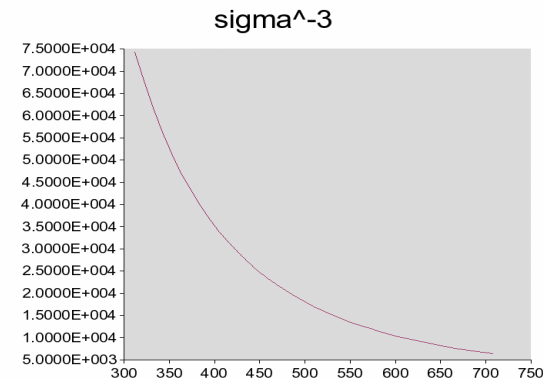# Halo simulation in ATF extraction line
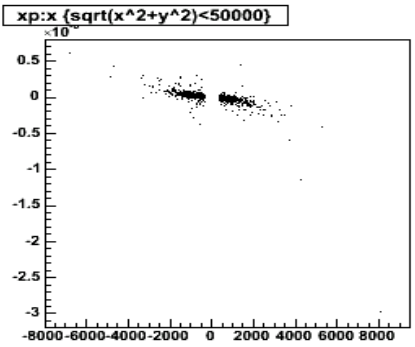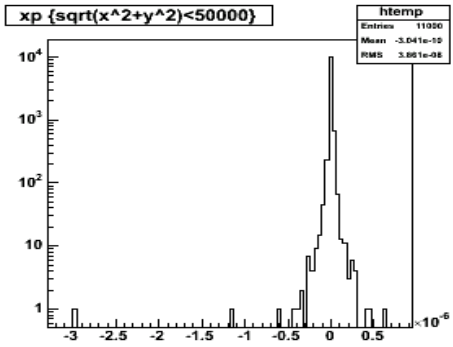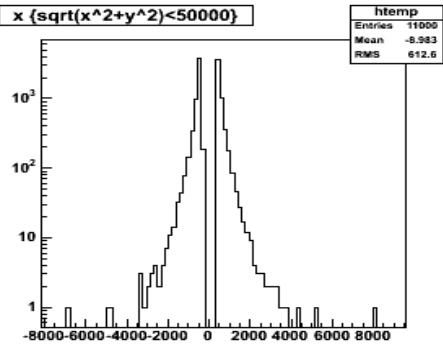
Lawrence Deacon

- halo
- simulation details
- beam losses
- future plans

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- Made a halo distribution file by writing a ROOT macro-
- x, y
- x', y'
- z(=0), zp
- E, energy spread Distribution in x and x' was sigma^(1/r) starting at 3 or 4 sigma where r=3,4. This was based on wire scanner measurements of the halo carried out by Shintake monitor group
- x' and y' follow a similar distribution
- Defined by twiss parameters so that halo surrounds a phase ellipse
- I put a cut on x so that only the tails were included- ignoring the central gaussian as they they do not contribute much to background
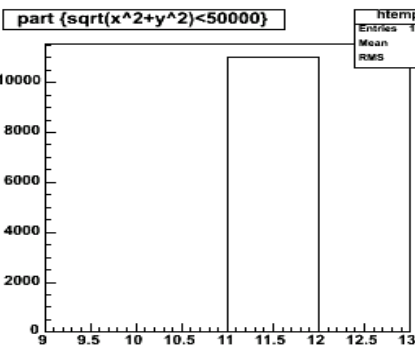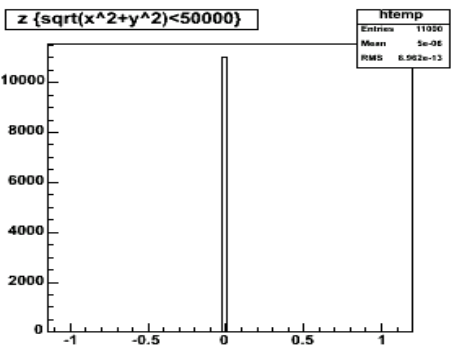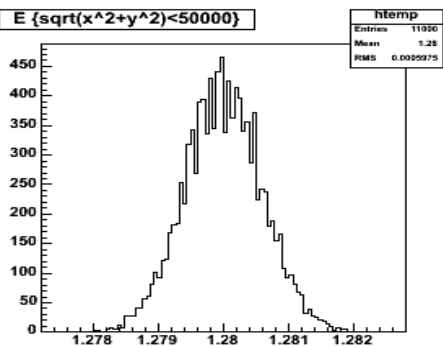

sigma^-3

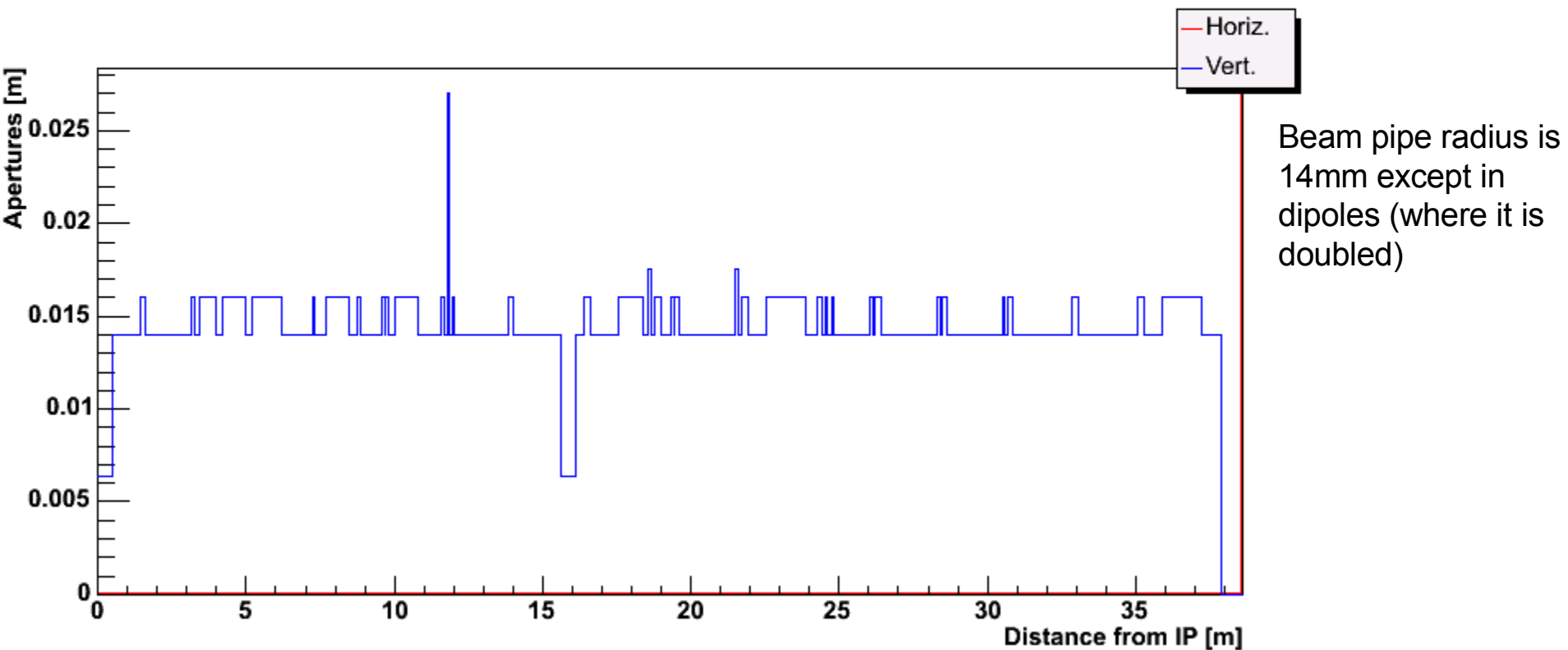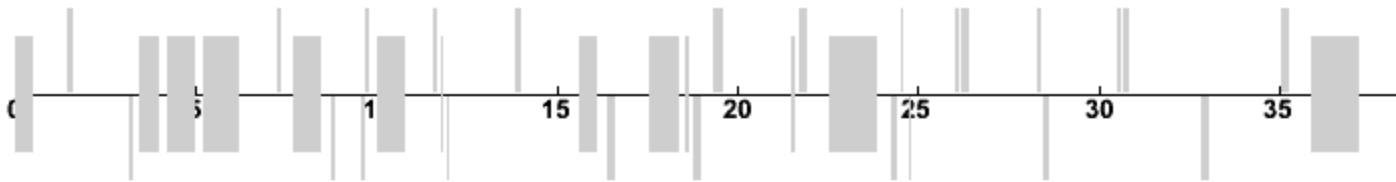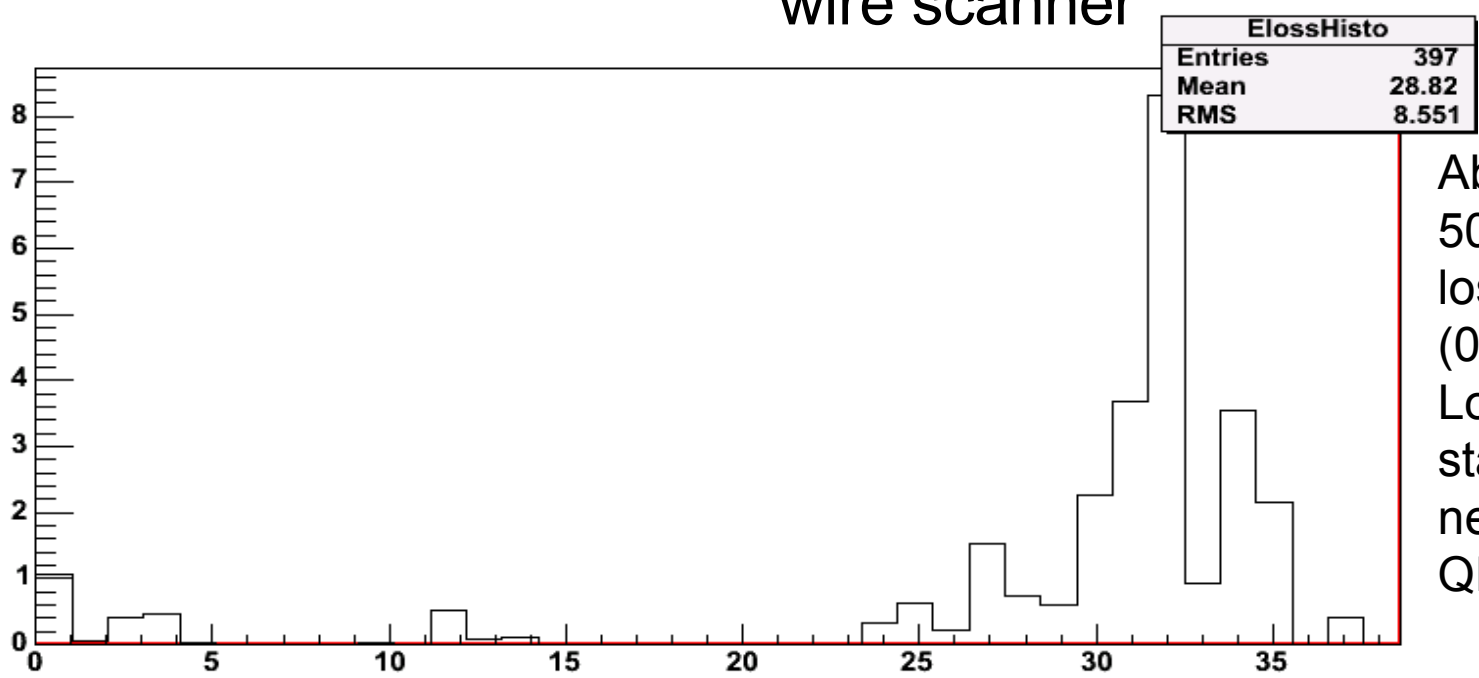Lawrence Deacon   October 9 2006

left to right:
x,   x',   x':x

y,   y',   y':y

E, z, particle type

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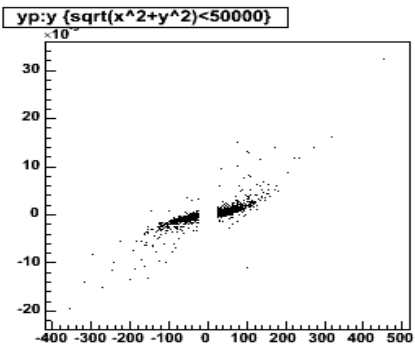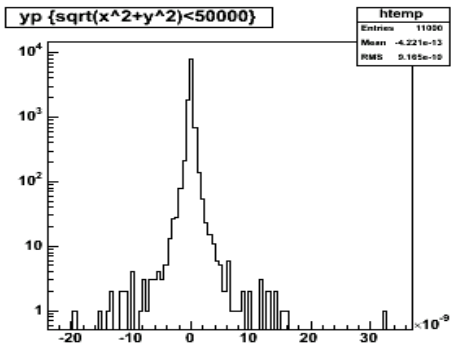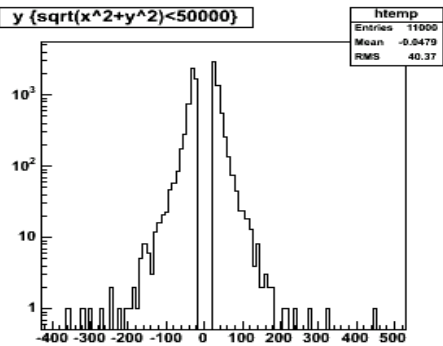
- Used MAD deck by Mark Woodley, SLAC
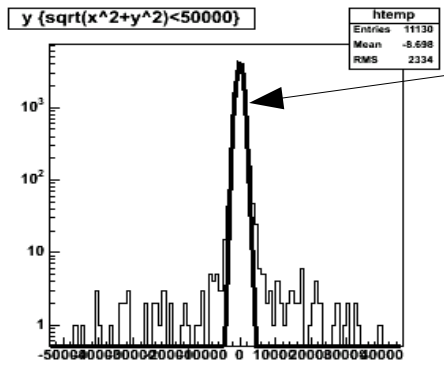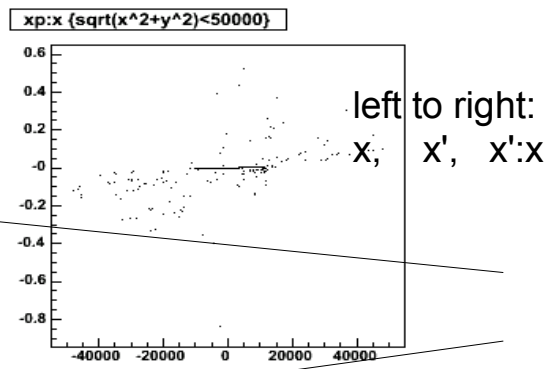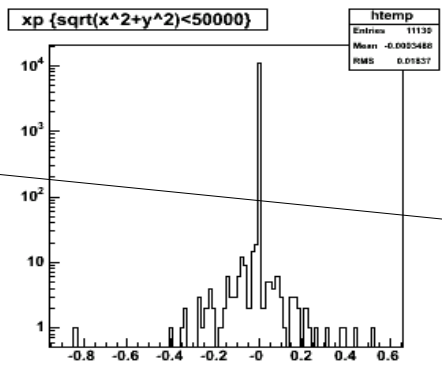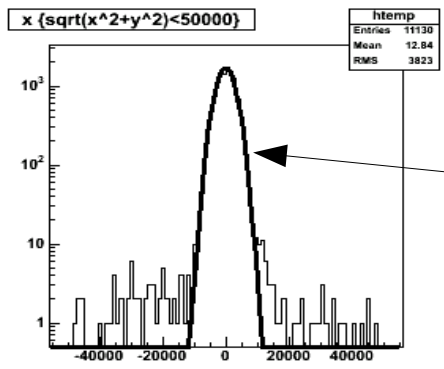- Used laser wire optics with small vertical electron spot size at laser wire
- Twiss parameters and emittances defined at start of simulation- these defined the distribution in phase space of the electrons

Beam pipe radius is 14mm except in dipoles (where it is doubled)

deacon, Mon Oct 9 07:48:51 BST 2006

BDSIM input file : /scratch0/deacon/BDSIM/AT

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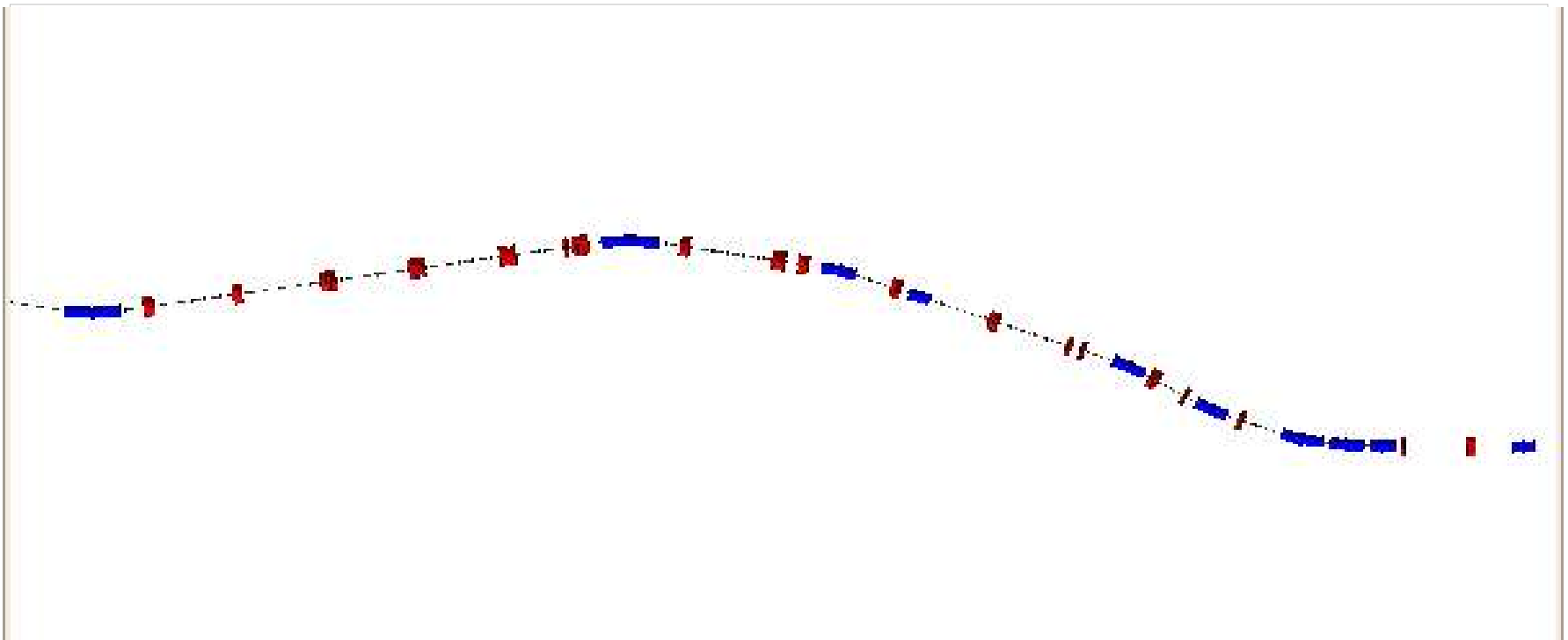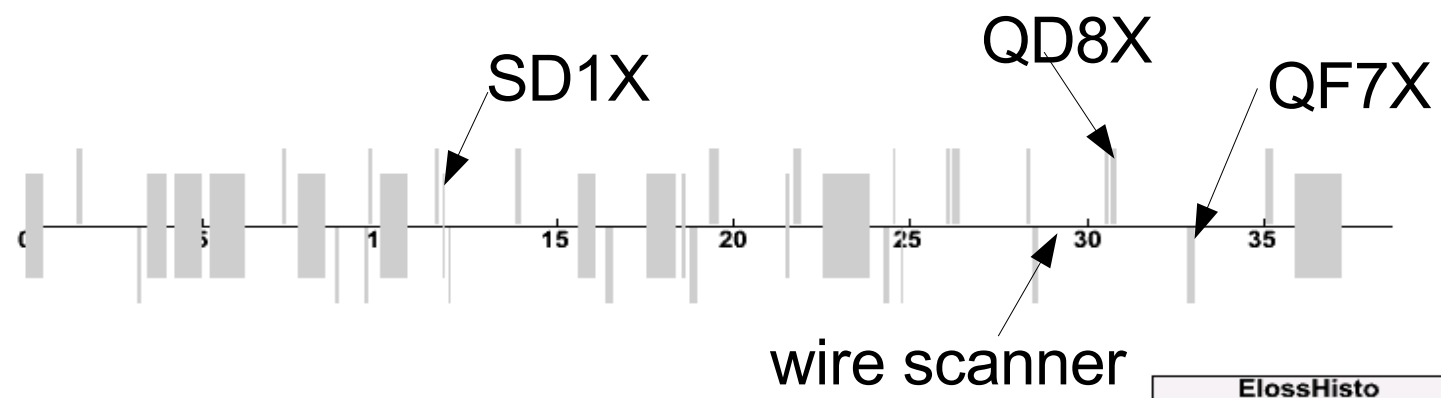
About 400 out of 50000particles lost- (0.8%). Losses occur at start of line, near SD1X, and QF7X.

deacon, Mon Oct 9 07:56:52 BST 2006

BDSIM input file : /scratch0/deacon/BDSIM/AT

left to right:
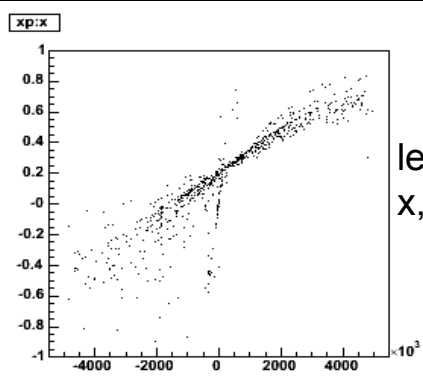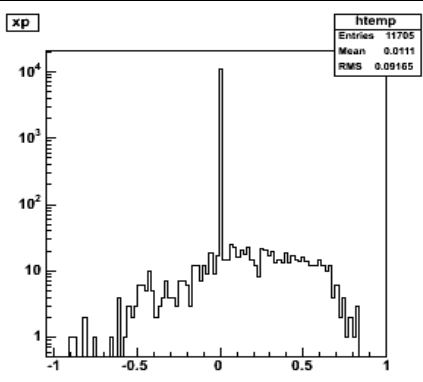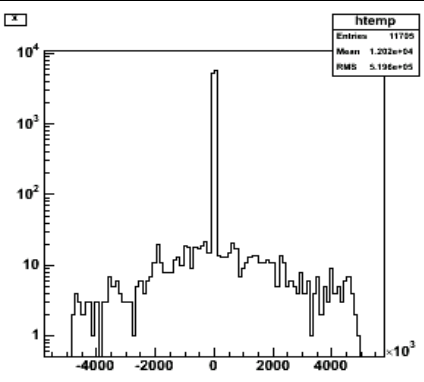x,   x',   x':x

y,   y',   y':y
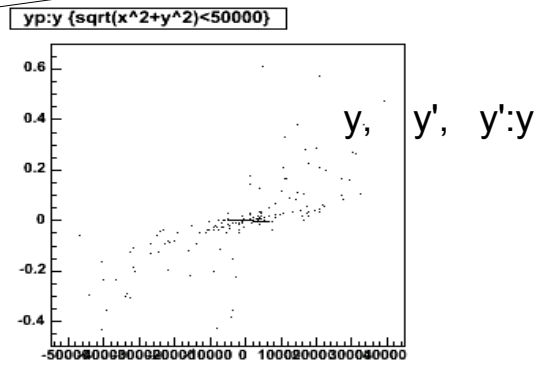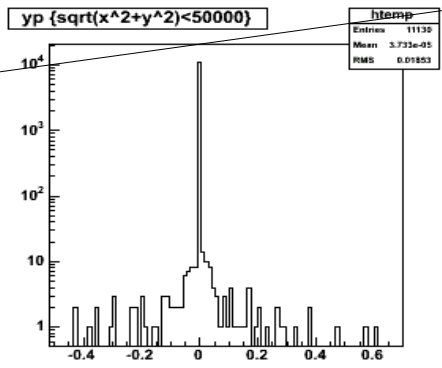
E, z, particle type

Some halo particles have formed a gaussian (sigmax=2840 +/- 20 microns, sigmay=968 +/- 7 microns)
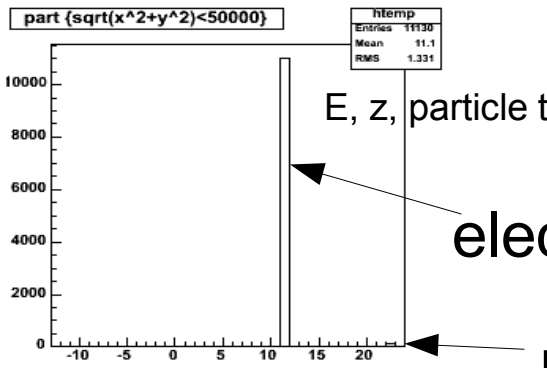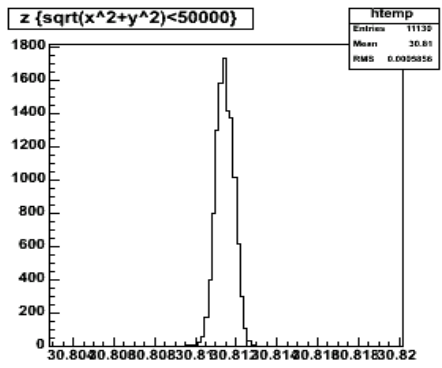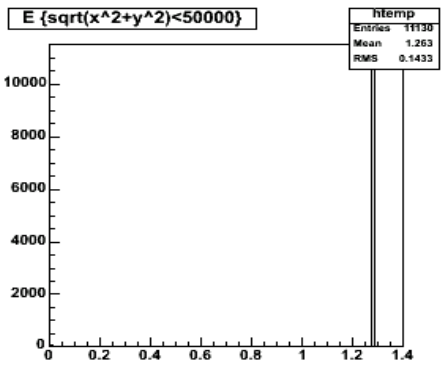
electrons

photons

left to right:
x,   x',   x':x
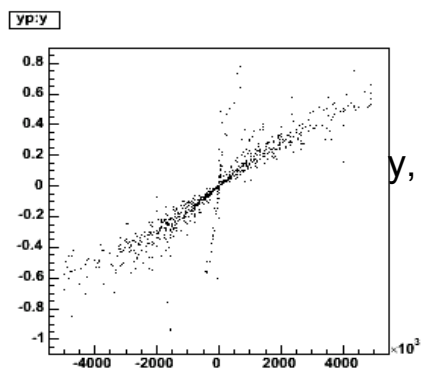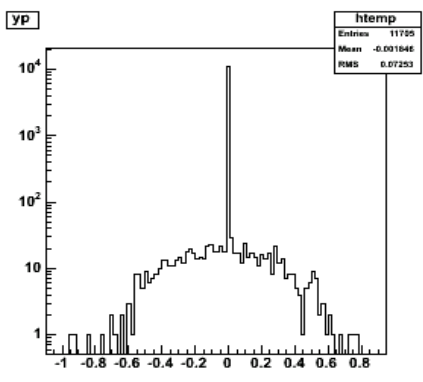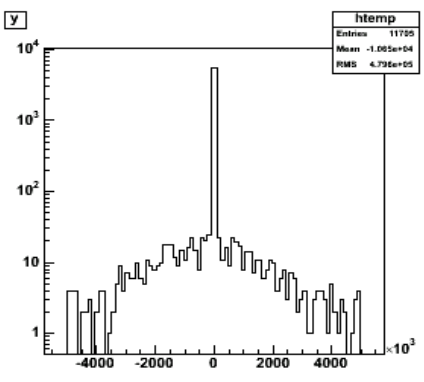
y,   y',   y':y
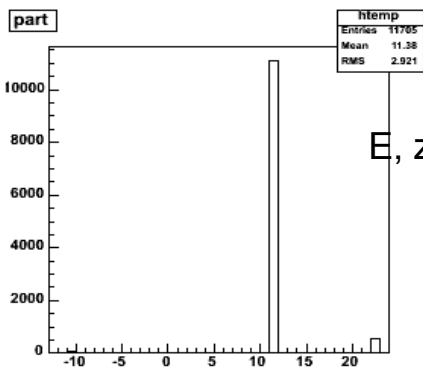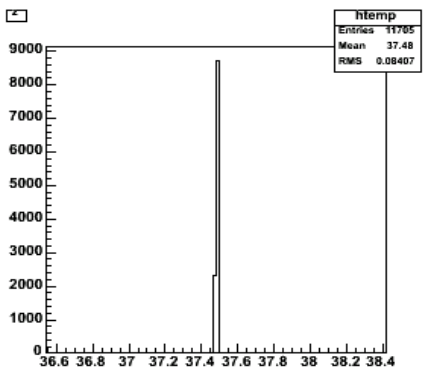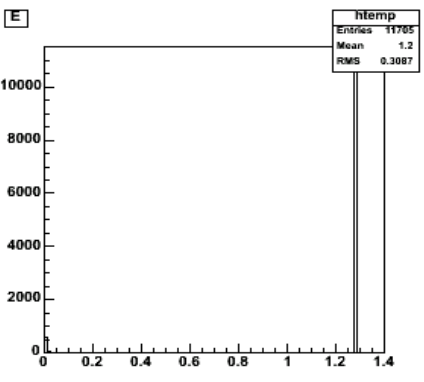
E, z, particle type

- Calculate the ratio of the number of particles in the core of the beam to the number of particles in the halo.
  - Use this to estimate background in laser wire and Shintake monitor detectors.
  - Compare estimated background with experiments
  - Simulation of ATF2 extraction line using the halo distribution to estimate background and beam losses. Include effective collimators such as the 20mm diameter BPMs in the beam line.