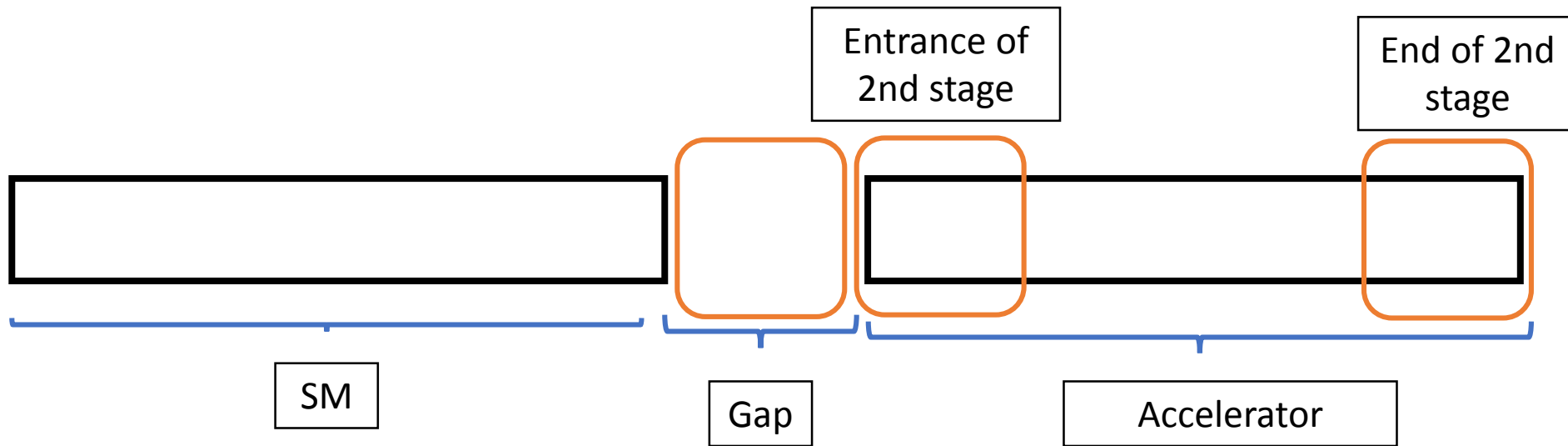


# My Run 2 Simulation Plan

Pablo Israel Morales Guzmán

Run 2 meeting 31/10/2019

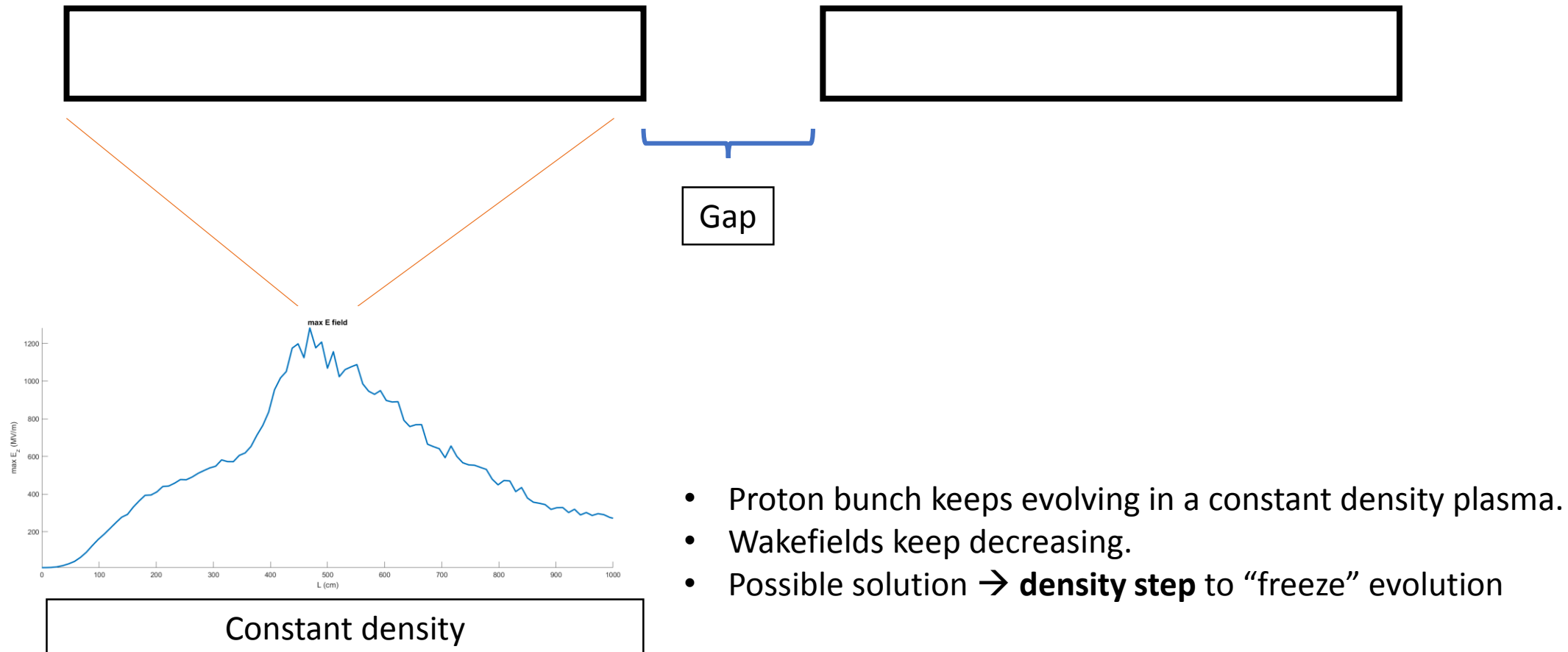
# Understand the proton bunch evolution in the second stage



- Do the microbunches survive?
- Do they produce constant wakefields?
- Is the wakefield phase constant?

# (Density step)

## Wakefields in a plasma with constant density



# (Density step)

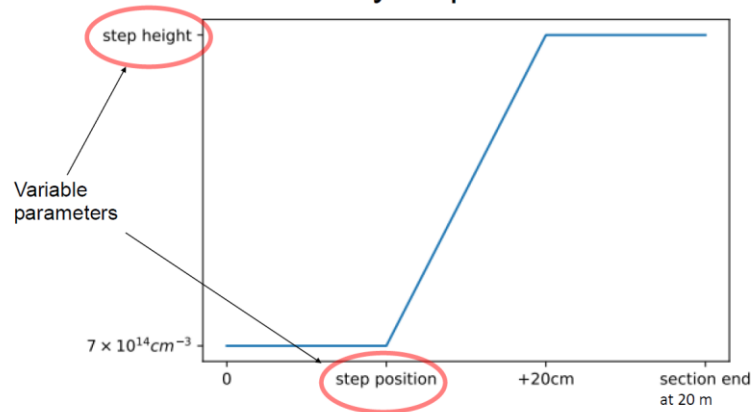


Gap

- K. Lotov and his team calculated optimal parameters considering a plasma of one stage  
→ Apply those parameters in Osiris, together with the gap and the second stage.

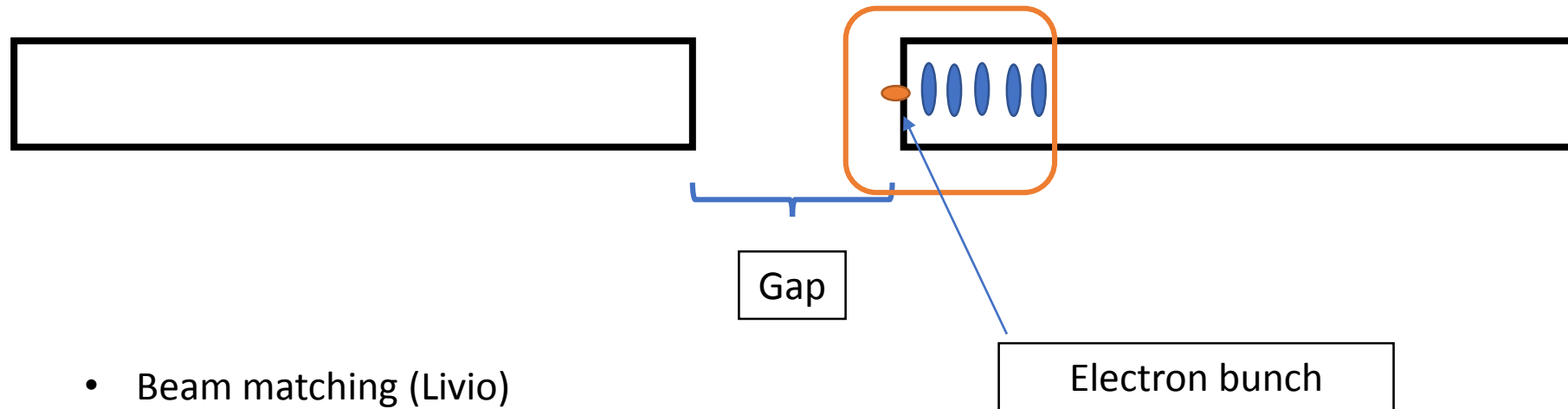
V. Minakov, K. Lotov, AWAKE CM, CERN, 11.09.2019, slide 6 of 19

Density step form



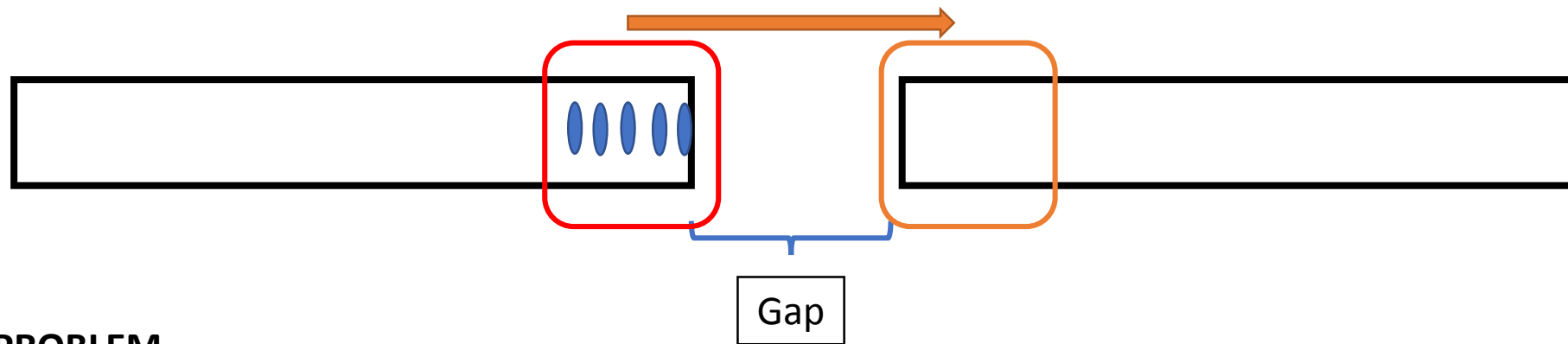
Slide from Lotov, et. al. at AWAKE CM September 2019

# Optimize injection parameters of the electron bunch in the 2<sup>nd</sup> stage



- Beam matching (Livio)
- Beam loading
  - Blowout regime for matching
  - Low energy spread
- Produce the most energetic electron bunches

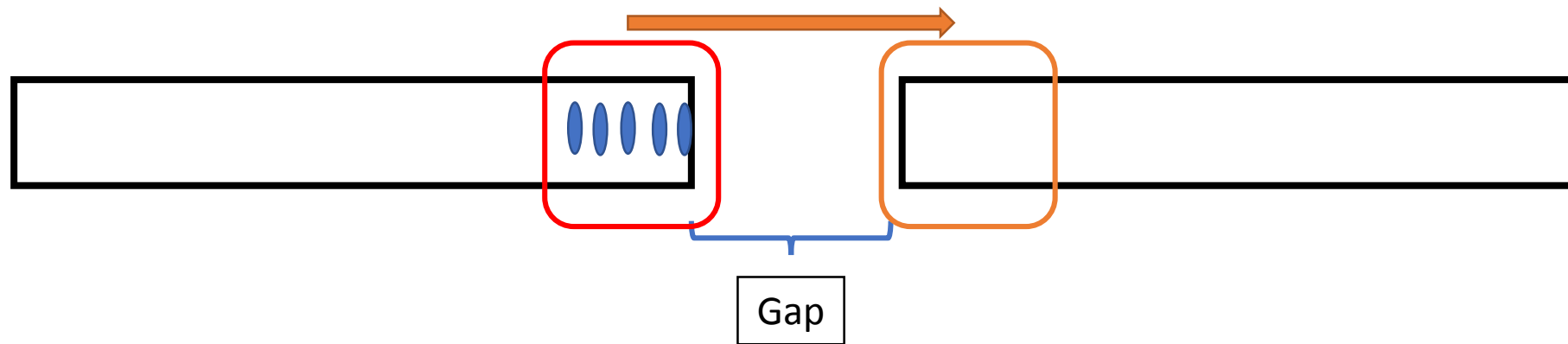
# Optimize injection parameters of the electron bunch in the 2<sup>nd</sup> stage



## PROBLEM

- Optimization may require many trials
- Osiris is not designed for this kind of simulations.
- Take the status of the experiment at the end of the first stage
  - Position and momentum of all macroparticles
- Use it to simulate many different situations on the second stage.
  - Change plasma density
  - Change electron bunch parameters
- Normally I need just a few decimeters in the second stage (short simulation).

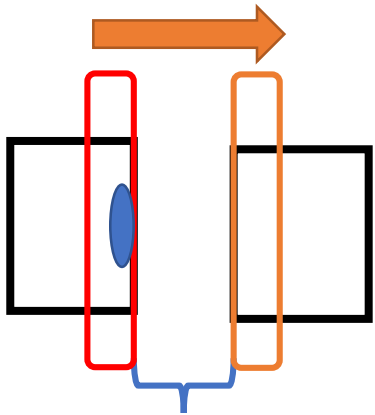
# Optimize injection parameters of the electron bunch in the 2<sup>nd</sup> stage



## SOLUTION

- Use restart files
  - Osiris can create restart files
    - save position and momentum of all macroparticles in a checkpoint 😊
  - Designed for system crashes
  - Not optimized for changing the simulation each time 😞
    - Do testing

# Restart files testing (with very short simulation)



- Use restart file in general 1 core
- Use restart file in general multiple core
- Change plasma density (flat or gradient)
- Change electron bunch density
- Change electron bunch charge
- Change electron bunch shape
- Change dump frequency
- Change gap size
- Change electron bunch start time



- Change electron bunch position





# Electron bunch injection simulation using restart files

- After some technical difficulties (links to restart files)...
- First real simulation using restart files sent yesterday!
- Wait for it to start running and check the results
- So ... more coming soon (maybe).

Thank you for your attention!