

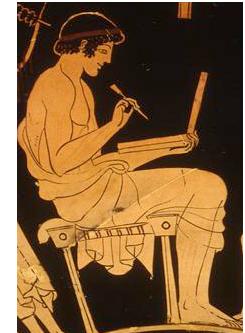


New features in guineapig++ (automatic grid sizing...)

Guy Le Meur



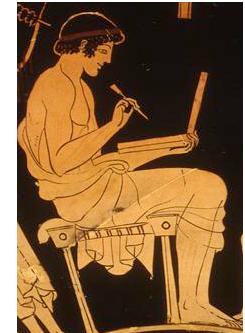
The grid in guineapig



- Computation of the electric field (Poisson equation)
- in transverse dimensions : x and y
- the total size of the grid : $\pm\text{cut}_x$, $\pm\text{cut}_y$
- Number of cells : n_x , n_y



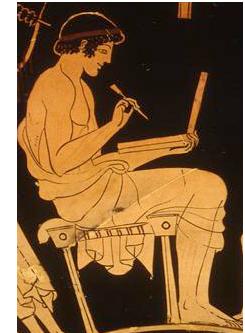
« miss » parameters



- Output :
 - maximum relative amount of interacting particles that were outside the grid during one time step :
 - miss.1 : beam1 ; miss.2 : beam2
 - Maximum number of interacting part. that were outside the grid during one time step :
 - out.1 : beam1 ; out.2 : beam2



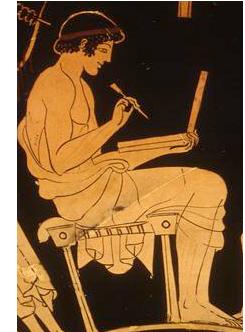
Standard user's data :



- **beta (_x, _y), emitt (_x, _y), sigma (_x, _y)**
 - 2 of these 3 parameters must be given by users :
 - If beta given :
 - if emitt given : $\sigma = f(\beta, \text{emitt})$
 - if sigma given : $\text{emitt} = f(\sigma, \beta)$
 - else error
 - else :
 - if emitt and sigma given : $\beta = f(\text{emitt}, \sigma)$
 - else error
 - **Cut (_x, _y)**
 - if given : this will be the grid size
 - else : default value : $3 * \sigma$



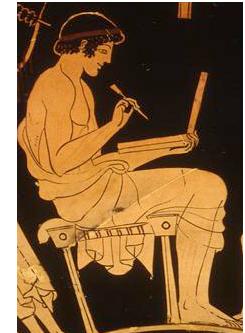
new keyword :



- **automatic_grid_sizing** :
 - = 0 : as in guineapig « standard »
 - = 1 : automatic determination of `cut_x`,
`cut_y`, and of `n_x`, `n_y`.....



automatic grid sizing



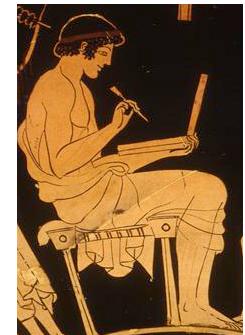
- Cut = $mp + \text{delta} + \text{deflection} + 4 * \sigma$
- Both beams are taken into account :
 - $mp = (mp_1 + mp_2) / 2$
 - $\text{delta} = |mp_1 - mp_2| / 2$
 - mp_1 mean position of beam1
 - mp_2 mean position of beam2

deflection ??



cdm deflection : empirical formula

(Yokoya, Chen : beam-beam phenomena in linear colliders)



$$\Theta = \frac{1}{2} \theta_0 F(\delta)$$

$$\delta = \frac{2 * \text{delta}}{\sigma}$$

offset between beams

Form factor :

$$\theta_0 = \frac{2Nr_e}{\gamma(\sigma_x + \sigma_y)}$$

disruption angle

$$F(\delta) = \delta \left[C_1 + C_2 \delta^2 + \frac{1}{\pi^2} \delta^4 \right]^{-1/4}$$

$$D_{x,y} = \theta_0 \frac{\sigma_z}{\sigma_{x,y}}$$

disruption parameter

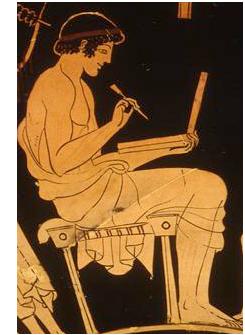
$$A_{x,y} = \frac{\sigma_z}{\beta_{x,y}}$$

$$C_1 = (1 + A^2) \left[1 + \frac{0,5}{0,6 + (\sqrt{D} - 2,5)^2} \right]^2$$

$$C_2 = \left[\frac{1,2D^2}{D + 10} \right]^2$$



Numbers of cells



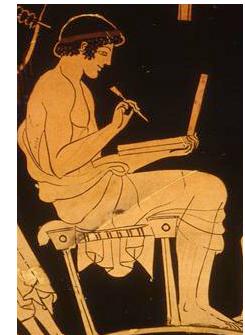
- Power of 2 which is nearest from :

$4 * \text{cut}/\sigma$

(for both n_x and n_y)



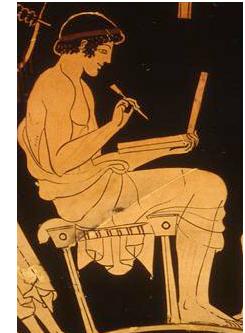
About load_beam



- If `load_beam = 3` (except 0, other values are not available)
 - if `cuts_from_loaded_beam = 0` : nothing is changed
 - else (`cuts_from_loaded_beam = 1`) :
 - The cuts are computed from sigma's of actually from files loaded beams, assuming gaussian distribution
 - `cut_x = cut_x_factor*sigma_x`
 - `cut_y = cut_y_factor*sigma_y`
 - `cut_z = cut_z_factor*sigma_z`
 - `cut_x_factor`, `cut_y_factor`, `cut_z_factor` are 3 new keywords with default value 3.



Others :



- A general cleaning and resturcration of the code has been made (much yet remains to make)
- No more results on the « output screen »
- All results on [output file](#) : with units and little explanations.