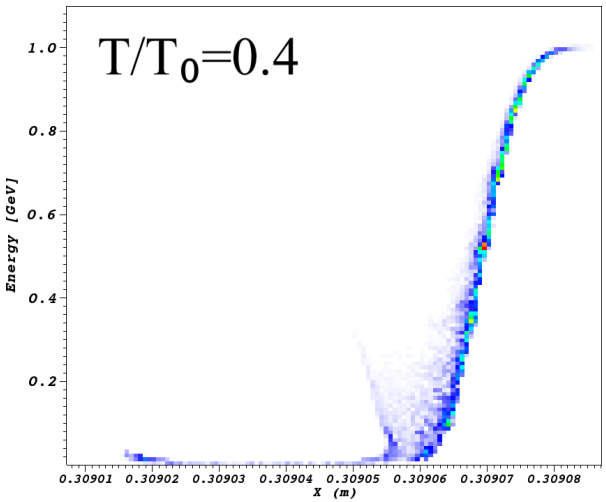


- Laser pulse



- Active dump
  ↓
  Full dump ($\sim$ a few cm)





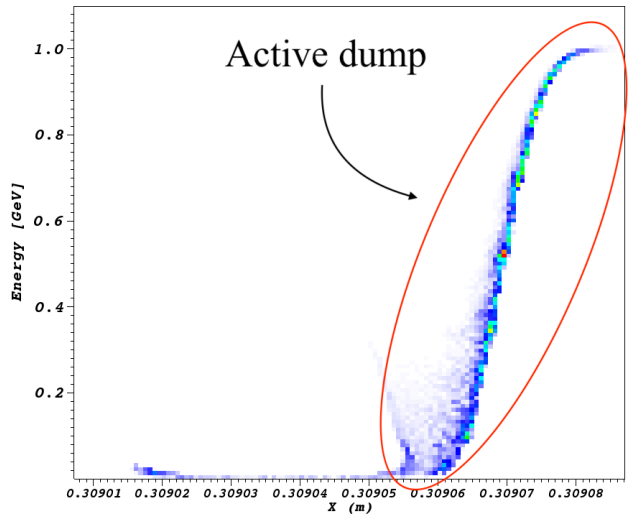
- EuPRAXIA beam
  - 30 pC
  - 1 GeV
  - RMS energy spread $\sigma_E/E = 1\%$
  - Expand bunch

$$\left.\begin{aligned} \sigma_x = 0.3\mu m &\rightarrow 5\mu m \\ \sigma_x = 0.3\mu m &\rightarrow 5\mu m \end{aligned}\right\} \Rightarrow n_b \sim 10^{18}\ \mathrm{cm}^{-3}$$

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

We're here!

- Need to find optimal
  - Initial conditions
    - σ_x, σ_y
    - n_p/n_b
  - Simulation parameters vs. computational cost
    - Grid resolution
    - Number of macro-particles
  - Active dump scheme - laser parameters
    - t(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