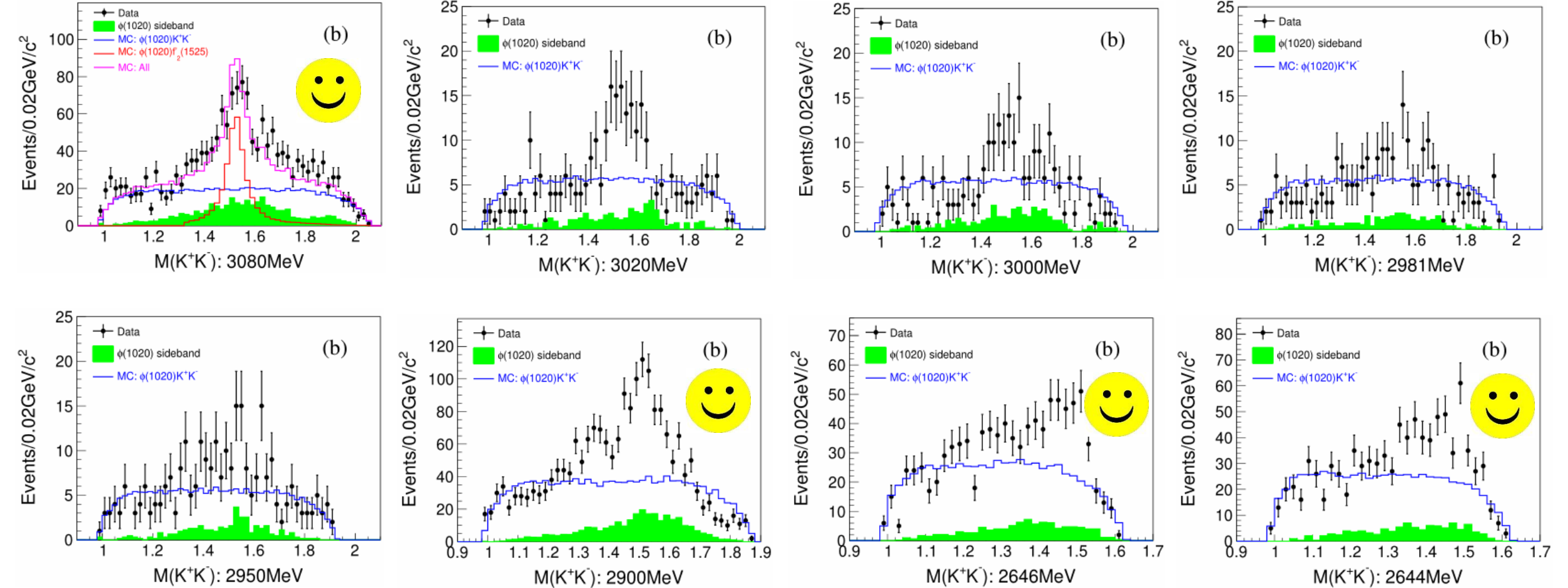


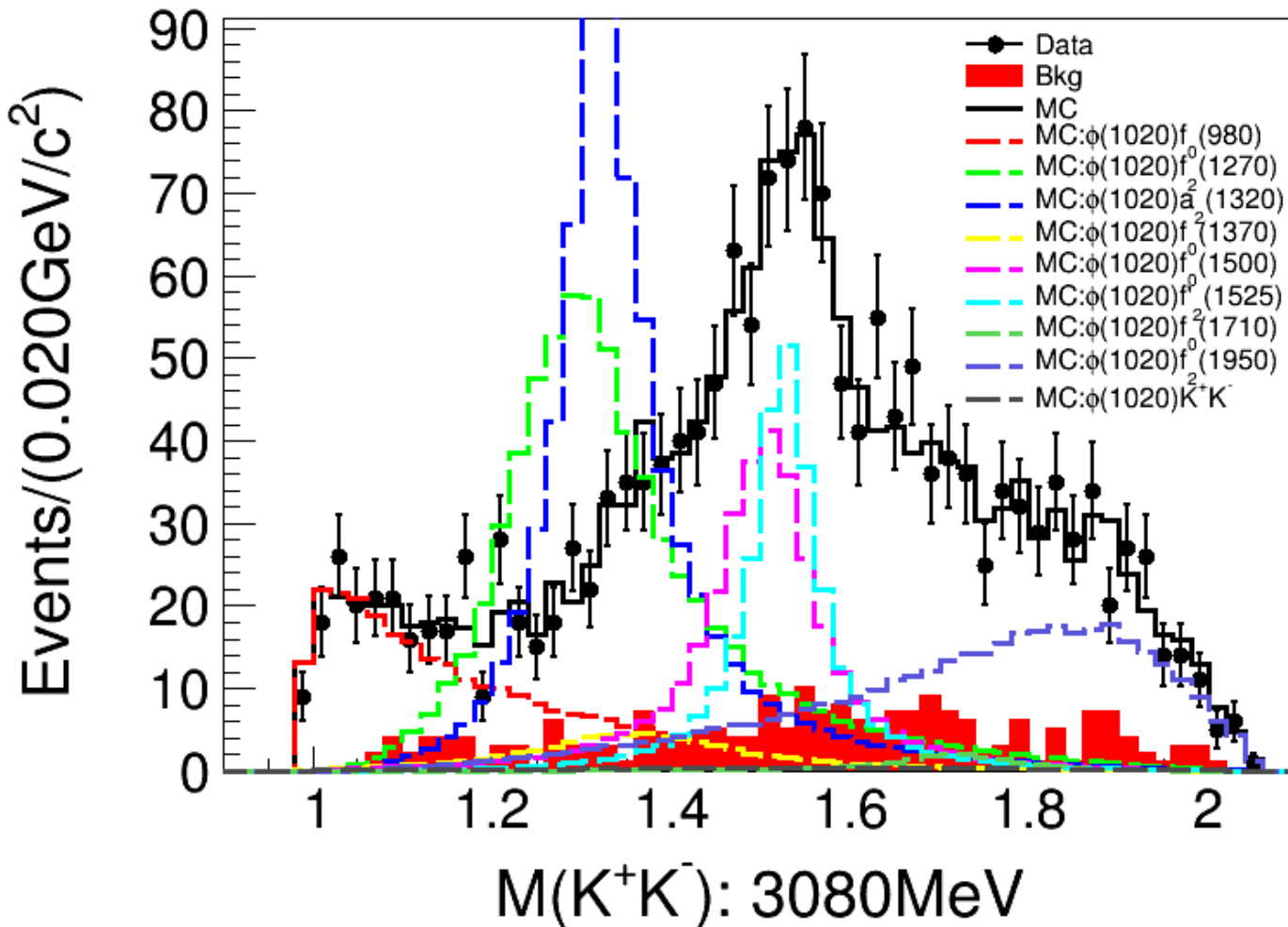
PWA results of $e^+e^- \rightarrow \phi K^+K^-$

Yankun Sun Zhihong Wang
(BESIII-USTC Group)

Data sets



HelPWAAlg @3080MeV (I)

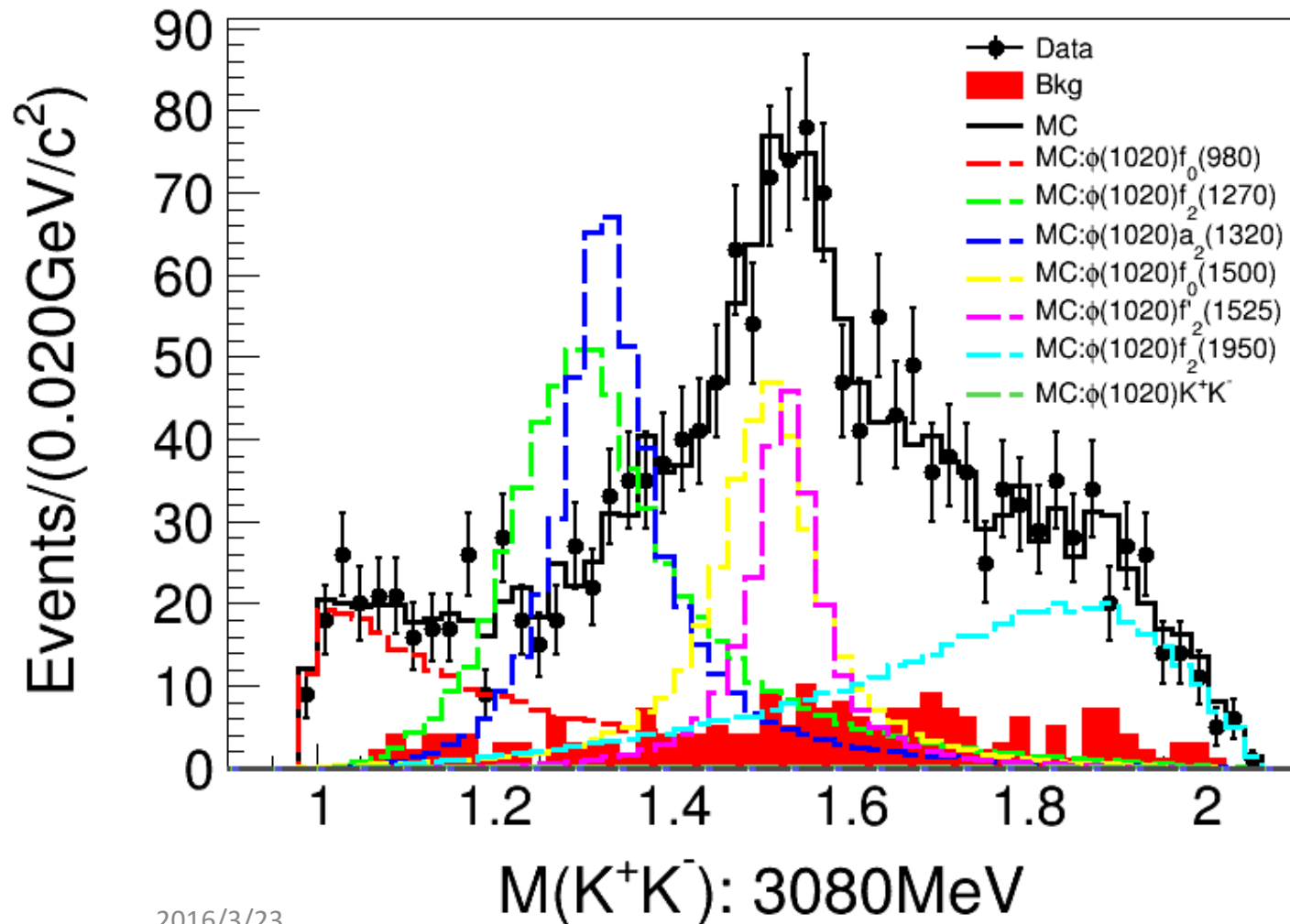


$N_{\text{mode}} = 8$
 $-\ln L = -138.921$

HelPWAAlg @3080MeV (II)

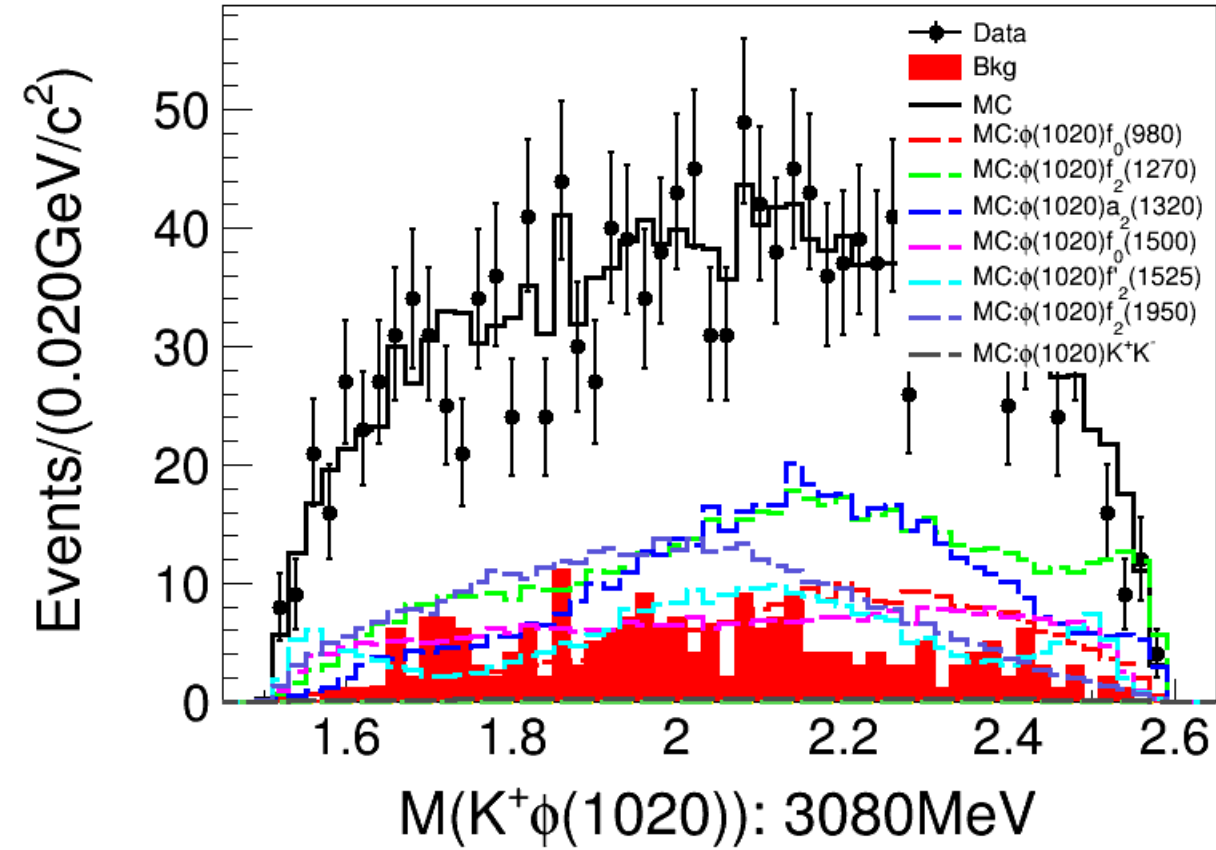
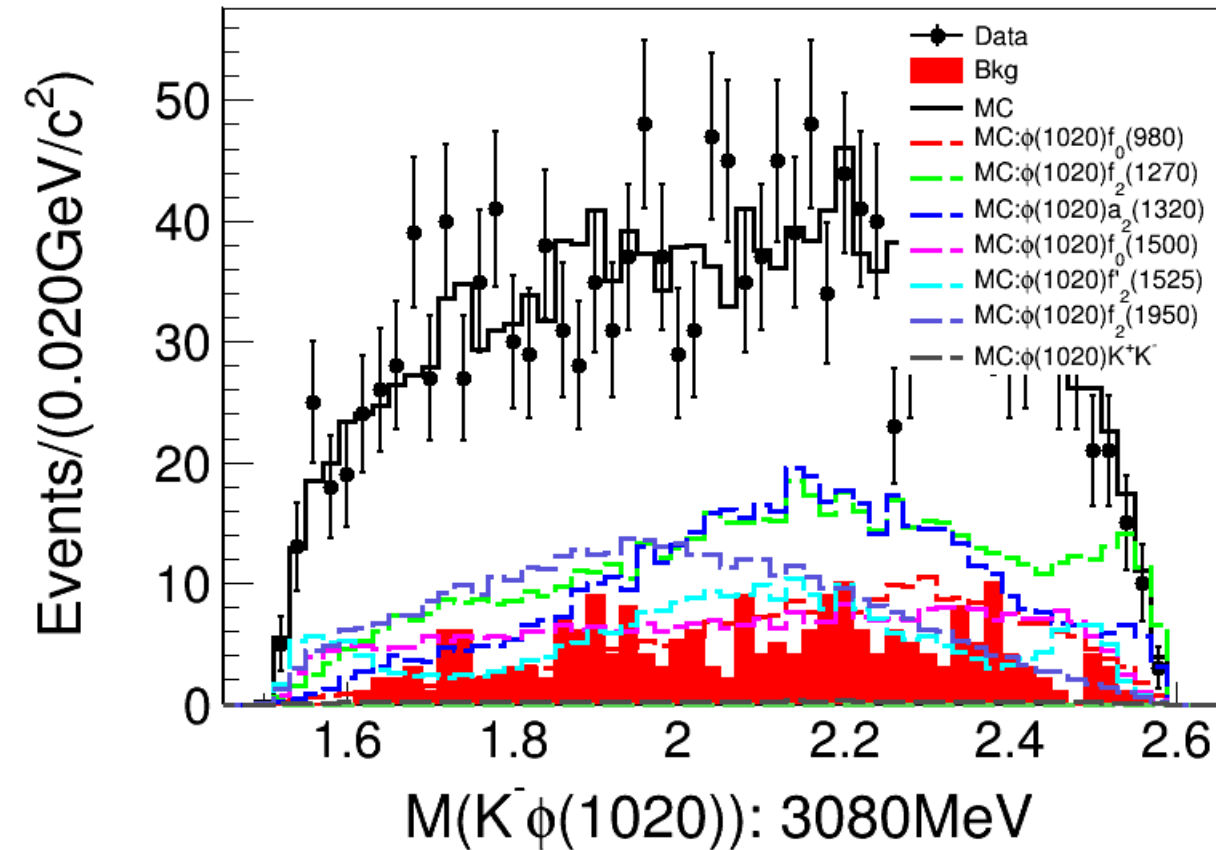
Mode	Process	ΔFCN	Δndf	Significance	Event
0	$e^+e^- \rightarrow \phi f_0(980)$	156.715	3	12.1σ	259.8 ± 26.4
1	$e^+e^- \rightarrow \phi f_2(1270)$	39.158	6	5.0σ	600.5 ± 205.3
2	$e^+e^- \rightarrow \phi a_2(1320)$	45.766	6	5.5σ	489.8 ± 205.3
3	$e^+e^- \rightarrow \phi f_0(1370)$	10.444	3	2.4σ	($\pm$)
4	$e^+e^- \rightarrow \phi f_0(1500)$	74.36	3	8.1σ	370.8 ± 44.6
5	$e^+e^- \rightarrow \phi f'_2(1525)$	68.882	6	7.2σ	249.2 ± 59.4
6	$e^+e^- \rightarrow \phi f_0(1710)$	9.312	3	2.2σ	($\pm$)
7	$e^+e^- \rightarrow \phi f_0(1950)$	113.522	6	9.7σ	433.1 ± 46.0
8	$e^+e^- \rightarrow \phi K^+ K^-$				8.0 ± 9.4

HelPWAAlg @3080MeV (III)

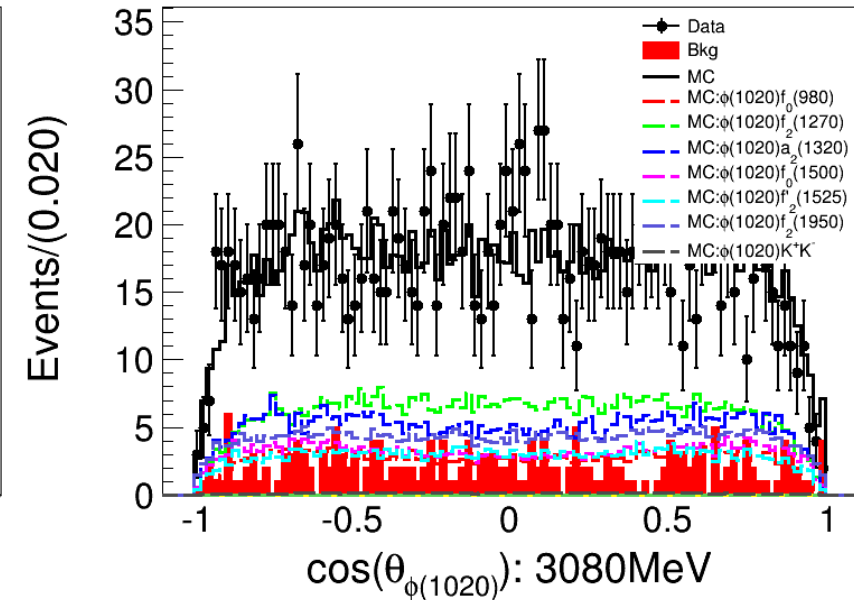
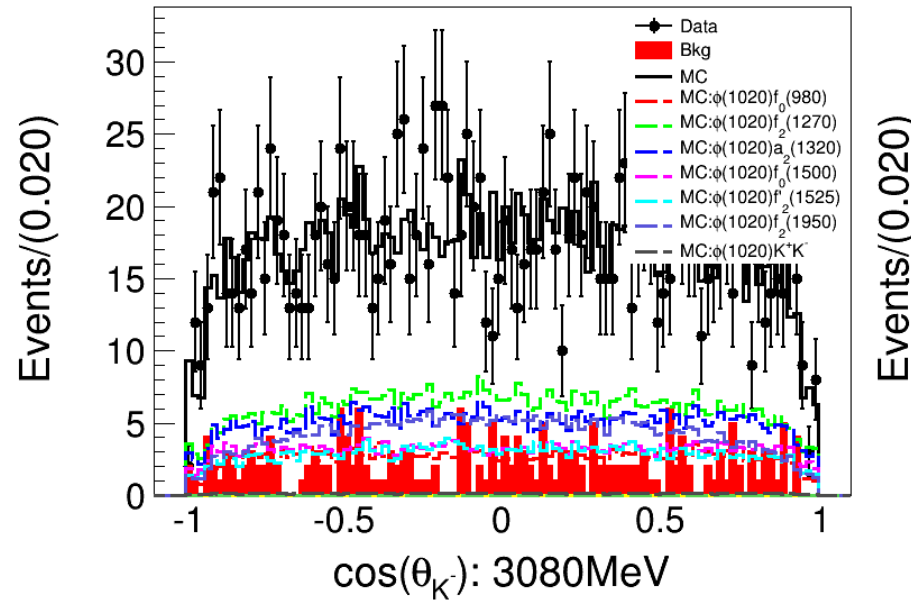
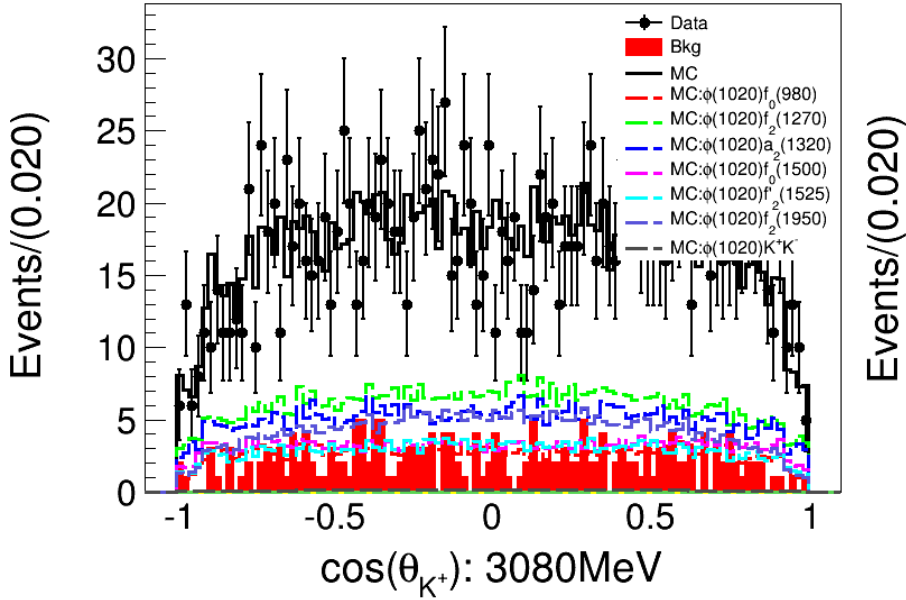


$N_{\text{mode}} = 6$
 $-\ln L = -134.345$

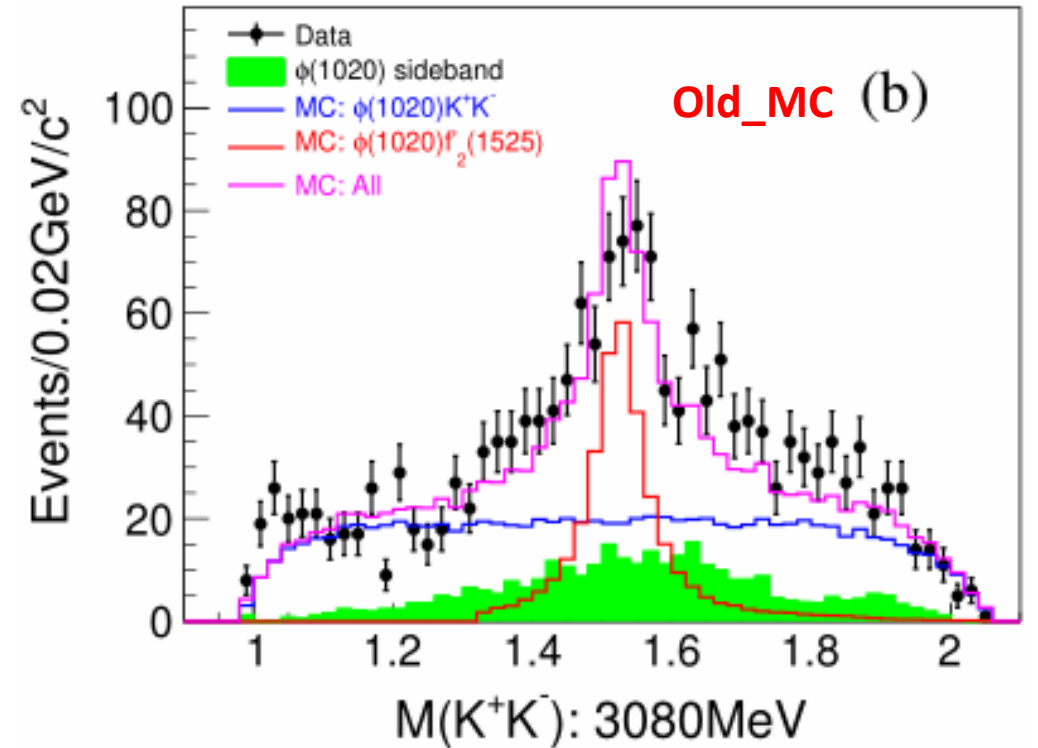
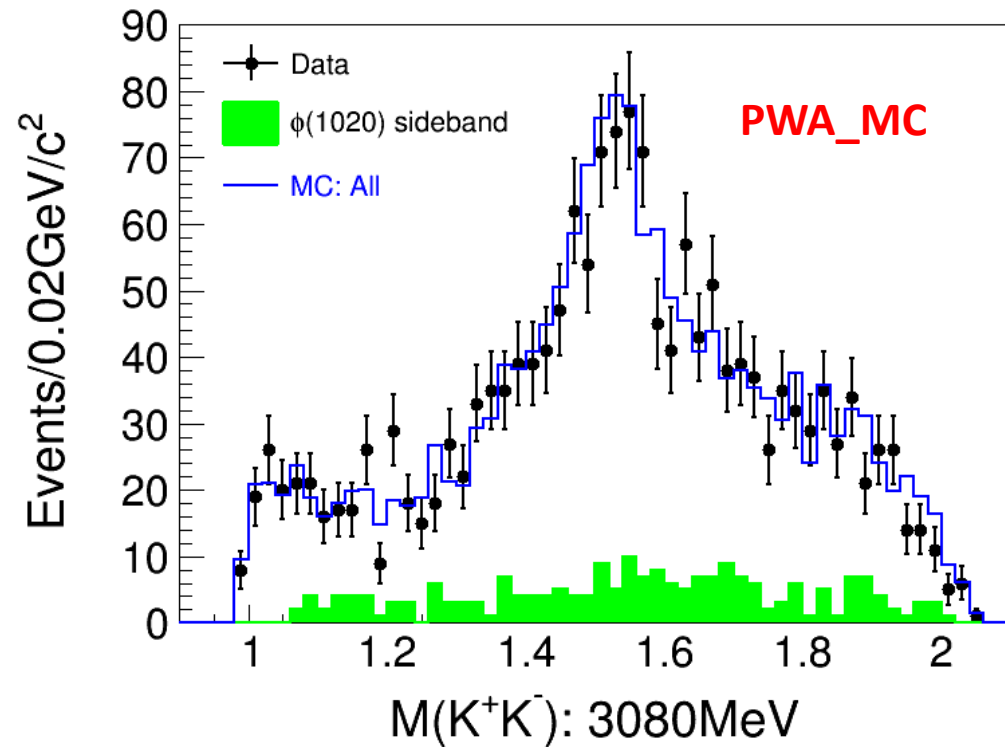
HelPWAAlg @3080MeV (III)



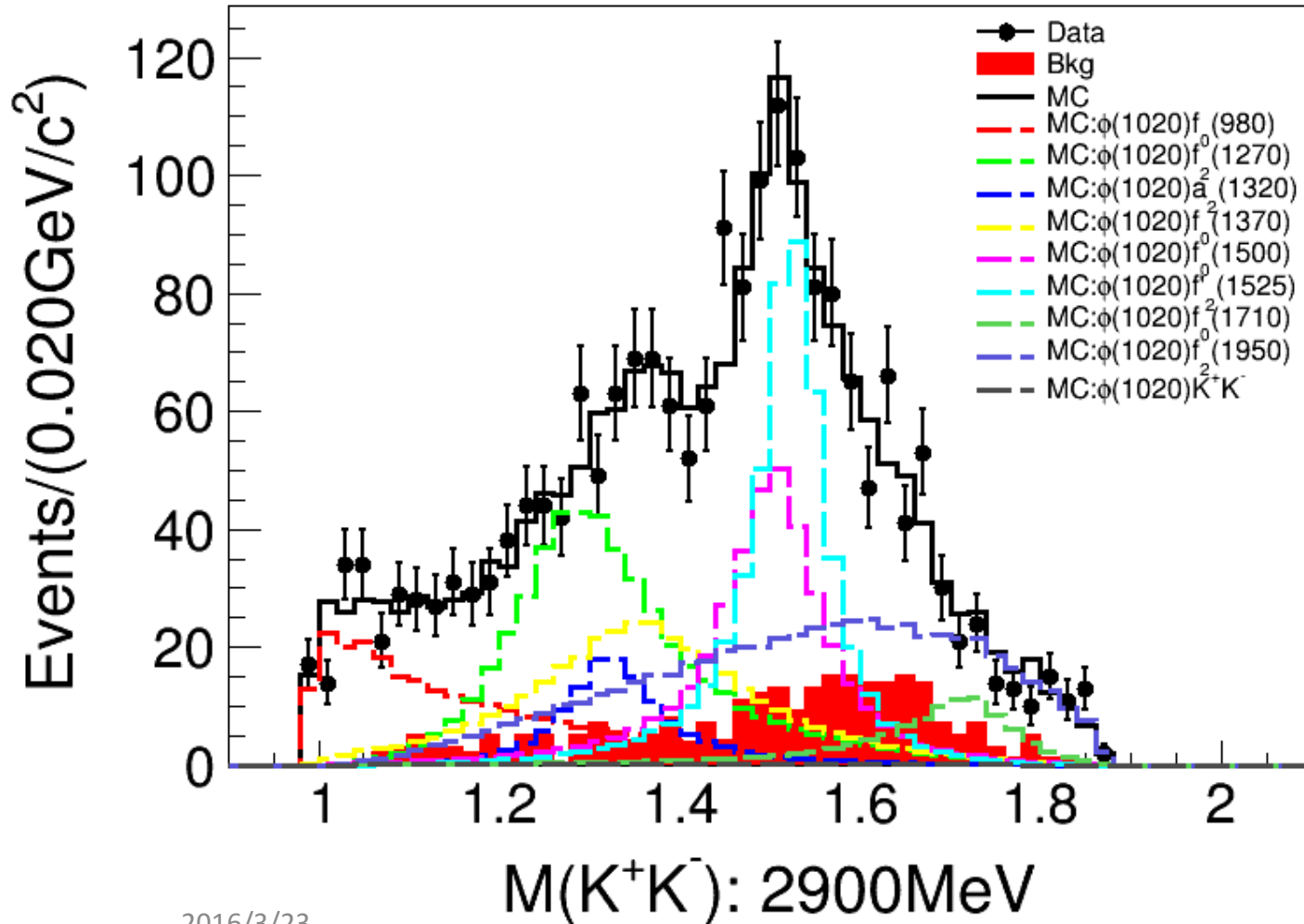
HelPWAAlg @3080MeV (III)



PWA_MC @3080MeV (IV)



HelPWAAlg @2900MeV (I)

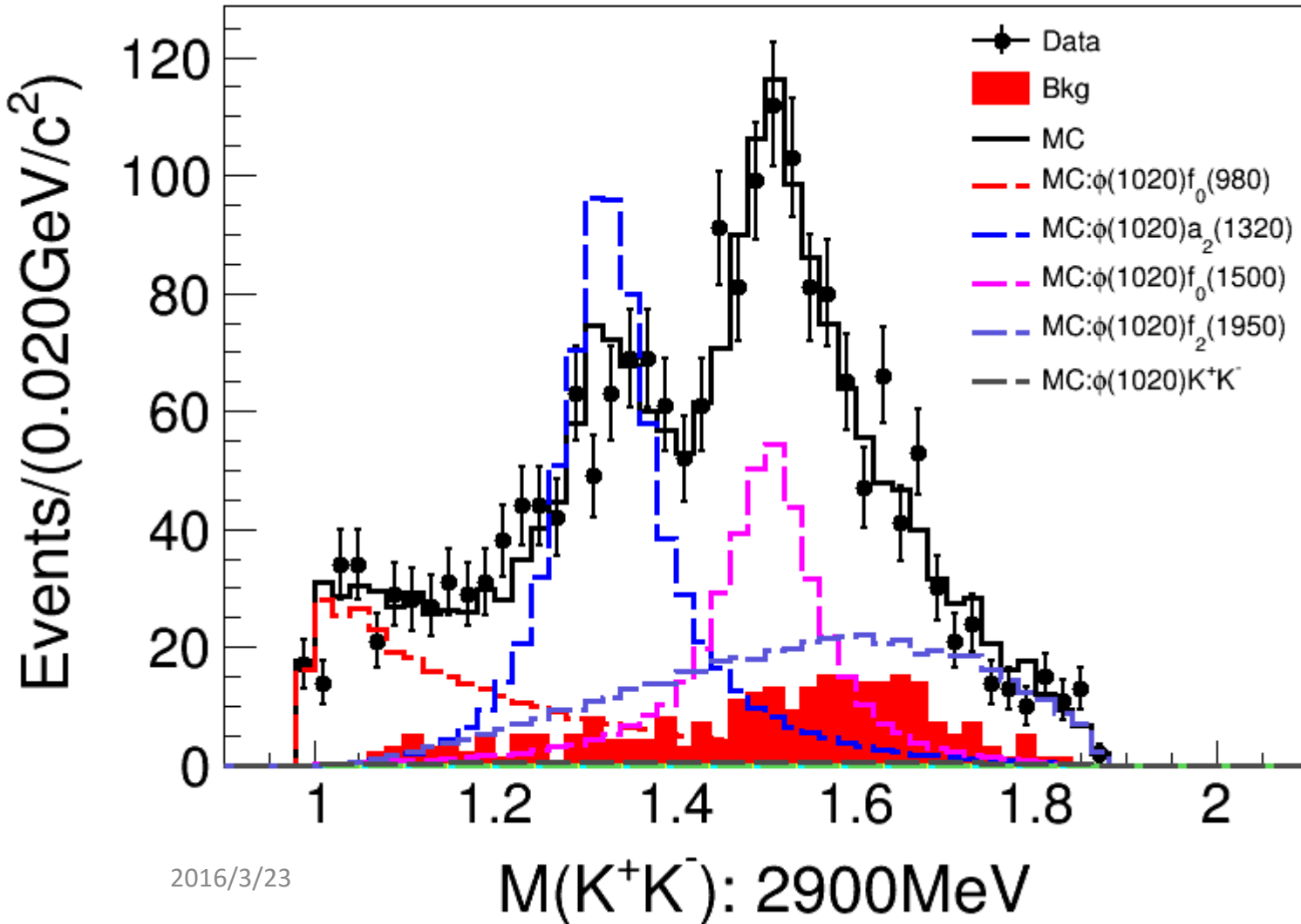


$N_{\text{mode}} = 8$
 $-\ln L = -186.378$

HelPWAAlg @2900MeV (II)

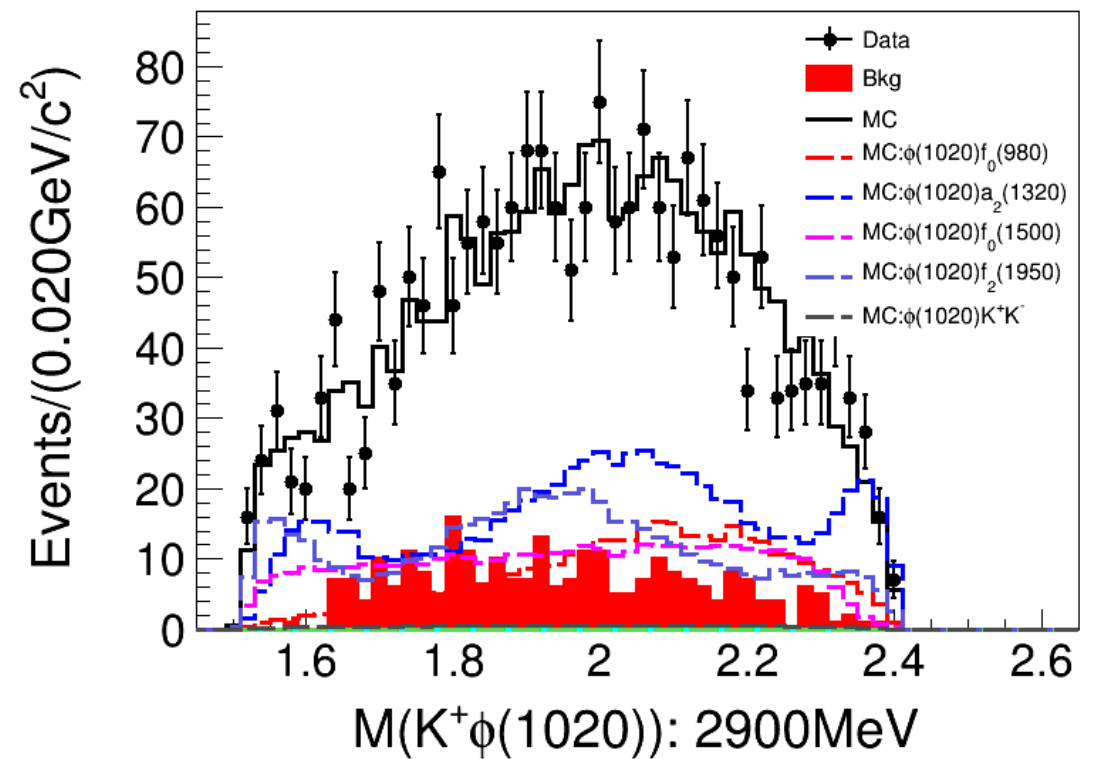
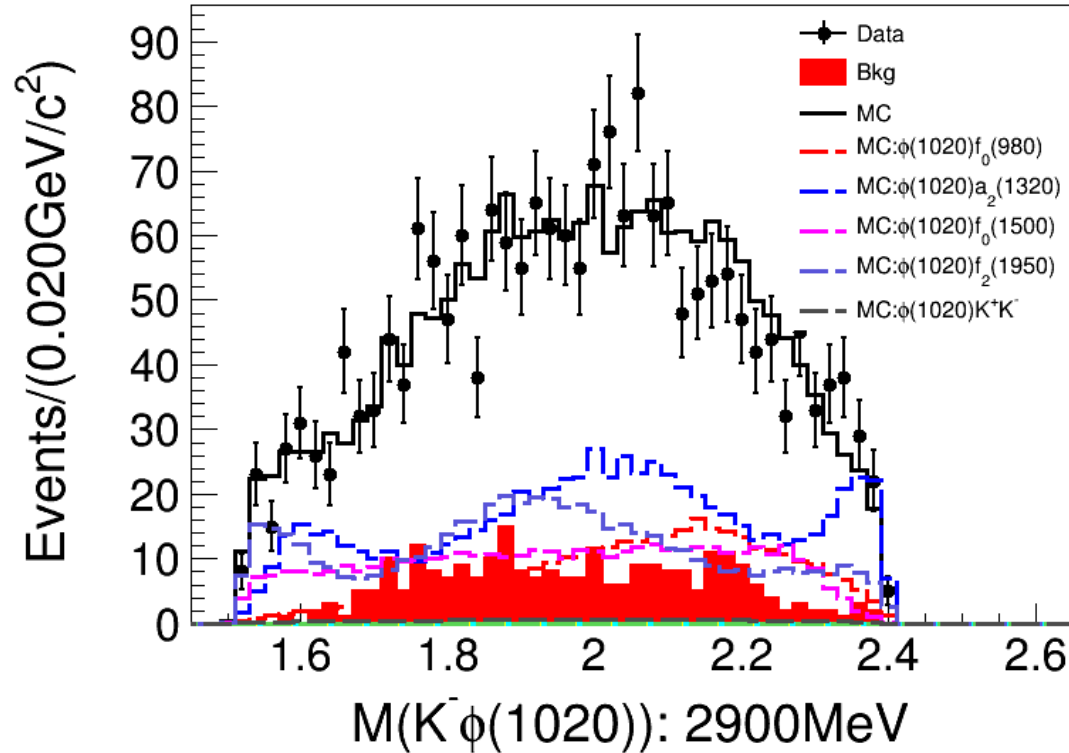
Mode	Process	ΔFCN	Δndf	Significance	Event
0	$e^+e^- \rightarrow \phi f_0(980)$	168.884	3	12.6σ	345.8 ± 30.8
1	$e^+e^- \rightarrow \phi f_2(1270)$	21.744	6	3.2σ	$\pm$
2	$e^+e^- \rightarrow \phi a_2(1320)$	18.396	6	2.8σ	719.4 ± 48.0
3	$e^+e^- \rightarrow \phi f_0(1370)$	9.792	3	2.3σ	$(\pm)$
4	$e^+e^- \rightarrow \phi f_0(1500)$	51.24	3	6.6σ	413.8 ± 38.3
5	$e^+e^- \rightarrow \phi f'_2(1525)$	9.632	6	1.5σ	$\pm$
6	$e^+e^- \rightarrow \phi f_0(1710)$	12.136	3	2.7σ	$(\pm)$
7	$e^+e^- \rightarrow \phi f_0(1950)$	74.278	6	7.5σ	528.3 ± 49.8
8	$e^+e^- \rightarrow \phi K^+ K^-$				19.6 ± 14.0

HelPWAAIg @2900MeV (III)

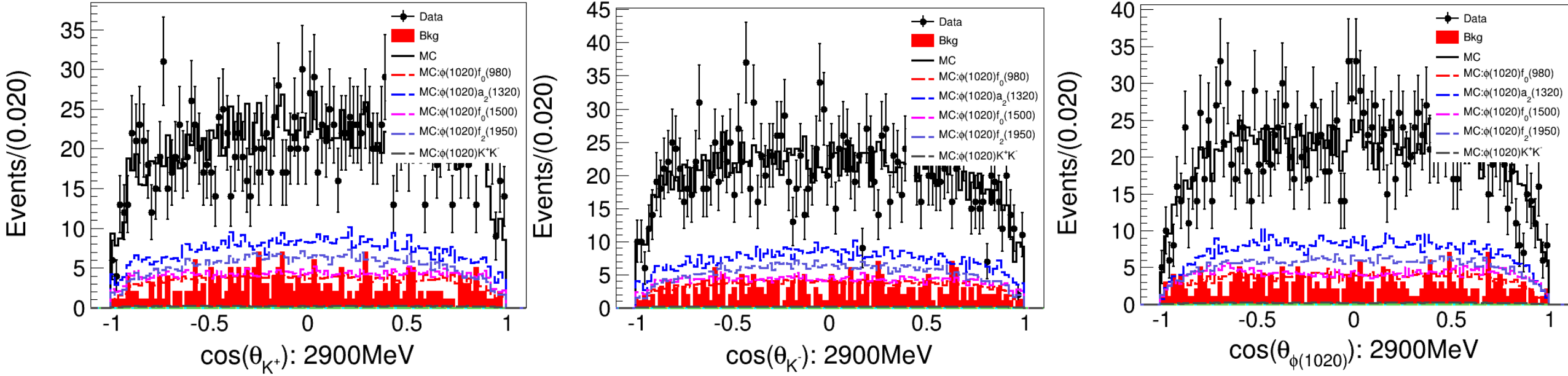


N_mode = 4
-lnL= -137.007

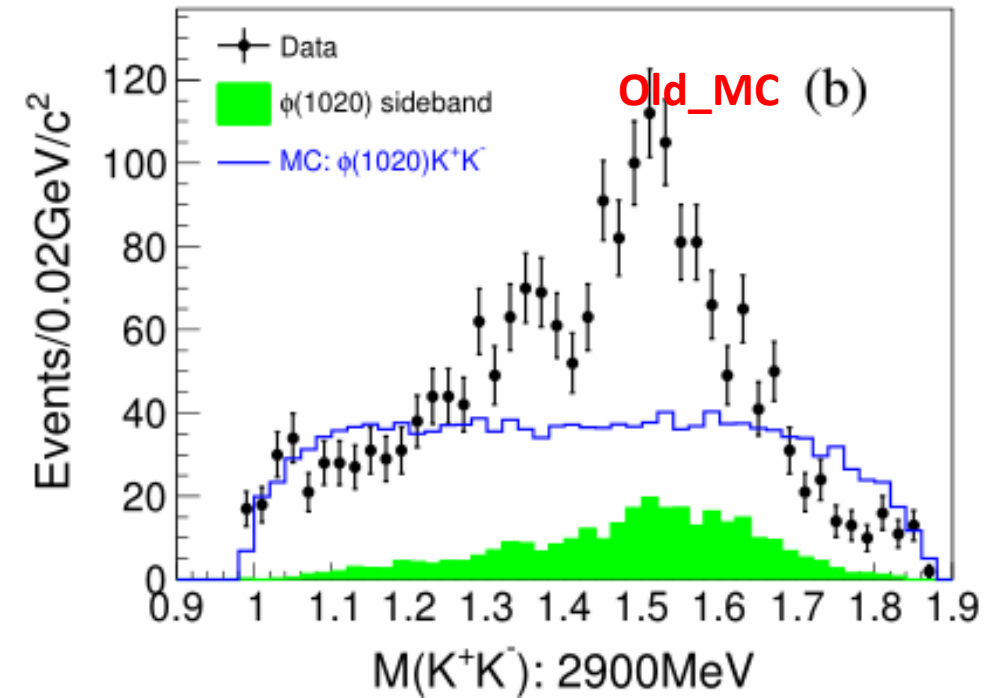
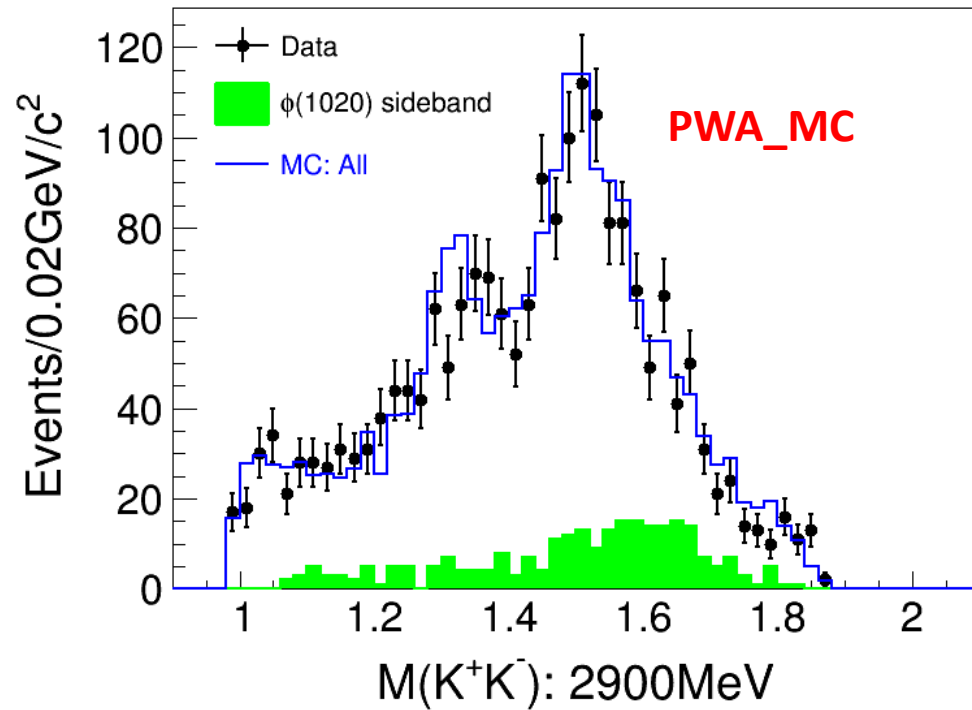
HelPWAAIg @2900MeV (III)



HelPWAAIg @2900MeV (III)



PWA_MC @2900MeV (IV)



Backup

PWA(MC_sample)

MC samples(Boss665p01,v1_pwagen.dat is from pwagen_v2
" v1_pwagen.dat"):

```
[sunyk@lxslc606 pwagen_V3]$ ll
total 1.4M
drwxr-xr-x 2 sunyk physics 4.0K Mar 17 22:25 dst
-rwxr-xr-x 1 sunyk physics 2.8K Mar 17 22:25 Mac.rec
-rwxr-xr-x 1 sunyk physics 2.8K Mar 17 22:25 Mac.sim
-rw-r--r-- 1 sunyk physics 57K Mar 17 22:25 pdt.table
-rw-r--r-- 1 sunyk physics 2.0K Mar 17 22:25 rec.txt
-rw-r--r-- 1 sunyk physics 1.1K Mar 17 22:25 sim.txt
-rw-r--r-- 1 sunyk physics 129 Mar 17 22:25 test.dec
-rw-r--r-- 1 sunyk physics 1.3M Mar 17 22:25 v1_pwagen.dat
```

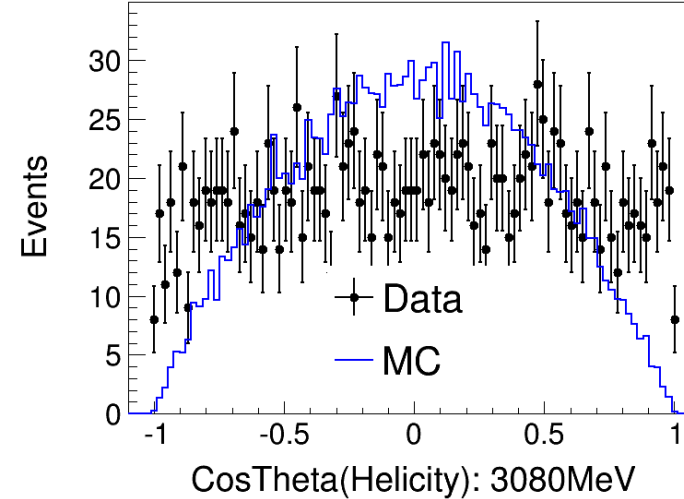
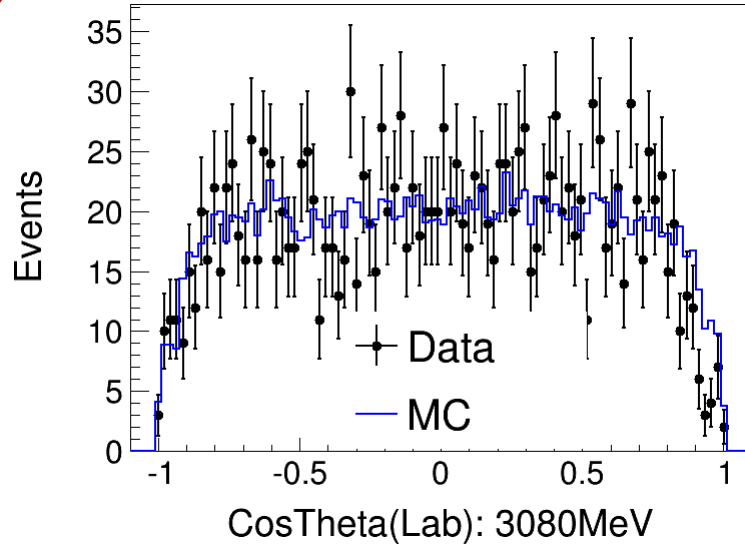
```
Particle gamma* 3.080 0
Decay gamma*
1 K+ K- phi TrackGen 0;
Enddecay

Decay phi
1 K+ K- AngSam 1 -1;
Enddecay

End
```

test.dec

PWA(Data and MC_3080)(5modes)

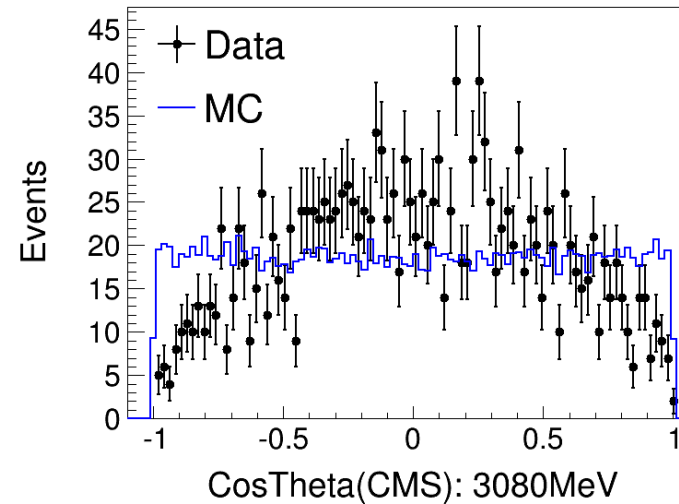


```
Particle gamma* 3.080 0
Decay gamma*
1 K+ K- phi TrackGen 0;
Enddecay

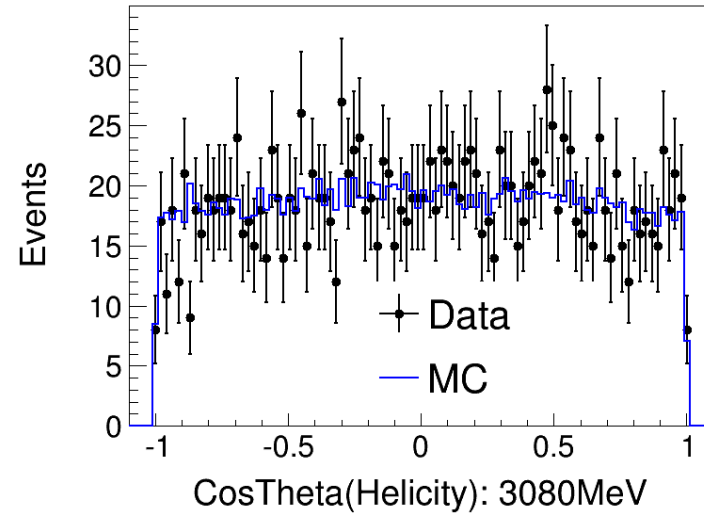
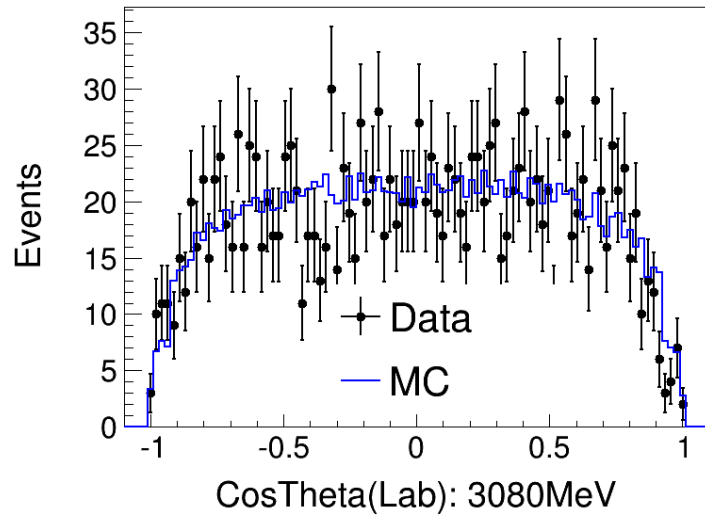
Decay phi
1 K+ K- AngSam 1 -1;
Enddecay

End
```

test.dec



Plot(MC_3080)(e+e- to PhiKK)



```

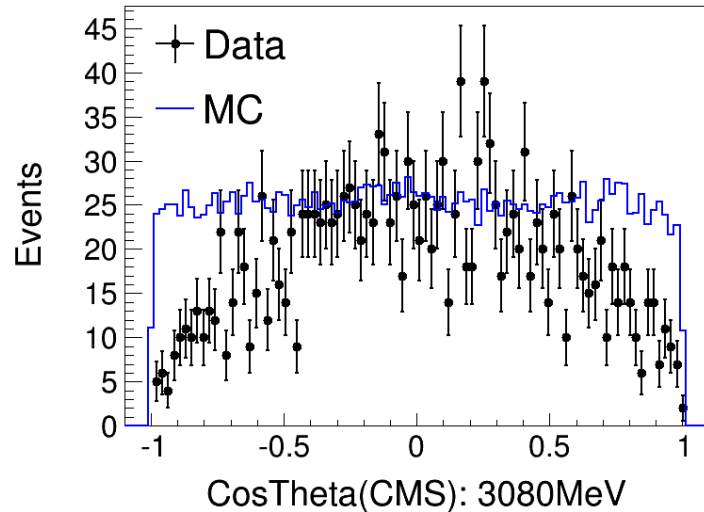
Particle vpho 3.080 0.0
Decay vpho
1 ConExc -2 333 321 -321;
Enddecay

Decay vhdr
1.0 phi K+ K- PHSP;
Enddecay

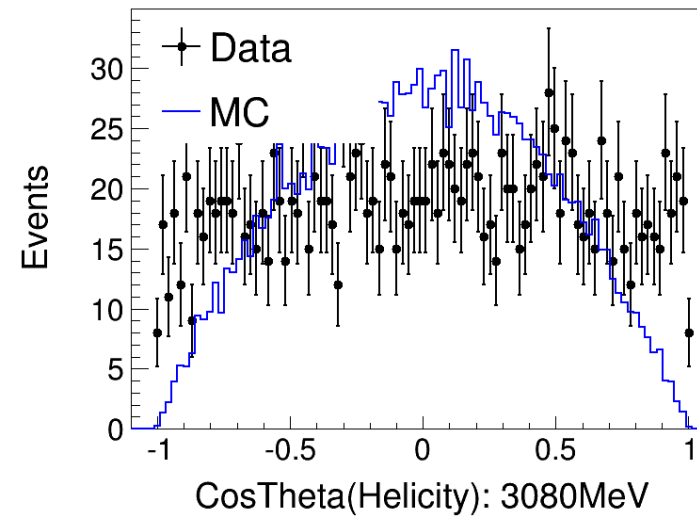
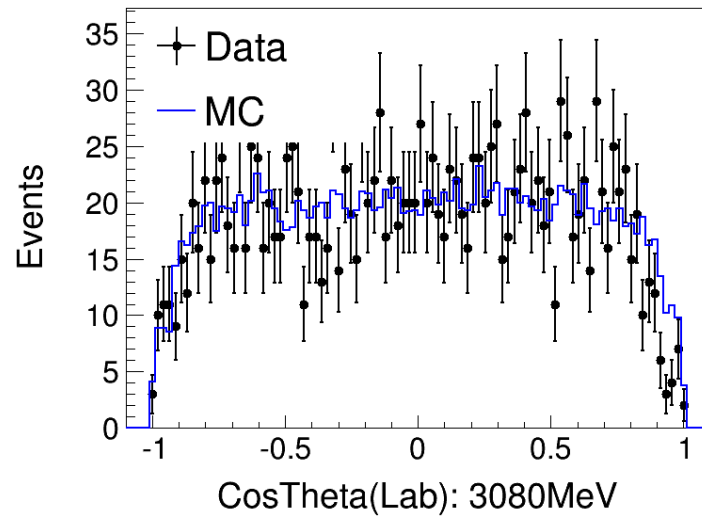
Decay phi
1.000 K+ K- VSS;
Enddecay

End
    
```

Decay Card



Plot(MC_3080)(e+e- to PhiKK)



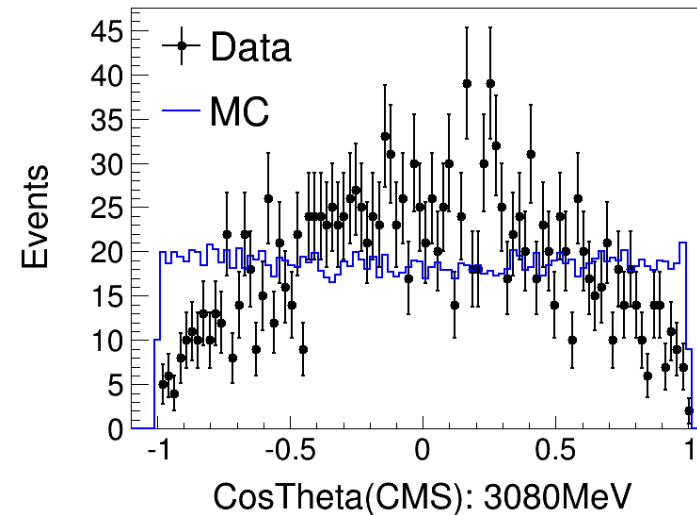
```
Particle vpho 3.080 0.0
Decay vpho
1 ConExc -2 333 321 -321;
Enddecay

Decay vhdr
1.0 phi K+ K- PHSP;
Enddecay

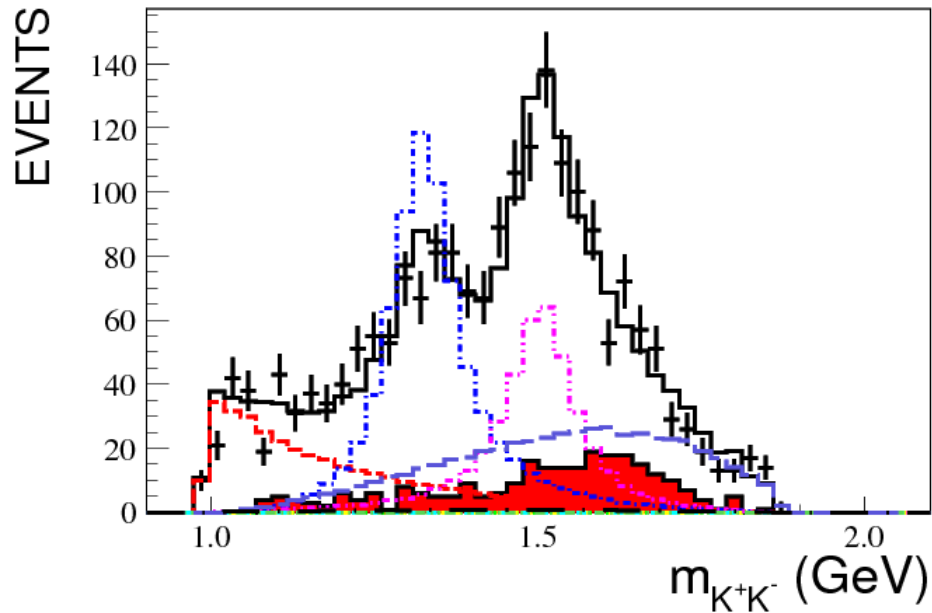
Decay phi
1.000 K+ K- AngSam 1 -1;
Enddecay

End
```

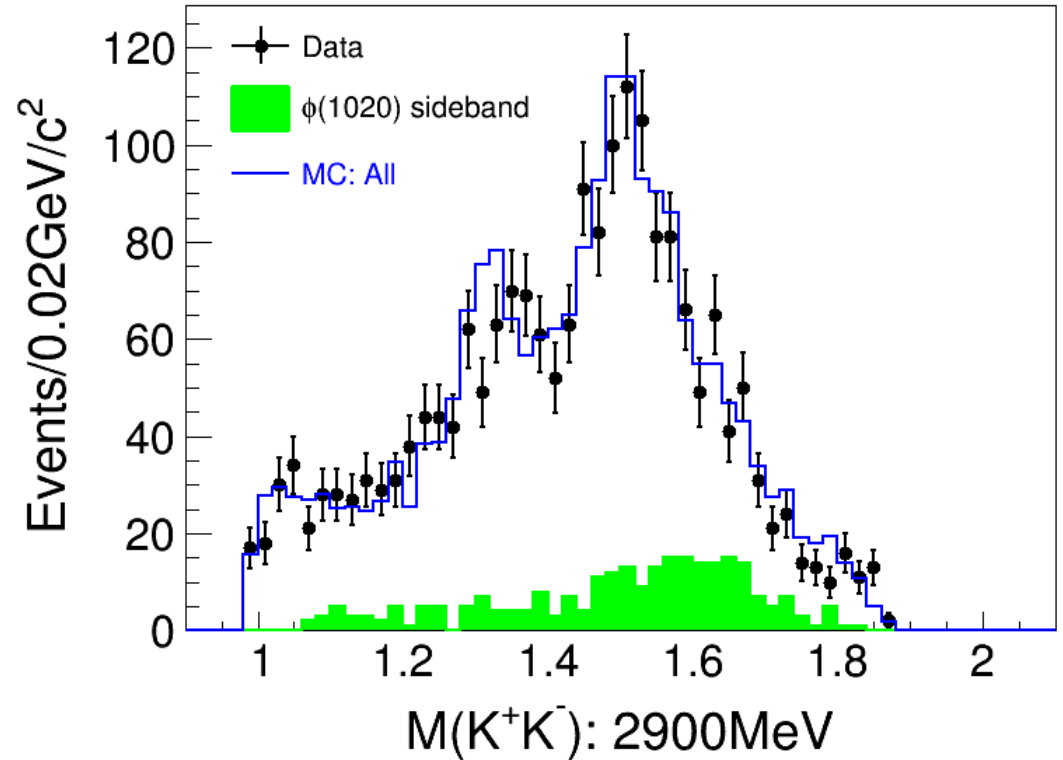
Decay Card



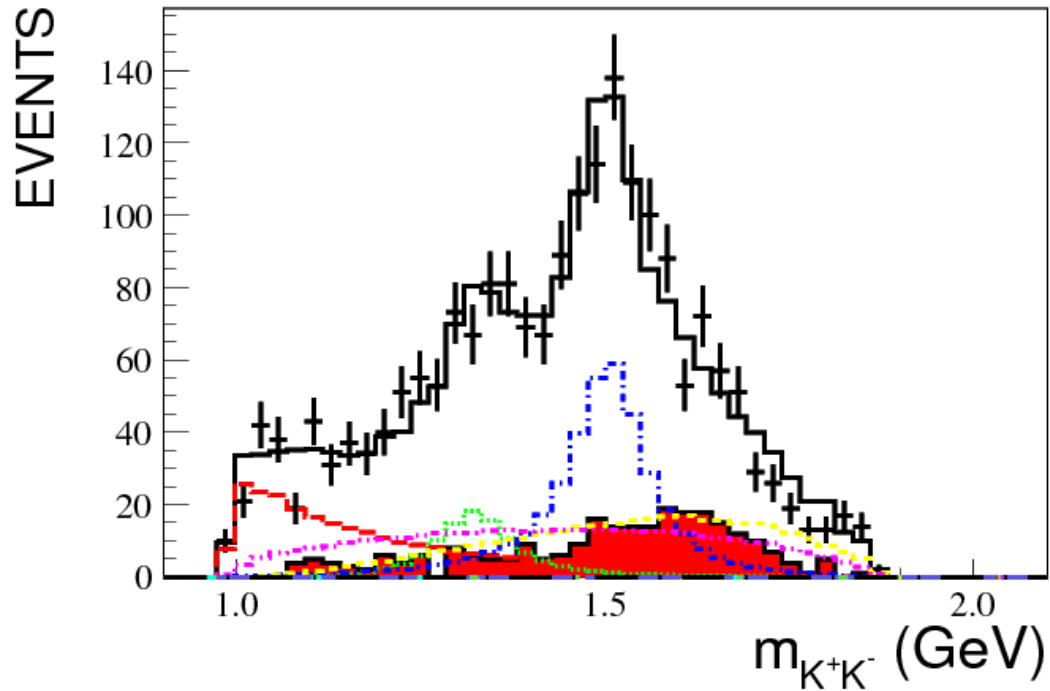
HelPWAAlg @2900MeV (III)



$N_{\text{mode}} = 4$
 $-\ln L = -137.007$

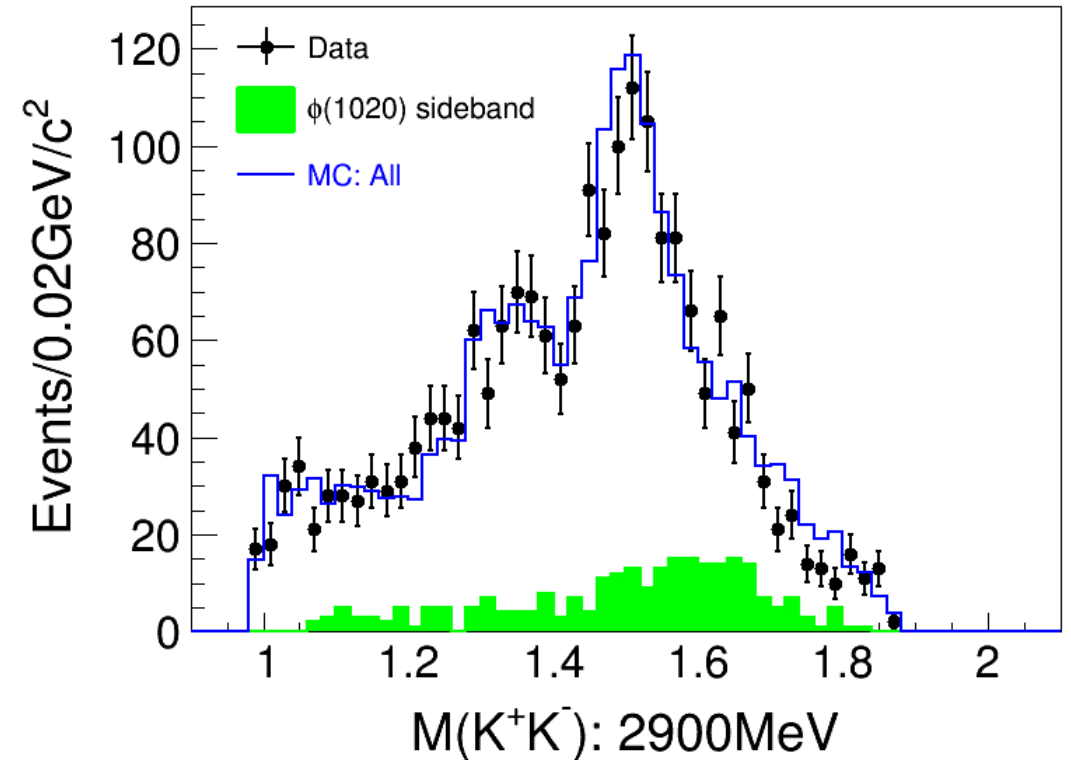


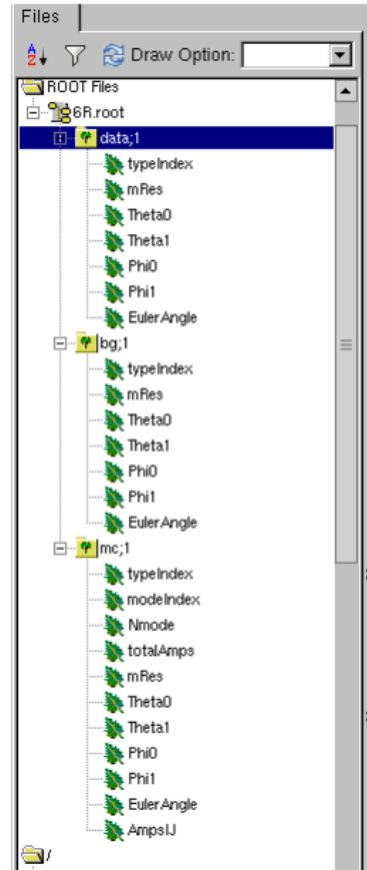
HelPWAAIg @2900MeV (III)



N_mode = 4

$-\ln L = -131.917$





$mRes[*]$: mass of two body

`GPUUpwa.VFinalState={"a","b","c"}; //final states`

`mRes[0]=mbc, mRes[1]=mac,mRes[2]=mab`

$\Theta_{0}[mode_index], \Phi_{0}[mode_index]$:

helicity angles for the first decay of mode_index

$\Theta_{1}[mode_index], \Phi_{1}[mode_index]$:

helicity angles for the second decay of mode_index

$EulerAngle[i]$: Euler angles for 3-body decay

$totalAmps$: total amplitude squared

$AmpsIJ[mode_i][mode_i]$:

amplitude for mode_i times the conjugate of that for mode_j