J-PARC K1.8BRビームラインにおける 液体^{3}He標的へのK$^-$ビーム照射実験(5)

Study of the anti-kaon helium-3 interaction at the J-PARC K1.8BR beam line(5)

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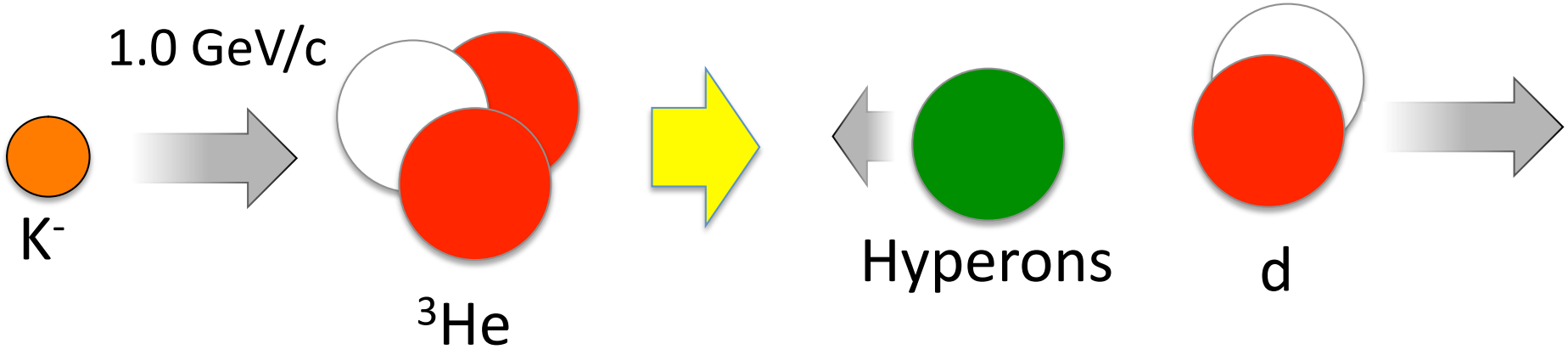
^{3}He(K^-, d) Analysis Motivation

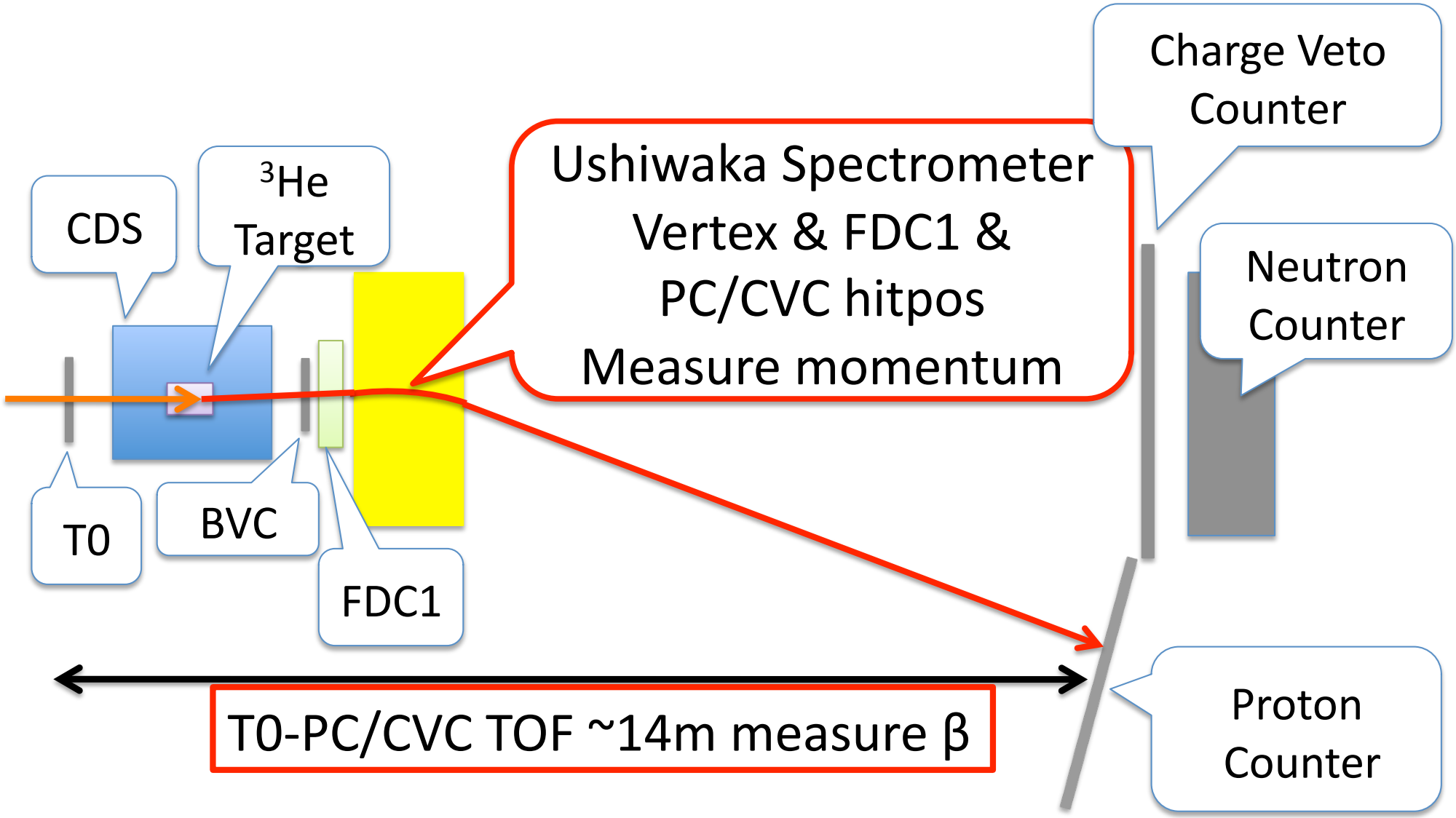
Was ^{3}He(K^-, d) reaction product hyperons?



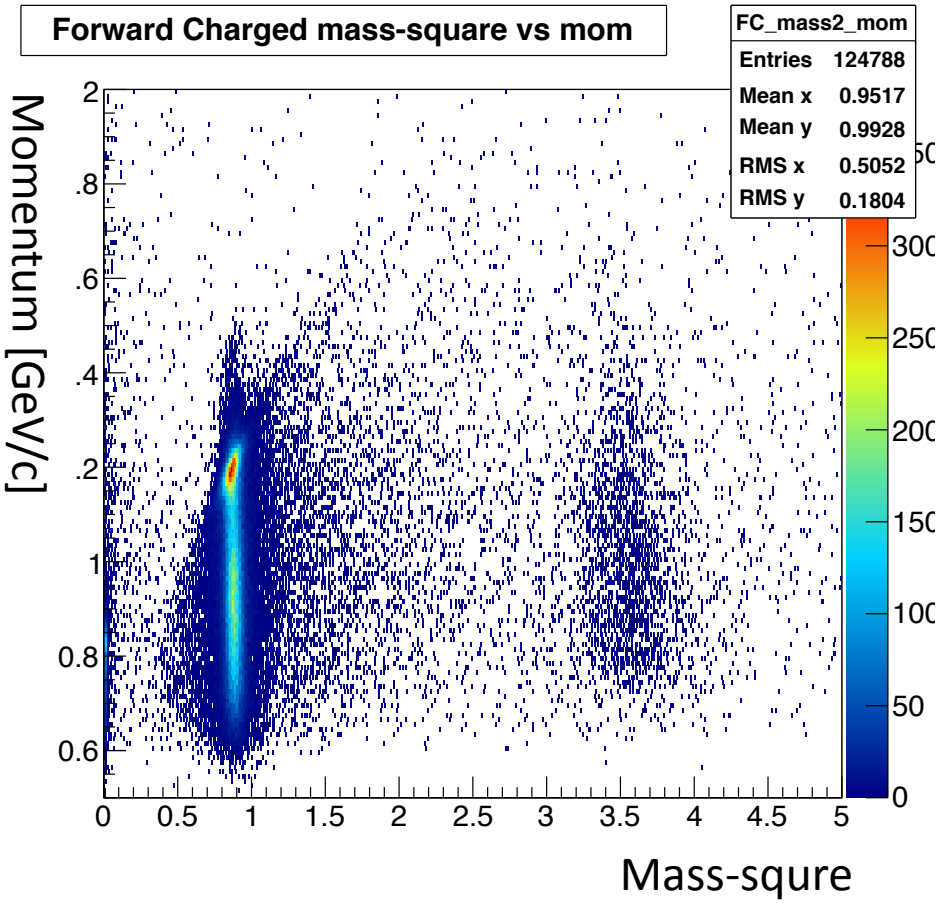
	Momnetum Transfer[GeV/c]	d momentum
Λ(1520)	0.4 GeV/c	~1.4 GeV/c
Λ(1405)	0.5 GeV/c	~1.5 GeV/c
Σ(1385)	0.55 GeV/c	~1.55 GeV/c

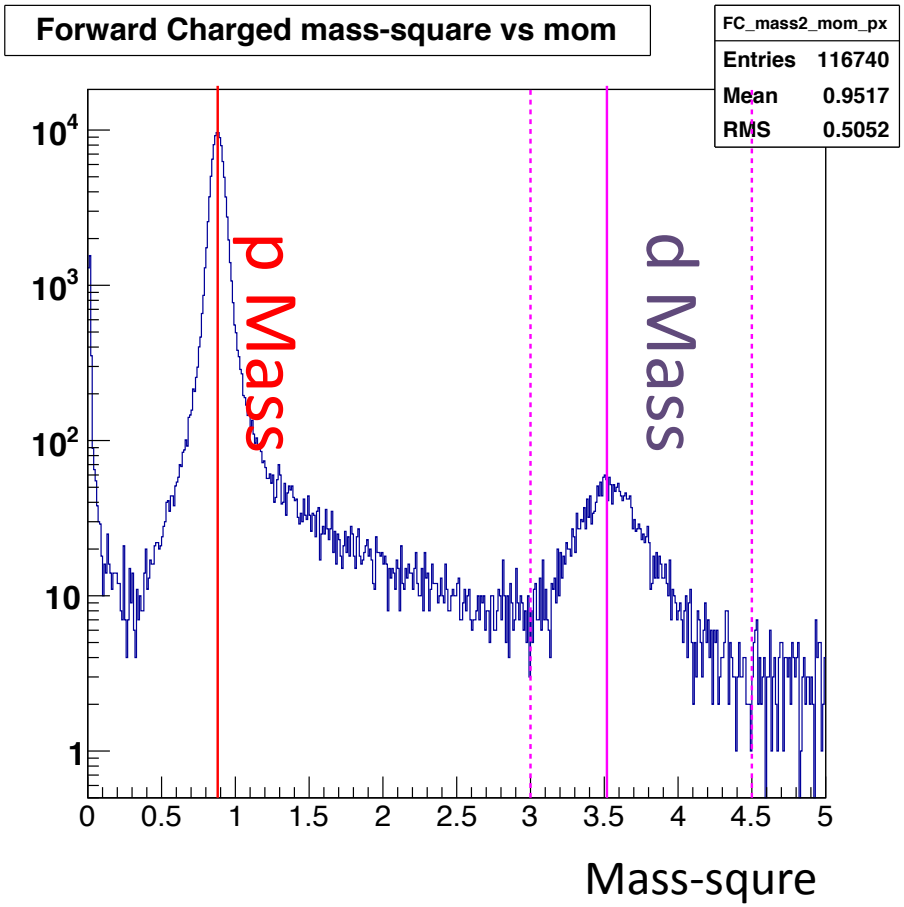
(@K^- 1.0GeV/c)

Set up for Forward Charged



Forward Charged PID

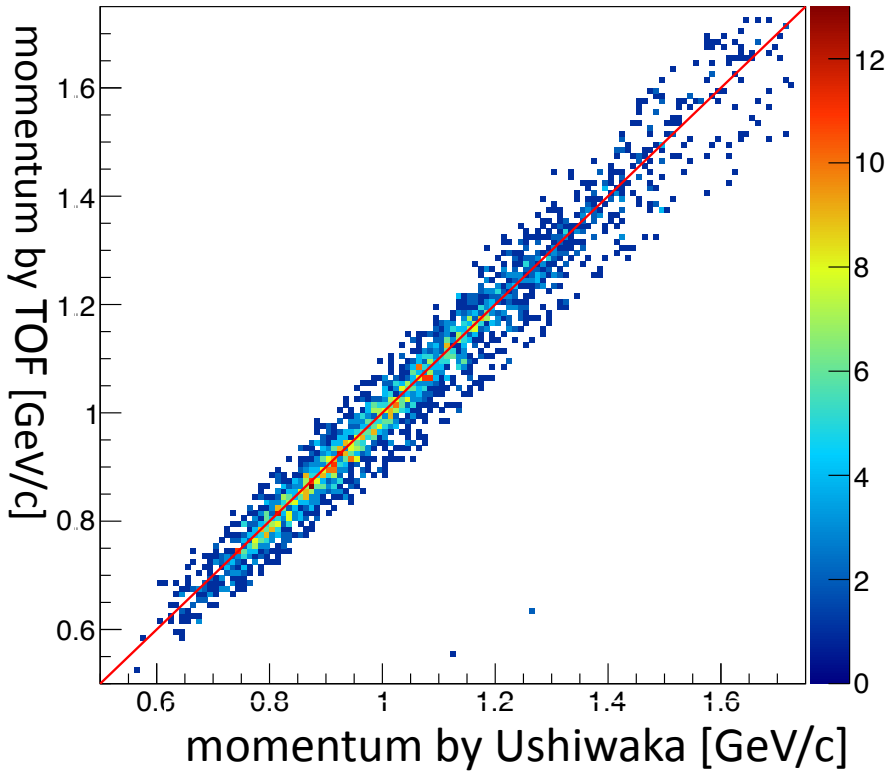




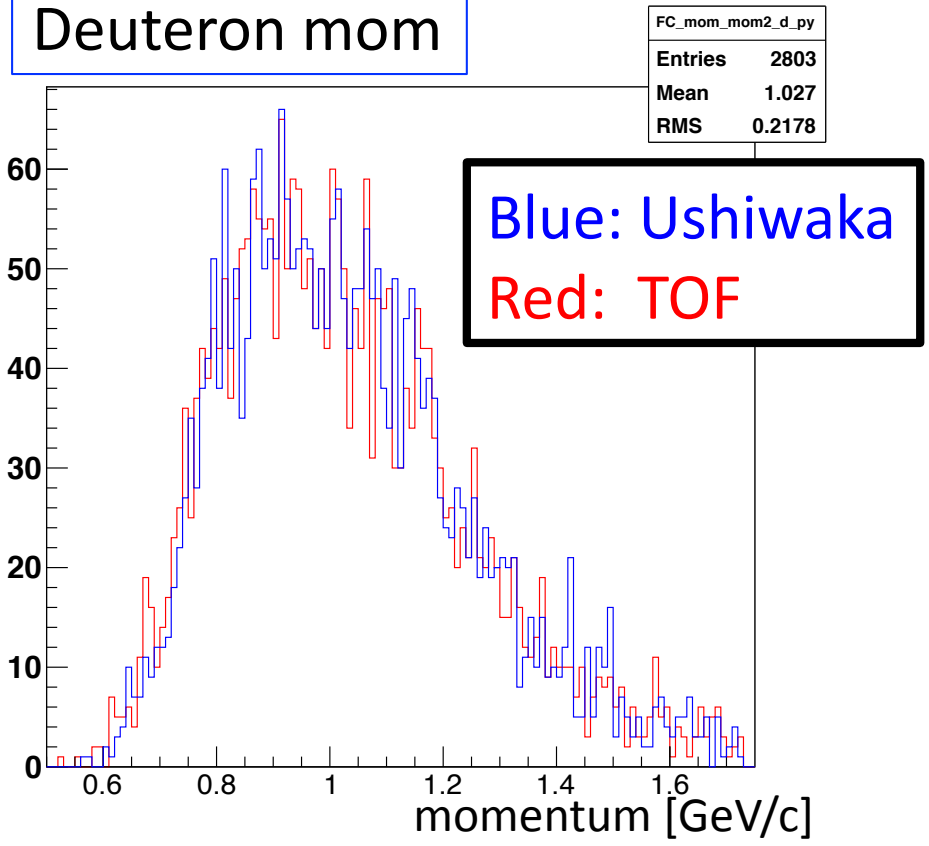
π, p & d was seen clearly.

Forward Deuteron Momentum

Deuteron mom uswk vs TOF



Deuteron mom

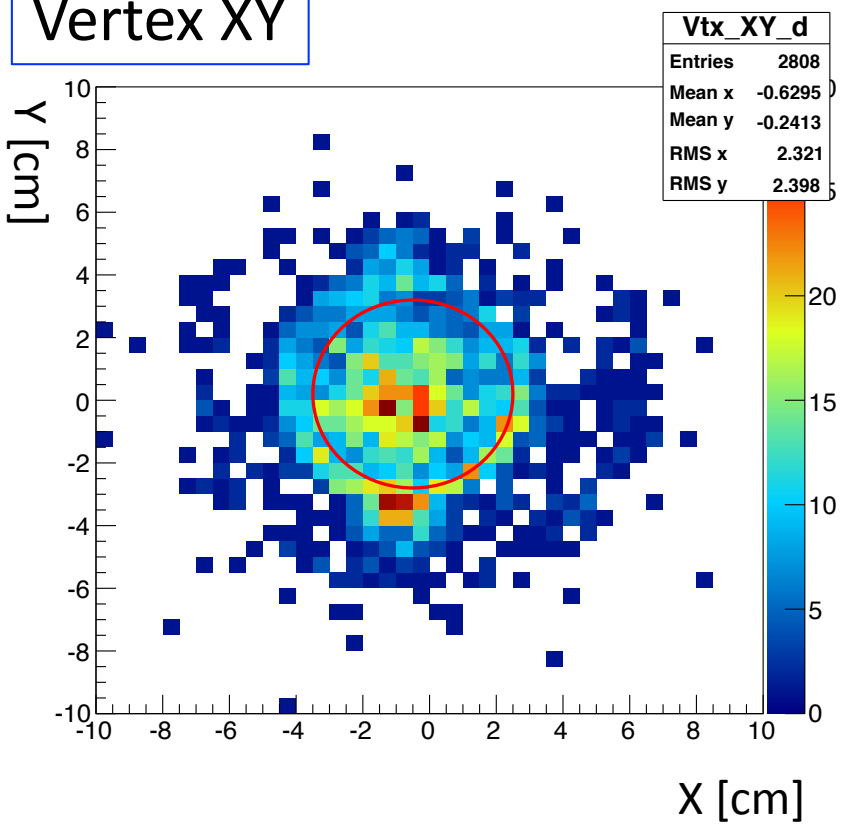


Momentum by TOF & Ushiwaka is almost same

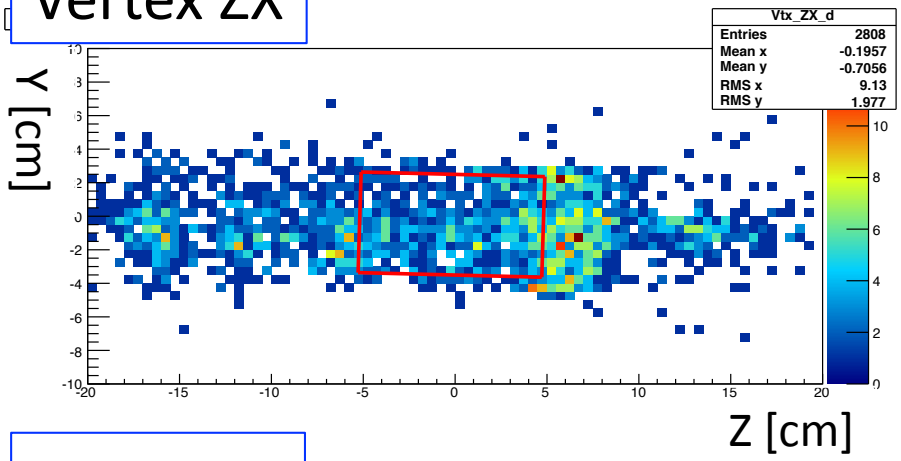
→Momentum analysis is OK

Vertex with Forward Deuteron

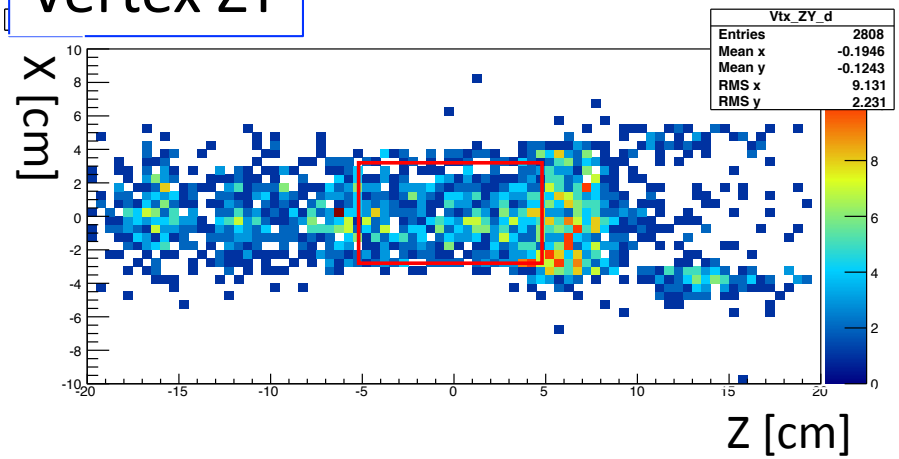
Vertex XY



Vertex ZX

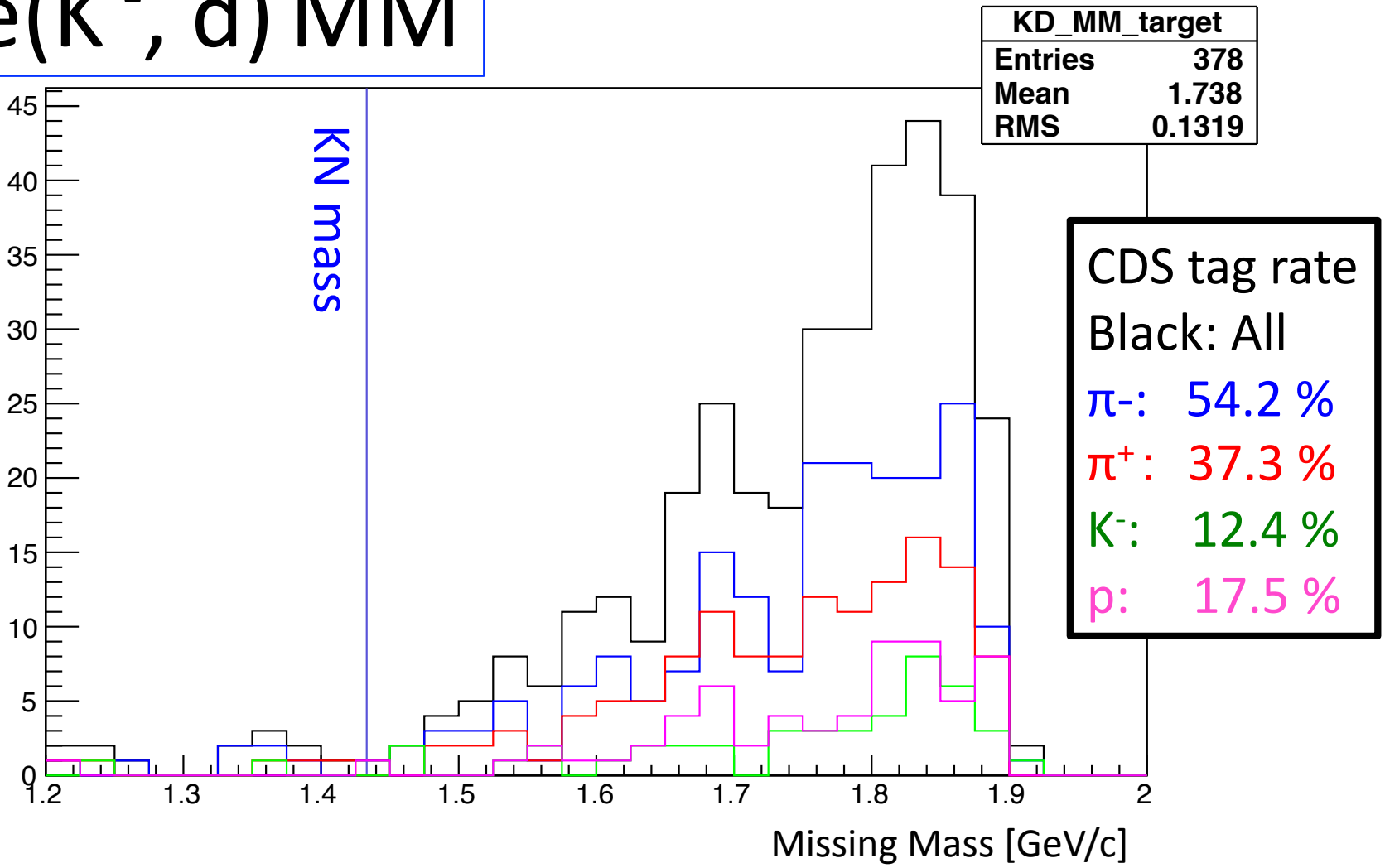


Vertex ZY



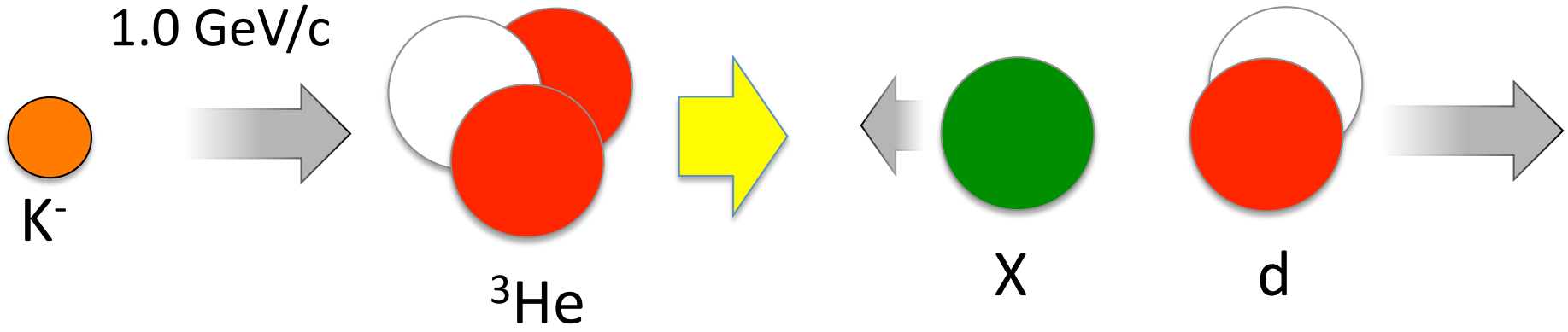
There are forward d events in target.

^{3}He(K$^-$, d) MM



The ^{3}He(K$^-$,d) Spectrum is dominant at around 1.8GeV/c.

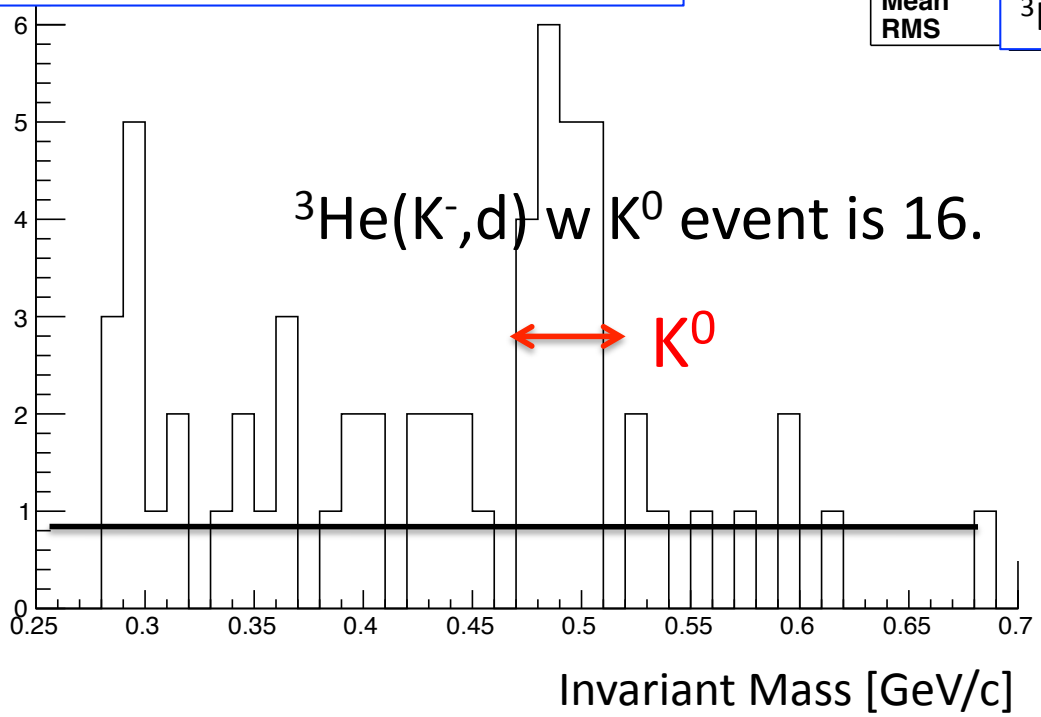
Missing mass



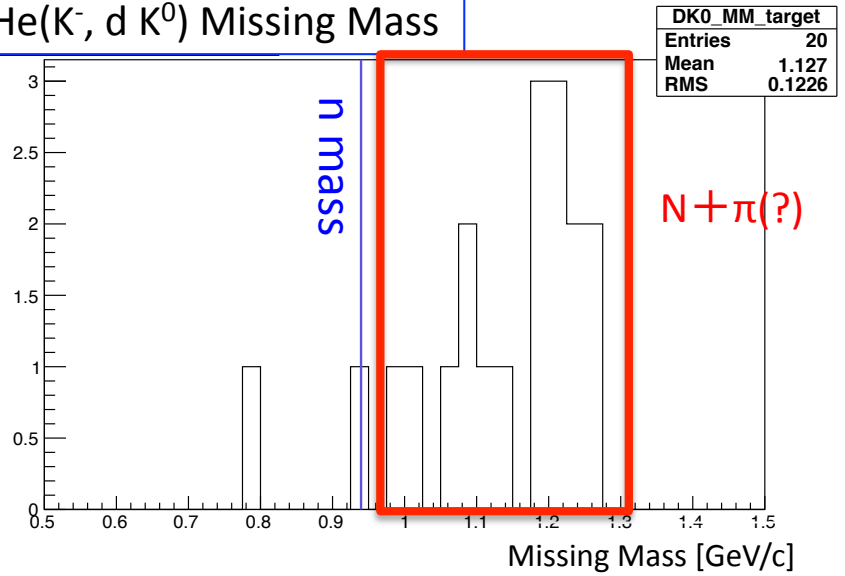
- Missing mass as large as deuteron mass.
- X must carry a strangeness.
- We checked Λ or K^0 associate w/ $^3He(K^-, d)$

CDS $\pi^+ \pi^-$ /w ^{3}He(K^-, d)

CDS $\pi^+ \pi^-$ IM w $d_{Forward}$



^{3}He(K^-, d K^0) Missing Mass



^{3}He(K^-,d K^0) "π" is dominant

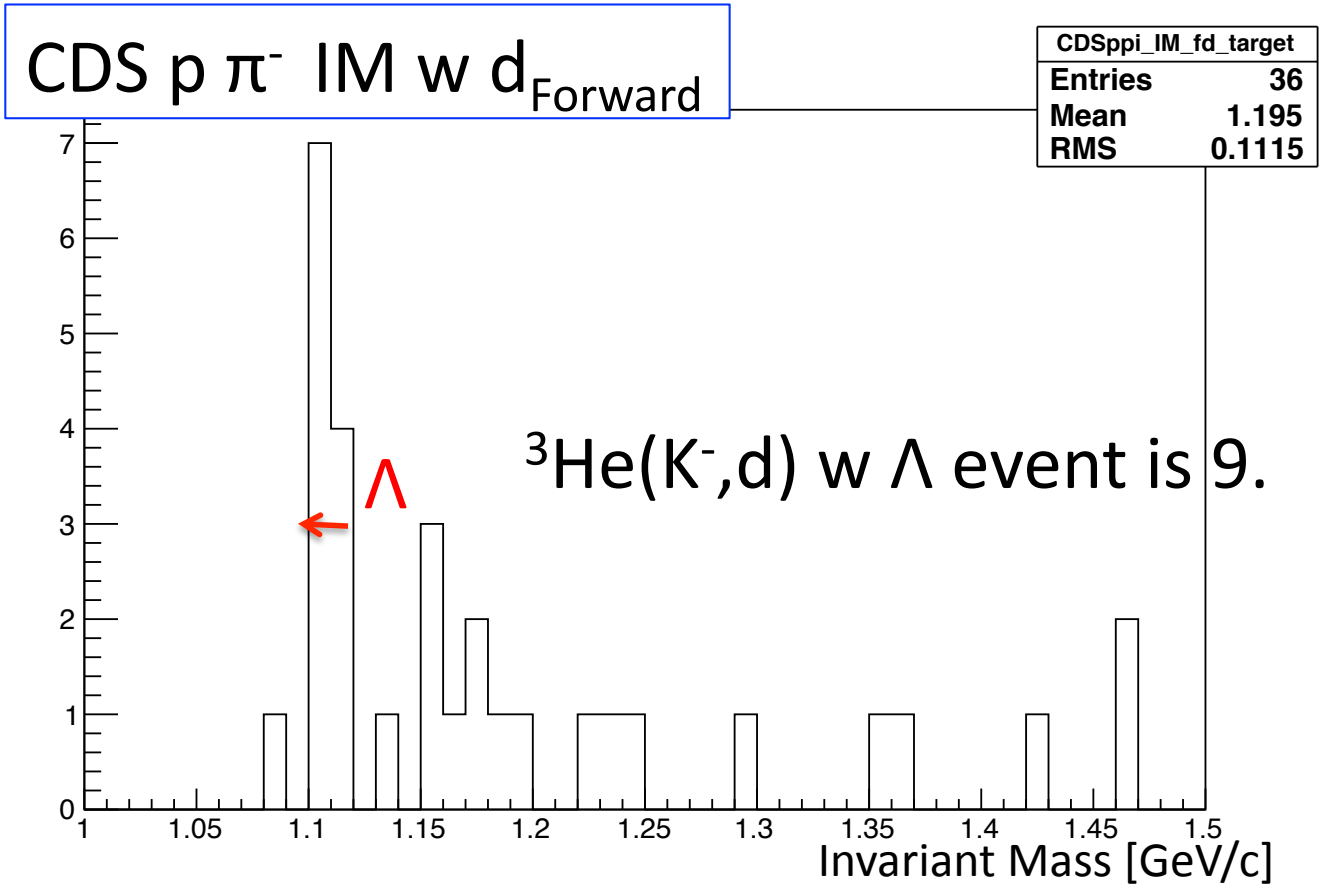
K^0 events very rough estimation

CDS Acceptance = 36～60%, $K^0_S \rightarrow \pi^+\pi^-$(69.2%), K^0_S:K^0_L=1:1

Tracking efficiency ~ 0.9

K^0 tag/^{3}He(K^-, d) = 28～42%

CDS p π^- /w ^{3}He(K^-, d)



Λ events very rough estimation

CDS Acceptance = 36～60%, Λ→pπ^-(64.2%)

Tracking efficiency ~ 0.9

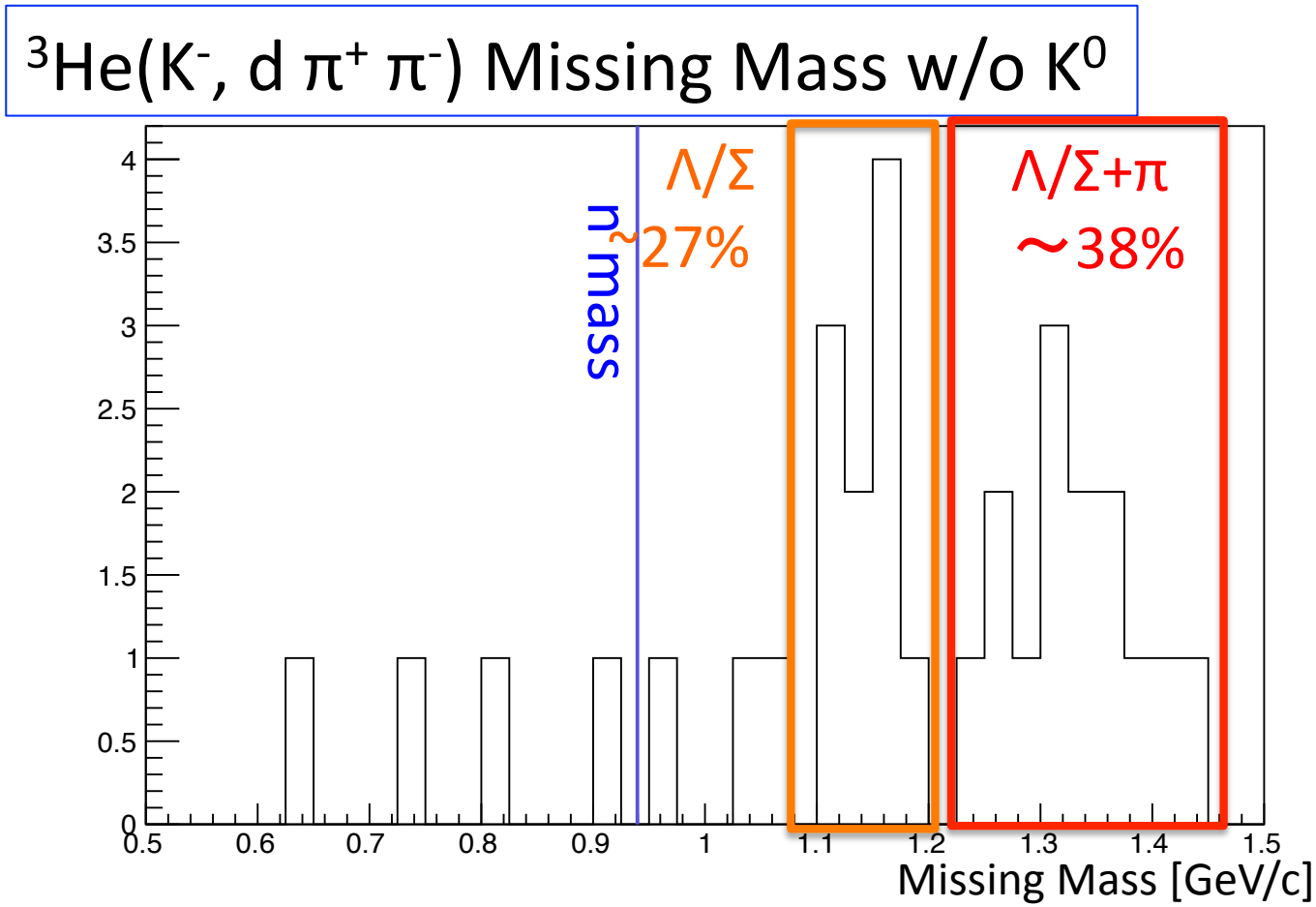
K^0 tag/^{3}He(K^-, d) = 8～13%

Summary

- Forward deuterons are seen clearly.
- The $^{3}He(K^{-}, d)$ MM spectrum is measured.
- The spectrum is dominant at around 1.8GeV/c^{2}.
- Missing particles are further decomposed
  $K^{0}+X$: 28～42%　X ~ Nπ seems dominant.
  $\Lambda+X$: 8～13%　X seems at least 2π.
- $^{3}He(K^{-}, d)$ reaction hardly explain by a simple d knock-out process.
  multi nucleon absorption process maybe considered.

Back up

^{3}He(K$^-$, d π^+ π^-) Missing Mass w/o K^0



There are some events around Λ/Σ mass.

There are some events around 1.35GeV/c^2.

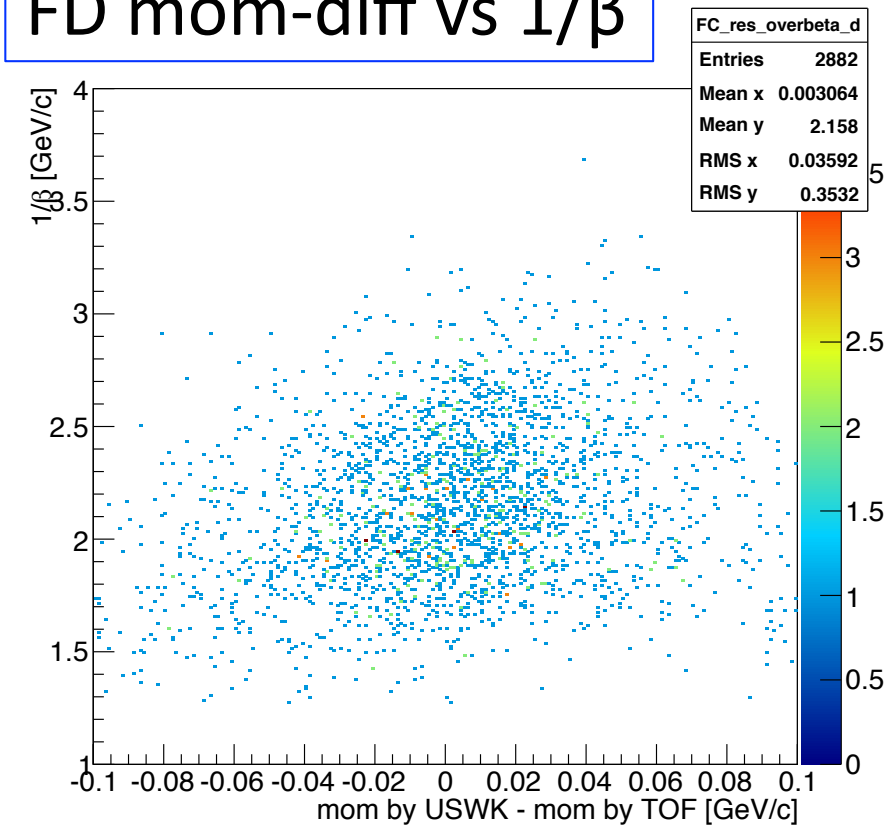
Back up Item

Λ(1600),Λ(1660),Λ(1670),Λ(1800),Λ(1810),Λ(1820),Λ(1830),Λ(1890)
Σ(1660),Σ(1670),Σ(1750),Σ(1775),Σ(1915)

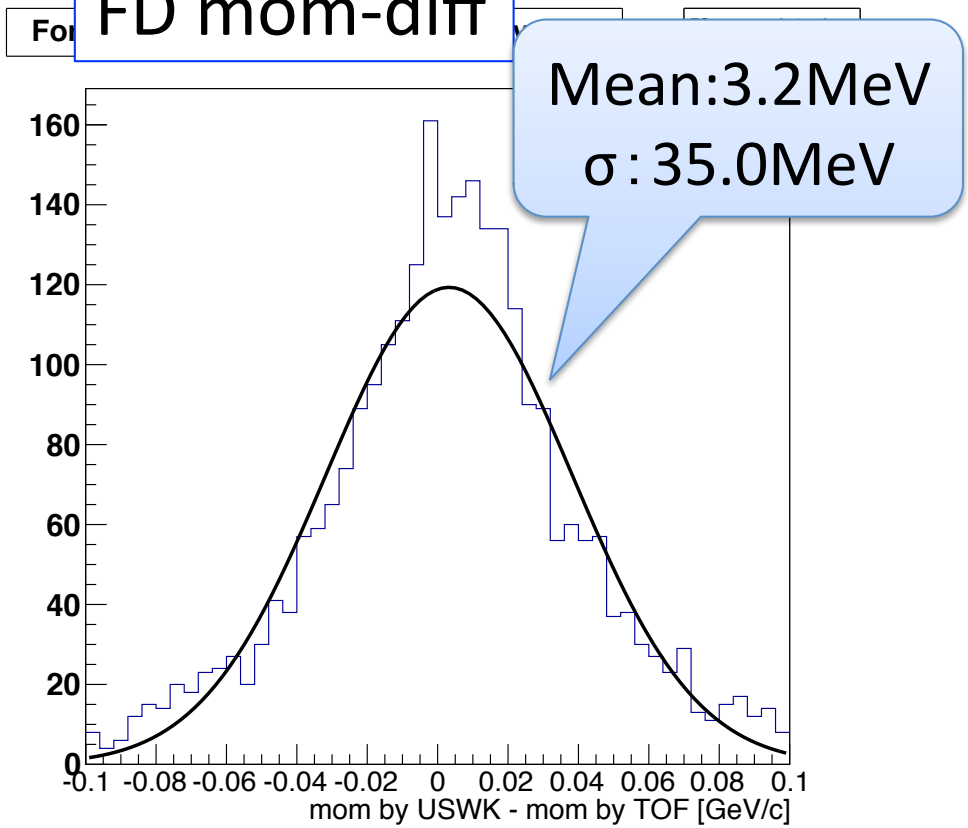
- Y*→πΣ、ππΣ
- Y*→πΛ、ππΛ
- Σ(1775)→πΛ(1520)　(π(K^0n or K^-p))
- Y*→NK (pK^- or nK^0)
- …more

Momentum resolution

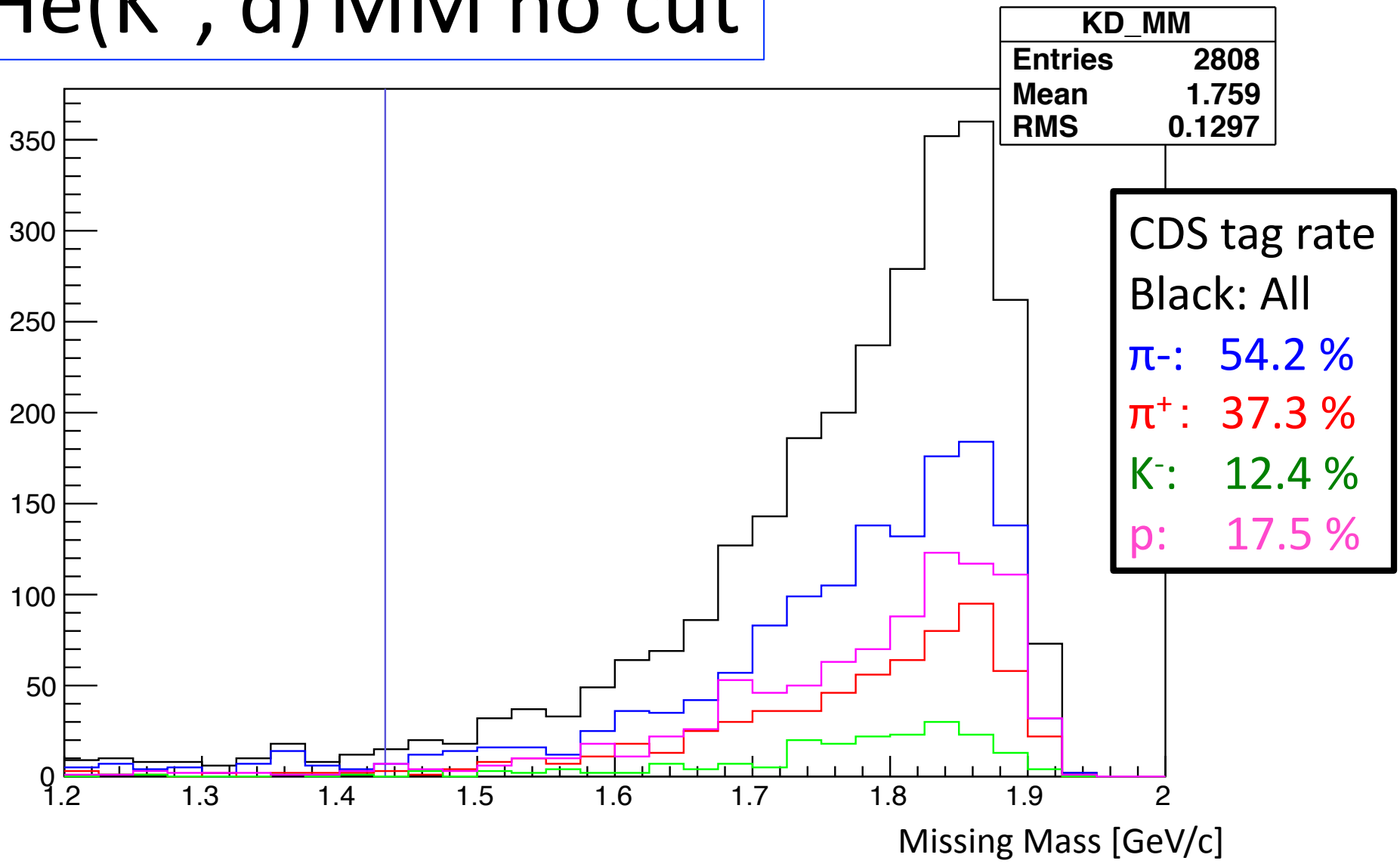
FD mom-diff vs 1/β



FD mom-diff

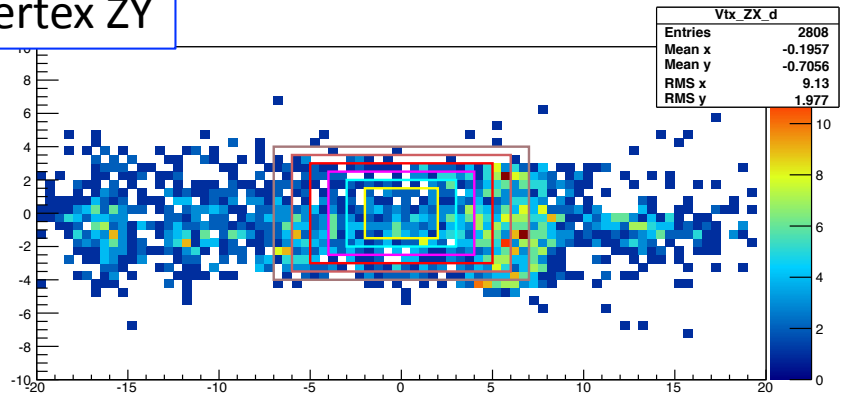


^{3}He(K^{-}, d) MM no cut



Forward d Vertex Cut

Vertex ZY



6. R=4.0cm Z=±7cm

5. R=3.5cm Z=±6cm

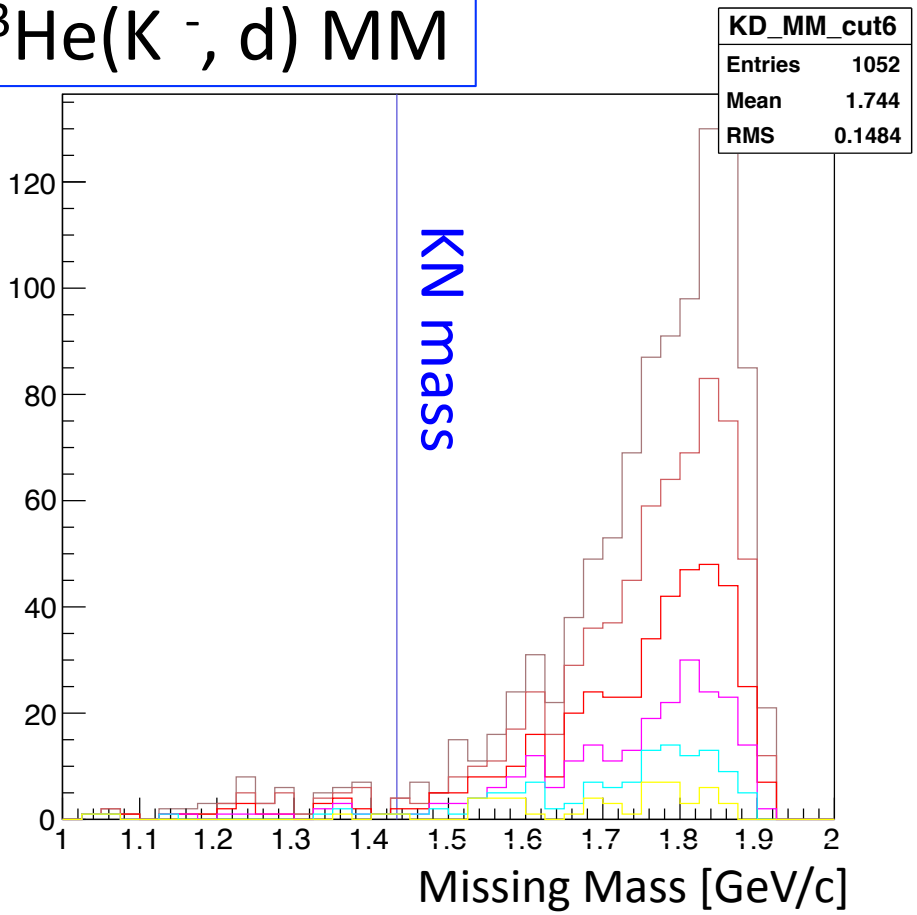
4. R=3.0cm Z=±5cm

3. R=2.5cm Z=±4cm

2. R=2.0cm Z=±3cm

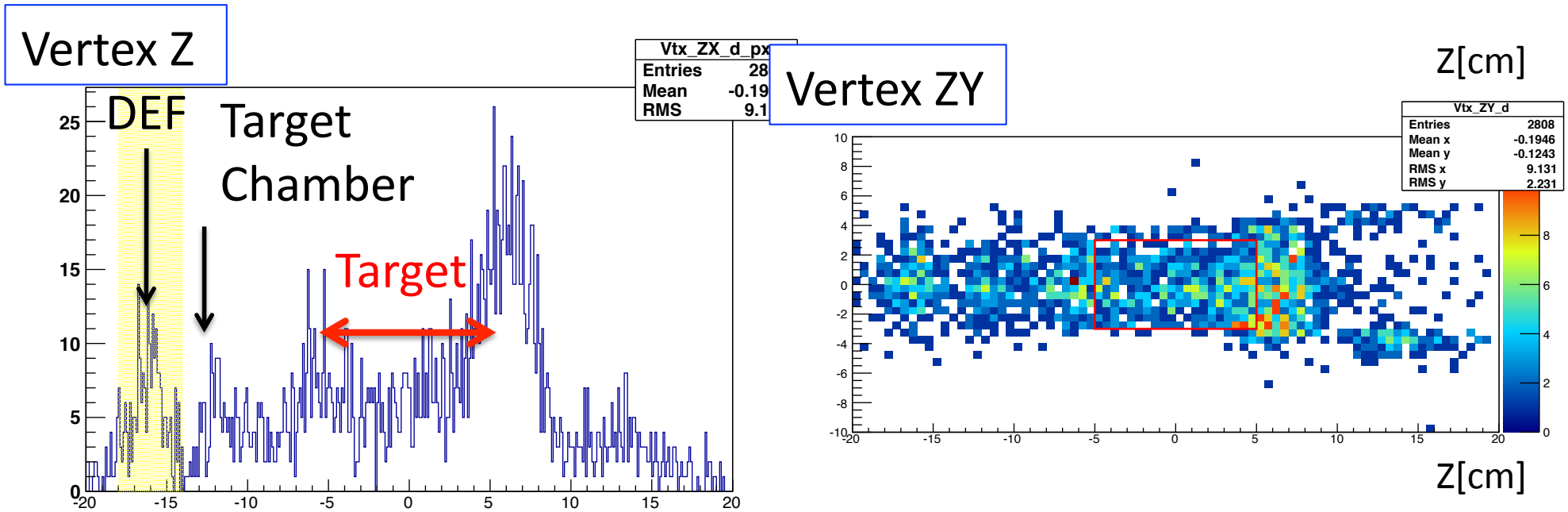
1. R=1.5cm Z=±2cm

^{3}He(K^{-}, d) MM



^{3}He(K^{-},d) MM don’t change by Vertex-cut.

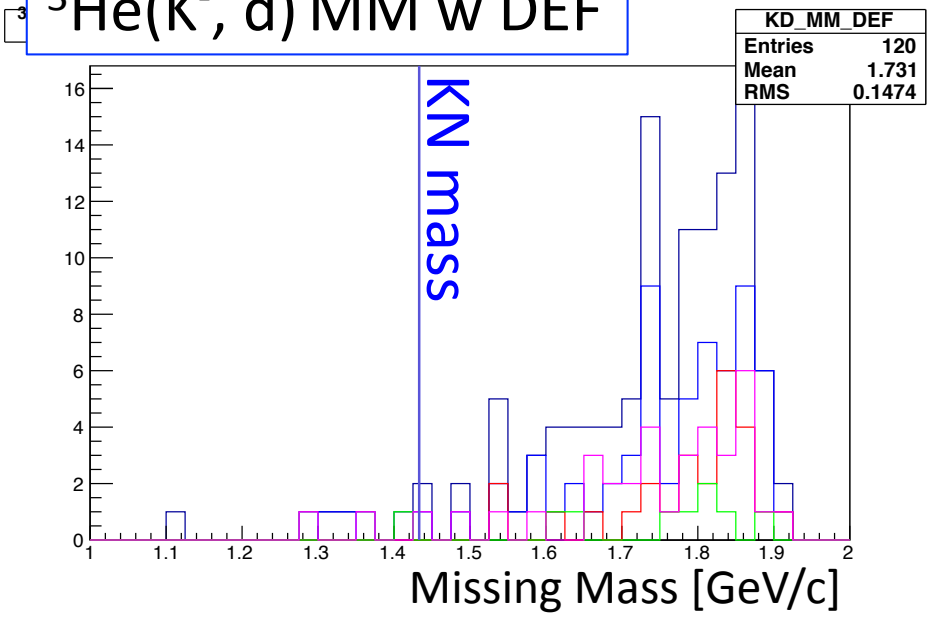
Vertex Cut with Target & DEF



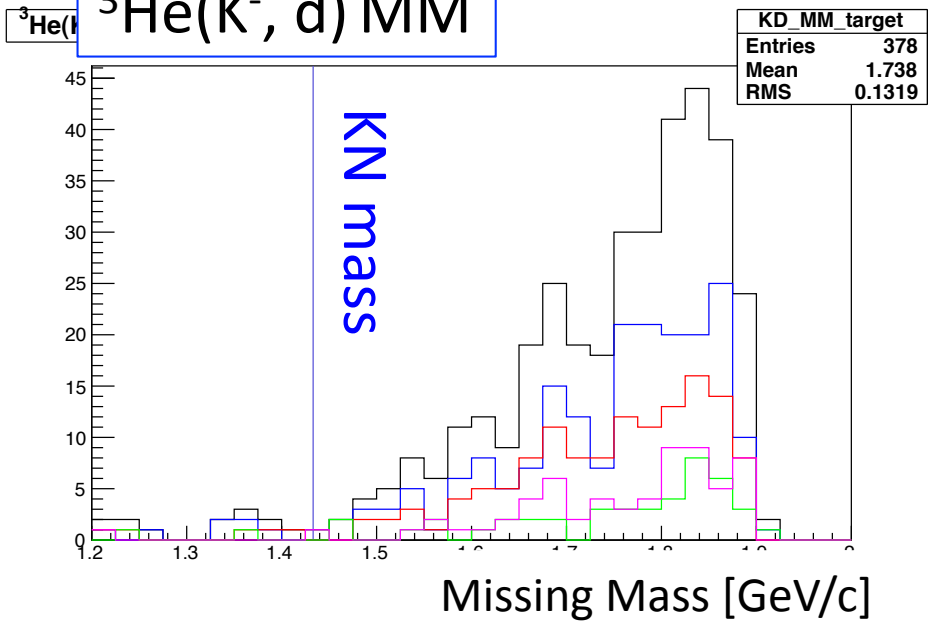
DEF is 0.3mm plastic scintilator was placated at 16.5cm upstream of ^{3}He target.

Compare ^{3}He & Plastic (DEF)

^{3}He(K$^-$, d) MM w DEF



^{3}He(K$^-$, d) MM



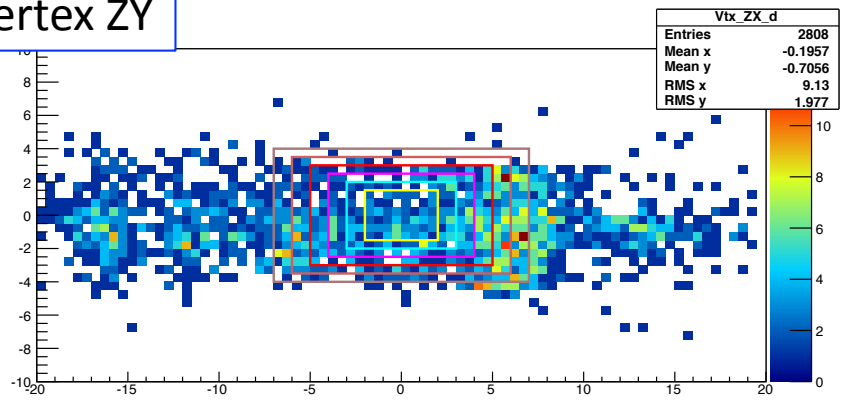
CDS tag	Target	DEF
π^-	54.2%	54.2%
π^+	37.3%	20.8%
K$^-$	12.4%	7.5%
p	17.5%	30%

^{3}He(K$^-$, d) MM is almost same ^{3}He & Plastic.

There are more CDS tagged events on DEF than ^{3}He

Forward d Vertex Cut

Vertex ZY



6. R=4.0cm Z=±7cm

5. R=3.5cm Z=±6cm

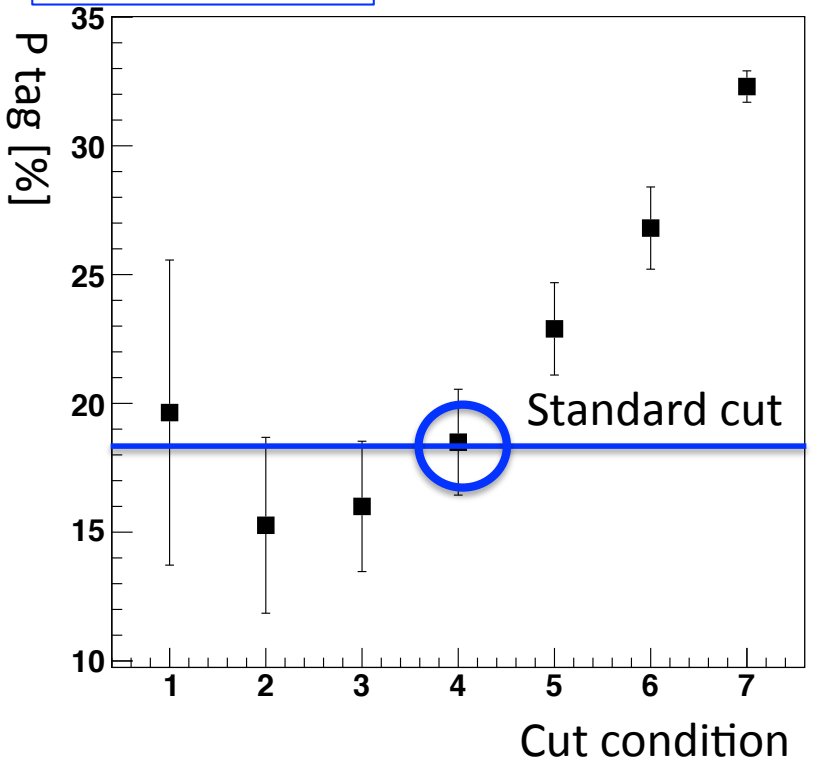
4. R=3.0cm Z=±5cm

3. R=2.5cm Z=±4cm

2. R=2.0cm Z=±3cm

1. R=1.5cm Z=±2cm

P tag rate

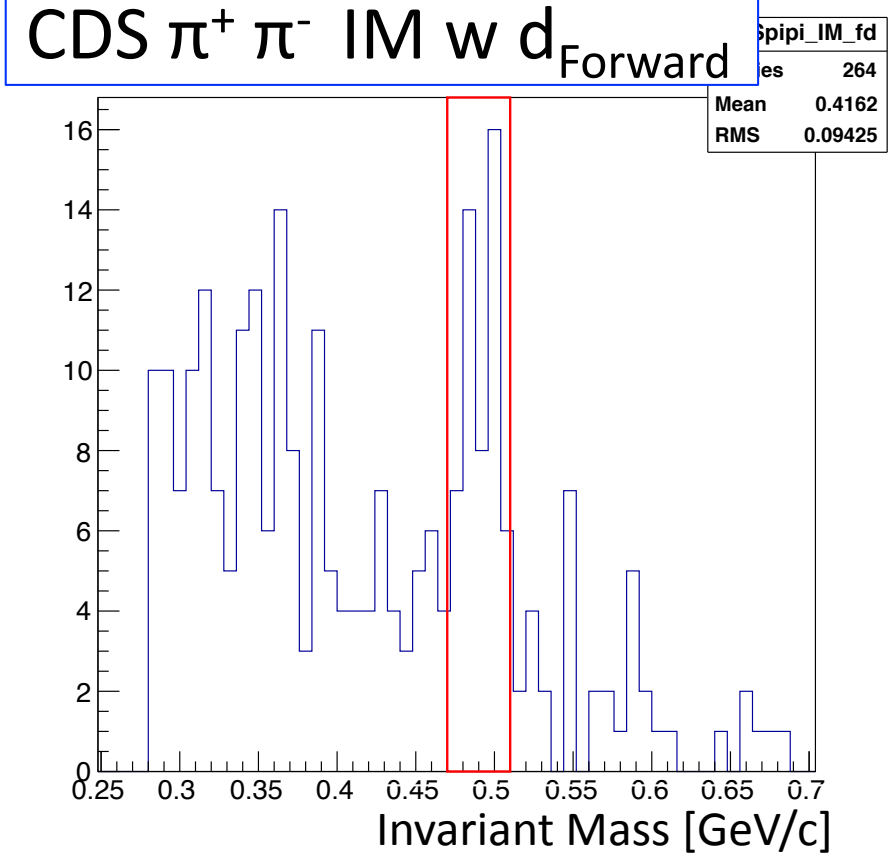


On ^{3}He target, CDS tag rate is about 15~20%.

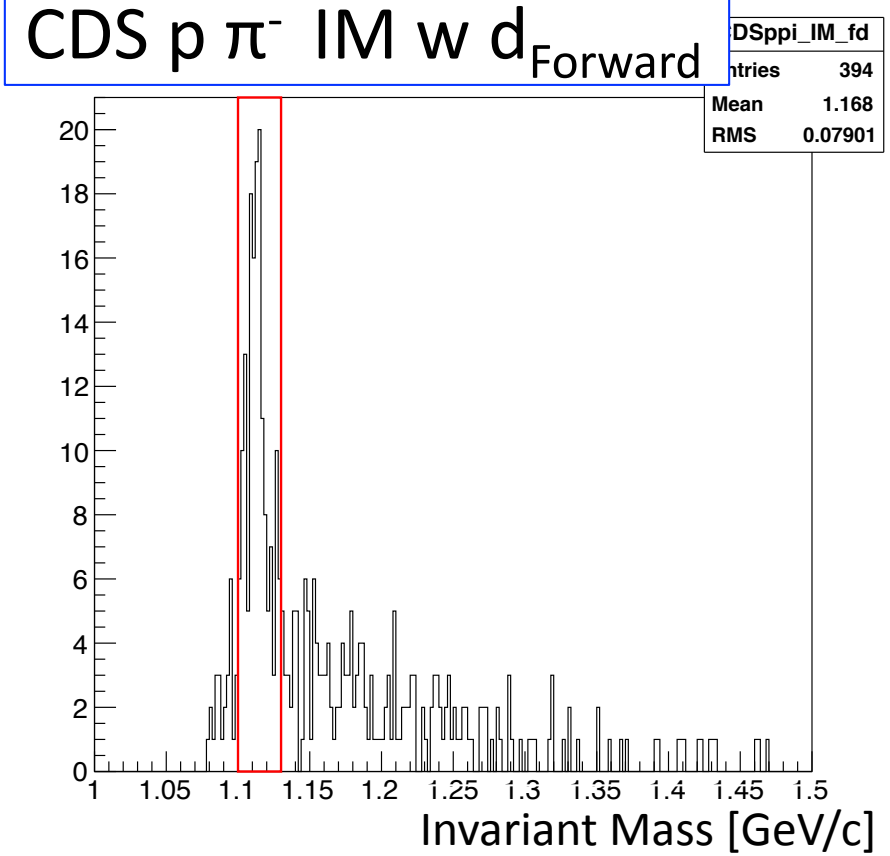
Standard cut select roughly ^{3}He target.

CDS IM with $d_{Forward}$ w/o Vtx-cut

CDS $\pi^+ \pi^-$ IM w $d_{Forward}$

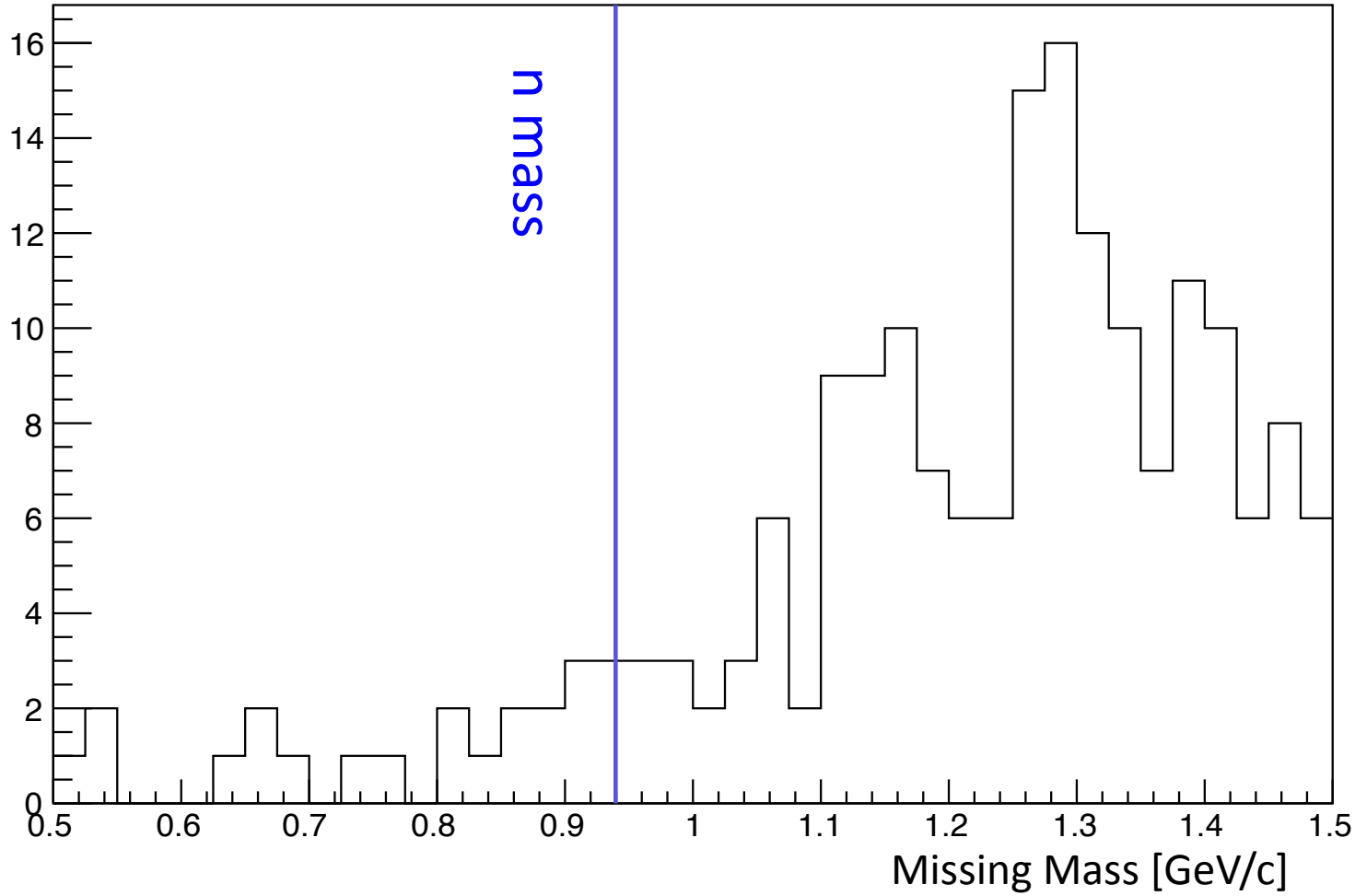


CDS $p \pi^-$ IM w $d_{Forward}$



$^3He(K^-, d\ \pi^+\ \pi^-)$ Missing Mass w/o K^0

$^3He(K^-, d\ \pi^+\ \pi^-)$ Missing Mass w/o K^0 not cut



$^3He(K^-, d\ K^0)$ Missing Mass