



BDSIM-Placet Interface and Benchmarking

Steve Malton

JAI@RHUL

17th April 2008



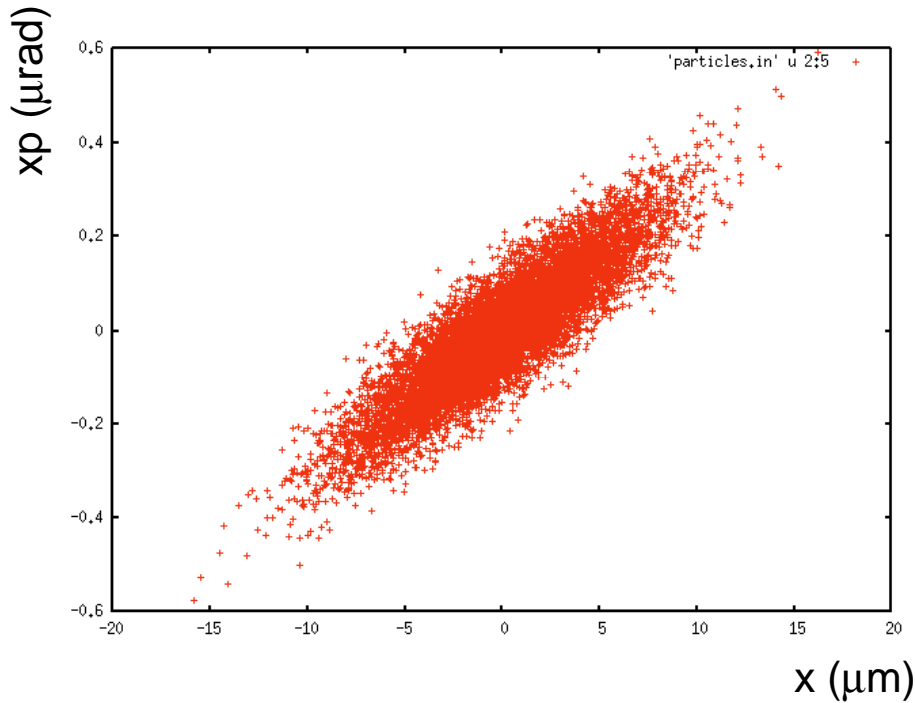
Introduction



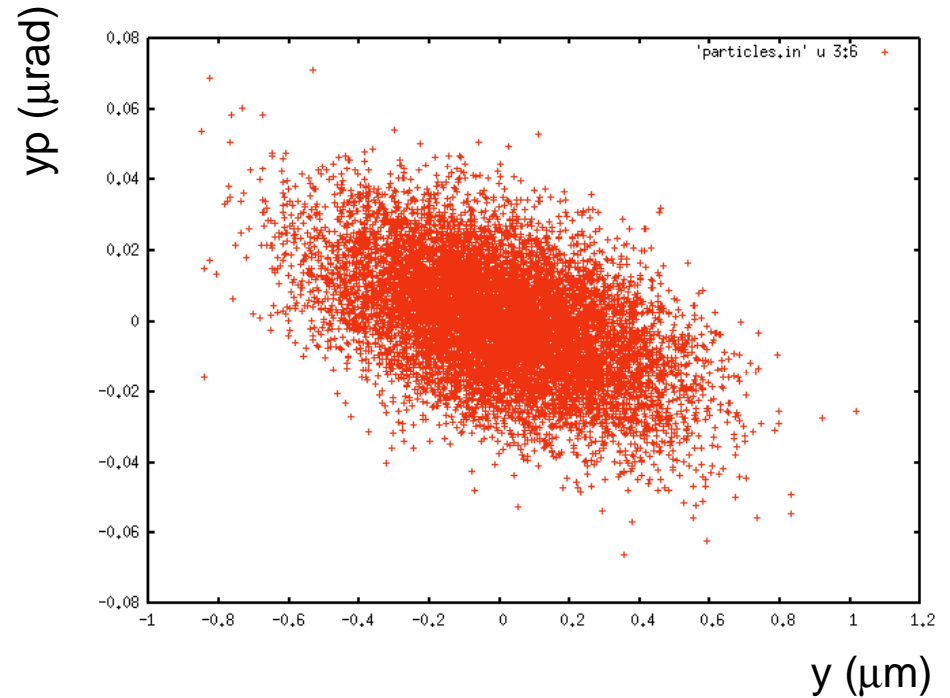
- Core bunch tracking in CLIC
 - Comparison with BDSIM and Placet
- Halo tracking
 - Collimator parameters
 - Energy deposition
 - Particle losses
- Wakefield effects?



Input Bunch distribution



- $\beta_x = 64.171 \text{ m}$
- $\alpha_x = -1.95133$
- $\epsilon_x = 680 \text{ nm}$



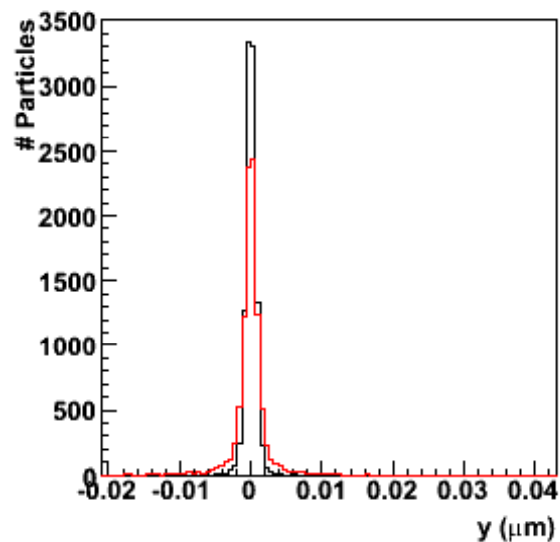
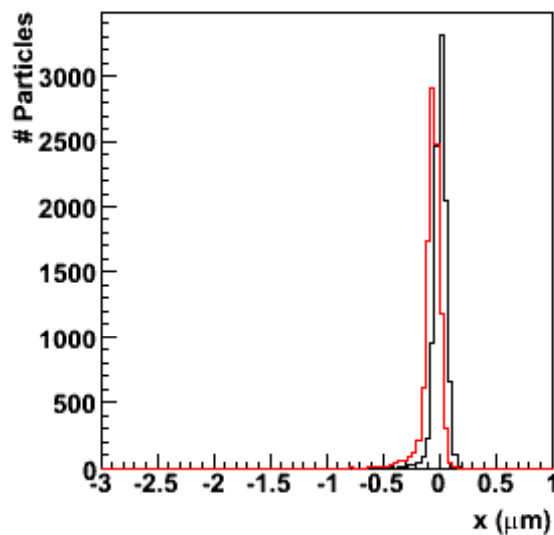
- $\beta_y = 18.244 \text{ m}$
- $\alpha_y = 0.605865$
- $\epsilon_y = 100 \text{ nm}$



IP Distribution

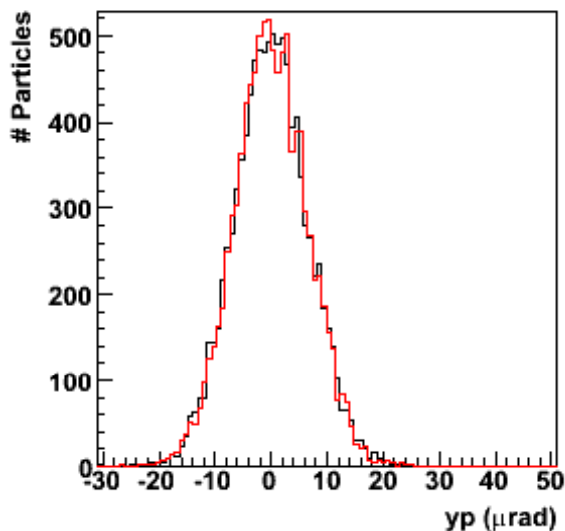
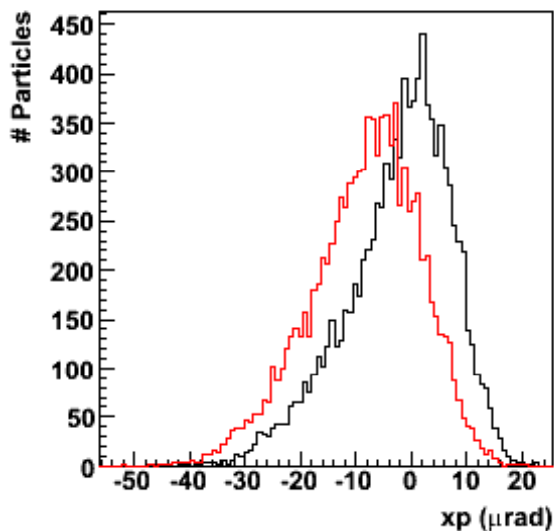


- 64nm
- 96nm



- 0.99nm
- 2.9nm

- 9.5μrad
- 9.9μrad

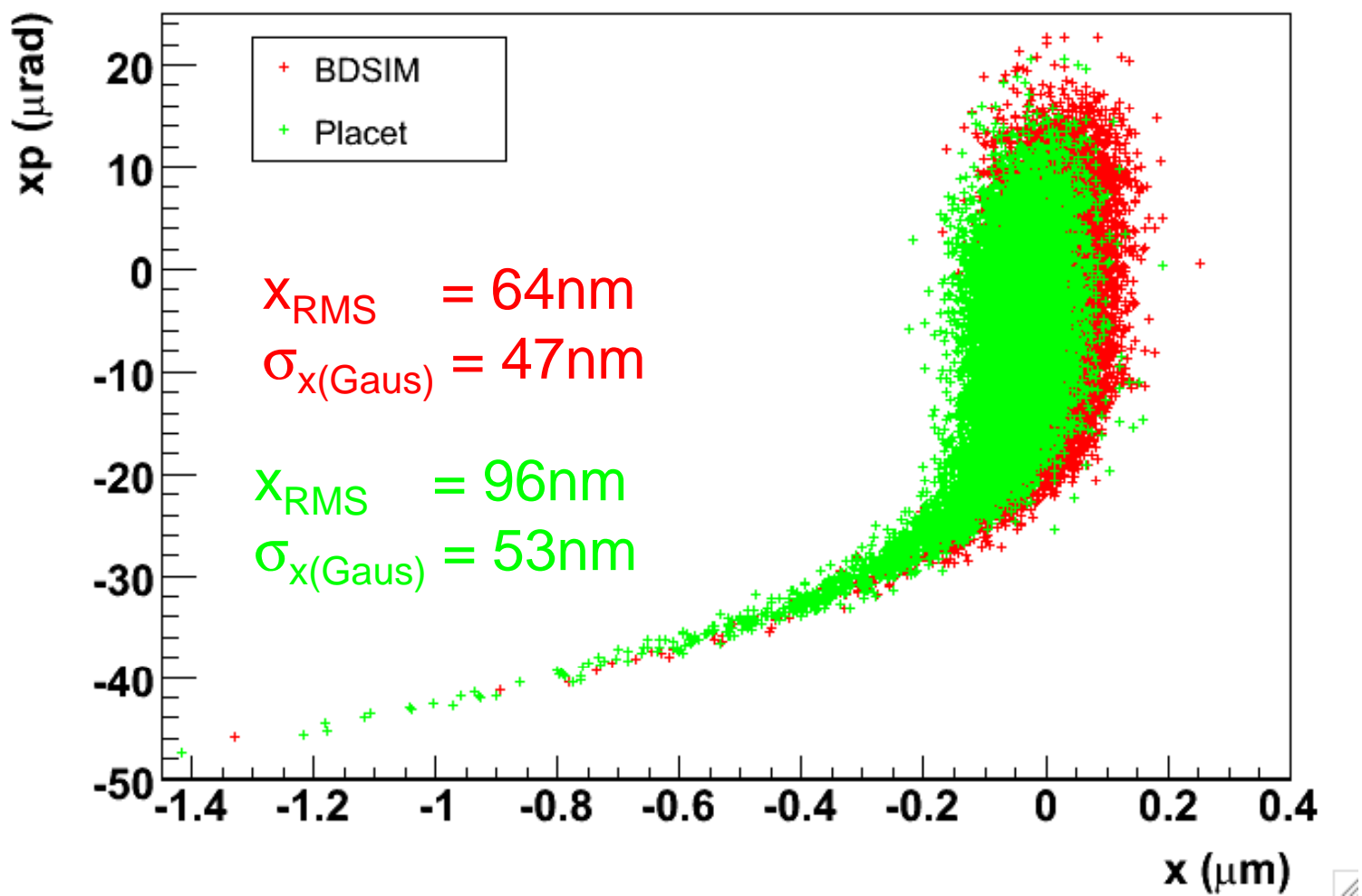


- 6.6μrad
- 6.5μrad

17/04/08

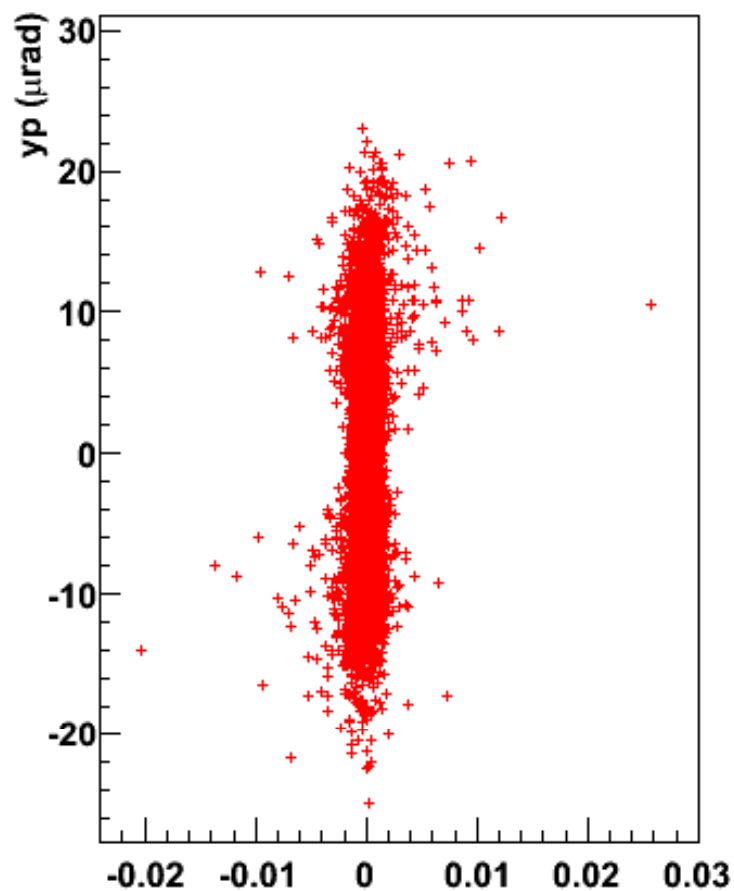


IP Distribution - x:xp



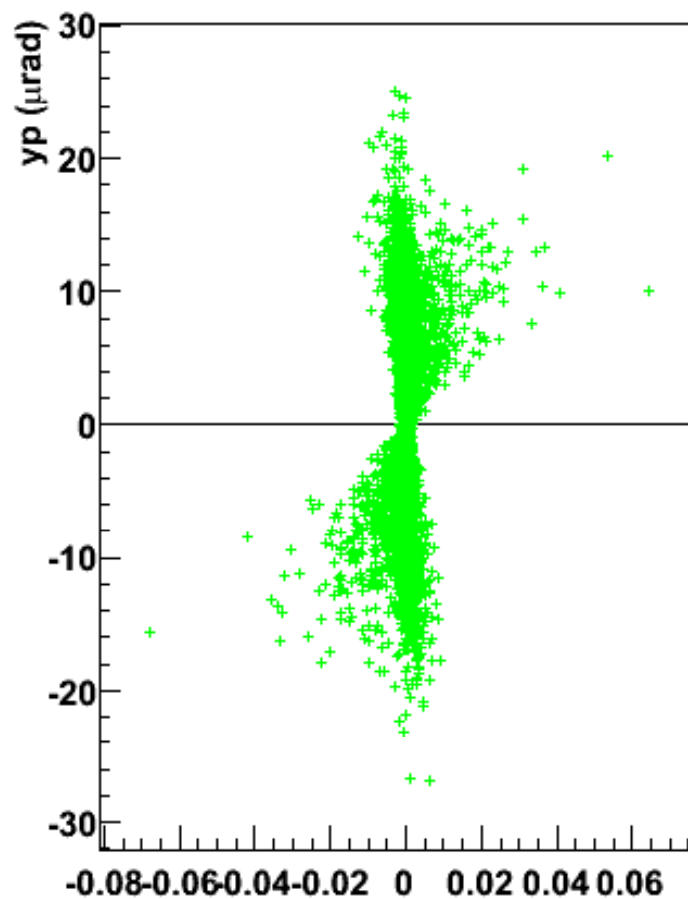


IP Distribution - y:yp



$$y_{\text{RMS}} = 0.99 \text{ nm } y (\mu\text{m})$$

17/04/08 $\sigma_{y(\text{Gaus})} = 0.68 \text{ nm}$

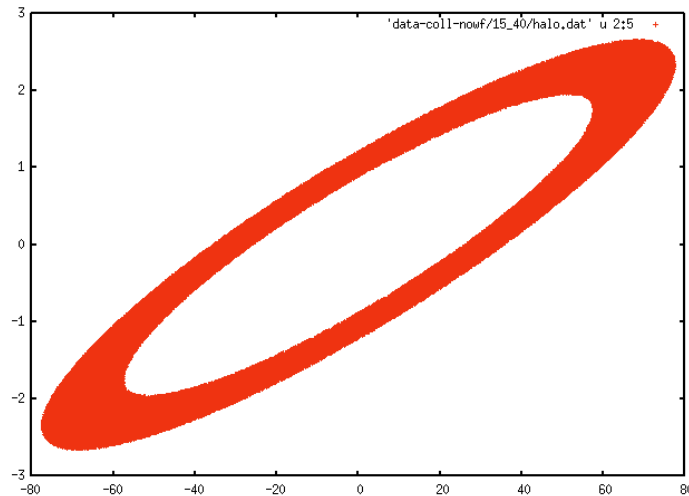


$$y_{\text{RMS}} = 2.9 \text{ nm } y (\mu\text{m})$$

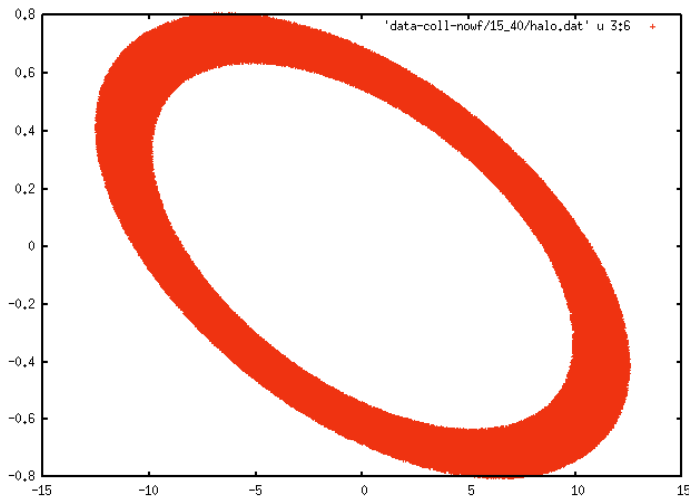
$$\sigma_{y(\text{Gaus})} = 1.0 \text{ nm}$$



Halo distributions



- 10000 particles
- Rings of 5σ in $x:xp$
 - track distributions
0- 5σ to 35-40 σ



- Rings of 10σ in $y:yp$
 - track distributions
0- 10σ to 180-190 σ



Collimator Parameters

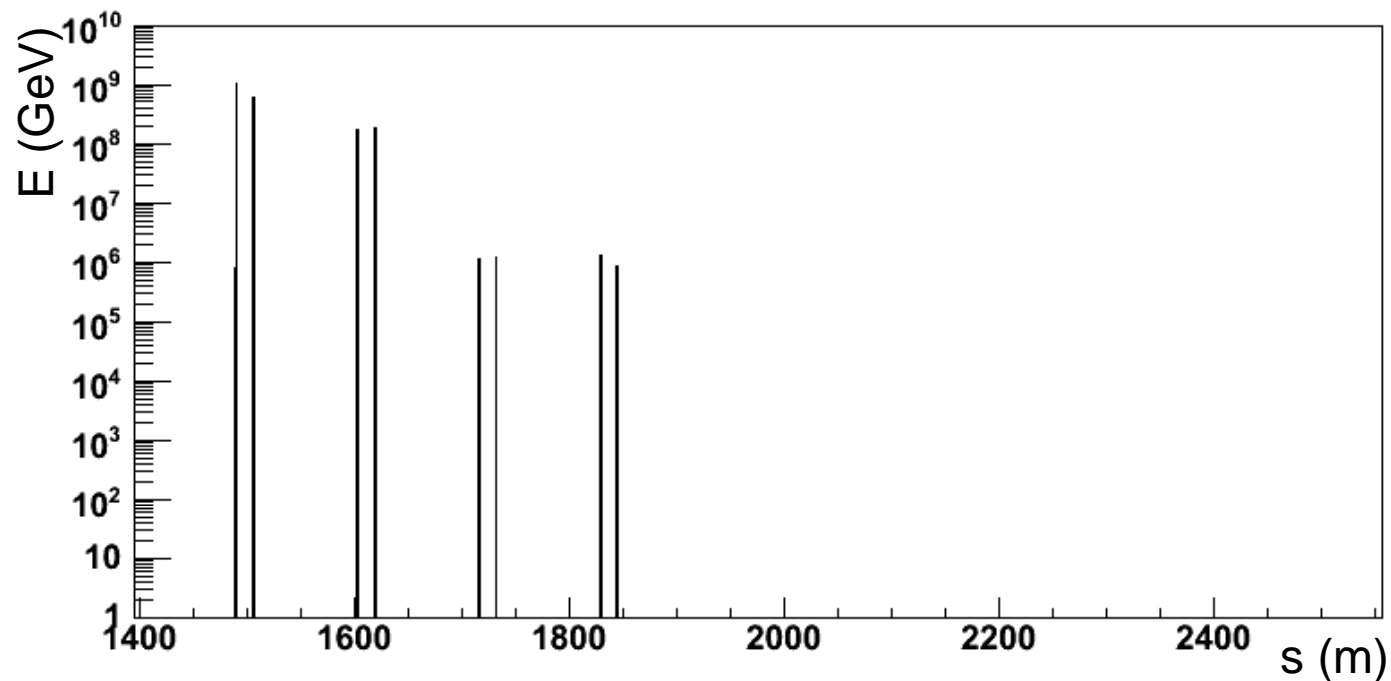
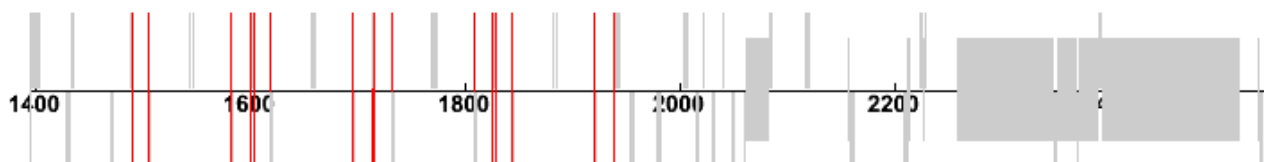


- $\text{ENGYSP}=\{A_x 3.51 \cdot 10^{-3}, A_y 25.4 \cdot 10^{-3}, L_f 0., L_t 9.0 \cdot 10^{-3}\}$
- $\text{ENGYAB}=\{A_x 5.4 \cdot 10^{-3}, A_y 25.4 \cdot 10^{-3}, L_f 0.646, L_t 0.027\}$
- $\text{YSP}=\{A_x 10.0 \cdot 10^{-3}, A_y 0.102 \cdot 10^{-3}, L_f 0., L_t 0.09\}$
- $\text{XSP}=\{A_x 0.08 \cdot 10^{-3}, A_y 10.0 \cdot 10^{-3}, L_f 0., L_t 0.09\}$
- $\text{XAB}=\{A_x 1.0 \cdot 10^{-3}, A_y 1.0 \cdot 10^{-3}, L_f 0.646, L_t 27.0 \cdot 10^{-3}\}$
- $\text{YAB}=\{A_x 1.0 \cdot 10^{-3}, A_y 1.0 \cdot 10^{-3}, L_f 0.646, L_t 27.0 \cdot 10^{-3}\}$

Javier Resta-López



Energy loss - Black Collimators



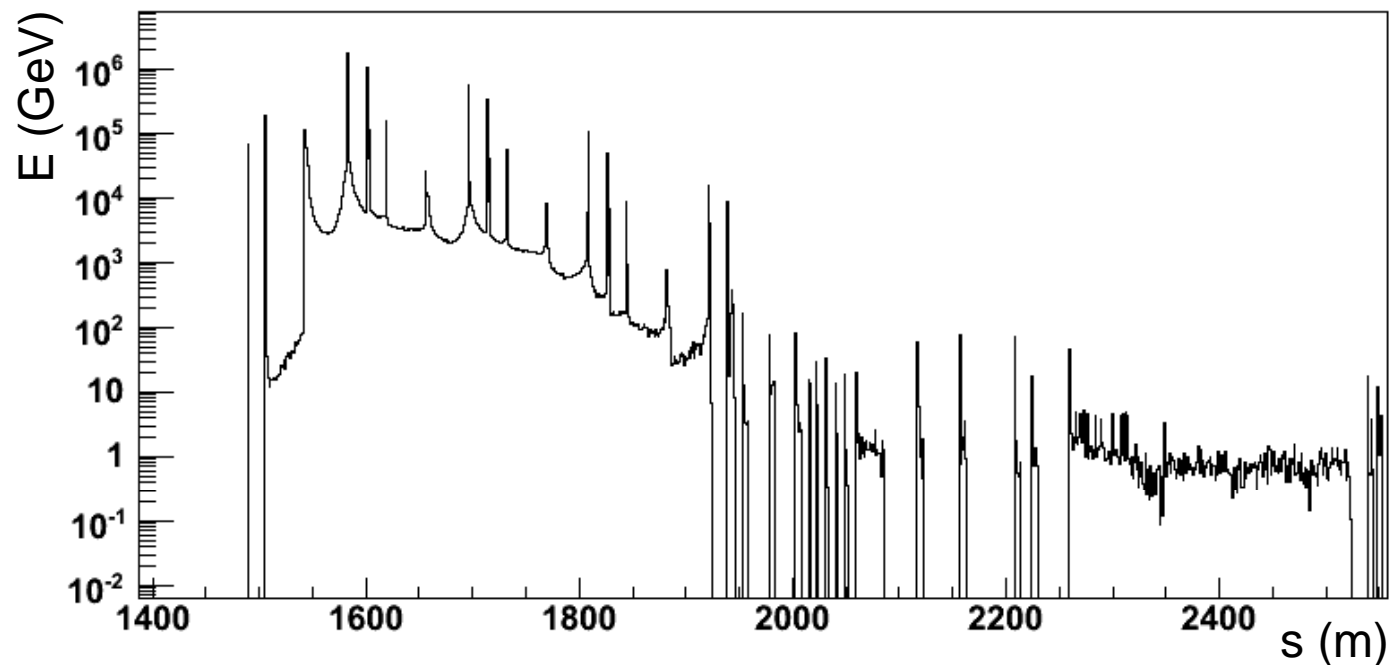
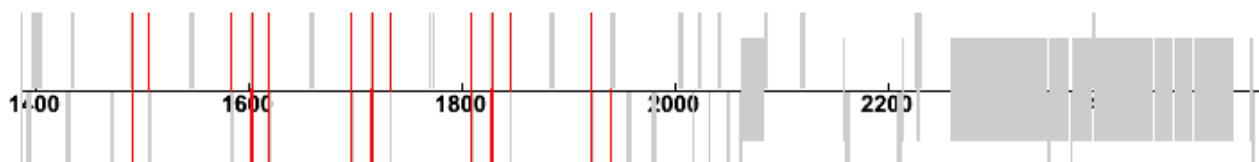
spm, Wed 16 Apr 2008 20:27:52 BST

BDSIM input file : CLICx.Coll.gmad





Energy Loss - with secondaries



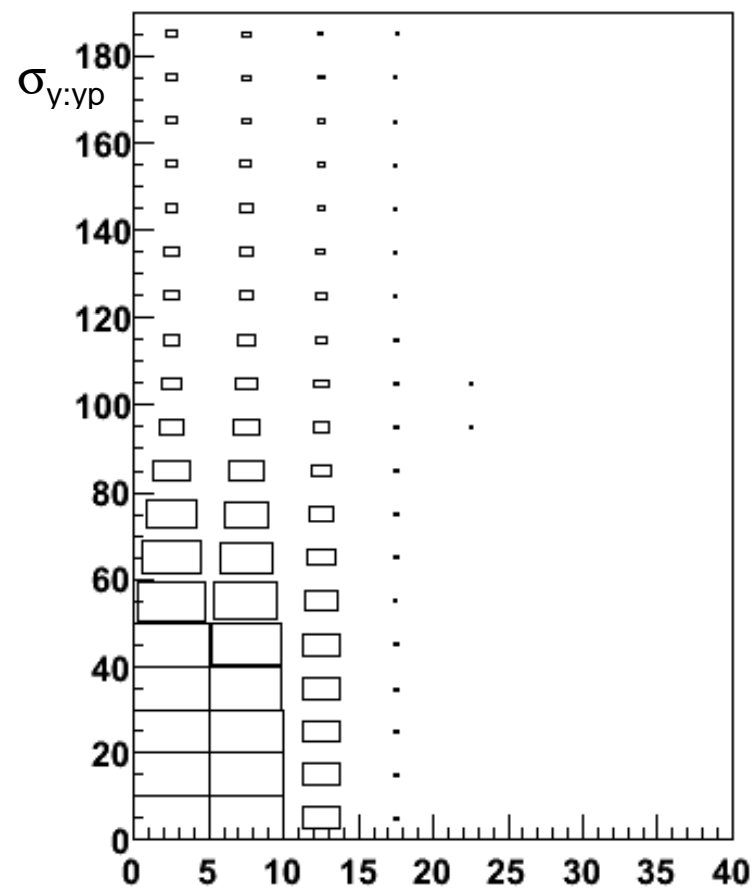
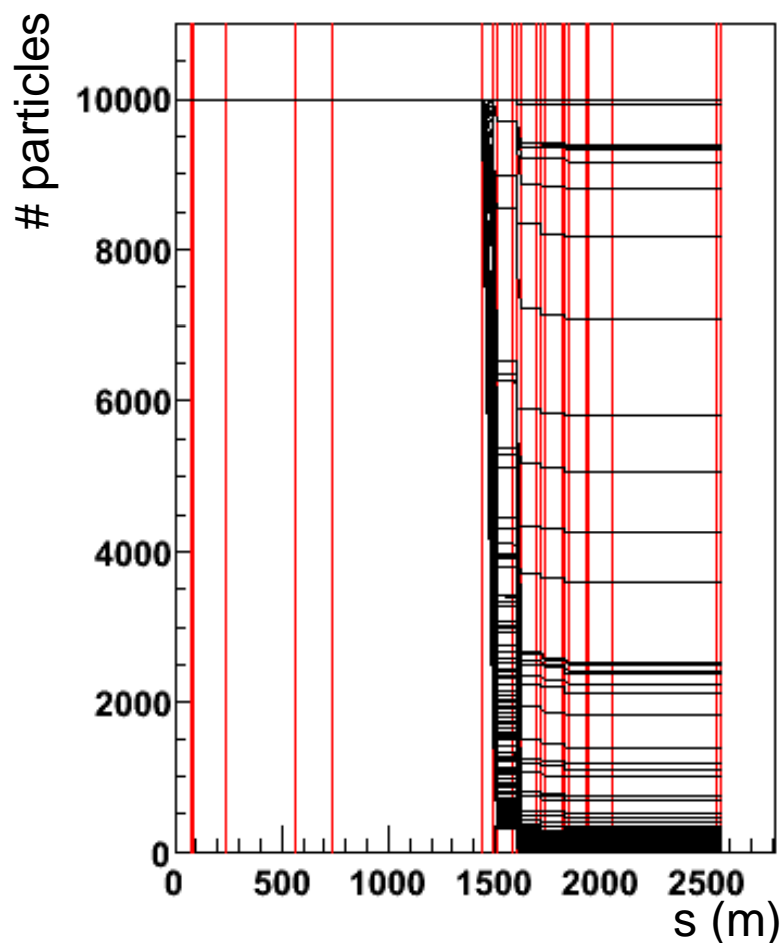
spm, Wed 16 Apr 2008 20:20:31 BST

BDSIM input file : CLICx.Coll.gmad





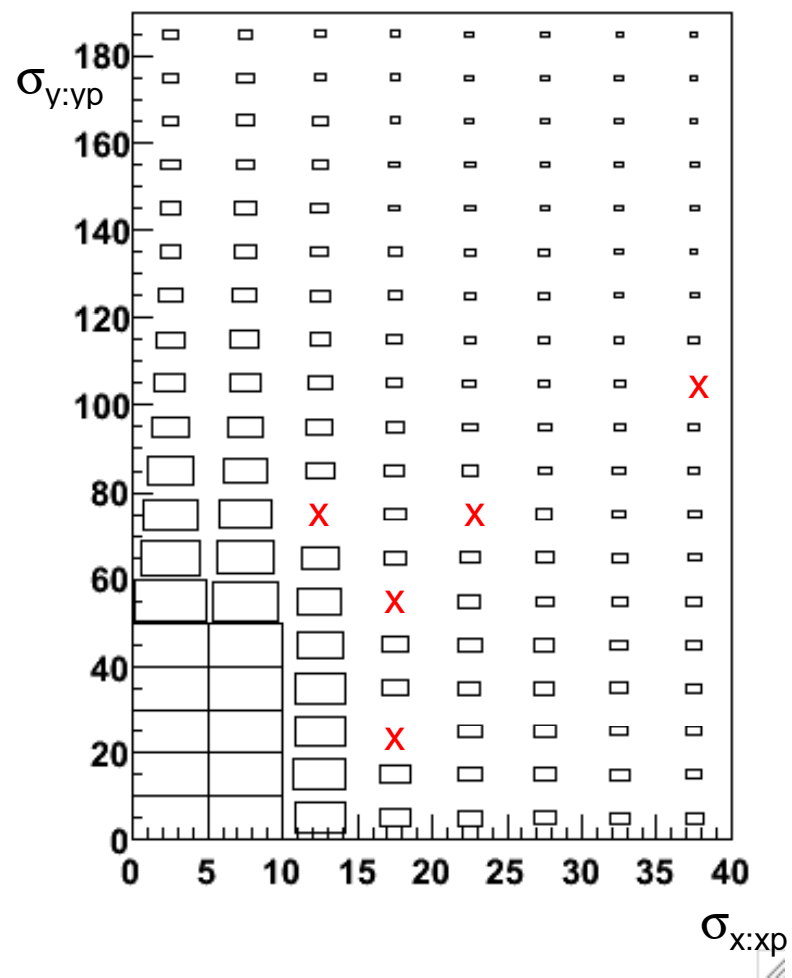
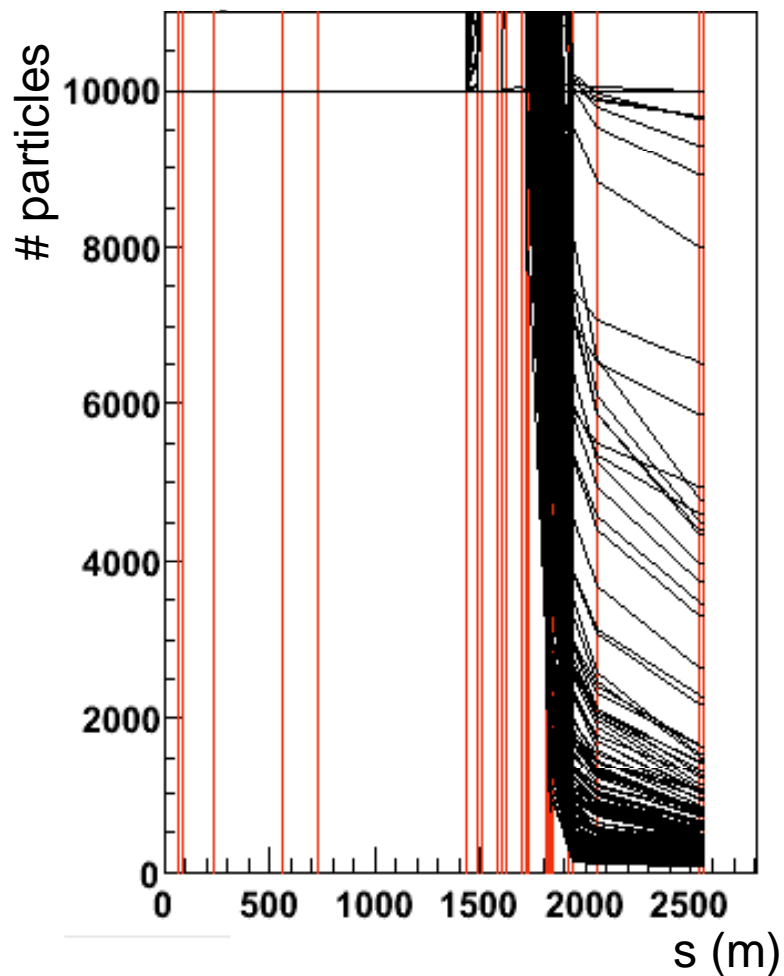
Particle Numbers - Black Collimators



Number of particles reaching IP_{//}^{sigma_x:xp}
from a halo ring of σ in $i:ip$

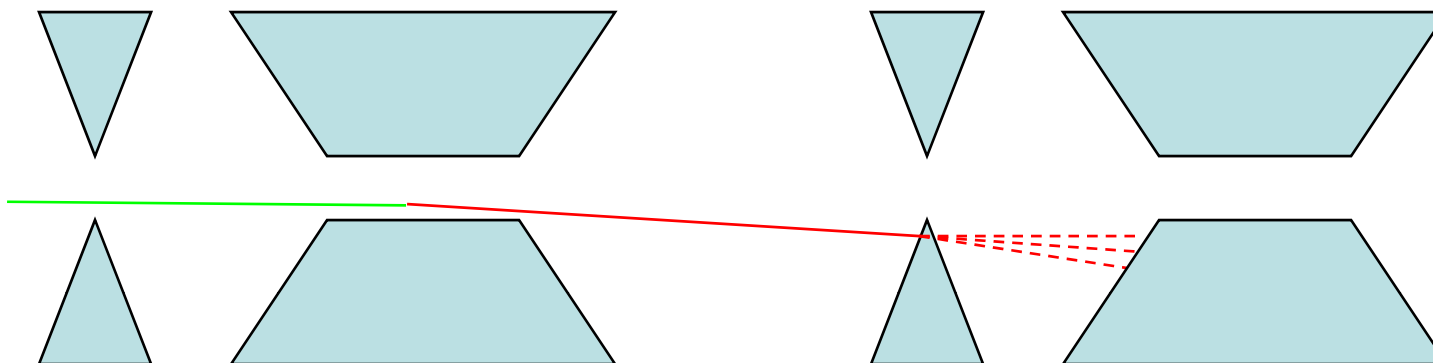


Particle Numbers - with secondaries





Wakefield-Induced Backgrounds



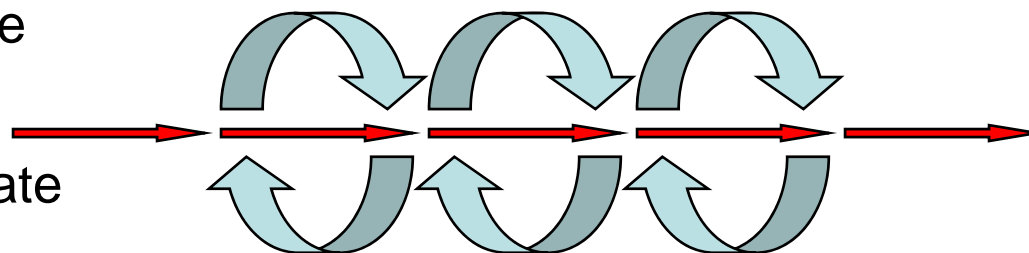
- Multi-particle effect
 - Particles at the head of the bunch cause a kick on trailing particles
- Transverse wakefield kick
 - Previously uncollimated particles can be kicked into beam elements
 - Direct hits to FD and VX
 - Secondary particles from beampipe scattering



BDSIM-PLACET

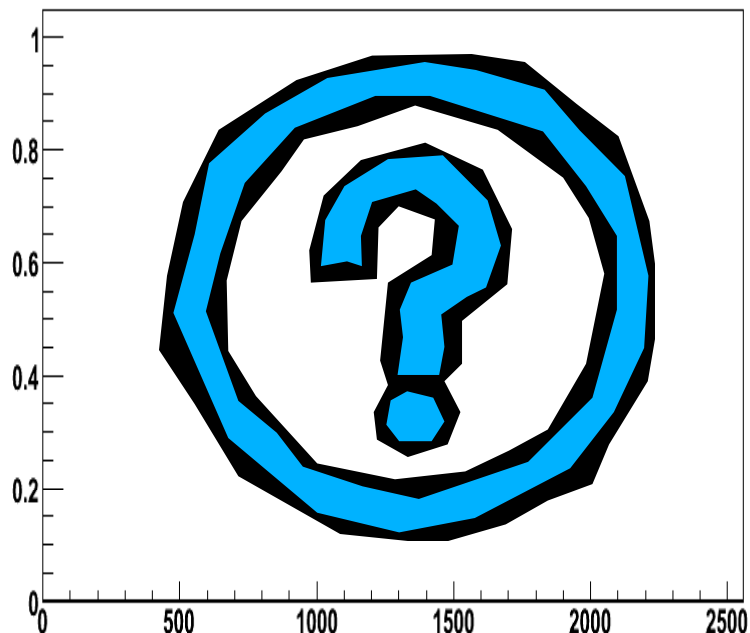
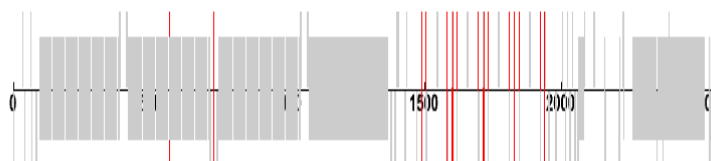


- Main beam tracking in BDSIM
- At collimators and spoilers bunch is held on stack
- Bunch is passed to Placet and tracked to calculate wakefield kicks
- Placet passes appropriate kicks to BDSIM
- BDSIM restarts at held position and applies kicks
- Repeat through wakefield region and then continue standard tracking





Energy Loss and Particle Numbers - with Wakefields



- Jobs still running!
 - Air-con failure in cluster room...
- Some minor code issues still to fix
 - Updates coming soon



Summary



- BDSIM in reasonable agreement with Placet tracking to IP
 - Tighter focus and more on-axis?
- Black collimation does not accurately describe particle loss
 - Need to account for secondary particle generation in collimators
- Examining effect of wakefield kicks on particle loss and secondary production