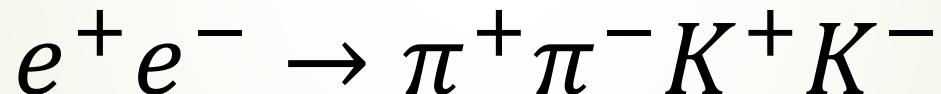


Tracking efficiency for XYZ data



1

2

$$\varepsilon = \frac{n}{N}$$

$N : (\text{nGood} = 3) \parallel (\text{nGood} = 4)$

for π^+ , at least have a π^- , K^+ , K^-

for π^- , at least have a π^+ , K^+ , K^-

for K^+ , at least have a π^+ , π^- , K^-

for K^- , at least have a π^+ , π^- , K^+

$n : \text{nGood} = 4$

Good track : $|R_{xy}| < 1\text{cm}$, $|R_z| < 10\text{cm}$, $|\cos\theta| < 0.93$

$\pi : P_\pi > P_K, P_\pi > P_p, P_\pi > 0.001, E_{emc} < 1 \text{ GeV}$

$K : P_K > P_\pi, P_K > P_p, P_K > 0.001, E_{emc} < 1 \text{ GeV}$

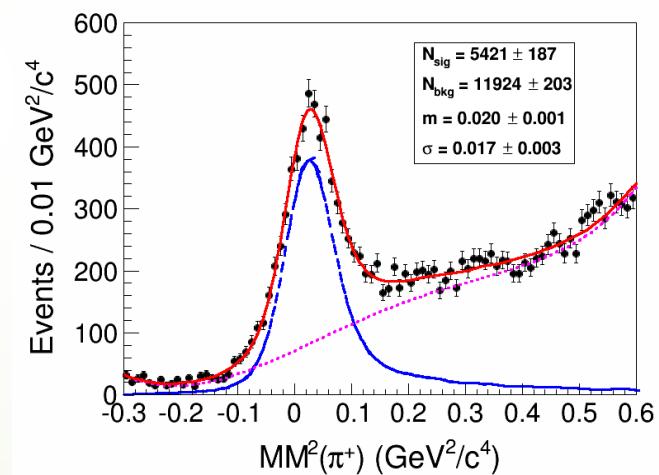
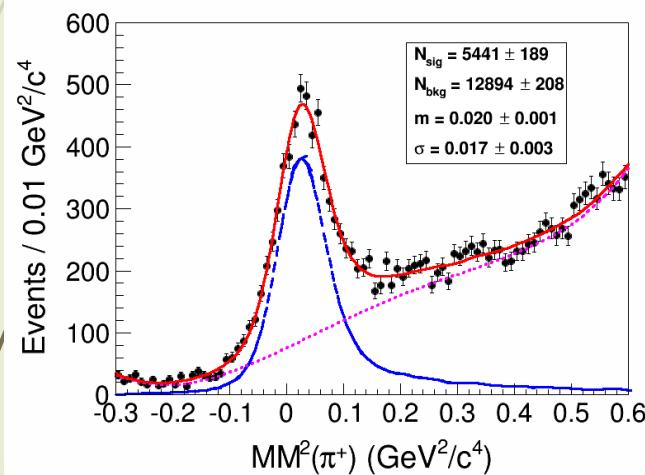
Boss version : 7.0.2.p01

Data : 4.19 GeV, 4.20 GeV, 4.21 GeV, 4.22 GeV, 4.237 GeV

3

π^+

$$P_t \in (0.9, 1.1)\text{GeV}$$

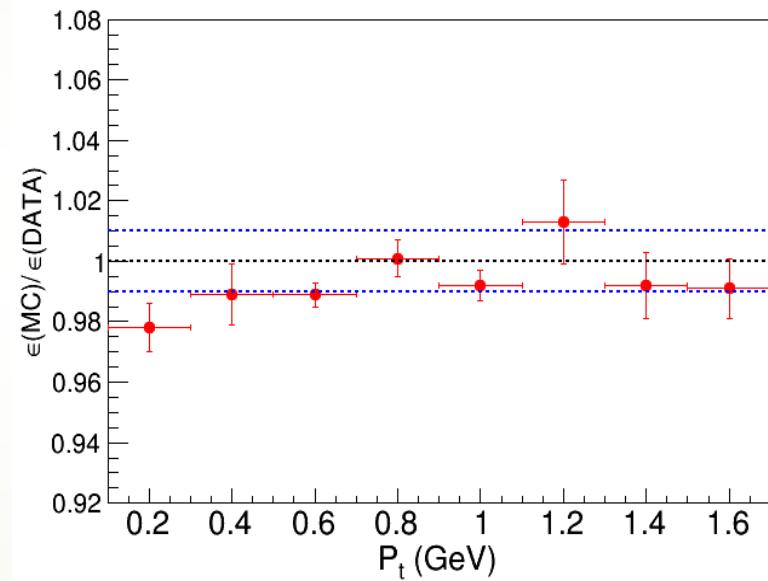
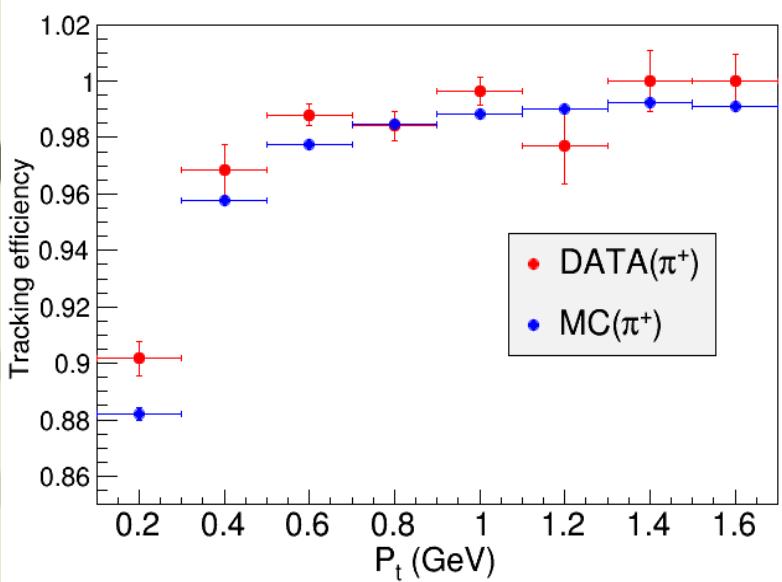


$$\Delta \varepsilon = 1 - \varepsilon^{MC} / \varepsilon^{data}$$

$$\sigma_{\varepsilon^{data}} = \frac{1}{N} \sqrt{(1 - 2\varepsilon^{data})\sigma_n^2 + \varepsilon^{data^2}\sigma_N^2}$$

$$\sigma_{\varepsilon^{MC}} = \sqrt{\frac{\varepsilon^{MC}(1 - \varepsilon^{MC})}{N}}$$

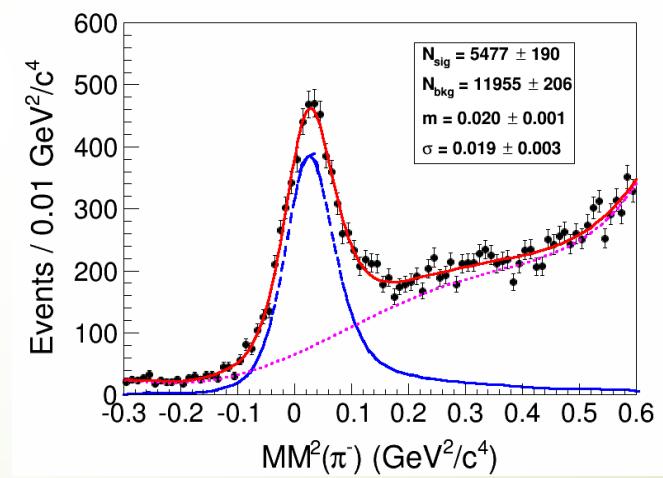
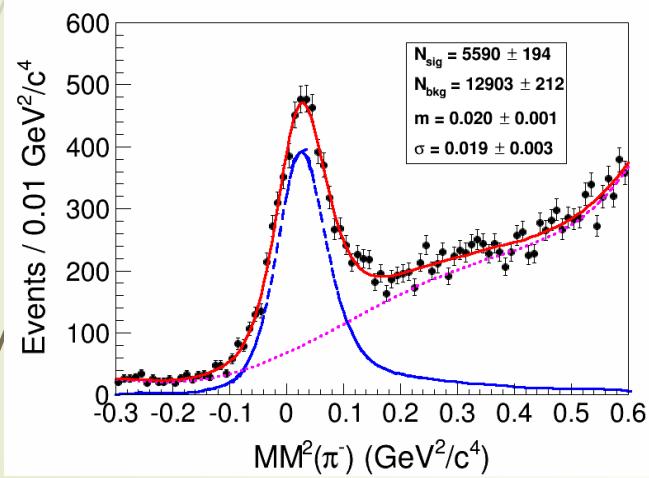
$P_t(\text{GeV})$	$\varepsilon^{data}(\%)$	$\varepsilon^{MC}(\%)$	$\varepsilon^{MC}/\varepsilon^{data}$	$\Delta \varepsilon(\%)$
(0.1, 0.3)	90.18 ± 0.61	88.20 ± 0.24	0.978 ± 0.008	2.2 ± 0.8
(0.3, 0.5)	96.83 ± 0.94	95.78 ± 0.11	0.989 ± 0.010	1.1 ± 1.0
(0.5, 0.7)	98.81 ± 0.37	97.75 ± 0.08	0.989 ± 0.004	1.1 ± 0.4
(0.7, 0.9)	98.41 ± 0.51	98.47 ± 0.07	1.001 ± 0.006	0.1 ± 0.6
(0.9, 1.1)	99.63 ± 0.50	98.84 ± 0.07	0.992 ± 0.005	0.8 ± 0.5
(1.1, 1.3)	97.72 ± 1.37	99.00 ± 0.08	1.013 ± 0.014	-1.3 ± 1.4
(1.3, 1.5)	100.00 ± 1.08	99.22 ± 0.08	0.992 ± 0.011	0.8 ± 1.1
(1.5, 1.7)	100.00 ± 0.95	99.09 ± 0.13	0.991 ± 0.010	0.9 ± 1.0



7

π^-

$$P_t \in (0.9, 1.1)\text{GeV}$$



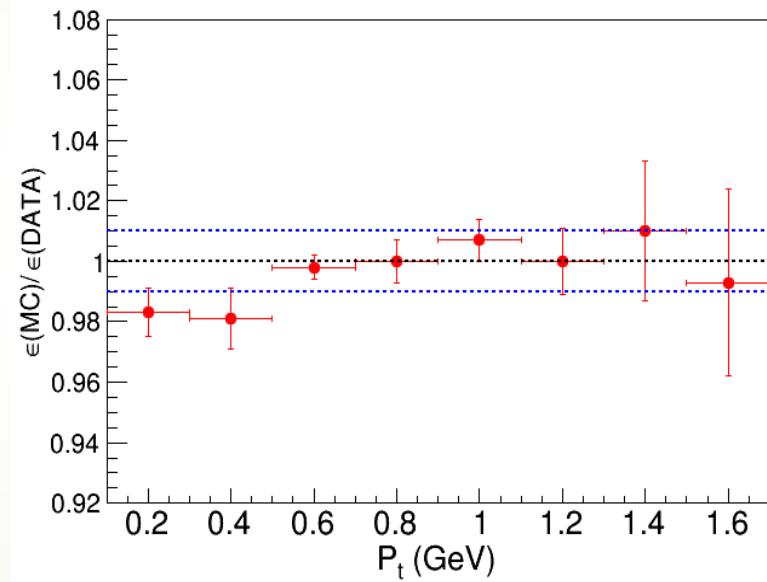
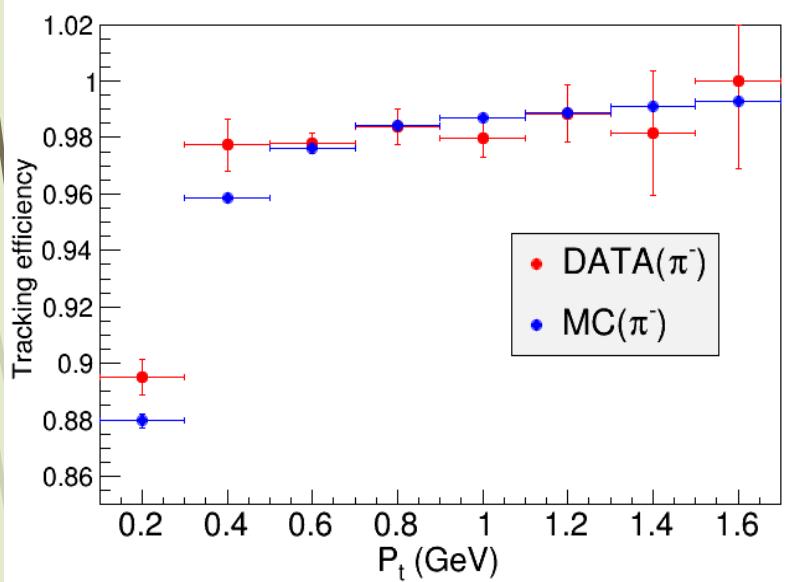
$$\Delta \varepsilon = 1 - \varepsilon^{MC} / \varepsilon^{data}$$

$$\sigma_{\varepsilon^{data}} = \frac{1}{N} \sqrt{(1 - 2\varepsilon^{data})\sigma_n^2 + \varepsilon^{data^2}\sigma_N^2}$$

$$\sigma_{\varepsilon^{MC}} = \sqrt{\frac{\varepsilon^{MC}(1 - \varepsilon^{MC})}{N}}$$

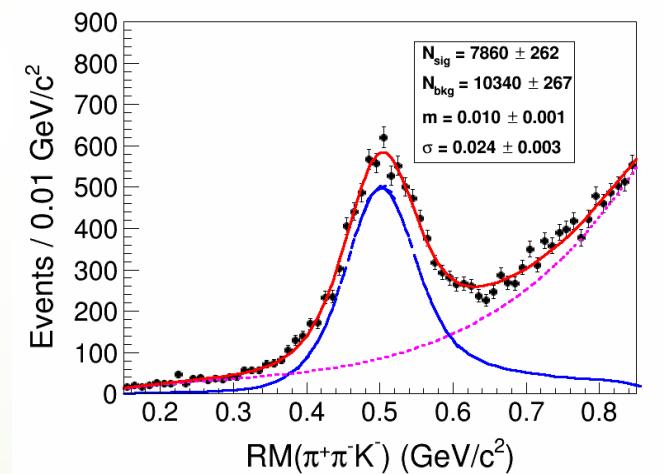
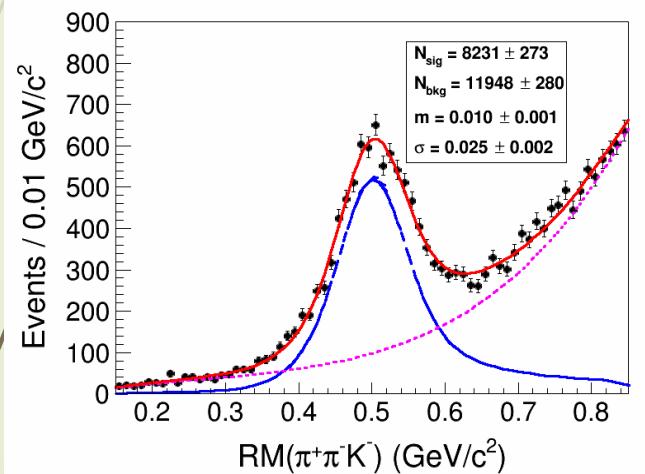
$P_t(\text{GeV})$	$\varepsilon^{data}(\%)$	$\varepsilon^{MC}(\%)$	$\varepsilon^{MC}/\varepsilon^{data}$	$\Delta \varepsilon(\%)$
(0.1, 0.3)	89.53 ± 0.63	87.96 ± 0.24	0.983 ± 0.008	1.7 ± 0.8
(0.3, 0.5)	97.73 ± 0.91	95.86 ± 0.11	0.981 ± 0.010	1.9 ± 1.0
(0.5, 0.7)	97.79 ± 0.36	97.62 ± 0.08	0.998 ± 0.004	0.2 ± 0.4
(0.7, 0.9)	98.40 ± 0.63	98.42 ± 0.07	1.000 ± 0.007	0.0 ± 0.7
(0.9, 1.1)	97.98 ± 0.69	98.71 ± 0.07	1.007 ± 0.007	-0.7 ± 0.7
(1.1, 1.3)	98.84 ± 1.02	98.88 ± 0.08	1.000 ± 0.011	0.0 ± 1.1
(1.3, 1.5)	98.16 ± 2.20	99.12 ± 0.09	1.010 ± 0.023	-1.0 ± 2.3
(1.5, 1.7)	100.00 ± 3.12	99.30 ± 0.11	0.993 ± 0.031	0.7 ± 3.1

10



K^+

$$P_t \in (0.9, 1.1)\text{GeV}$$



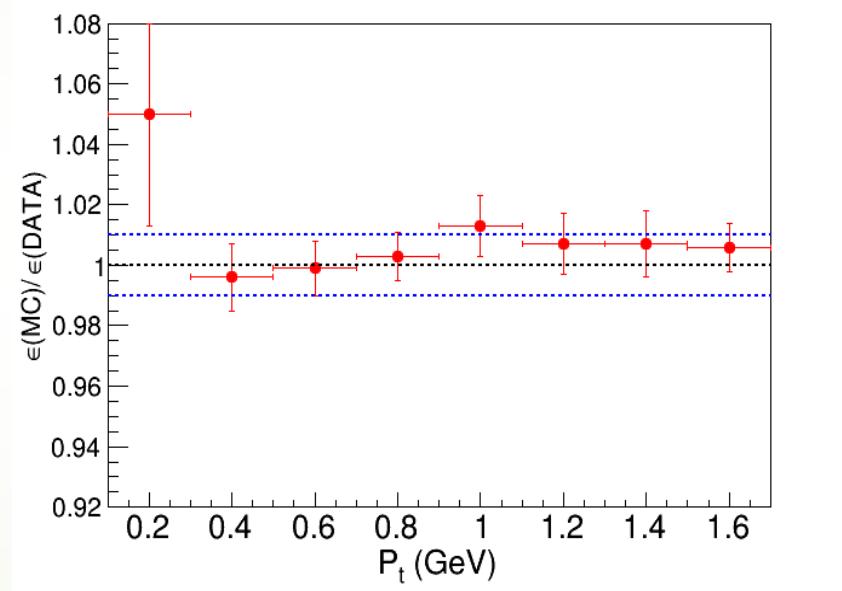
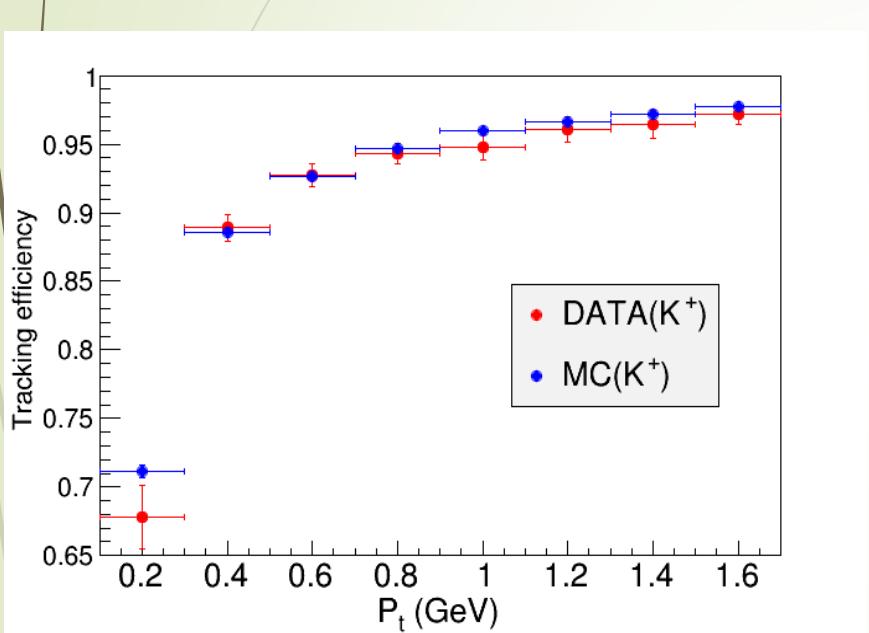
$$\Delta \varepsilon = 1 - \varepsilon^{MC} / \varepsilon^{data}$$

13

$$\sigma_{\varepsilon^{data}} = \frac{1}{N} \sqrt{(1 - 2\varepsilon^{data})\sigma_n^2 + \varepsilon^{data^2}\sigma_N^2}$$

$$\sigma_{\varepsilon^{MC}} = \sqrt{\frac{\varepsilon^{MC}(1 - \varepsilon^{MC})}{N}}$$

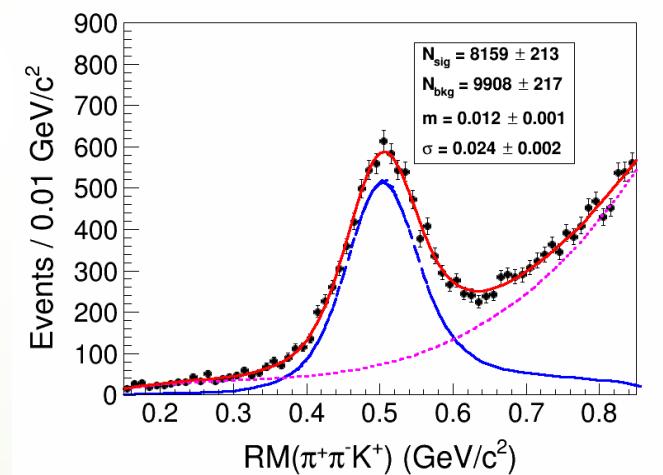
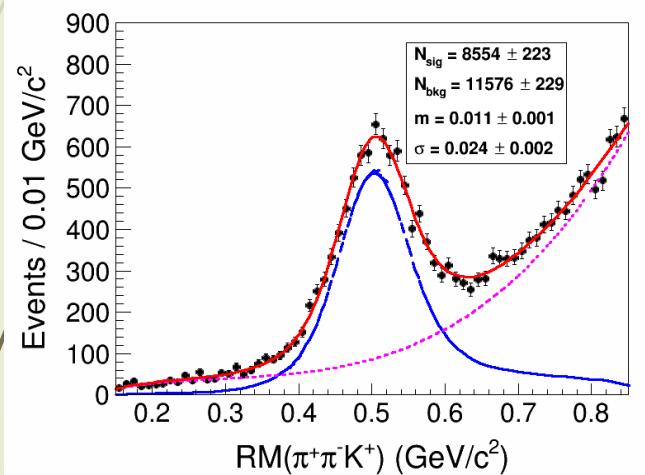
$P_t(\text{GeV})$	$\varepsilon^{data}(\%)$	$\varepsilon^{MC}(\%)$	$\varepsilon^{MC}/\varepsilon^{data}$	$\Delta \varepsilon(\%)$
(0.1, 0.3)	67.78 ± 2.32	71.17 ± 0.44	1.050 ± 0.037	-5.0 ± 3.7
(0.3, 0.5)	88.90 ± 0.98	88.55 ± 0.19	0.996 ± 0.011	0.4 ± 1.1
(0.5, 0.7)	92.73 ± 0.80	92.60 ± 0.14	0.999 ± 0.009	0.1 ± 0.9
(0.7, 0.9)	94.34 ± 0.74	94.65 ± 0.12	1.003 ± 0.008	-0.3 ± 0.8
(0.9, 1.1)	94.76 ± 0.90	96.02 ± 0.11	1.013 ± 0.010	-1.3 ± 1.0
(1.1, 1.3)	96.04 ± 0.92	96.66 ± 0.12	1.007 ± 0.010	-0.7 ± 1.0
(1.3, 1.5)	96.45 ± 1.03	97.17 ± 0.13	1.007 ± 0.011	-0.7 ± 1.1
(1.5, 1.7)	97.17 ± 0.75	97.77 ± 0.16	1.006 ± 0.008	-0.6 ± 0.8



15

K^-

$$P_t \in (0.9, 1.1)\text{GeV}$$



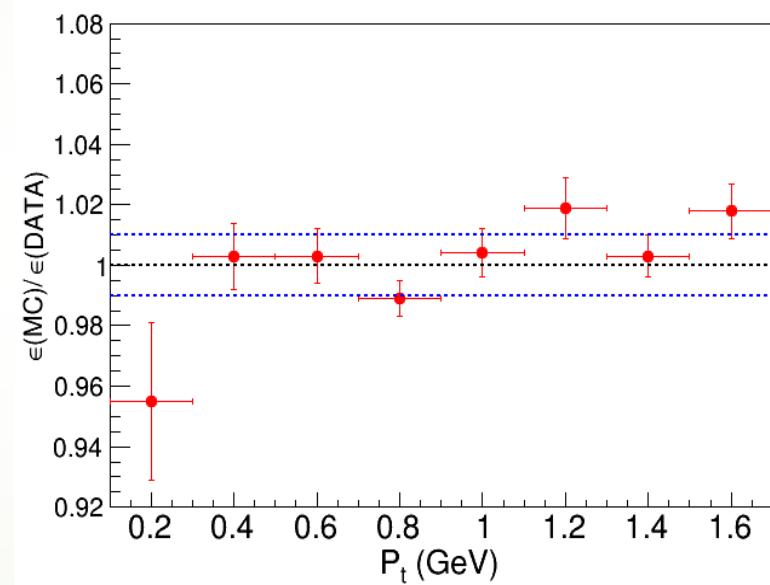
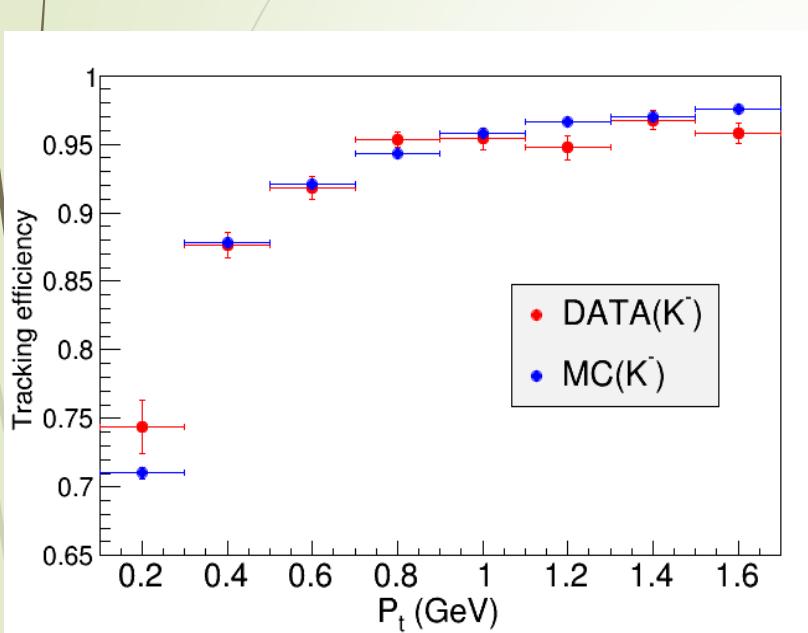
$$\Delta \varepsilon = 1 - \varepsilon^{MC} / \varepsilon^{data}$$

17

$$\sigma_{\varepsilon^{data}} = \frac{1}{N} \sqrt{(1 - 2\varepsilon^{data})\sigma_n^2 + \varepsilon^{data^2}\sigma_N^2}$$

$$\sigma_{\varepsilon^{MC}} = \sqrt{\frac{\varepsilon^{MC}(1 - \varepsilon^{MC})}{N}}$$

$P_t(\text{GeV})$	$\varepsilon^{data}(\%)$	$\varepsilon^{MC}(\%)$	$\varepsilon^{MC}/\varepsilon^{data}$	$\Delta \varepsilon(\%)$
(0.1, 0.3)	74.38 ± 1.96	71.02 ± 0.44	0.955 ± 0.026	4.5 ± 2.6
(0.3, 0.5)	87.65 ± 0.93	87.87 ± 0.20	1.003 ± 0.011	-0.3 ± 1.1
(0.5, 0.7)	91.83 ± 0.84	92.12 ± 0.14	1.003 ± 0.009	-0.3 ± 0.9
(0.7, 0.9)	95.37 ± 0.56	94.31 ± 0.12	0.989 ± 0.006	1.1 ± 0.6
(0.9, 1.1)	95.38 ± 0.75	95.77 ± 0.11	1.004 ± 0.008	-0.4 ± 0.8
(1.1, 1.3)	94.74 ± 0.90	96.59 ± 0.12	1.019 ± 0.010	-1.9 ± 1.0
(1.3, 1.5)	96.76 ± 0.66	97.03 ± 0.13	1.003 ± 0.007	-0.3 ± 0.7
(1.5, 1.7)	95.79 ± 0.76	97.54 ± 0.16	1.018 ± 0.009	-1.8 ± 0.9



Summary

19

1. Tracking efficiency for π^+ , π^- , K^+ and K^- is studied using control sample $e^+e^- \rightarrow \pi^+\pi^-K^+K^-$

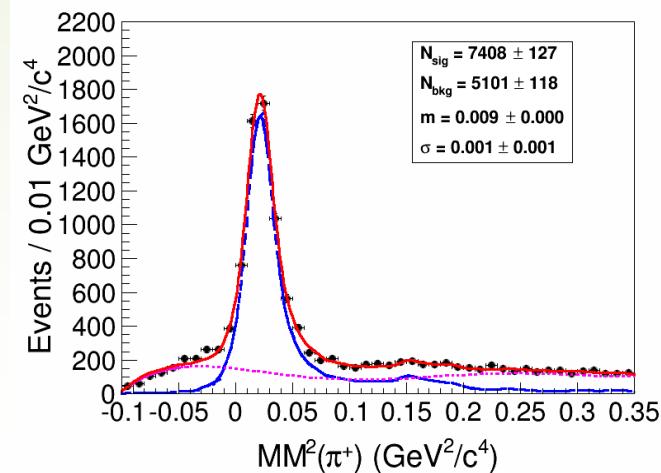
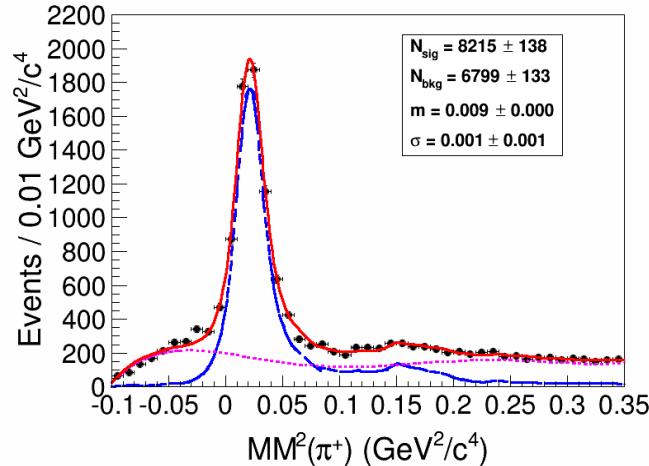
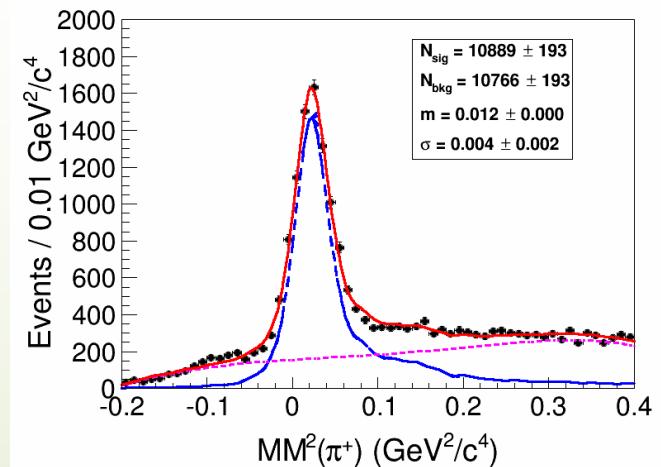
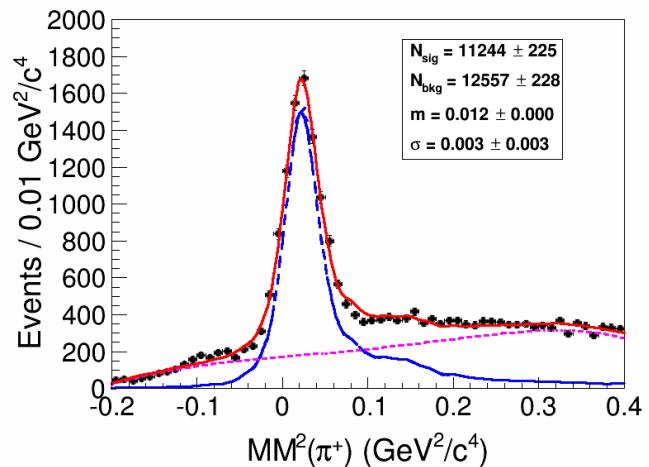
Thanks for your attention!

20

BACK UP

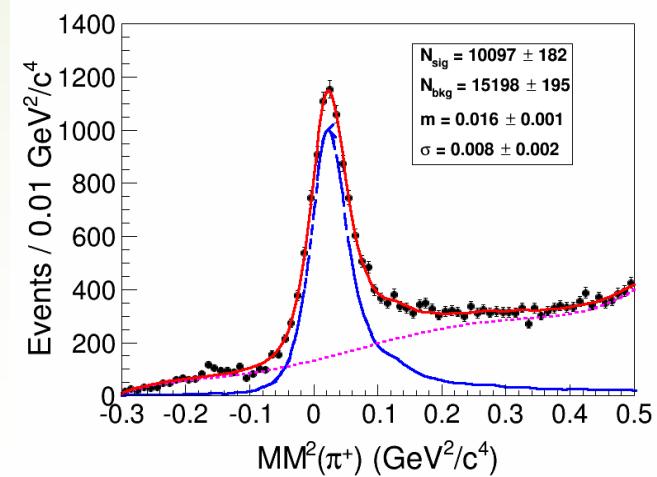
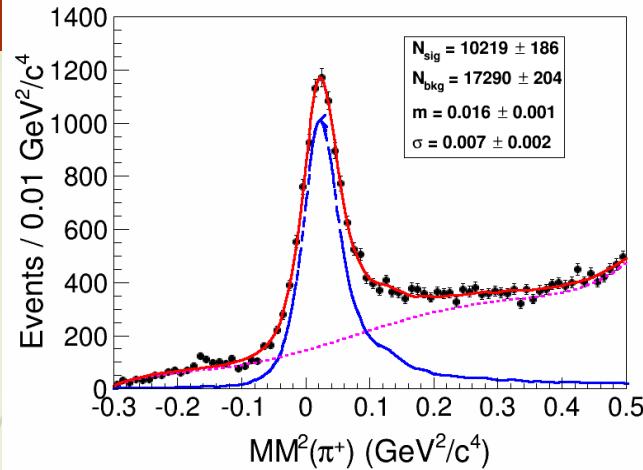
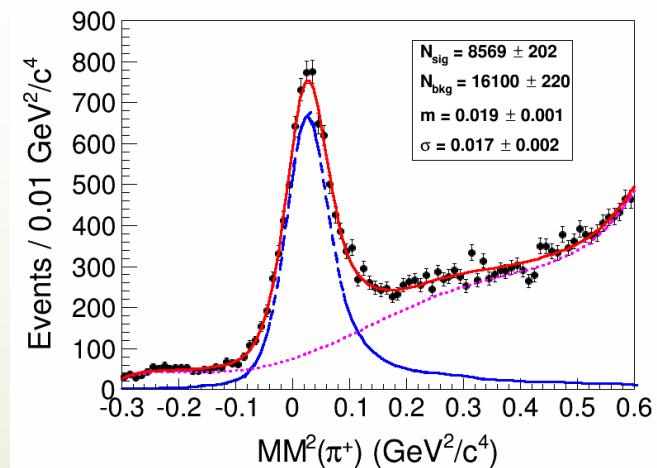
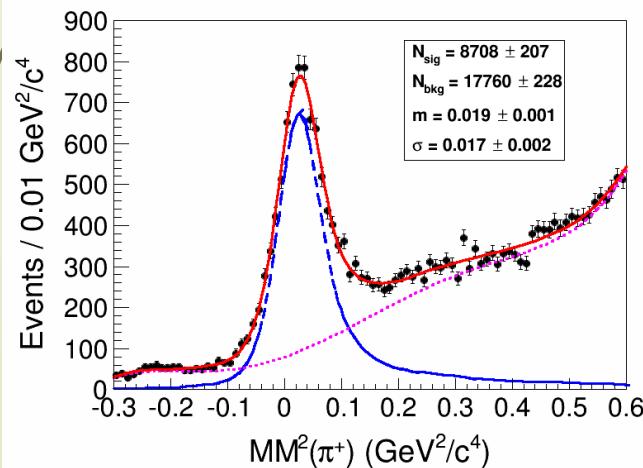
π^+ $P_t \in (0.1, 0.3)\text{GeV}$

21

 $P_t \in (0.3, 0.5)\text{GeV}$ 

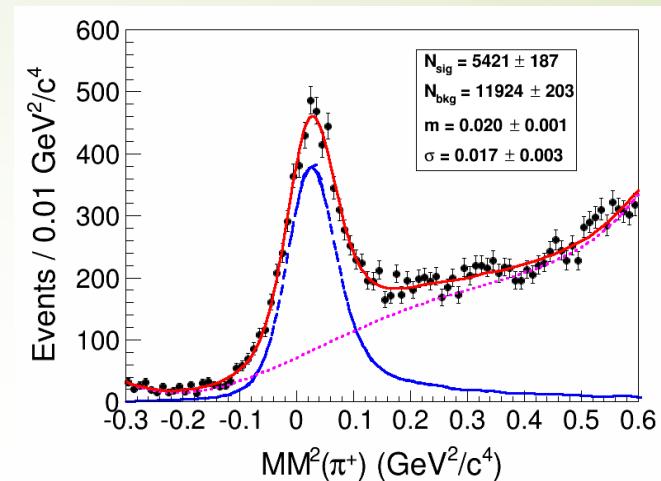
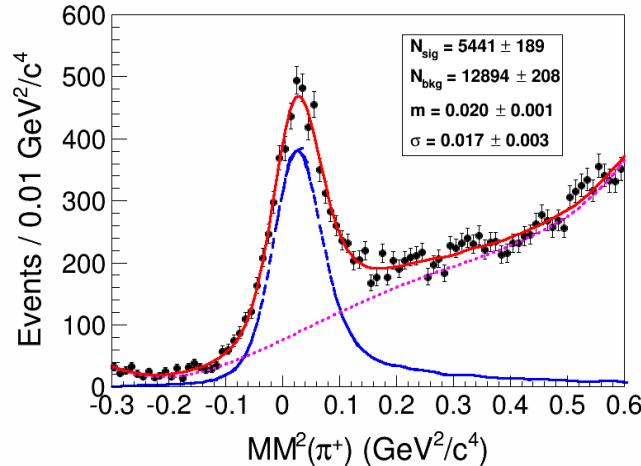
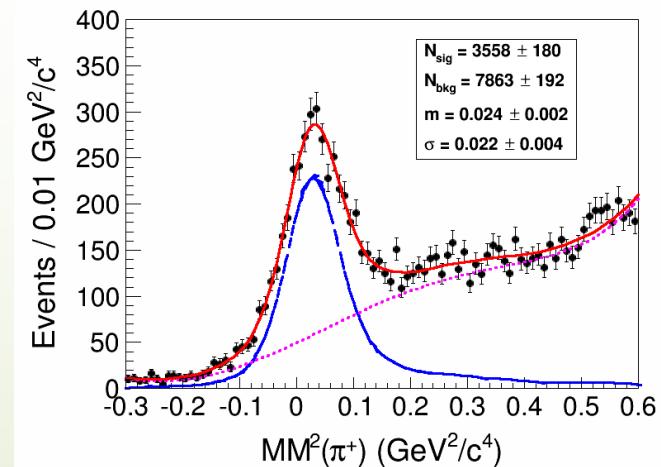
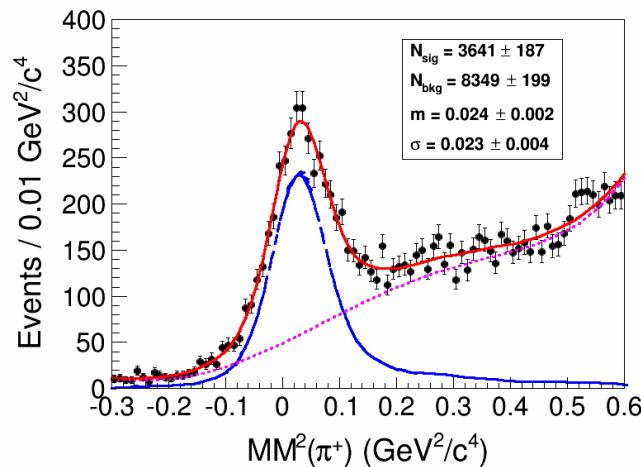
π^+ $P_t \in (0.5, 0.7)\text{GeV}$

22

 $P_t \in (0.7, 0.9)\text{GeV}$ 

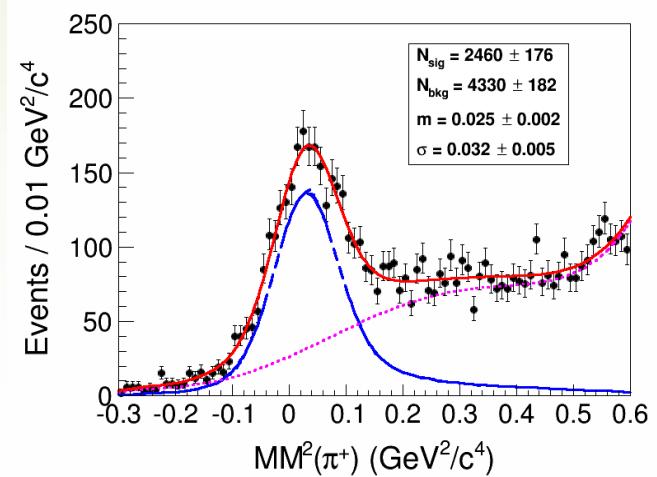
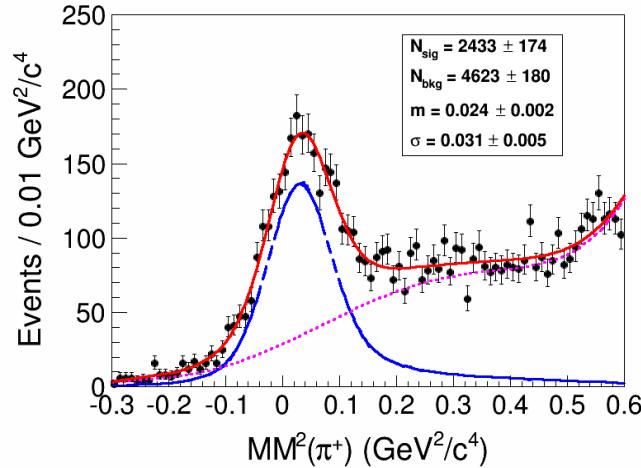
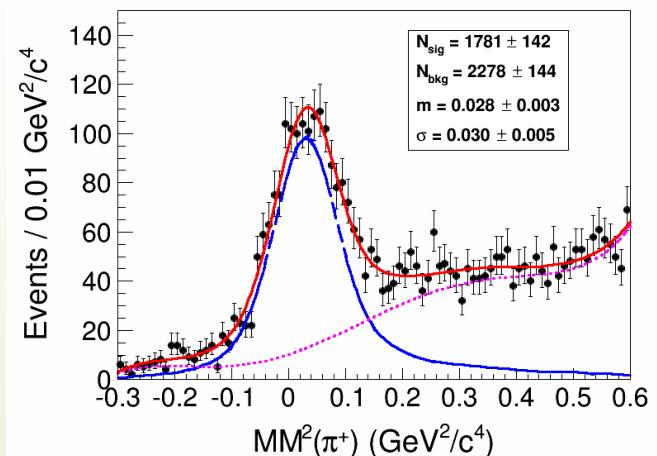
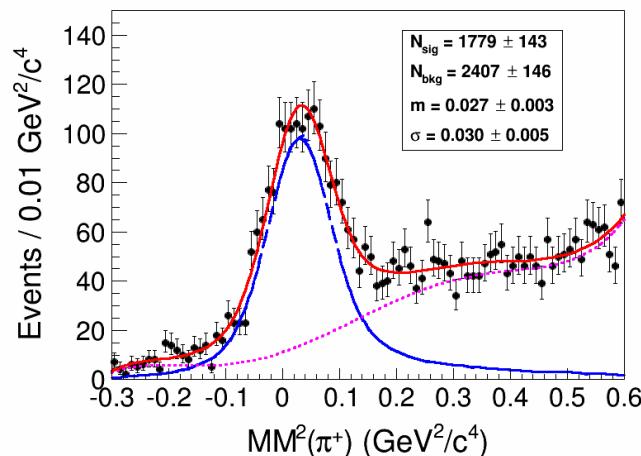
π^+ $P_t \in (0.9, 1.1)\text{GeV}$

23

 $P_t \in (1.1, 1.3)\text{GeV}$ 

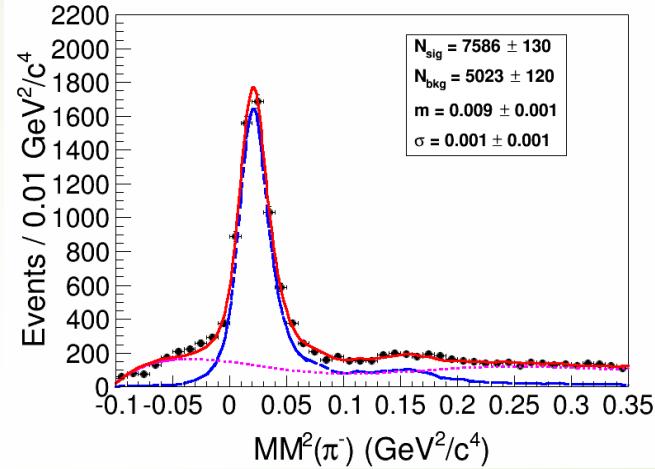
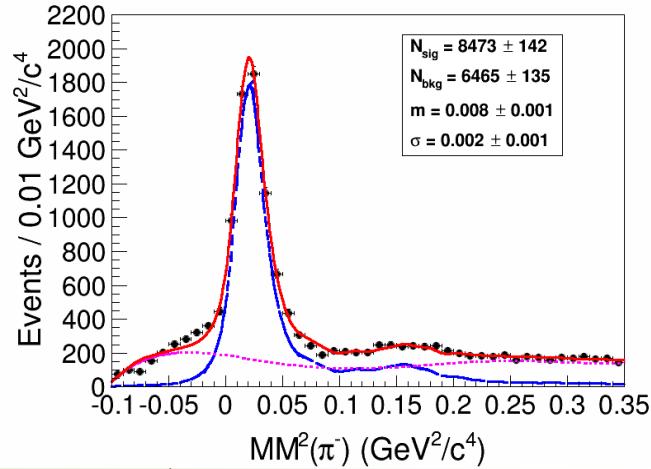
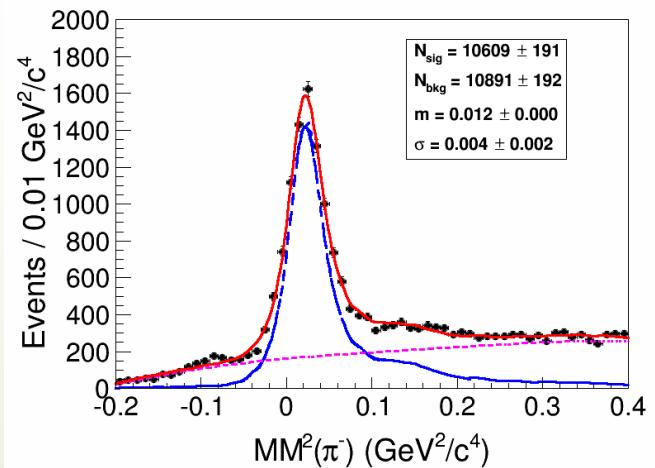
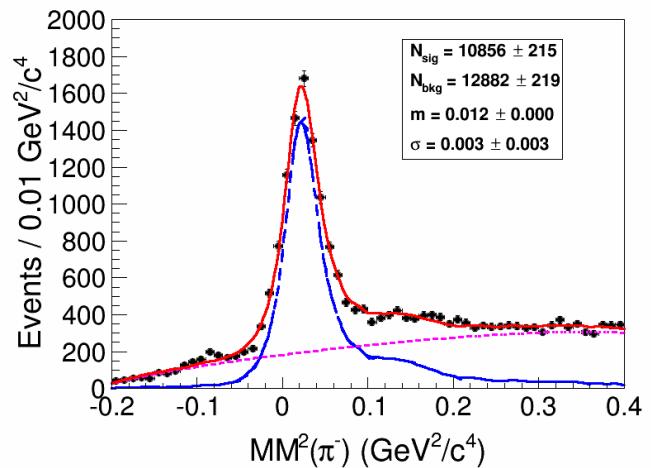
π^+ $P_t \in (1.3, 1.5)\text{GeV}$

24

 $P_t \in (1.5, 1.7)\text{GeV}$ 

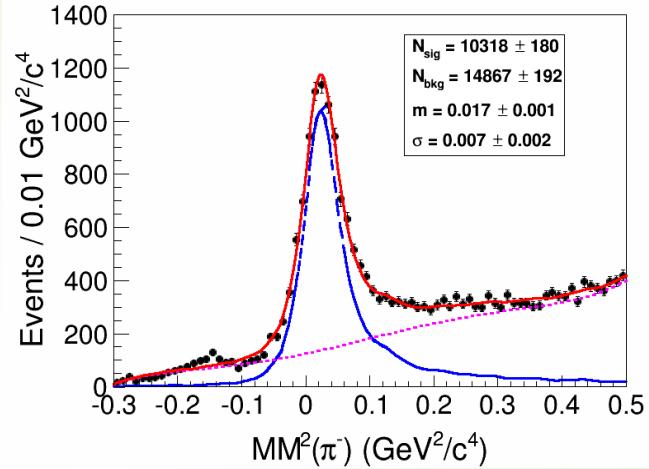
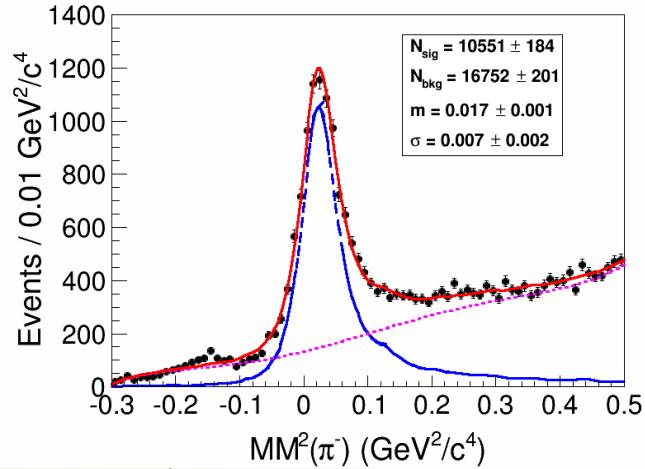
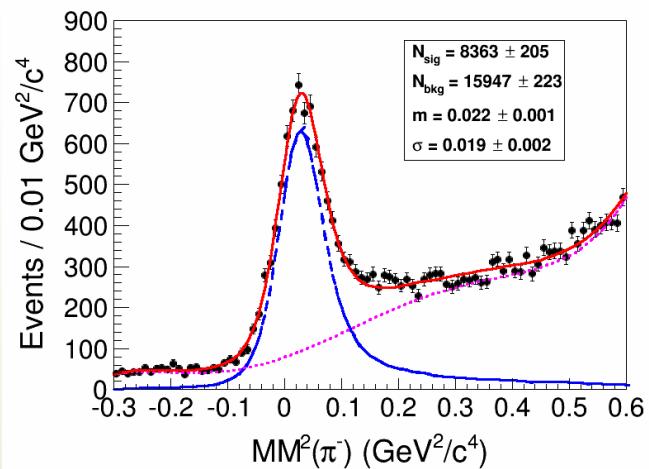
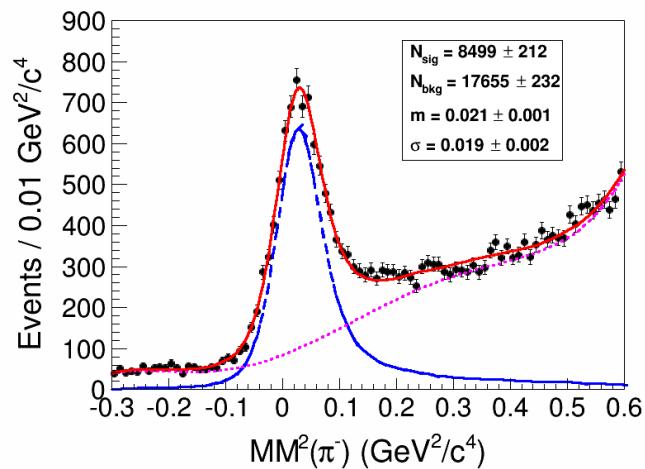
π^-

25

 $P_t \in (0.1, 0.3)\text{GeV}$  $P_t \in (0.3, 0.5)\text{GeV}$ 

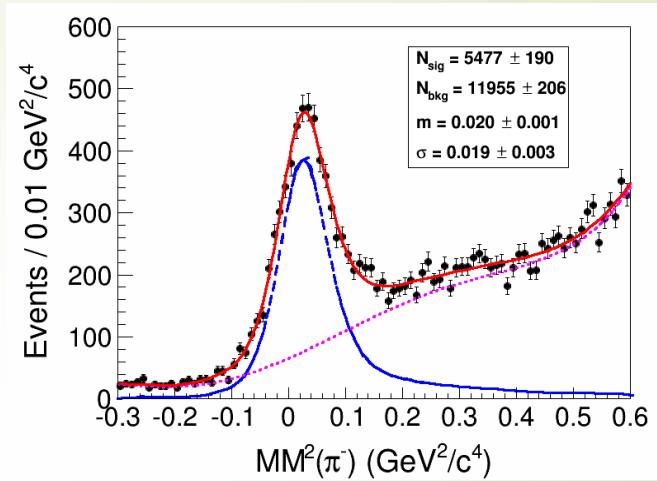
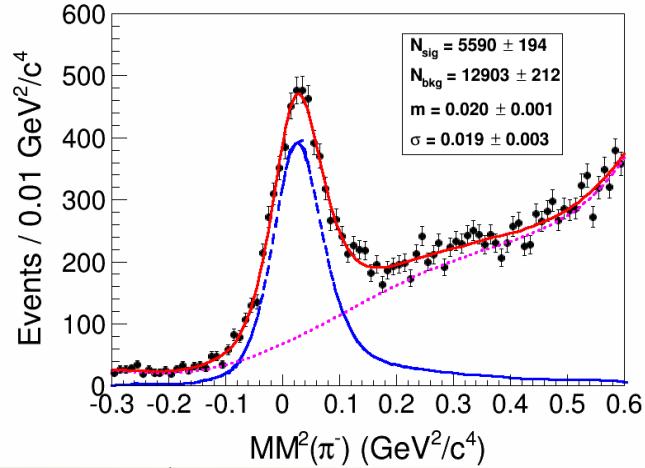
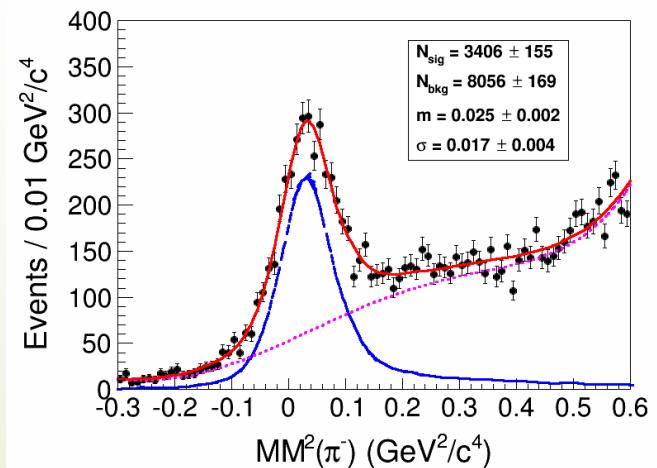
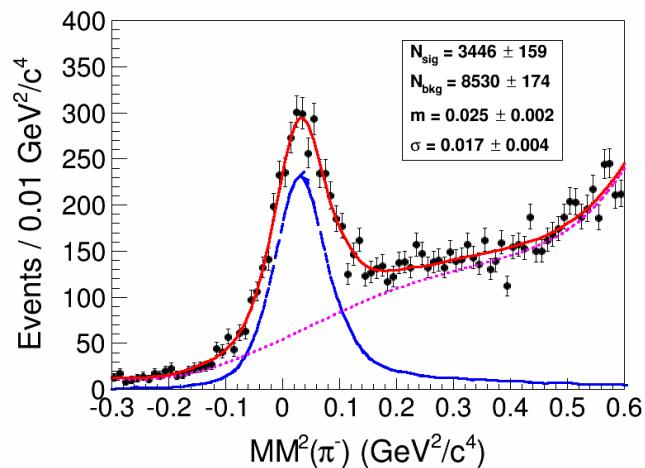
π^-

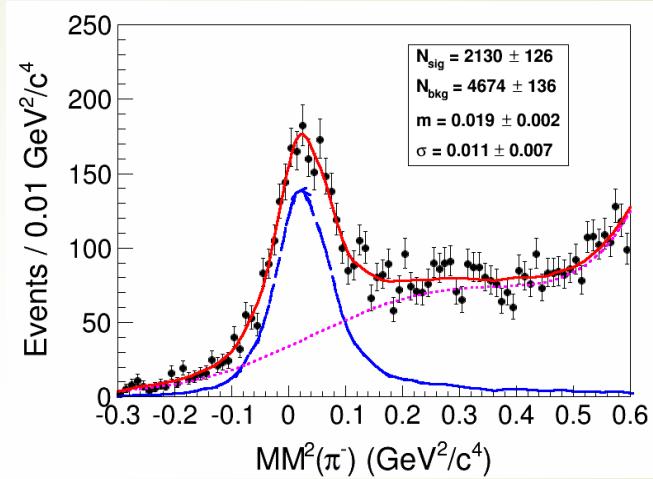
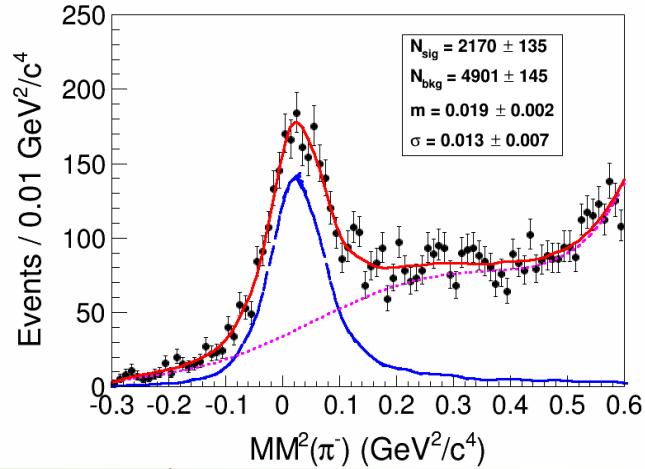
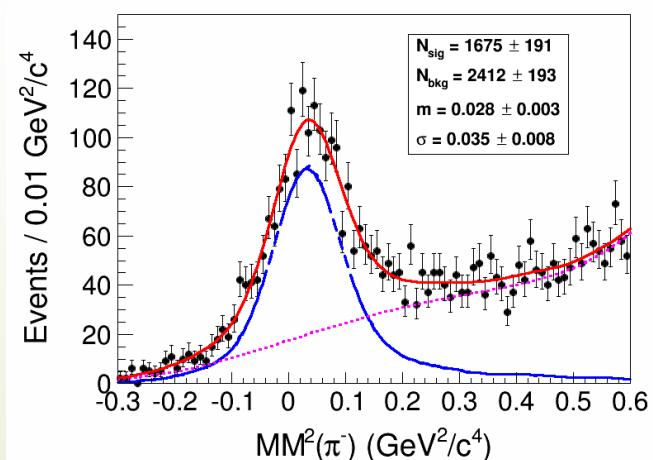
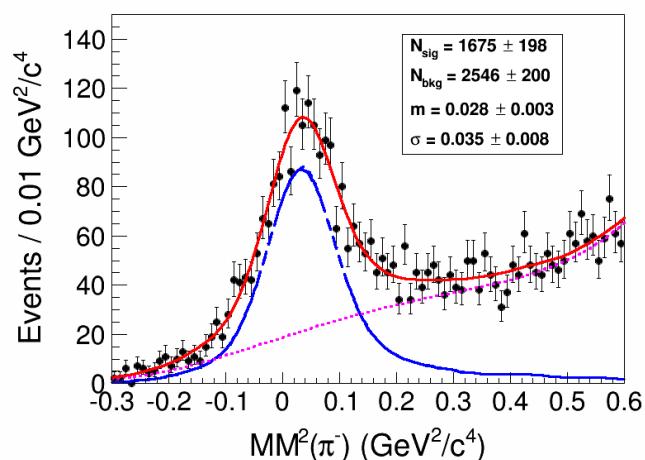
26

 $P_t \in (0.5, 0.7)\text{GeV}$  $P_t \in (0.7, 0.9)\text{GeV}$ 

π^-

27

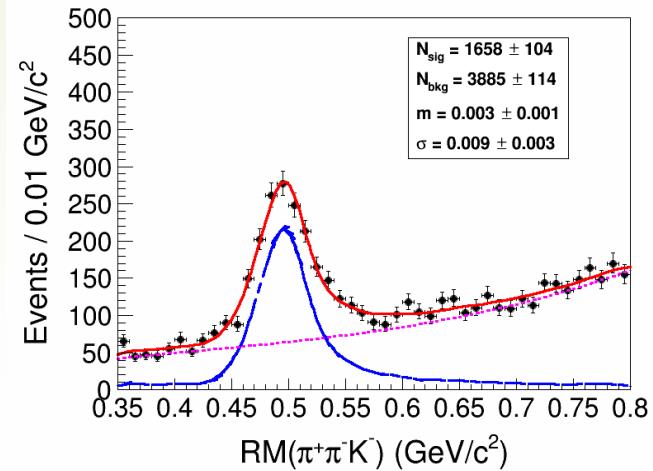
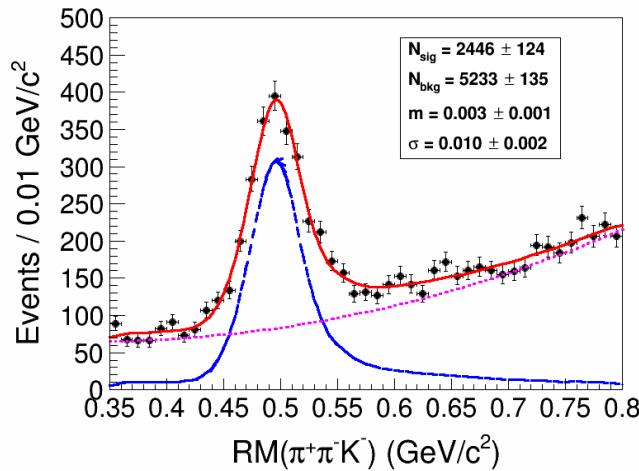
 $P_t \in (0.9, 1.1)\text{GeV}$  $P_t \in (1.1, 1.3)\text{GeV}$ 

$P_t \in (1.3, 1.5)\text{GeV}$

 $P_t \in (1.5, 1.7)\text{GeV}$


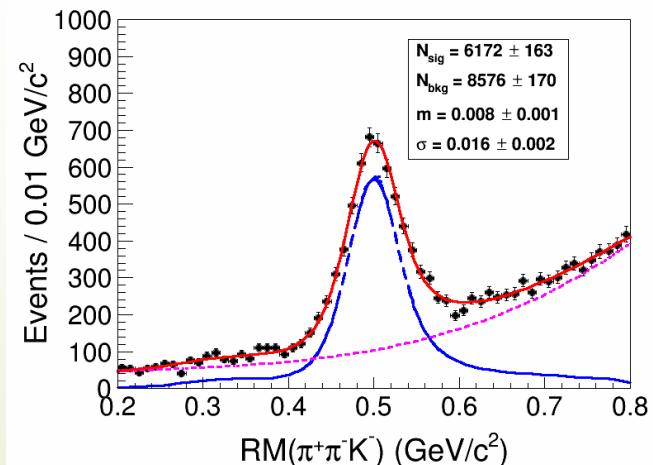
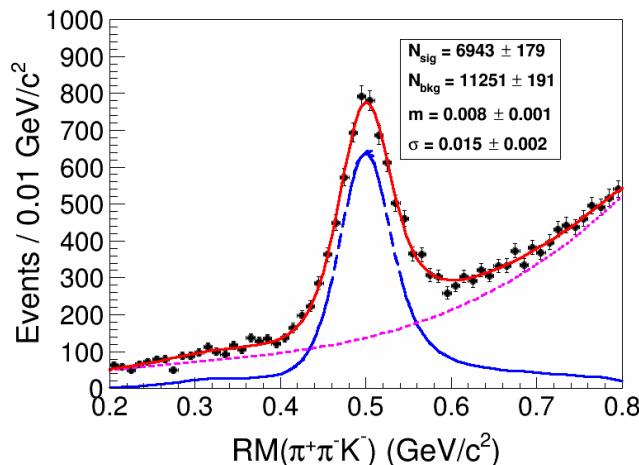
K^+

29

$$P_t \in (0.1, 0.3)\text{GeV}$$



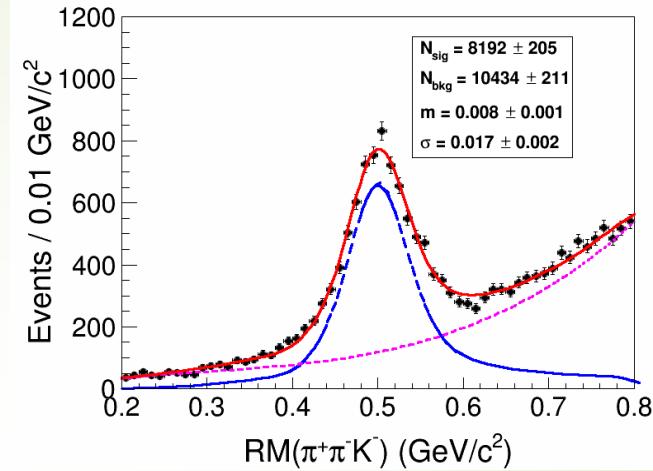
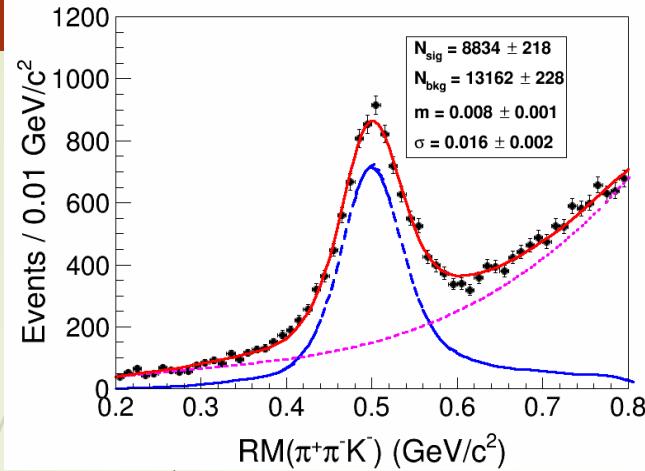
$$P_t \in (0.3, 0.5)\text{GeV}$$



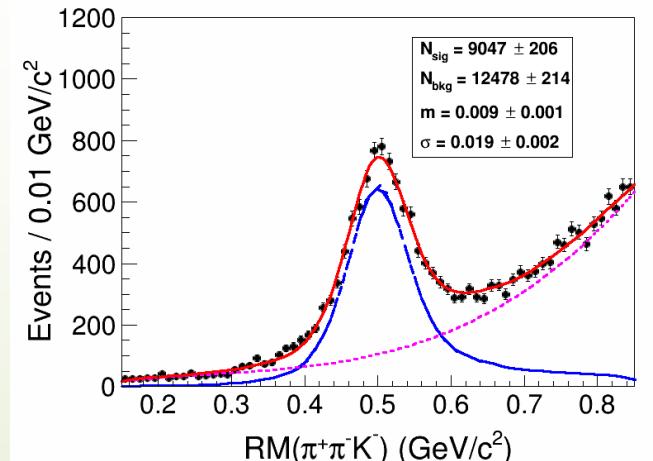
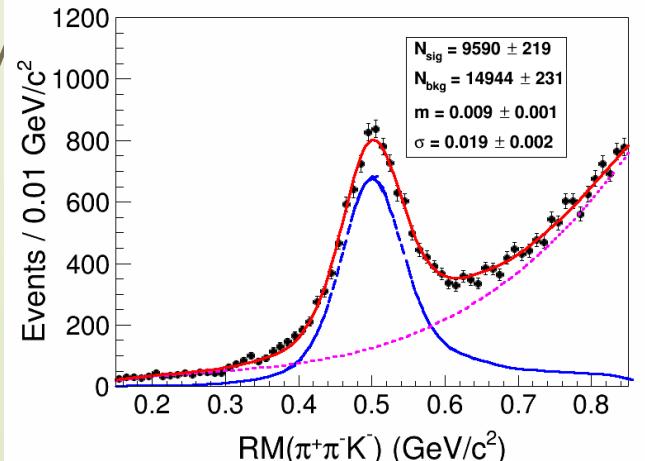
K^+

30

$P_t \in (0.5, 0.7)\text{GeV}$



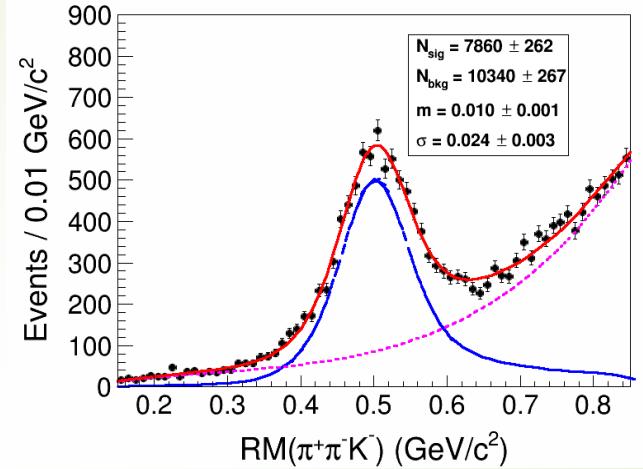
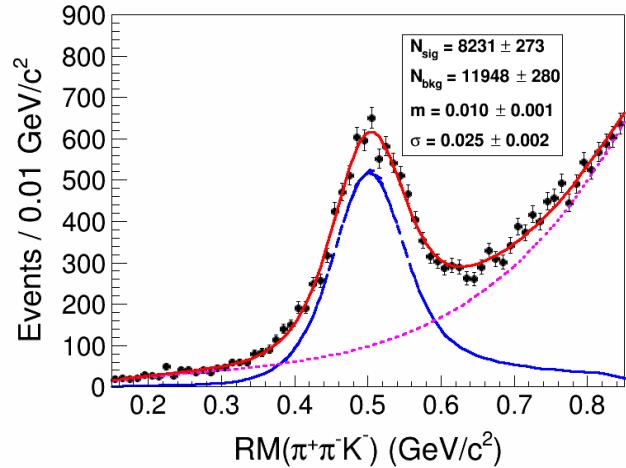
$P_t \in (0.7, 0.9)\text{GeV}$



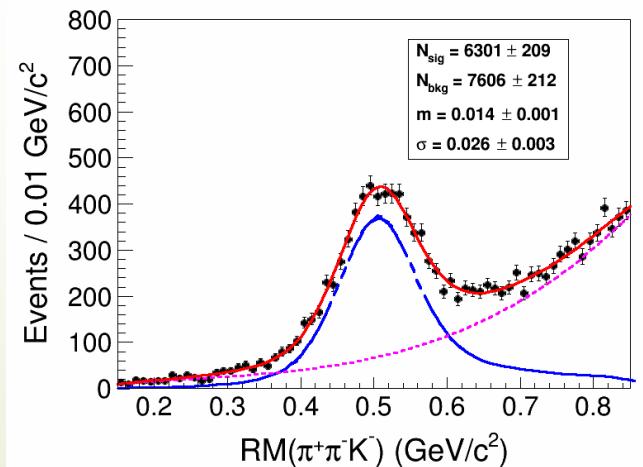
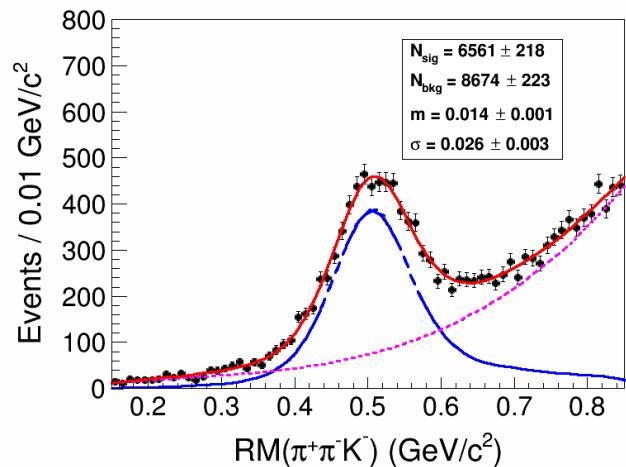
K^+

$P_t \in (0.9, 1.1)\text{GeV}$

31



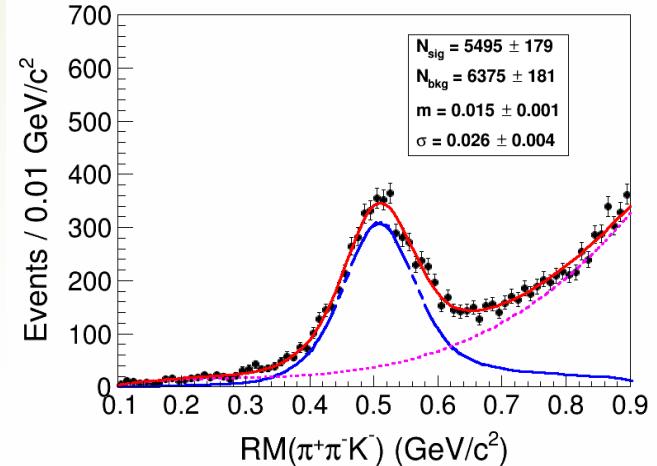
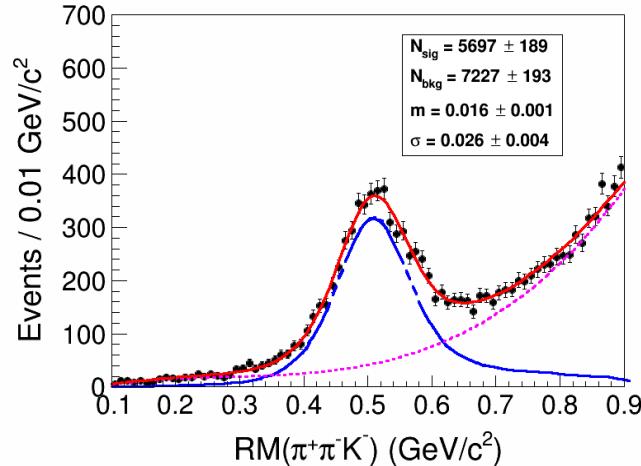
$P_t \in (1.1, 1.3)\text{GeV}$



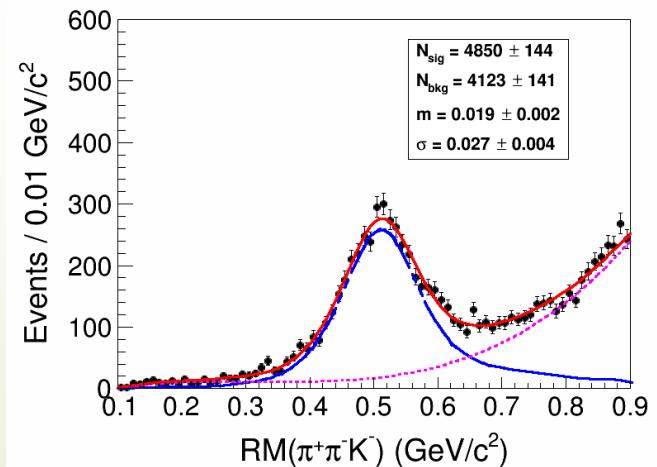
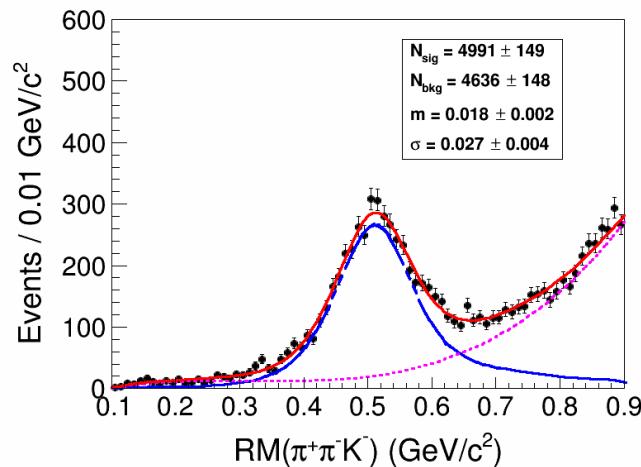
K^+

$P_t \in (1.3, 1.5)\text{GeV}$

32



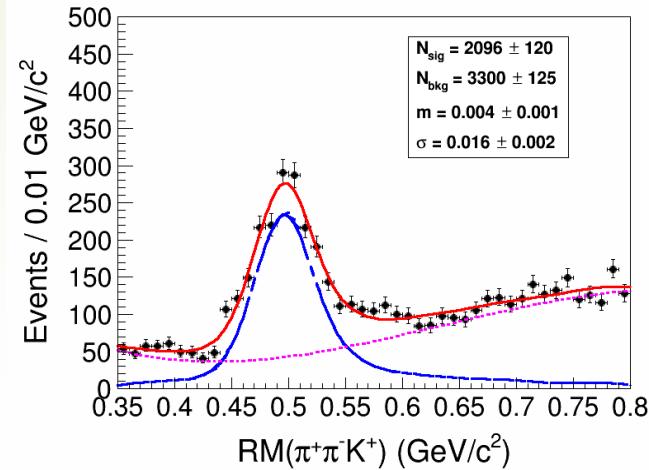
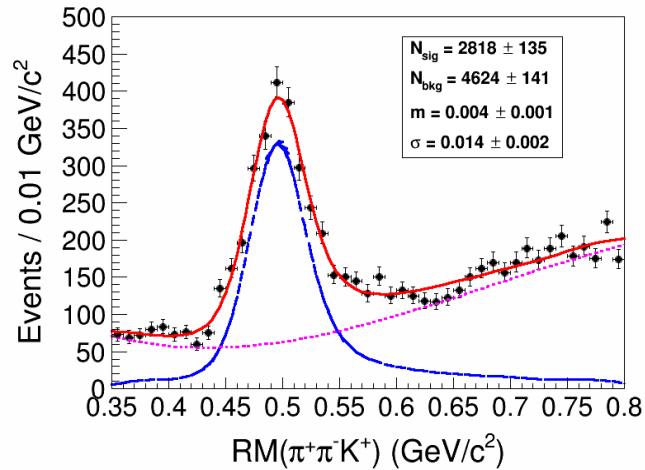
$P_t \in (1.5, 1.7)\text{GeV}$



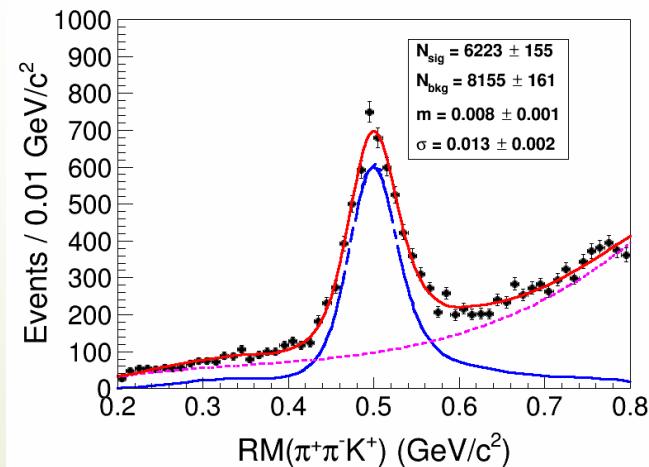
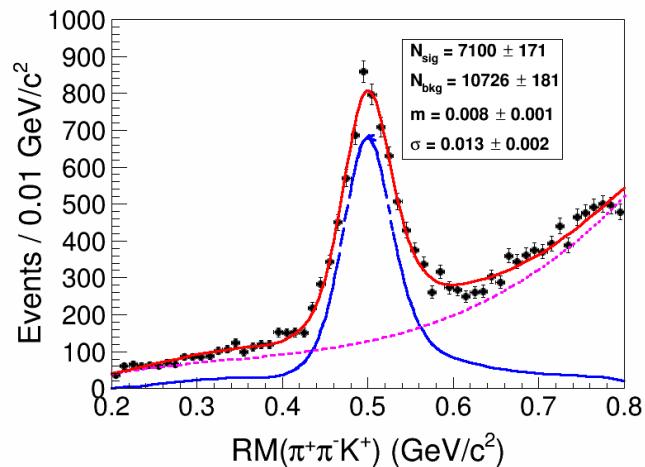
K^-

33

$P_t \in (0.1, 0.3)\text{GeV}$



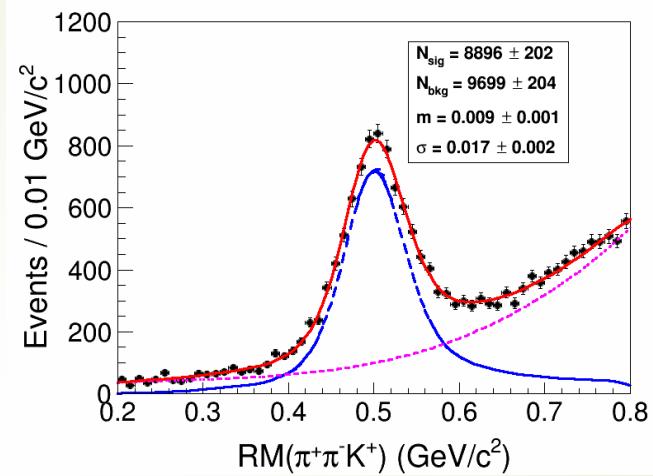
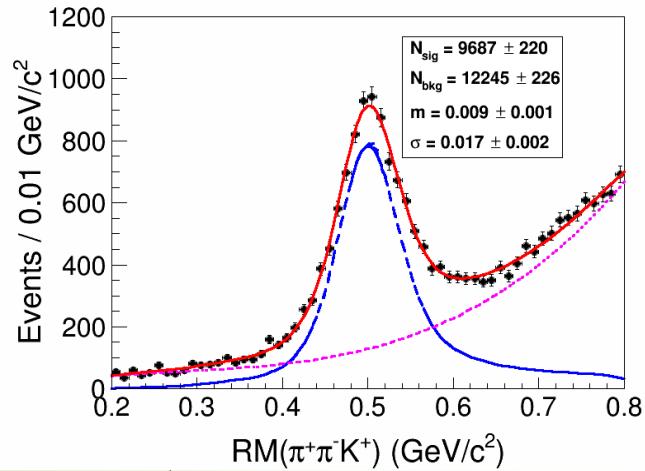
$P_t \in (0.3, 0.5)\text{GeV}$



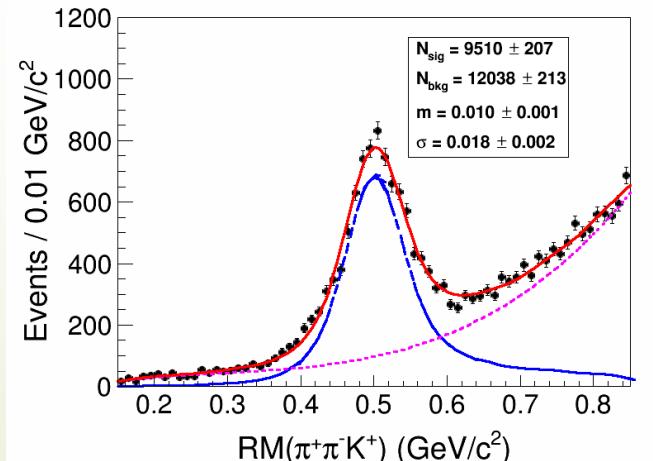
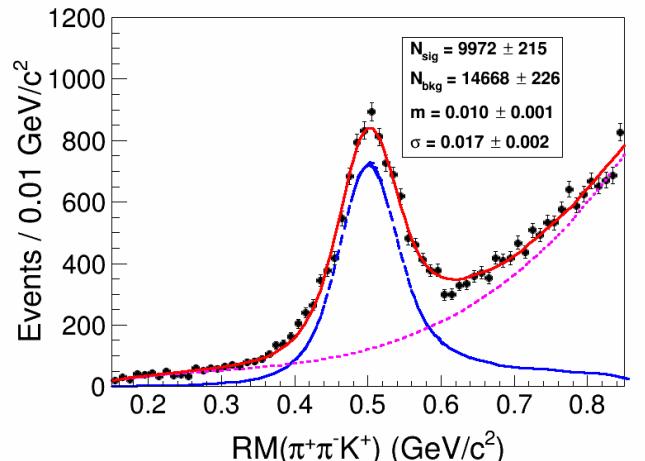
K^-

34

$P_t \in (0.5, 0.7)\text{GeV}$



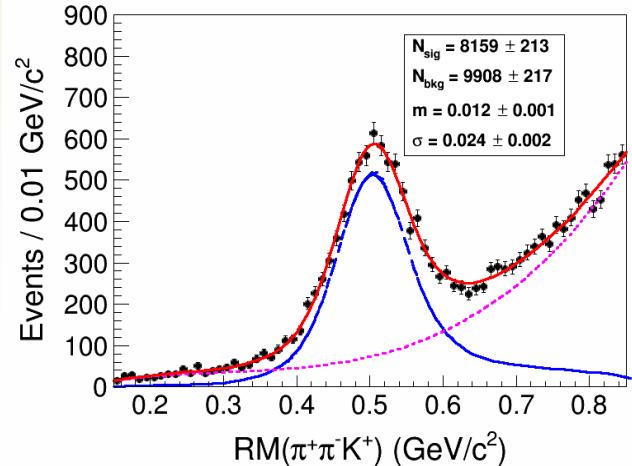
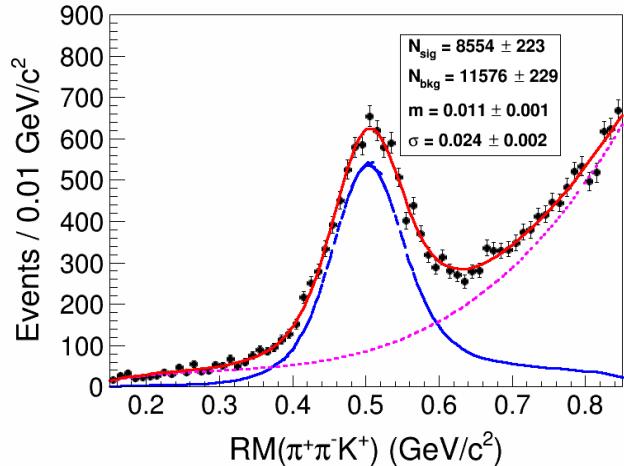
$P_t \in (0.7, 0.9)\text{GeV}$



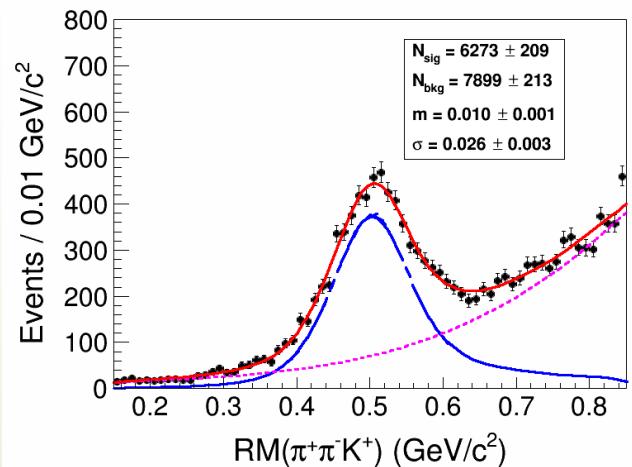
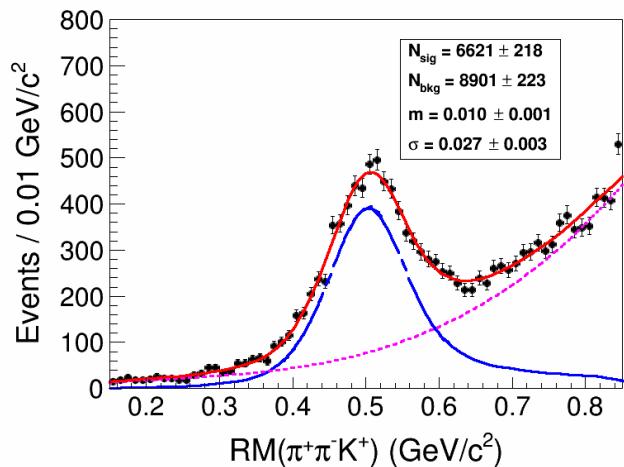
K^-

35

$P_t \in (0.9, 1.1)\text{GeV}$



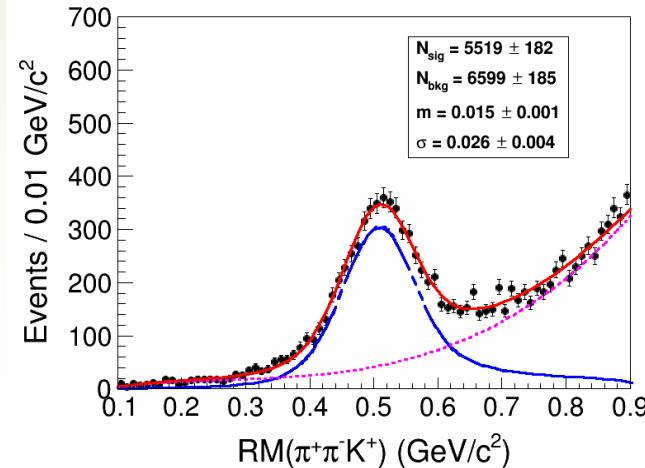
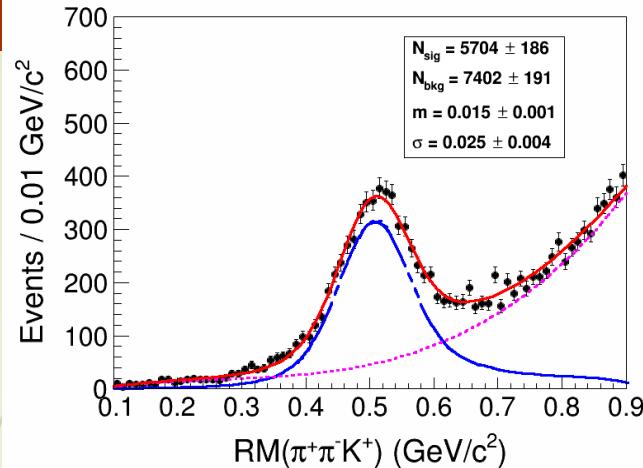
$P_t \in (1.1, 1.3)\text{GeV}$



K^-

$P_t \in (1.3, 1.5)\text{GeV}$

36



$P_t \in (1.5, 1.7)\text{GeV}$

