Practical: Numerical simulation

of plasma acceleration

with a PIC code

Introduction:

* Exercise 1 :

nc (cm-3) =

E0 (TV/m) =

* Exercise 2 :

Lx (c/ω0) =

Lr (c/ω0) =

Lx (μm) =

Lr (μm) =

Section 4 :

* Exercise 3 :

waist (c/ω0) =

waist (μm) =

waist (c/ω0) =

LFWHM (1/ω0) =

LFWHM (fs) =

Center laser (c/ω0) =

Center laser (μm) =

xfocus (c/ω0) =

xfocus (μm) =

* Exercise 4 :

a0 =

I (W/cm-2) =

* Exercise 5 :

xR (c/ω0) =

xR (μm) =

* Exercise 6 :

Include a plot of the comparison

Section 5 :

* Exercise 7 :

n0 (cm-3) =

write the asked command here

* Exercise 8 :

λp (theoretical, c/ω0 ) =

λp (theoretical, μm) =

λp (simulated, c/ω0 ) =

λp (simulated, μm) =

* Exercise 9 :

Include a plot of the comparison

* Exercise 10 :

Include a plot of the comparison

Section 6 :

* Exercise 11 :

Q (pC) =

Rms size along x σx (c/ω0) =

Rms size along x σx (μm) =

Rms size along y σy (c/ω0) =

Rms size along y σy (μm) =

Rms size along z σz (c/ω0) =

Rms size along z σz (μm) =

Energy E (mec2) =

Energy E (MeV) =

Relative energy spread δE/E (%) =

Normalised emittance along y εny (c/ω0) =

Normalised emittance along z εny  (mm-mrad) =

Normalised emittance along y εnz (c/ω0) =

Normalised emittance along z εnz  (mm-mrad) =

Center bunch (c/ω0) =

Center bunch (μm) =

* Exercise 12 :

Include plot showing the plasma wave and the electron bunch

* Exercise 13 :

Include a plot with the charge density and the longitudinal electric field Ex

* Exercise 14 :

ΔE (mec2) =

ΔE (MeV) =

L (c/ω0) =

L (μm) =

Eacc (meω0c/e)

Eacc (GV/m) =

* Exercise 15 :

Include a plot of the bunch parameters evolution and provide an estimate of the accelerating gradient in GV/m.

* Exercise 16 :

Include a plot with the results of the three simulations

Can you explain why the bunch gains more (or less) energy varying the charge?

* Exercise 17 :

Include a plot with the results of the three simulations

* Exercise 18 :

Include a plot of the bunch energy spectrum and send the script to the instructor

* Exercise 19 :

Include the plot and send the script to the instructor

* Exercise 20 :

Include the plot and send the script to the instructor