$$
\left\{
\begin{array}{lcl}
\sigma_{pp} & = & 9Z + B\ln^2\left(\dfrac{s}{s_0}\right) + Y_1^{pp}s^{-\eta} - 5Y_2^{\pi p}s^{-\eta}, \\
\sigma_{\bar{p}p} & = & 9Z + B\ln^2\left(\dfrac{s}{s_0}\right) + Y_1^{pp}s^{-\eta} + 5Y_2^{\pi p}s^{-\eta}, \\
\sigma_{\pi^+p} & = & 6\lambda_m Z + B\ln^2\left(\dfrac{s}{s_0}\right) + Y_1^{\pi p}s^{-\eta} - Y_2^{\pi p}s^{-\eta}, \\
\sigma_{\pi^-p} & = & 6\lambda_m Z + B\ln^2\left(\dfrac{s}{s_0}\right) + Y_1^{\pi p}s^{-\eta} + Y_2^{\pi p}s^{-\eta}, \\
\sigma_{K^+p} & = & 3\lambda_m(1+\lambda_s) Z + B\ln^2\left(\dfrac{s}{s_0}\right) + Y_1^{Kp}s^{-\eta} - 2Y_2^{\pi p}s^{-\eta}, \\
\sigma_{K^-p} & = & 3\lambda_m(1+\lambda_s) Z + B\ln^2\left(\dfrac{s}{s_0}\right) + Y_1^{Kp}s^{-\eta} + 2Y_2^{\pi p}s^{-\eta}, \\
\sigma_{\gamma p} & = & 6\delta\lambda_m Z + \delta B\ln^2\left(\dfrac{s}{s_0}\right) + Y_1^{\gamma p}s^{-\eta}, \\
\sigma_{\gamma\gamma} & = & 4\delta^2\lambda_m^2 Z + \delta^2 B\ln^2\left(\dfrac{s}{s_0}\right) + Y_1^{\gamma\gamma}s^{-\eta}, \\
\sigma_{\Sigma^-p} & = & (6+3\lambda_s) Z + B\ln^2\left(\dfrac{s}{s_0}\right) + Y_1^{\Sigma p}s^{-\eta}. \quad \blacksquare
\end{array}
\right.
$$

$$
\left\{
\begin{array}{lcl}
\rho_{pp}\sigma_{pp} & = & \pi B\ln\left(\dfrac{s}{s_0}\right) - \dfrac{Y_1^{pp}s^{-\eta}}{\tan\left[\dfrac{1-\eta}{2}\pi\right]} - \dfrac{5Y_2^{\pi p}s^{-\eta}}{\cot\left[\dfrac{1-\eta}{2}\pi\right]}, \\
\rho_{\bar{p}p}\sigma_{\bar{p}p} & = & \pi B\ln\left(\dfrac{s}{s_0}\right) - \dfrac{Y_1^{pp}s^{-\eta}}{\tan\left[\dfrac{1-\eta}{2}\pi\right]} + \dfrac{5Y_2^{\pi p}s^{-\eta}}{\cot\left[\dfrac{1-\eta}{2}\pi\right]}, \\
\rho_{\pi^+p}\sigma_{\pi^+p} & = & \pi B\ln\left(\dfrac{s}{s_0}\right) - \dfrac{Y_1^{\pi p}s^{-\eta}}{\tan\left[\dfrac{1-\eta}{2}\pi\right]} - \dfrac{Y_2^{\pi p}s^{-\eta}}{\cot\left[\dfrac{1-\eta}{2}\pi\right]}, \\
\rho_{\pi^-p}\sigma_{\pi^-p} & = & \pi B\ln\left(\dfrac{s}{s_0}\right) - \dfrac{Y_1^{\pi p}s^{-\eta}}{\tan\left[\dfrac{1-\eta}{2}\pi\right]} + \dfrac{Y_2^{\pi p}s^{-\eta}}{\cot\left[\dfrac{1-\eta}{2}\pi\right]}, \\
\rho_{K^+p}\sigma_{K^+p} & = & \pi B\ln\left(\dfrac{s}{s_0}\right) - \dfrac{Y_1^{Kp}s^{-\eta}}{\tan\left[\dfrac{1-\eta}{2}\pi\right]} - \dfrac{2Y_2^{\pi p}s^{-\eta}}{\cot\left[\dfrac{1-\eta}{2}\pi\right]}, \\
\rho_{K^-p}\sigma_{K^-p} & = & \pi B\ln\left(\dfrac{s}{s_0}\right) - \dfrac{Y_1^{Kp}s^{-\eta}}{\tan\left[\dfrac{1-\eta}{2}\pi\right]} + \dfrac{2Y_2^{\pi p}s^{-\eta}}{\cot\left[\dfrac{1-\eta}{2}\pi\right]},
\end{array}
\right.
$$

Variable s is in the units $[GeV^2]$. The additional scale $s_1 = 1\ [GeV^2]$ in terms with $(s/s_1)^{-\eta}$ is omitted for brevity.

Adjustable parameters naming. In total 14 parameters used:

$\eta, \delta, \lambda_s, \lambda_m$ – dimensionless
s_0 – [GeV²]
$B, Z, Y_1^{pp}, Y_{1,2}^{\pi p}, Y_1^{Kp}, Y_1^{\Sigma p}, Y_1^{\gamma p}, Y_1^{\gamma\gamma}$ – [mb]

Scan-fits summary. 2000 database. Without cosmic data points.

E_{cm}^{min} [GeV]	3	4	5	6	7	8	9	10
N_{dof}: ρ excluded	712	567	493	420	355	315	271	216
N_{dof}: ρ included	890	728	634	555	484	439	383	315
χ^2/dof: ρ excluded	2.11	1.22	0.96	0.88	0.90	0.90	0.89	0.86
χ^2/dof: ρ included	2.40	1.39	1.10	1.05	1.03	0.98	0.97	0.97

Details of the fit to the data in the whole domain of applicability

	$\sqrt{s}$ of the starting point in [GeV]	Number of data points
Breakdown of the CS data sample		
pp:	8.21361	78
$\bar{p}p$:	8.0405	43
π^+p:	8.15962	28
π^-p:	8.15962	61
K^+p:	8.17372	26
K^-p:	8.17372	37
Σ^-p:	11.922	8
γp:	8.06586	28
$\gamma\gamma$:	8.	22
Breakdown of the ρ data sample		
pp:	8.55262	62
$\bar{p}p$:	11.5382	11
π^+p:	8.98072	8
π^-p:	8.36404	28
K^+p:	8.99347	8
K^-p:	11.5102	5

χ^2/dof	=	**0.981**
CL[%]	=	60.29
Name of value	Numerical value	Error value
η	0.55122458	0.0093197076
λ_m	0.89283022	0.0032303677
λ_s	0.71361803	0.004785475
δ	0.0048899165	0.000028070492
B	0.31752323	0.0090313054
Z	4.1303189	0.023646417
s_0	47.118111	5.8779199
Y_{pp1}	46.318568	1.9163571
$Y_{\pi p1}$	17.085278	1.5120415
$Y_{\pi p2}$	6.8915267	0.3123523
Y_{Kp1}	1.7352263	1.7893599
$Y_{\Sigma p1}$	-15.157044	3.3248419
$Y_{\gamma p1}$	0.066559167	0.011903973
$Y_{\gamma\gamma 1}$	-0.0002564489	0.00015905965

Model quality indicators:

	A^M	C_1^M	C_2^M	U^M	R_1^M	R_2^M	S_1^M	S_2^M
$(RR_c)^d$ $P^{qc}L2_u(14)$	1.796	60.29	67.08	19.94	30.20	0.912	0.429	1.100

Repository:

computer - **NPT1**

`directory - d:\MathemD\Kolja\Evela\Gauron\(RRc)dPqcL2u(14)`

Appendix $(RR_c)^d$ $P^{qc}L2_u(14)$ (№30) χ^2/NoP by data samples

	CS data								
Reaction	pp	$\bar{p}p$	π^+p	π^-p	K^+p	K^-p	Σ^-p	γp	$\gamma\gamma$
χ^2/NoP	1.07	1.17	0.32	0.92	0.38	0.67	0.48	0.95	1.17

	ρ data					
Reaction	pp	$\bar{p}p$	π^+p	π^-p	K^+p	K^-p
χ^2/NoP	1.31	0.59	1.72	0.94	0.63	1.51

	η	λ_m	λ_s	δ	B	Z	s_0	Y_{pp1}	$Y_{\pi p1}$	$Y_{\pi p2}$	Y_{Kp1}	$Y_{\Sigma p1}$	$Y_{\gamma p1}$	$Y_{\gamma\gamma 1}$
η	100	48	-7	-2.46	24.1	52.3	39.5	47.5	-21	**98.8**	-40.6	-52.9	-17.5	-13.9
λ_m	48	100	27.7	-3.3	81.7	83.1	89.6	-31.1	-88.9	47.2	-84.8	-60.2	-57	-19.3
λ_3	-7	27.7	100	12.2	49	46.9	52.4	-52.8	-46.1	-6.21	-67.4	-52.5	-37.1	-8.3
δ	-2.46	-3.3	12.2	100	3.88	4.21	4.52	-6.76	-1.17	-2.4	-4.45	-5.4	-73.5	-39.7
B	24.1	81.7	49	3.88	100	78.2	**91.9**	-49.5	-82.6	23.9	-80.9	-57	-56.3	-16.9
Z	52.3	83.1	46.9	4.21	78.2	100	**95.4**	-48.5	**-90.1**	52	**-93.8**	-80.9	-63.3	-19.7
s_0	39.5	89.6	52.4	4.52	**91.9**	**95.4**	100	-53.8	**-94**	39.1	**-94.6**	-73.7	-65	-19.8
Y_{pp1}	47.5	-31.1	-52.8	-6.76	-49.5	-48.5	-53.8	100	67.9	47.3	52	29.3	45.1	5.31
$Y_{\pi p1}$	-21	-88.9	-46.1	-1.17	-82.6	**-90.1**	**-94**	67.9	100	-21.2	**90.7**	64.8	65.1	17.6
$Y_{\pi p2}$	**98.8**	47.2	-6.21	-2.4	23.9	52	39.1	47.3	-21.2	100	-40.7	-52.8	-17.5	-13.7
Y_{Kp1}	-40.6	-84.8	-67.4	-4.45	-80.9	**-93.8**	**-94.6**	52	**90.7**	-40.7	100	79.2	63.1	19.1
$Y_{\Sigma p1}$	-52.9	-60.2	-52.5	-5.4	-57	-80.9	-73.7	29.3	64.8	-52.8	79.2	100	48	16
$Y_{\gamma p1}$	-17.5	-57	-37.1	-73.5	-56.3	-63.3	-65	45.1	65.1	-17.5	63.1	48	100	41
$Y_{\gamma\gamma 1}$	-13.9	-19.3	-8.3	-39.7	-16.9	-19.7	-19.8	5.31	17.6	-13.7	19.1	16	41	100

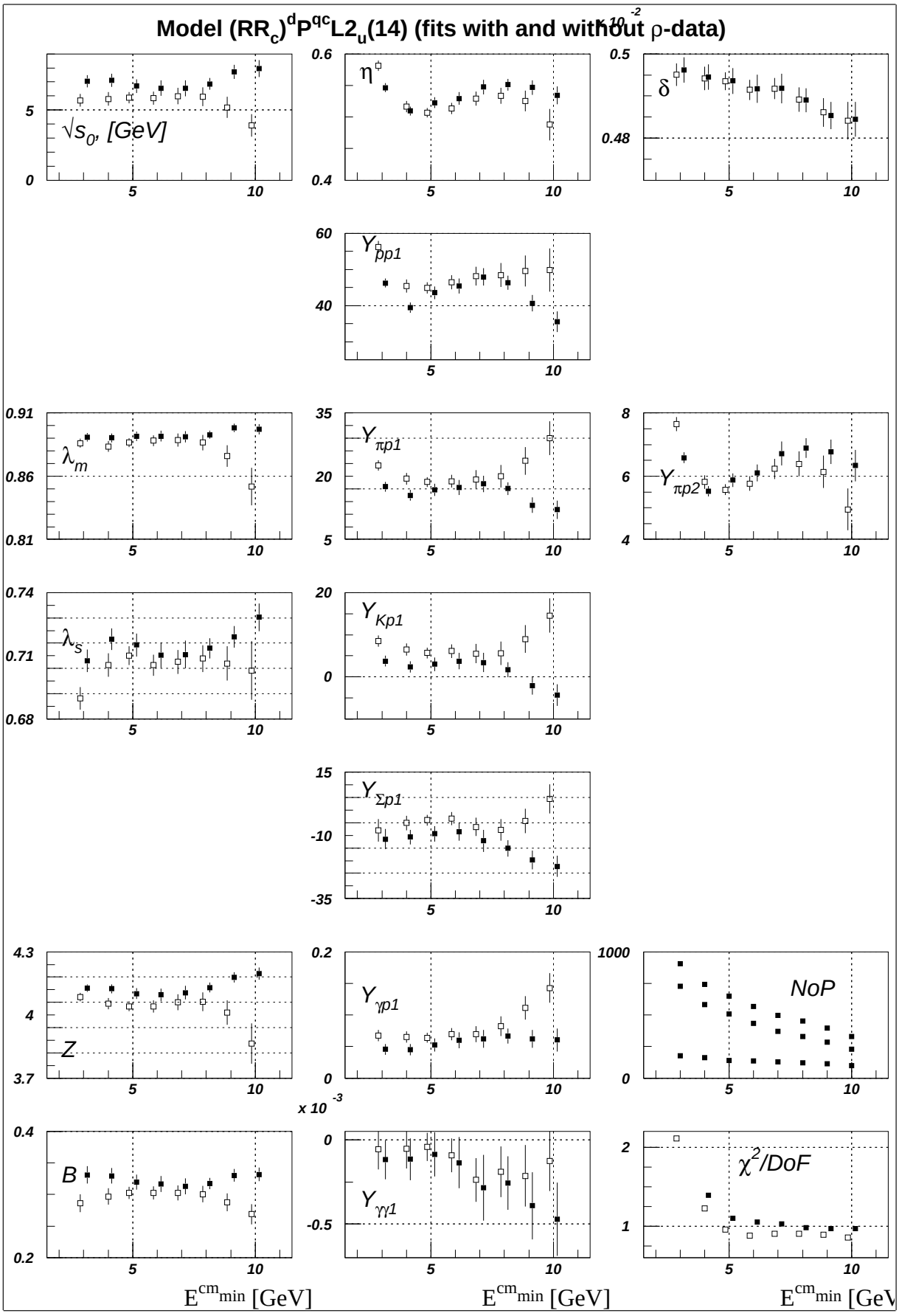
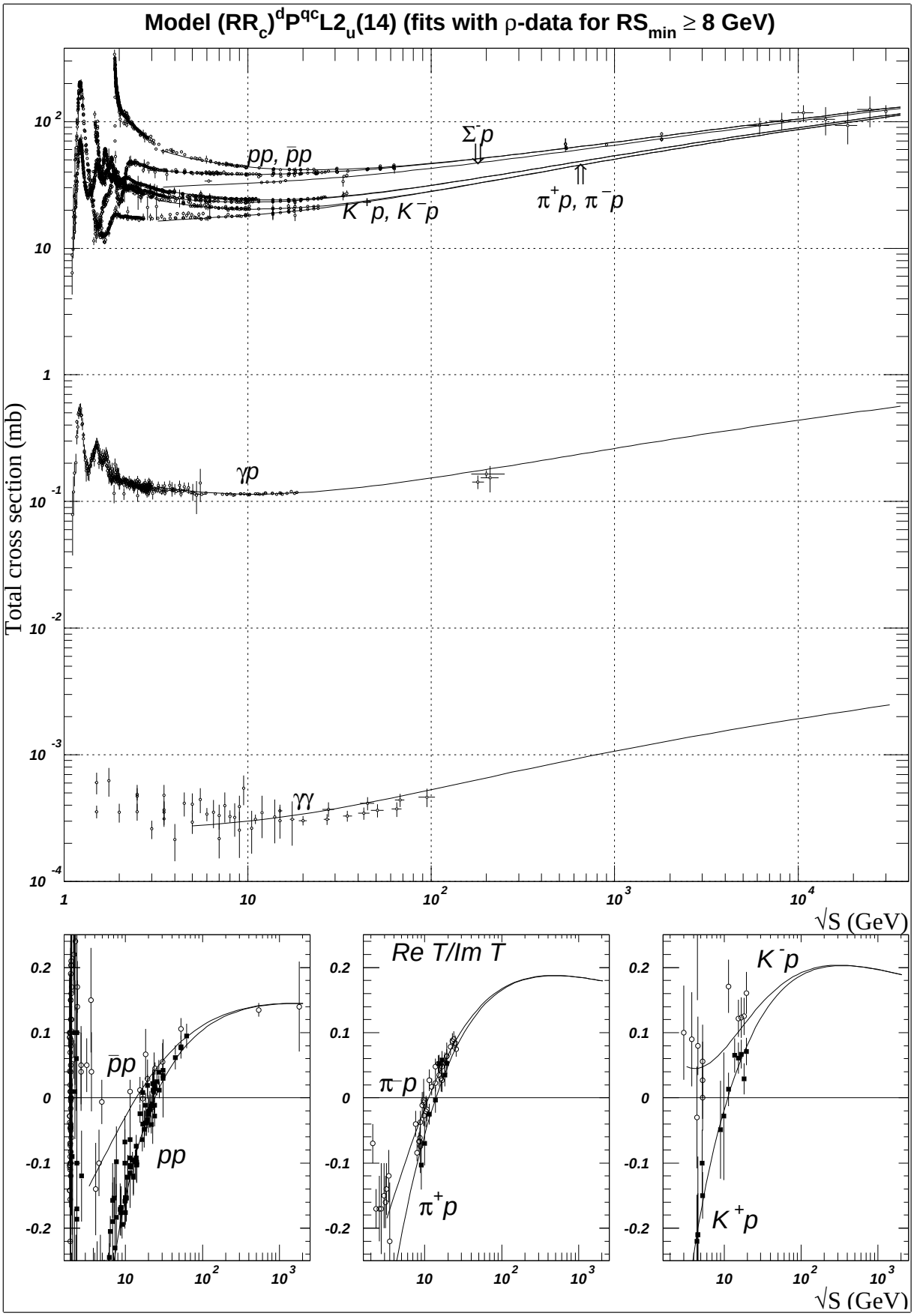


Figure 13: Bold (empty) symbol marks fits with (without) $\boldsymbol{\rho}$ data and are shifted to the right (left) in energy slightly for the cleareness


Model (RR_c)^d P^qc L2_u(14) (fits with ρ-data for RS_min ≥ 8 GeV)
Total cross section (mb)
√S (GeV)
pp, p̄p
Σ⁻p
K⁺p, K⁻p
π⁺p, π⁻p
γp
γγ
Re T/Im T
p̄p
pp
π⁻p
π⁺p
K⁻p
K⁺p
√S (GeV)