Measurements of the Υ(1S), Υ(2S), and Υ(3S) differential cross sections in pp collisions at $\sqrt{s} = 7$ TeV

—Supplemental material—

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Abstract

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Table 1: The p_T bin width, the weighted mean p_T within a bin, and the differential cross section times the dimuon branching fraction: $(d\sigma/dp_T)\mathcal{B}(\Upsilon(nS) \to \mu^+\mu^-)$ for the Υ(1S), Υ(2S), and Υ(3S) with $0 < |y| < 0.6$. The statistical uncertainty in the differential cross section is given as the percentage of the cross section in the format: $\sigma_{stat}/(d\sigma/dp_T)(\%)$ and similarly for the systematic uncertainty. The percentage systematic uncertainty for a negative systematic shift is given in parentheses. The statistical uncertainties are derived from the fit to the dimuon mass spectrum. The systematic uncertainties are discussed in the text. The 2.2% systematic uncertainty in the integrated luminosity is not included.

		Υ(1S)			Υ(2S)			Υ(3S)		
p_T	$\langle p_T \rangle$	$\frac{d\sigma}{dp_T}\mathcal{B}$	$\frac{\sigma_{stat}}{d\sigma/dp_T}$	$\frac{\sigma_{syst}}{d\sigma/dp_T}$	$\frac{d\sigma}{dp_T}\mathcal{B}$	$\frac{\sigma_{stat}}{d\sigma/dp_T}$	$\frac{\sigma_{syst}}{d\sigma/dp_T}$	$\frac{d\sigma}{dp_T}\mathcal{B}$	$\frac{\sigma_{stat}}{d\sigma/dp_T}$	$\frac{\sigma_{syst}}{d\sigma/dp_T}$
GeV	GeV	(fb/GeV)	(%)	(%)	(fb/GeV)	(%)	(%)	(fb/GeV)	(%)	(%)
10–12	11.0	60936	0.5	6.8 (7.2)	20036	1.0	8.6 (9.4)	10951	1.4	10.0 (11.3)
12–14	13.0	33828	0.5	5.1 (5.6)	12072	1.1	6.0 (6.7)	7181	1.4	7.1 (8.0)
14–16	15.0	19670	0.6	4.8 (5.2)	7621	1.2	5.2 (5.7)	4596	1.6	5.7 (6.3)
16–18	17.0	11504	0.8	4.6 (4.9)	4858	1.3	5.1 (5.5)	3097	1.7	5.6 (6.1)
18–20	19.0	6914	0.9	4.5 (4.7)	3034	1.5	4.9 (5.2)	1966	2.0	5.2 (5.6)
20–22	21.0	4235	1.1	4.2 (4.4)	1932	1.8	4.6 (4.9)	1423	2.2	5.0 (5.2)
22–24	23.0	2721	1.4	4.1 (4.3)	1203	2.3	4.5 (4.6)	893	2.7	4.7 (4.9)
24–26	25.0	1848	1.7	4.1 (4.2)	849	2.6	4.6 (4.7)	594	3.3	4.9 (5.1)
26–28	27.0	1117	2.2	4.3 (4.4)	537	3.6	5.7 (5.8)	381	4.4	6.1 (6.2)
28–30	29.0	845	2.5	4.4 (4.5)	413	4.0	5.8 (5.8)	314	4.7	6.0 (6.1)
30–32	31.0	593	2.8	4.3 (4.4)	288	4.4	5.0 (5.1)	209	5.2	5.0 (5.2)
32–34	33.0	420	3.5	4.7 (4.8)	194	6.0	6.7 (6.8)	162	6.5	6.4 (6.5)
34–36	35.0	314	3.8	4.6 (4.6)	158	5.8	5.9 (6.0)	112	7.1	5.7 (5.8)
36–38	37.0	209	4.8	4.5 (4.6)	123	6.5	4.6 (4.7)	92	7.5	4.6 (4.7)
38–40	39.0	157	5.4	4.2 (4.2)	86	7.8	4.4 (4.6)	61	9.5	4.6 (4.7)
40–43	41.4	114	5.0	4.0 (4.1)	61	7.6	4.3 (4.4)	42	9.3	4.4 (4.6)
43–46	44.4	76	6.3	5.8 (5.8)	36	10.0	9.5 (9.5)	39	9.4	7.8 (7.9)
46–50	47.9	49	6.6	4.2 (4.2)	27	9.6	4.8 (4.9)	22	10.9	5.1 (5.3)
50–55	52.4	24	9.2	5.9 (5.8)	17	10.9	4.8 (4.9)	12	13.6	4.4 (4.6)
55–60	57.4	15	11.0	6.3 (6.2)	9.8	14.8	5.0 (5.1)	8.5	15.5	4.6 (4.8)
60–70	64.6	9.2	10.1	6.6 (6.5)	4.7	15.7	7.3 (7.3)	4.9	14.8	6.0 (6.1)
70–100	82.0	2.3	12.6	11.9 (11.8)	1.2	17.6	8.9 (8.9)	1.0	19.1	7.3 (7.2)

Table 2: The p_T bin width, the weighted mean p_T within a bin, and the differential cross section times the dimuon branching fraction: $(d\sigma/p_T)\mathcal{B}(\Upsilon(nS) \to \mu^+\mu^-)$ for the Υ(1S), Υ(2S), and Υ(3S) with $0.6 < |y| < 1.2$. The notation is the same as for Table 1.

		Υ(1S)			Υ(2S)			Υ(3S)		
p_T	$\langle p_T \rangle$	$\frac{d\sigma}{dp_T}\mathcal{B}$	$\frac{\sigma_{stat}}{d\sigma/dp_T}$	$\frac{\sigma_{syst}}{d\sigma/dp_T}$	$\frac{d\sigma}{dp_T}\mathcal{B}$	$\frac{\sigma_{stat}}{d\sigma/dp_T}$	$\frac{\sigma_{syst}}{d\sigma/dp_T}$	$\frac{d\sigma}{dp_T}\mathcal{B}$	$\frac{\sigma_{stat}}{d\sigma/dp_T}$	$\frac{\sigma_{syst}}{d\sigma/dp_T}$
GeV	GeV	(fb/GeV)	(%)	(%)	(fb/GeV)	(%)	(%)	(fb/GeV)	(%)	(%)
10–12	11.0	55260	0.5	6.1 (6.3)	18371	1.2	7.8 (8.2)	9855	1.6	8.9 (10.0)
12–14	13.0	31331	0.6	4.1 (4.2)	10973	1.1	4.9 (5.2)	6741	1.5	5.5 (6.0)
14–16	15.0	18063	0.7	3.8 (4.0)	6685	1.5	4.6 (4.8)	4298	2.0	5.5 (5.7)
16–18	17.0	10481	0.9	3.8 (3.9)	4105	1.7	4.9 (5.1)	2759	2.3	4.8 (5.0)
18–20	19.0	6286	1.1	3.7 (3.8)	2624	2.1	4.6 (4.8)	1871	2.6	4.6 (4.7)
20–22	21.0	3875	1.4	3.8 (3.9)	1746	2.4	4.7 (4.8)	1220	3.0	5.0 (5.2)
22–24	23.0	2439	1.6	3.6 (3.7)	1188	2.4	3.8 (3.9)	819	3.0	4.0 (4.2)
24–26	25.0	1633	1.9	3.8 (3.9)	865	2.8	4.0 (4.1)	530	3.7	4.0 (4.2)
26–28	27.0	1080	2.2	3.8 (3.9)	551	3.4	4.5 (4.5)	377	4.3	4.7 (4.8)
28–30	29.0	765	2.5	3.7 (3.8)	397	3.9	3.9 (4.0)	274	5.0	4.2 (4.3)
30–32	31.0	484	3.8	5.0 (5.1)	229	6.5	9.0 (9.0)	170	7.8	10.3 (10.3)
32–34	33.0	371	3.7	6.0 (6.1)	175	6.0	9.8 (9.8)	123	7.8	10.3 (10.4)
34–36	35.0	263	4.3	3.7 (3.8)	151	6.1	4.0 (4.1)	101	8.1	4.3 (4.4)
36–38	37.0	193	4.9	3.6 (3.7)	113	7.0	3.9 (4.0)	84	8.6	4.3 (4.4)
38–40	39.0	152	5.7	3.7 (3.8)	87	8.1	4.0 (4.1)	47	11.9	4.2 (4.3)
40–43	41.4	98	6.0	5.0 (5.0)	55	8.4	4.3 (4.4)	43	9.8	4.2 (4.3)
43–46	44.4	73	6.5	7.1 (7.1)	37	10.3	9.9 (9.9)	34	11.1	13.4 (13.4)
46–50	47.9	51	6.7	4.0 (4.0)	23	11.0	3.9 (4.0)	16	14.2	4.0 (4.2)
50–55	52.4	27	8.6	5.1 (5.1)	14	13.2	4.5 (4.5)	8.7	18.3	4.0 (4.2)
55–60	57.4	15	11.2	5.1 (5.0)	9.2	15.5	4.6 (4.6)	11	13.7	4.5 (4.7)
60–70	64.6	8.1	10.8	5.6 (5.6)	3.6	19.7	5.1 (5.1)	3.3	20.9	5.2 (5.3)
70–100	82.0	1.6	15.0	7.4 (7.2)	1.0	24.0	7.0 (6.9)	1.3	19.8	6.6 (6.7)

Table 3: The p_T bin width, the weighted mean p_T within a bin, and the differential cross section times the dimuon branching fraction: $(d\sigma/p_T)\mathcal{B}(\Upsilon(nS) \to \mu^+\mu^-)$ for the Υ(1S), Υ(2S), and Υ(3S) with $0 < |y| < 1.2$. The notation is the same as for Table 1.

		Υ(1S)			Υ(2S)			Υ(3S)		
p_T	$\langle p_T \rangle$	$\frac{d\sigma}{dp_T}\mathcal{B}$	$\frac{\sigma_{stat}}{d\sigma/dp_T}$	$\frac{\sigma_{syst}}{d\sigma/dp_T}$	$\frac{d\sigma}{dp_T}\mathcal{B}$	$\frac{\sigma_{stat}}{d\sigma/dp_T}$	$\frac{\sigma_{syst}}{d\sigma/dp_T}$	$\frac{d\sigma}{dp_T}\mathcal{B}$	$\frac{\sigma_{stat}}{d\sigma/dp_T}$	$\frac{\sigma_{syst}}{d\sigma/dp_T}$
GeV	GeV	(fb/GeV)	(%)	(%)	(fb/GeV)	(%)	(%)	(fb/GeV)	(%)	(%)
10–12	11.0	116415	0.4	6.4 (6.7)	38540	0.7	8.1 (8.7)	20882	1.1	9.3 (10.5)
12–14	13.0	65266	0.4	4.6 (4.9)	23088	0.8	5.4 (5.9)	13947	1.0	6.2 (6.9)
14–16	15.0	37778	0.5	4.3 (4.6)	14321	0.9	4.7 (5.1)	8909	1.3	5.2 (5.7)
16–18	17.0	22008	0.6	4.1 (4.4)	8969	1.1	4.7 (5.0)	5873	1.4	5.0 (5.3)
18–20	19.0	13212	0.7	4.1 (4.2)	5665	1.3	4.6 (4.8)	3842	1.6	4.7 (5.0)
20–22	21.0	8116	0.9	4.0 (4.1)	3683	1.5	4.4 (4.6)	2648	1.8	4.7 (4.9)
22–24	23.0	5162	1.0	3.9 (4.0)	2393	1.7	4.1 (4.2)	1713	2.0	4.3 (4.5)
24–26	25.0	3483	1.3	3.9 (4.0)	1715	1.9	4.2 (4.3)	1124	2.4	4.4 (4.5)
26–28	27.0	2197	1.5	4.0 (4.0)	1089	2.5	4.6 (4.7)	759	3.1	4.9 (5.0)
28–30	29.0	1611	1.8	4.0 (4.1)	811	2.8	4.6 (4.7)	588	3.4	4.8 (5.0)
30–32	31.0	1077	2.3	4.2 (4.3)	517	3.8	5.7 (5.7)	380	4.5	6.2 (6.3)
32–34	33.0	791	2.5	4.7 (4.7)	369	4.2	6.5 (6.6)	286	5.0	6.5 (6.6)
34–36	35.0	577	2.8	4.1 (4.1)	309	4.2	4.7 (4.7)	213	5.3	4.8 (4.9)
36–38	37.0	402	3.4	4.0 (4.1)	236	4.8	4.2 (4.3)	176	5.7	4.4 (4.6)
38–40	39.0	308	3.9	3.9 (3.9)	173	5.6	4.2 (4.3)	109	7.5	4.4 (4.5)
40–43	41.4	212	3.9	4.1 (4.2)	116	5.6	4.2 (4.3)	86	6.8	4.3 (4.5)
43–46	44.4	148	4.5	5.3 (5.3)	73	7.2	7.5 (7.5)	73	7.2	8.1 (8.2)
46–50	47.9	100	4.7	4.0 (4.0)	50	7.3	4.2 (4.3)	38	8.7	4.5 (4.6)
50–55	52.4	51	6.3	5.0 (5.0)	31	8.4	4.5 (4.6)	21	11.0	4.2 (4.4)
55–60	57.4	29	7.9	5.4 (5.4)	19	10.7	4.8 (4.8)	20	10.3	4.6 (4.7)
60–70	64.6	17	7.4	6.0 (5.9)	8.3	12.4	6.1 (6.1)	8.1	12.2	5.5 (5.6)
70–100	82.0	3.9	9.7	8.9 (8.8)	2.2	14.6	7.6 (7.5)	2.3	14.0	6.9 (6.9)

Table 4: The p_T bin width and corrected yield ratios R_{21} and R_{31} for $|y| < 0.6$. The statistical uncertainty in the corrected yield ratios is given as the percentage of the ratio in the format: σ_{stat}/R_{n1} (%) (n = 2,3) and similarly for the systematic uncertainty. The statistical uncertainties are derived from the fit to the dimuon mass spectrum. The systematic uncertainties are discussed in the text. The 2.2% systematic uncertainty in the integrated luminosity is not included.

p_T GeV	R_{21}	$\frac{\sigma_{stat}}{R_{21}}$ (%)	$\frac{\sigma_{syst}}{R_{21}}$ (%)	R_{31}	$\frac{\sigma_{stat}}{R_{31}}$ (%)	$\frac{\sigma_{syst}}{R_{31}}$ (%)
10–12	0.33	1.0	7.2	0.18	1.4	8.6
12–14	0.36	1.1	5.9	0.21	1.5	6.7
14–16	0.39	1.3	4.9	0.23	1.7	5.5
16–18	0.42	1.4	4.7	0.27	1.8	5.2
18–20	0.44	1.7	4.1	0.28	2.1	4.6
20–22	0.46	2.1	3.8	0.34	2.4	4.2
22–24	0.44	2.6	3.4	0.33	3.0	3.8
24–26	0.46	3.0	3.4	0.32	3.6	3.8
26–28	0.48	3.9	3.9	0.34	4.6	4.5
28–30	0.49	4.4	3.8	0.37	5.0	4.1
30–32	0.49	5.1	3.5	0.35	5.8	3.6
32–34	0.46	6.4	4.1	0.39	6.9	4.1
34–36	0.50	6.8	3.6	0.36	7.8	3.7
36–38	0.59	7.8	3.3	0.44	8.6	4.0
38–40	0.55	9.2	3.1	0.39	10.6	3.5
40–43	0.54	8.8	3.0	0.37	10.3	3.3
43–46	0.48	11.4	5.3	0.51	10.9	3.9
46–50	0.55	11.3	3.1	0.45	12.3	3.5
50–55	0.72	13.4	3.2	0.51	15.6	4.6
55–60	0.66	17.4	2.9	0.57	18.2	4.8
60–70	0.51	17.8	2.5	0.53	16.9	2.8
70–100	0.53	20.3	4.1	0.44	21.9	9.1

Table 5: The p_T bin width and corrected yield ratios R_{21} and R_{31} for $0.6 < |y| < 1.2$. The notation is the same as for Table 4.

p_T GeV	R_{21}	$\frac{\sigma_{stat}}{R_{21}}$ (%)	$\frac{\sigma_{syst}}{R_{21}}$ (%)	R_{31}	$\frac{\sigma_{stat}}{R_{31}}$ (%)	$\frac{\sigma_{syst}}{R_{31}}$ (%)
10–12	0.33	1.1	5.5	0.18	1.6	6.4
12–14	0.35	1.2	3.9	0.22	1.5	4.3
14–16	0.37	1.4	3.6	0.24	1.9	4.1
16–18	0.39	1.7	3.4	0.26	2.2	4.1
18–20	0.42	2.1	3.4	0.30	2.5	3.6
20–22	0.45	2.4	3.2	0.31	3.0	3.8
22–24	0.49	2.8	2.8	0.34	3.3	3.0
24–26	0.53	3.2	2.8	0.32	4.0	3.3
26–28	0.51	3.9	3.1	0.35	4.7	3.2
28–30	0.52	4.6	2.9	0.36	5.5	3.4
30–32	0.47	6.4	5.3	0.35	7.6	6.6
32–34	0.47	6.8	5.3	0.33	8.2	5.9
34–36	0.58	7.3	3.0	0.39	8.9	3.5
36–38	0.58	8.2	2.9	0.44	9.5	3.4
38–40	0.57	9.4	2.9	0.31	12.8	3.2
40–43	0.56	9.8	3.0	0.44	11.0	4.5
43–46	0.51	12.9	6.8	0.47	15.5	5.4
46–50	0.45	12.3	2.6	0.31	15.0	3.3
50–55	0.51	14.9	2.6	0.33	19.4	4.2
55–60	0.63	18.4	4.6	0.77	16.6	2.9
60–70	0.46	21.0	4.7	0.38	23.2	6.4
70–100	0.66	25.8	4.2	0.75	23.4	9.7

Table 6: The p_T bin width and corrected yield ratios R_{21} and R_{31} for $|y| < 1.2$. The notation is the same as for Table 4.

p_T GeV	R_{21}	$\frac{\sigma_{stat}}{R_{21}}$ (%)	$\frac{\sigma_{syst}}{R_{21}}$ (%)	R_{31}	$\frac{\sigma_{stat}}{R_{31}}$ (%)	$\frac{\sigma_{syst}}{R_{31}}$ (%)
10–12	0.33	0.7	6.2	0.18	1.0	7.4
12–14	0.35	0.8	4.8	0.21	1.1	5.4
14–16	0.38	1.0	4.1	0.24	1.3	4.5
16–18	0.41	1.1	4.0	0.27	1.4	4.3
18–20	0.43	1.3	3.6	0.29	1.6	3.9
20–22	0.45	1.6	3.4	0.33	1.9	3.7
22–24	0.46	1.9	3.0	0.33	2.2	3.3
24–26	0.49	2.2	3.0	0.32	2.7	3.4
26–28	0.50	2.8	3.2	0.34	3.3	3.4
28–30	0.50	3.2	3.1	0.36	3.7	3.5
30–32	0.48	4.0	3.3	0.35	4.6	3.5
32–34	0.47	4.7	3.8	0.36	5.3	4.0
34–36	0.53	5.0	3.1	0.37	5.9	3.5
36–38	0.58	5.7	3.1	0.44	6.4	3.4
38–40	0.56	6.6	3.0	0.35	8.2	3.3
40–43	0.55	6.6	2.9	0.40	7.5	3.2
43–46	0.49	8.6	4.5	0.50	8.9	3.7
46–50	0.49	8.4	2.7	0.37	9.7	3.2
50–55	0.59	10.1	2.6	0.40	12.5	3.6
55–60	0.65	12.6	2.8	0.65	12.4	3.0
60–70	0.49	13.6	2.5	0.45	13.9	2.6
70–100	0.56	16.0	3.3	0.50	16.5	7.0

Table 7: The dimuon acceptance $\mathcal{A}$ calculated using the CMS measured polarization and its positive and negative uncertainties $\mathcal{A}(\sigma^{\pm})$, and the values of the acceptance assuming no polarization $\mathcal{A}$(unpol), transverse polarization $\mathcal{A}(T)$, and longitudinal polarization $\mathcal{A}(L)$ for the Υ(1S) state and $|y| < 0.6$.

p_T [GeV]	$\mathcal{A}$	$\mathcal{A}(\sigma^+)$	$\mathcal{A}(\sigma^-)$	$\mathcal{A}$(unpol)	$\mathcal{A}(T)$	$\mathcal{A}(L)$
10–12	0.31	0.29	0.32	0.32	0.26	0.45
12–14	0.38	0.36	0.40	0.39	0.32	0.54
14–16	0.44	0.42	0.45	0.45	0.36	0.61
16–18	0.49	0.48	0.51	0.50	0.41	0.67
18–20	0.53	0.52	0.55	0.54	0.45	0.71
20–22	0.57	0.56	0.58	0.57	0.48	0.74
22–24	0.60	0.59	0.61	0.60	0.51	0.77
24–26	0.62	0.61	0.64	0.62	0.54	0.79
26–28	0.64	0.63	0.66	0.65	0.56	0.81
28–30	0.66	0.64	0.67	0.66	0.58	0.83
30–32	0.67	0.66	0.69	0.68	0.60	0.84
32–34	0.69	0.67	0.70	0.69	0.62	0.85
34–36	0.70	0.69	0.71	0.71	0.63	0.86
36–38	0.71	0.70	0.72	0.72	0.64	0.87
38–40	0.72	0.71	0.74	0.73	0.66	0.88
40–43	0.73	0.72	0.75	0.74	0.67	0.89
43–46	0.75	0.73	0.76	0.76	0.69	0.89
46–50	0.76	0.75	0.78	0.77	0.71	0.90
50–55	0.78	0.77	0.80	0.79	0.73	0.91
55–60	0.80	0.78	0.81	0.80	0.75	0.92
60–70	0.82	0.81	0.83	0.82	0.77	0.93
70–100	0.87	0.86	0.88	0.87	0.83	0.96

Table 8: The dimuon acceptance $\mathcal{A}$ calculated using the CMS measured polarization and its positive and negative uncertainties $\mathcal{A}(\sigma^{\pm})$, and the values of the acceptance assuming no polarization $\mathcal{A}$(unpol), transverse polarization $\mathcal{A}(T)$, and longitudinal polarization $\mathcal{A}(L)$ for the Υ(1S) state and $0.6 < |y| < 1.2$.

p_{T} [GeV]	$\mathcal{A}$	$\mathcal{A}(\sigma^{+})$	$\mathcal{A}(\sigma^{-})$	$\mathcal{A}$(unpol)	$\mathcal{A}(T)$	$\mathcal{A}(L)$
10–12	0.29	0.28	0.30	0.29	0.24	0.38
12–14	0.35	0.34	0.36	0.35	0.30	0.46
14–16	0.42	0.41	0.43	0.42	0.36	0.54
16–18	0.47	0.46	0.48	0.47	0.40	0.60
18–20	0.52	0.51	0.53	0.51	0.44	0.66
20–22	0.55	0.54	0.56	0.55	0.48	0.70
22–24	0.59	0.58	0.60	0.59	0.51	0.74
24–26	0.61	0.60	0.63	0.62	0.54	0.77
26–28	0.64	0.63	0.65	0.64	0.57	0.79
28–30	0.66	0.64	0.67	0.66	0.59	0.81
30–32	0.67	0.66	0.69	0.68	0.61	0.83
32–34	0.69	0.67	0.70	0.70	0.63	0.84
34–36	0.70	0.69	0.71	0.71	0.64	0.86
36–38	0.71	0.70	0.72	0.73	0.66	0.87
38–40	0.72	0.71	0.74	0.74	0.67	0.88
40–43	0.74	0.73	0.75	0.75	0.68	0.88
43–46	0.75	0.74	0.77	0.77	0.70	0.89
46–50	0.77	0.76	0.78	0.78	0.72	0.90
50–55	0.79	0.78	0.80	0.80	0.74	0.91
55–60	0.81	0.80	0.82	0.81	0.76	0.92
60–70	0.83	0.82	0.84	0.83	0.78	0.93
70–100	0.88	0.87	0.89	0.88	0.84	0.96

Table 9: The dimuon acceptance $\mathcal{A}$ calculated using the CMS measured polarization and its positive and negative uncertainties $\mathcal{A}(\sigma^{\pm})$, and the values of the acceptance assuming no polarization $\mathcal{A}$(unpol), transverse polarization $\mathcal{A}(T)$, and longitudinal polarization $\mathcal{A}(L)$ for the Υ(1S) state and $|y| < 1.2$.

p_{T} [GeV]	$\mathcal{A}$	$\mathcal{A}(\sigma^{+})$	$\mathcal{A}(\sigma^{-})$	$\mathcal{A}$(unpol)	$\mathcal{A}(T)$	$\mathcal{A}(L)$
10–12	0.30	0.28	0.31	0.30	0.25	0.42
12–14	0.37	0.35	0.38	0.37	0.31	0.50
14–16	0.43	0.42	0.44	0.43	0.36	0.57
16–18	0.48	0.47	0.49	0.48	0.41	0.64
18–20	0.52	0.51	0.54	0.53	0.45	0.68
20–22	0.56	0.55	0.57	0.56	0.48	0.72
22–24	0.59	0.58	0.61	0.59	0.51	0.75
24–26	0.62	0.61	0.63	0.62	0.54	0.78
26–28	0.64	0.63	0.65	0.64	0.56	0.80
28–30	0.66	0.64	0.67	0.66	0.58	0.82
30–32	0.67	0.66	0.69	0.68	0.60	0.84
32–34	0.69	0.67	0.70	0.70	0.62	0.85
34–36	0.70	0.69	0.71	0.71	0.64	0.86
36–38	0.71	0.70	0.72	0.72	0.65	0.87
38–40	0.72	0.71	0.74	0.73	0.66	0.88
40–43	0.74	0.72	0.75	0.75	0.68	0.88
43–46	0.75	0.74	0.77	0.76	0.70	0.89
46–50	0.77	0.76	0.78	0.78	0.71	0.90
50–55	0.79	0.77	0.80	0.79	0.73	0.91
55–60	0.80	0.79	0.81	0.81	0.75	0.92
60–70	0.82	0.81	0.84	0.83	0.78	0.93
70–100	0.87	0.86	0.89	0.88	0.83	0.96

Table 10: The dimuon acceptance $\mathcal{A}$ calculated using the CMS measured polarization and its positive and negative uncertainties $\mathcal{A}(\sigma^{\pm})$, and the values of the acceptance assuming no polarization $\mathcal{A}$(unpol), transverse polarization $\mathcal{A}(T)$, and longitudinal polarization $\mathcal{A}(L)$ for the Υ(2S) state and $|y| < 0.6$.

p_{T} [GeV]	$\mathcal{A}$	$\mathcal{A}(\sigma^{+})$	$\mathcal{A}(\sigma^{-})$	$\mathcal{A}$(unpol)	$\mathcal{A}(T)$	$\mathcal{A}(L)$
10–12	0.31	0.30	0.33	0.34	0.27	0.48
12–14	0.37	0.36	0.39	0.41	0.33	0.56
14–16	0.43	0.41	0.45	0.47	0.38	0.63
16–18	0.48	0.46	0.50	0.51	0.42	0.68
18–20	0.52	0.51	0.54	0.55	0.46	0.73
20–22	0.56	0.54	0.57	0.58	0.49	0.76
22–24	0.59	0.57	0.61	0.61	0.52	0.79
24–26	0.61	0.59	0.63	0.63	0.55	0.81
26–28	0.64	0.62	0.65	0.66	0.58	0.83
28–30	0.65	0.63	0.67	0.67	0.59	0.84
30–32	0.66	0.64	0.68	0.69	0.61	0.85
32–34	0.68	0.66	0.70	0.71	0.63	0.87
34–36	0.69	0.67	0.71	0.72	0.64	0.88
36–38	0.70	0.68	0.72	0.73	0.65	0.88
38–40	0.71	0.69	0.73	0.74	0.66	0.89
40–43	0.73	0.71	0.75	0.76	0.69	0.90
43–46	0.74	0.72	0.76	0.77	0.70	0.91
46–50	0.76	0.74	0.78	0.79	0.72	0.92
50–55	0.77	0.76	0.79	0.80	0.74	0.92
55–60	0.79	0.78	0.81	0.82	0.76	0.93
60–70	0.82	0.80	0.83	0.84	0.78	0.95
70–100	0.87	0.85	0.88	0.88	0.84	0.97

Table 11: The dimuon acceptance $\mathcal{A}$ calculated using the CMS measured polarization and its positive and negative uncertainties $\mathcal{A}(\sigma^{\pm})$, and the values of the acceptance assuming no polarization $\mathcal{A}$(unpol), transverse polarization $\mathcal{A}(T)$, and longitudinal polarization $\mathcal{A}(L)$ for the Υ(2S) state and $0.6 < |y| < 1.2$.

p_{T} [GeV]	$\mathcal{A}$	$\mathcal{A}(\sigma^{+})$	$\mathcal{A}(\sigma^{-})$	$\mathcal{A}$(unpol)	$\mathcal{A}(T)$	$\mathcal{A}(L)$
10–12	0.28	0.27	0.30	0.30	0.25	0.39
12–14	0.35	0.34	0.37	0.36	0.31	0.47
14–16	0.42	0.41	0.43	0.42	0.36	0.54
16–18	0.47	0.46	0.49	0.47	0.41	0.60
18–20	0.51	0.50	0.53	0.52	0.45	0.66
20–22	0.54	0.53	0.56	0.56	0.49	0.70
22–24	0.56	0.55	0.58	0.59	0.52	0.74
24–26	0.58	0.57	0.60	0.62	0.54	0.77
26–28	0.61	0.60	0.63	0.65	0.57	0.79
28–30	0.64	0.62	0.66	0.67	0.60	0.82
30–32	0.66	0.64	0.68	0.69	0.61	0.84
32–34	0.68	0.66	0.69	0.70	0.63	0.85
34–36	0.69	0.68	0.71	0.72	0.65	0.87
36–38	0.72	0.70	0.73	0.74	0.67	0.88
38–40	0.72	0.71	0.74	0.75	0.68	0.89
40–43	0.74	0.72	0.76	0.76	0.69	0.89
43–46	0.76	0.74	0.78	0.78	0.71	0.91
46–50	0.77	0.75	0.79	0.79	0.73	0.92
50–55	0.79	0.78	0.81	0.81	0.75	0.93
55–60	0.81	0.80	0.83	0.83	0.77	0.94
60–70	0.83	0.82	0.85	0.84	0.79	0.95
70–100	0.88	0.87	0.90	0.89	0.85	0.97

Table 12: The dimuon acceptance $\mathcal{A}$ calculated using the CMS measured polarization and its positive and negative uncertainties $\mathcal{A}(\sigma^{\pm})$, and the values of the acceptance assuming no polarization $\mathcal{A}$(unpol), transverse polarization $\mathcal{A}(T)$, and longitudinal polarization $\mathcal{A}(L)$ for the Υ(2S) state and $|y| < 1.2$.

p_{T} [GeV]	$\mathcal{A}$	$\mathcal{A}(\sigma^{+})$	$\mathcal{A}(\sigma^{-})$	$\mathcal{A}$(unpol)	$\mathcal{A}(T)$	$\mathcal{A}(L)$
10–12	0.30	0.28	0.32	0.32	0.26	0.44
12–14	0.36	0.35	0.38	0.38	0.32	0.52
14–16	0.42	0.41	0.44	0.44	0.37	0.59
16–18	0.47	0.46	0.49	0.49	0.41	0.64
18–20	0.52	0.50	0.53	0.53	0.46	0.69
20–22	0.55	0.53	0.56	0.57	0.49	0.73
22–24	0.58	0.56	0.59	0.60	0.52	0.76
24–26	0.60	0.58	0.61	0.62	0.54	0.79
26–28	0.62	0.61	0.64	0.65	0.57	0.81
28–30	0.64	0.63	0.66	0.67	0.59	0.83
30–32	0.66	0.64	0.68	0.69	0.61	0.85
32–34	0.68	0.66	0.70	0.71	0.63	0.86
34–36	0.69	0.67	0.71	0.72	0.65	0.87
36–38	0.71	0.69	0.72	0.73	0.66	0.88
38–40	0.71	0.70	0.73	0.74	0.67	0.89
40–43	0.73	0.72	0.75	0.76	0.69	0.90
43–46	0.75	0.73	0.77	0.77	0.71	0.91
46–50	0.76	0.75	0.78	0.79	0.72	0.92
50–55	0.78	0.77	0.80	0.80	0.74	0.93
55–60	0.80	0.79	0.82	0.82	0.76	0.93
60–70	0.82	0.81	0.84	0.84	0.79	0.95
70–100	0.87	0.86	0.89	0.88	0.84	0.97

Table 13: The dimuon acceptance $\mathcal{A}$ calculated using the CMS measured polarization and its positive and negative uncertainties $\mathcal{A}(\sigma^{\pm})$, and the values of the acceptance assuming no polarization $\mathcal{A}$(unpol), transverse polarization $\mathcal{A}(T)$, and longitudinal polarization $\mathcal{A}(L)$ for the Υ(3S) state and $|y| < 0.6$.

p_{T} [GeV]	$\mathcal{A}$	$\mathcal{A}(\sigma^{+})$	$\mathcal{A}(\sigma^{-})$	$\mathcal{A}$(unpol)	$\mathcal{A}(T)$	$\mathcal{A}(L)$
10–12	0.34	0.32	0.37	0.35	0.28	0.49
12–14	0.39	0.37	0.42	0.42	0.34	0.58
14–16	0.44	0.42	0.46	0.47	0.39	0.64
16–18	0.49	0.47	0.51	0.52	0.43	0.69
18–20	0.52	0.50	0.55	0.55	0.46	0.73
20–22	0.55	0.54	0.58	0.59	0.50	0.77
22–24	0.59	0.57	0.60	0.62	0.53	0.79
24–26	0.61	0.59	0.63	0.64	0.55	0.82
26–28	0.63	0.62	0.66	0.67	0.58	0.84
28–30	0.65	0.63	0.67	0.68	0.60	0.85
30–32	0.67	0.65	0.69	0.70	0.61	0.86
32–34	0.69	0.67	0.71	0.71	0.63	0.87
34–36	0.70	0.68	0.72	0.73	0.65	0.88
36–38	0.72	0.70	0.74	0.74	0.67	0.89
38–40	0.73	0.70	0.75	0.75	0.67	0.90
40–43	0.74	0.72	0.76	0.76	0.69	0.91
43–46	0.75	0.73	0.78	0.78	0.71	0.91
46–50	0.77	0.75	0.79	0.79	0.72	0.92
50–55	0.79	0.77	0.81	0.81	0.74	0.93
55–60	0.81	0.79	0.83	0.82	0.77	0.94
60–70	0.82	0.81	0.85	0.84	0.79	0.95
70–100	0.87	0.85	0.89	0.88	0.84	0.98

Table 14: The dimuon acceptance $\mathcal{A}$ calculated using the CMS measured polarization and its positive and negative uncertainties $\mathcal{A}(\sigma^{\pm})$, and the values of the acceptance assuming no polarization $\mathcal{A}$(unpol), transverse polarization $\mathcal{A}(T)$, and longitudinal polarization $\mathcal{A}(L)$ for the Υ(3S) state and $0.6 < |y| < 1.2$.

p_{T} [GeV]	$\mathcal{A}$	$\mathcal{A}(\sigma^{+})$	$\mathcal{A}(\sigma^{-})$	$\mathcal{A}$(unpol)	$\mathcal{A}(T)$	$\mathcal{A}(L)$
10–12	0.31	0.29	0.33	0.30	0.25	0.40
12–14	0.35	0.34	0.37	0.36	0.31	0.47
14–16	0.40	0.39	0.41	0.42	0.36	0.54
16–18	0.44	0.43	0.46	0.48	0.41	0.60
18–20	0.49	0.48	0.50	0.52	0.46	0.66
20–22	0.53	0.52	0.55	0.56	0.49	0.70
22–24	0.58	0.56	0.59	0.59	0.52	0.73
24–26	0.61	0.60	0.63	0.62	0.55	0.77
26–28	0.63	0.61	0.65	0.64	0.57	0.79
28–30	0.65	0.63	0.67	0.67	0.60	0.82
30–32	0.66	0.65	0.68	0.69	0.62	0.84
32–34	0.68	0.66	0.70	0.71	0.64	0.85
34–36	0.69	0.67	0.71	0.72	0.65	0.87
36–38	0.70	0.68	0.72	0.74	0.67	0.88
38–40	0.72	0.70	0.74	0.76	0.69	0.89
40–43	0.73	0.72	0.76	0.77	0.70	0.90
43–46	0.75	0.73	0.77	0.78	0.72	0.91
46–50	0.77	0.75	0.79	0.80	0.73	0.92
50–55	0.79	0.77	0.81	0.81	0.75	0.93
55–60	0.81	0.79	0.83	0.83	0.77	0.94
60–70	0.83	0.82	0.85	0.85	0.80	0.95
70–100	0.88	0.87	0.90	0.89	0.85	0.98

Table 15: The dimuon acceptance $\mathcal{A}$ calculated using the CMS measured polarization and its positive and negative uncertainties $\mathcal{A}(\sigma^{\pm})$, and the values of the acceptance assuming no polarization $\mathcal{A}$(unpol), transverse polarization $\mathcal{A}(T)$, and longitudinal polarization $\mathcal{A}(L)$ for the Υ(3S) state and $|y| < 1.2$.

p_{T} [GeV]	$\mathcal{A}$	$\mathcal{A}(\sigma^{+})$	$\mathcal{A}(\sigma^{-})$	$\mathcal{A}$(unpol)	$\mathcal{A}(T)$	$\mathcal{A}(L)$
10–12	0.32	0.30	0.35	0.33	0.27	0.44
12–14	0.37	0.36	0.39	0.39	0.33	0.52
14–16	0.42	0.40	0.44	0.45	0.37	0.59
16–18	0.47	0.45	0.48	0.50	0.42	0.65
18–20	0.51	0.49	0.52	0.54	0.46	0.69
20–22	0.54	0.53	0.56	0.57	0.49	0.73
22–24	0.58	0.57	0.60	0.60	0.53	0.76
24–26	0.61	0.59	0.63	0.63	0.55	0.79
26–28	0.63	0.61	0.65	0.65	0.58	0.81
28–30	0.65	0.63	0.67	0.68	0.60	0.83
30–32	0.67	0.65	0.69	0.69	0.62	0.85
32–34	0.68	0.66	0.70	0.71	0.63	0.86
34–36	0.69	0.67	0.72	0.72	0.65	0.87
36–38	0.71	0.69	0.73	0.74	0.67	0.89
38–40	0.72	0.70	0.75	0.75	0.68	0.89
40–43	0.74	0.72	0.76	0.77	0.70	0.90
43–46	0.75	0.73	0.77	0.78	0.71	0.91
46–50	0.77	0.75	0.79	0.79	0.73	0.92
50–55	0.79	0.77	0.81	0.81	0.75	0.93
55–60	0.81	0.79	0.83	0.83	0.77	0.94
60–70	0.83	0.81	0.85	0.85	0.79	0.95
70–100	0.88	0.86	0.90	0.89	0.84	0.98