中国科学技术大学
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BESIII

Measurement of $e^+e^- \to p\bar{p}$ cross section and form factors of proton

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Momentum-PID Comparation

- Momentum-PID Comparation
  - ➢ Momentum range is conflict with Yadi
    - ✓ Conexc is different with Phokhara

$$p_{exp} - 0.1\ GeV < p_p < p_{exp} + 0.1\ GeV, p_{exp} - 0.1\ GeV < p_{\overline{p}} < p_{exp} + 0.1\ GeV$$

$\sqrt{s}$(GeV)	p_{exp}(GeV)	p_{mean} (GeV)				σ_p (MeV)			
		With PID		Without PID		With PID		Without PID	
		Conexc	Phokhara	Conexc	Phokhara	Conexc	Phokhara	Conexc	Phokhara
2	0.346	0.345	0.345	0.345	0.345	2.68	2.66	2.68	2.66
2.05	0.413	0.412	0.412	0.412	0.412	2.88	2.85	2.88	2.85
2.1	0.471	0.471	0.471	0.471	0.471	3.08	3.07	3.08	3.07
2.125	0.499	0.498	0.498	0.498	0.498	3.19	3.18	3.19	3.18
2.15	0.525	0.524	0.524	0.524	0.524	3.26	3.27	3.26	3.27
2.175	0.550	0.549	0.549	0.549	0.549	3.37	3.35	3.36	3.35
2.2	0.574	0.574	0.574	0.574	0.574	3.46	3.45	3.46	3.45
2.2324	0.605	0.604	0.604	0.604	0.604	3.57	3.57	3.57	3.57
2.3094	0.673	0.673	0.673	0.672	0.673	3.93	3.85	3.94	3.85
2.3864	0.737	0.737	0.737	0.737	0.737	4.20	4.16	4.20	4.16
2.396	0.745	0.744	0.744	0.744	0.745	4.23	4.22	4.23	4.20
2.5	0.826	0.825	0.826	0.825	0.826	4.69	4.61	4.70	4.61
2.6444	0.932	0.931	0.930	0.931	0.931	6.41	6.41	6.54	6.46
2.6464	0.933	0.932	0.932	0.932	0.932	6.46	6.46	6.55	6.55
2.7	0.971	0.971	0.969	0.971	0.969	6.52	6.52	6.83	6.83
2.8	1.039	1.038	1.038	1.038	1.038	6.96	6.95	7.29	7.29
2.9	1.106	1.105	1.105	1.105	1.105	7.65	7.65	7.76	7.79
2.95	1.138	1.138	1.138	1.138	1.138	8.04	8.04	8.05	8.05
2.981	1.158	1.158	1.158	1.158	1.158	8.10	8.10	8.25	8.25
3	1.170	1.169	1.169	1.169	1.169	8.29	8.31	8.38	8.38
3.02	1.183	1.183	1.183	1.183	1.183	8.34	8.35	8.44	8.47
3.08	1.221	1.221	1.221	1.221	1.221	8.66	8.66		

Momentum-PID Comparation

- ✓ Difference of calculate for double Gaussian resolution

  My formula:

$$\sigma_{doube\ gaussian} = \sqrt{f \cdot {\sigma_1}^2 + (1-f) \cdot {\sigma_2}^2 + f \cdot (1-f) \cdot (p_{mean1} - p_{mean2})^2}$$

  Yadi's formula:

$$\sigma_{doube\ gaussian} = f \cdot \sigma_1 + (1-f) \cdot \sigma_2$$

- ✓ Momentum range of $\overline{p}$ when fit p in σ measurement in MC

  p fit range:

$$p_{exp} - 0.1\ GeV < p_p < p_{exp} + 0.1\ GeV$$

  $\overline{p}$ cut range:

$$p_{exp} - 0.1\ GeV < p_{\overline{p}} < p_{exp} + 0.1\ GeV$$

$$\Rightarrow \quad p_{exp} - 4\sigma < p_{\overline{p}} < p_{exp} + 3\sigma \quad ?$$

Momentum-PID Comparation

- Momentum range comparation
  - ✓ @2.0 GeV, without $|cos\theta| < 0.8$, $e/p < 0.5$

    My PID: use dedx, $prob(p) > prob(K) \&\& prob(p) > prob(\pi)$;

    Yadi's PID: use dedx, $normPH > 3$.

    My momentum cut: $p_p \in (0.306356, 0.369578)$, $p_{\overline{p}} \in (0.307233, 0.368811)$;

    Yadi's momentum cut: $p_{p,\overline{p}} \in (0.327341\ 0.359816)$;

    Momentum fit range: $p_{p,\overline{p}} \in (0.2459\ 0.4459)$.

$\sqrt{s}$(GeV)	Yadi's PID			My PId			No PID		
	N_{signal}	efficiency	N_{exept}	N_{signal}	efficiency	N_{exept}	N_{signal}	efficiency	N_{exept}
Yadi's cut	4828	62.227%	7759	4827	61.694%	7824	5101	59.041%	-
My cut	5249	67.549%	7770	5242	66.970%	7827	6211	67.555%	-
p fit, $\overline{p}$ Yadi's cut	5005	64.229%	7792	4998	63.660%	7851	5058	64.234%	7874
					2 order	bkg	4994	64.234%	7775
p fit, $\overline{p}$ my cut	5345	68.782%	7771	5335	68.174%	7826	5473	68.790%	7956
					2 order	bkg	5347	68.790%	7773

My 5015, 67.504, 7429, (isr=0.892); Yadi, 4825, 62.530%, 7716, (isr=0.916).

e/p and $\cos\theta$ comparation

- e/p and $cos\theta$ comparation
  - Use e/p ratio and $cos\theta$

$\sqrt{s}$(GeV)	Yadi's PID			My PId			No PID		
	N_{signal}	efficiency	N_{exept}	N_{signal}	efficiency	N_{exept}	N_{signal}	efficiency	N_{exept}
Yadi's cut	4560	59.039%	7724	4559	58.533%	7789	4593	59.041%	-
p fit, $\bar{p}$ Yadi's cut	4701	60.455%	7776	4695	53.939%	7833	4633	60.458%	7663
					2 order	bkg	4650	60.458%	7691

  - Use $cos\theta$, don't use e/p ratio

$\sqrt{s}$(GeV)	Yadi's PID			My PId			No PID		
	N_{signal}	efficiency	N_{exept}	N_{signal}	efficiency	N_{exept}	N_{signal}	efficiency	N_{exept}
Yadi's cut	4657	60.129%	7745	4656	59.610%	7811	4830	60.131%	-
p fit, $\bar{p}$ Yadi's cut	4801	61.568%	7798	4795	61.039%	7856	4820	61.572%	7828
					2 order	bkg	4767	61.572%	7742

e/p and $\cos\theta$ comparation

- e/p and $cos\theta$ comparation
  - Use e/p , don't use $cos\theta$

$\sqrt{s}$(GeV)	Yadi's PID			My PId			No PID		
	N_{signal}	efficiency	N_{exept}	N_{signal}	efficiency	N_{exept}	N_{signal}	efficiency	N_{exept}
Yadi's cut	4731	61.124%	7740	4730	60.604%	7850	4782	61.126%	-
p fit, $\bar{p}$ Yadi's cut	4897	63.100%	7760	4904	62.545%	7841	4830	63.104%	7654
					2 order	bkg	4845	63.104%	7678

  - Don't use e/p ratio and $cos\theta$

$\sqrt{s}$(GeV)	Yadi's PID			My PId			No PID		
	N_{signal}	efficiency	N_{exept}	N_{signal}	efficiency	N_{exept}	N_{signal}	efficiency	N_{exept}
Yadi's cut	4828	62.227%	7759	4827	61.694%	7824	5101	59.041%	-
p fit, $\bar{p}$ Yadi's cut	5005	64.229%	7792	4998	63.660%	7851	5058	64.234%	7874
					2 order	bkg	4994	64.234%	7775

Thanks for Your Attention!