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E570 meeting report

A fitting method of final histograms
and
Differences between w/ vertex cut and w/o it

Data set : all of E570 1st and 2nd cycles calibrated by self trigger events (with fout-out correlation cut and upper rate cut)

Vertex cut : only fiducial volume cut
fiducial volume means (r <=120 mm, -70 mm <= z <= 100 mm)

Kaon timing is loosely chosen, 500 ch < TDC(SDDT1) < 1300 ch

1. Fitting method

i) self triggered events

ii) e549 triggered events

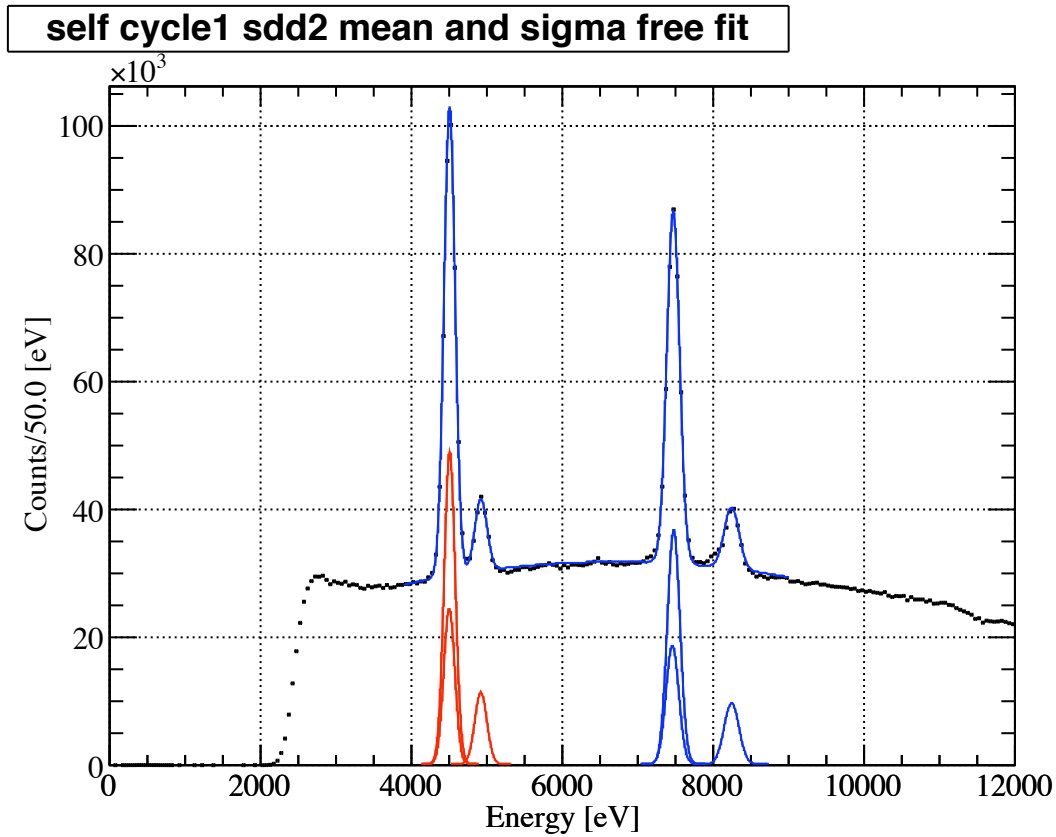
2. Comparing the fit results

i) self triggered events

ii) e549 triggered events

Self triggered events (calibrated by itself)

fit using 6 Gaussians and a quadratic background



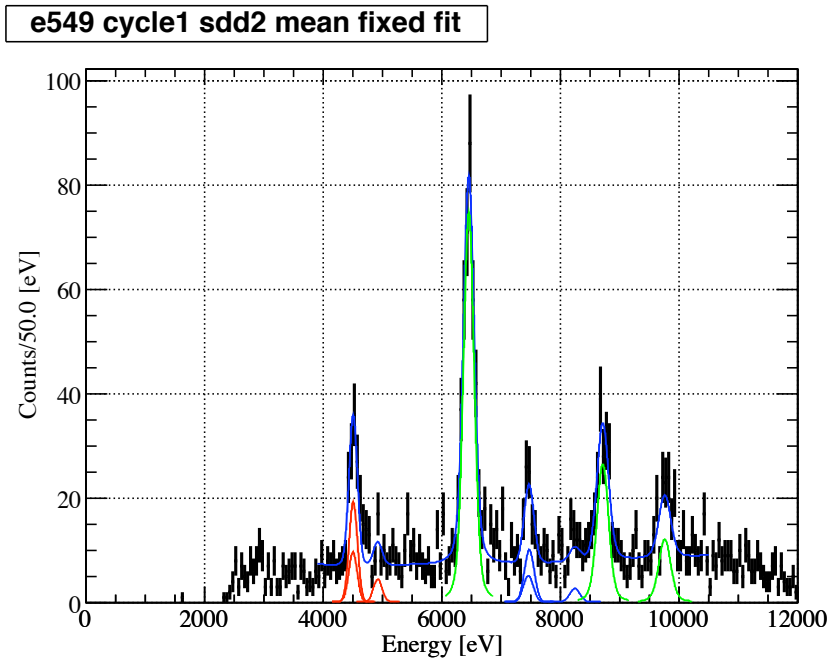
Get parameters

TiKa1 mean [eV]	TiKb mean [eV]
NiKa1 mean [eV]	NiKb mean [eV]
TiKa1 sigma [eV]	Fano factor

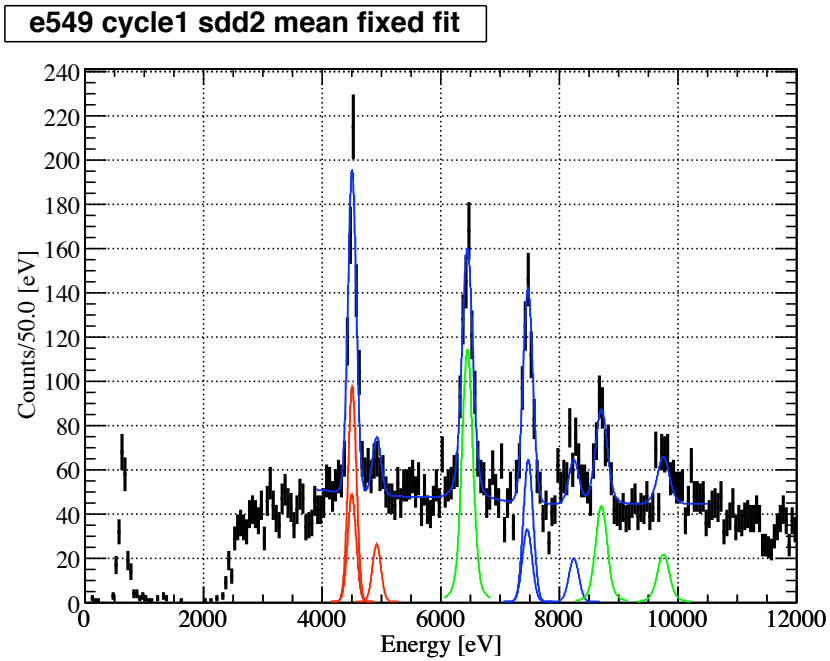
E549 triggered events (calibrated by self trigger)

fit using 3 Voigtians and 6 Gaussians and a quadratic background

with vertex cut



without vertex cut



Fix

TiKa1 mean [eV] TiKb mean [eV]

NiKa1 mean [eV] NiKb mean [eV]

Fano factor

these parameters are fixed by the fit results of self triggered events

Merits of this fitting method

1. Fixing Fano factor SDD by SDD

   To fit the KHeX width simultaneously the sigma of Gaussian.

   Fano factor can depends on the temperature of SDD if the electron-hole pair creation energy is fixed globally.

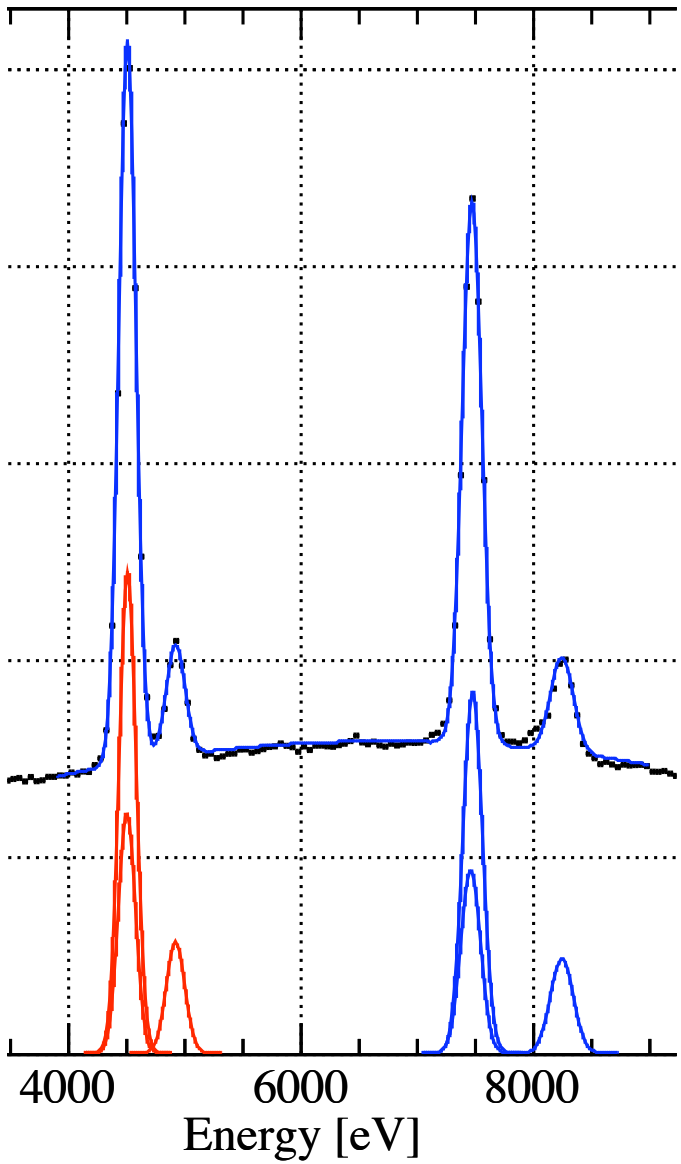
2. Fixing the centroids of calibration lines included in signal

   To fit the low statistic calibration lines included in signal.

   * These calibration lines do not influence the centroids of KHeX peaks (not propagated).

   Do not need to estimate the shift of K-beta lines of E549 trigger.

Problem of this fitting method



1. More systematic error of the centroids of calibration lines from the excess between K-alpha and K-beta

When we estimate the systematic error of the calibration by re-fitting the calibrated histograms, the re-fit can have another systematic error due to the same excess.

Flash ADC can remove the excess ?

If the excess couldn't be removed, it must be included in the response function → PSI experiment in August (?).

1. Fitting method

i) self triggered events

ii) e549 triggered events

2. Comparing the fit results

i) self triggered events

ii) e549 triggered events

Self triggered events

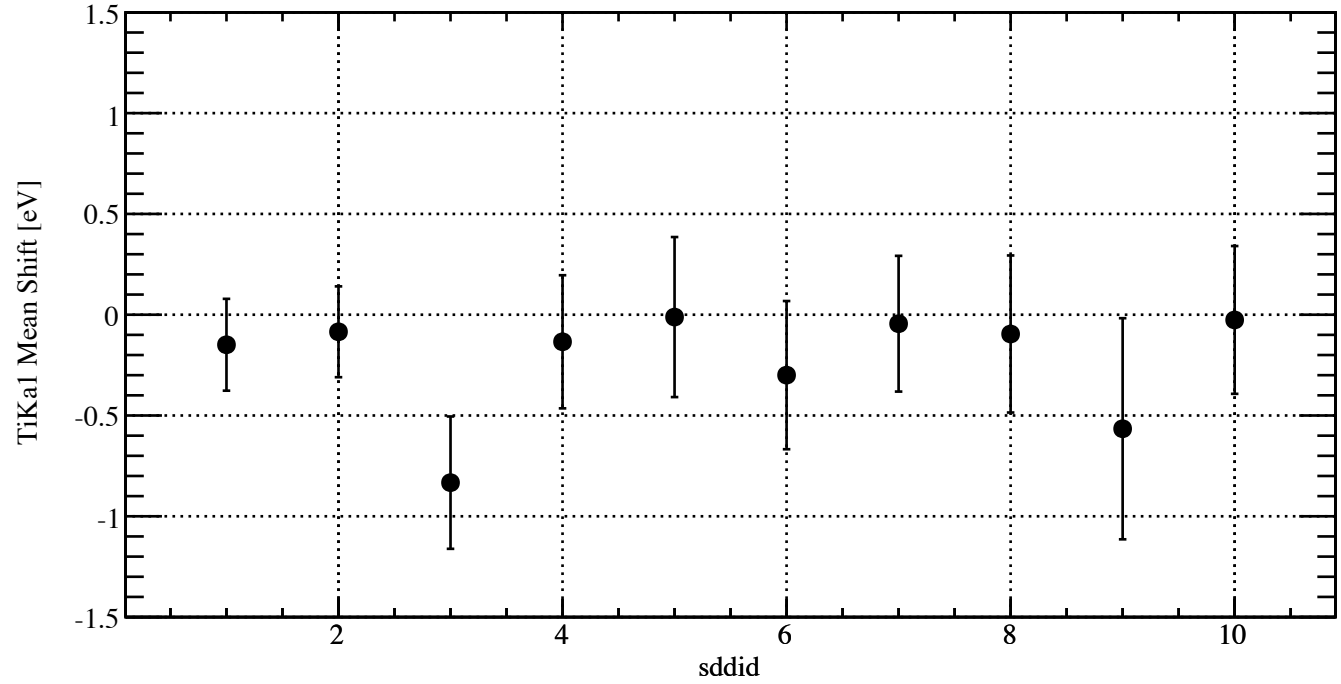
6 graphs

TiKa1 Mean Shift
NiKa1 Mean Shift
TiKb1Mean Shift
NiKb1 Mean Shift
TiKa1 Sigma
Fano

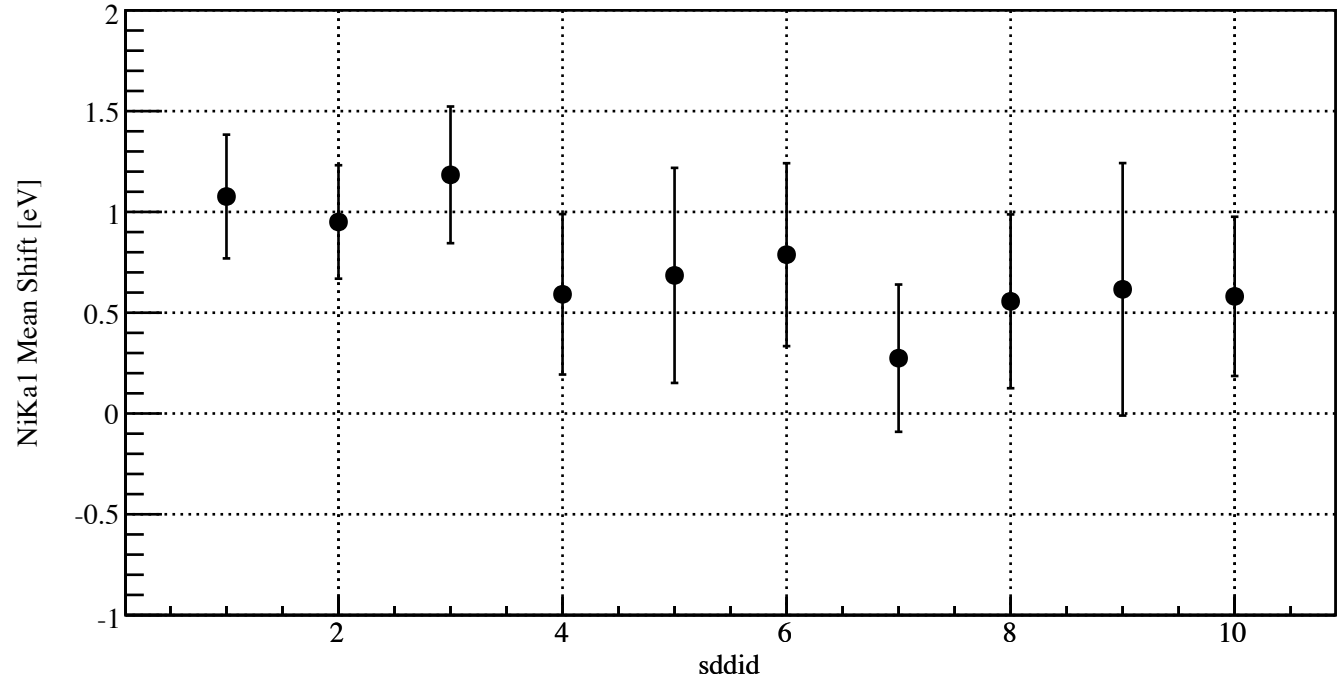
horizontal axis = sddid (1-10)

We have total 10 SDDs
1-3 (1st cycle), 4-10 (2nd cycle)

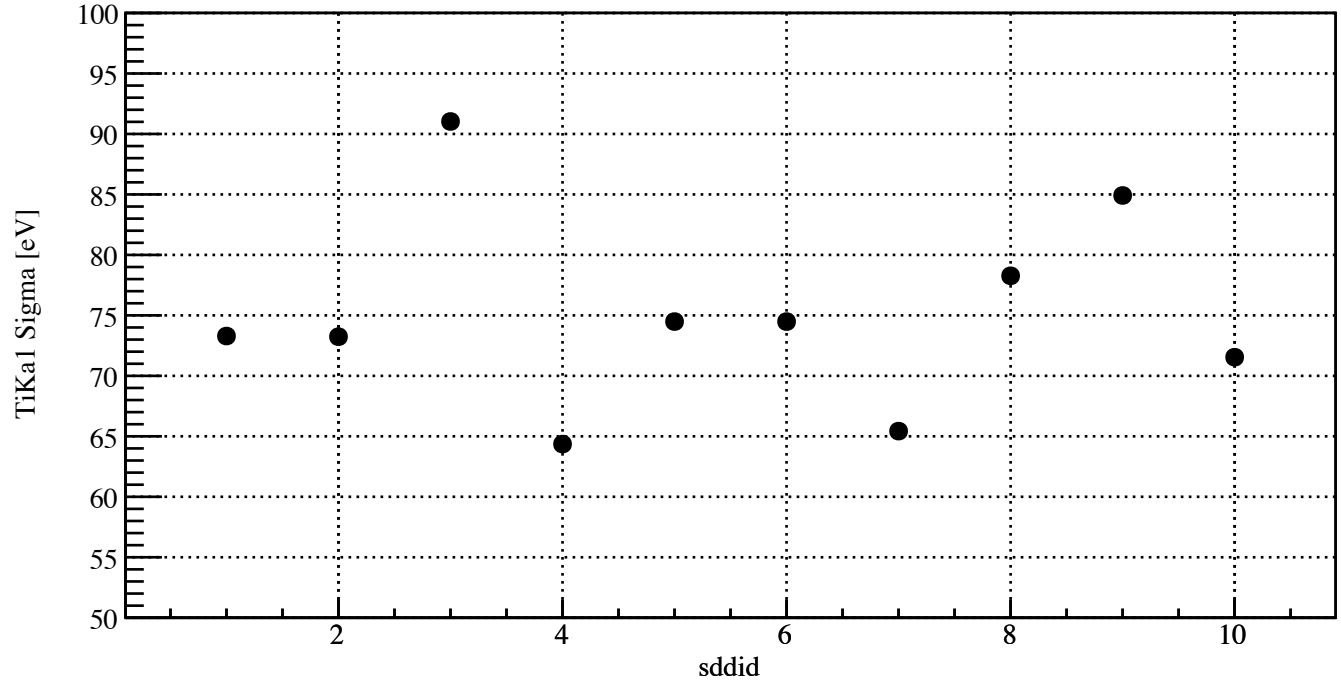
TiKa1 Mean Shift



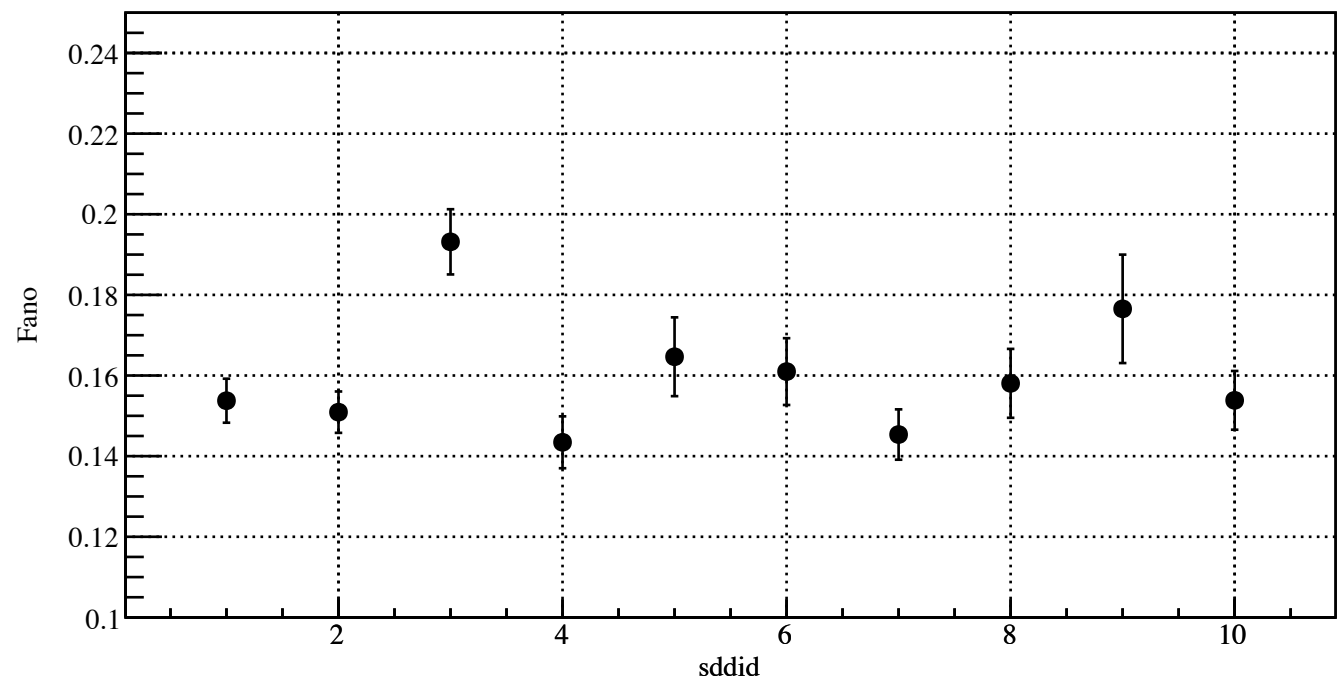
NiKa1 Mean Shift

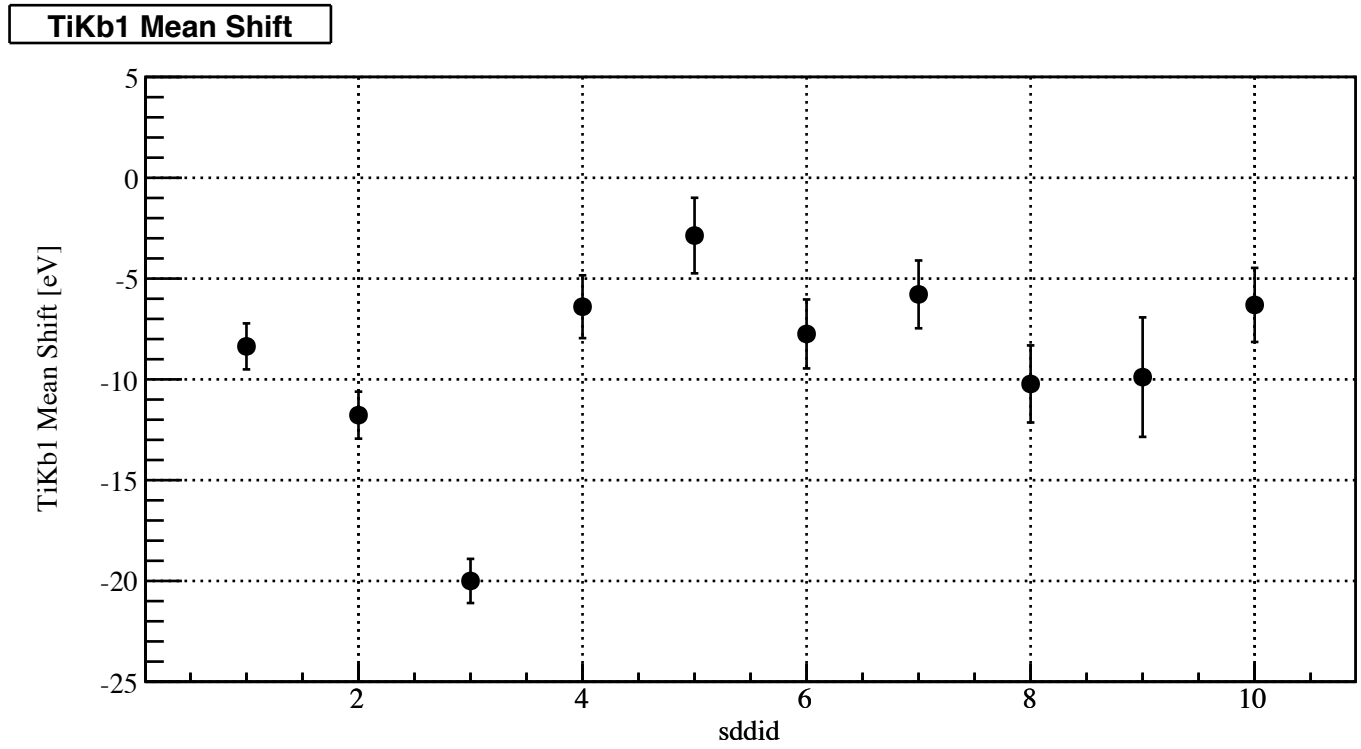


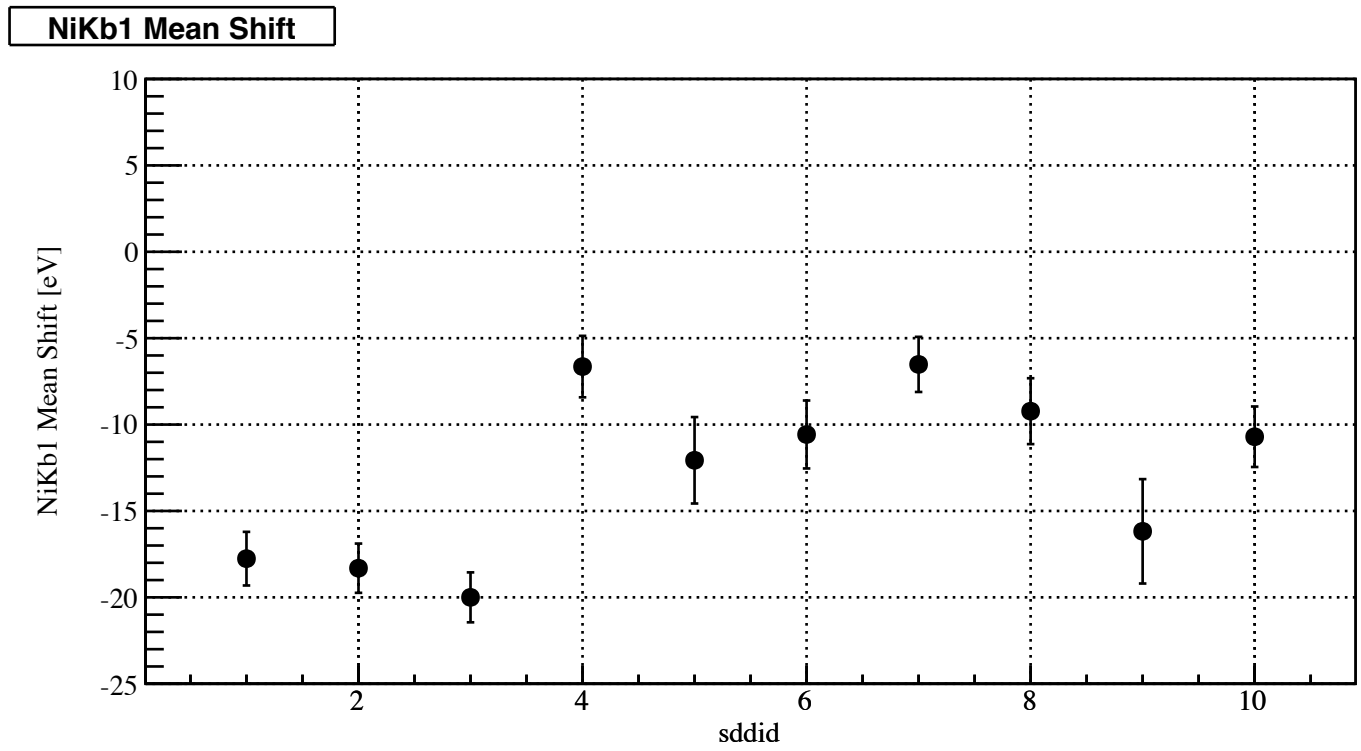
TiKa1 Sigma.



Fano.




TiKb1 Mean Shift
TiKb1 Mean Shift [eV]
5
0
-5
-10
-15
-20
-25
2
4
6
8
10
sddid


NiKb1 Mean Shift
NiKb1 Mean Shift [eV]
10
5
0
-5
-10
-15
-20
-25
2
4
6
8
10
sddid

E549 triggered events

with vertex cut : red

4 graphs

KHeX Shift
KHeX Gamma
KHeXLa Sigma
chi^2/ndf

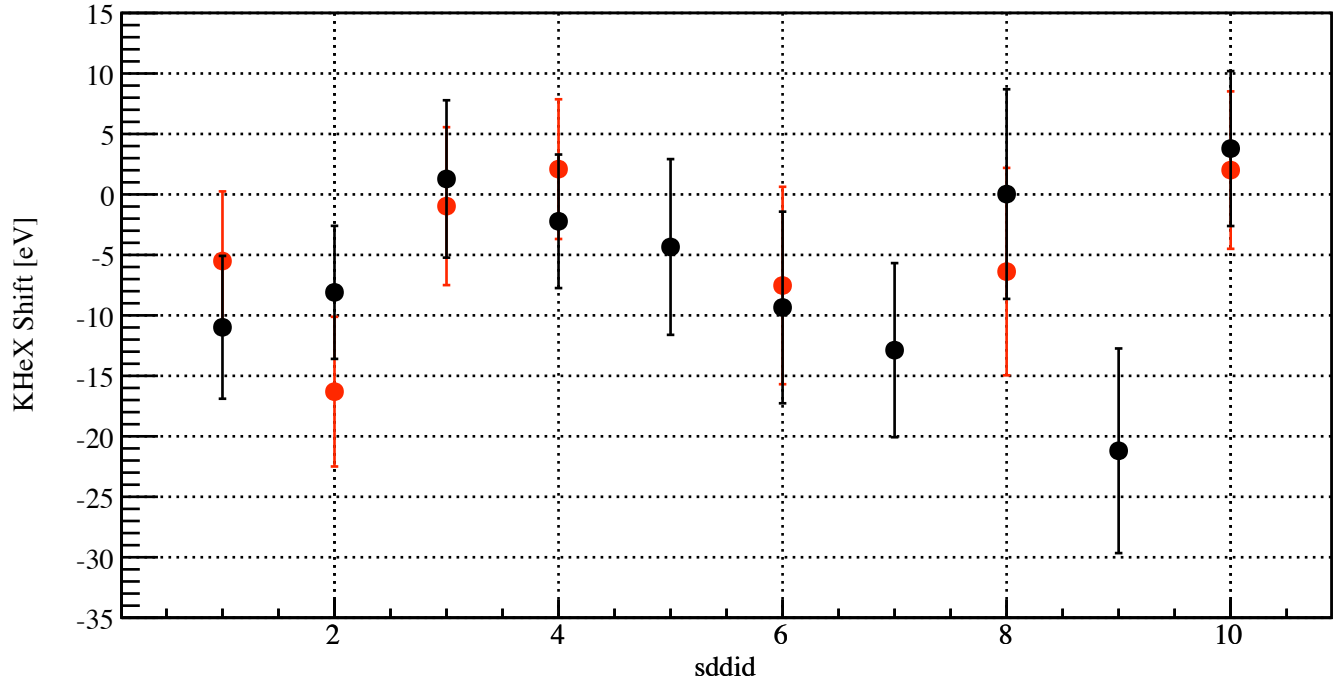
without vertex cut : black

* For sddid 5,7,9 the fit of vertex cut events didn't converged due to low static background.

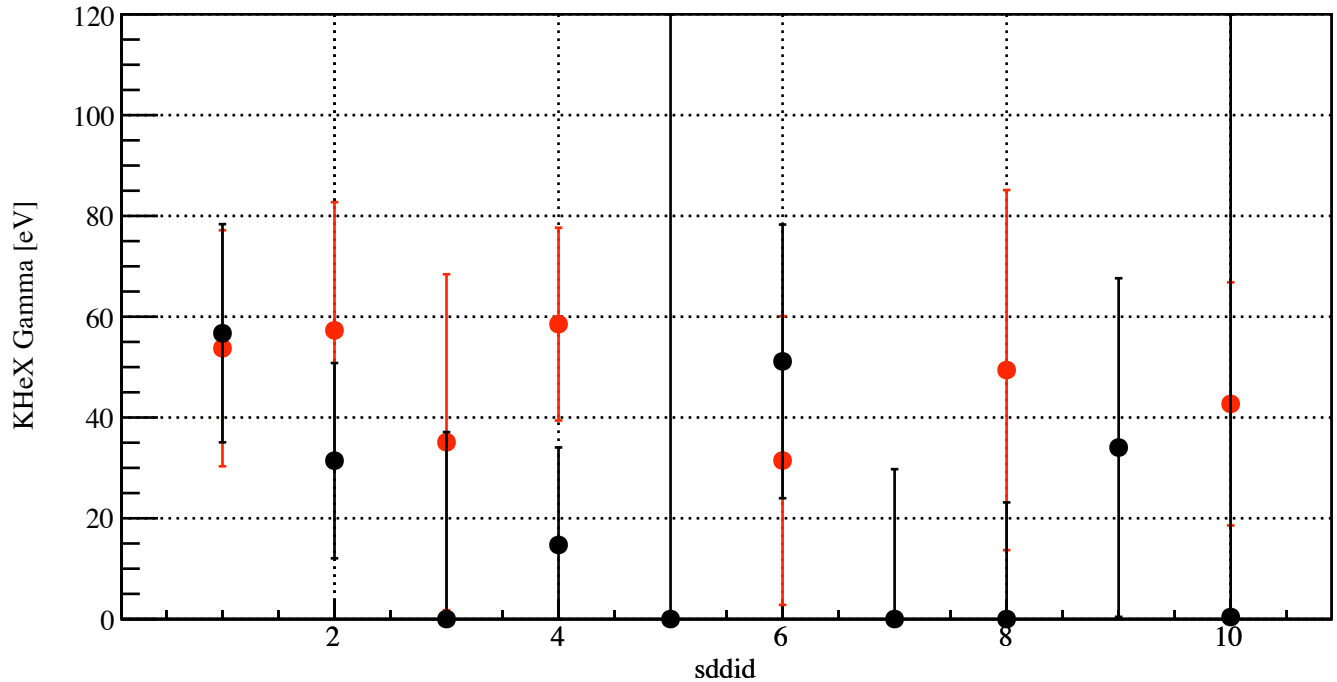
horizontal axis = sddid (1-10)

We have total 10 SDDs
1-3 (1st cycle), 4-10 (2nd cycle)

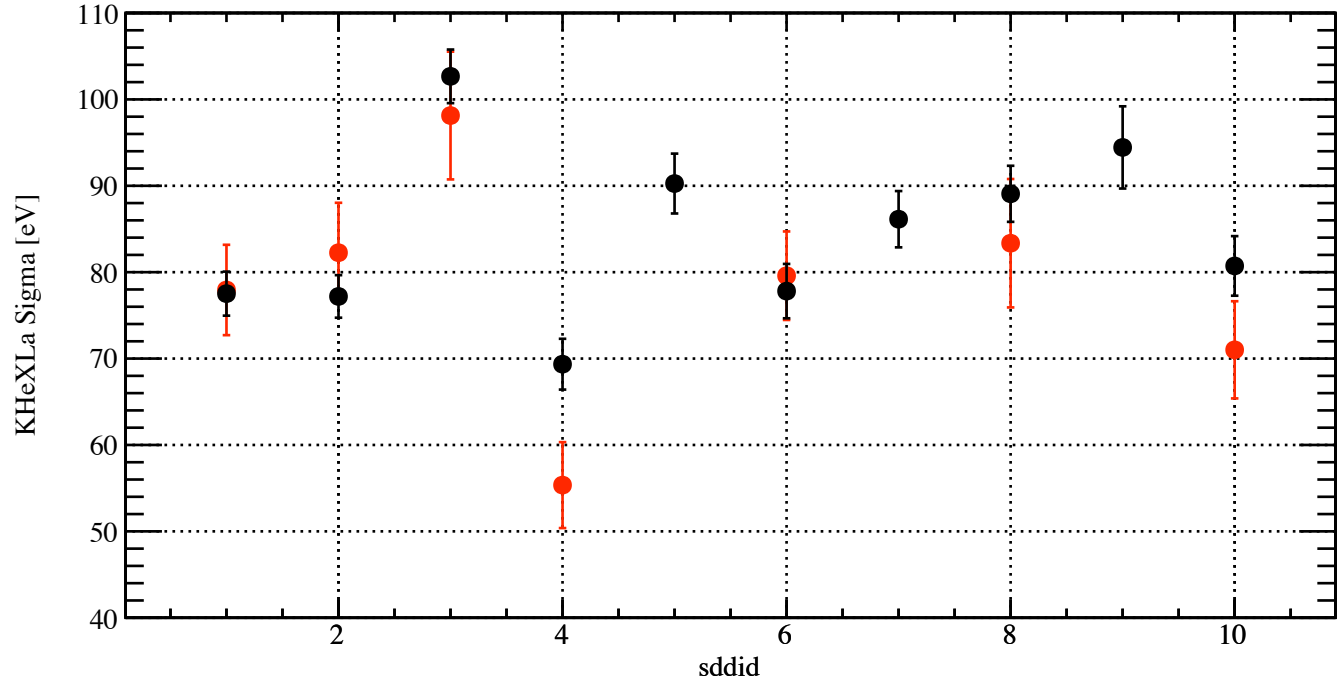
KHeX Shift



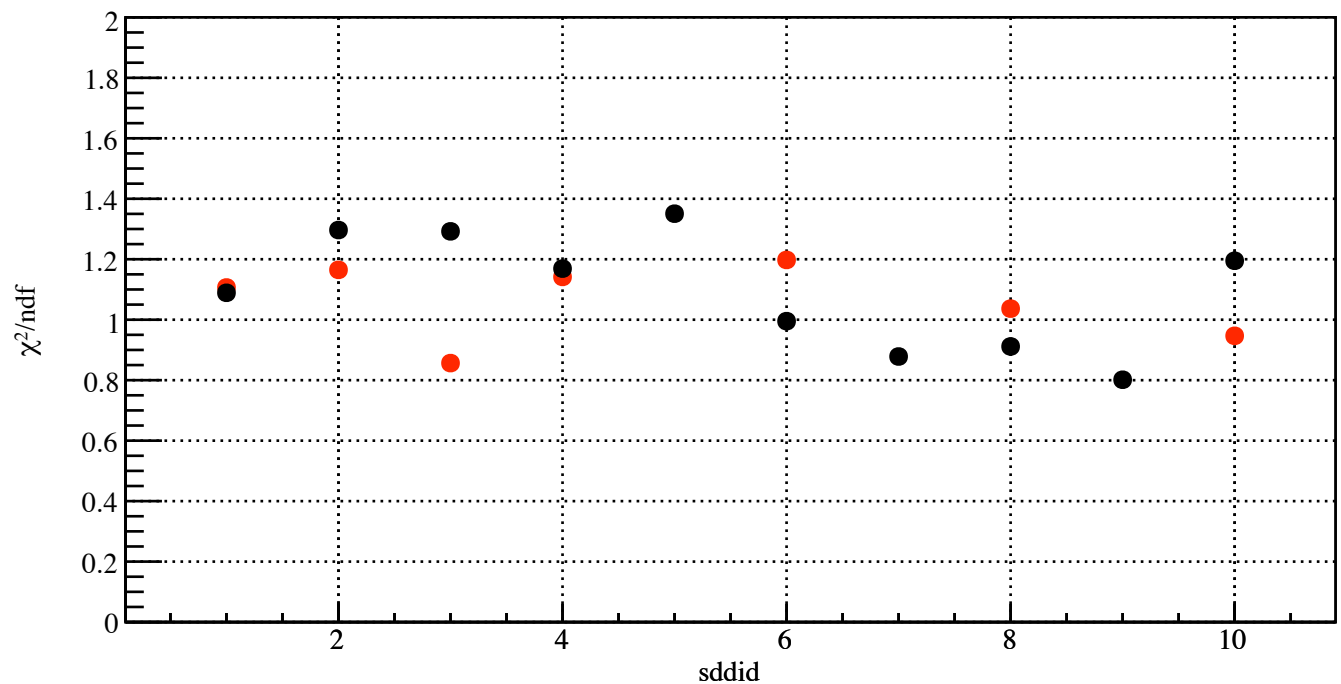
KHeX Gamma



KHeXLa Sigma



χ^2/ndf



summed SDDs up

1st cycle with vertex cut

```
KHeXLa Sigma = 85.157 +-  3.690
Fano         =  0.174 +-  0.000
lalb_ratio   =  0.363 +-  0.027
lalg_ratio   =  0.166 +-  0.021
Gamma        = 46.846 +- 16.326
Shift        = -6.504 +-  3.538
Chisq/NDF    = 136.383/120
```

1st cycle without vertex cut

```
KHeXLa Sigma = 85.514 +-  1.668
Fano         =  0.174 +-  0.000
lalb_ratio   =  0.364 +-  0.027
lalg_ratio   =  0.166 +-  0.023
Gamma        = 24.122 +- 12.893
Shift        = -6.081 +-  3.414
Chisq/NDF    = 138.998/120
```

2nd cycle with vertex cut

```
KHeXLa Sigma = 72.690 +-  2.638
Fano         =  0.154 +-  0.000
lalb_ratio   =  0.369 +-  0.024
lalg_ratio   =  0.186 +-  0.019
Gamma        = 45.722 +- 11.424
Shift        = -1.437 +-  2.752
Chisq/NDF    = 154.101/120
```

2nd cycle without vertex cut

```
KHeXLa Sigma = 84.895 +-  1.445
Fano         =  0.154 +-  0.000
lalb_ratio   =  0.407 +-  0.026
lalg_ratio   =  0.225 +-  0.022
Gamma        =  5.718 +- 10.681
Shift        = -7.187 +-  2.735
Chisq/NDF    = 161.495/120
```