# Simulation to estimate in-flight events ratio

GEANT 4.9.1

- At rest process

  KaonMinusAbsorption

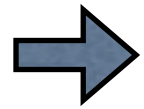
  PionMinusAbsorptionAtRest

  ? ?

  segmentation fault

  KaonMinusAbsorptionAtRest

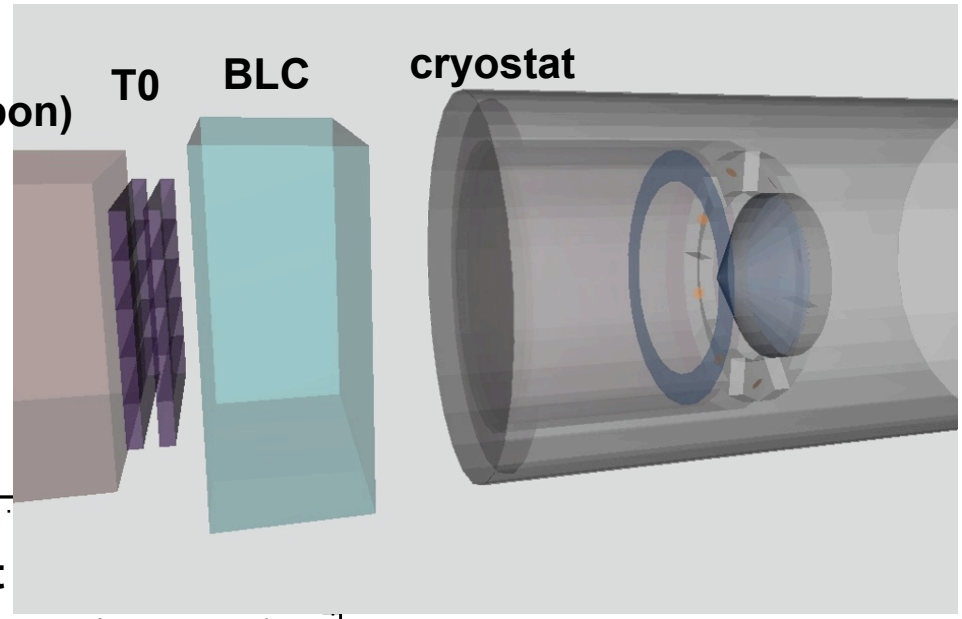
  PiMinusAbsorptionAtRest

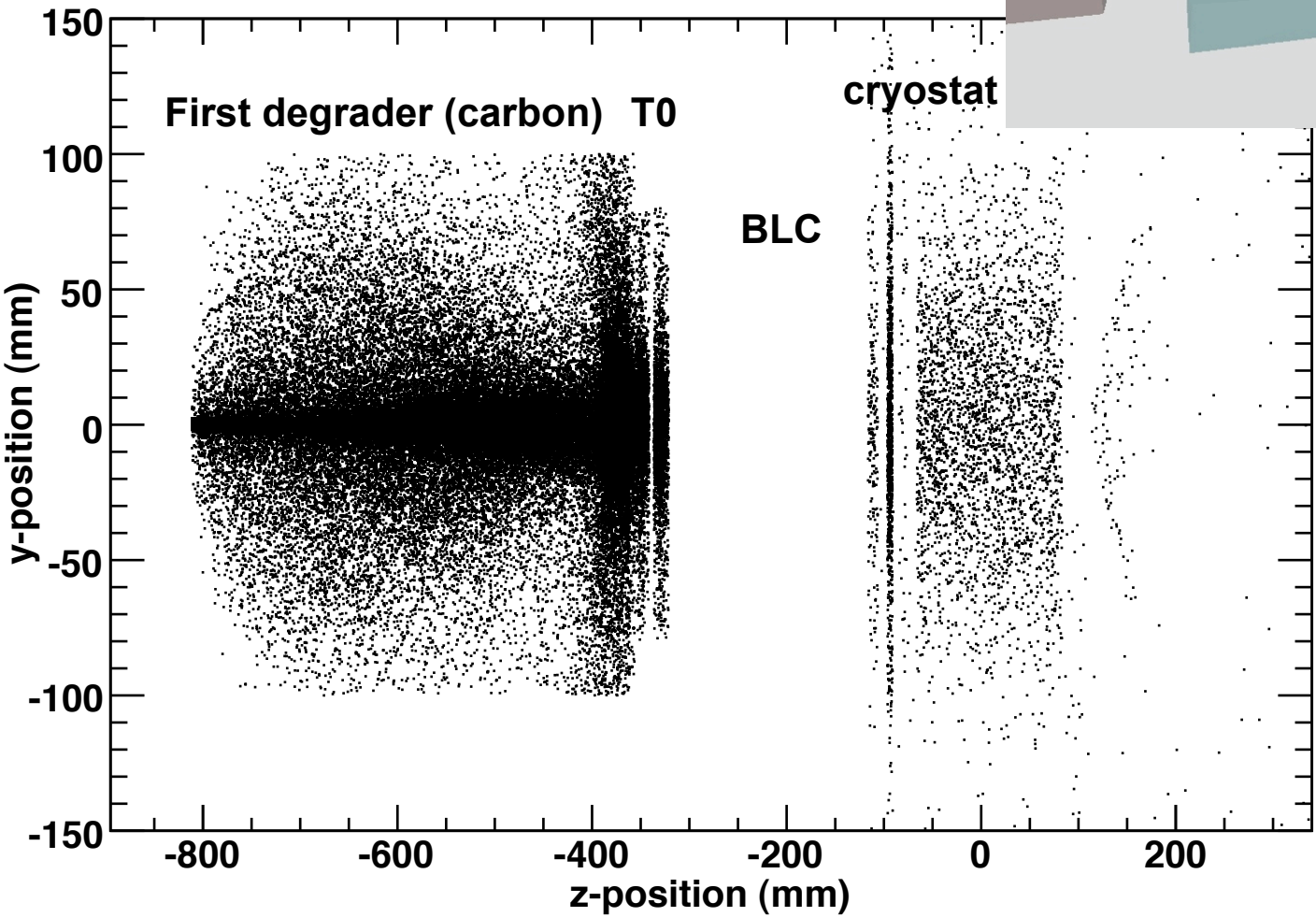
  excitation energy < 0 for some fragments ..... ? ?

- Cut length : 0.1 mm

# Setup E570




## Stopped position of K- beam

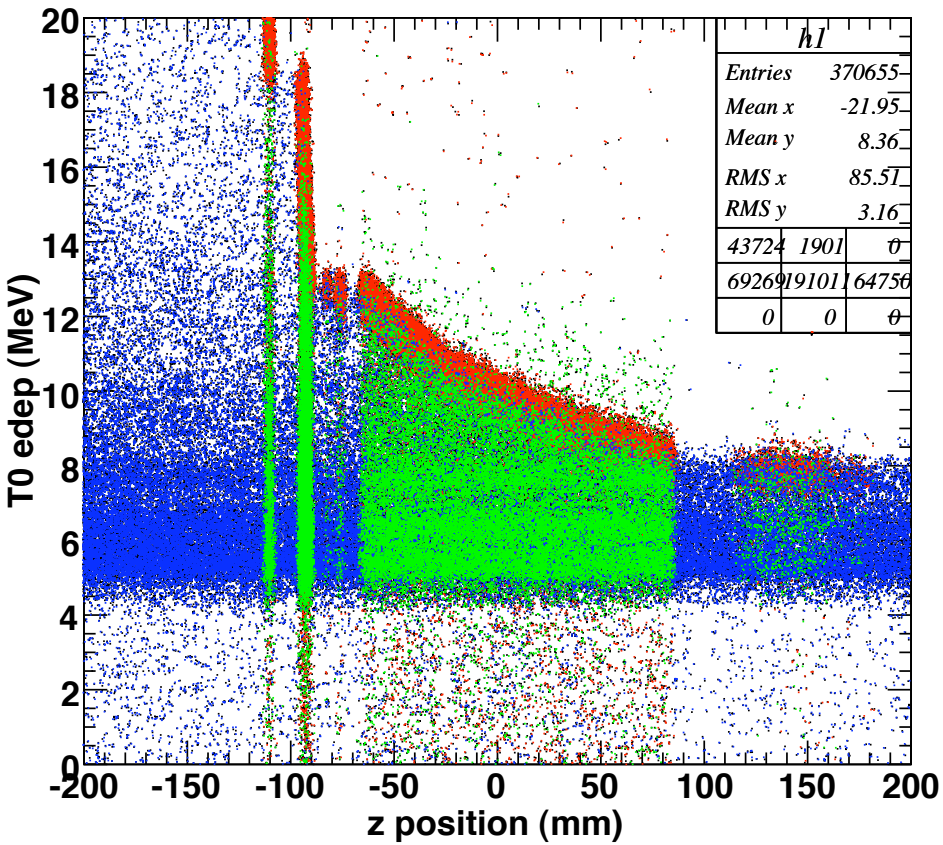


# Note:

- First degrader thickness was optimized by monochromatic K+ beam with momentum 650 MeV/c
  - 45.0 cm-thick-Carbon (1.99 g/cm3)
- Now BeamLine Chamber (BLC) is empty (vacuum)
- Inelastic scattering cross section in low energy region is not realistic.
  - Number of stopped-K- is ~2 times smaller
    (→ will influence on the in-flight event ratio)
- Momentum bit is +-4% flat distribution for 650 MeV/c K-
- Pencil beam was generated at *z*=-1.5 m position

# Energy deposits on T0 vs z-vertex position

t0edep vs lastpos

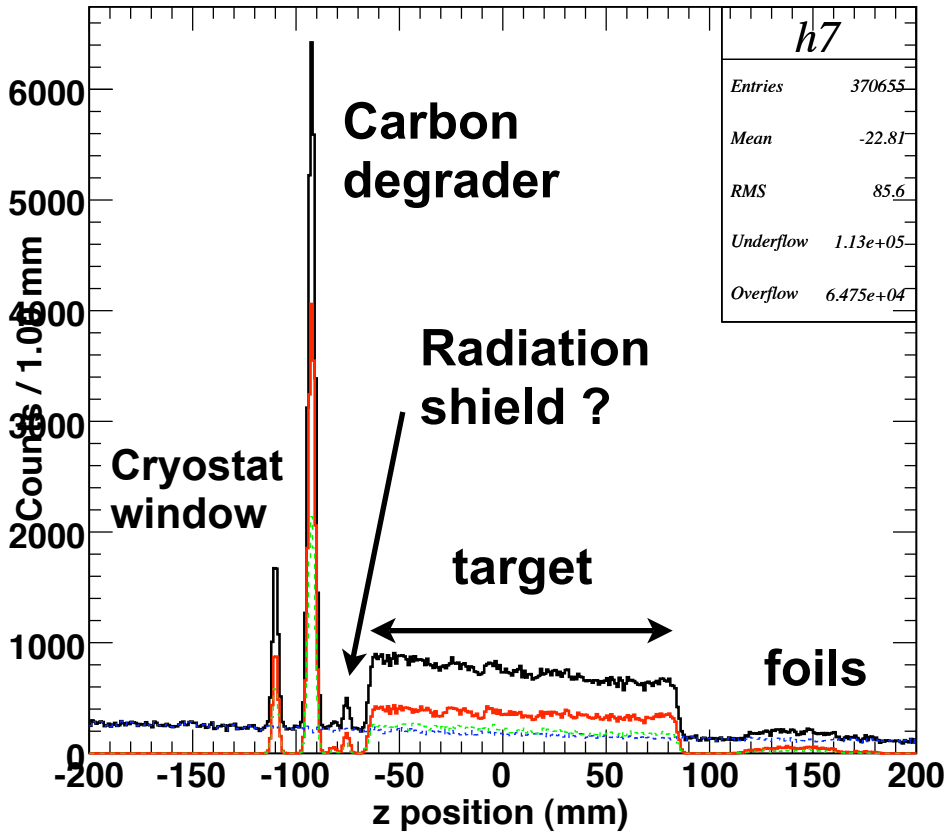



red: stop

blue: in-flight decay

green: in-flight inelastic scattering

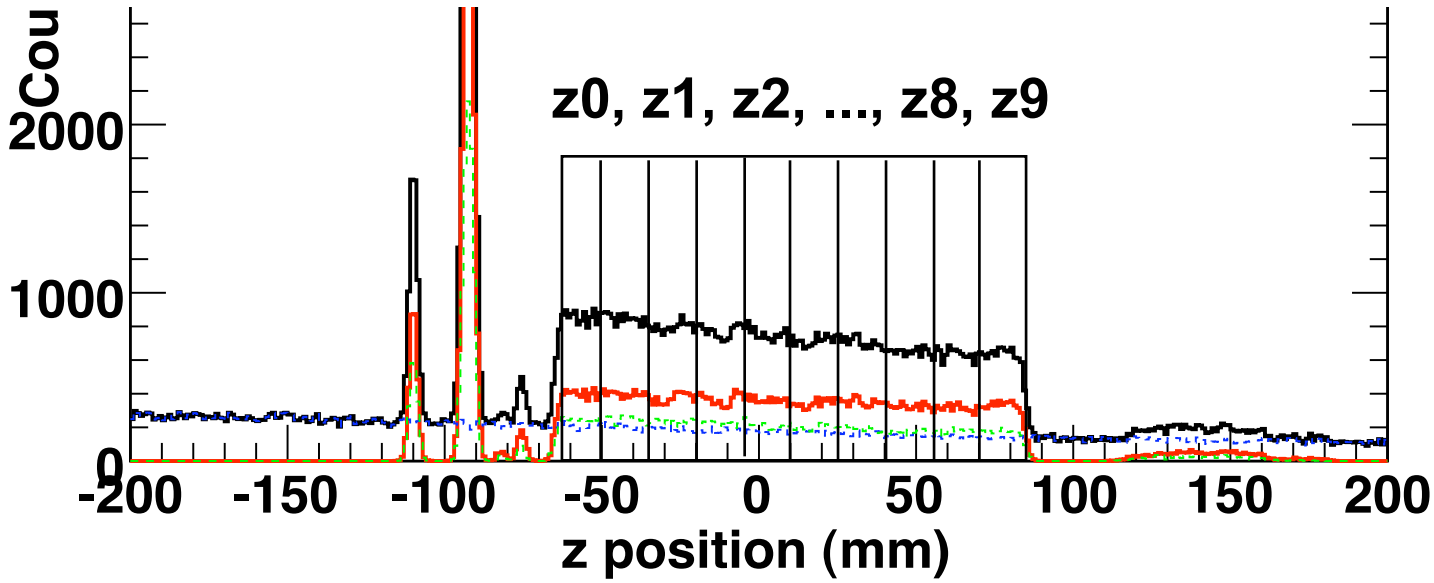
lastpos

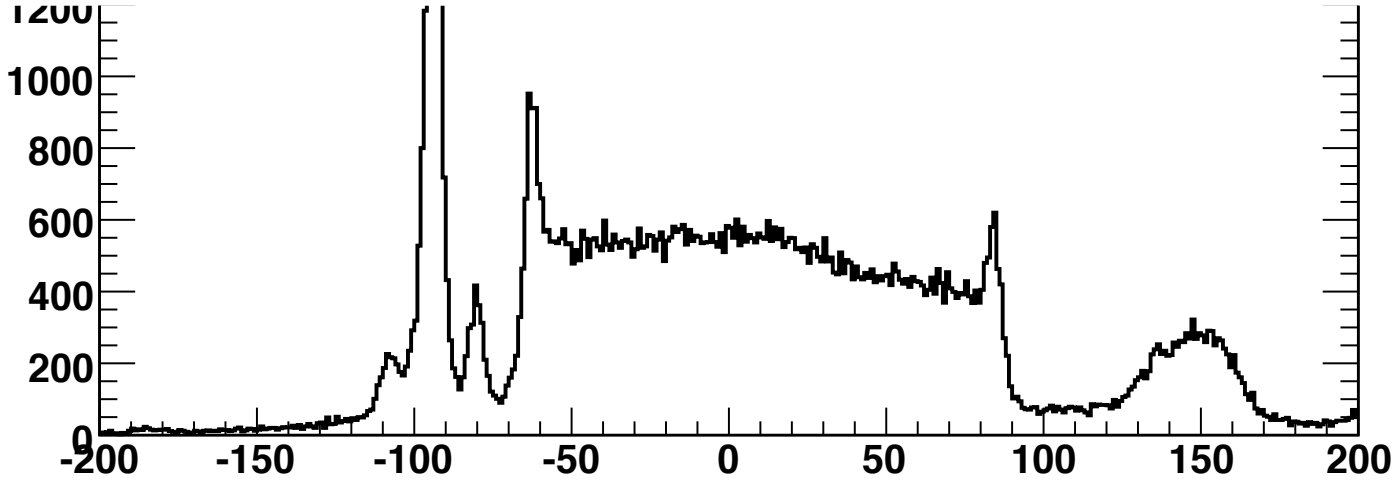



*z-vertex resolution 3.0 mm (FWHM)*

※ Geometry has a bug : the position of the radiation shield is not realistic ! (to be modified)

# Slice the target region into 10 parts

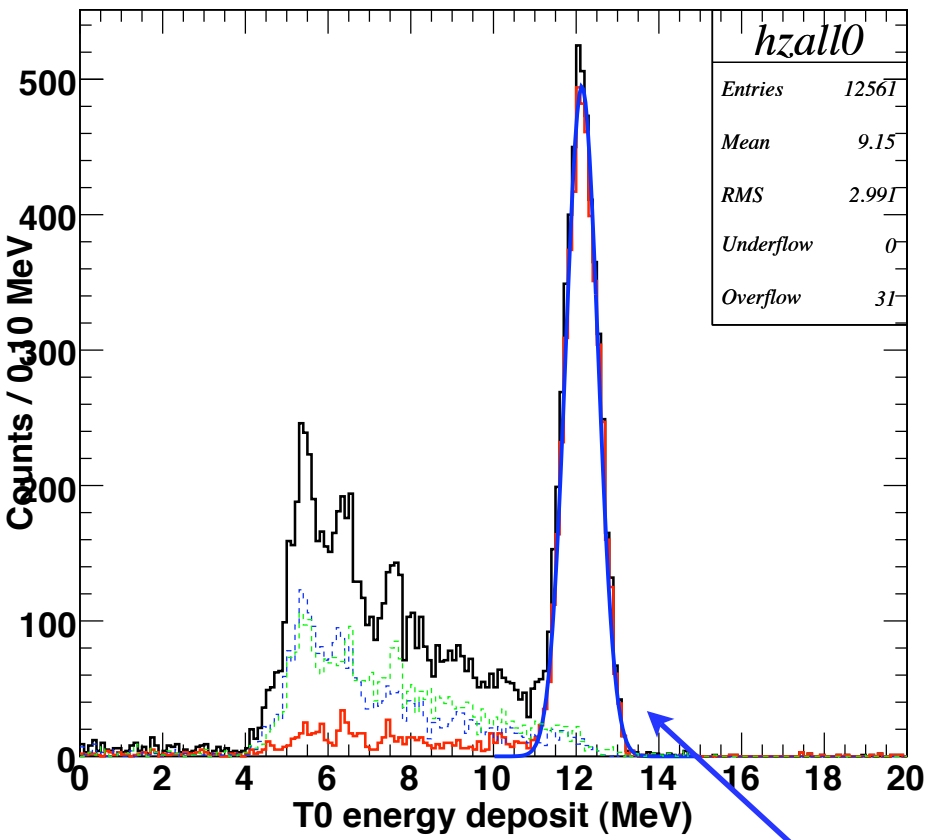


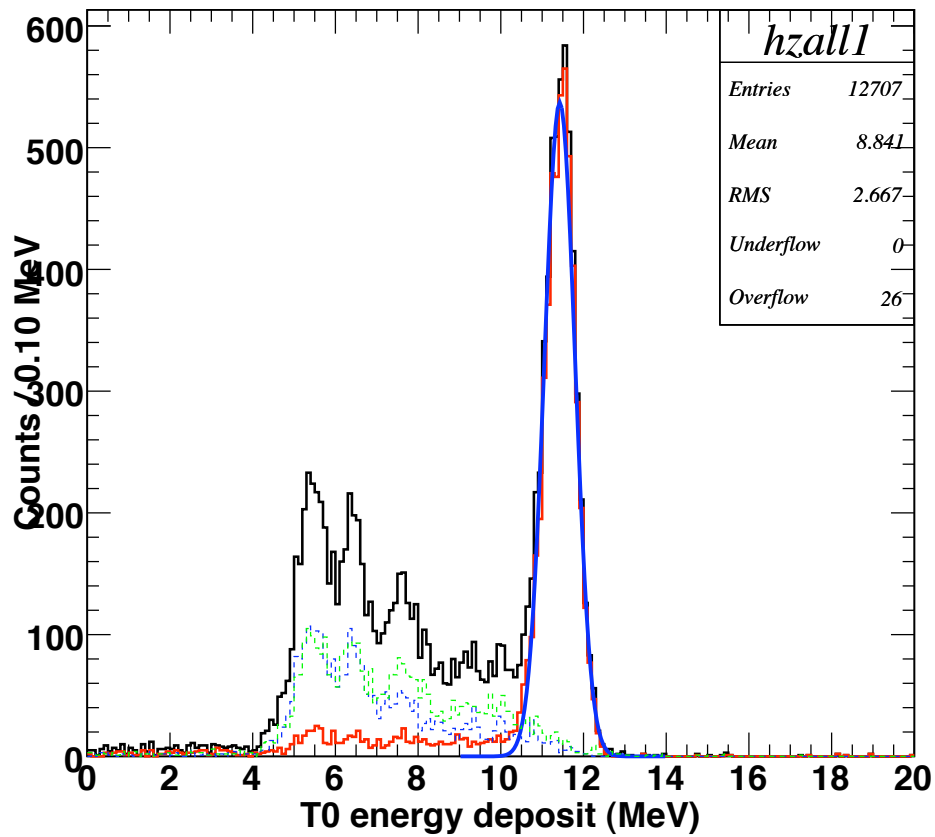

*DATA: run 225 and 226 (r<=100, kstop)*

# ΔE_T0 in sliced z-regions

t0edep z0




t0edep z1




red: stop

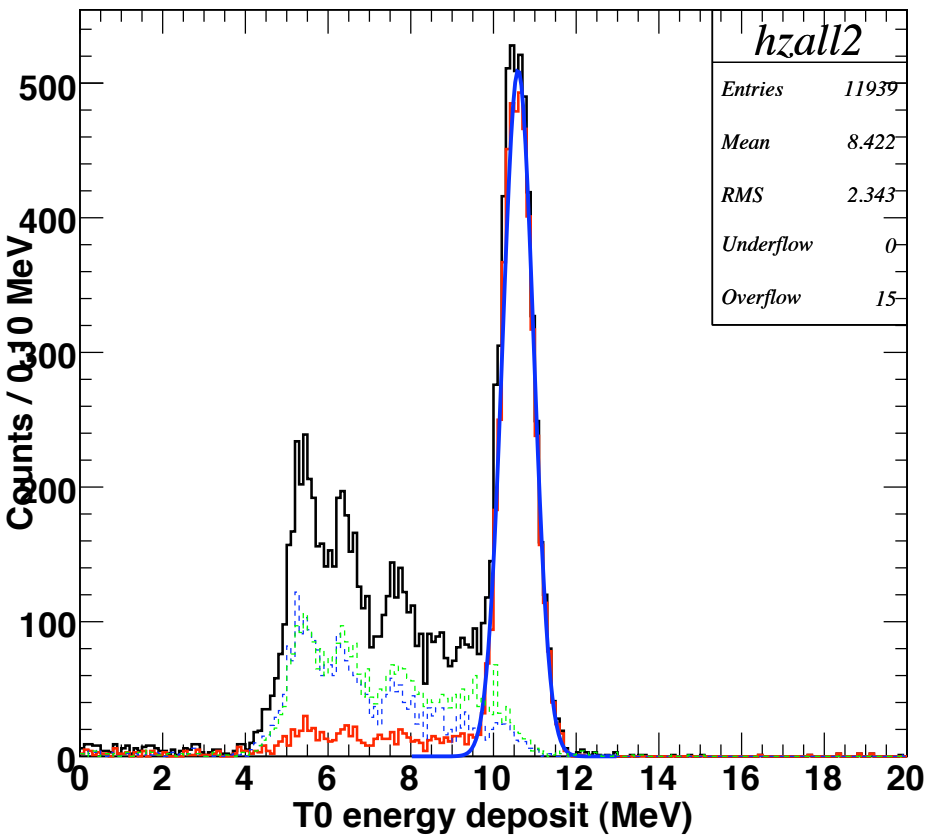
blue: in-flight decay

green: in-flight inelastic scattering

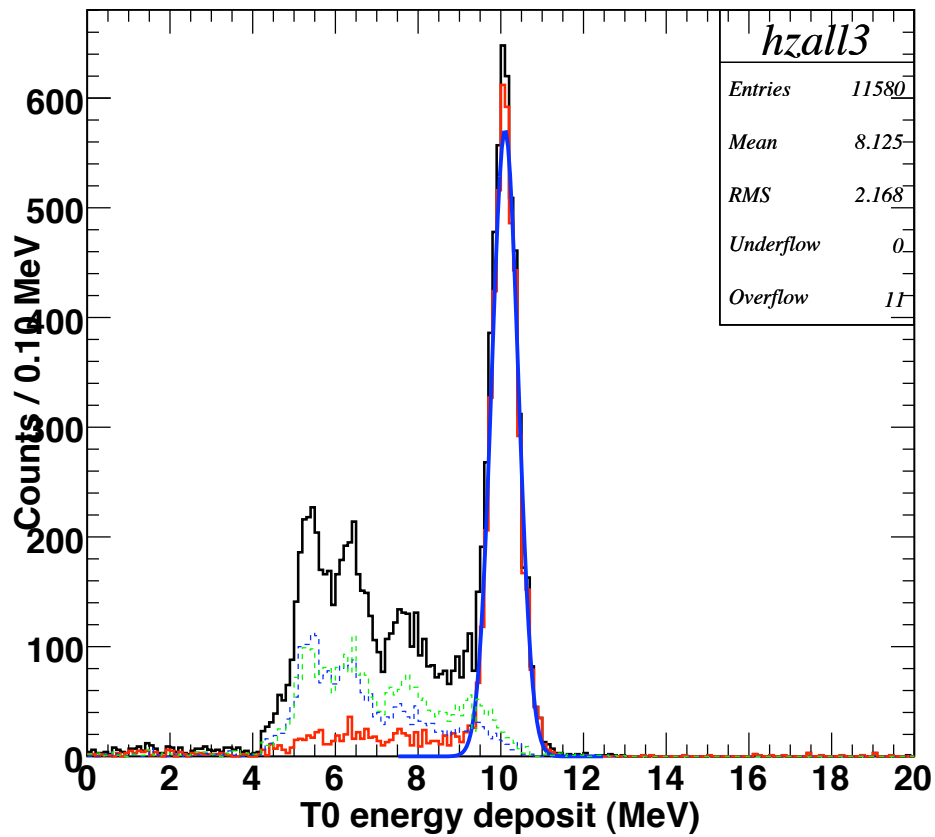
Gaussian fitting -> Get the energy-range relation

# ΔE_T0 in sliced z-regions

t0edep z2




t0edep z3



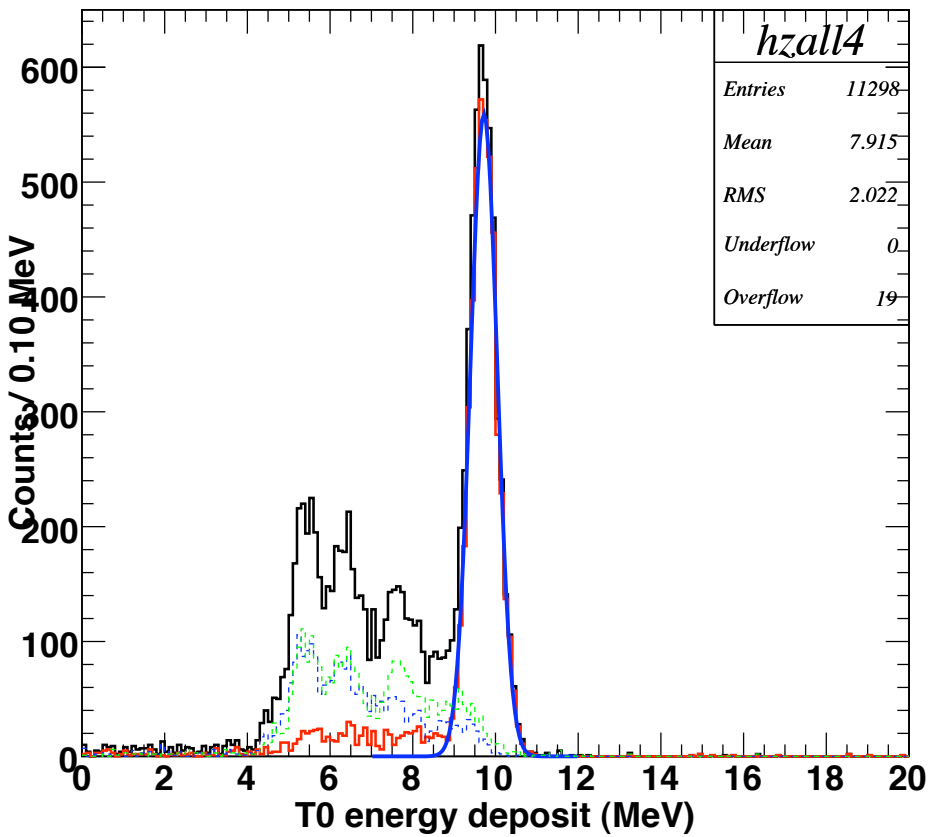

red: stop

blue: in-flight decay

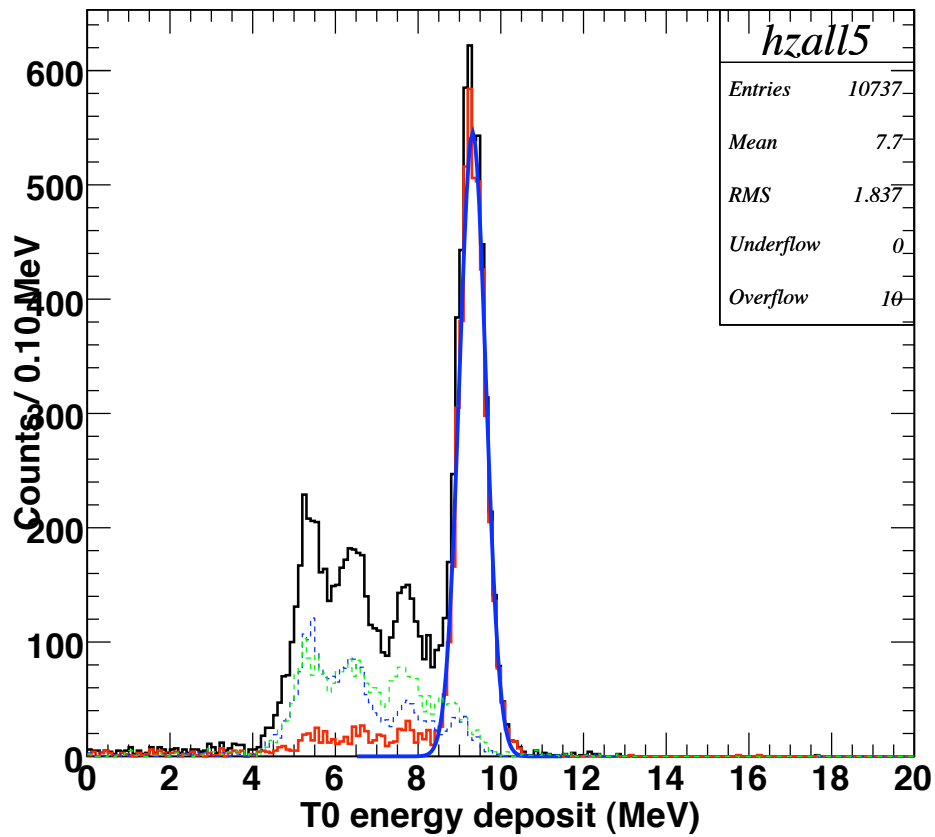
green: in-flight inelastic scattering

# ΔE_T0 in sliced z-regions

t0edep z4




t0edep z5



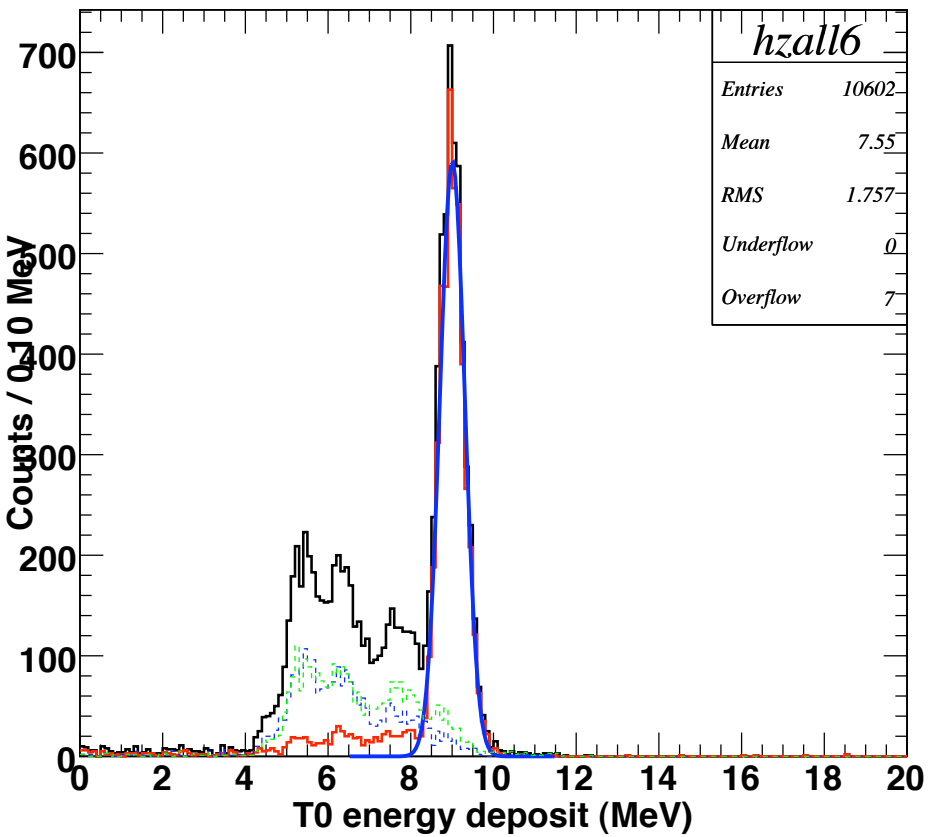

red: stop

blue: in-flight decay

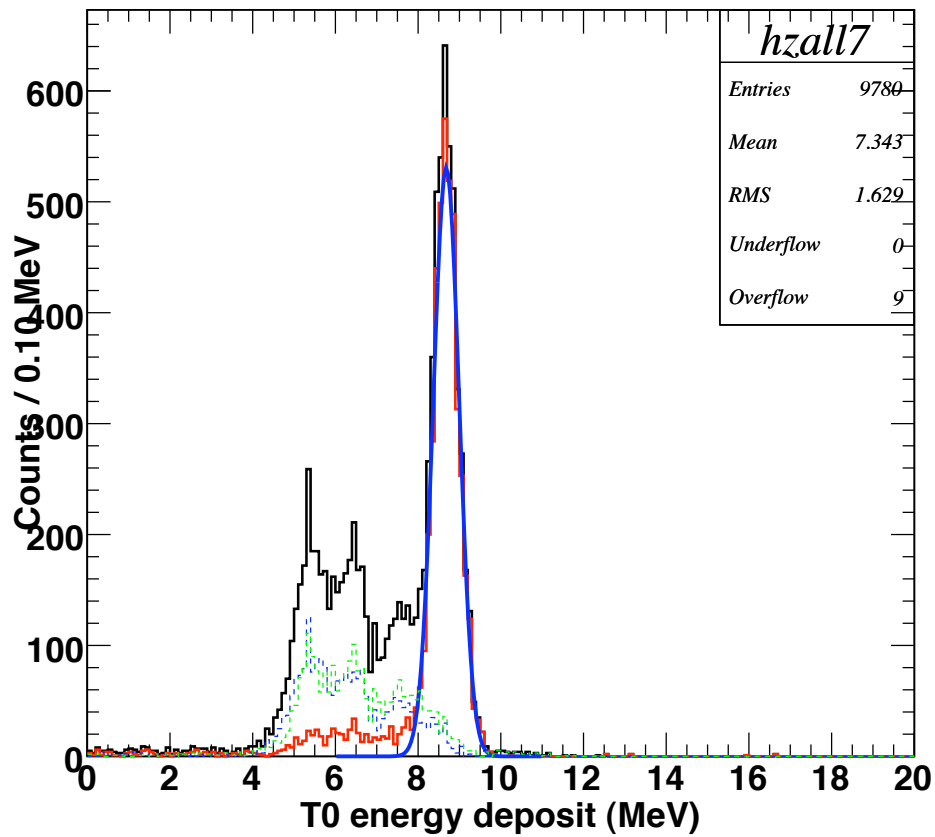
green: in-flight inelastic scattering

# ΔE_T0 in sliced z-regions

t0edep z6




t0edep z7



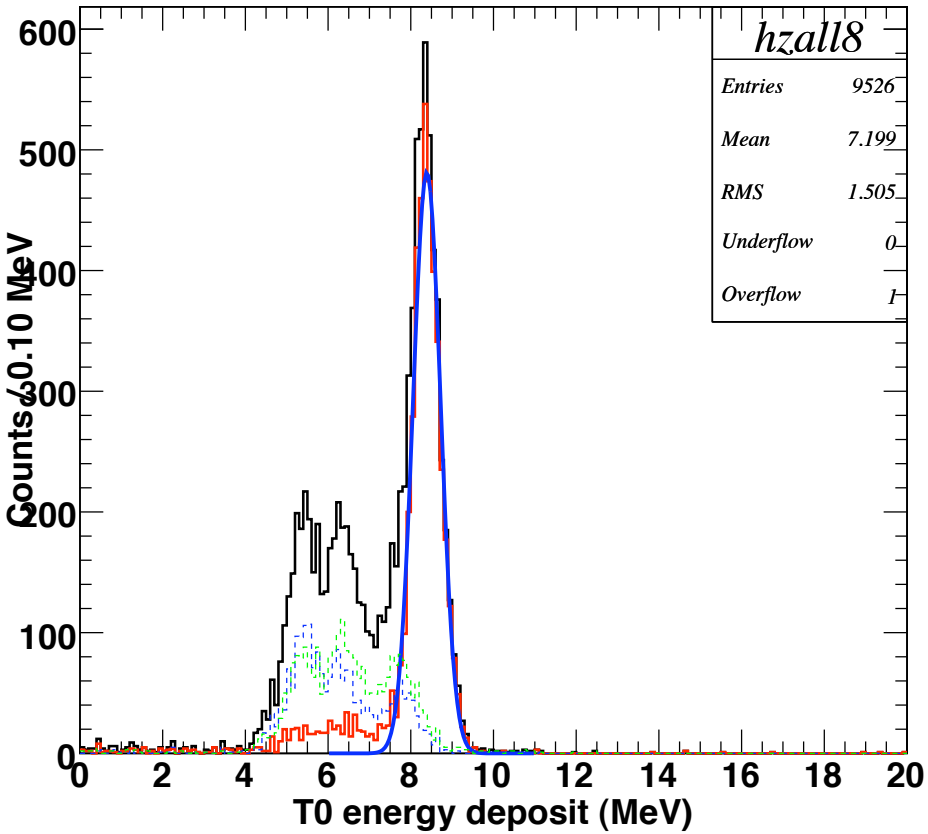

red: stop

blue: in-flight decay

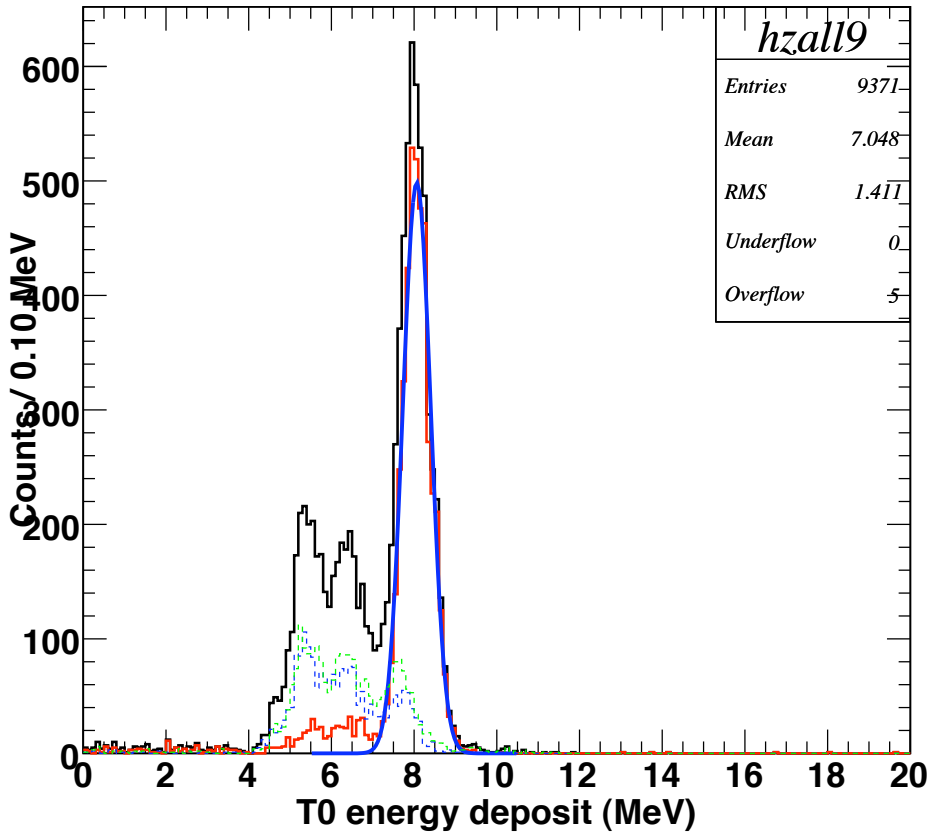
green: in-flight inelastic scattering

# ΔE_T0 in sliced z-regions

t0edep z8




t0edep z9



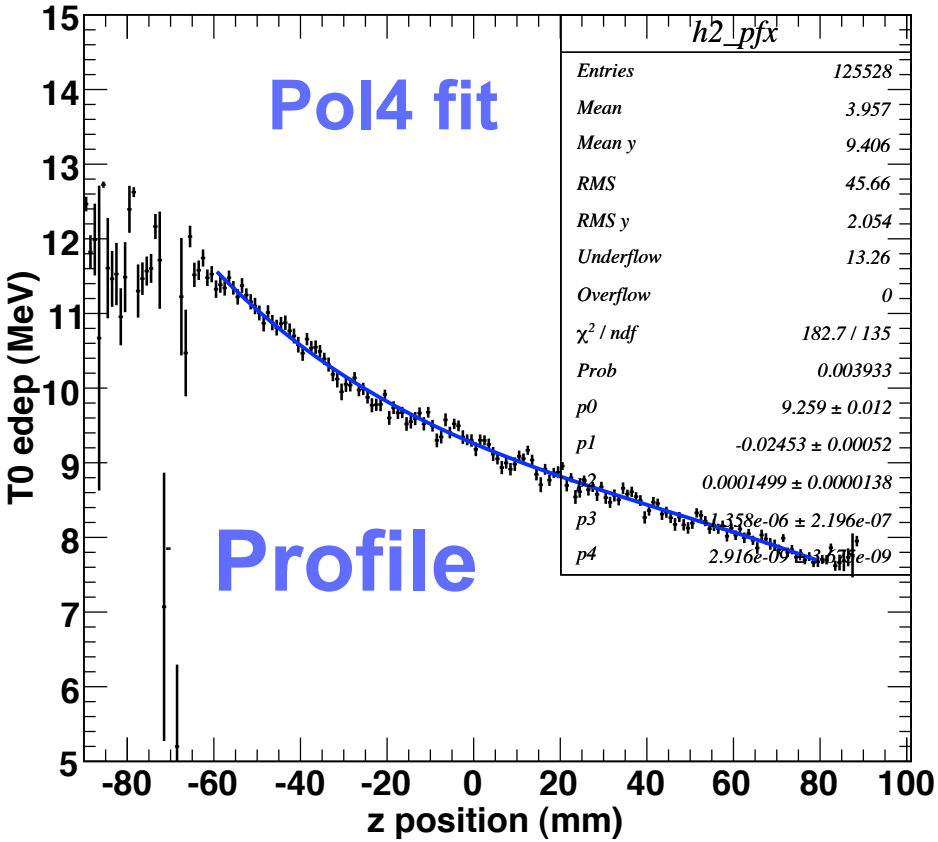

red: stop

blue: in-flight decay

green: in-flight inelastic scattering

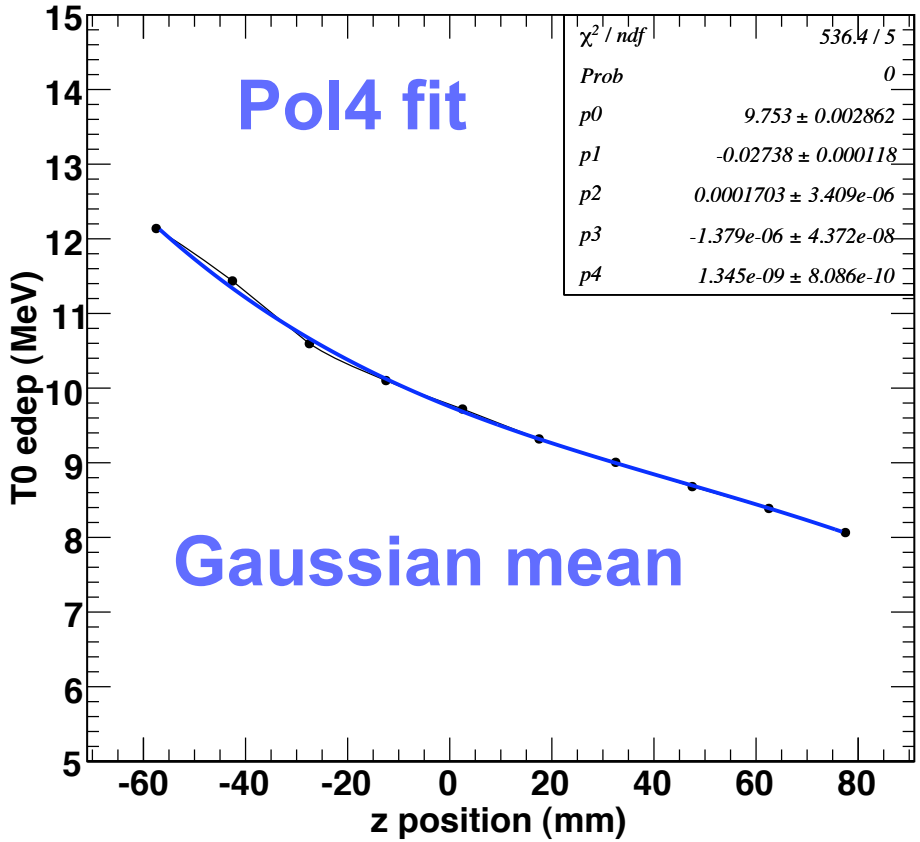
# Slewing between ΔE_T0 vs z-vertex

## t0edep vs lastpos




*not correct, pulled by low ΔE events*

## slewing T0edep vs z-vertex

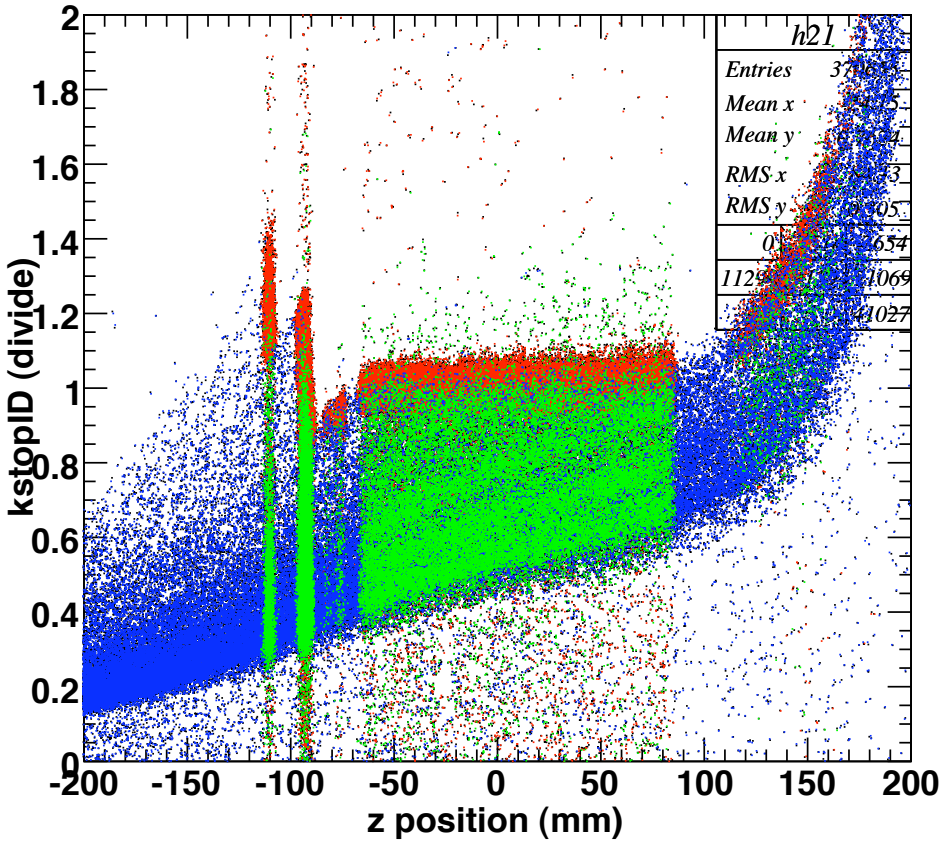



*Good slewing correction !*

# Slewing correction

## Divide type

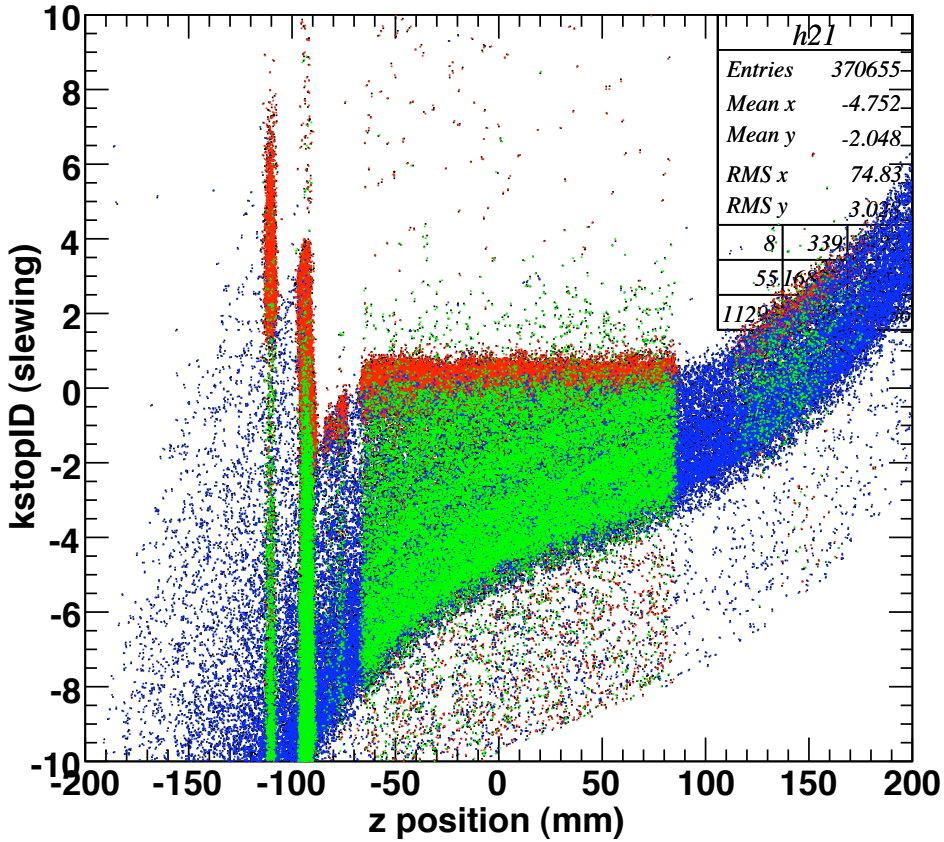
kstopid2 vs lastpos




ΔE_data/ΔE_range

## Subtract type

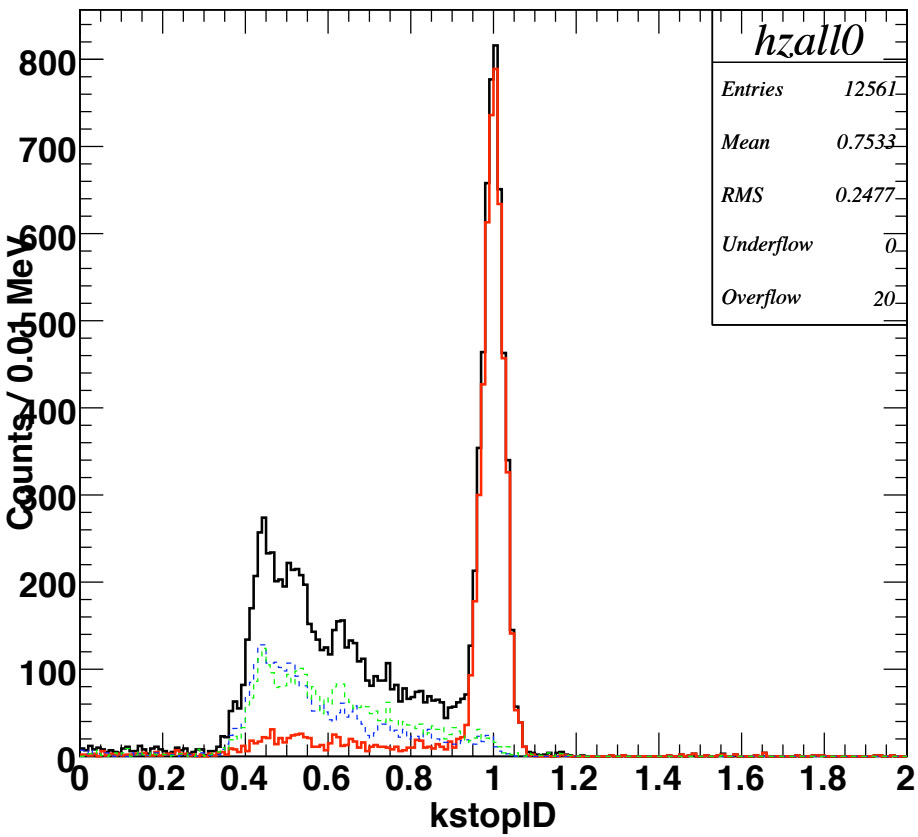
kstopid2 vs lastpos



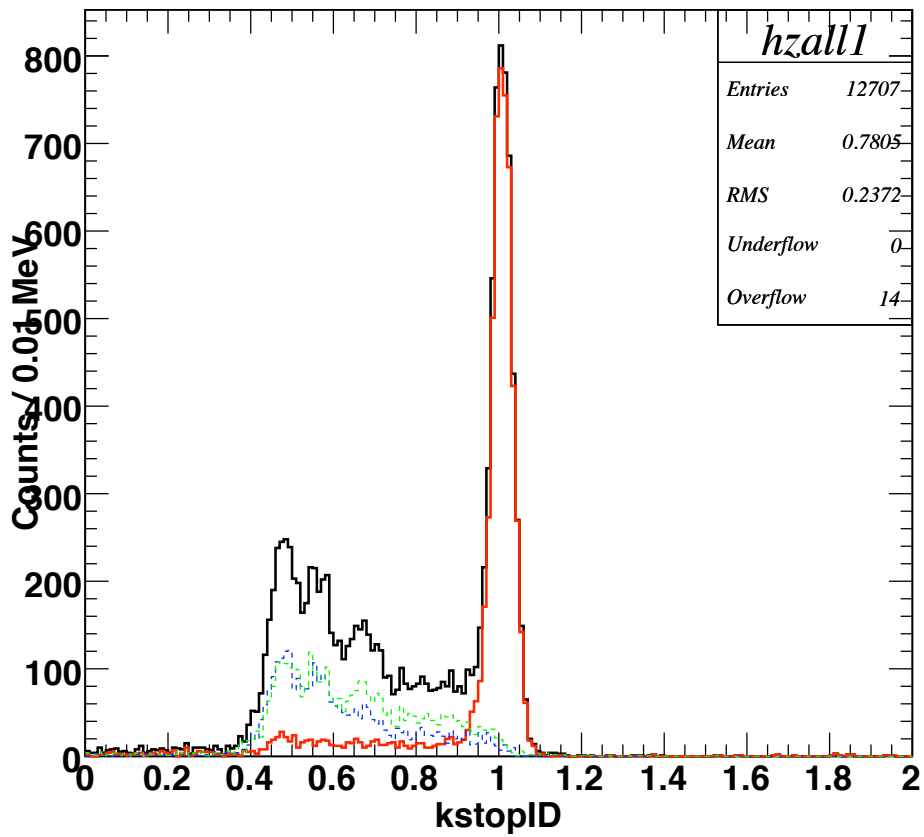

ΔE_data - ΔE_range

# Divide type

kstopid z0




kstopid z1



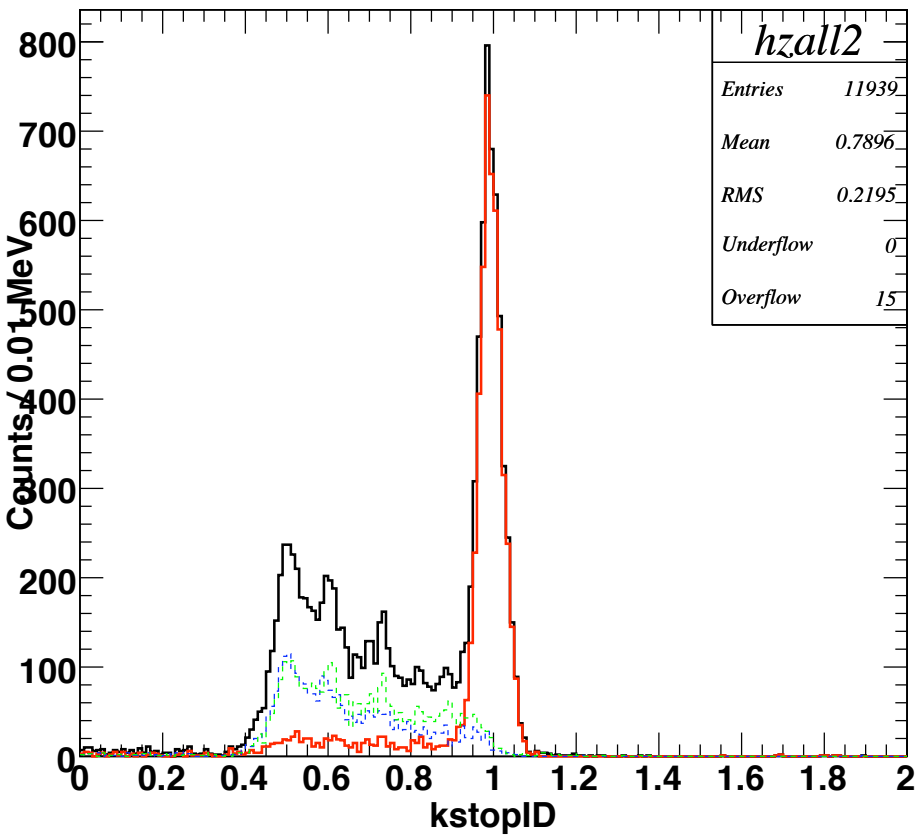

red: stop

blue: in-flight decay

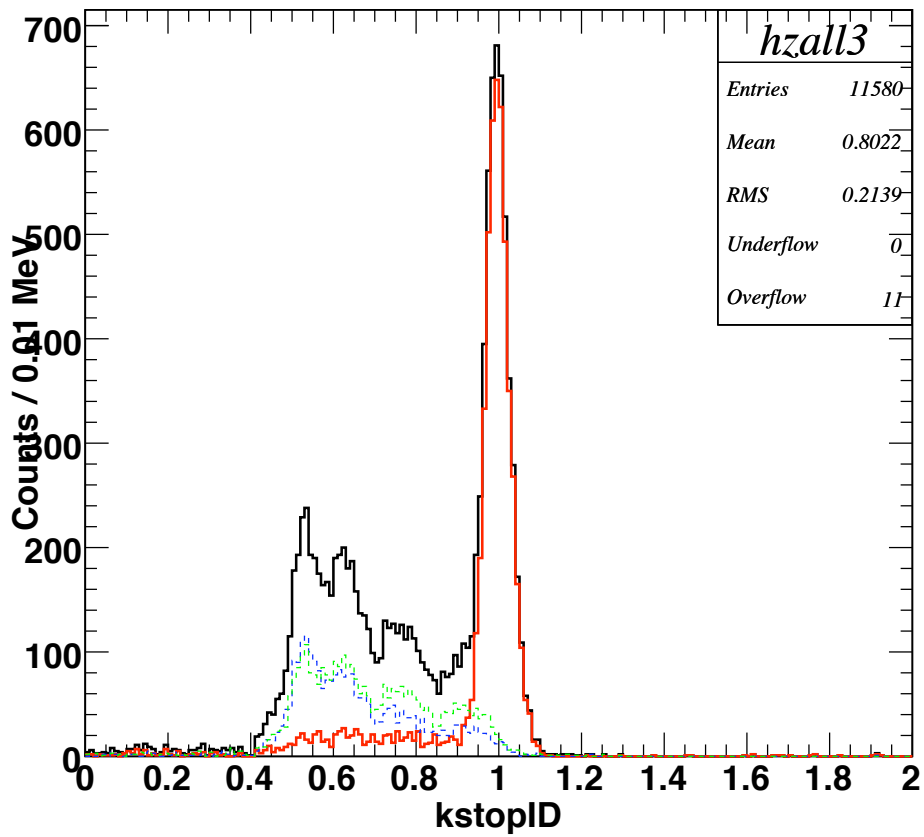
green: in-flight inelastic scattering

# Divide type

## kstopid z2




## kstopid z3



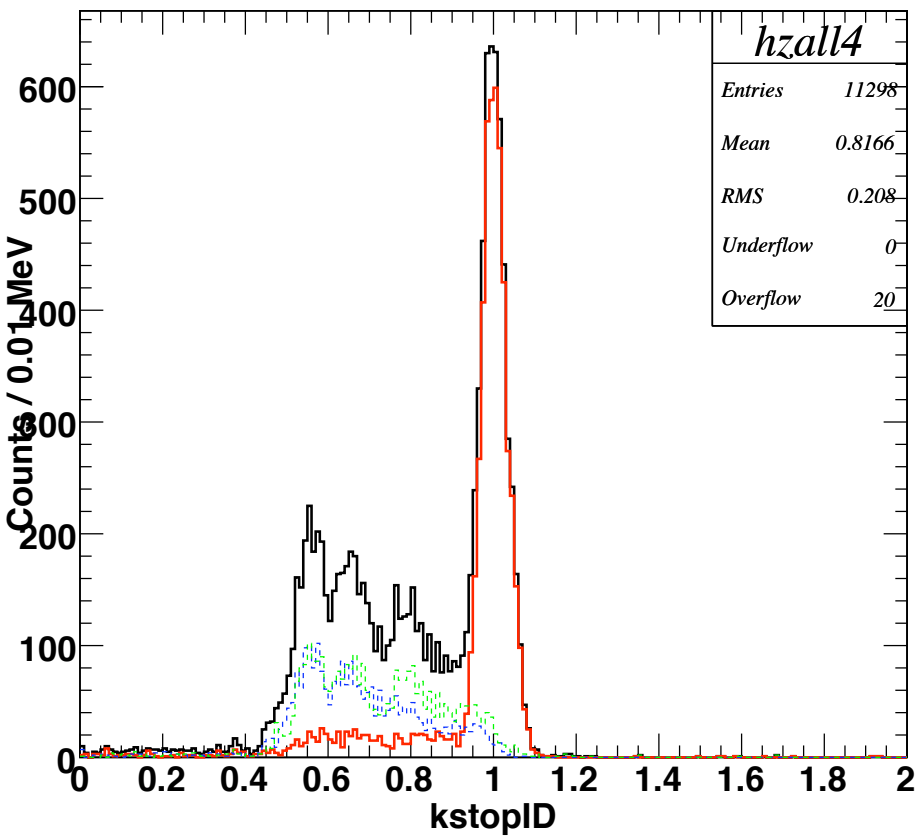

red: stop

blue: in-flight decay

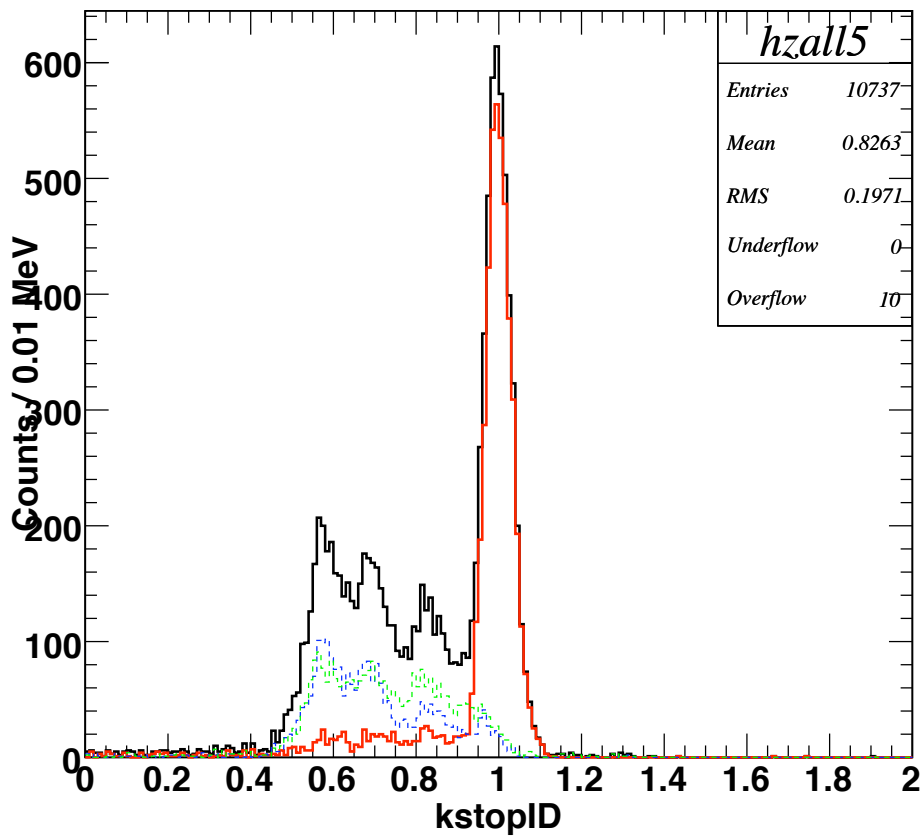
green: in-flight inelastic scattering

# Divide type

## kstopid z4




## kstopid z5



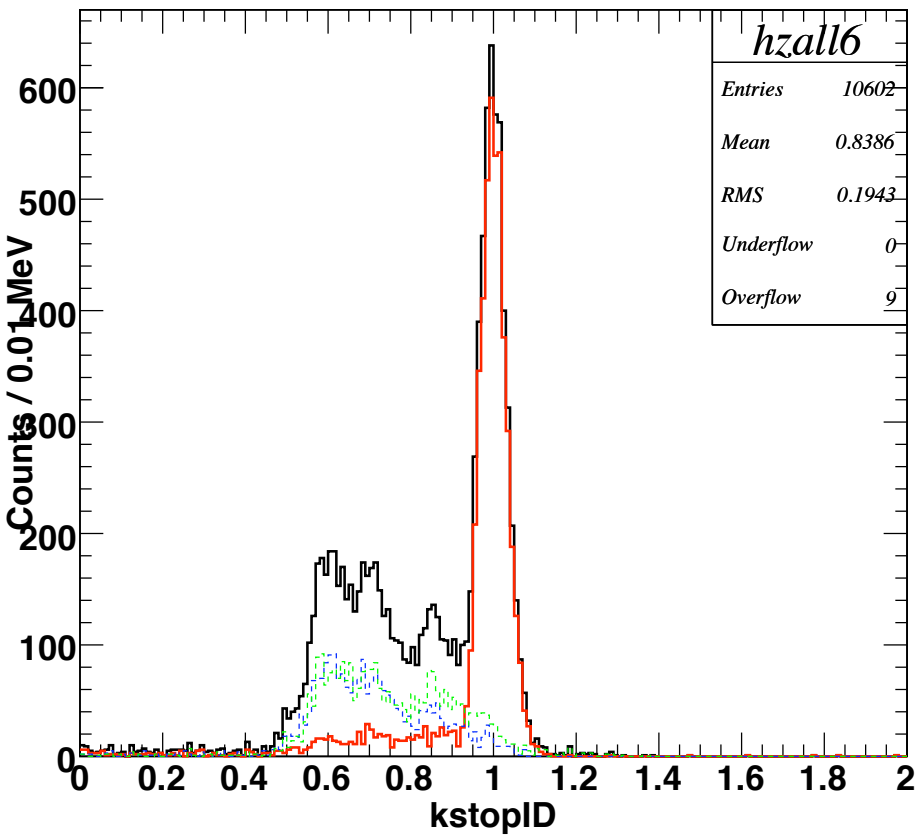

red: stop

blue: in-flight decay

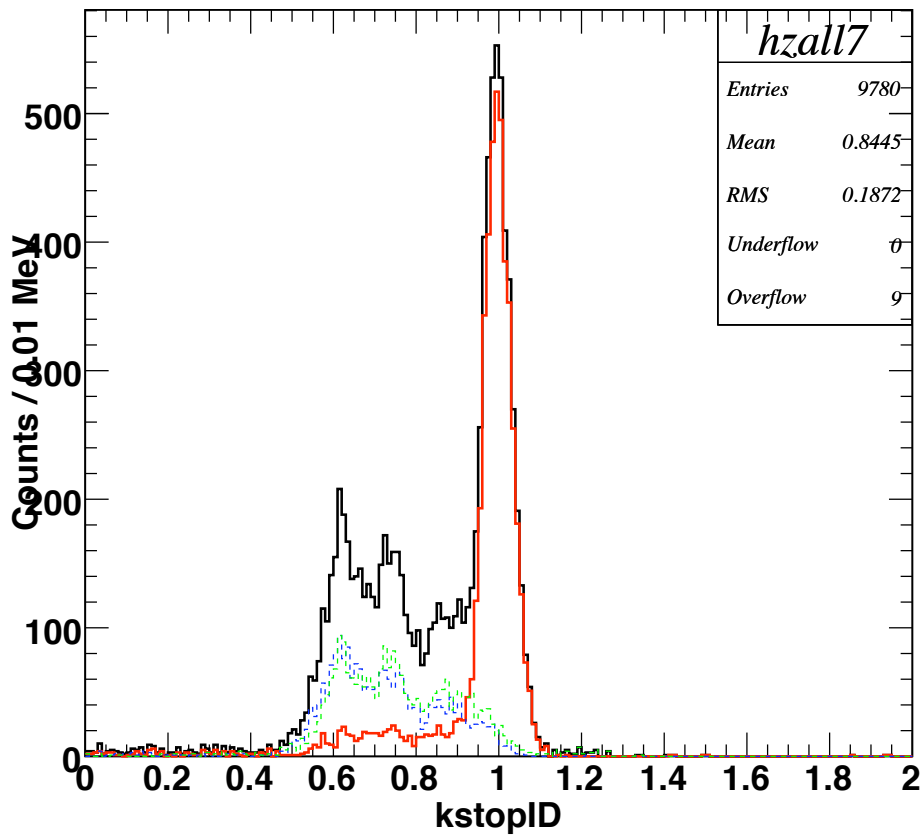
green: in-flight inelastic scattering

# Divide type

kstopid z6




kstopid z7



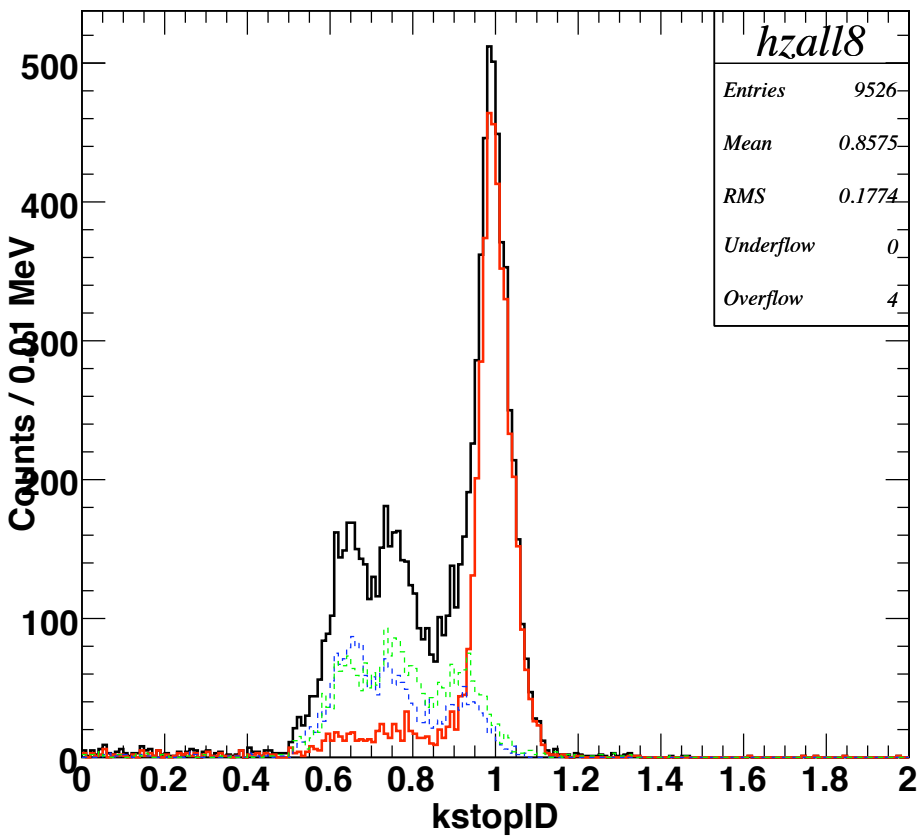

red: stop

blue: in-flight decay

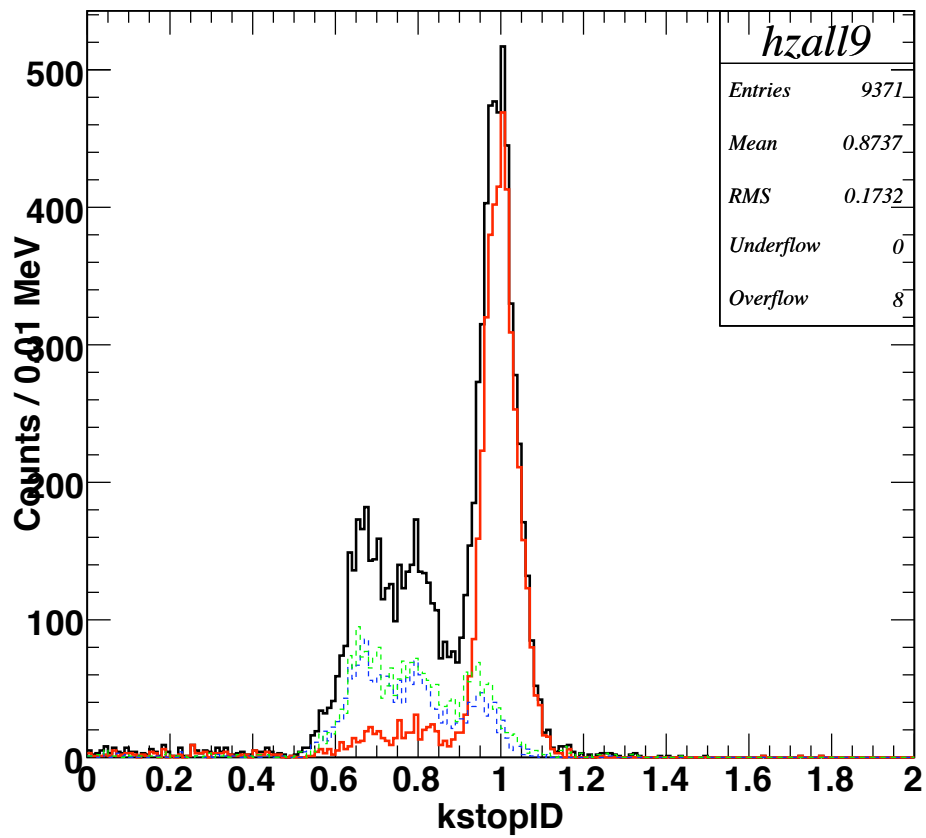
green: in-flight inelastic scattering

# Divide type

kstopid z8




kstopid z9



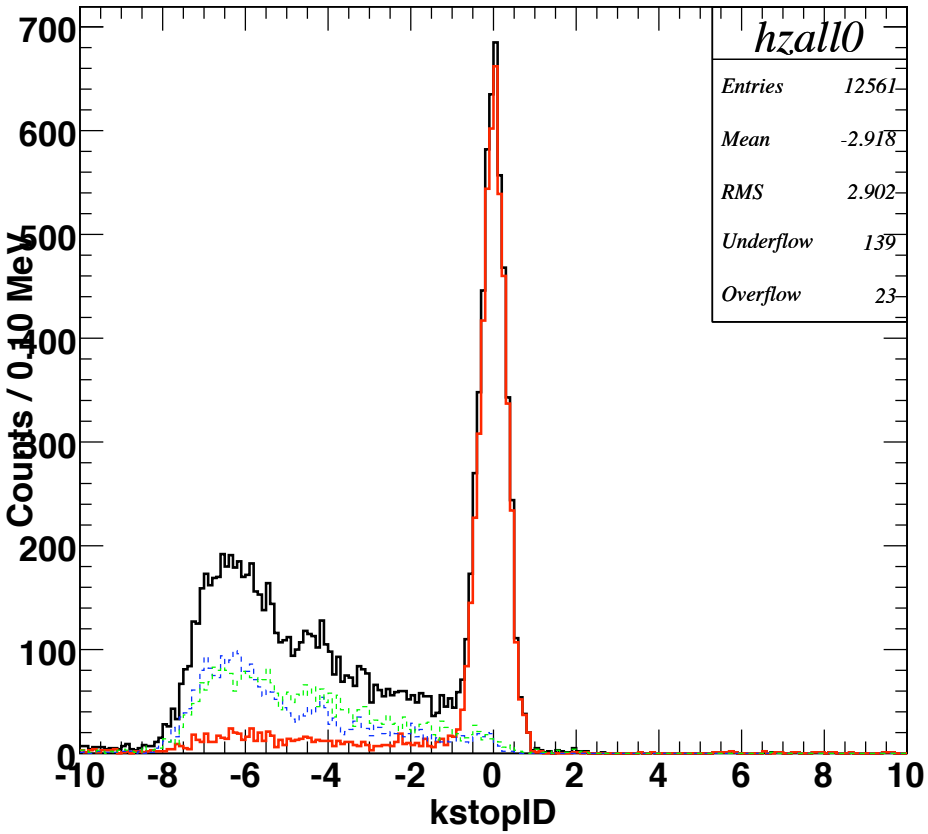

red: stop

blue: in-flight decay

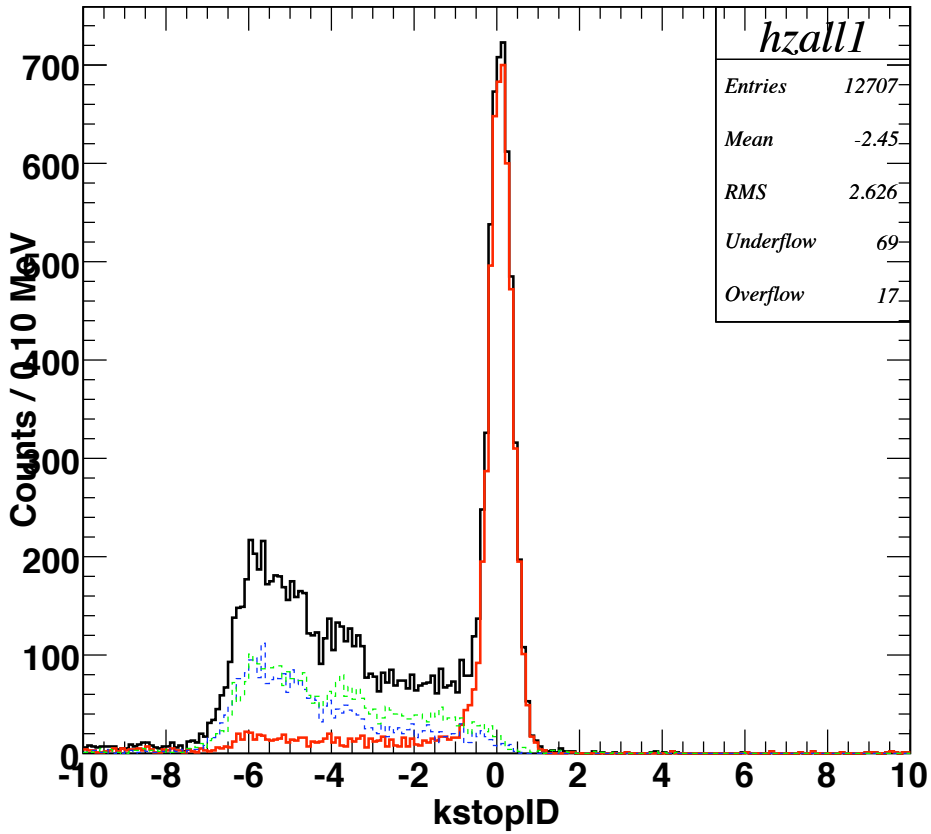
green: in-flight inelastic scattering

# Subtract type

kstopid z0




kstopid z1



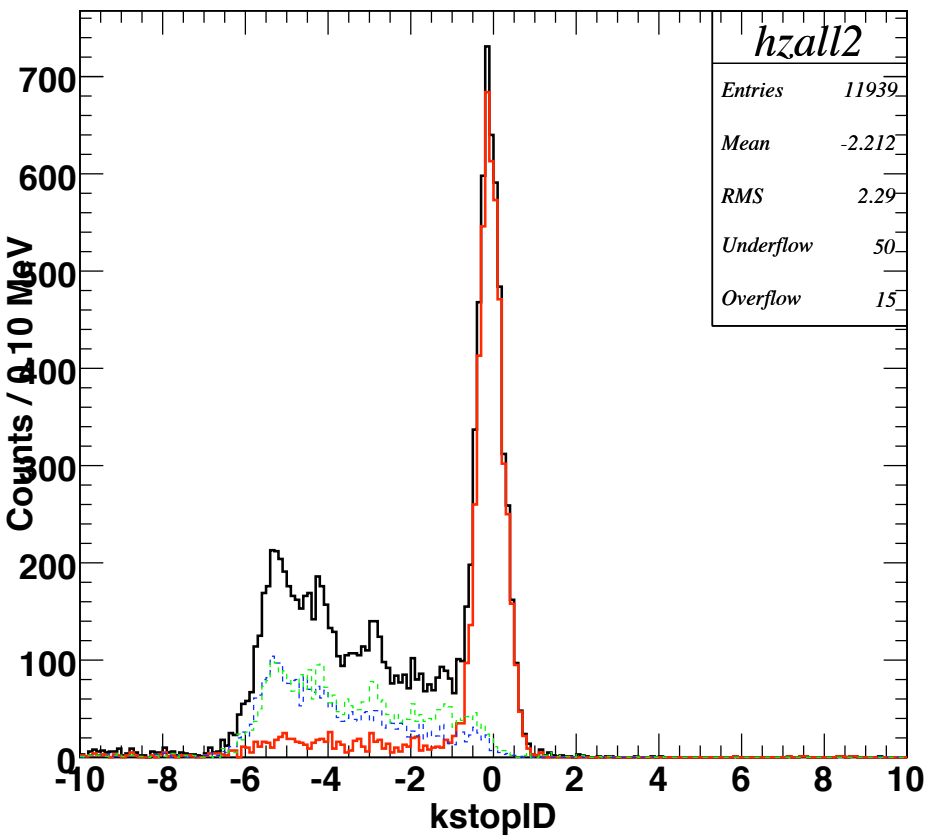

red: stop

blue: in-flight decay

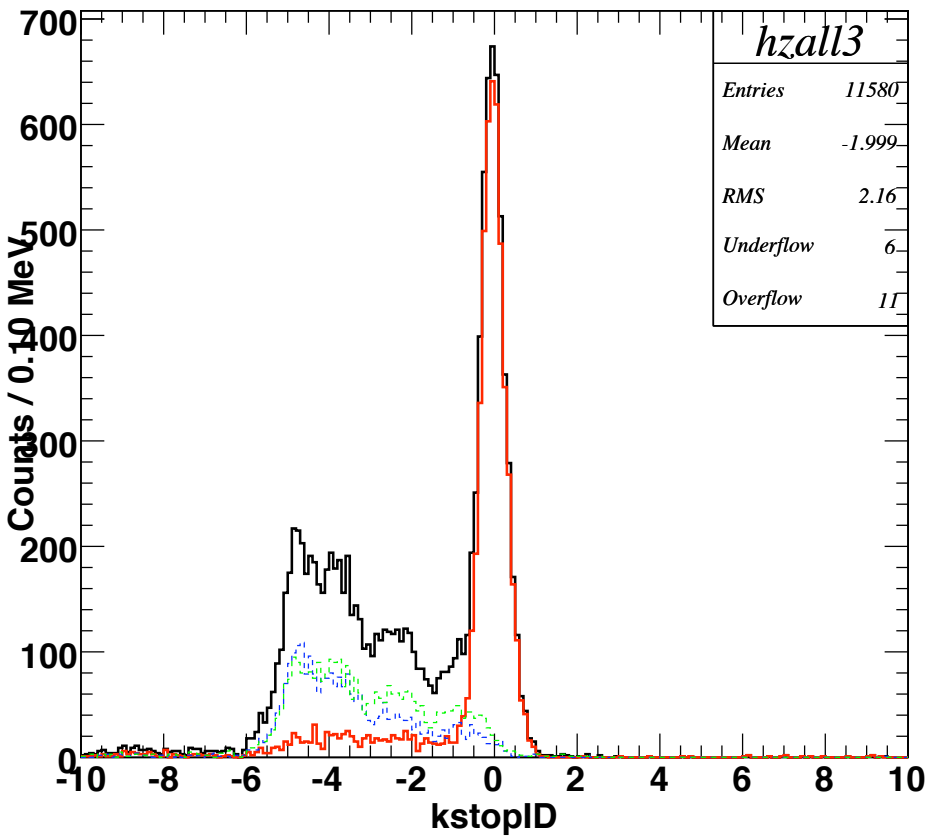
green: in-flight inelastic scattering

# Subtract type

kstopid z2




kstopid z3



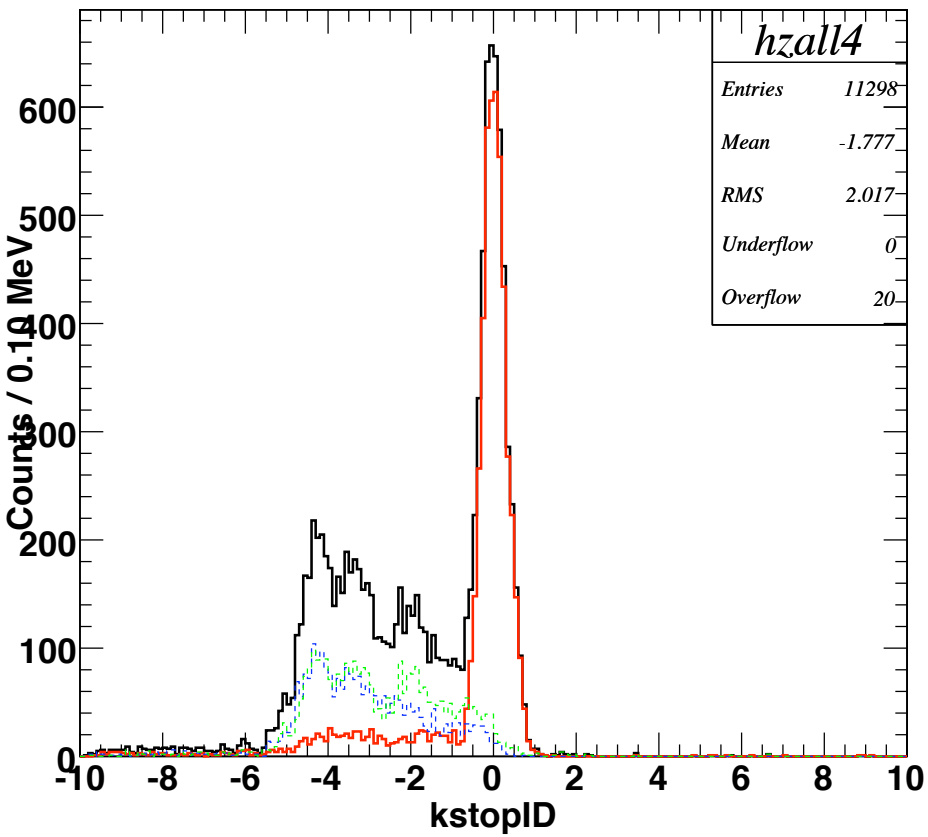

red: stop

blue: in-flight decay

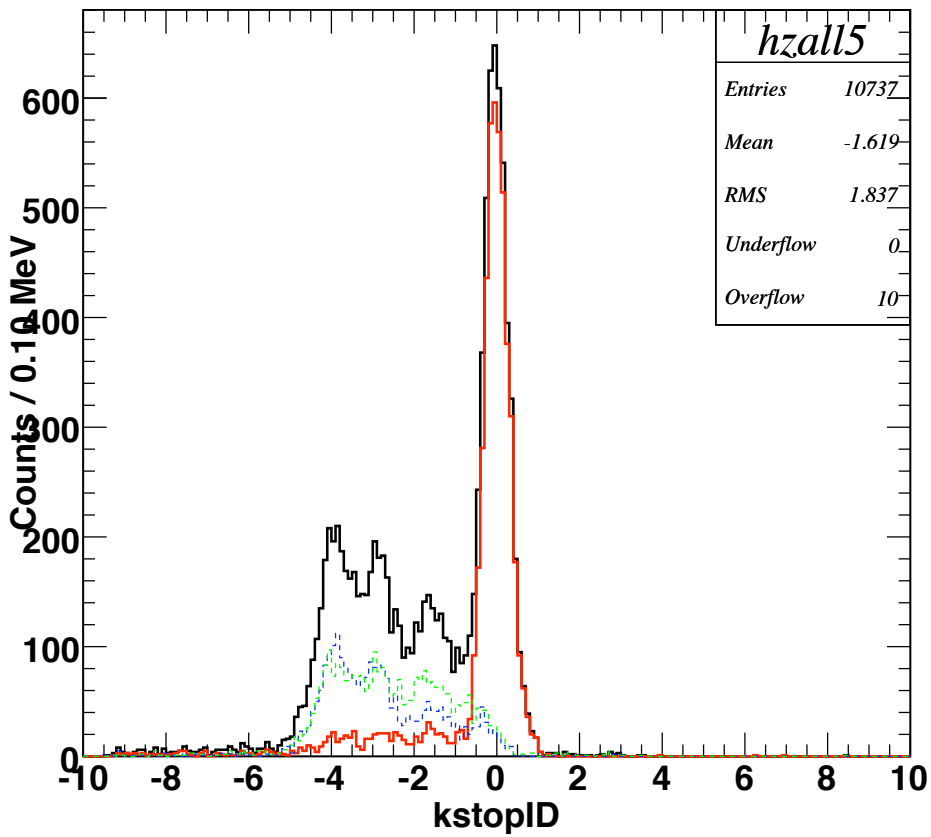
green: in-flight inelastic scattering

# Subtract type

kstopid z4




kstopid z5



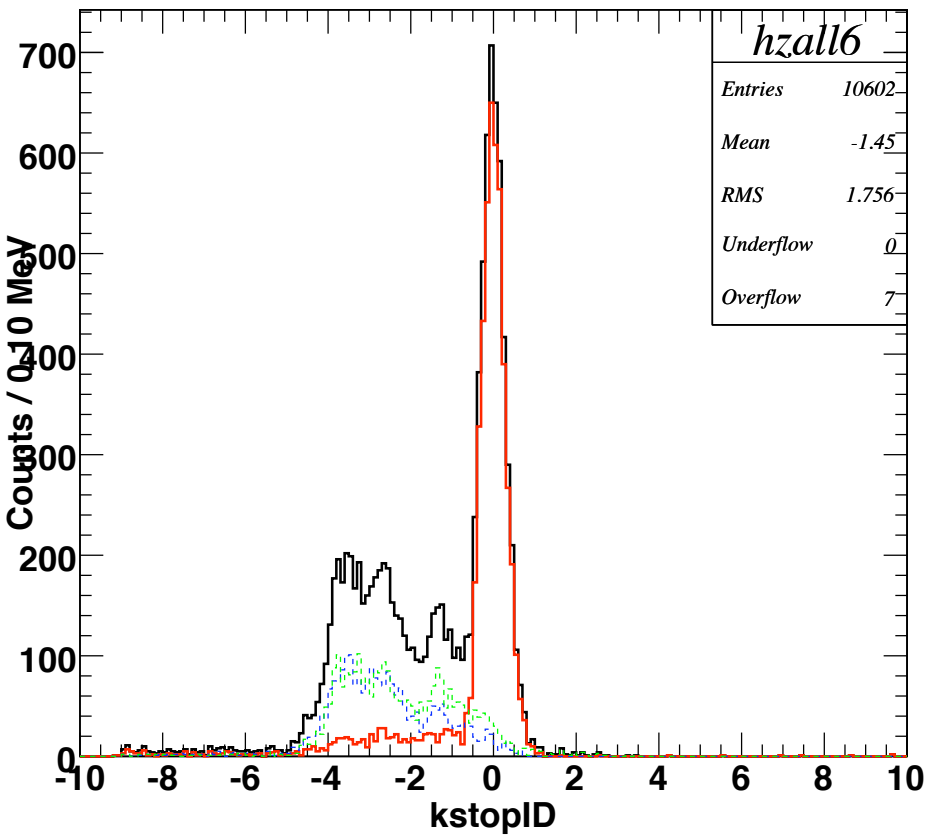

red: stop

blue: in-flight decay

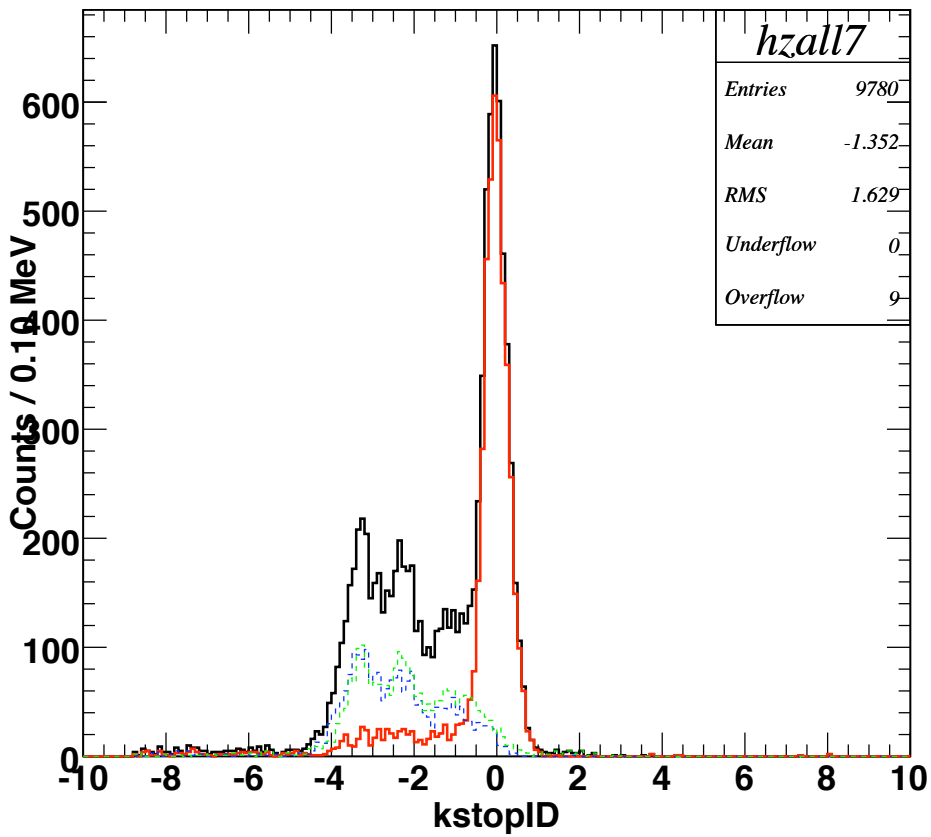
green: in-flight inelastic scattering

# Subtract type

kstopid z6




kstopid z7



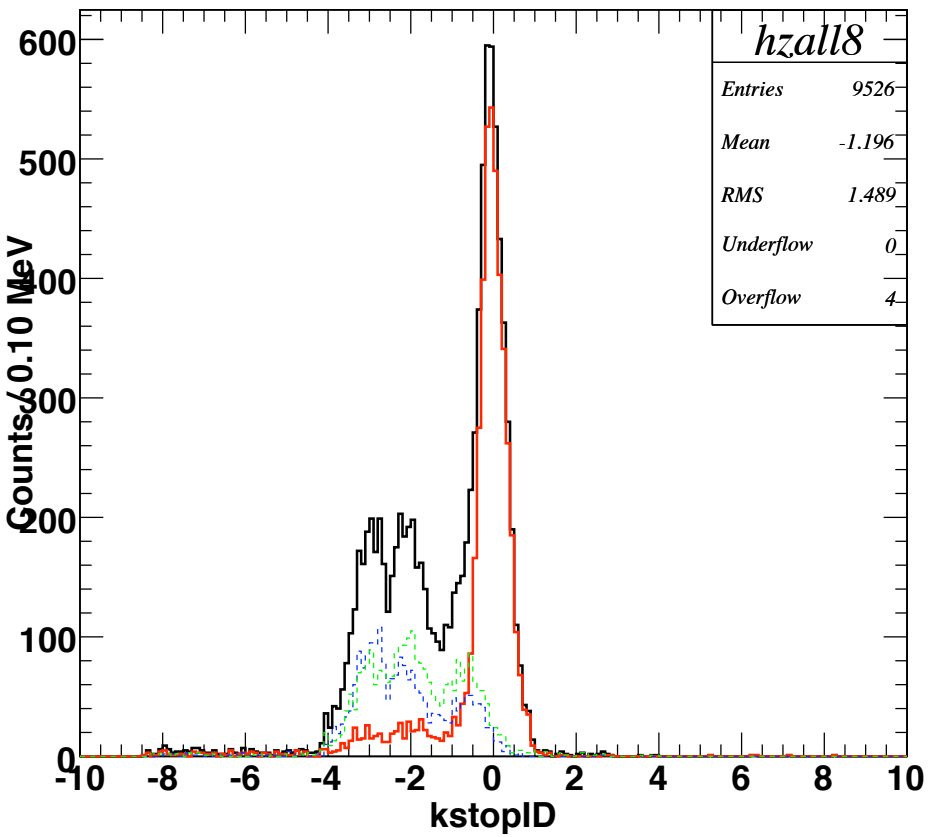

red: stop

blue: in-flight decay

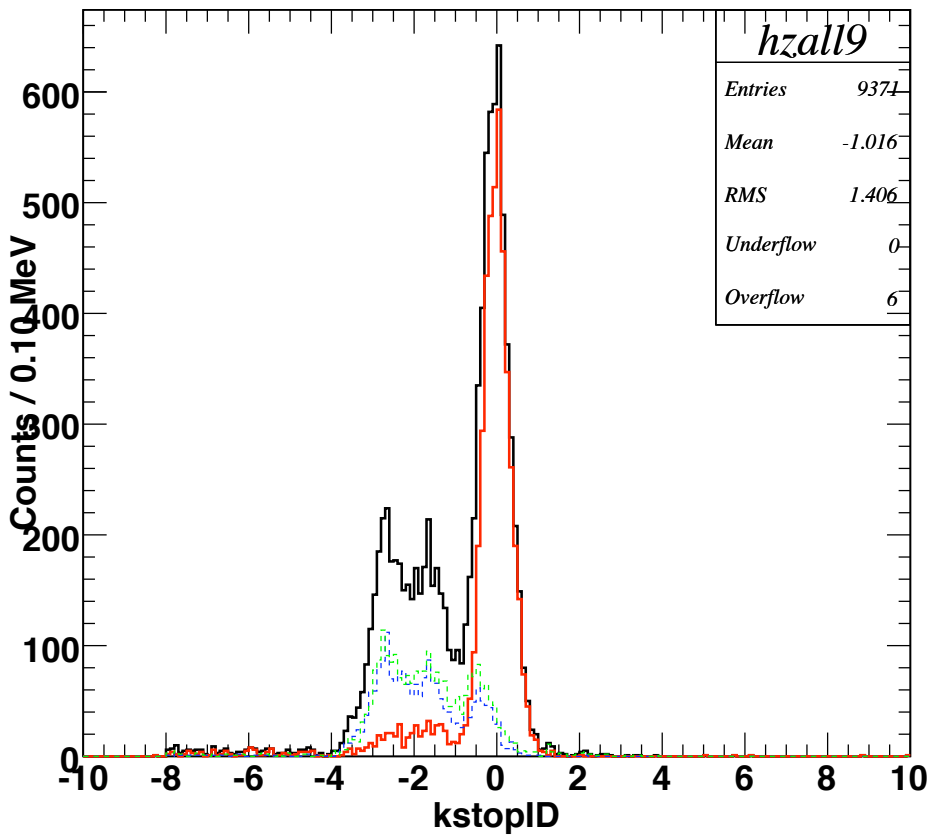
green: in-flight inelastic scattering

# Subtract type

kstopid z8




kstopid z9




red: stop

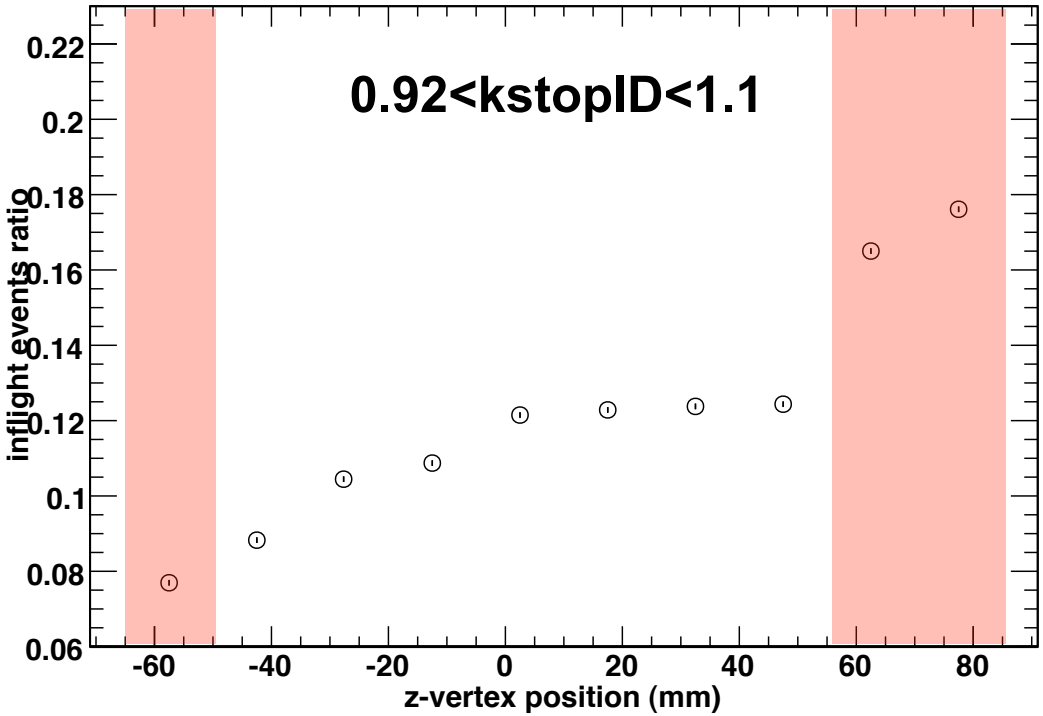
blue: in-flight decay

green: in-flight inelastic scattering

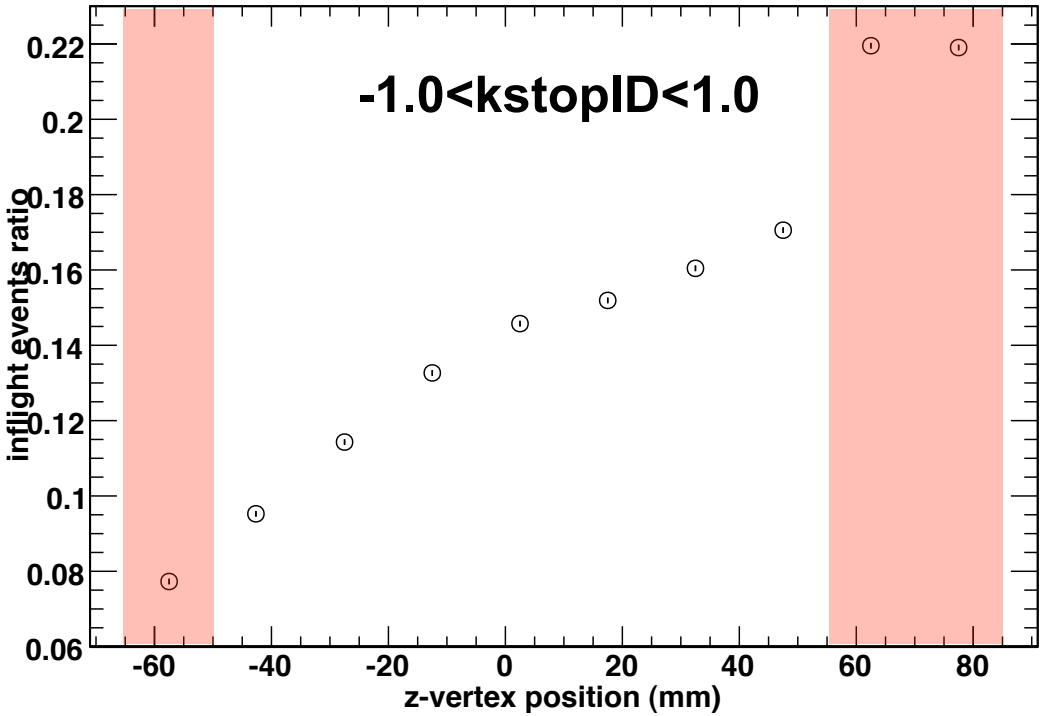
# In-flight events ratio

**in-flight ratio = (decay+inelastic)/(all)**

**Divide type**




**subtract type**




Geometrical bugs remain in these red regions , to be fixed...

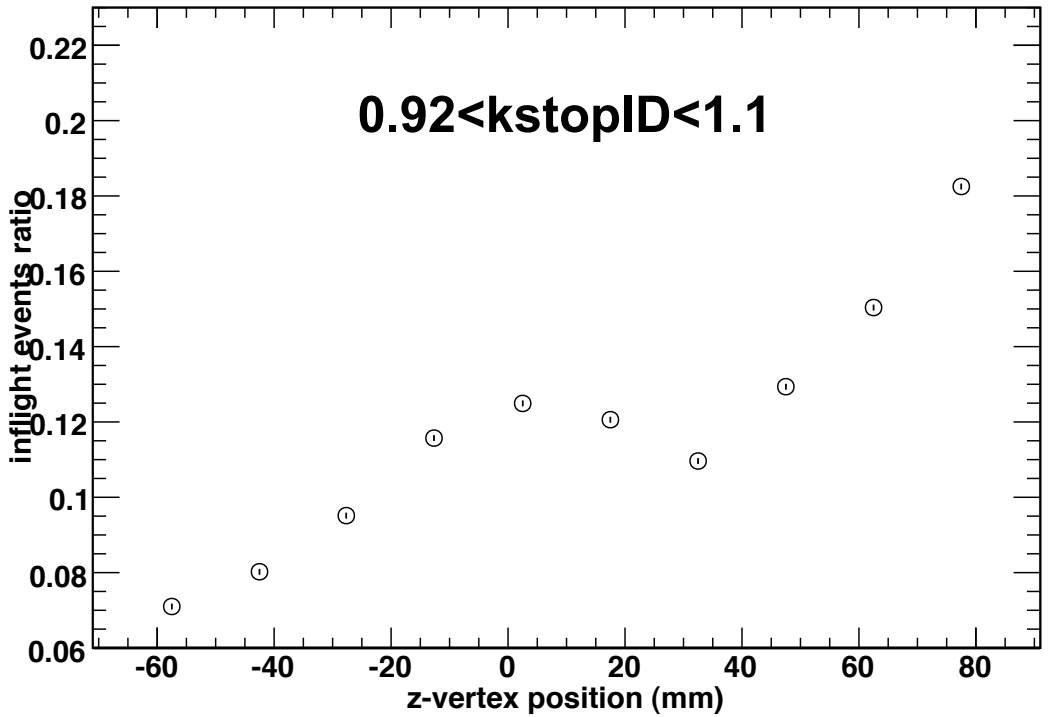
Note: energy resolution and acceptance was not included !

: inelastic scattering rate is higher, must be corrected ....

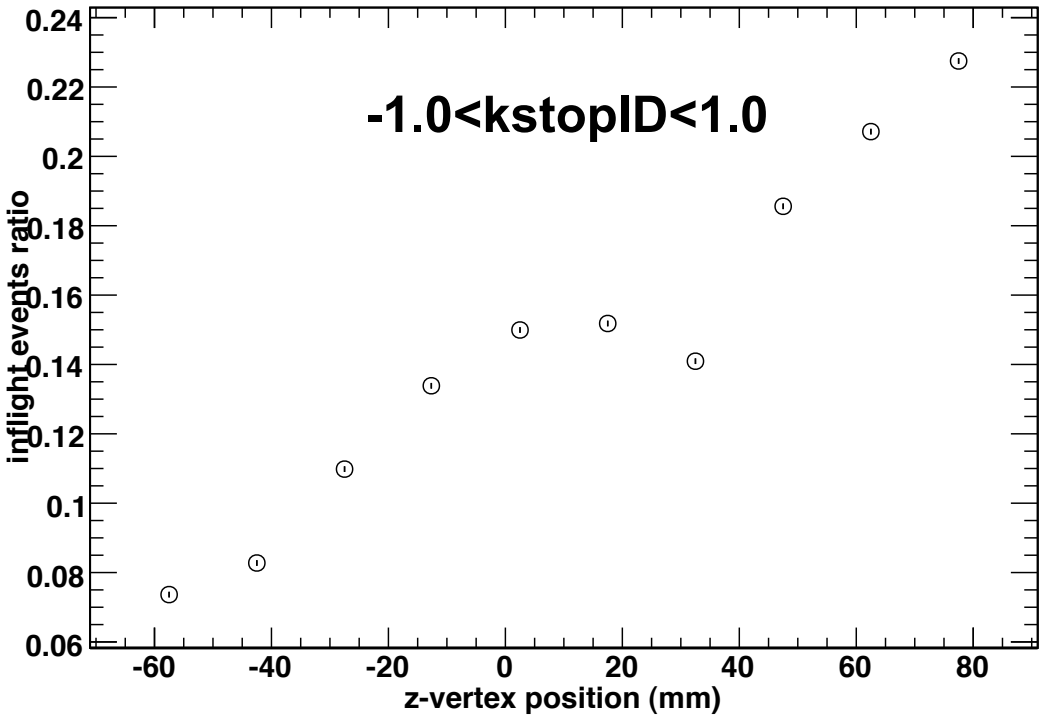
# In-flight events ratio (modified)

**in-flight ratio = (decay+inelastic)/(all)**

**Divide type (modified)**




**Subtract type (modified)**




Modified geometrical bugs ....

Note: energy resolution and acceptance was not included !

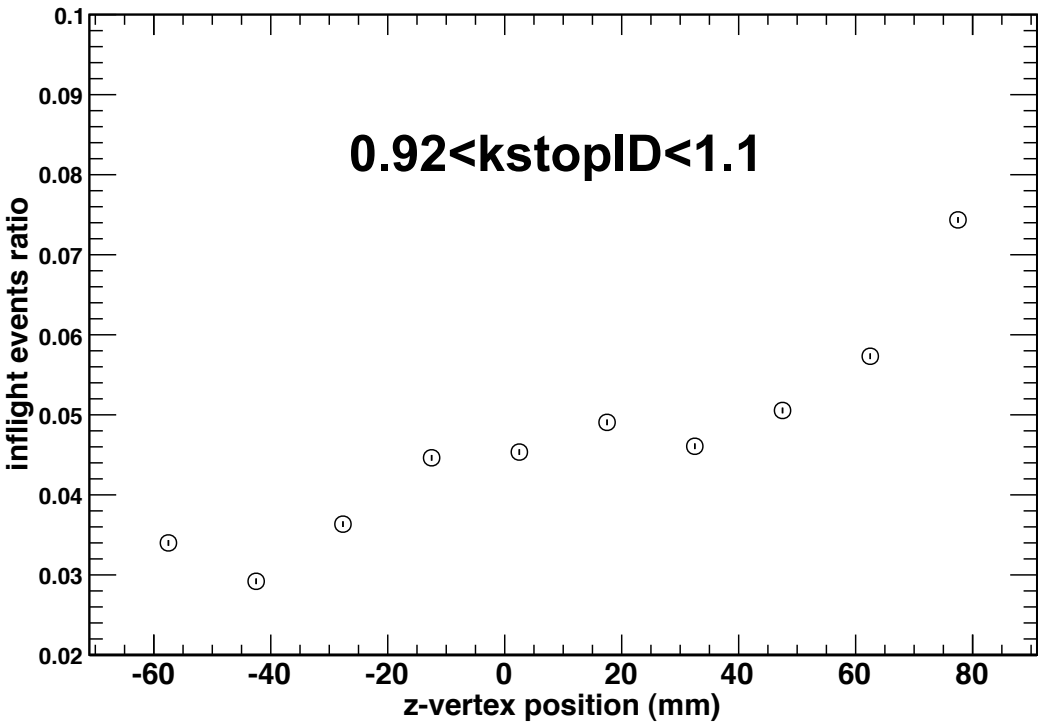
**: inelastic scattering rate is higher, must be corrected ....**

# In-flight events ratio (modified)

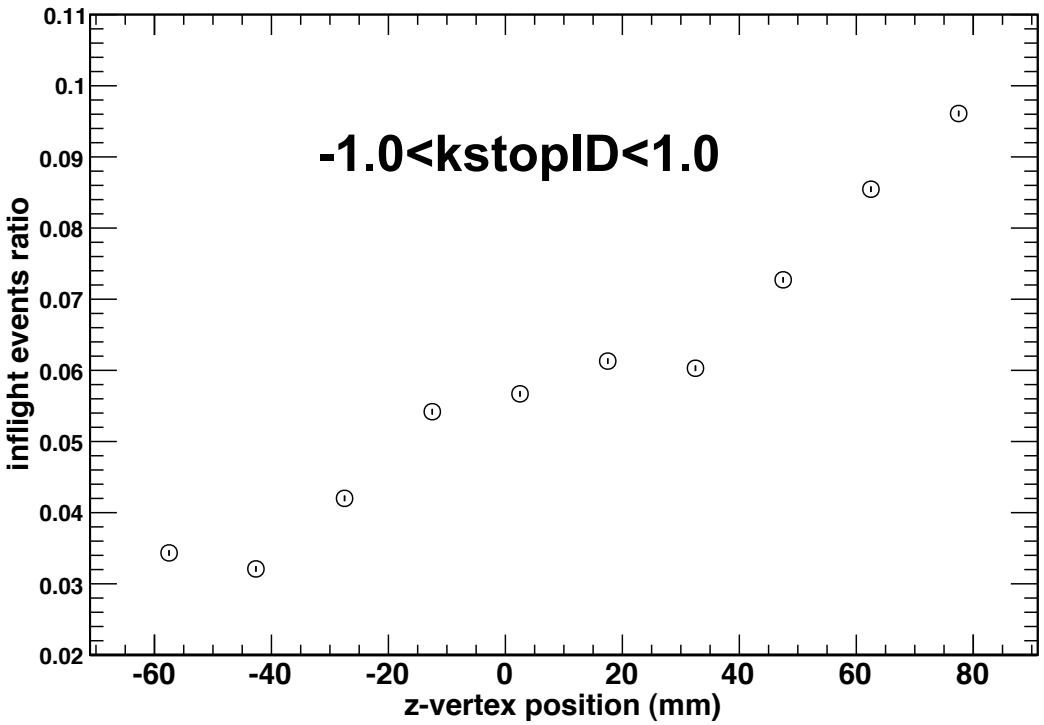
**in-flight ratio = (decay+inelastic)/(all)**

## K+ beam

**Divide type (K+ beam)**




**Subtract type (K+ beam)**



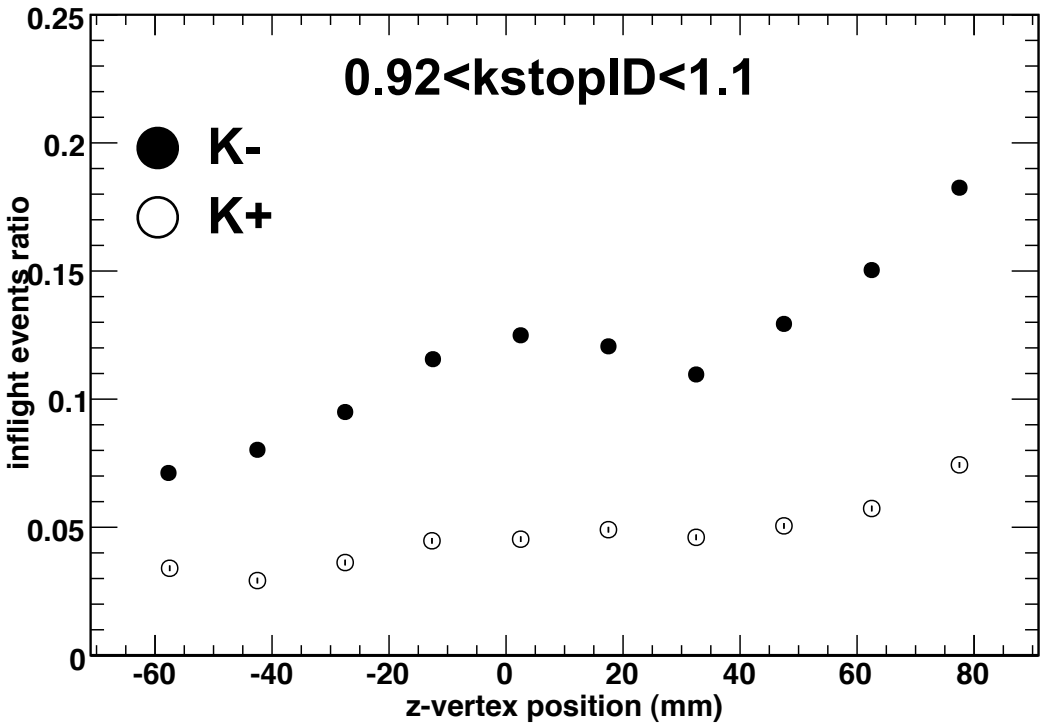

Note: energy resolution and acceptance was not included !

**: inelastic scattering rate is zero in the target**

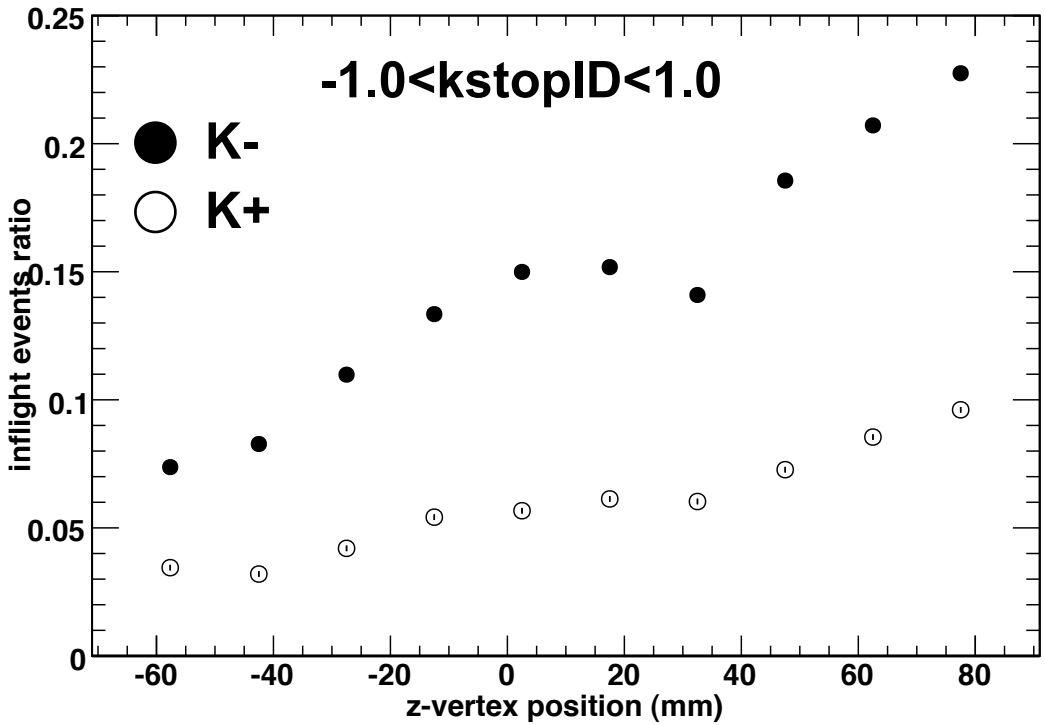
# In-flight events ratio (modified)

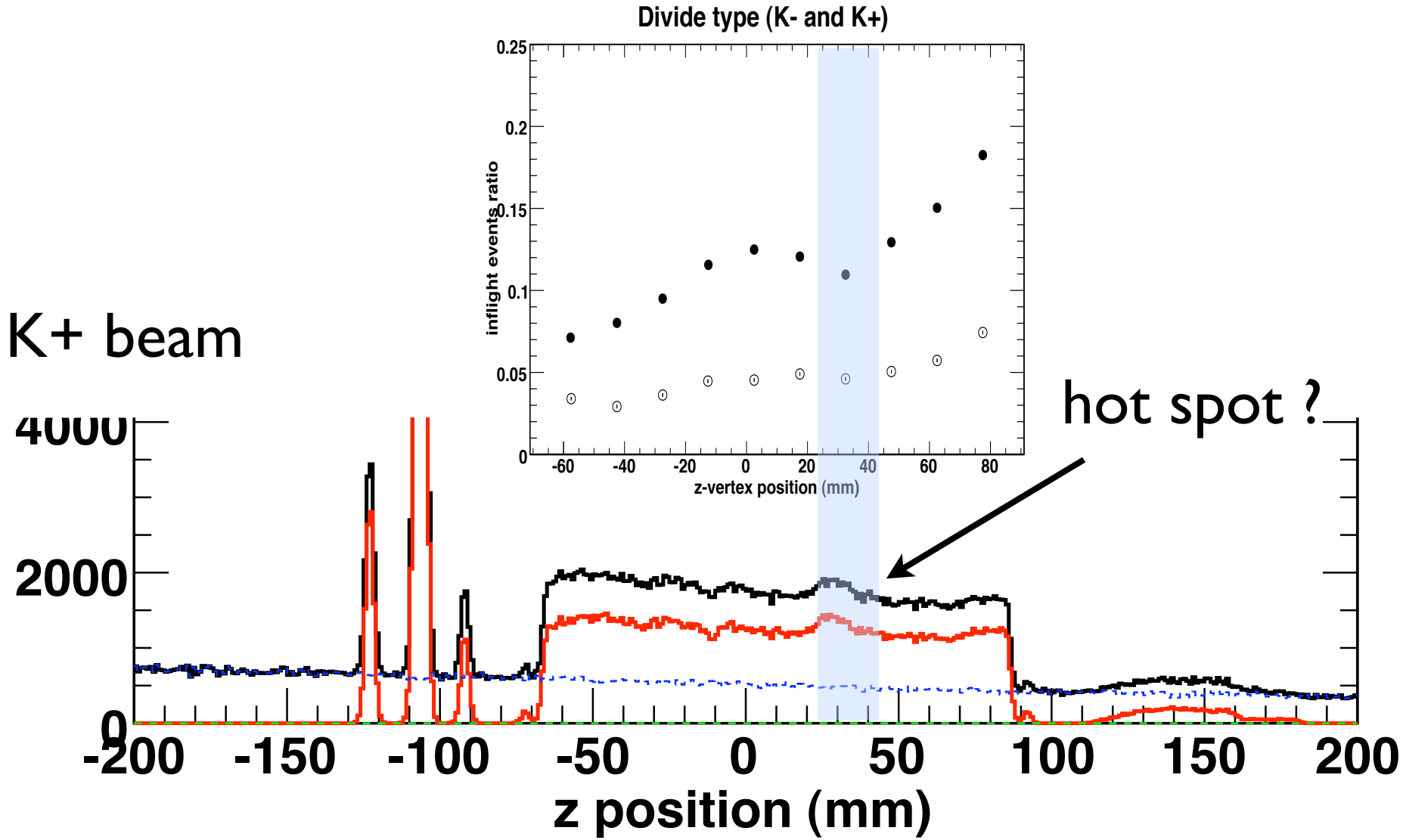
**in-flight ratio = (decay+inelastic)/(all)**

**Divide type (K- and K+)**




**Subtract type (K- and K+)**






target itself in this area ...

Why ?