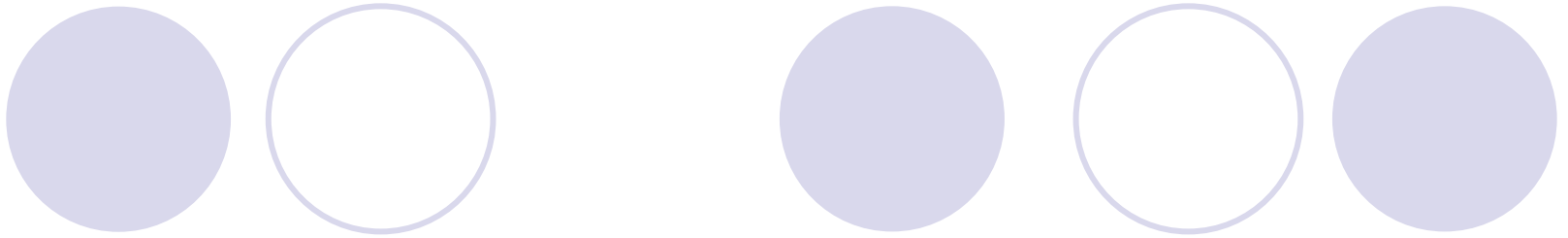




# Background studies in CLIC- BDS using HTGEN

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## HTGEN Interface with PLACET

The HTGEN (Halo & Tail Generation) code

Installation instructions and Documentation can be seen:

<http://cern.ch/hbu/HTGEN.html>

HTGEN file system:

- background.h, background.cc  
(halo and tail generation )
- photon.h, photon.cc  
(Photon tracking)

## CLIC BDS Lattice with no collimators

- Quadrupole = 125
- Drift = 229
- Girders = 748
- Sbend = 206
- BPMs = 38
- Multipoles = 37
  - Sextupole = 34
  - Octopole = 03

---

Total elements = 637 (excluding girders)



## Beam-gas scattering parameters

# of particles = 31000

# initial energy = 1496 GeV

# of slices = 31

# of macro particles = 1000

N<sub>2</sub> gas at room temperature (300K)

Gas pressure = 10 nTorr

Angular cut-off for mott scattering = 0.02 mrad (used here)

$$\mathcal{G}_{\min} \approx \sqrt{\frac{\epsilon_y}{\gamma\beta}}$$

[http://clic-meeting.web.cern.ch/clic-meeting/2006/03\\_17ln.pdf](http://clic-meeting.web.cern.ch/clic-meeting/2006/03_17ln.pdf)



- Vacuum
  - gaslist: List of the gas mixture
  - temperature: Temperature in K
  - thetamin: Mott. scattering Cutoff (micro radian)
  - iel: Element number
  - nel: Number of elements



- **Material**

- X0: Radiation length of material
- iel: Element number
- nel: Number of elements

- **Spoilers**

- **X0 = 0.35 , element number = 530**



## Routines (3)

- TrackBackground

- beam: Name of the beam to be used for tracking
- dir: Directory for the results
- start: Starting element number for background tracking
- full tracking: Tracking mode
- charge: Number of particles/bunch
- linac: set 1 for linac tracking

- Output Directory: `beam*.txt` (E, x, y, z, xp, yp)

`halo*.txt` (E, x, y, z, xp, yp)

`loss*.txt` (E, x, y, z, xp, yp)



## Routines (4)

- TrackPhoton

- filename: File name for results
- aperture: Default aperture in mm
- sampling: Sampling fraction for writing
- fultracking: stored into photon directory

-Output Directory: photon\*.txt (E, x, y, z, xp, yp)

-Output file : photon.dat (icur, zcur, elem,  
nphot, nloss, eloss)



## Halo Studies---Major background

Total halo particles = 3801

element # 1, 381, 465, 495, 562, 616, 626, 636

Total lost particles = 6

element # 381, 465, 495, 562, 616, 626

Probability for muon production =  $1.58 \times 10^{-3}$

Halo  
24330

Loss

6

SR-ON

Total Halo Particles = 3868

element # 1, 282, 418, 636

Total lost particles = 1

element # 282, 418

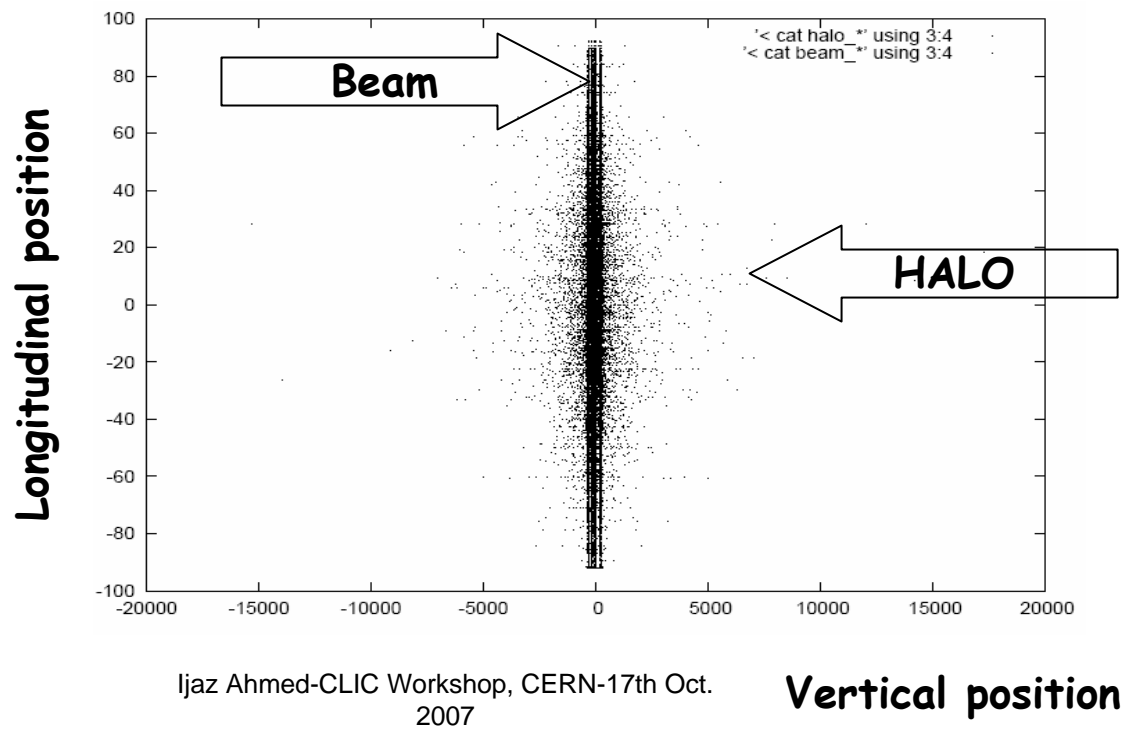
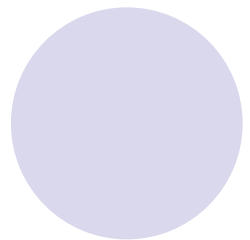
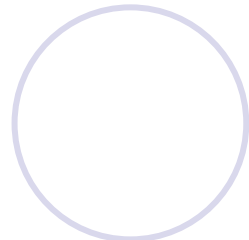
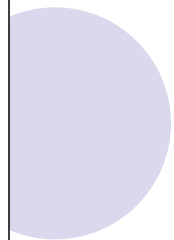
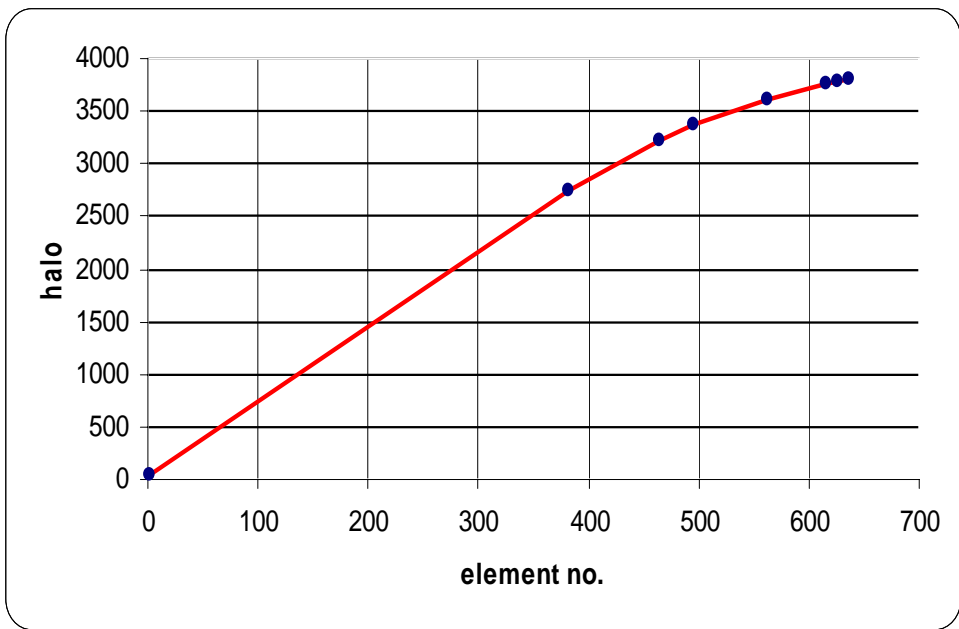
Probability for muon production =  $2.60 \times 10^{-4}$

Halo  
11265

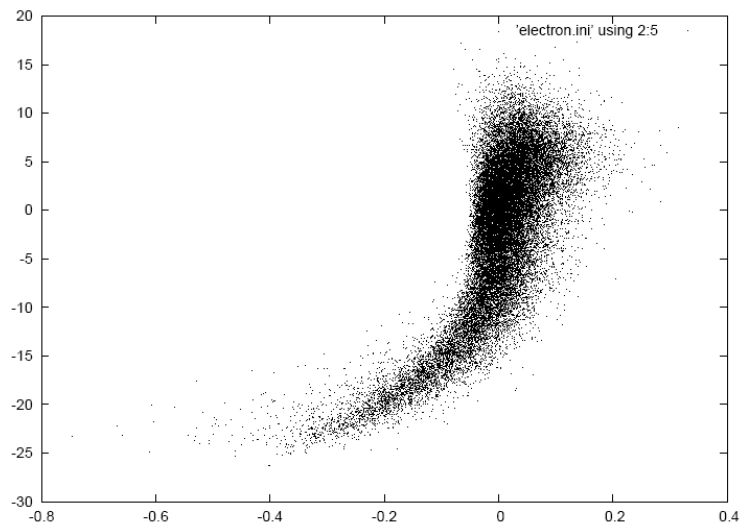
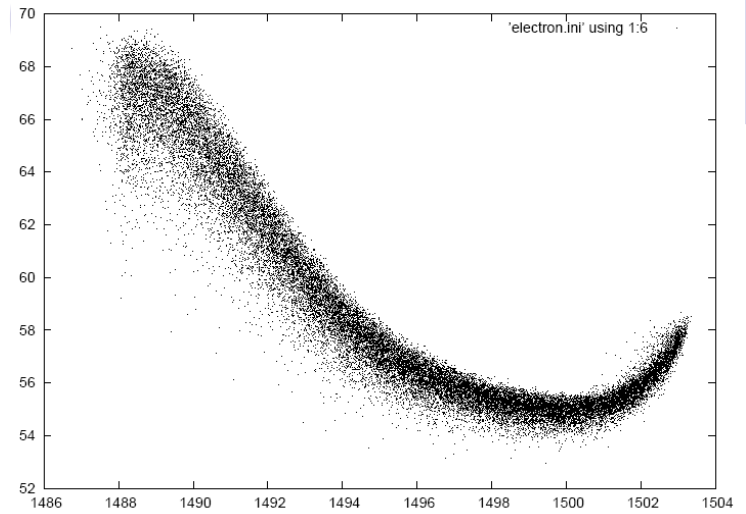
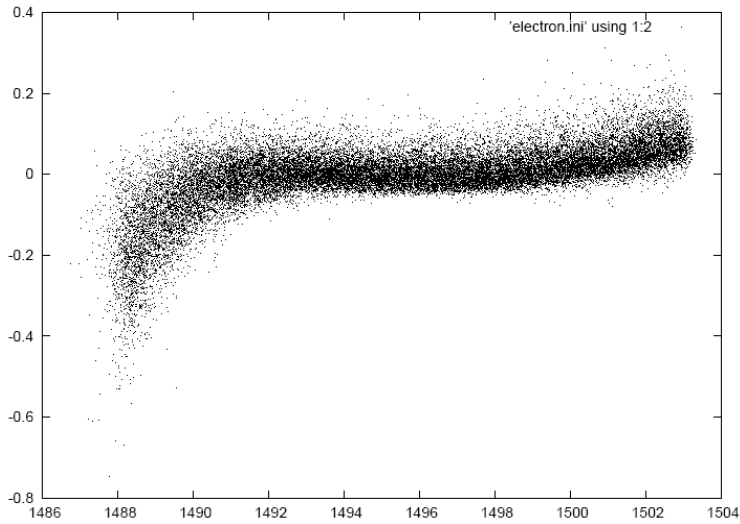
Lost

2

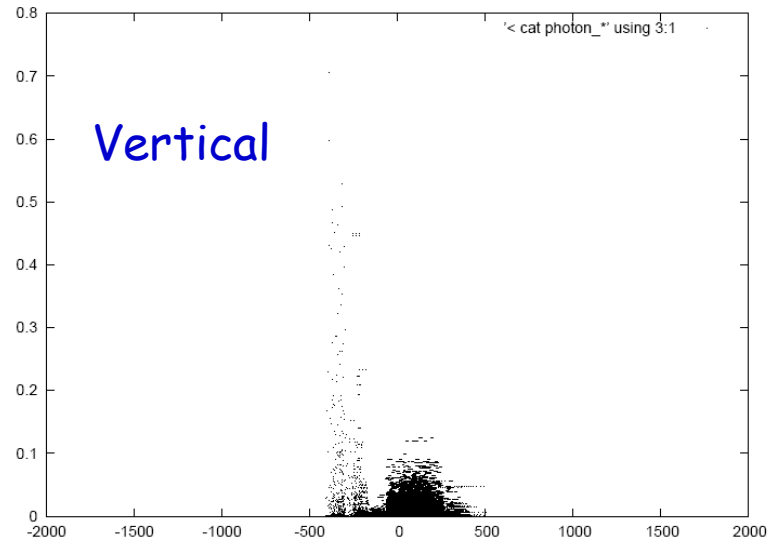
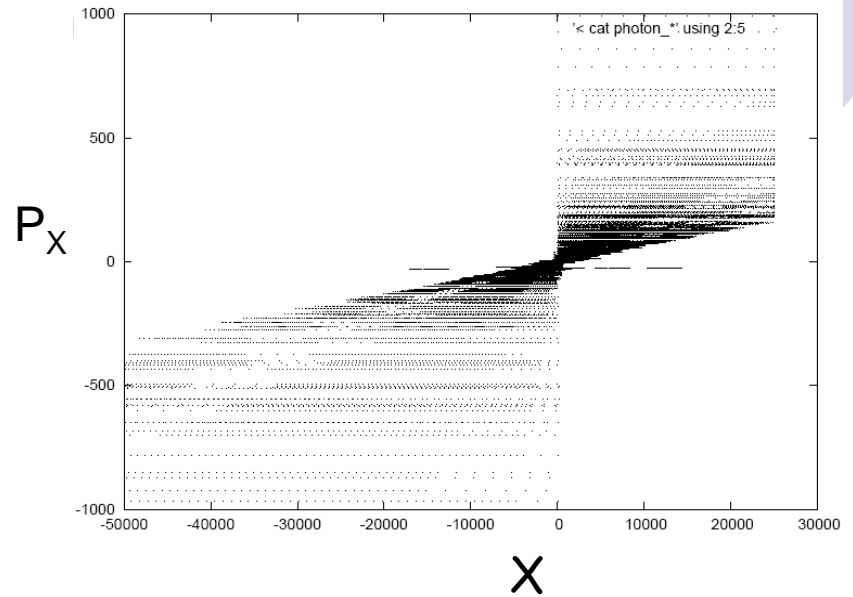
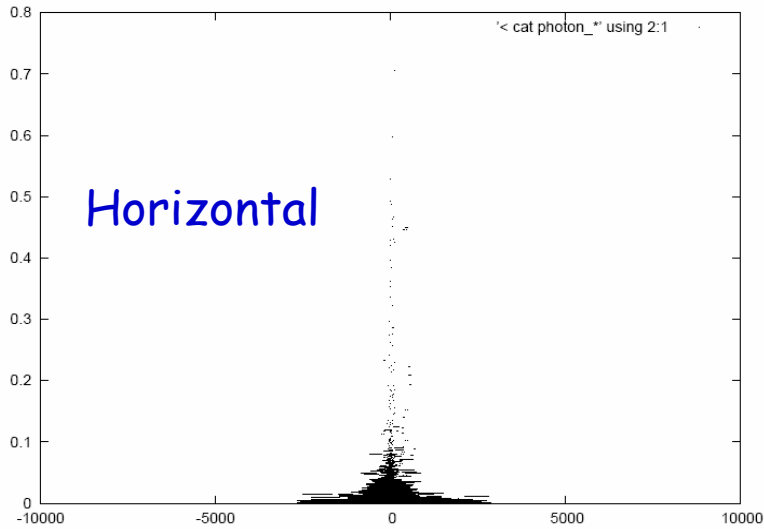
SR-OFF



# Beam Profile at IP

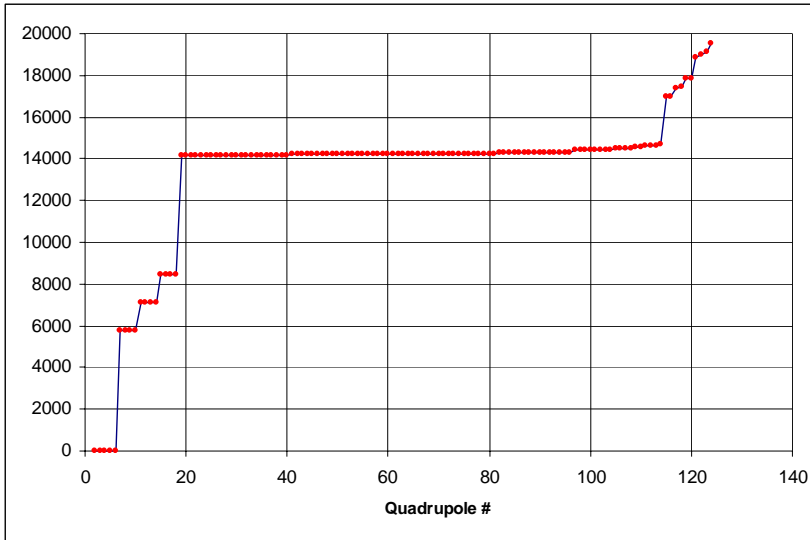


# Synchrotron Radiation (1)



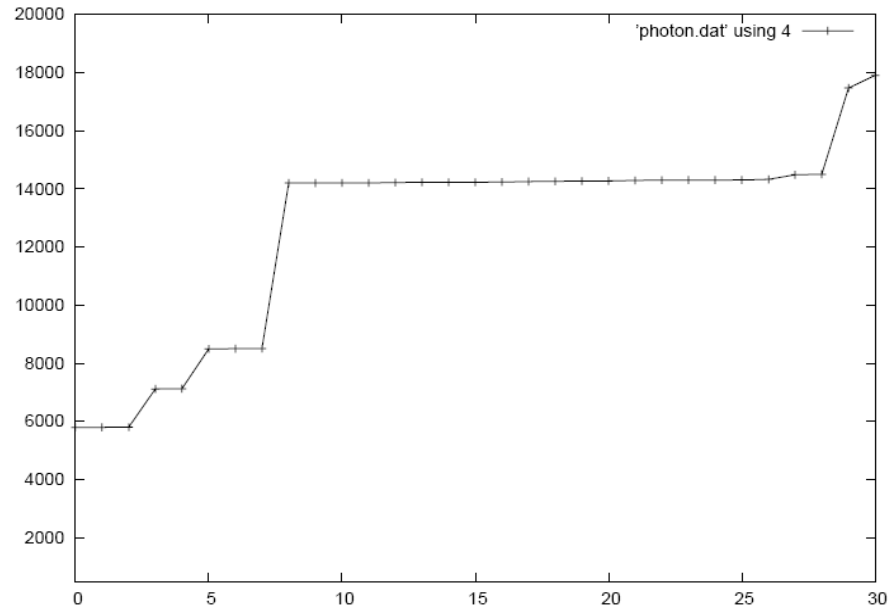
# Synchrotron Radiation (2)

# of photons



# of focusing elements  
(Quadrupoles)

# of photons





## Summary and outlook

- Preliminary results are focused on most important scattering process, that is **elastic beam-gas scattering**.
- Need modification in HTGEN (by Helmut + me)
- Our future plane is the background estimation in the following regions
  - Beam Delivery System (in progress)
  - Main beam
  - Drive beam (Damping rings)