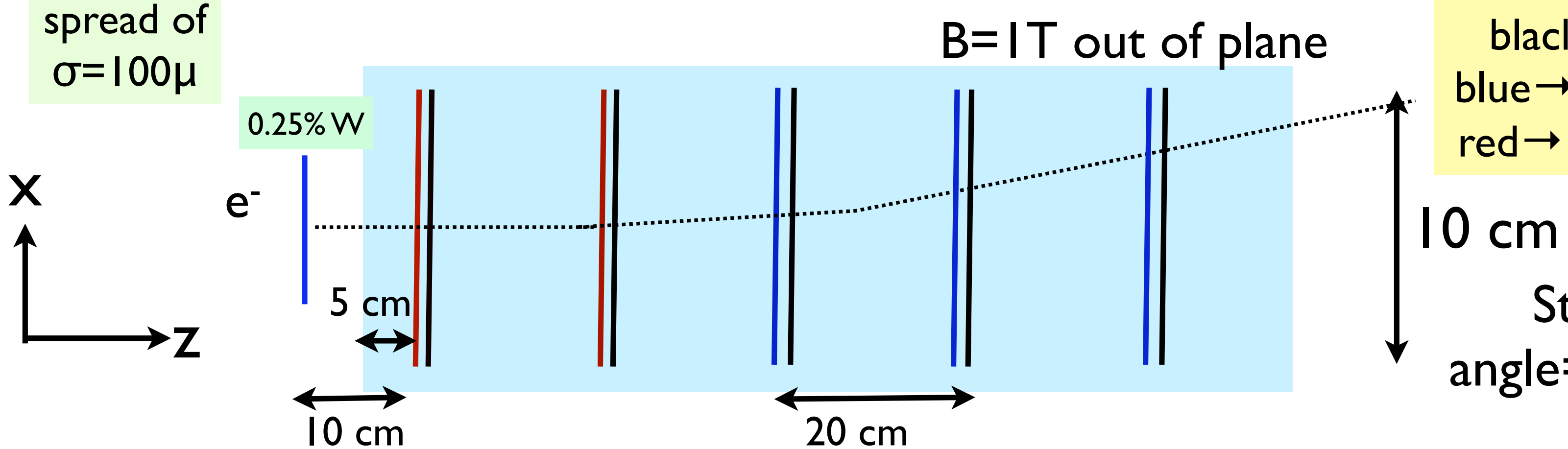
Layout and Setup...v2.8

xy beam spread of σ=100μ

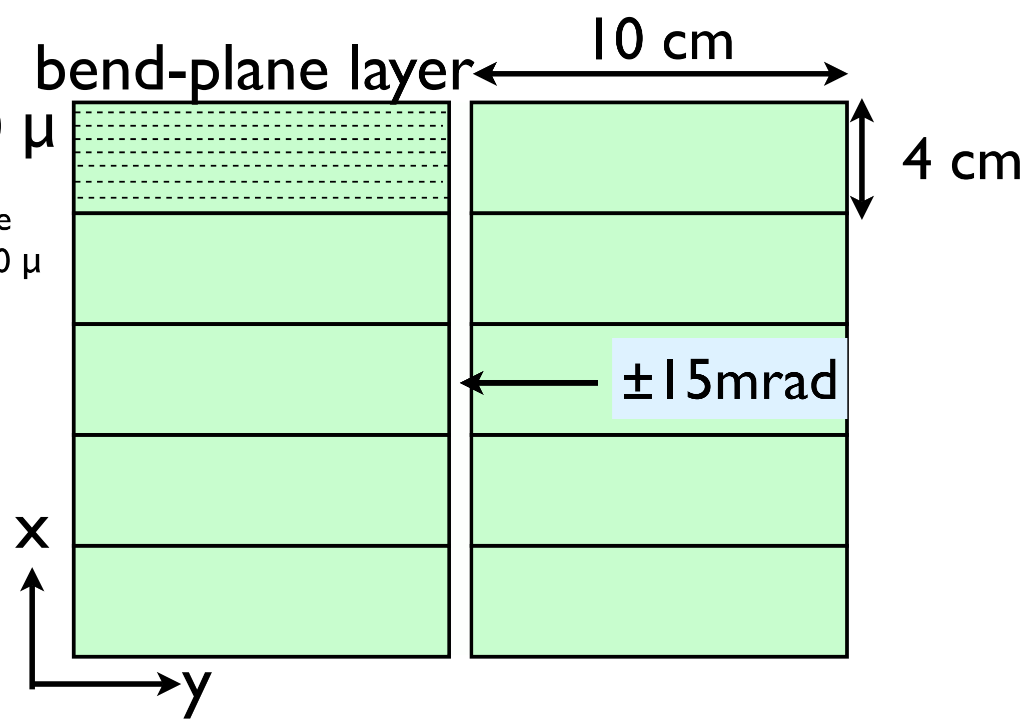


black→Bend
blue→SAS-Bend
red→Non-bend

Stereo angle=50mrad

Silicon is 300μ thick, “services”=0.2%/layer; detector is in ***vacuum***

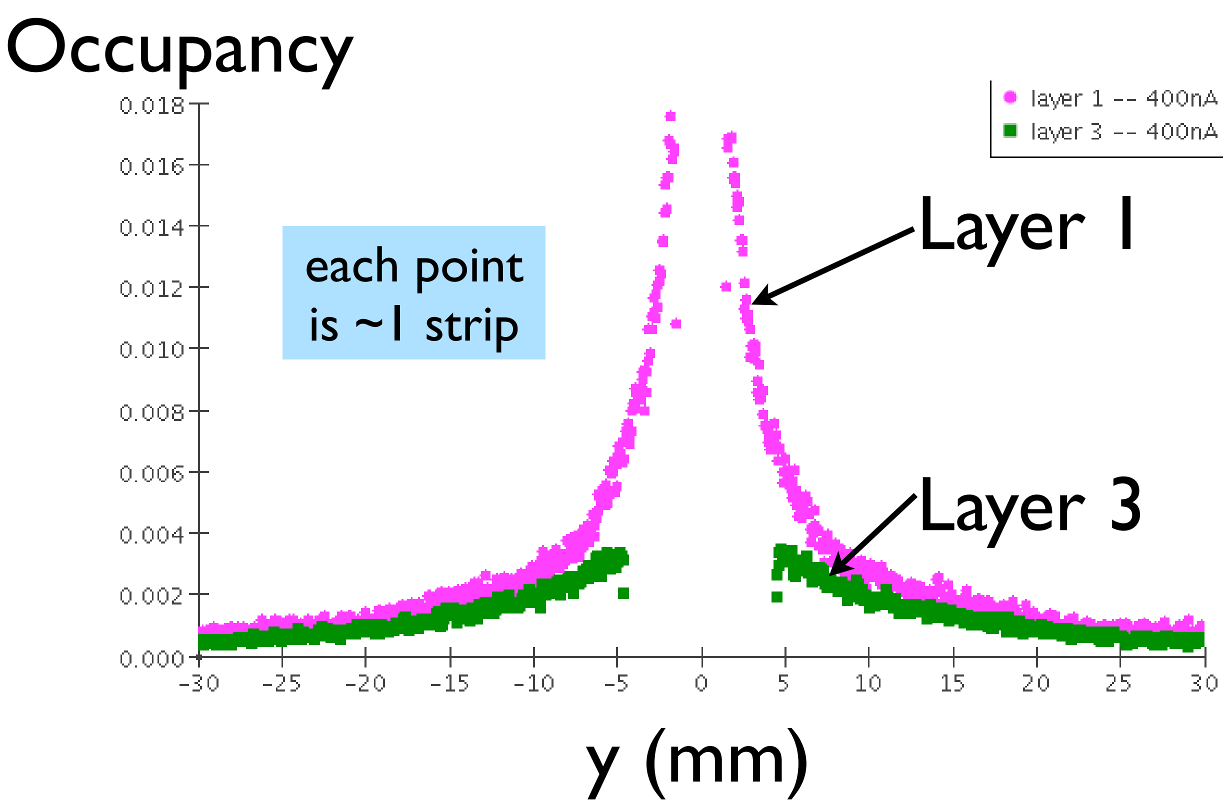
pitch=60 μ
with intermediate strips every 30 μ



readout chip=APV25
→7.5 ns integration

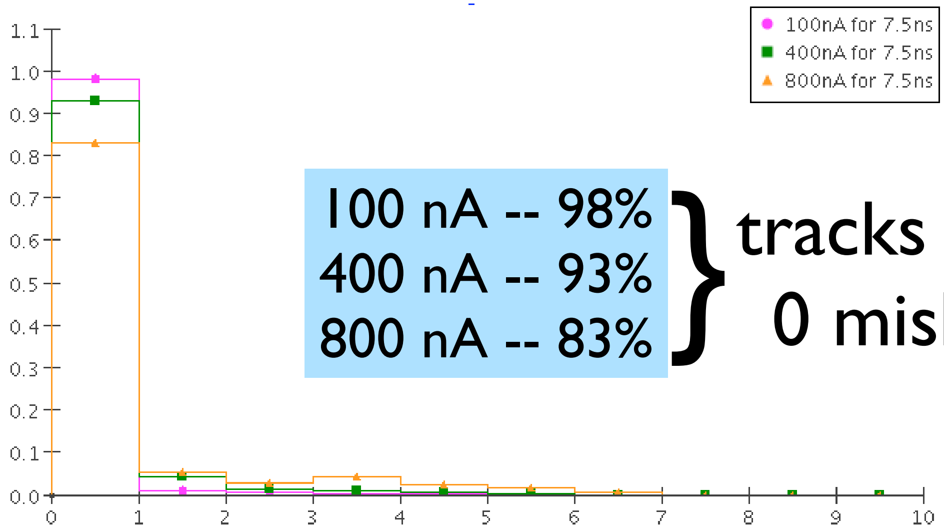
I am trying to use coordinates consistent with everyone else...these are not what’s used in lcsim

Occupancy -- 400nA for 7.5ns



...this seem to be in line with expectation from Takashi's simulation (~0.017/2strips-per-hit*25ns/7.5ns ~ 0.028)

Rate dependence: # of mishits



100 nA -- 98%
400 nA -- 93%
800 nA -- 83%

} tracks with 0 mishits

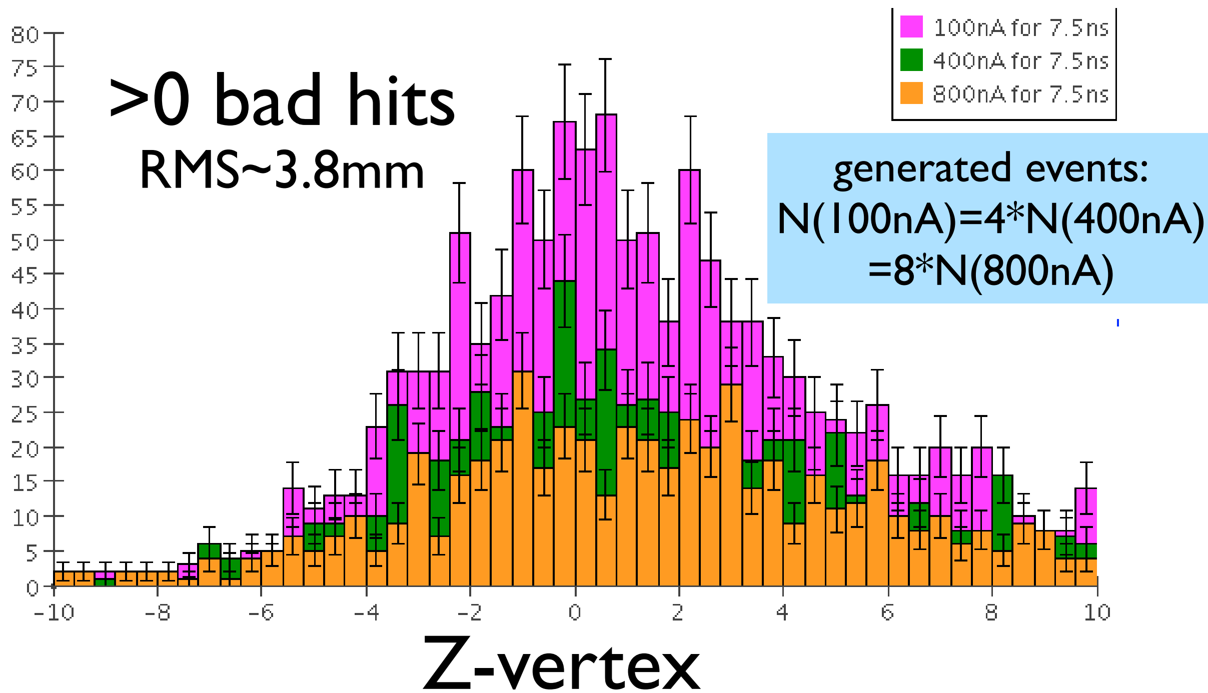
# of mishits

...same as above but removed 0 mishit bin

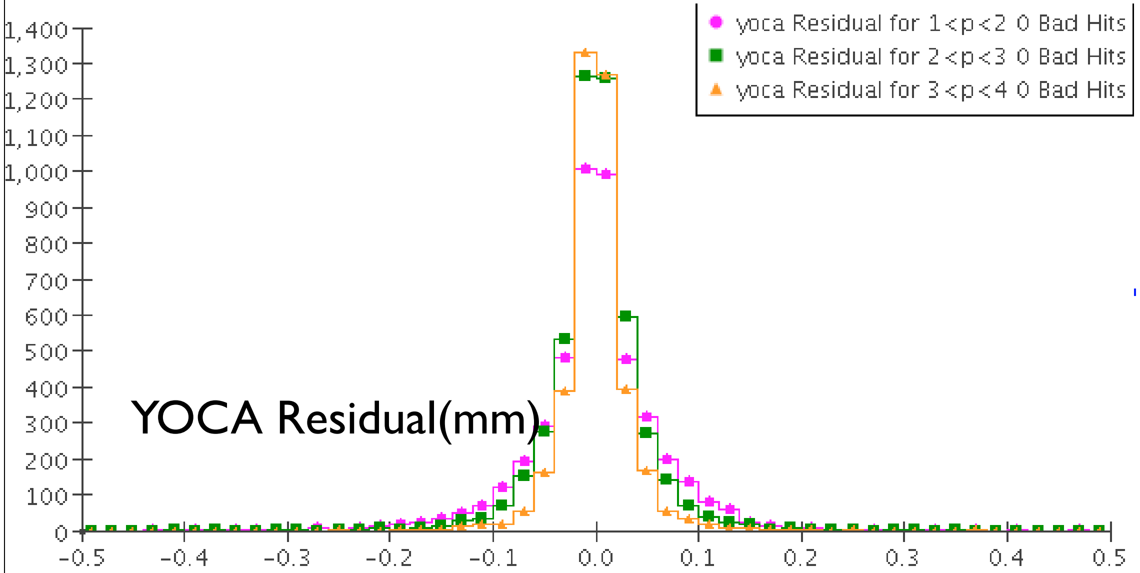
Rate dependence: Z-vertex

- The vertex resolution for correctly reconstructed tracks does not depend on pileup...
- for that matter, it's pretty constant for tracks with mishits...there are just more of them at higher rate

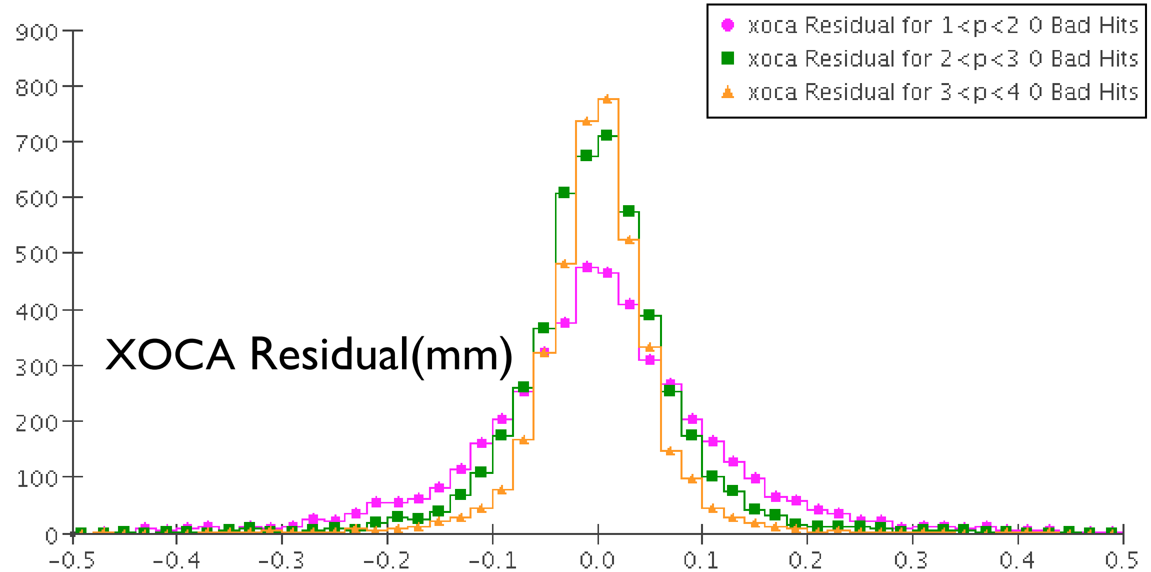
Number of events in the tail (e.g. >1cm) scales roughly linearly with rate...



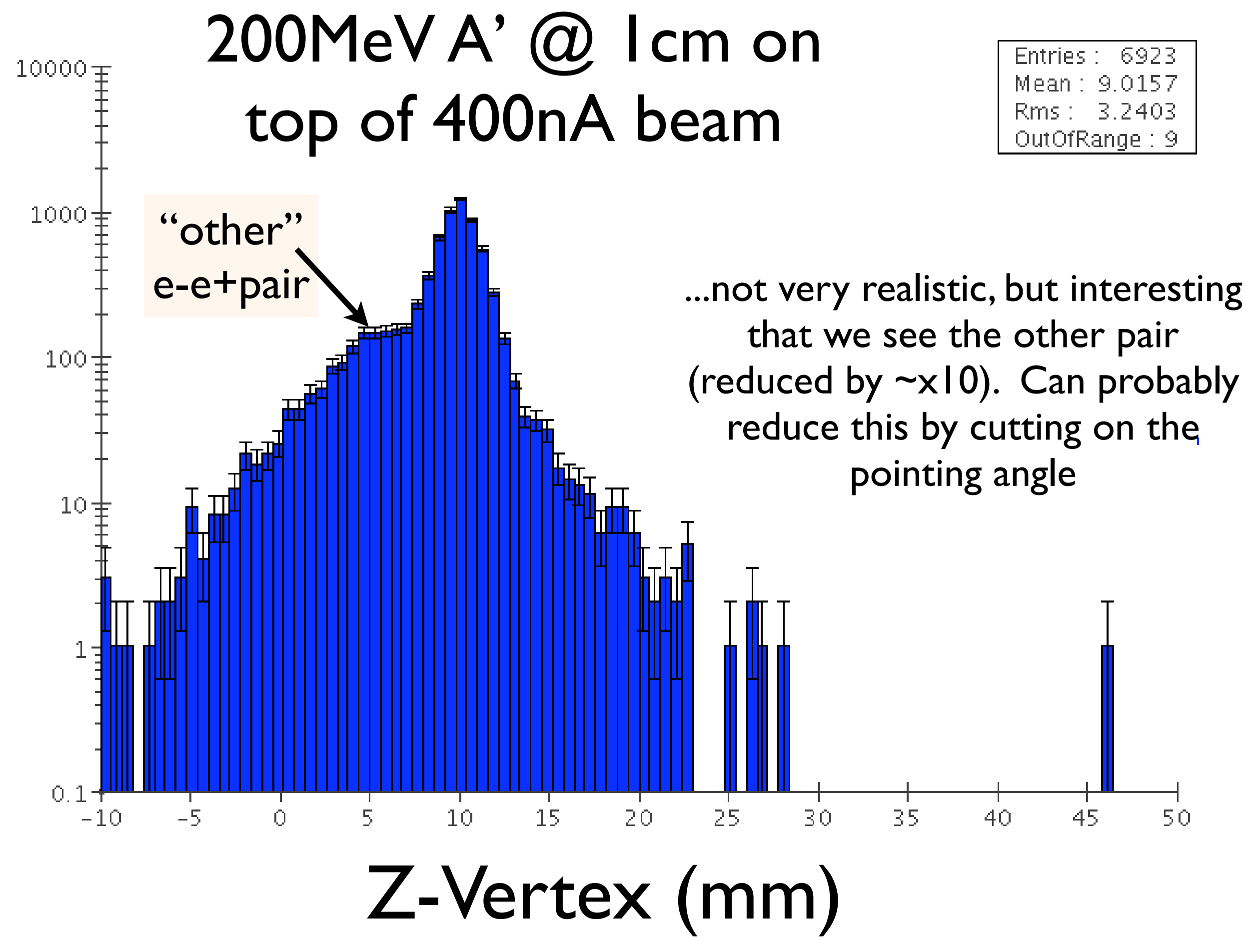
POCA momentum dependence



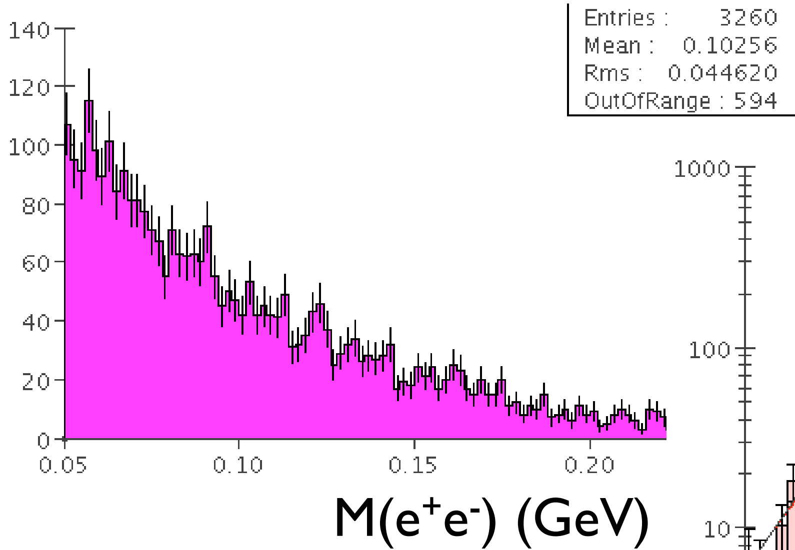
...both get narrower at higher momentum...



Signal e^+e^- Z_v @1cm

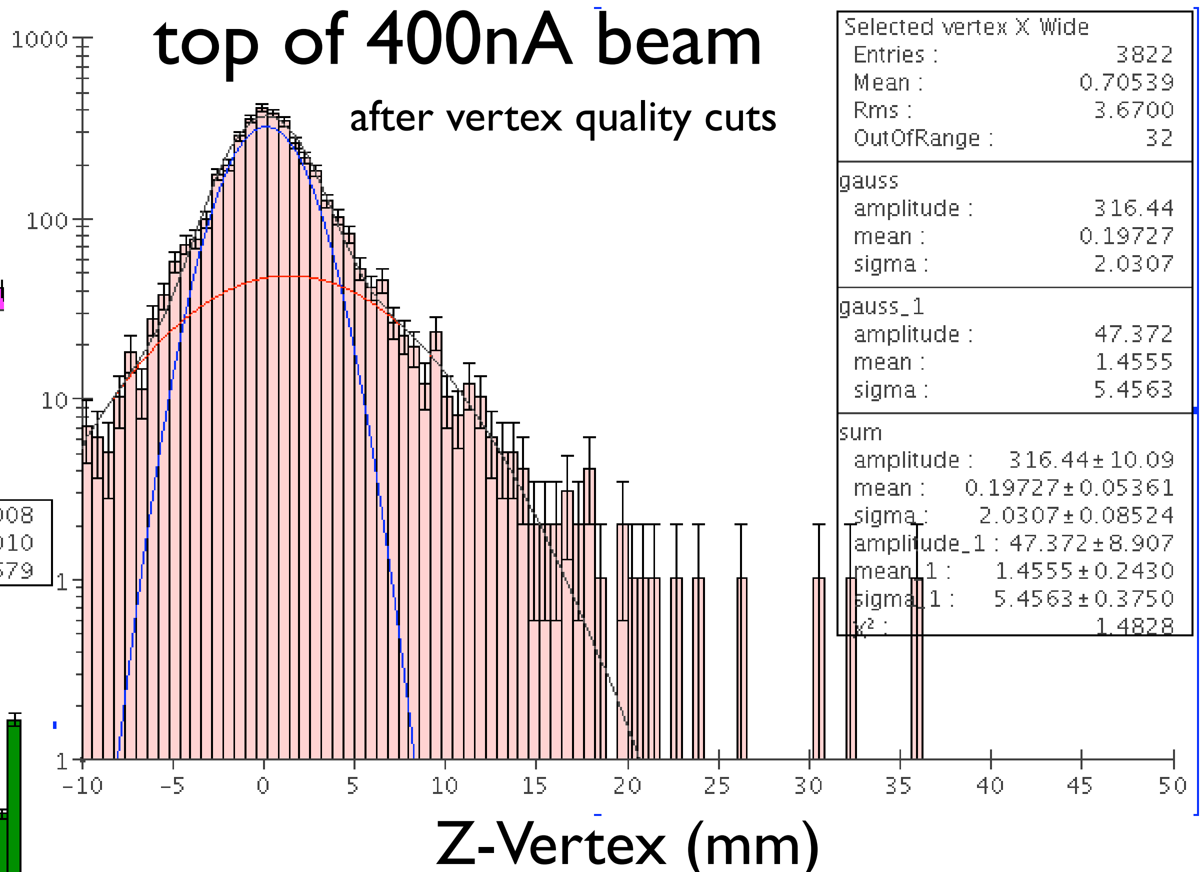


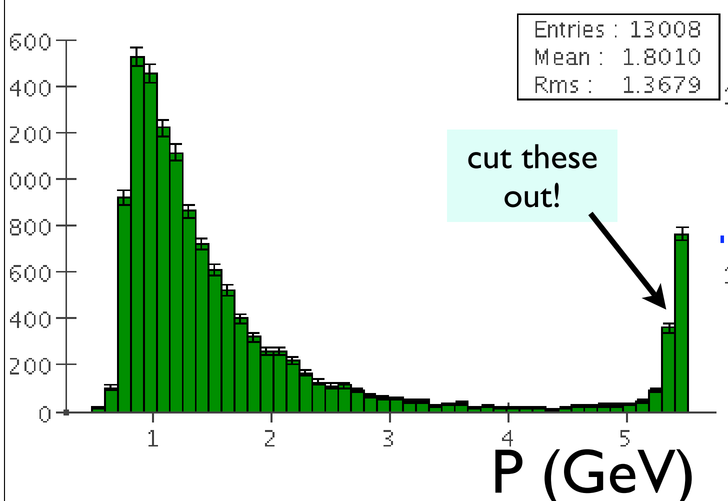
BH Background



BH background on top of 400nA beam

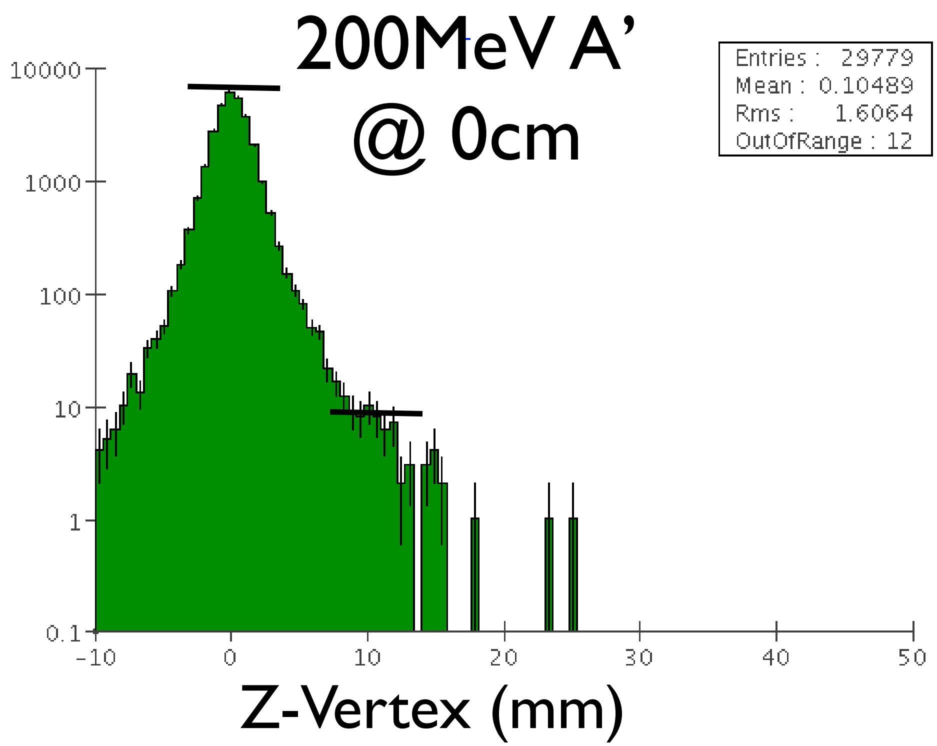
after vertex quality cuts





lower p tracks →worse resolution

Z-Vertex scaling



vertex position decreases ~x10^3 between 0-10mm

from previous slide, BH only decreases ~x30

- better to use $Z_v/\sigma(Z_v)$ → need reliable errors
  - not sure we have that now in lcsim code (for sure the scale is off by ~x5) probably because track errors aren't quite correct.

Some physics analysis thoughts

- I see (at least) two separate analyses:
  1. pure bump-hunt for prompt decays
     - require vertex within ~mm of target (maybe constrain tracks to target/ beamspot...help a bit); other clever cuts
     - Simple: ML fit to e^+e^- mass...smooth (e.g. polynomial) background and gaussian+low-side tail (mass dependent resolution); get limit vs mass by stepping peak mass and getting $L(N_{sig}=N_{best})-L(N_{sig}=0)$
     - more complicated: include kinematic variables to characterize the different backgrounds (maybe in an MVA)...
  2. bump-hunt/displaced vertex
     - require vertex be ~>2mm outside target and V0 points back
     - Simplest: cut in bins of vertex significance; do bump-hunt as above in each bin (independently or not); get limits; correct for efficiency in bins of mass/lifetime
     - Less simple: fit simultaneously in mass (fit A' mass) and vertex significance (fit lifetime--flight length would be easier!); need to include acceptance correction vs vertex significance
     - Pretty complex: same as above but with other kinematic/event variables (some which are likely correlated to vertexing/mass