Study of $J/\psi \to p\bar{p}\phi$, $\phi \to K^+K^-$

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Outline

- Motivation
- Data Sample
- Event Selection
- Background study
- Fitting results of $M(K^+K^-)$
- Next step work

Motivation

- **s quark constituents of N***

many excited states of nucleon were observed, some of them can not be fitted into the three-valence-quark model , they may contain $s\bar{s}$ components, such as $N^*(1535) \rightarrow K\Lambda$.

- **penta -quark baryon state**

It is expected that penta-quark have a narrow width and decay preferentially into the ϕN;

- **pp enhancement X(1860)**

a near-threshold enhancement in the pp mass spectrum was observed. However , such enhancement was not observed in other channels , such as $J/\psi \rightarrow p\bar{p}\omega$, what about $J/\psi \rightarrow p\bar{p}\phi$?

Data Sample

- BOSS version: BOSS664;
- 225M + 1087M J/ψ data sample;
- 225M + 200M + 800M J/ψ inclusive MC sample;
- 100K $J/\psi \to p\bar{p}\phi$, $\phi \to K^+K^-$ signal MC sample, and 100K other Exclusive MC samples;

Event Selection

- **Good Charged tracks**

  Vertex cut : |Rxy | < 1 cm , |Rz|<10cm;

  |cosθ|<0.93;

  Ngood =3||4 ;

- **PID(dE/dX and TOF)**

  for p: Prob(p)>Prob(K) and Prob(p)>Prob(π);

  for K: Prob(K)>Prob(p) and Prob(K)>Prob(π);

  np=n$\bar{p}$ =1

  nkp=1 || nkm=1

  nkp+nkm <=2

  $\Longleftrightarrow$

  ① np=n$\bar{p}$ =1 & nKp=1 & nKm=0

  ② np=n$\bar{p}$ =1 & nKp=1 & nKm=1

  ③ np=n$\bar{p}$ =1 & nKp=0 & nKm=1

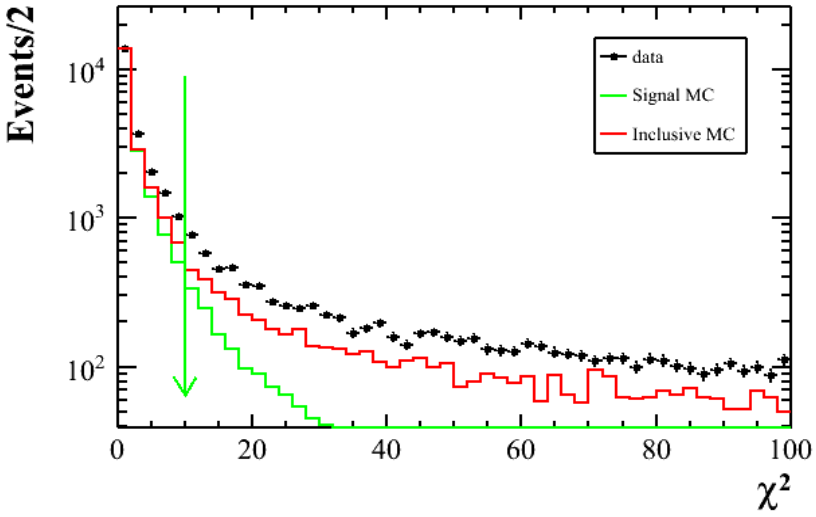
- **1CFitting by missing one K**

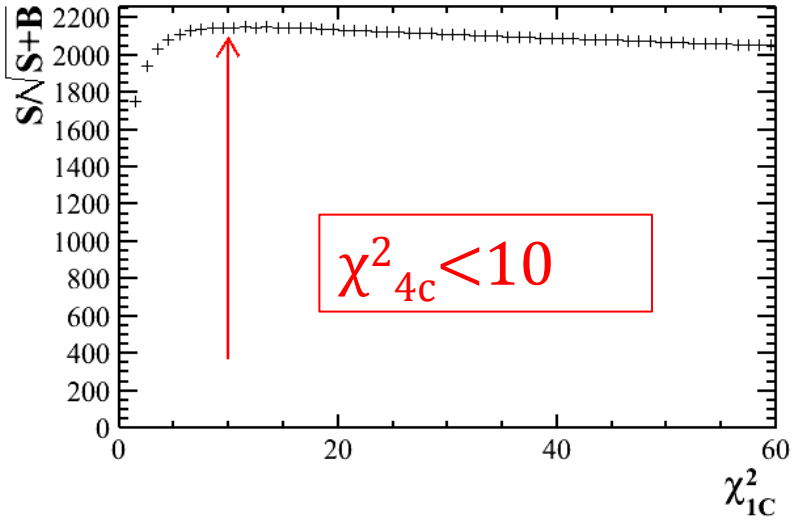
  Miss Kp ; p $\bar{p}$ Km 1C fitting

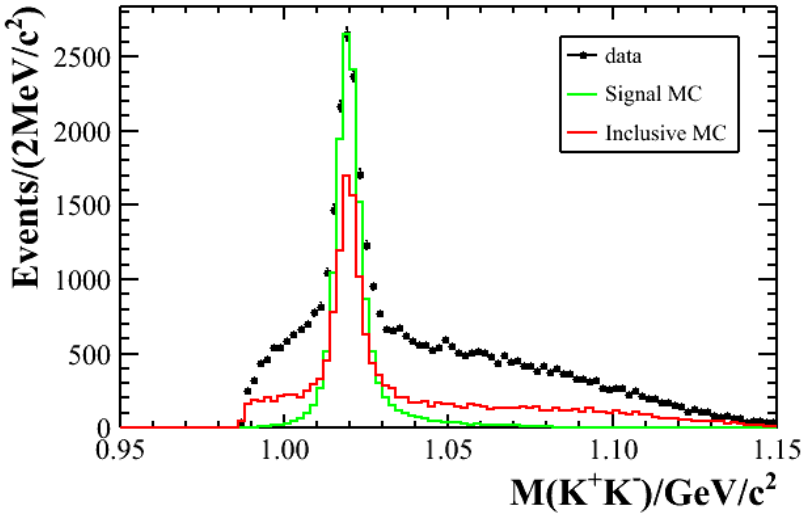
  Miss Km ; p $\bar{p}$ Kp 1C fitting

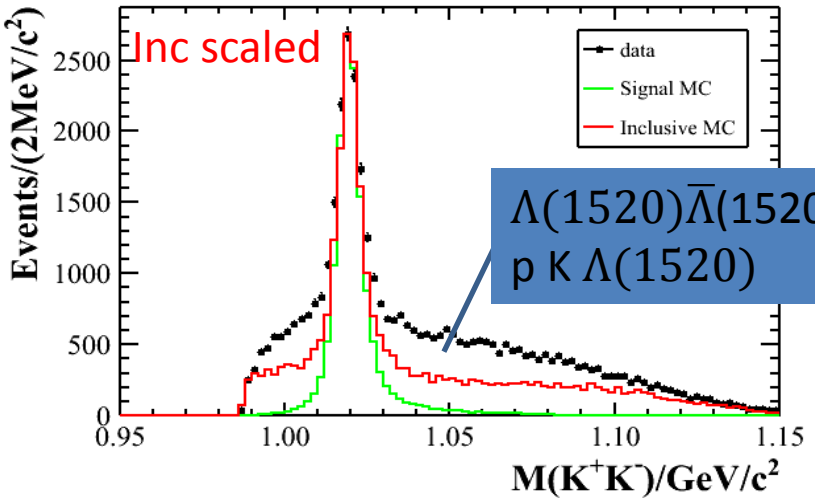
3 cases , 2 modes

1CFitting χ^2 and M(K^+K^-)









Inclusive topology

N:17393

No.	decay chain	final states	iTopo	nEvt	nTot
0	$J/\psi \to \bar{p}\phi p,\ \phi \to K^-K^+$	$J/\psi \to pK^+K^-\bar{p}$	0	7722	7722
1	$J/\psi \to \bar{p}K^-K^+p$	$J/\psi \to pK^+K^-\bar{p}$	1	3676	11398
2	$J/\psi \to \bar{p}pf_0',\ f_0' \to K^-K^+$	$J/\psi \to pK^+K^-\bar{p}$	5	1493	12891
3	$J/\psi \to \bar{p}pa_0^0,\ a_0^0 \to K^-K^+$	$J/\psi \to pK^+K^-\bar{p}$	4	802	13693
4	$J/\psi \to \bar{p}K^{*+}\Lambda,\ K^{*+} \to \pi^0K^+,\ \Lambda \to \pi^-p$	$J/\psi \to pK^+\pi^0\pi^-\bar{p}$	7	626	14319
5	$J/\psi \to \bar{\Lambda}K^{*-}p,\ \bar{\Lambda} \to \bar{p}\pi^+,\ K^{*-} \to K^-\pi^0$	$J/\psi \to p\pi^+\pi^0K^-\bar{p}$	12	586	14905
6	$J/\psi \to \bar{\Sigma}^{*0}K^-p,\ \bar{\Sigma}^{*0} \to \bar{\Lambda}\pi^0,\ \bar{\Lambda} \to \bar{p}\pi^+$	$J/\psi \to p\pi^+\pi^0K^-\bar{p}$	9	427	15332
7	$J/\psi \to \bar{\Sigma}^-K^-\Delta^{++},\ \bar{\Sigma}^- \to \bar{p}\pi^0,\ \Delta^{++} \to \pi^+p$	$J/\psi \to p\pi^+\pi^0K^-\bar{p}$	14	246	15578
8	$J/\psi \to \bar{\Delta}^{--}K^+\Sigma^+,\ \bar{\Delta}^{--} \to \bar{p}\pi^-,\ \Sigma^+ \to \pi^0p$	$J/\psi \to pK^+\pi^0\pi^-\bar{p}$	18	239	15817
9	$J/\psi \to \bar{\Delta}^+K^+\Sigma^0,\ \bar{\Delta}^+ \to \bar{p}\pi^0,\ \Sigma^0 \to \gamma\Lambda,\ \Lambda \to \pi^-p$	$J/\psi \to \gamma pK^+\pi^0\pi^-\bar{p}$	20	218	16035
10	$J/\psi \to \bar{\Sigma}^0K^-\Delta^+,\ \bar{\Sigma}^0 \to \bar{\Lambda}\gamma,\ \Delta^+ \to \pi^0p,\ \bar{\Lambda} \to \bar{p}\pi^+$	$J/\psi \to \gamma p\pi^+\pi^0K^-\bar{p}$	23	192	16227
11	$J/\psi \to \bar{\Sigma}^-K^+\Xi^0,\ \bar{\Sigma}^- \to \bar{p}\pi^0,\ \Xi^0 \to \pi^0\Lambda,\ \Lambda \to \pi^-p$	$J/\psi \to pK^+\pi^0\pi^0\pi^-\bar{p}$	26	98	16325
12	$J/\psi \to \bar{\Xi}^0K^-\Sigma^+,\ \bar{\Xi}^0 \to \bar{\Lambda}\pi^0,\ \Sigma^+ \to \pi^0p,\ \bar{\Lambda} \to \bar{p}\pi^+$	$J/\psi \to p\pi^+\pi^0\pi^0K^-\bar{p}$	21	84	16409
13	$J/\psi \to \bar{\Xi}^+K^-\Lambda,\ \bar{\Xi}^+ \to \bar{\Lambda}\pi^+,\ \Lambda \to \pi^-p,\ \bar{\Lambda} \to \bar{p}\pi^+$	$J/\psi \to p\pi^+\pi^+\pi^-K^-\bar{p}$	6	75	16484
14	$J/\psi \to \bar{\Sigma}^-\bar{K}^{*}p,\ \bar{\Sigma}^- \to \bar{p}\pi^0,\ \bar{K}^{*} \to K^-\pi^+$	$J/\psi \to p\pi^+\pi^0K^-\bar{p}$	10	68	16552
15	$J/\psi \to \bar{\Lambda}K^+\Xi^-,\ \bar{\Lambda} \to \bar{p}\pi^+,\ \Xi^- \to \pi^-\Lambda,\ \Lambda \to \pi^-p$	$J/\psi \to pK^+\pi^+\pi^-\pi^-\bar{p}$	30	64	16616
16	$J/\psi \to \bar{p}K^{*}\Sigma^+,\ K^{*} \to \pi^-K^+,\ \Sigma^+ \to \pi^0p$	$J/\psi \to pK^+\pi^0\pi^-\bar{p}$	32	45	16661
17	$J/\psi \to \bar{p}f_2(1270)p,\ f_2(1270) \to K^-K^+$	$J/\psi \to pK^+K^-\bar{p}$	36	45	16706
18	$J/\psi \to \bar{\Delta}^+K^+\Lambda,\ \bar{\Delta}^+ \to \bar{p}\pi^0,\ \Lambda \to \pi^-p$	$J/\psi \to pK^+\pi^0\pi^-\bar{p}$	27	43	16749

Table 1:

N_{inctot} = 17393 (truth level)

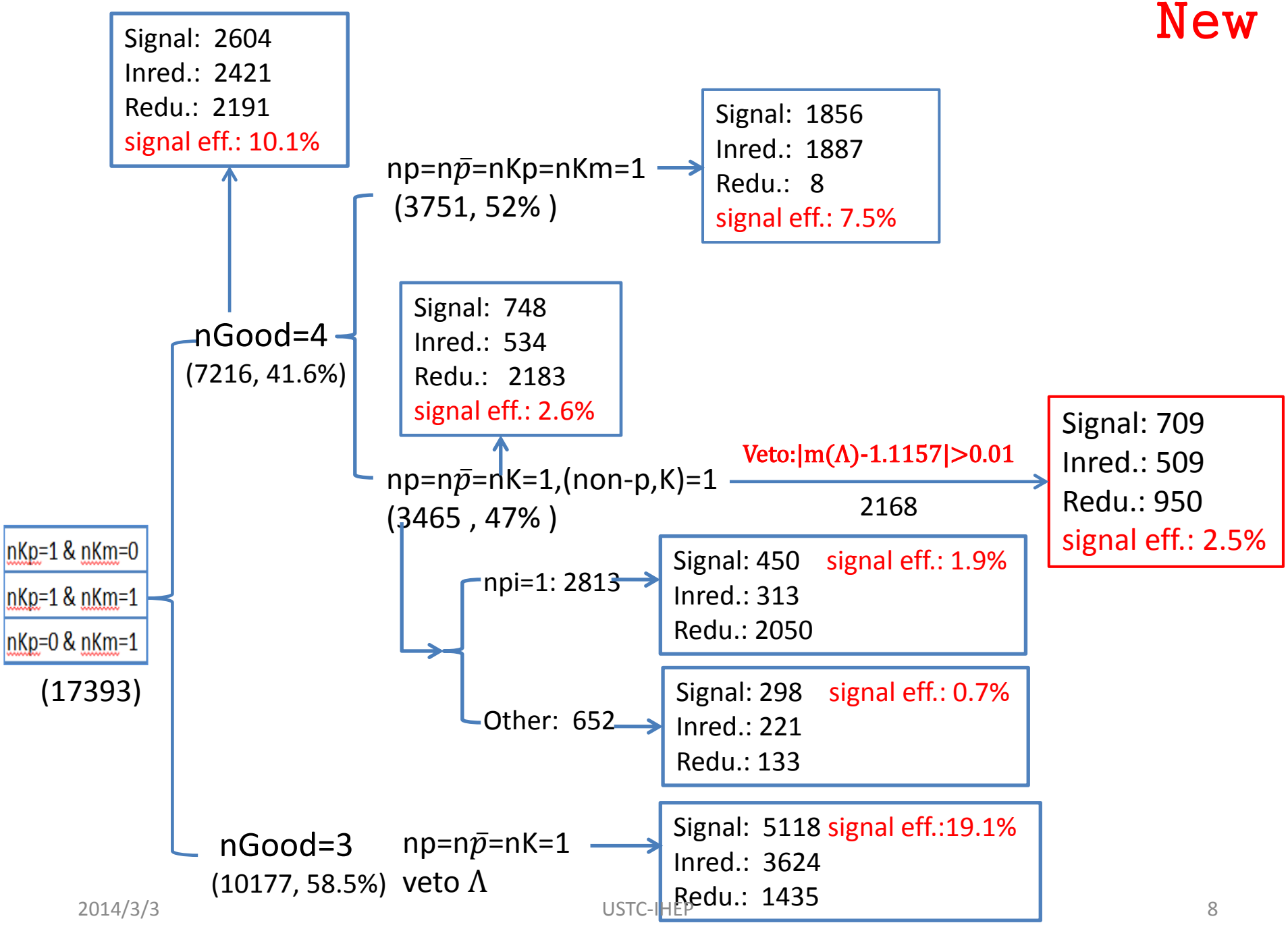
Signal: 7722 (44.4%) signal MC eff.: 29.3%

Inreduceable: 6045 (34.7%)

Reduceable: 3626 (20.8%) (typical: $p\bar{p}K^+\pi^-\pi^0$, $p\bar{p}K^-\pi^+\pi^0$)

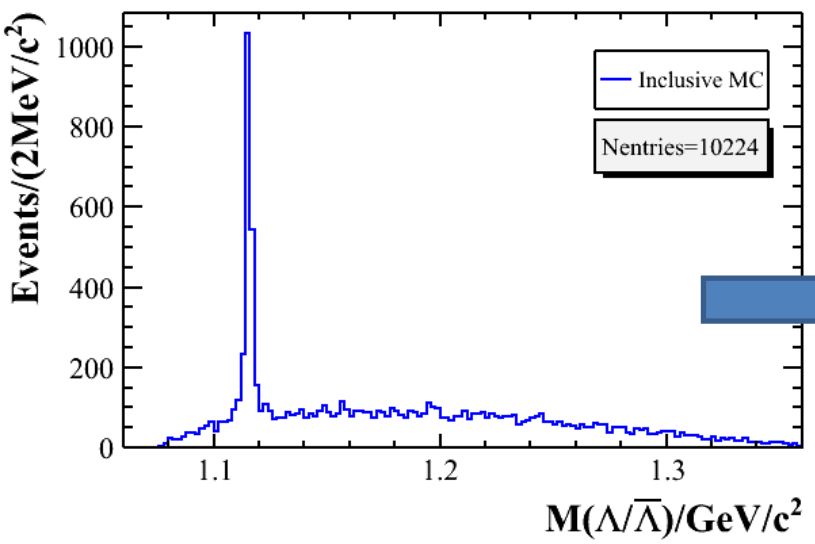
main include Λ ($\bar{\Lambda}$) (3141 18.0%)

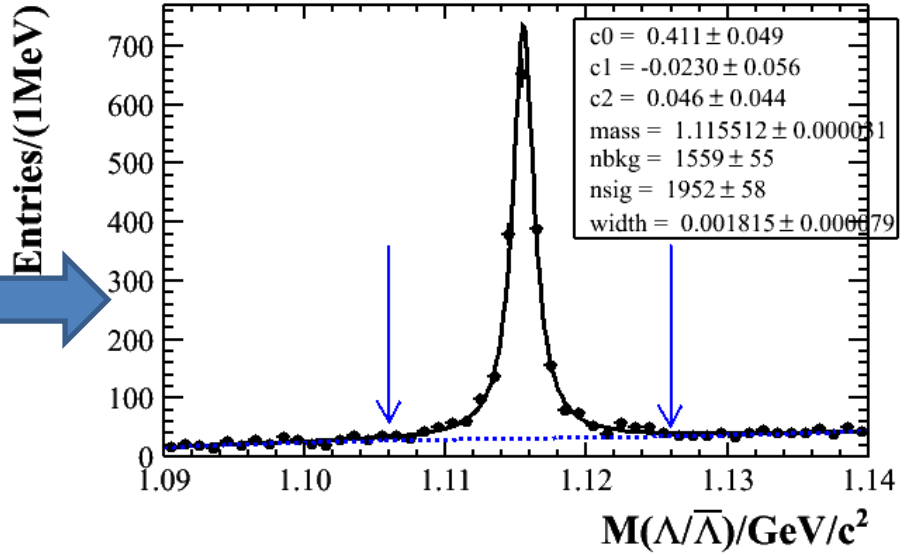
New


Signal: 2604
Inred.: 2421
Redu.: 2191
signal eff.: 10.1%
nKp=1 & nKm=0
nKp=1 & nKm=1
nKp=0 & nKm=1
(17393)
nGood=4
(7216, 41.6%)
nGood=3
(10177, 58.5%)
np=np̄=nKp=nKm=1
(3751, 52%)
Signal: 1856
Inred.: 1887
Redu.: 8
signal eff.: 7.5%
Signal: 748
Inred.: 534
Redu.: 2183
signal eff.: 2.6%
np=np̄=nK=1,(non-p,K)=1
(3465 , 47%)
Veto:|m(Λ)-1.1157|>0.01
2168
Signal: 709
Inred.: 509
Redu.: 950
signal eff.: 2.5%
npi=1: 2813
Signal: 450 signal eff.: 1.9%
Inred.: 313
Redu.: 2050
Other: 652
Signal: 298 signal eff.: 0.7%
Inred.: 221
Redu.: 133
np=np̄=nK=1
veto Λ
Signal: 5118 signal eff.:19.1%
Inred.: 3624
Redu.: 1435

reconstruct $\Lambda/\bar{\Lambda}$ (no matter nGood=3 or 4)

- In order to improve efficiency, except selected p,$\bar{p}$, K, treat left all tracks (include Bad tracks) as π;
- p π perform second vertex fitting to reconstruct $\Lambda/\bar{\Lambda}$;
- For np=n$\bar{p}$=nKp=nKm=1 , also reconstruct Λ , signal eff. loss is 0.3%;





Veto Λ:|m(Λ)-1.1157|>0.01

eff.: 62%

after veto $\Lambda/\bar{\Lambda}$

No.	decay chain	final states	iTopo	nEvt	nTot
0	$J/\psi \to \bar{p}\phi p,\ \phi \to K^-K^+$	$J/\psi \to pK^+K^-\bar{p}$	0	7406	7406
1	$J/\psi \to \bar{p}K^-K^+p$	$J/\psi \to pK^+K^-\bar{p}$	1	3543	10949
2	$J/\psi \to \bar{p}pf_0^{'},\ f_0^{'} \to K^-K^+$	$J/\psi \to pK^+K^-\bar{p}$	5	1433	12382
3	$J/\psi \to \bar{p}pa_0^0,\ a_0^0 \to K^-K^+$	$J/\psi \to pK^+K^-\bar{p}$	4	772	13154
4	$J/\psi \to \bar{p}K^{*+}\Lambda,\ K^{*+} \to \pi^0K^+,\ \Lambda \to \pi^-p$	$J/\psi \to pK^+\pi^0\pi^-\bar{p}$	7	307	13461
5	$J/\psi \to \bar{\Lambda}K^{*-}p,\ \bar{\Lambda} \to \bar{p}\pi^+,\ K^{*-} \to K^-\pi^0$	$J/\psi \to p\pi^+\pi^0K^-\bar{p}$	18	272	13733
6	$J/\psi \to \bar{\Sigma}^-K^-\Delta^{++},\ \bar{\Sigma}^- \to \bar{p}\pi^0,\ \Delta^{++} \to \pi^+p$	$J/\psi \to p\pi^+\pi^0K^-\bar{p}$	13	245	13978
7	$J/\psi \to \bar{\Delta}^{--}K^+\Sigma^+,\ \bar{\Delta}^{--} \to \bar{p}\pi^-,\ \Sigma^+ \to \pi^0p$	$J/\psi \to pK^+\pi^0\pi^-\bar{p}$	17	239	14217
8	$J/\psi \to \bar{\Sigma}^{*0}K^-p,\ \bar{\Sigma}^{*0} \to \bar{\Lambda}\pi^0,\ \bar{\Lambda} \to \bar{p}\pi^+$	$J/\psi \to p\pi^+\pi^0K^-\bar{p}$	9	202	14419
9	$J/\psi \to \bar{\Sigma}^0K^-\Delta^+,\ \bar{\Sigma}^0 \to \bar{\Lambda}\gamma,\ \Delta^+ \to \pi^0p,\ \bar{\Lambda} \to \bar{p}\pi^+$	$J/\psi \to \gamma p\pi^+\pi^0K^-\bar{p}$	21	104	14523
10	$J/\psi \to \bar{\Delta}^+K^+\Sigma^0,\ \bar{\Delta}^+ \to \bar{p}\pi^0,\ \Sigma^0 \to \gamma\Lambda,\ \Lambda \to \pi^-p$	$J/\psi \to \gamma pK^+\pi^0\pi^-\bar{p}$	25	101	14624
11	$J/\psi \to \bar{\Sigma}^-\bar{K}^*p,\ \bar{\Sigma}^- \to \bar{p}\pi^0,\ \bar{K}^* \to K^-\pi^+$	$J/\psi \to p\pi^+\pi^0K^-\bar{p}$	10	68	14692
12	$J/\psi \to \bar{\Sigma}^-K^+\Xi^0,\ \bar{\Sigma}^- \to \bar{p}\pi^0,\ \Xi^0 \to \pi^0\Lambda,\ \Lambda \to \pi^-p$	$J/\psi \to pK^+\pi^0\pi^0\pi^-\bar{p}$	24	63	14755
13	$J/\psi \to \Xi^+K^-\Lambda,\ \Xi^+ \to \bar{\Lambda}\pi^+,\ \Lambda \to \pi^-p,\ \bar{\Lambda} \to \bar{p}\pi^+$	$J/\psi \to p\pi^+\pi^+\pi^-K^-\bar{p}$	6	53	14808
14	$J/\psi \to \bar{p}K^*\Sigma^+,\ K^* \to \pi^-K^+,\ \Sigma^+ \to \pi^0p$	$J/\psi \to pK^+\pi^0\pi^-\bar{p}$	31	45	14853
15	$J/\psi \to \bar{p}f_2(1270)p,\ f_2(1270) \to K^-K^+$	$J/\psi \to pK^+K^-\bar{p}$	34	44	14897
16	$J/\psi \to \bar{\Xi}^0K^-\Sigma^+,\ \bar{\Xi}^0 \to \bar{\Lambda}\pi^0,\ \Sigma^+ \to \pi^0p,\ \bar{\Lambda} \to \bar{p}\pi^+$	$J/\psi \to p\pi^+\pi^0\pi^0K^-\bar{p}$	23	42	14939
17	$J/\psi \to \bar{\Lambda}K^+\Xi^-,\ \bar{\Lambda} \to \bar{p}\pi^+,\ \Xi^- \to \pi^-\Lambda,\ \Lambda \to \pi^-p$	$J/\psi \to pK^+\pi^+\pi^-\pi^-\bar{p}$	29	40	14979
18	$J/\psi \to \bar{\Sigma}^{*0}K^-p,\ \bar{\Sigma}^{*0} \to \bar{\Sigma}^-\pi^+,\ \bar{\Sigma}^- \to \bar{p}\pi^0$	$J/\psi \to p\pi^+\pi^0K^-\bar{p}$	8	38	15017
19	$J/\psi \to \bar{p}a_2^0p,\ a_2^0 \to K^-K^+$	$J/\psi \to pK^+K^-\bar{p}$	19	29	15046
20	$J/\psi \to \bar{\Delta}^+K^+\Lambda,\ \bar{\Delta}^+ \to \bar{p}\pi^0,\ \Lambda \to \pi^-p$	$J/\psi \to pK^+\pi^0\pi^-\bar{p}$	27	22	15068
21	$J/\psi \to \bar{p}K^{*+}\Sigma^0,\ K^{*+} \to \pi^0K^+,\ \Sigma^0 \to \gamma\Lambda,\ \Lambda \to \pi^-p$	$J/\psi \to \gamma pK^+\pi^0\pi^-\bar{p}$	22	21	15089
22	$J/\psi \to \bar{\Lambda}K^-\Delta^+,\ \bar{\Lambda} \to \bar{p}\pi^+,\ \Delta^+ \to \pi^0p$	$J/\psi \to p\pi^+\pi^0K^-\bar{p}$	41	20	15109
23	$J/\psi \to \bar{\Lambda}K^-\pi^-\Delta^{++},\ \bar{\Lambda} \to \bar{p}\pi^+,\ \Delta^{++} \to \pi^+p$	$J/\psi \to p\pi^+\pi^+\pi^-K^-\bar{p}$	37	19	15128
24	$J/\psi \to \bar{\Sigma}^0K^{*-}p,\ \bar{\Sigma}^0 \to \bar{\Lambda}\gamma,\ K^{*-} \to K^-\pi^0,\ \bar{\Lambda} \to \bar{p}\pi^+$	$J/\psi \to \gamma p\pi^+\pi^0K^-\bar{p}$	14	16	15144
25	$J/\psi \to \bar{\Sigma}^{*+}K^-\pi^-p,\ \bar{\Sigma}^{*+} \to \bar{\Lambda}\pi^+,\ \bar{\Lambda} \to \bar{p}\pi^+$	$J/\psi \to p\pi^+\pi^+\pi^-K^-\bar{p}$	56	14	15158
26	$J/\psi \to \bar{p}\pi^+K^+\Sigma^{*-},\ \Sigma^{*-} \to \pi^-\Lambda,\ \Lambda \to \pi^-p$	$J/\psi \to pK^+\pi^+\pi^-\pi^-\bar{p}$	2	12	15170
27	$J/\psi \to \bar{p}\pi^-\pi^+K^+\Lambda,\ \Lambda \to \pi^-p$	$J/\psi \to pK^+\pi^+\pi^-\pi^-\bar{p}$	59	12	15182
28	$J/\psi \to \bar{\Delta}^{--}\pi^+K^+\Lambda,\ \bar{\Delta}^{--} \to \bar{p}\pi^-,\ \Lambda \to \pi^-p$	$J/\psi \to pK^+\pi^+\pi^-\pi^-\bar{p}$	60	11	15193
29	$J/\psi \to \bar{p}\pi^0K^+\Sigma^0,\ \Sigma^0 \to \gamma\Lambda,\ \Lambda \to \pi^-p$	$J/\psi \to \gamma pK^+\pi^0\pi^-\bar{p}$	73	11	15204

N: 15434

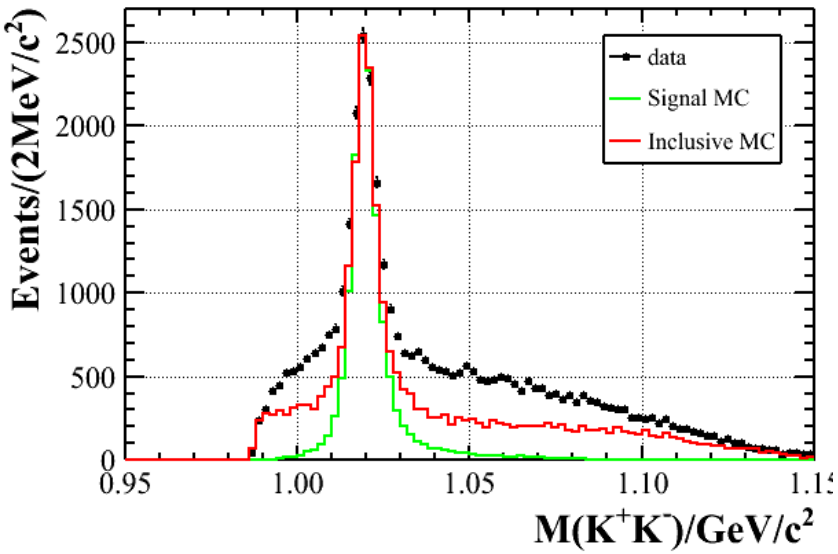
Signal: 7406 (48.0%) signal eff.: 28.3 %

Inred.: 5821 (37.7%)

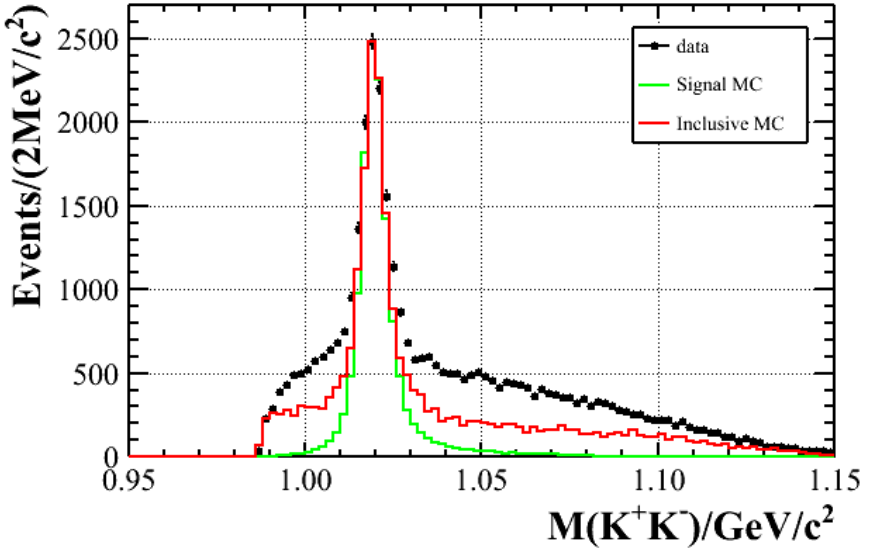
Redu.: 2207 (14.3%)

$M(K^+K^-)$

Previous Page$_3$

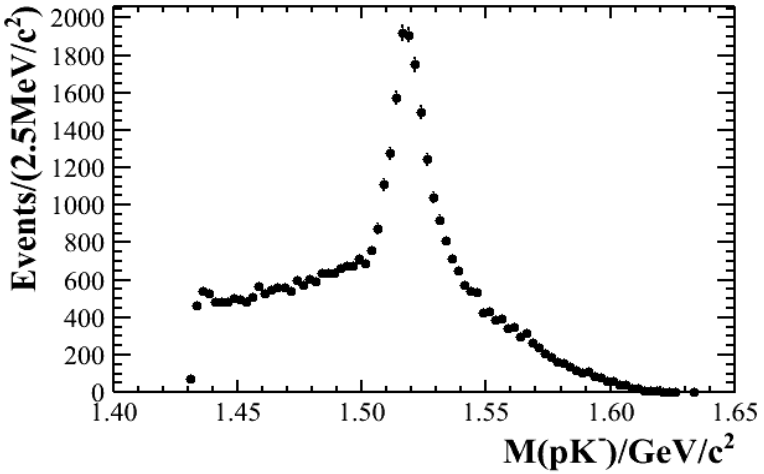


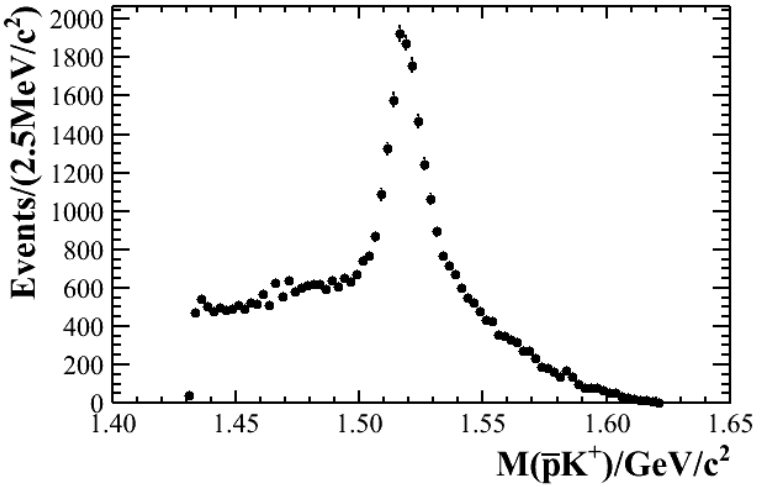
now



M(pK$^-$) and M($\bar{p}$K$^+$)

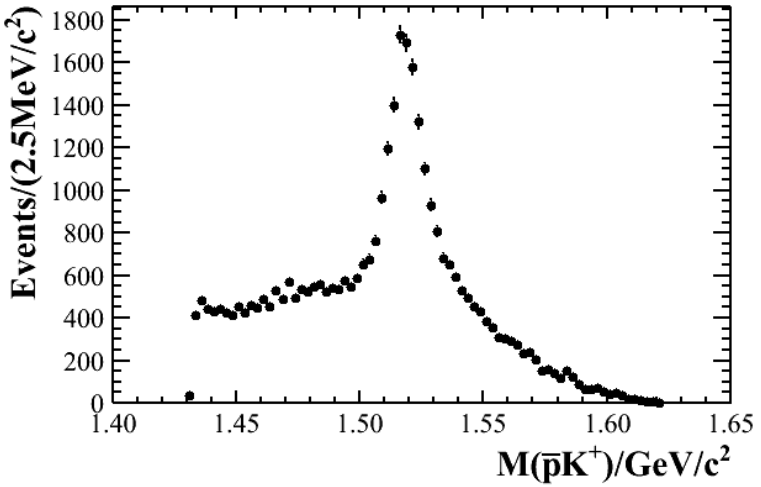
$\chi^2_{4c}<10$

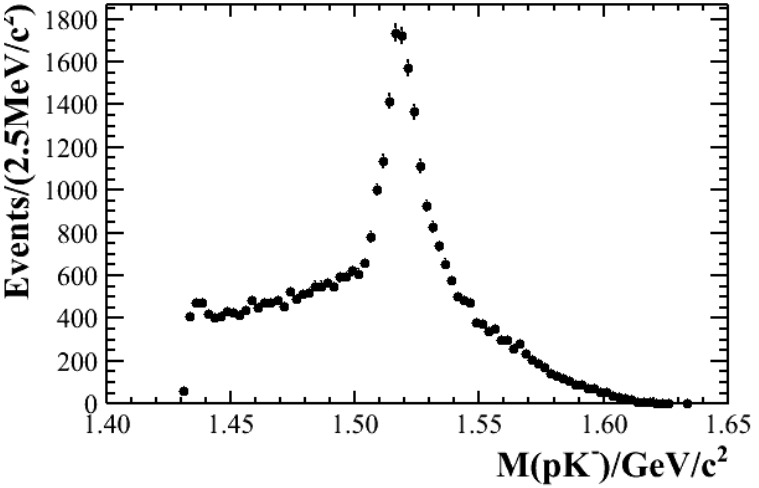




$\chi^2_{4c}<10$

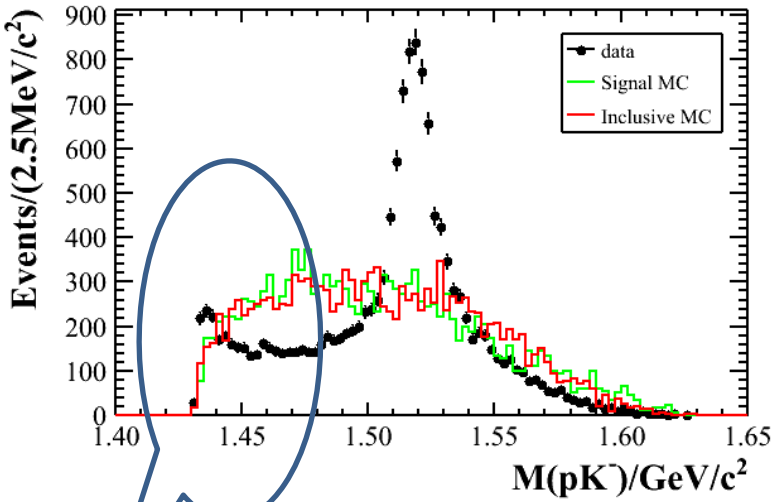
veto Λ

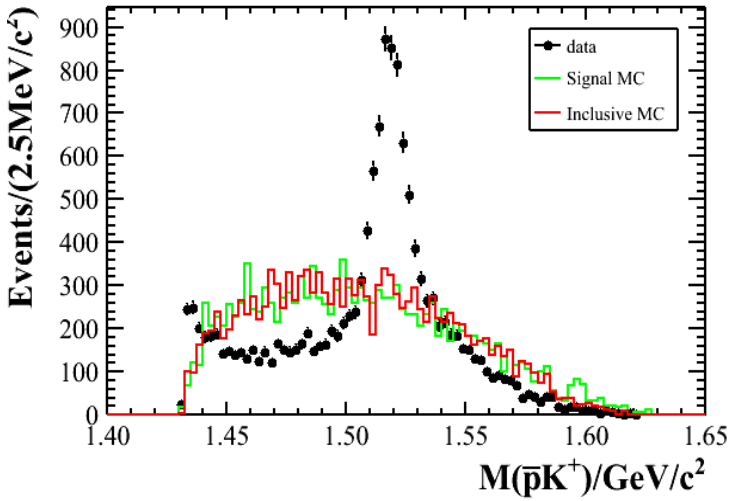


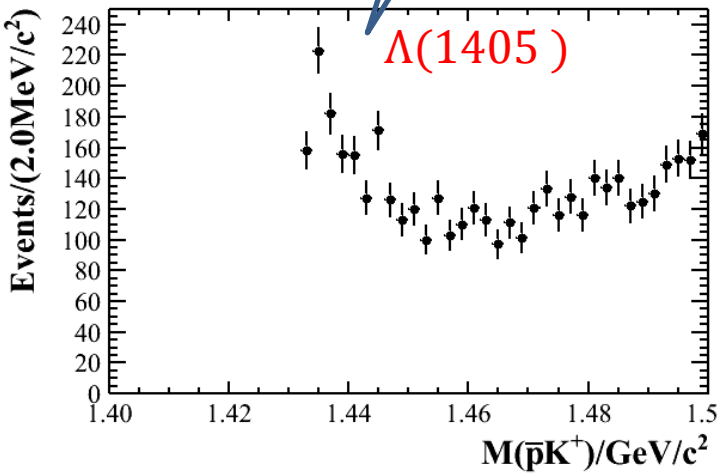


M(pK⁻) and M($\bar{p}$K⁺)

Further veto ϕ







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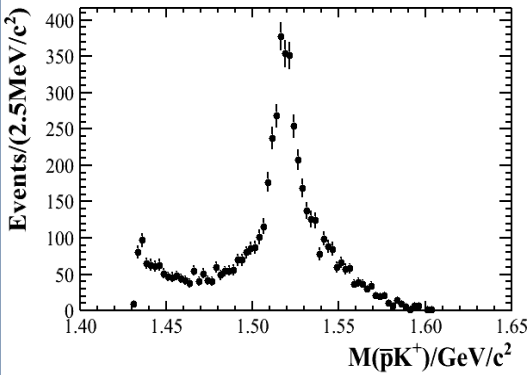
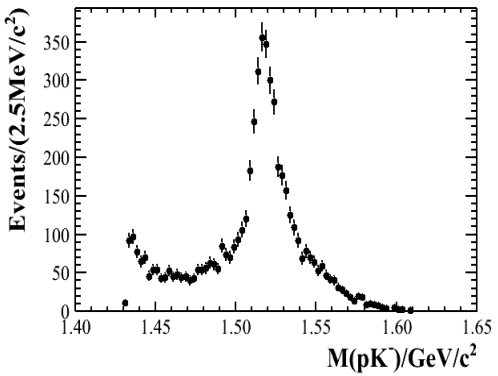
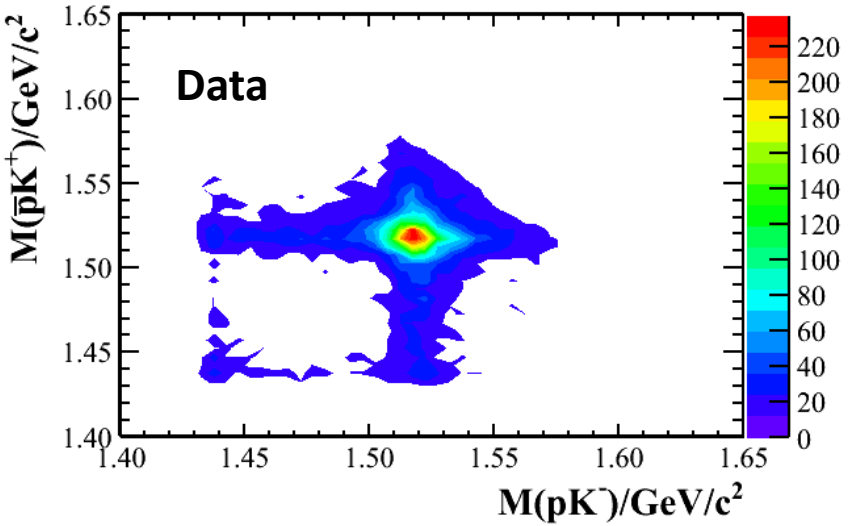
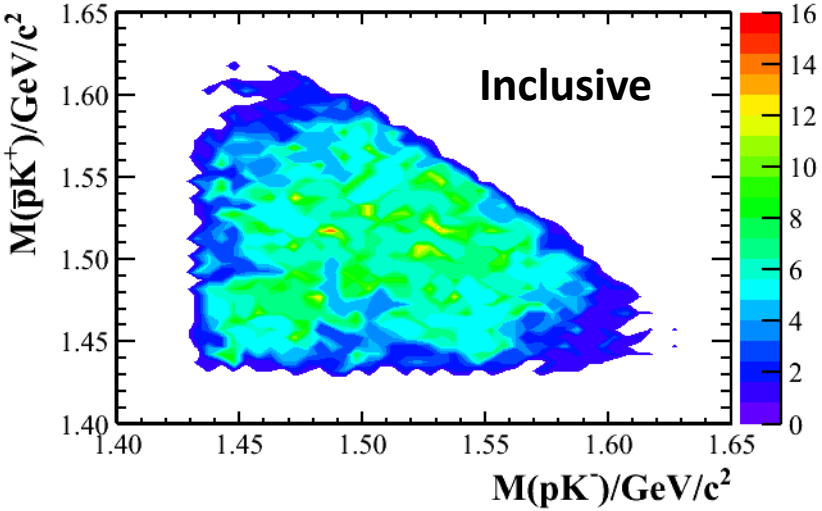
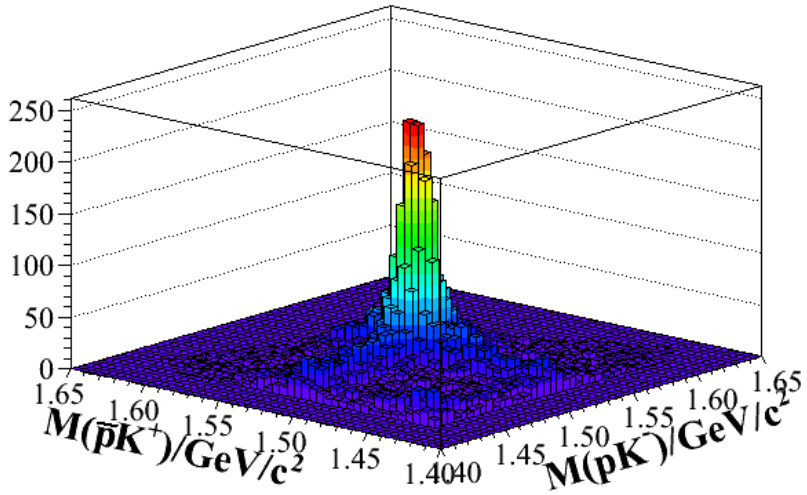




M(pK⁻) and M($\bar{p}$K⁺)





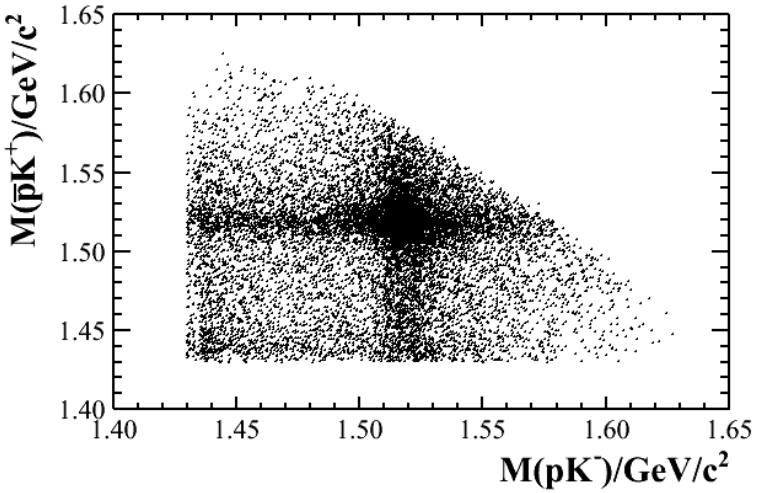


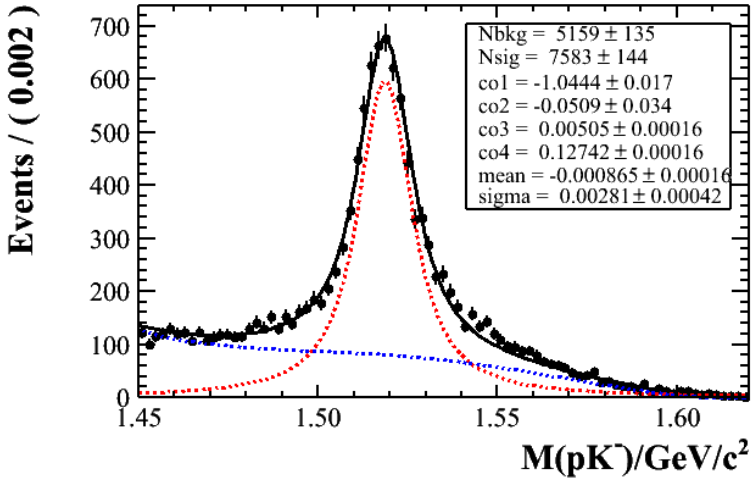
$J/\psi \to \Lambda(1520)\bar{\Lambda}(1520)$
$J/\psi \to \bar{p}\ K^+\Lambda(1520)$
$J/\psi \to p\ K^-\ \bar{\Lambda}(1520)$

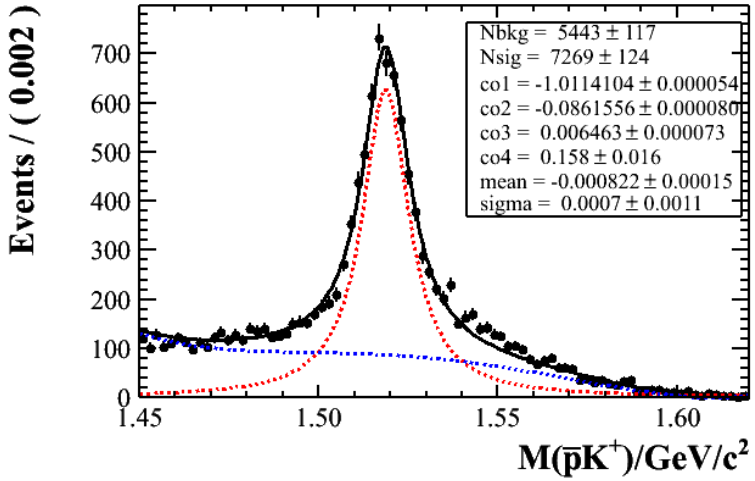
$J/\psi \to \Lambda(1405)\bar{\Lambda}(1405)$
$J/\psi \to \bar{p}\ K^+\Lambda(1405)$
$J/\psi \to p\ K^-\ \bar{\Lambda}(1405)$

$J/\psi \to \Lambda(1405)\bar{\Lambda}(1520)$+c.c. ?
other b.k.g.

Λ(1520) 2D Sideband



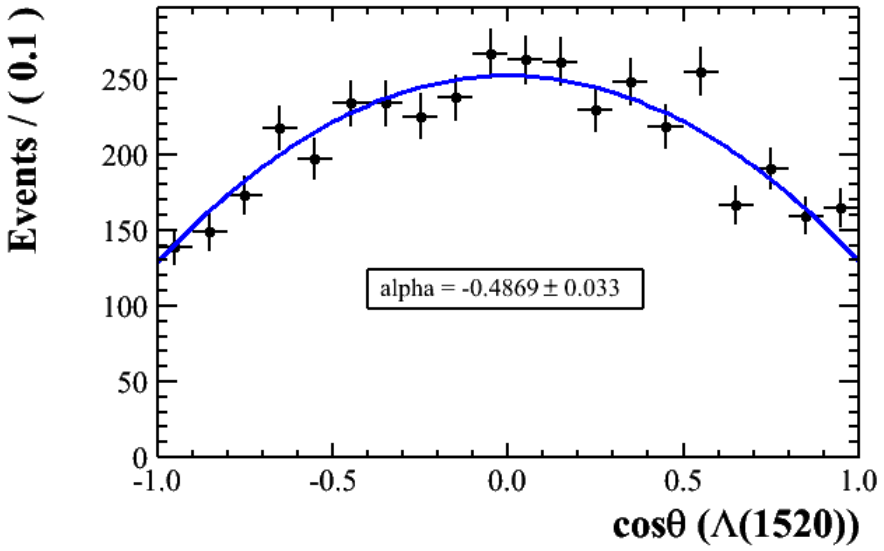


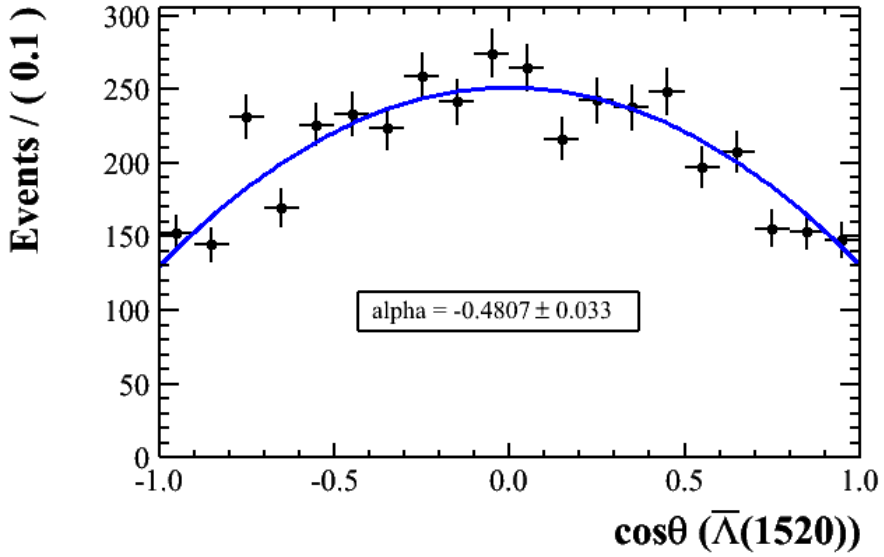


Updated

$J/\psi \to \Lambda(1520)\bar{\Lambda}(1520)$ angle distribution

$$\frac{d\Gamma}{d\cos\theta} \propto (1 + \alpha \cos^2\theta)$$

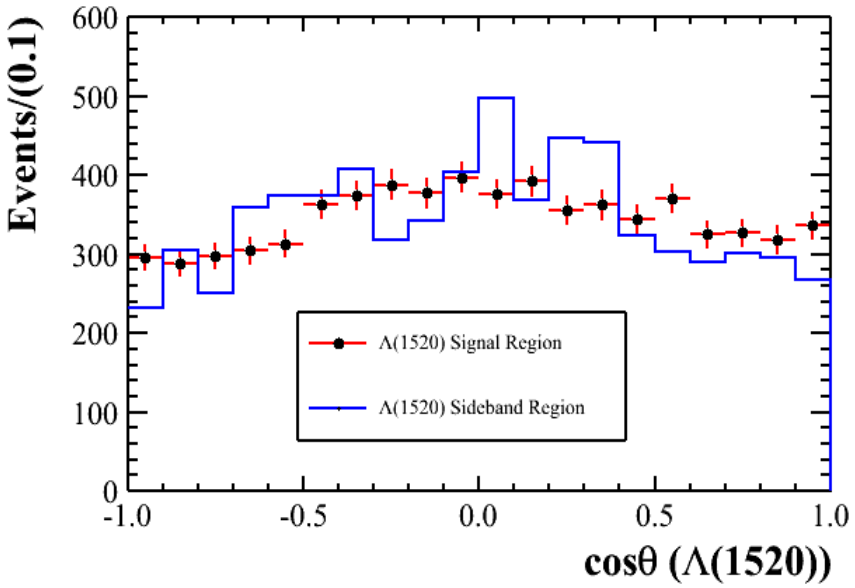


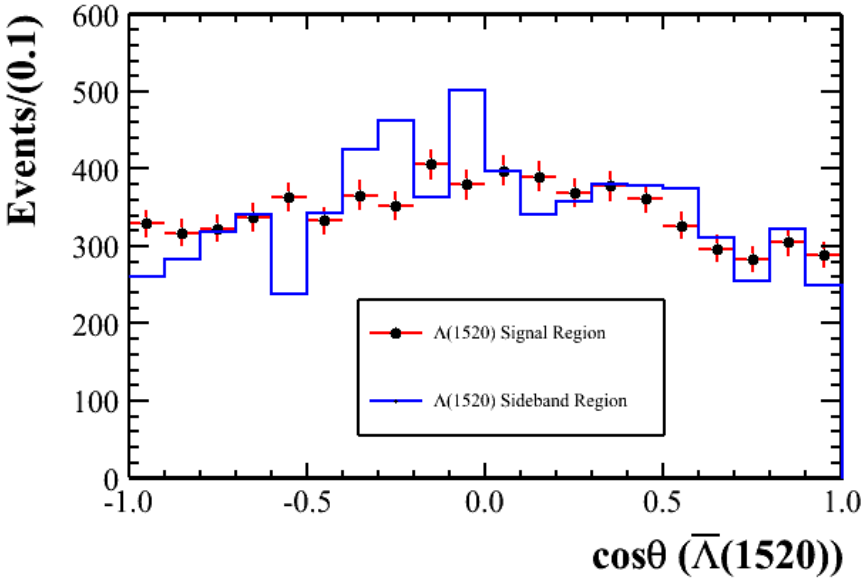


Bkg has been subtracted according to $\Lambda(1520)\bar{\Lambda}(1520)$ 2D-sideband.

$J/\psi \to \Lambda(1520)\bar{\Lambda}(1520)$ MC has generated .

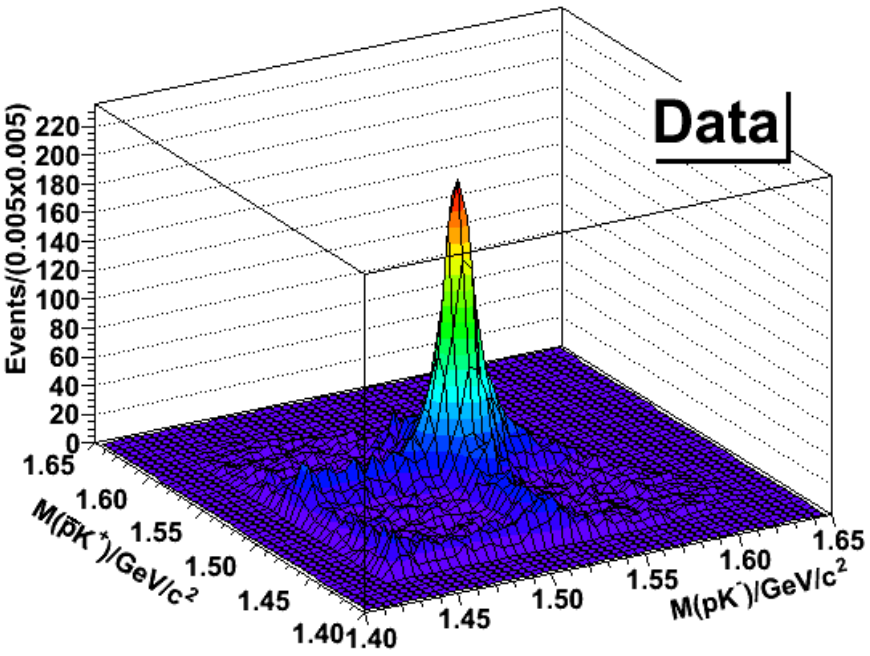
Comparison of signal and sideband region of $\Lambda(1520)$

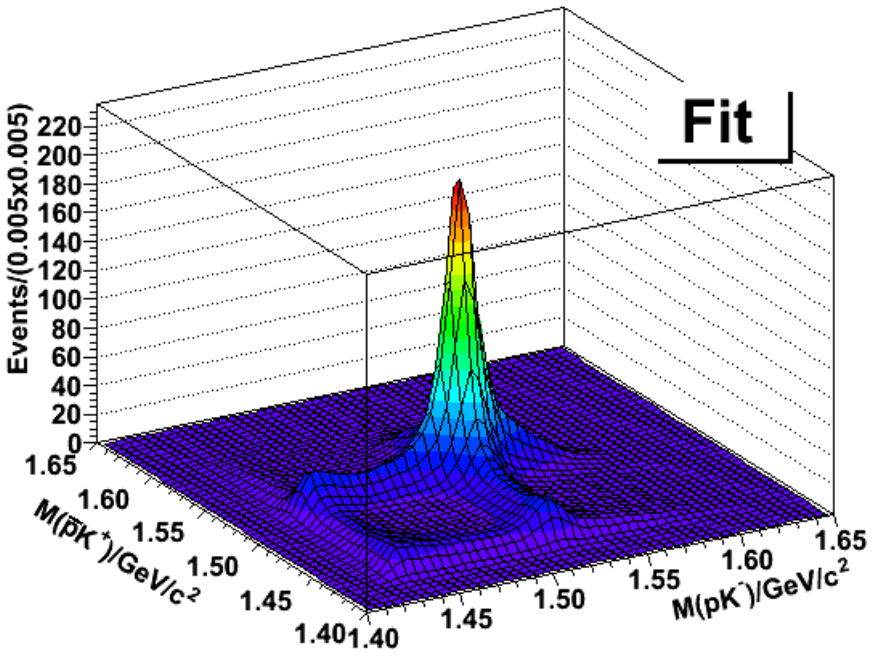




$\Lambda(1520)\overline{\Lambda}(1520)$ 2D-sideband estimation is effective !

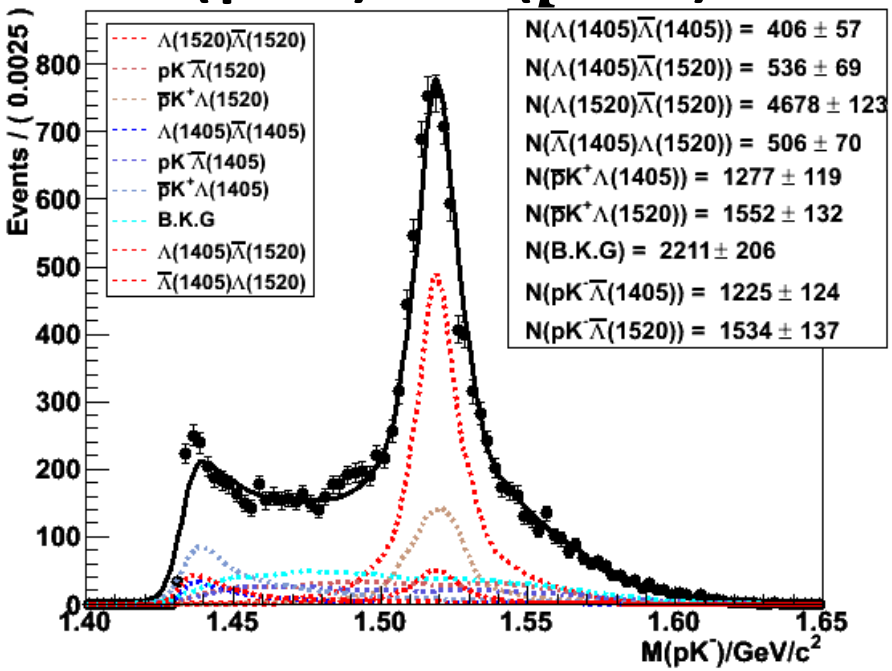
M(pK$^-$) vs M($\bar{p}$K$^+$) 2D Fitting

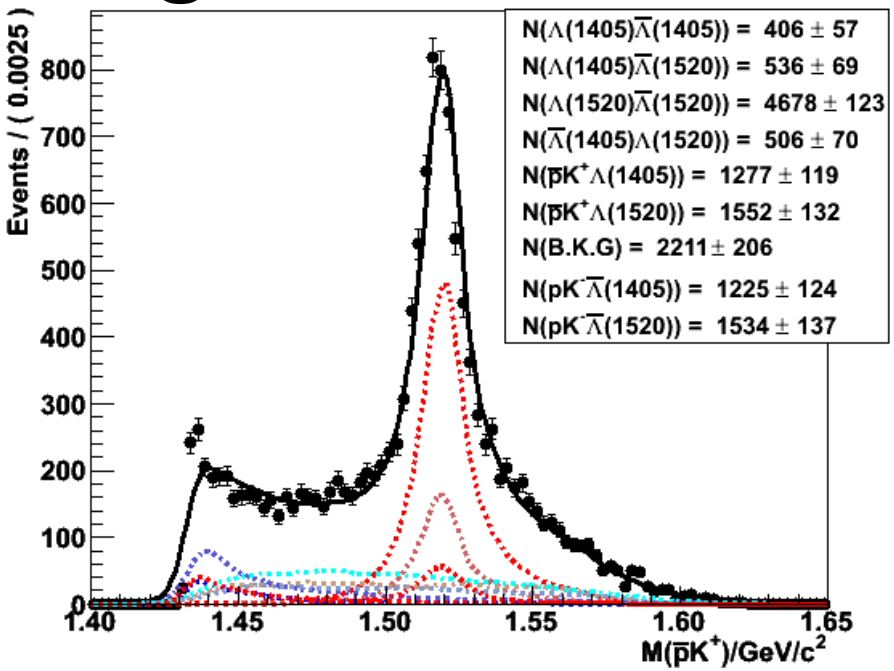




To remove affect from ppa_0^0(980) , we require M(K$^+$K$^-$)>1.04GeV/c^2 in 2D Fitting;

M(pK⁻)-M($\bar{p}$K⁺) 2D Fitting





Channels	Branch Fraction
Br(J/ψ→Λ(1520)$\bar{\Lambda}$(1520))	
Br(J/ψ→pK⁻$\bar{\Lambda}$(1520))	
Br(J/ψ→$\bar{p}$K⁺Λ(1520))	
Br(J/ψ→Λ(1405)$\bar{\Lambda}$(1405))	
Br(J/ψ→pK⁻$\bar{\Lambda}$(1405))×Br($\bar{\Lambda}$(1405)→$\bar{p}$K⁺)	
Br(J/ψ→$\bar{p}$K⁺Λ(1405))Br(Λ(1405)→pK⁻)	
J/ψ→Λ(1405)$\bar{\Lambda}$(1520) + c.c.	

M(K^+K^-) Fitting

1. Signal — **Signal MC Shape**

2. $p\bar{p}\,K^-K^+$

1. $J/\psi \to p\bar{p}\,K^-K^+$ PHSP
2. $J/\psi \to p\bar{p}\,a_0^0(980) \to p\bar{p}K^-K^+$ MC Shape , Float

3. $J/\psi \to p\bar{p}\,f_0(1370) \to p\bar{p}K^-K^+$
4. $J/\psi \to p\bar{p}\,f_2(1270) \to p\bar{p}K^-K^+$
5. $J/\psi \to p\bar{p}\,a_2^0(1320) \to p\bar{p}K^-K^+$

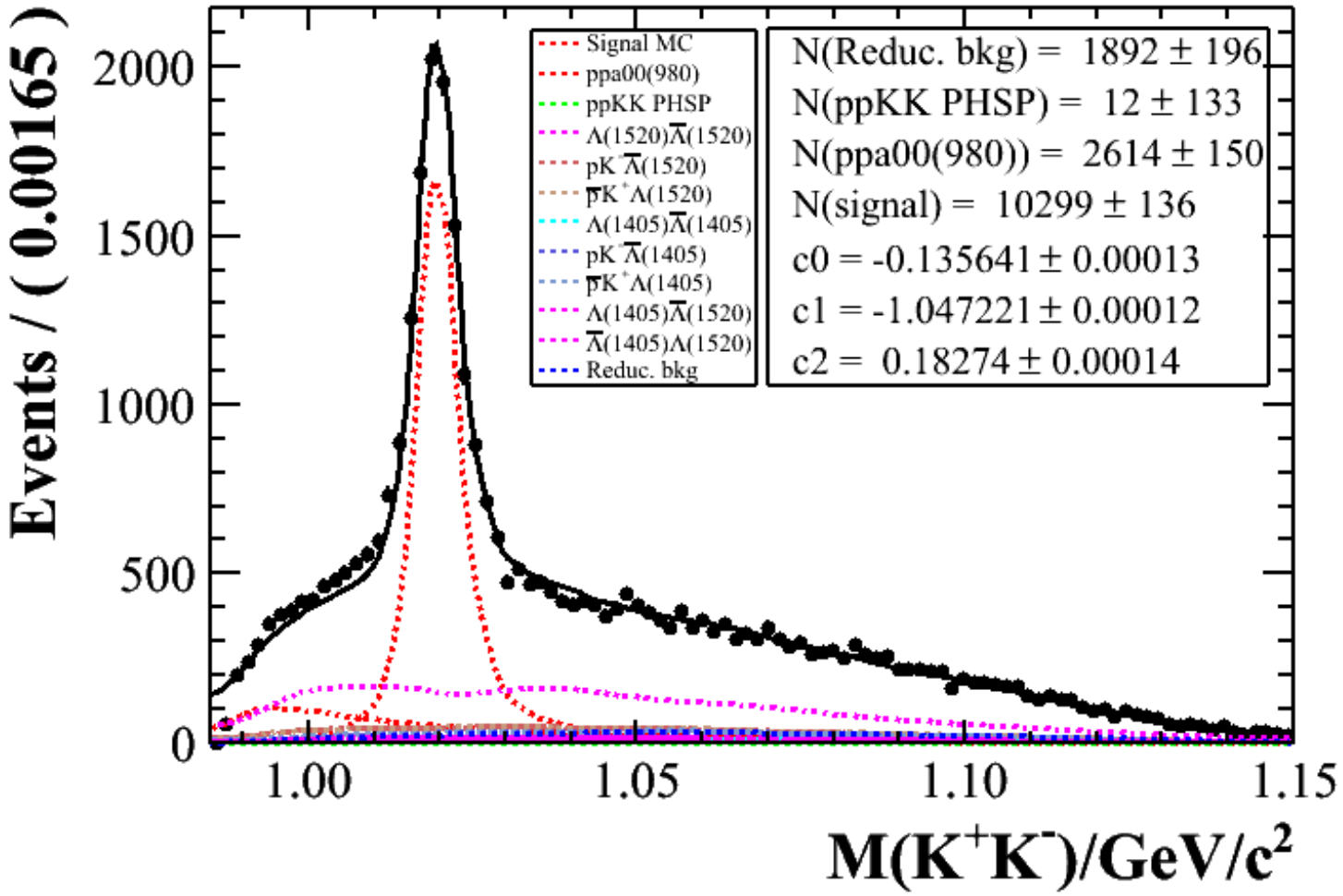
Consider in system error.

6. $J/\psi \to \Lambda(1520)\bar{\Lambda}(1520) \to p\bar{p}K^-K^+$
7. $J/\psi \to pK^-\bar{\Lambda}(1520) \to p\bar{p}K^-K^+$
8. $J/\psi \to \bar{p}K^+\Lambda(1520) \to p\bar{p}K^-K^+$
9. $J/\psi \to \Lambda(1405)\bar{\Lambda}(1405) \to p\bar{p}K^-K^+$
10. $J/\psi \to pK^-\bar{\Lambda}(1405) \to p\bar{p}K^-K^+$
11. $J/\psi \to \bar{p}K^+\Lambda(1405) \to p\bar{p}K^-K^+$
12. $J/\psi \to \Lambda(1405)\bar{\Lambda}(1520) \to p\bar{p}K^-K^+$
13. $J/\psi \to \Lambda(1405)\bar{\Lambda}(1520) \to p\bar{p}K^-K^+$

MC Shape, Fixed acc. 2Dfitting

3. Reducable B.K.G. — **Polynomial , Float**

M(K^+K^-) Fitting


Signal MC
ppa00(980)
ppKK PHSP
Λ(1520)$\bar{\Lambda}$(1520)
pK$^-\bar{\Lambda}$(1520)
$\bar{p}$K$^+$Λ(1520)
Λ(1405)$\bar{\Lambda}$(1405)
pK$^-\bar{\Lambda}$(1405)
$\bar{p}$K$^+$Λ(1405)
Λ(1405)$\bar{\Lambda}$(1520)
$\bar{\Lambda}$(1405)Λ(1520)
Reduc. bkg
N(Reduc. bkg) = 1892 ± 196
N(ppKK PHSP) = 12 ± 133
N(ppa00(980)) = 2614 ± 150
N(signal) = 10299 ± 136
c0 = -0.135641 ± 0.00013
c1 = -1.047221 ± 0.00012
c2 = 0.18274 ± 0.00014
Events / (0.00165)
2000
1500
1000
500
0
1.00
1.05
1.10
1.15
M(K$^+$K$^-$)/GeV/c^2

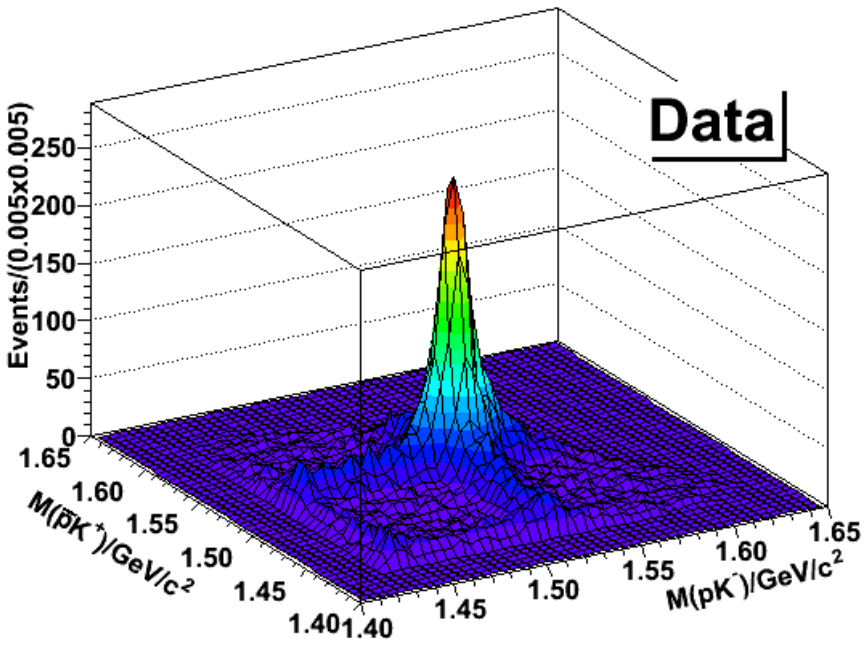
Next step work

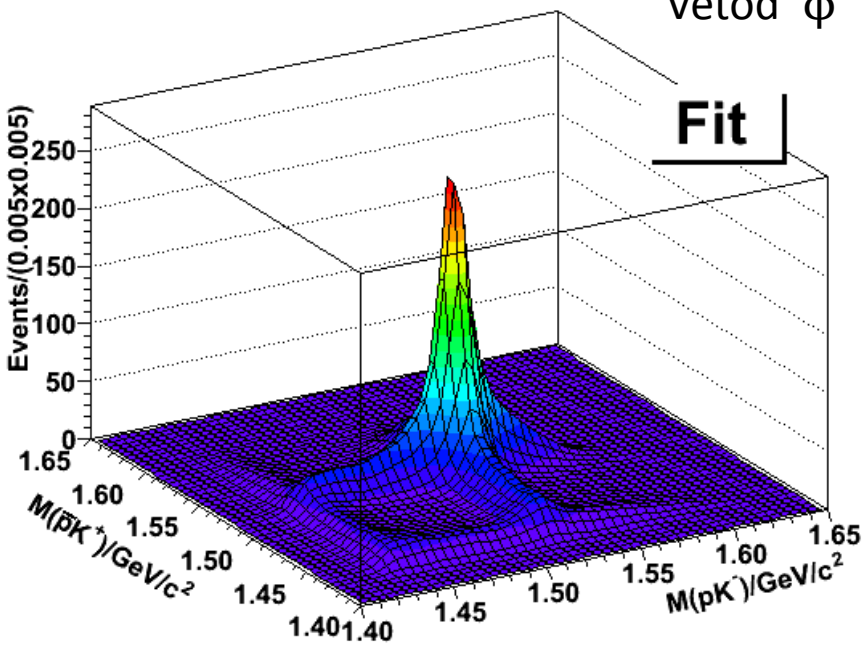
- Fitting result not very well in[0.99,1.1], try to generate $\mathrm{J}/\psi \rightarrow \mathrm{p}\bar{p}a_0^0(980)$ by Flatte fromula;
- How to get 2D-pdf correctly?
- Weighting and Branch fraction;
- …..

Backup

M(pK⁻)-M($\bar{p}$K⁺) 2D Fitting (I)

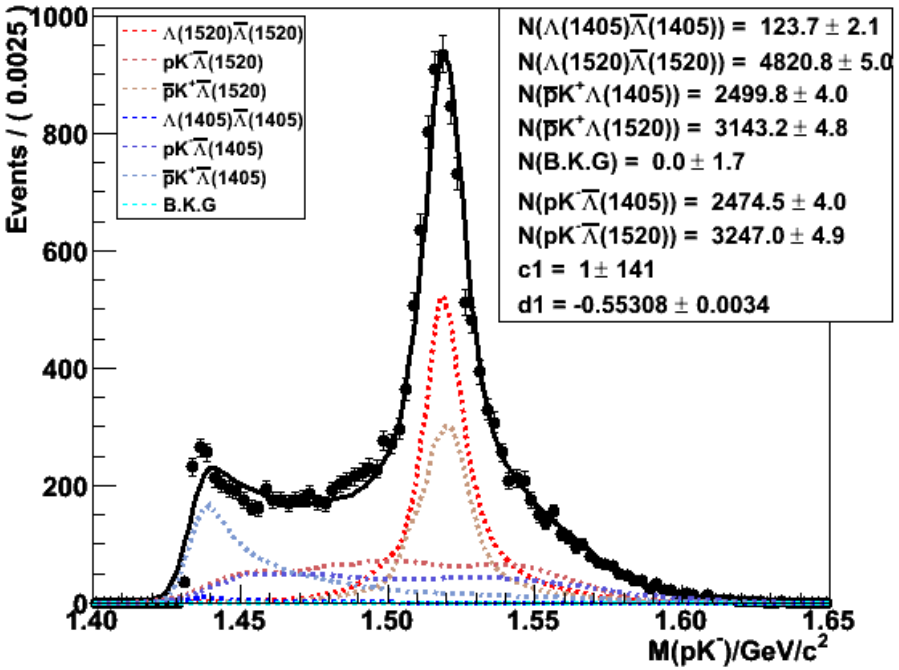
Vetod ϕ

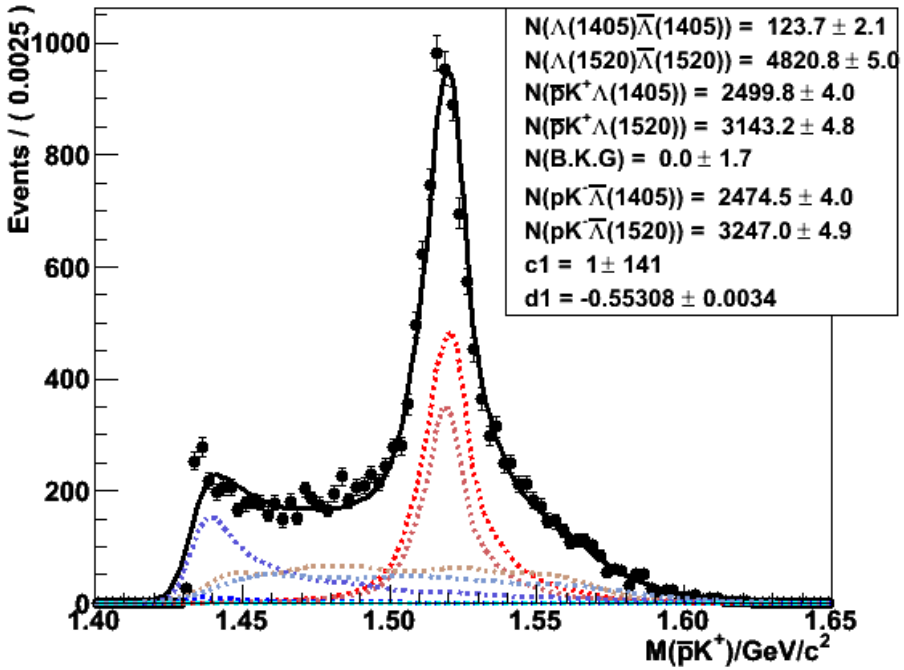




Don't consider : $J/\psi \to \Lambda(1405)\bar{\Lambda}(1520)$+c.c.

M(pK⁻)-M($\bar{p}$K⁺) 2D Fitting (I) FCN=-209380





Channels	Branch Fraction
Br(J/ψ→Λ(1520)$\bar{\Lambda}$(1520))	
Br(J/ψ→pK⁻$\bar{\Lambda}$(1520))	
Br(J/ψ→$\bar{p}$K⁺Λ(1520))	
Br(J/ψ→Λ(1405)$\bar{\Lambda}$(1405))	
Br(J/ψ→pK⁻$\bar{\Lambda}$(1405))×Br($\bar{\Lambda}$(1405)→$\bar{p}$K⁺)	
Br(J/ψ→$\bar{p}$K⁺Λ(1405))Br(Λ(1405)→pK⁻)	

M(K^+K^-) Fitting (I)

1. Signal — **Signal MC Shape ⊗Gauss**

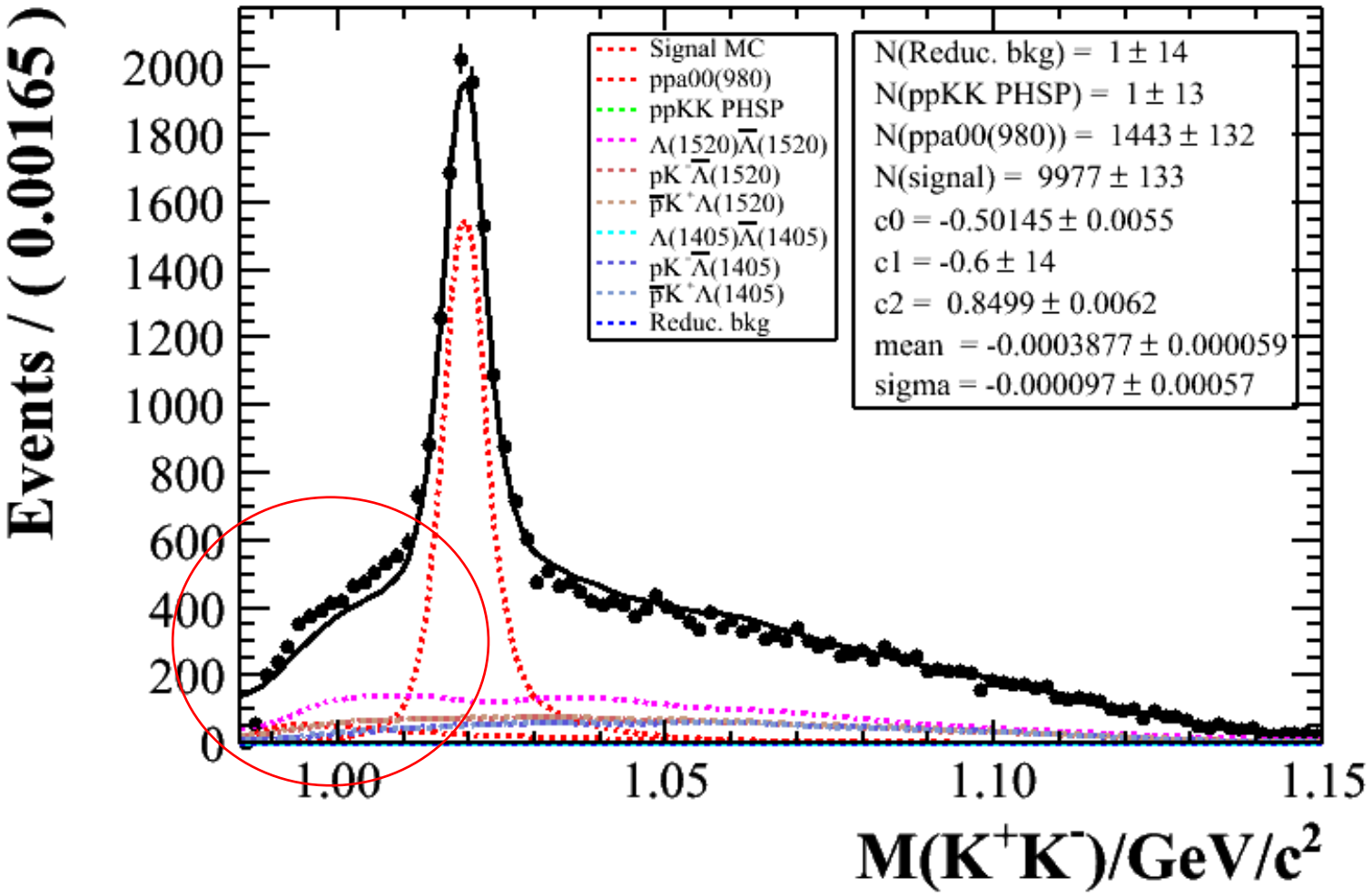
2. $p\bar{p}\,K^-K^+$

1.	$J/\psi \to p\bar{p}\,K^-K^+$ PHSP	
2.	$J/\psi \to p\bar{p}\,a_0^0(980) \to p\bar{p}K^-K^+$	MC Shape , Float
3.	$J/\psi \to p\bar{p}\,f_0(1370) \to p\bar{p}K^-K^+$	**Consider in system error.**
4.	$J/\psi \to p\bar{p}\,f_2(1270) \to p\bar{p}K^-K^+$	
5.	$J/\psi \to p\bar{p}\,a_2^0(1320) \to p\bar{p}K^-K^+$	
6.	$J/\psi \to \Lambda(1520)\bar{\Lambda}(1520) \to p\bar{p}K^-K^+$	**MC Shape, Fixed acc. 2Dfitting**
7.	$J/\psi \to pK^-\bar{\Lambda}(1520) \to p\bar{p}K^-K^+$	
8.	$J/\psi \to \bar{p}K^+\Lambda(1520) \to p\bar{p}K^-K^+$	
9.	$J/\psi \to \Lambda(1405)\bar{\Lambda}(1405) \to p\bar{p}K^-K^+$	
10.	$J/\psi \to pK^-\bar{\Lambda}(1405) \to p\bar{p}K^-K^+$	
11.	$J/\psi \to \bar{p}K^+\Lambda(1405) \to p\bar{p}K^-K^+$	

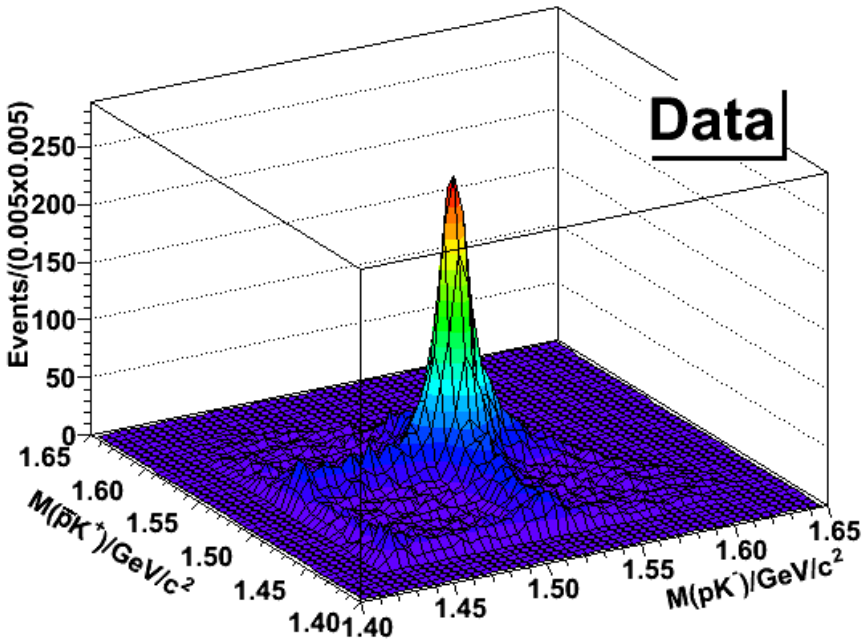
3. Reducable B.K.G. — **Polynomial , Float**

M(K^+K^-) Fitting (I)

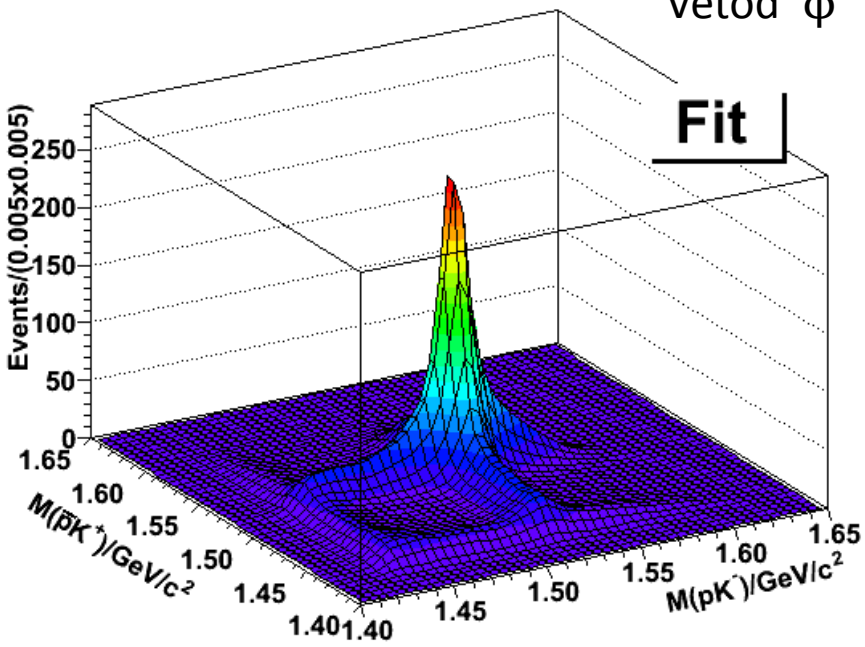
FCN=-420982



M(pK⁻)-M($\bar{p}$K⁺) 2D Fitting (II)

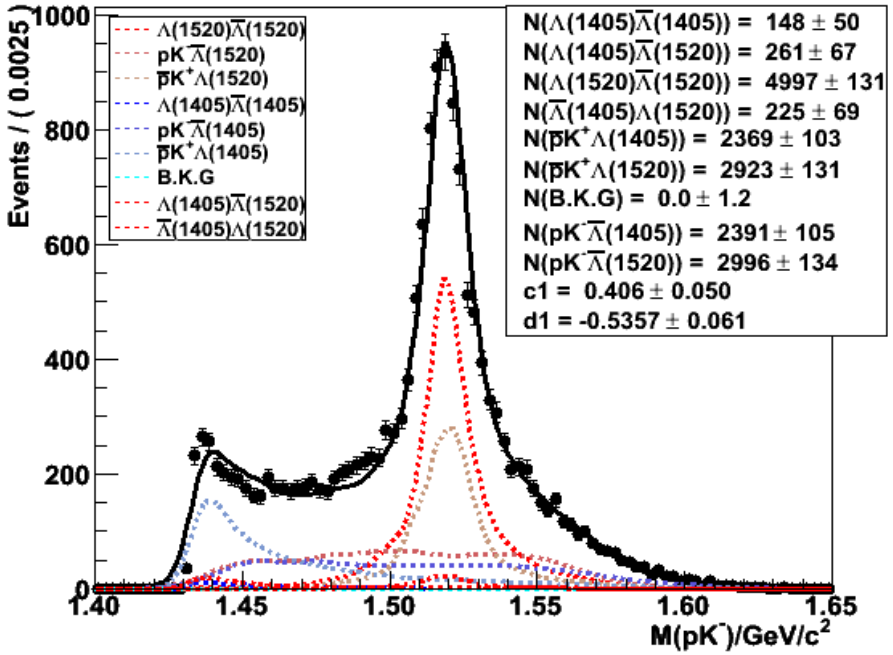


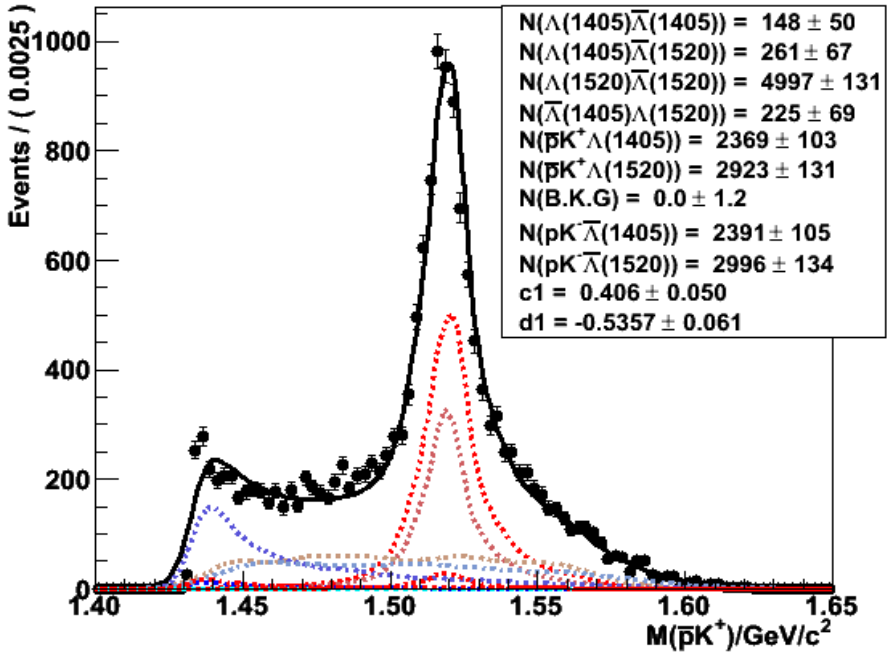
Vetod ϕ



consider : J/ψ→$\Lambda(1405)\bar{\Lambda}(1520)$+c.c.

M(pK⁻)-M($\bar{p}$K⁺) 2D Fitting (II) FCN=-209396





Channels	Branch Fraction
Br(J/ψ→Λ(1520)$\bar{\Lambda}$(1520))	
Br(J/ψ→pK⁻$\bar{\Lambda}$(1520))	
Br(J/ψ→$\bar{p}$K⁺Λ(1520))	
Br(J/ψ→Λ(1405)$\bar{\Lambda}$(1405))	
Br(J/ψ→pK⁻$\bar{\Lambda}$(1405))×Br($\bar{\Lambda}$(1405)→$\bar{p}$K⁺)	
Br(J/ψ→$\bar{p}$K⁺Λ(1405))Br(Λ(1405)→pK⁻)	
J/ψ→Λ(1405)$\bar{\Lambda}$(1520)+c.c.	

M(K^+K^-) Fitting (II)

1. Signal — **Signal MC Shape ⊗Gauss**

2. $p\bar{p}\,K^-K^+$

1. $J/\psi \to p\bar{p}\,K^-K^+$ PHSP
2. $J/\psi \to p\bar{p}\,a_0^0(980) \to p\bar{p}K^-K^+$ MC Shape , Float
3. $J/\psi \to p\bar{p}\,f_0(1370) \to p\bar{p}K^-K^+$
4. $J/\psi \to p\bar{p}\,f_2(1270) \to p\bar{p}K^-K^+$
5. $J/\psi \to p\bar{p}\,a_2^0(1320) \to p\bar{p}K^-K^+$

Consider in system error.

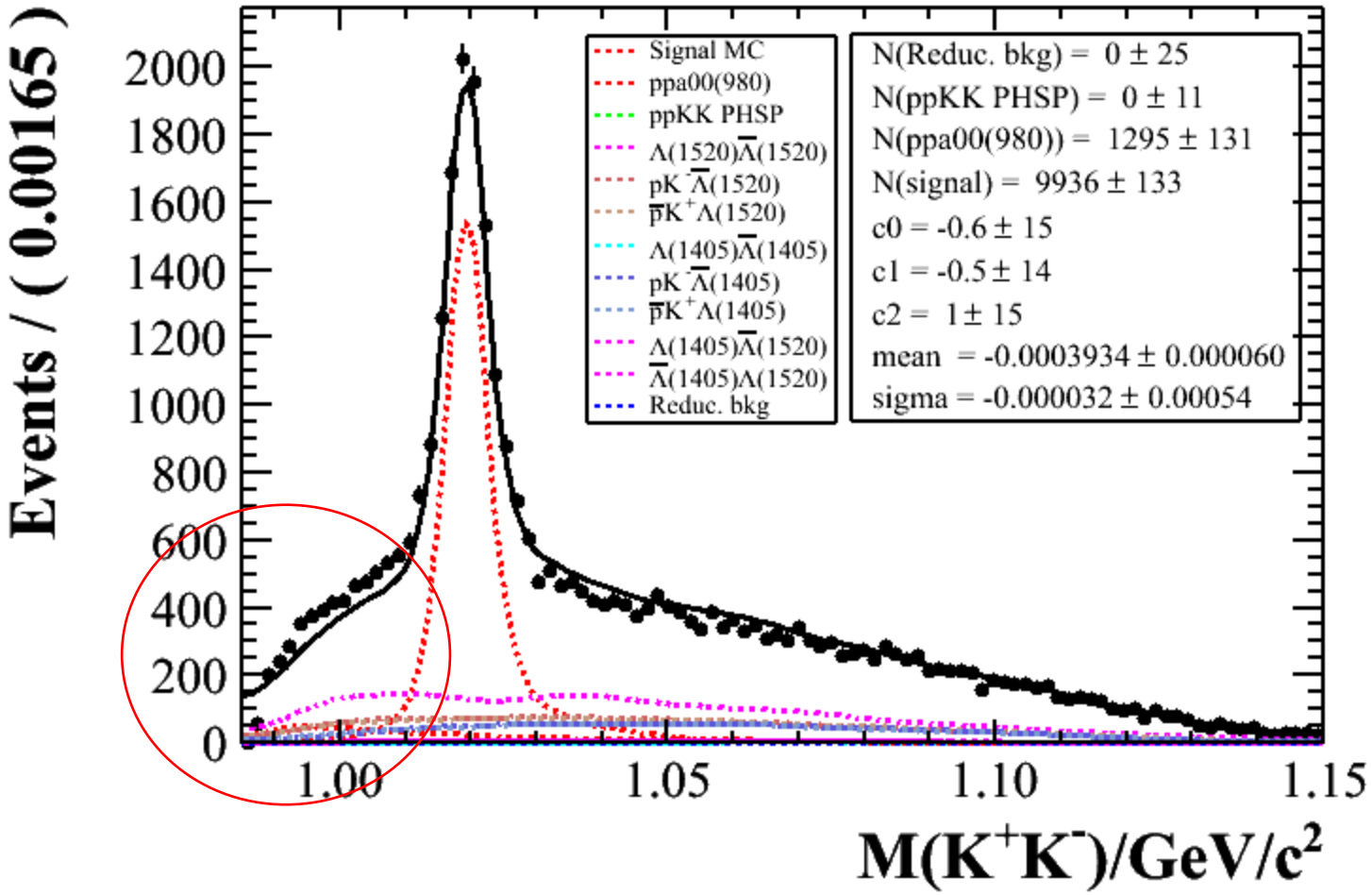
6. $J/\psi \to \Lambda(1520)\bar{\Lambda}(1520) \to p\bar{p}K^-K^+$
7. $J/\psi \to pK^-\bar{\Lambda}(1520) \to p\bar{p}K^-K^+$
8. $J/\psi \to \bar{p}K^+\Lambda(1520) \to p\bar{p}K^-K^+$
9. $J/\psi \to \Lambda(1405)\bar{\Lambda}(1405) \to p\bar{p}K^-K^+$
10. $J/\psi \to pK^-\bar{\Lambda}(1405) \to p\bar{p}K^-K^+$
11. $J/\psi \to \bar{p}K^+\Lambda(1405) \to p\bar{p}K^-K^+$
12. $J/\psi \to \Lambda(1405)\bar{\Lambda}(1520) \to p\bar{p}K^-K^+$
13. $J/\psi \to \Lambda(1405)\bar{\Lambda}(1520) \to p\bar{p}K^-K^+$

MC Shape, Fixed acc. 2Dfitting

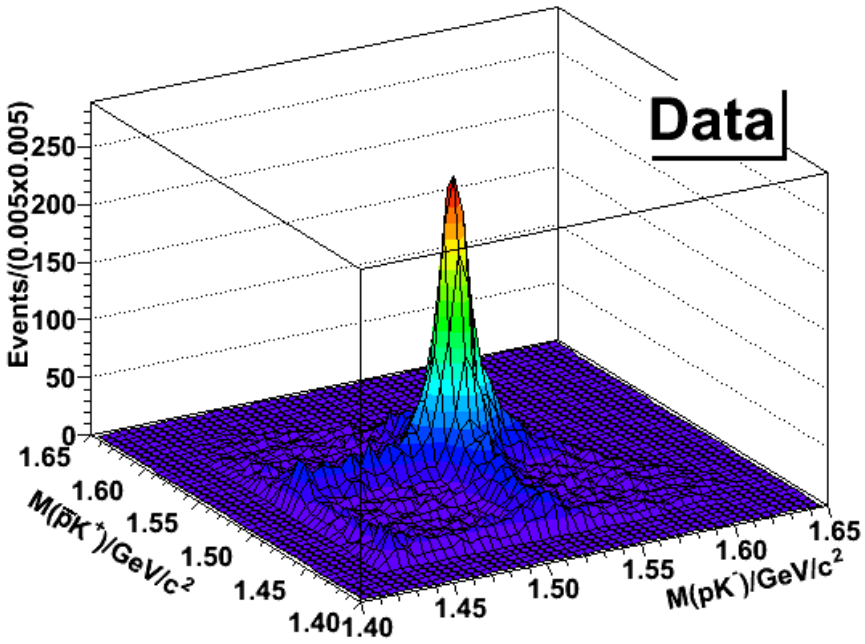
3. Reducable B.K.G. — **Polynomial , Float**

M(K^+K^-) Fitting (II)

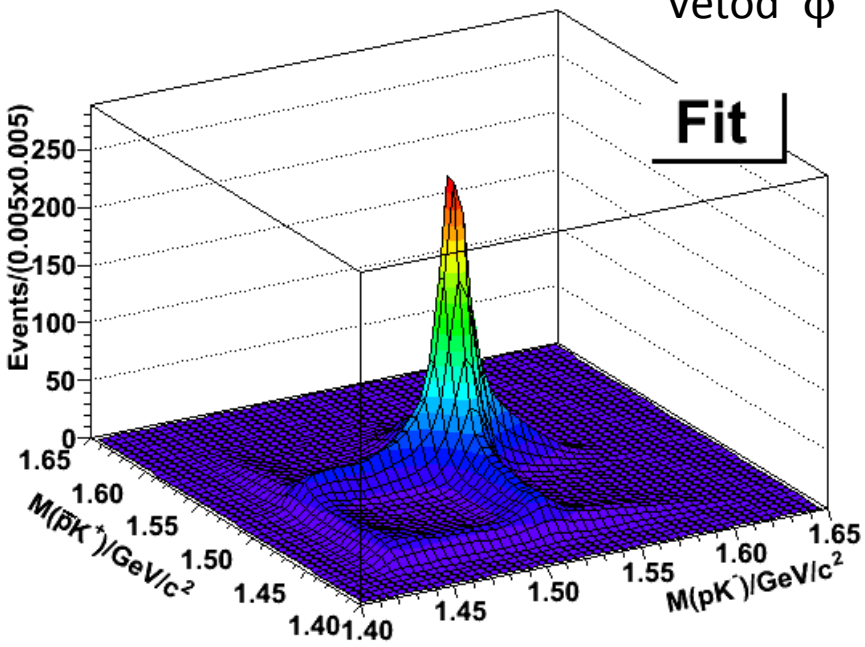
FCN=-420966



M(pK⁻)-M($\bar{p}$K⁺) 2D Fitting (III)



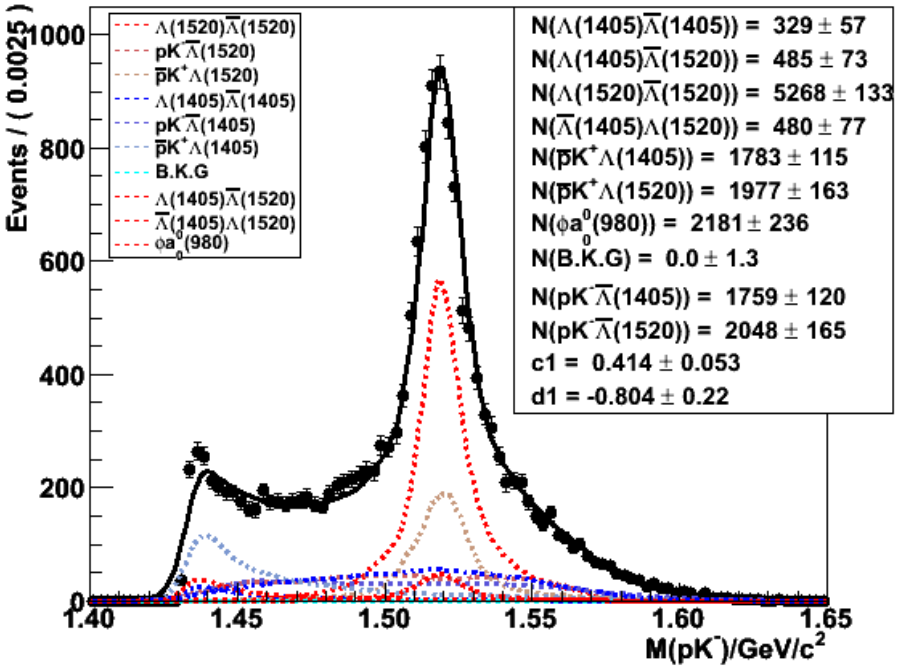
Vetod ϕ

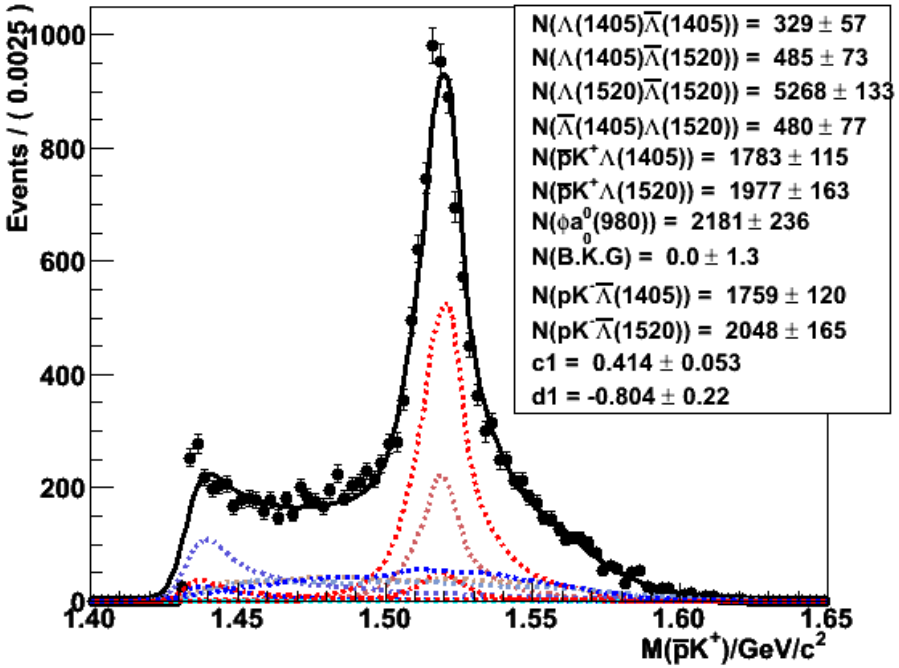


consider : $J/\psi \to \Lambda(1405)\bar{\Lambda}(1520)$+c.c.

$J/\psi \to p\bar{p}\, a_0^0(980)$

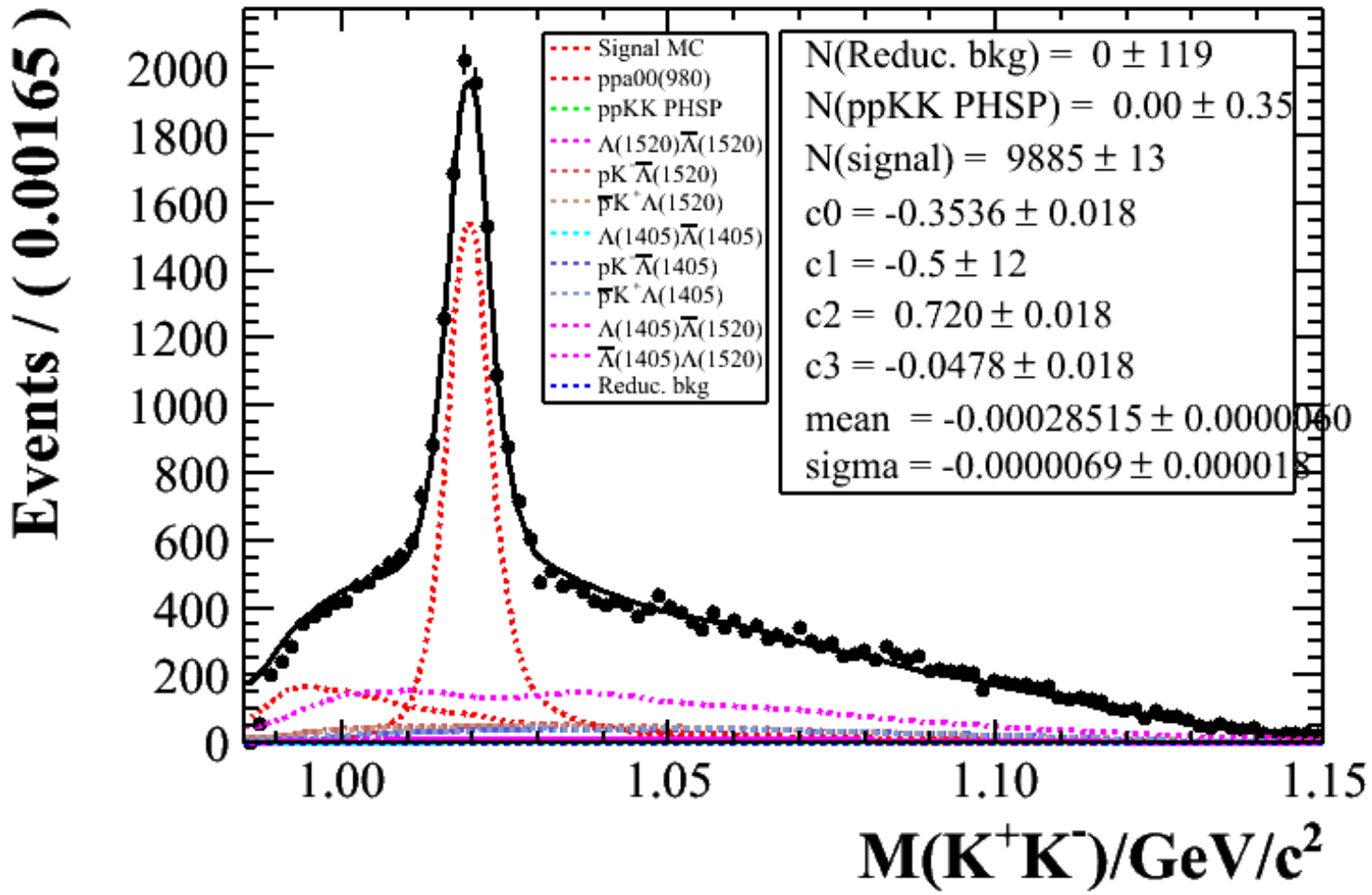
M(pK⁻)-M($\bar{p}$K⁺) 2D Fitting (III) FCN=-209440





M(K^+K^-) Fitting (III)

STATUS=NOT POSDEF



M(K^+K^-) Fitting (III)

N($p\bar{p}$ a_0^0(980)) is float

STATUS=NOT POSDEF