Kstop distribution study

2007 Sep 13 H. Tatsuno

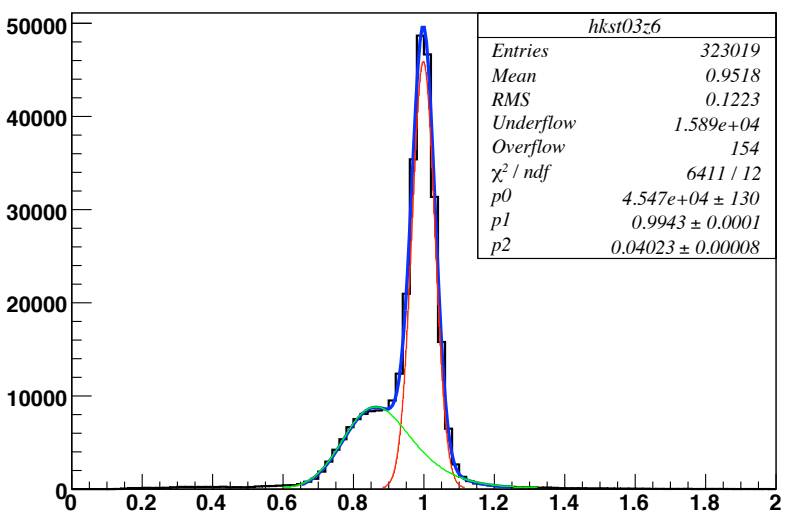
In-flight events ratio T0 ID dependence

$$R = \frac{N_{infl}}{N_{kstop} + N_{infl}}$$

N_{infl} : Area(ExpTail, 0.92<kstopid<1.1, r<=80., z-region)

N_{kstop} : Area(Gauss, 0.92<kstopid<1.1, r<=80., z-region)

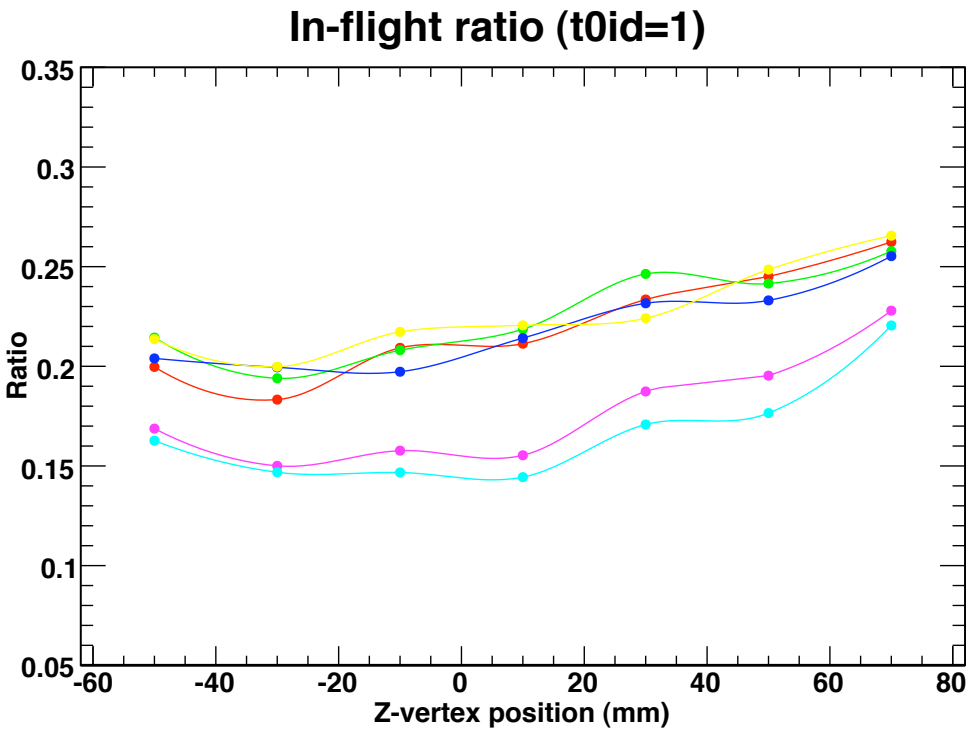
z-region = {{-60, -40}, {-40, -20}, {-20, 0}, {0, 20}, {20, 40}, {40, 60}, {60, 80}}

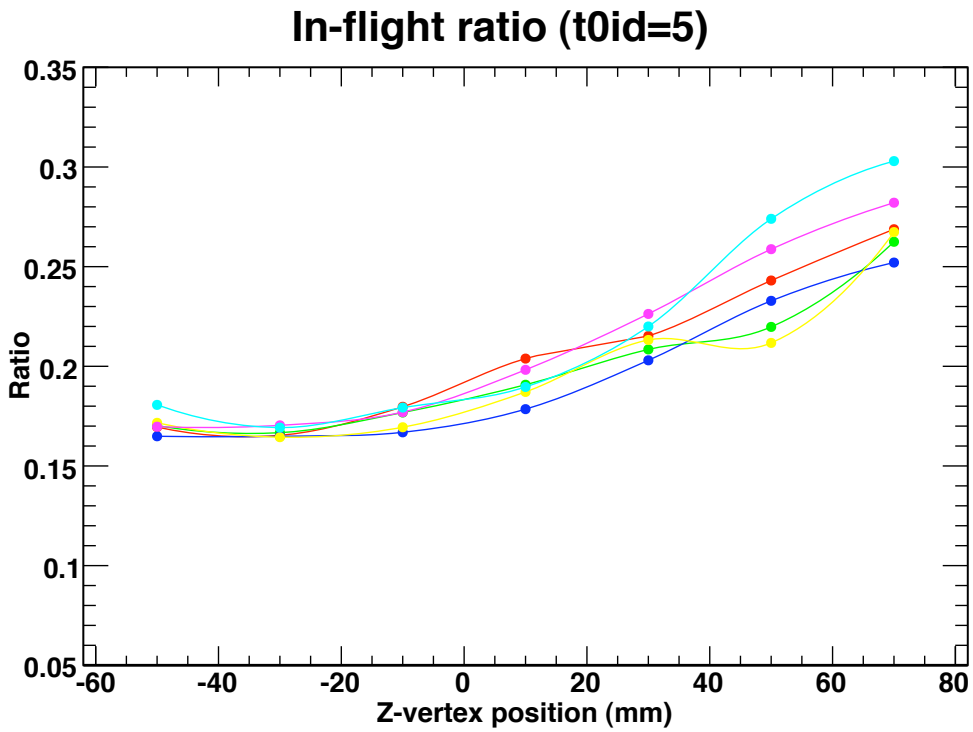


Fit: for example

Fit region: -0.65 < kstopID func. < 1.25

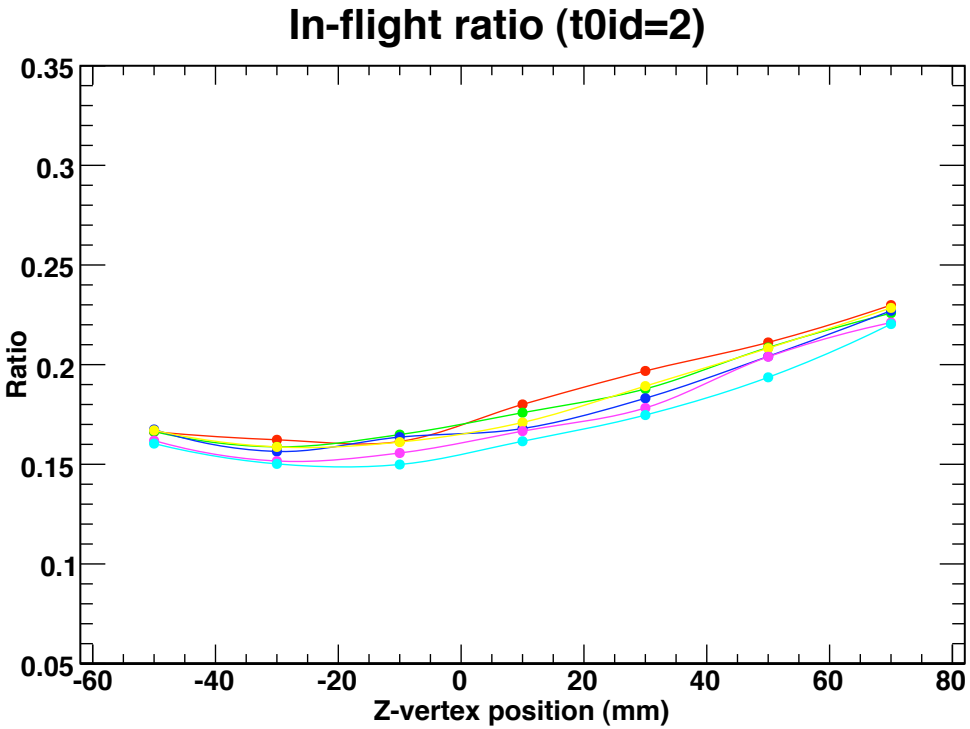
```
FCN=839.27 FROM MINOS     STATUS=SUCCESSFUL    885 CALLS        1349 TOTAL
                     EDM=7.95553e-06    STRATEGY= 1      ERROR MATRIX ACCURATE
 EXT PARAMETER                   PARABOLIC         MINOS ERRORS
 NO.   NAME      VALUE            ERROR      NEGATIVE      POSITIVE
  1  G height     3.55687e+04   1.40511e+02  -1.40277e+02   1.40539e+02
  2  G1 mean      9.99443e-01   1.08232e-04  -1.07500e-04   1.07422e-04
  3  G1 sigma     2.79081e-02   1.08427e-04  -1.06692e-04   1.06863e-04
  4  GExpTail mean   8.12351e-01   1.14041e-03  -1.07036e-03   1.08767e-03
  5  GExpTail sigma   7.30529e-02   6.82624e-04  -6.40637e-04   6.49154e-04
  6  GExpTail D height   1.85125e+04   6.31257e+02  -5.77612e+02   6.20925e+02
  7  GExpTail D beta   7.65418e-02   9.59283e-04  -9.21460e-04   9.15298e-04
ChiSqr/NDF =  528.38 / 24 = 22.015664, NumEv = 124410.72
TotalEv = 151368.41+-389.06, KstopEv = 124116.27, InflEv = 27252.14
InflRatio =  0.1800+-0.0012
```

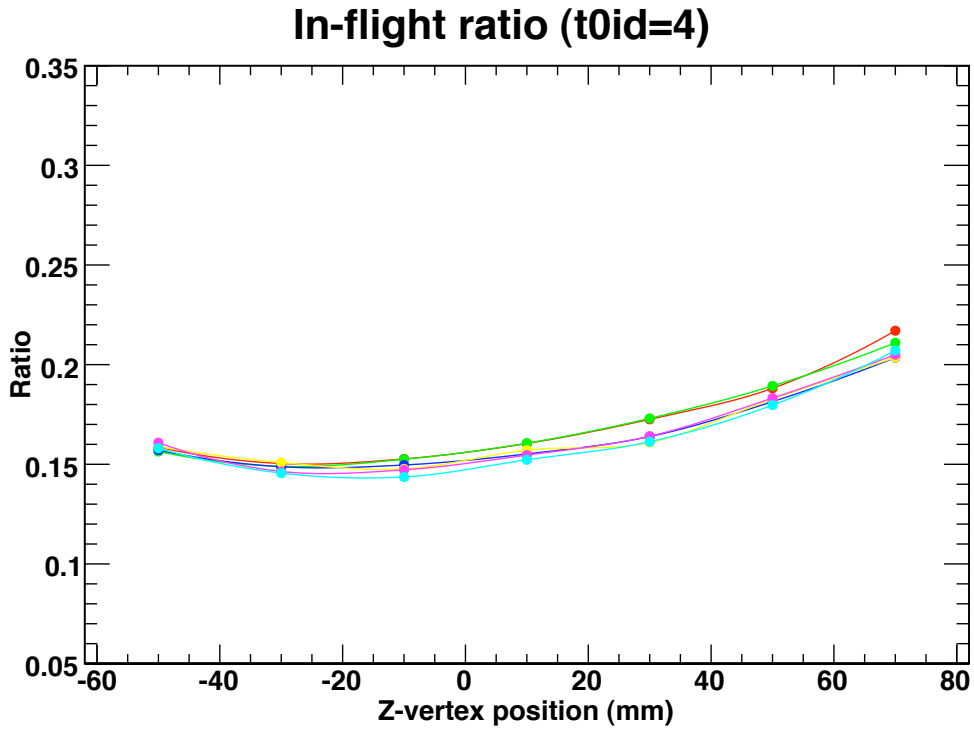


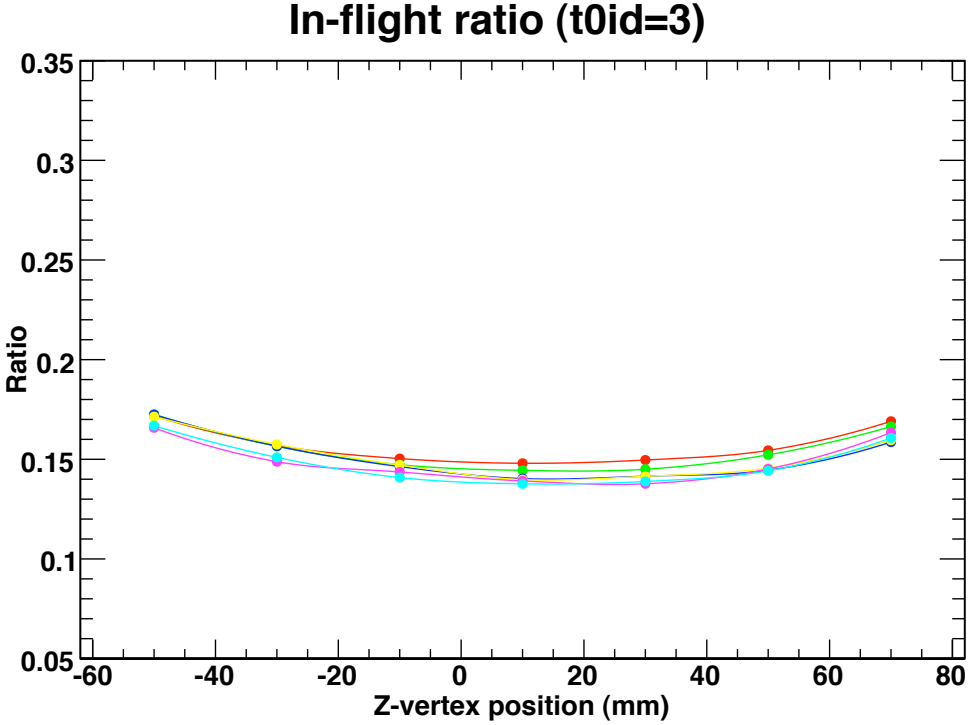


cycle 1 run 37-100
run 101-200
run 201-300
run 301-386

cycle 2 run 419-500
run 500-600







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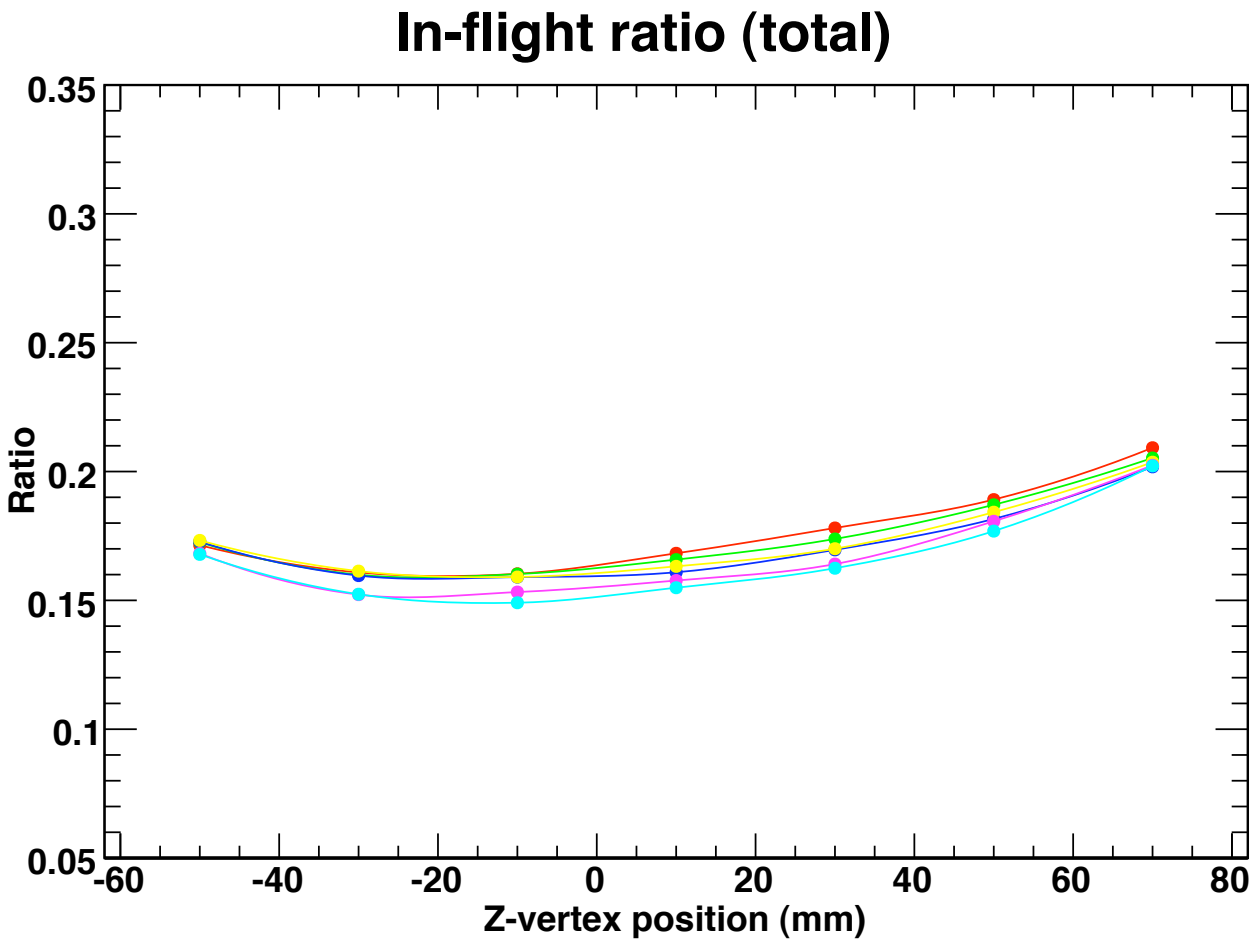

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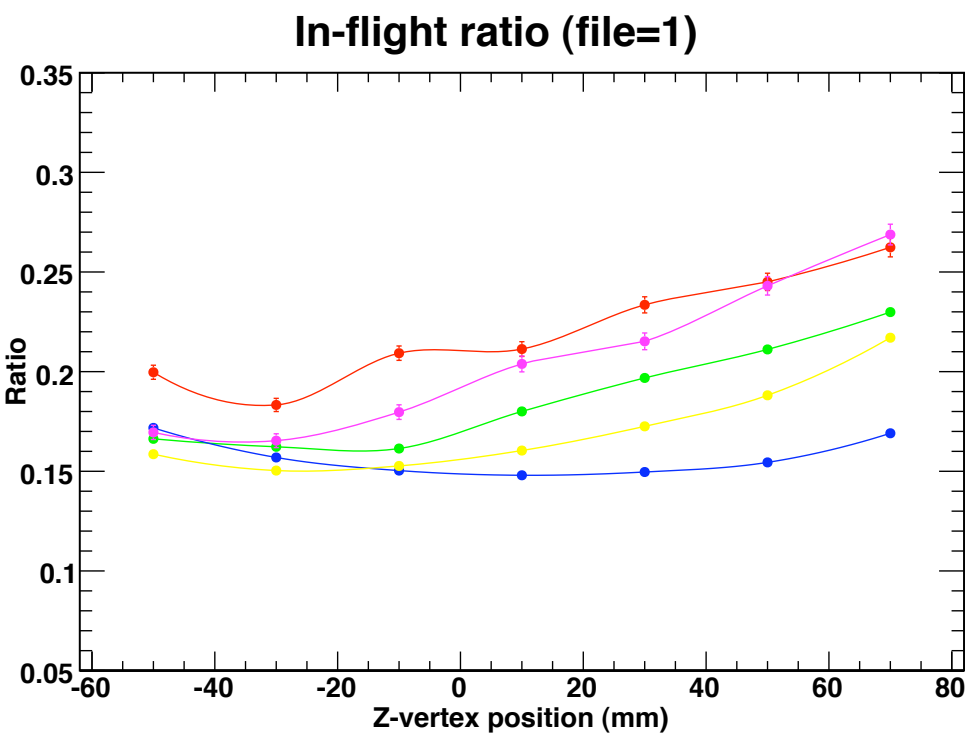
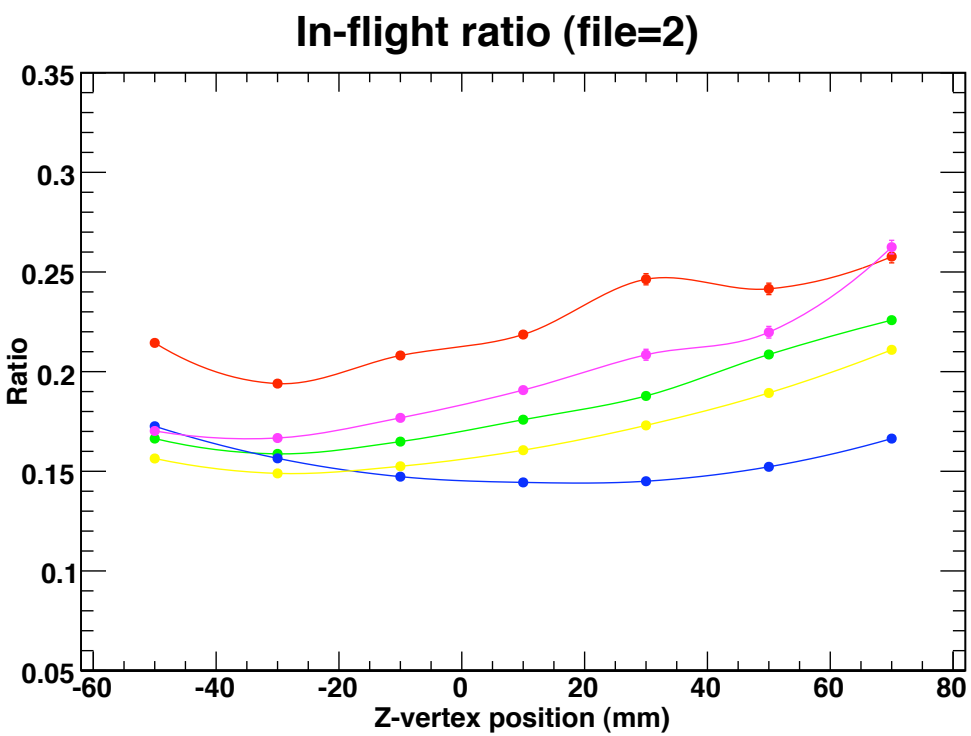
In-flight events ratio T0 ID dependence

run 37-100



run 101-200



T0ID=1

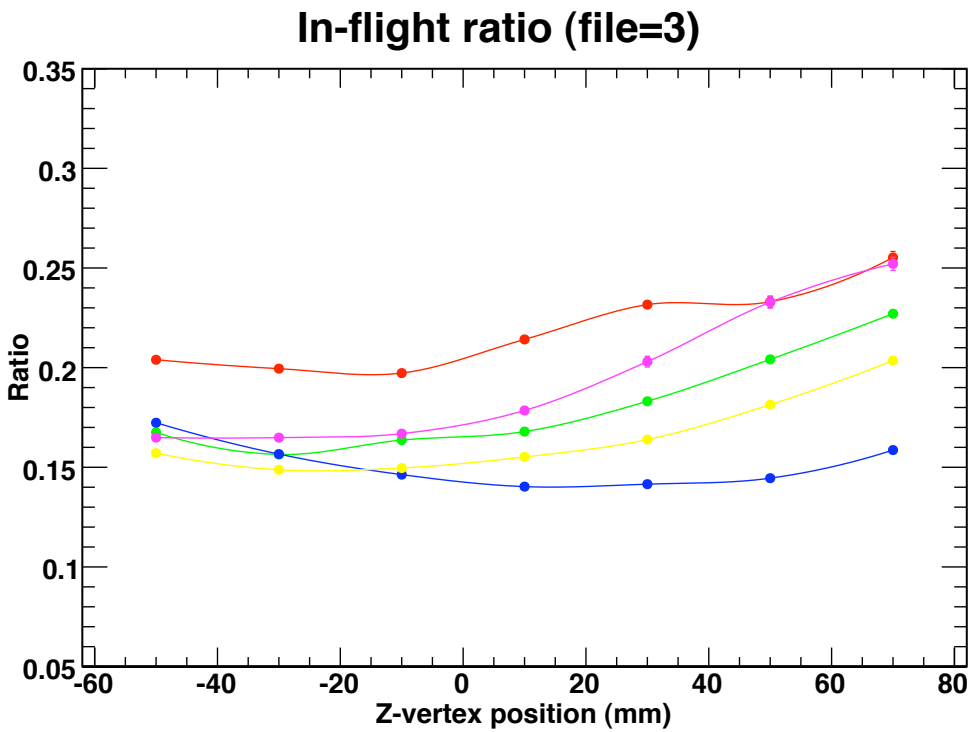
T0ID=2

T0ID=3

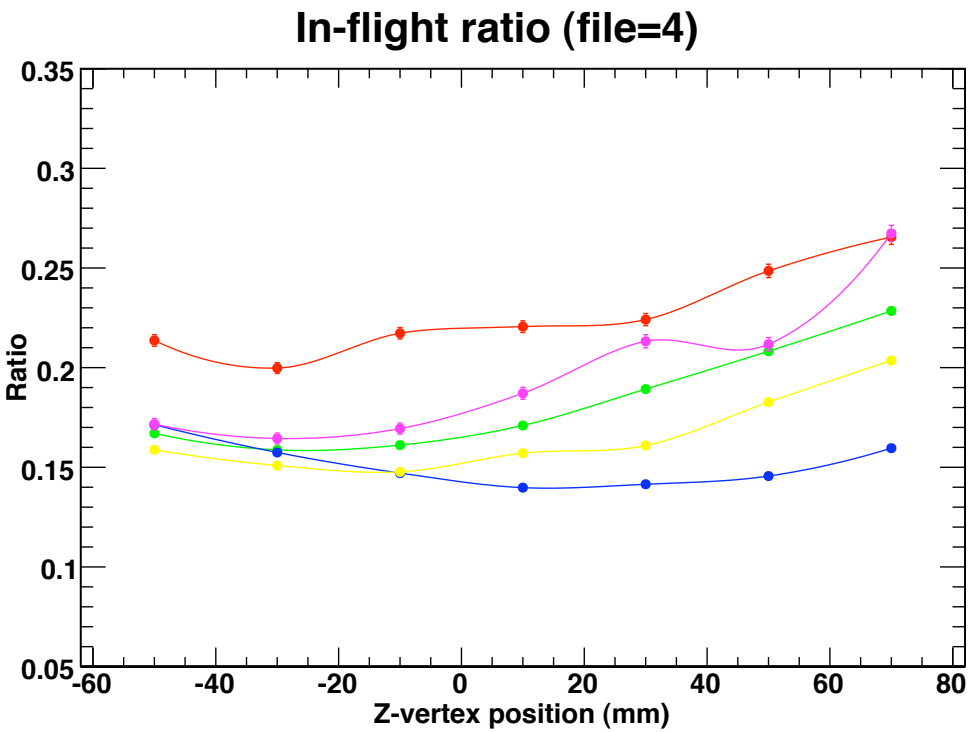
T0ID=4

T0ID=5

run 201-300



run 301-386



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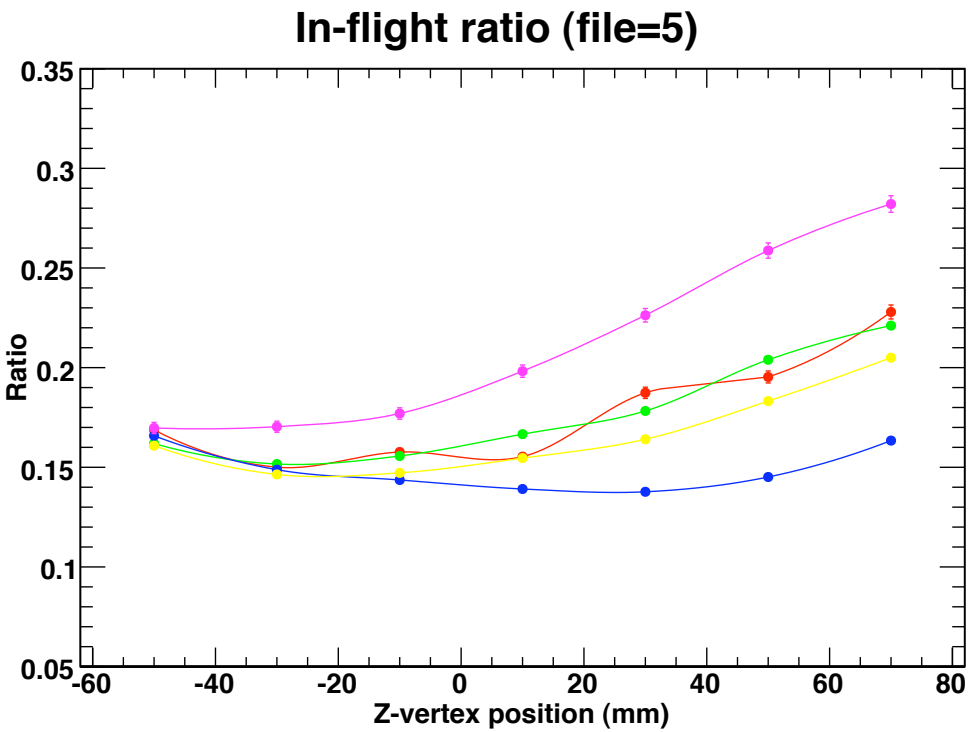
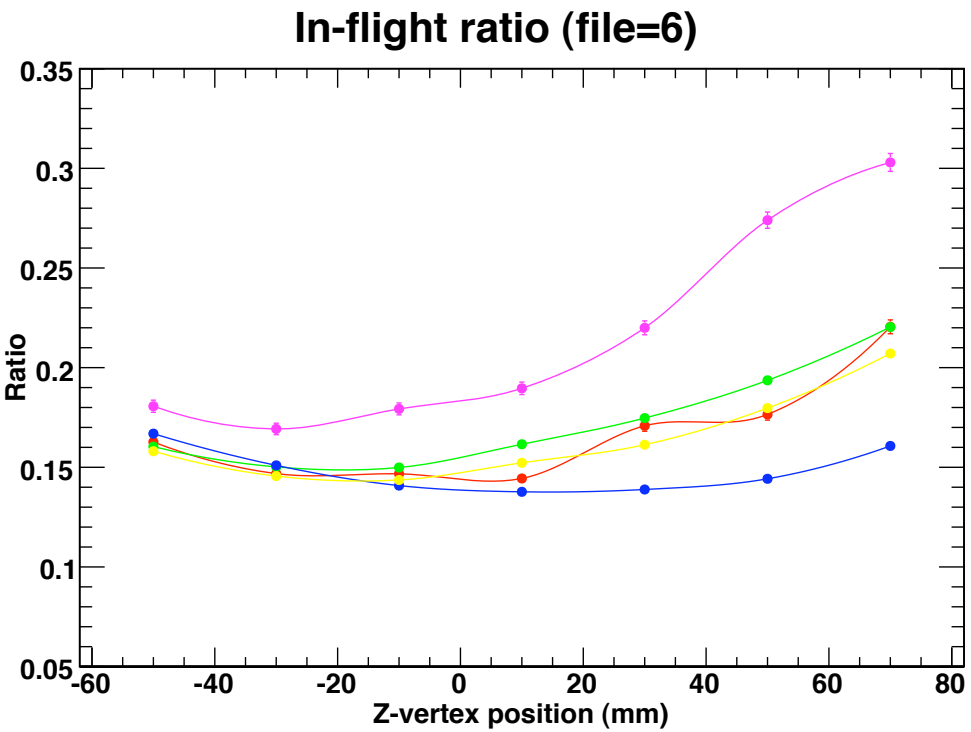
run 419-500



run 500-600



T0ID=1

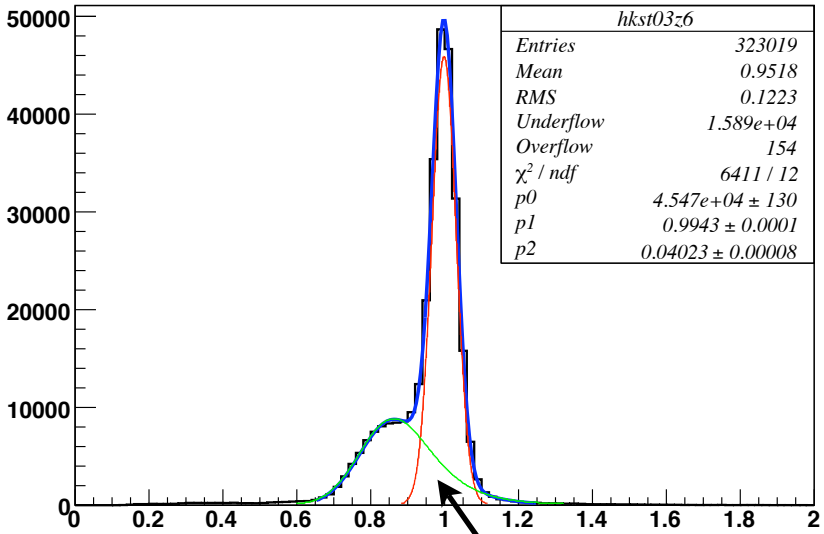
T0ID=2

T0ID=3

T0ID=4

T0ID=5

Fit dependence

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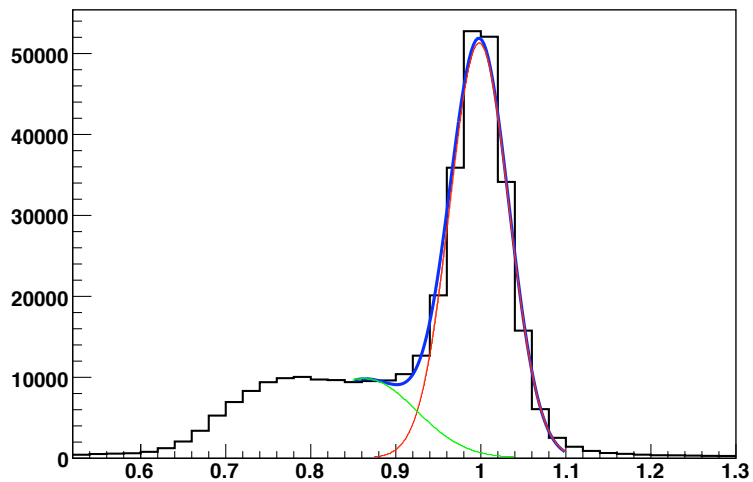
InflRatio =  0.1800+-0.0012
```

This tail has too large contribution to the “stopped-K” region (1>kstopID)

The tail should rise from near kstopID=1 position, and the in-flight event contamination must be much smaller than the current estimation.

Assuming :
almost zero contamination in kstopID > 1 region
→ should be fitted by a Gaussian → can fix the sigma

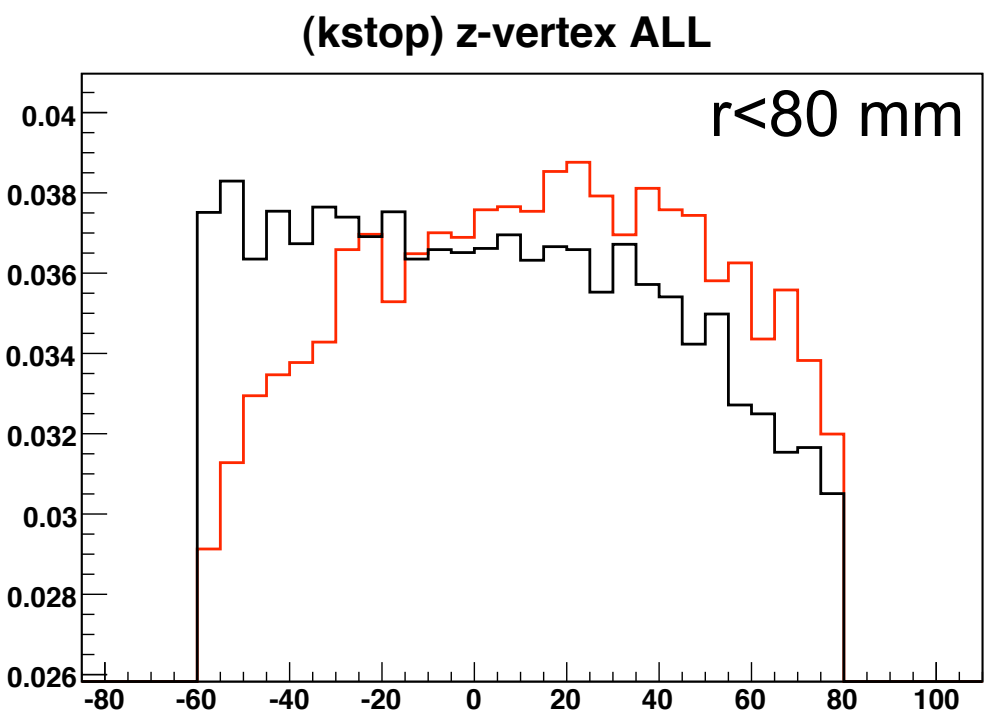



```
 FCN=1794.48 FROM MINOS     STATUS=SUCCESSFUL    159 CALLS         418 TOTAL
                     EDM=4.75826e-06    STRATEGY= 1      ERROR MATRIX ACCURATE
  EXT PARAMETER                   PARABOLIC         MINOS ERRORS
  NO.   NAME      VALUE            ERROR      NEGATIVE      POSITIVE
   1  G height     5.12357e+04   1.15423e+02  -1.15507e+02   1.15429e+02
   2  G1 mean      9.98386e-01     fixed
   3  G1 sigma     3.48759e-02     fixed
   4  GExpTail mean   9.00000e-01     fixed
   5  GExpTail sigma   5.23138e-02     fixed
   6  GExpTail D height   2.43351e+04   1.70950e+03  -1.62771e+03   1.82590e
+03
   7  GExpTail D beta   5.41983e-02   2.45431e-03  -2.39236e-03   2.55751e-03
File name : .pdf
Info in <TCanvas::Print>: pdf file ./c1.pdf has been created
ChiSqr/NDF = 1625.55 / 10 = 162.555277, NumEv = 223953.64
TotalEv = 232902.92+-482.60, KstopEv = 220798.52, InflEv = 12104.40
InflRatio =  0.0520+-0.0005
```

In-flight event ratio ~18% -> ~5%

more realistic one ?

KstopID separation



If the previous assumptions are correct, the black histogram contains no in-flight event contamination !

1.0<kstopID<1.1

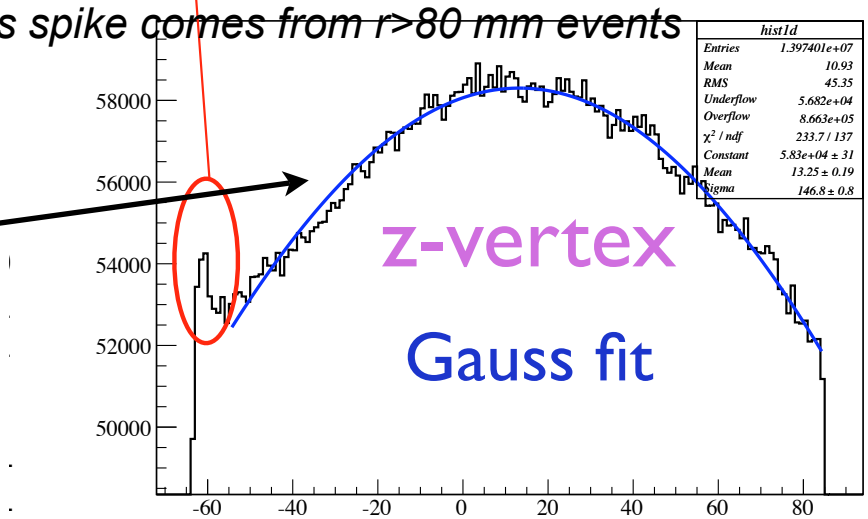
0.9<kstopID<1.0

A z-vertex distribution used for a simulation.

This shape is similar to the red histogram.

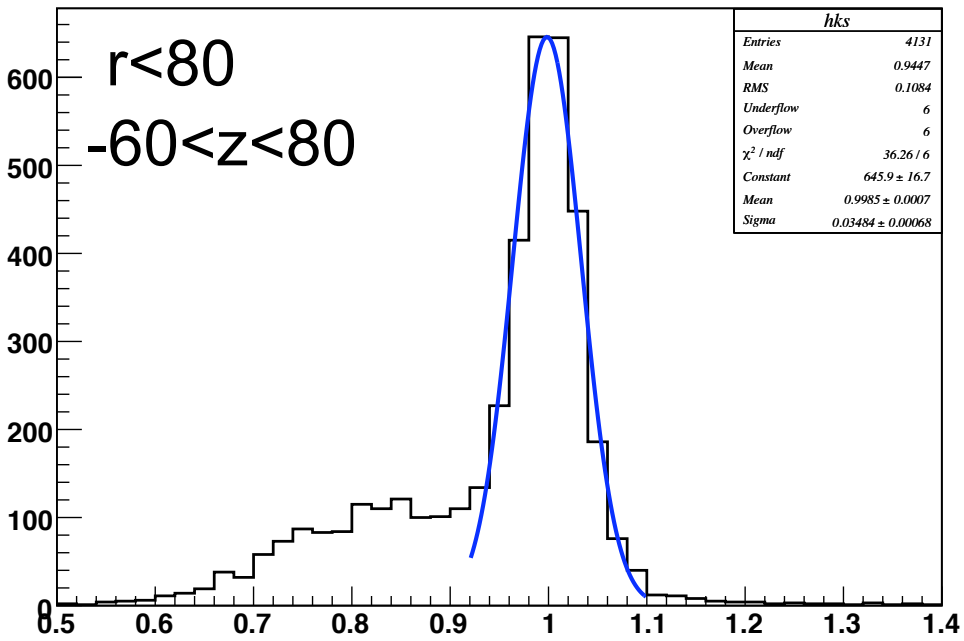
This spike was excluded

This spike comes from r>80 mm events



SDD2 cycle 1

1000 < ADC

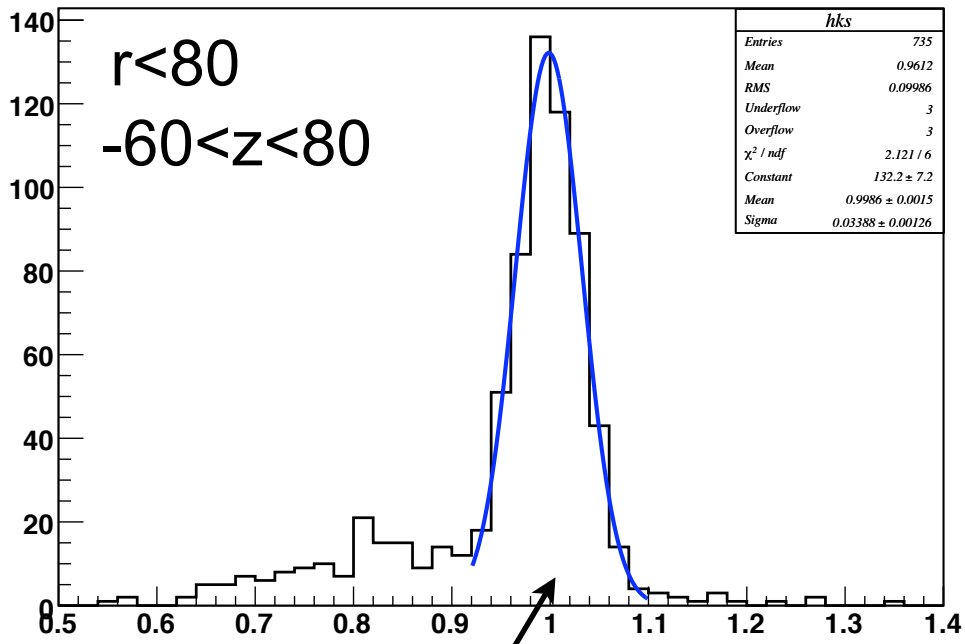


kstopID func

SDD2 cycle 1

2000 < ADC < 2400

required x-ray hits

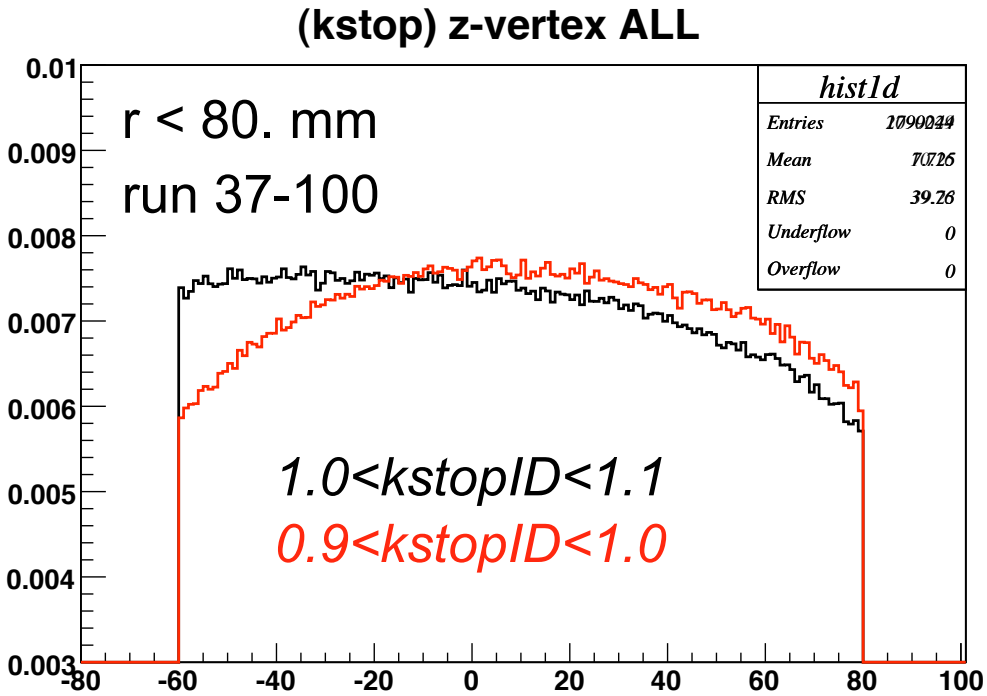


kstopID func

KstopID can be expressed well by a Gaussian

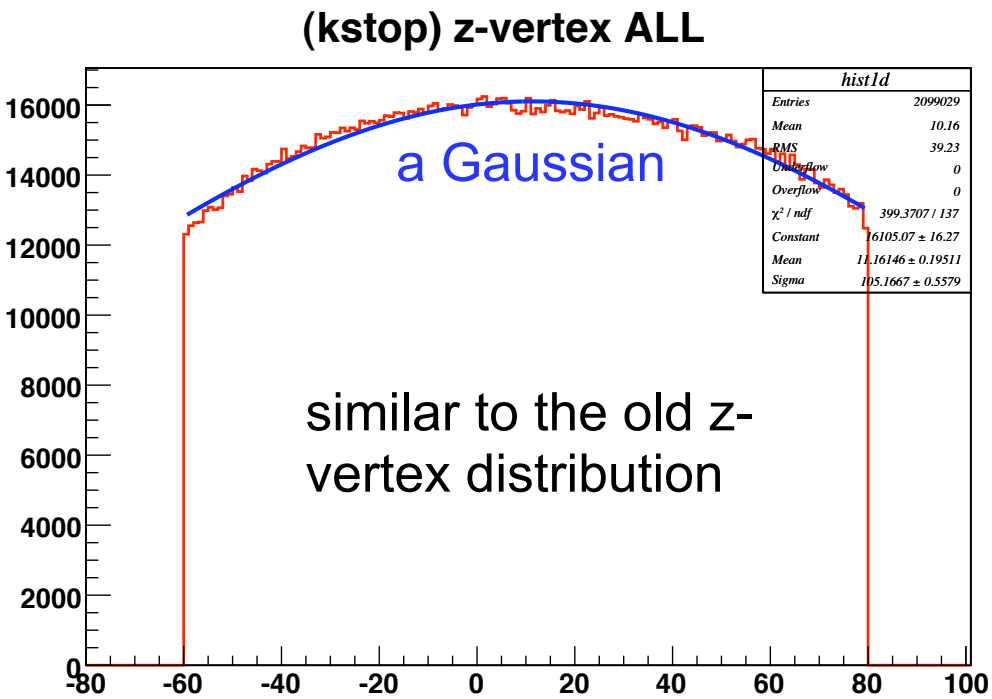
0.92<kstopID<1.1

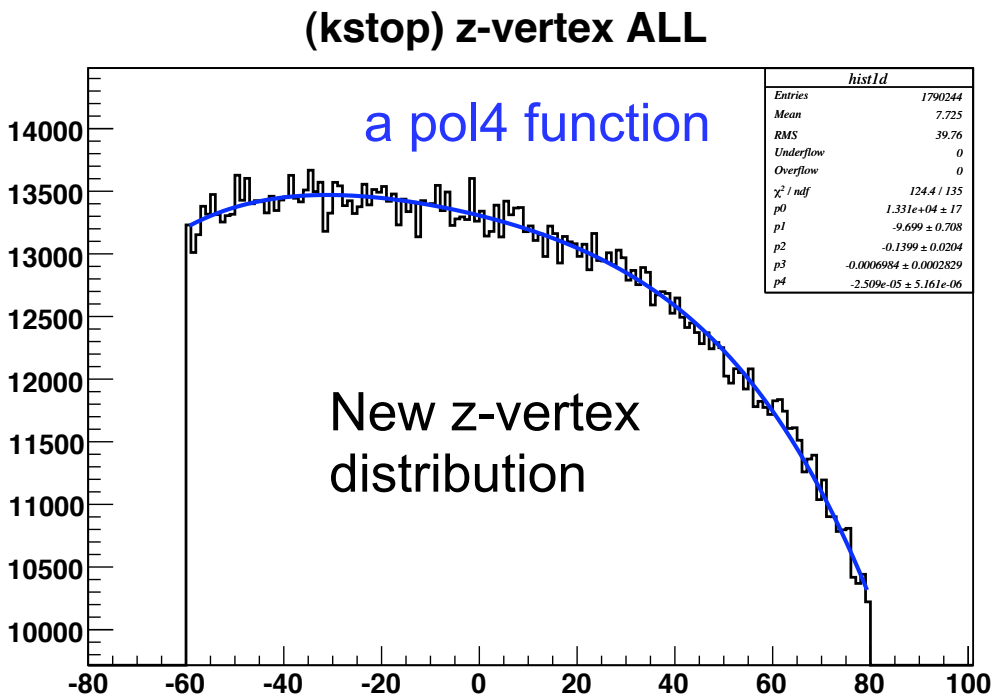
sigma = 0.034(1)



Z-vertex distribution re-think

more realistic z-vertex distribution can be gotten by fitting the histogram with tight kstopID separation

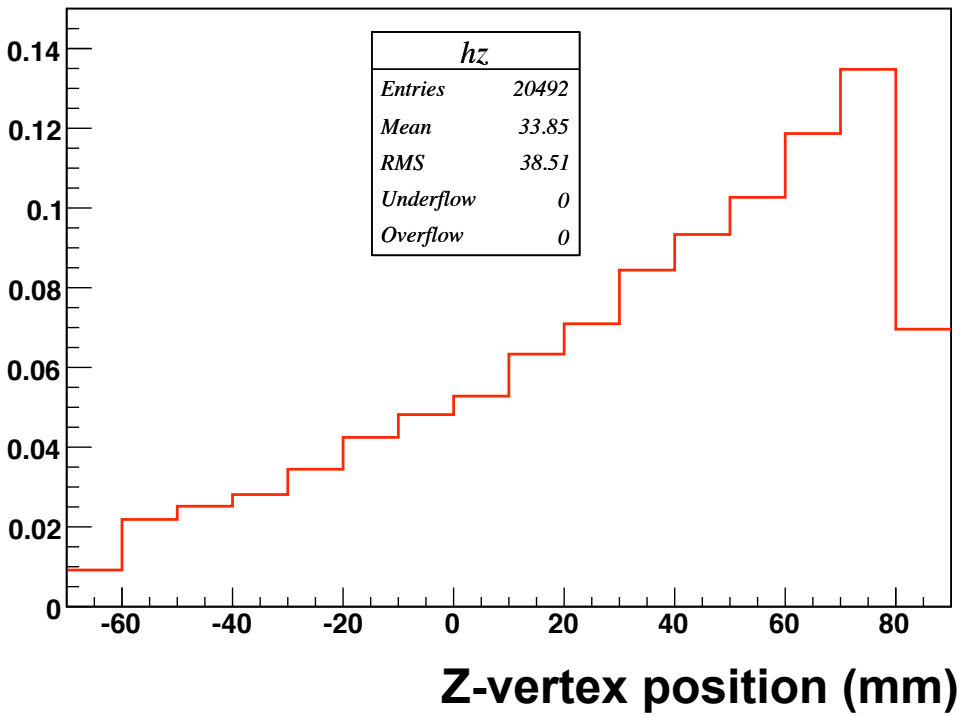




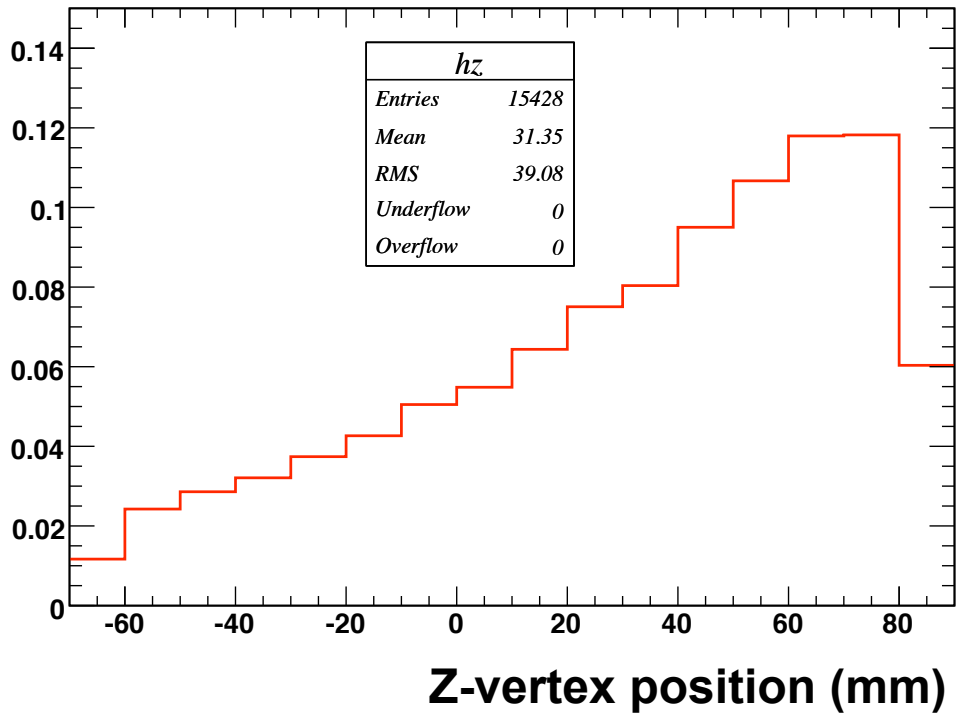
Simulation

Summed over SDD 2, 4 and 5
(required KHeX Lα hits)

Old z-vertex distribution



New z-vertex distribution

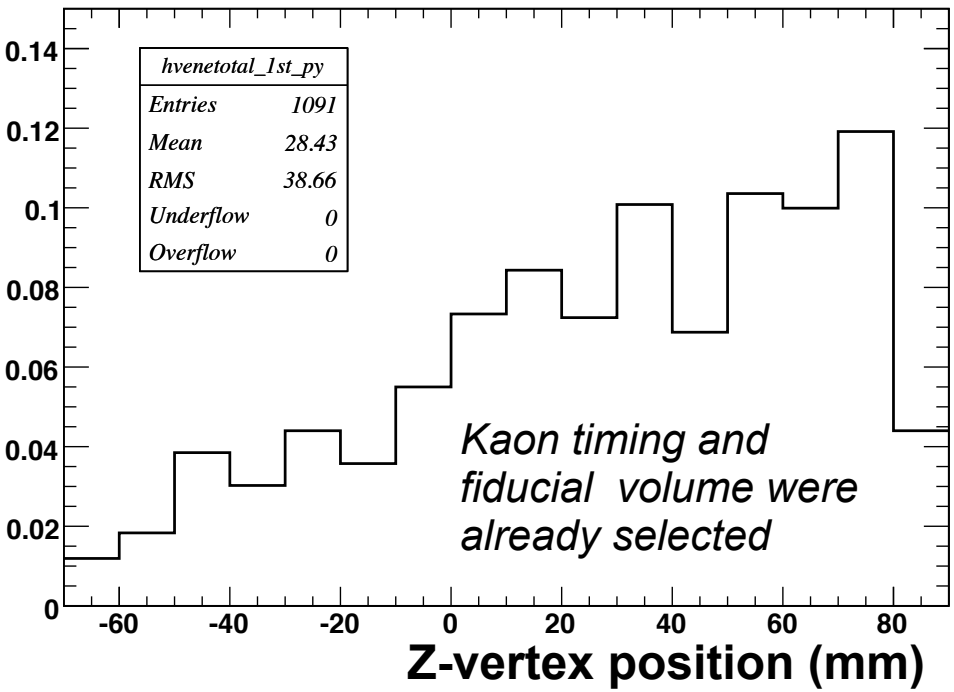


target cell region

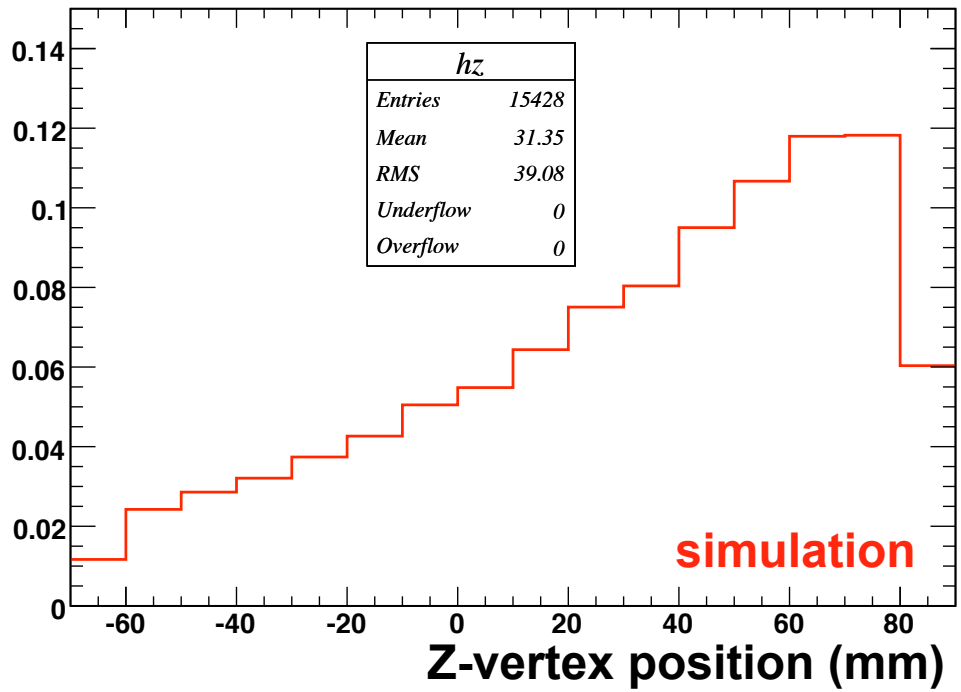
r < 100 mm

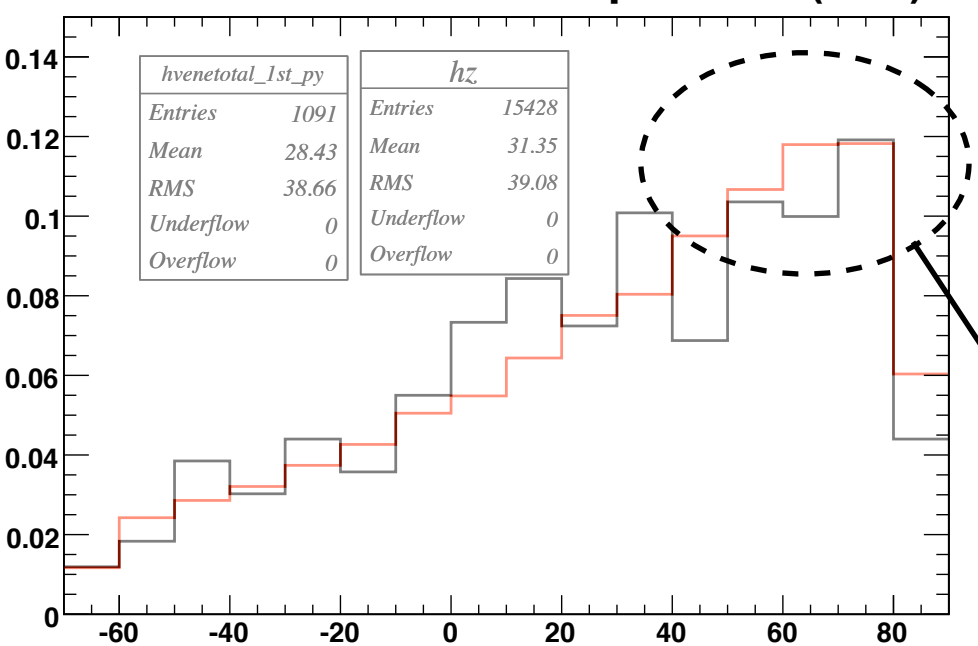
-65 mm < z < 85 mm

Data cycle1 SDD total
6 keV < E < 6.8 keV



Cycle1 SDD total
new simulation KHeXLa





Summed over SDD 2, 4 and 5

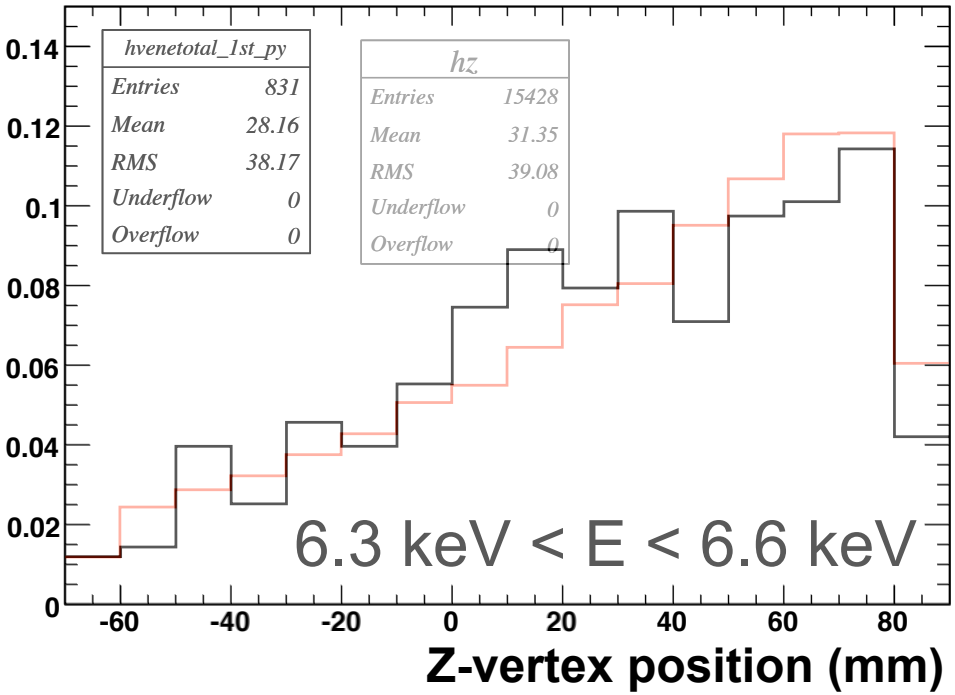
target cell region was selected

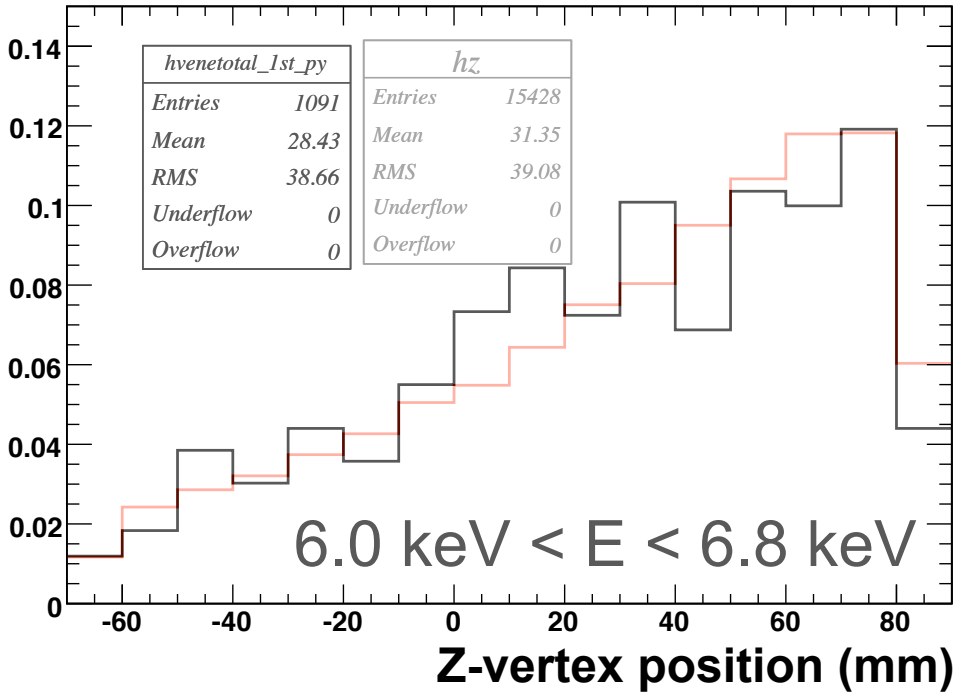
r < 100 mm

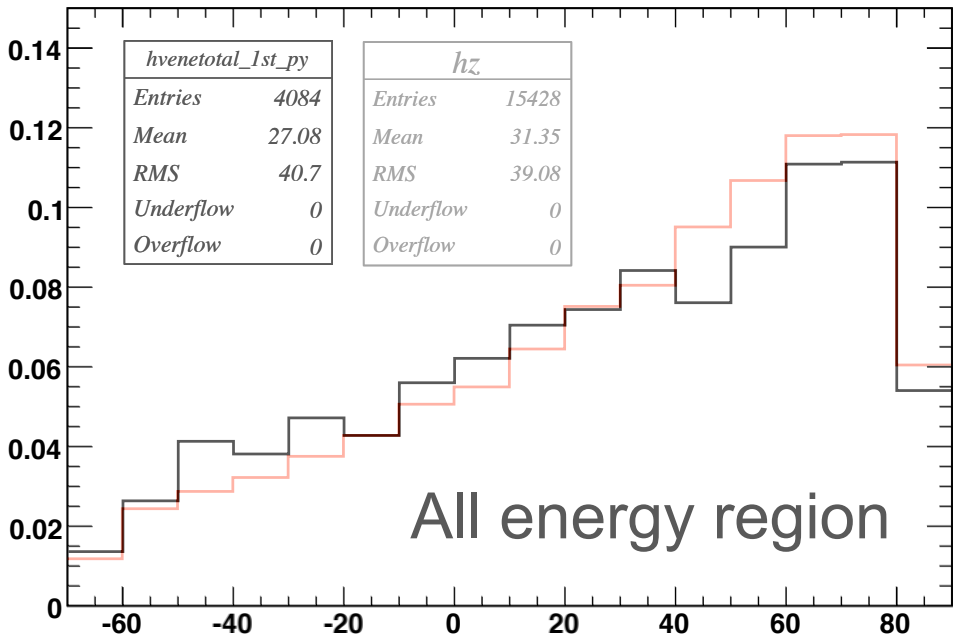
-65 mm < z < 85 mm

Excess disappeared !

Cycle1 SDD total　Energy region cut dependence



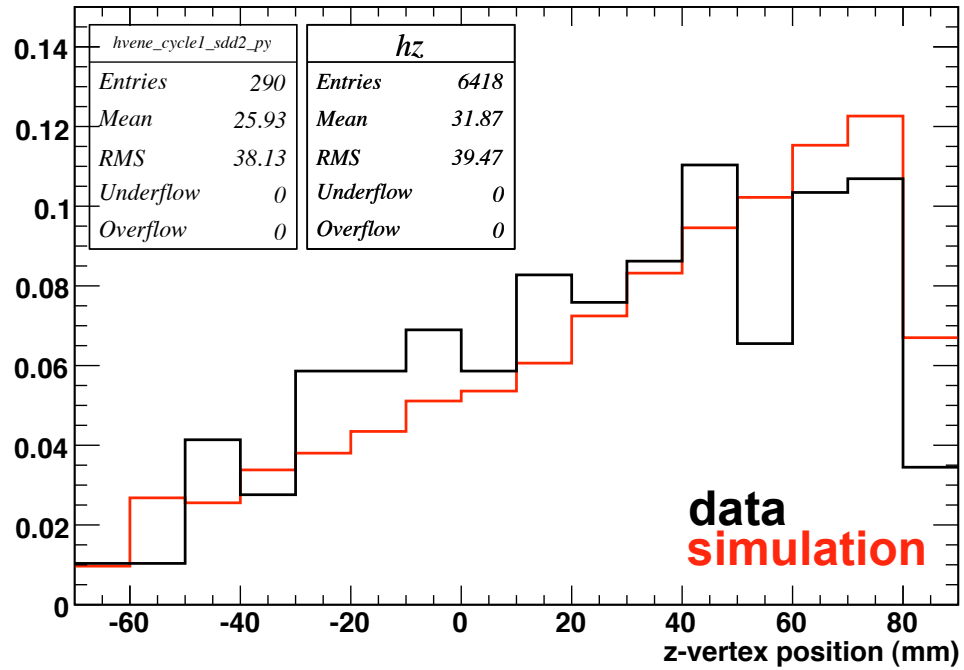




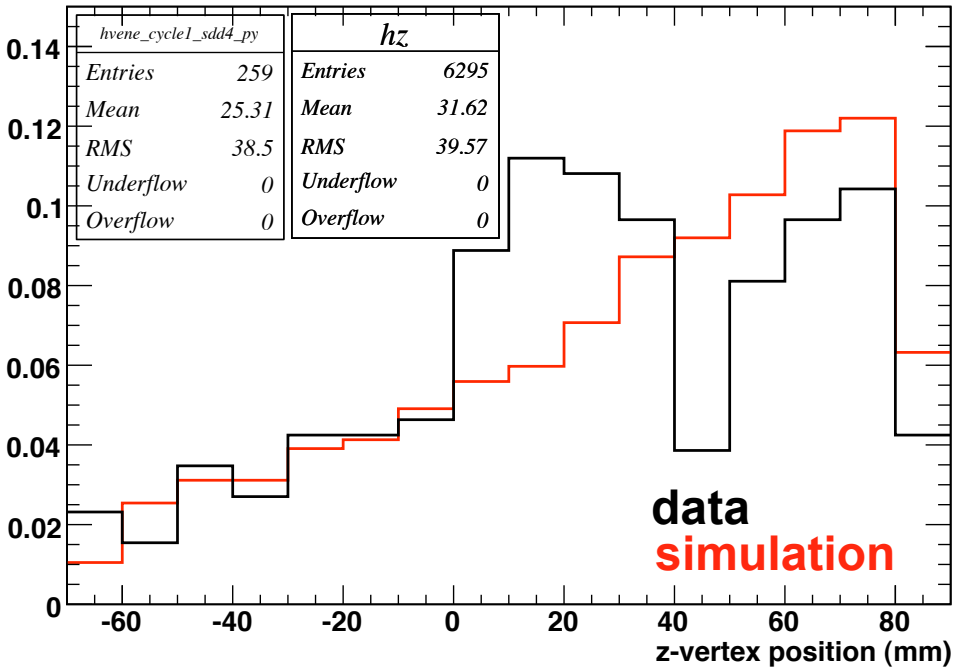
Cycle1 SDD dependence

6.3 keV < E < 6.6 keV

SDD2



SDD4



SDD5