

Multiple scattering

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Random numbers in sim

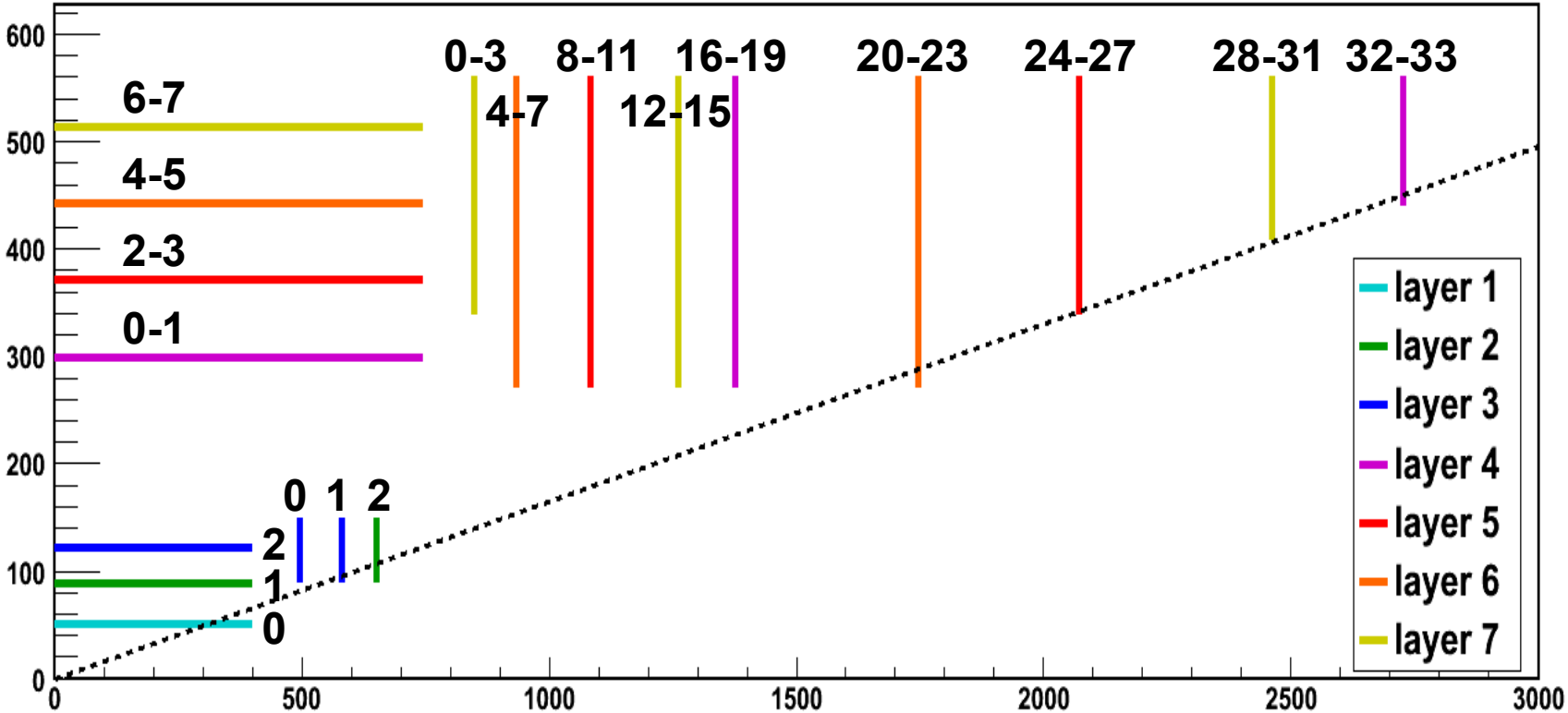
- In Athena V12:
 - SimFlags.SeedsG4.set_Value(RandomSeed)
- BUT: this makes it only partially random
- WORKAROUND:
 - Generate event once: event.pool.root
 - Add event.pool.root 30k times to a collection
 - Simulate withing the same job
- Had to use Athena V13
 - New configurables interface
 - athenaCommonFlags.PoolEvgenInput=[f1,f2...]
 - In V12, sim jobs only take a single file
 - SimFlags.EvgenInput.set_Value(f1)

Event selection

- Simulate 30k times
- Cluster pixels (SCT already clustered)
 - Added new “dumpMode” to pattgen
- Require 1 and only 1 hit in each logical layer
 - Updated filterTracks.c and printTrack() in th_rd.c
- Repeat for 200 different MC tracks
 - Only ~100 cases have >1500 events left
 - Highest-statistics case: 23k events
- In plots to follow, results are per pmap layer
 - Because SS size can be given per pmap layer
 - Disk divided by *axial/stereo* and *inner/outer*
 - See next page for details

Ref: logical and pmap layers

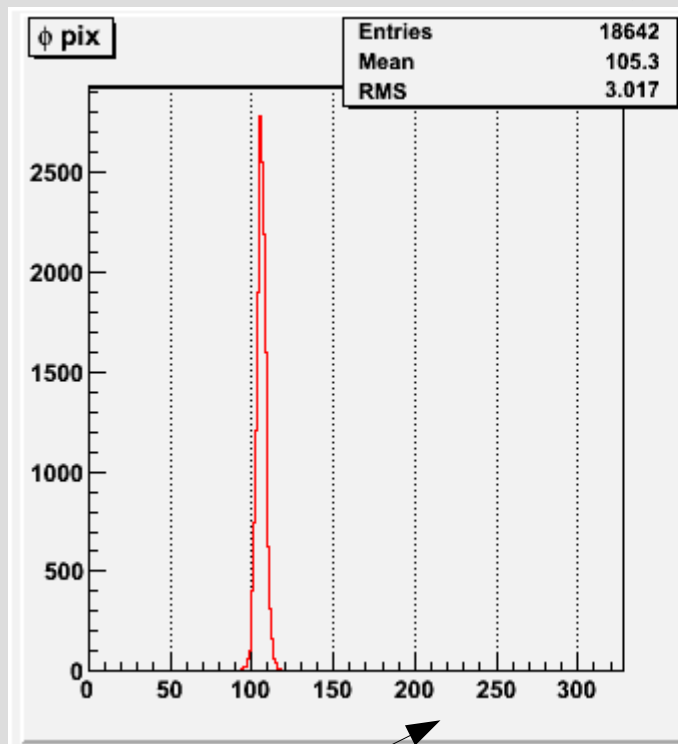
Silicon Geometry



Sample plot with explanations

How many of 30k events survived filtering

Width (in pixels)
containing 68/95%



68%: 7 95%: 13

Track P = 1.73 GeV

Track P_T = 1.51 GeV

Track η = 0.52

Layer = 2

isPixel = 1

Barrel = 0

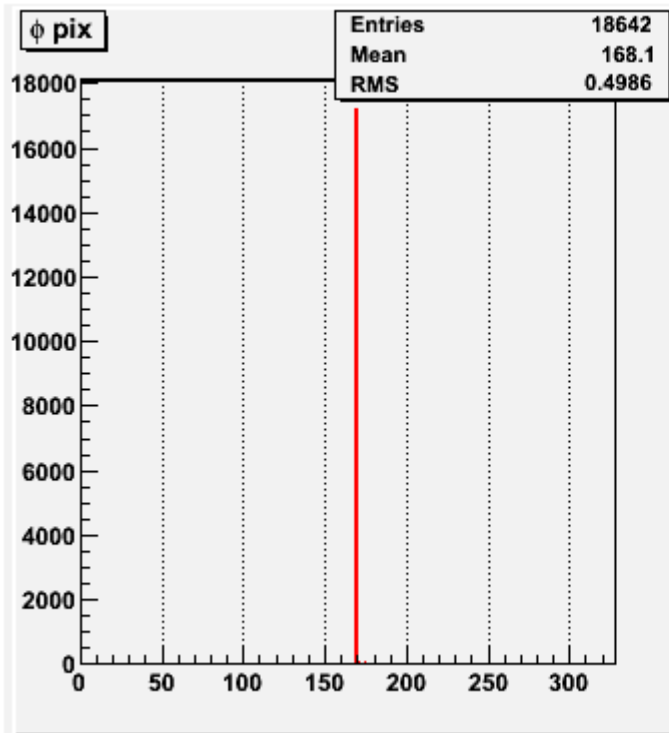
Most tracks are
lowPt (worst case)

Pmap layer

0 for barrel
+2/-2 for endcap

X-axis show pixels 0..328 with bin size 1

So, this is outer pixel layer
in the barrel



68%: 1 95%: 3

Track P = 1.73 GeV

Track P_T = 1.51 GeV

Track η = 0.52

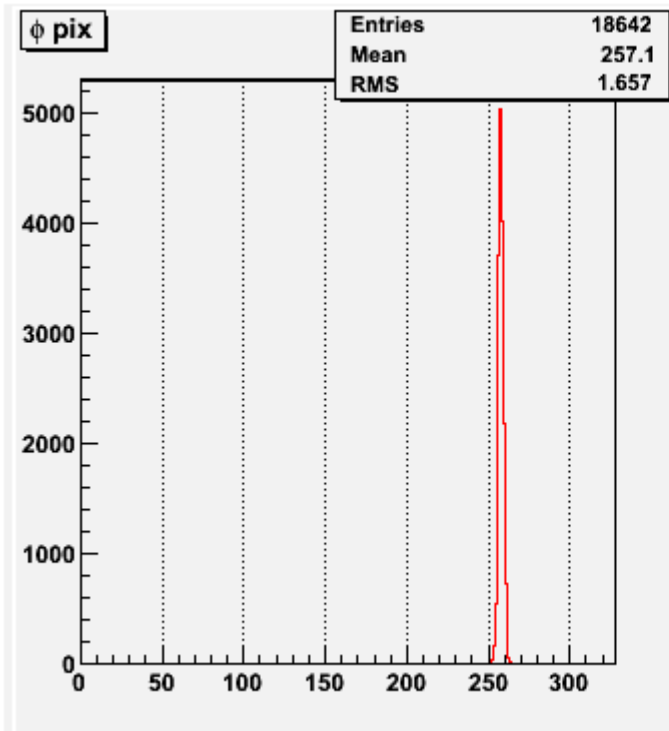
Layer = 0

isPixel = 1

Barrel = 0

PIXELS

B-layer



68%: 3 95%: 7

Track P = 1.73 GeV

Track P_T = 1.51 GeV

Track η = 0.52

Layer = 1

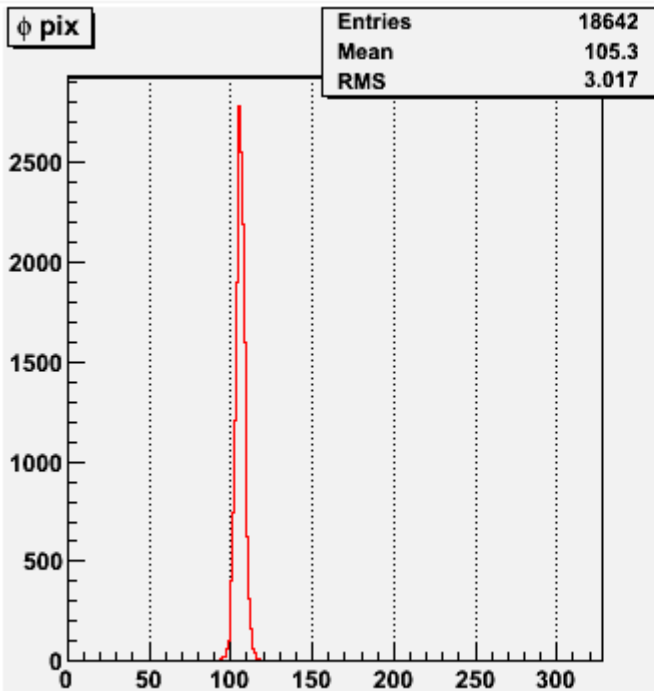
isPixel = 1

Barrel = 0

Layer 1

PIXELS

Layer 2



68%: 7 95%: 13

Track P = 1.73 GeV

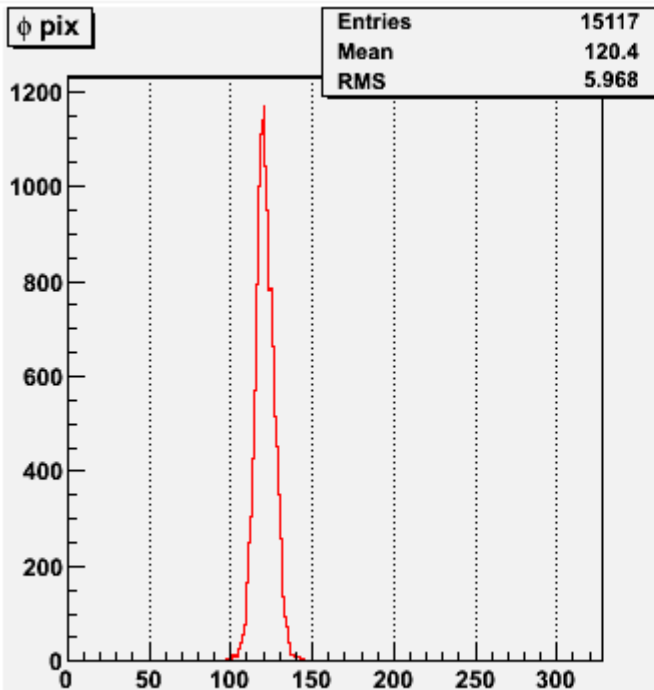
Track P_T = 1.51 GeV

Track η = 0.52

Layer = 2

isPixel = 1

Barrel = 0



68%: 13 95%: 23

Track P = 7.21 GeV

Track P_T = 1.20 GeV

Track η = 2.48

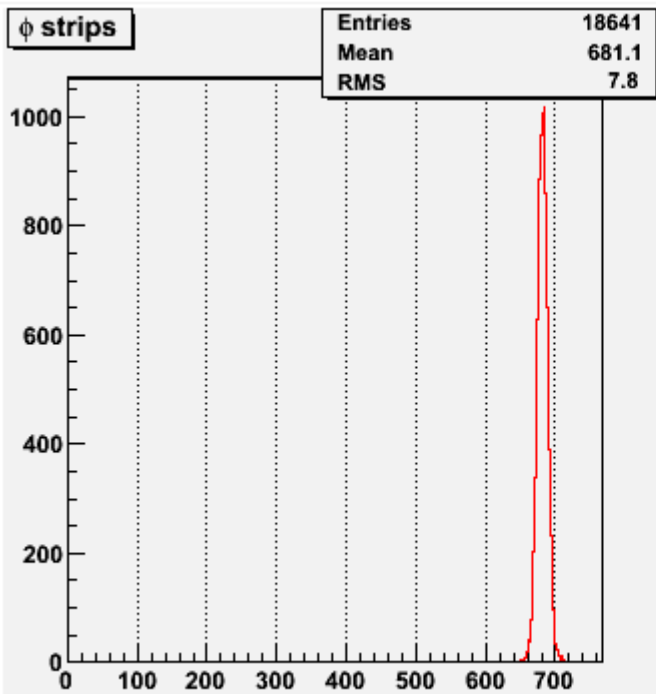
Layer = 2

isPixel = 1

Barrel = 2

Layer 2 (endcap)

Cur. SS:
50 pixels



68%: 15 95%: 31

Track P = 1.73 GeV

Track P_T = 1.51 GeV

Track η = 0.52

Layer = 0

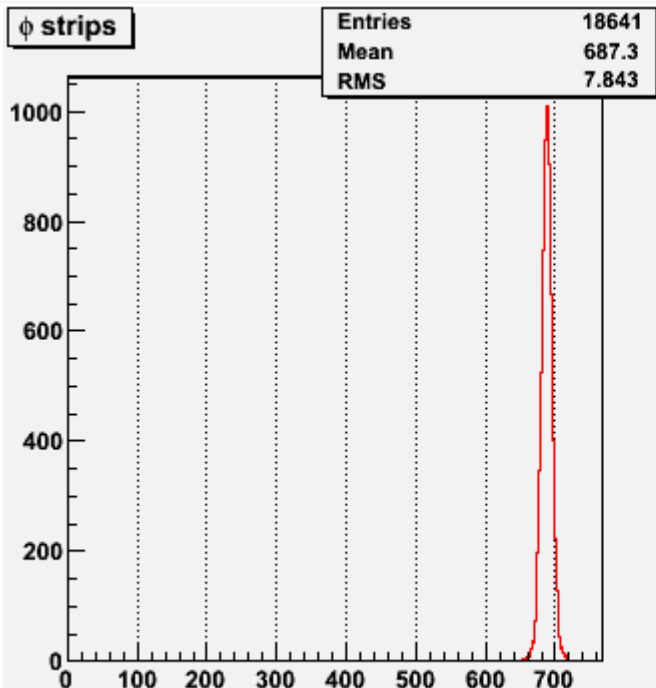
isPixel = 0

Barrel = 0

SCT

Layer 0 (stereo)

As expected, no difference between stereo and axial.



68%: 15 95%: 31

Track P = 1.73 GeV

Track P_T = 1.51 GeV

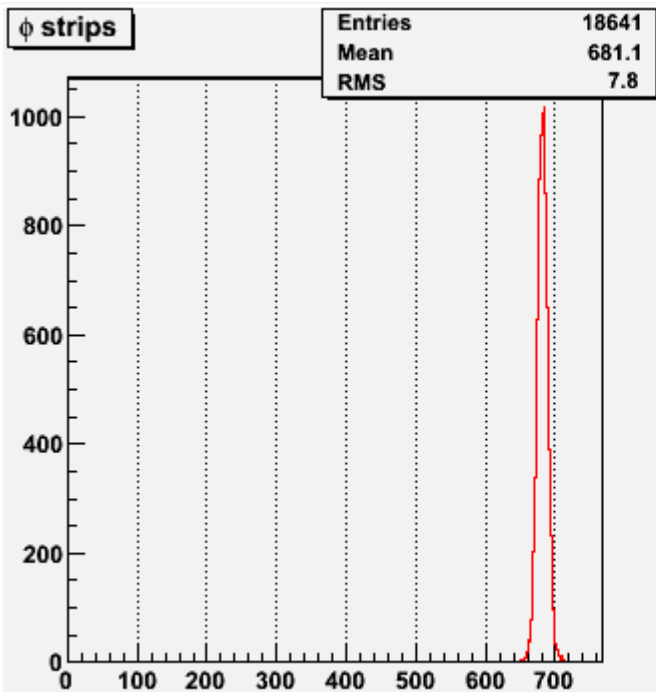
Track η = 0.52

Layer = 1

isPixel = 0

Barrel = 0

Layer 0 (r-phi)



68%: 15 95%: 31

Track P = 1.73 GeV

Track P_T = 1.51 GeV

Track η = 0.52

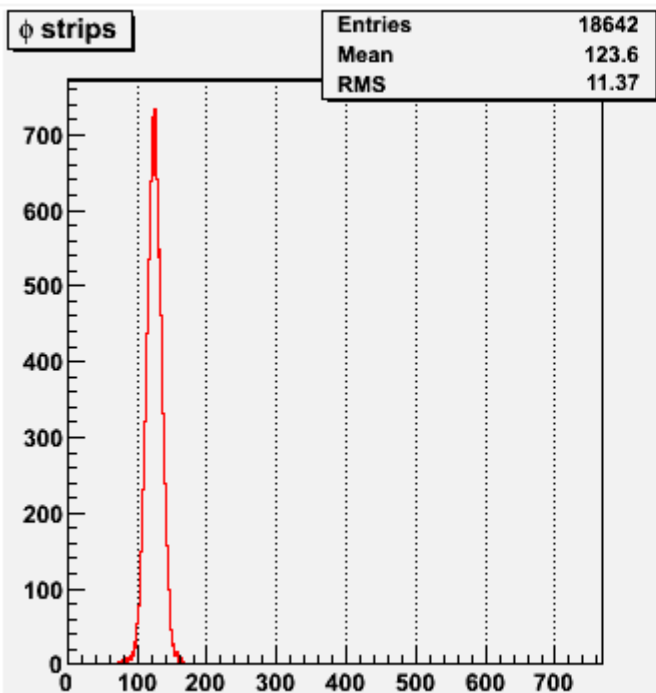
Layer = 0

isPixel = 0

Barrel = 0

SCT

Layer 0



68%: 23 95%: 45

Track P = 1.73 GeV

Track P_T = 1.51 GeV

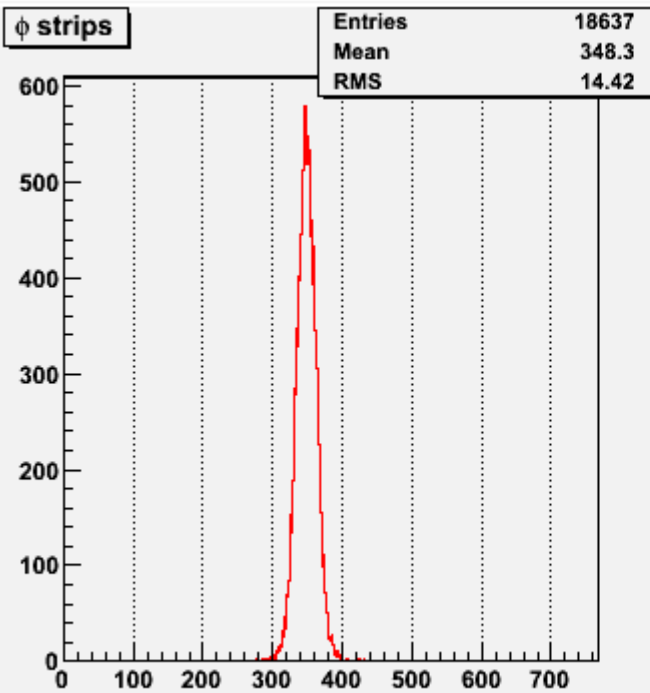
Track η = 0.52

Layer = 2

isPixel = 0

Barrel = 0

Layer 1



68%: 29 95%: 57

Track P = 1.73 GeV

Track P_T = 1.51 GeV

Track η = 0.52

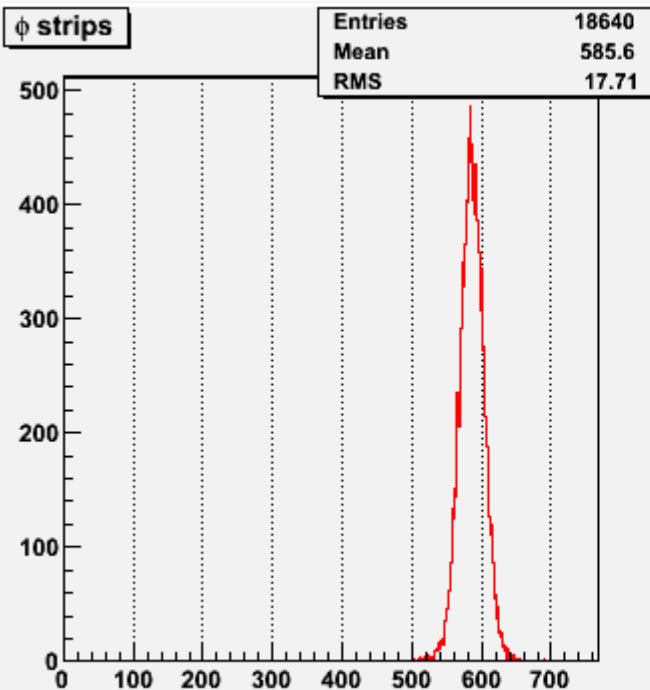
Layer = 4

isPixel = 0

Barrel = 0

SCT

Layer 2



68%: 35 95%: 69

Track P = 1.73 GeV

Track P_T = 1.51 GeV

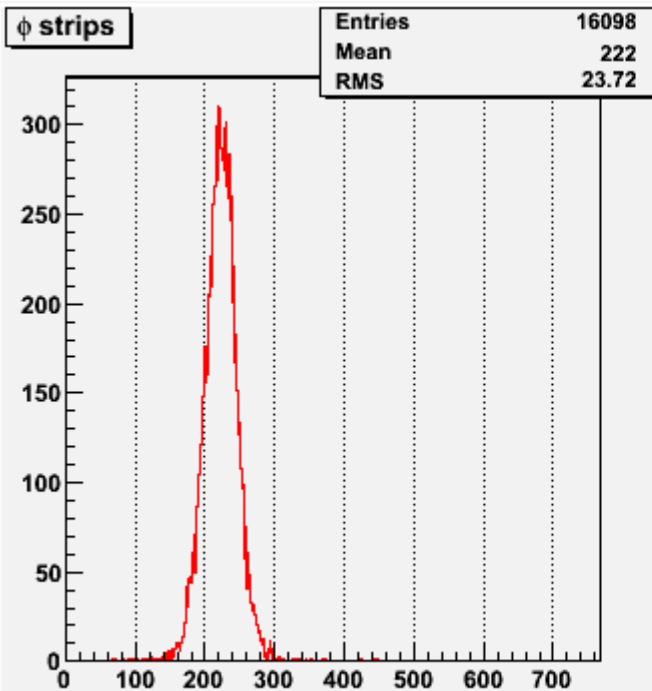
Track η = 0.52

Layer = 6

isPixel = 0

Barrel = 0

Layer 3



68%: 45 95%: 93

Track P = 5.16 GeV

Track P_T = 1.44 GeV

Track η = -1.95

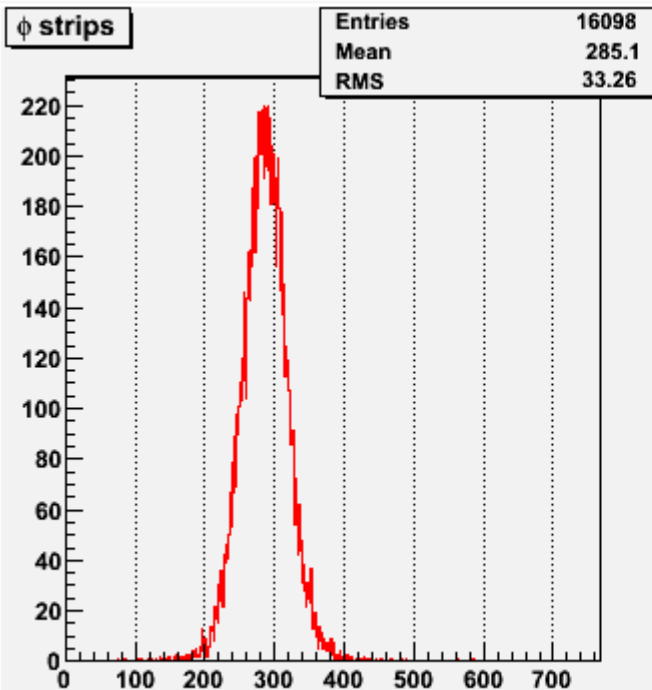
Layer = 19

isPixel = 0

Barrel = -2

**SCT
(endcap)**

Disk 5



68%: 63 95%: 131

Track P = 5.16 GeV

Track P_T = 1.44 GeV

Track η = -1.95

Layer = 21

isPixel = 0

Barrel = -2

Disk 6

Cur. SS:
64 strips

Further actions & questions

- I will systematize the results a bit
 - Currently: several thousand pictures & numbers
- Preliminary:
 - We can potentially go to smaller pixel SS
 - I'm not so sure about SCT, especially in endcaps
- Should the road size increase for outer layers?

Off-topic: new banks

- I had a bug in old bank production code
 - Pattgen only processed first 150M tracks
- Fixed for new banks. Should help efficiency!
- Total tracks: 348M + more in progress
- Made sectors and constants (13 hours each)
- 87k sectors / region; average eff = 95.4%
- Constants file: ~250Mb
- Patterns-from-constants:
 - Can only go to ~50M MC tracks / job
 - Probably generating many patterns per MC track
 - Note: changing #subregs is easy now:
 - Sectors, slices, constants are unsplit at this point!