$$
\begin{cases}
\sigma_{pp} &= A + B\ln s + Y_1^{pp} s^{-\eta_1} - Y_2^{pp} s^{-\eta_2}, \\
\sigma_{\bar{p}p} &= A + B\ln s + Y_1^{pp} s^{-\eta_1} + Y_2^{pp} s^{-\eta_2}, \\
\sigma_{\pi^+p} &= \lambda_{\pi p}(A + B\ln s) + Y_1^{\pi p} s^{-\eta_1} - Y_2^{\pi p} s^{-\eta_2}, \\
\sigma_{\pi^-p} &= \lambda_{\pi p}(A + B\ln s) + Y_1^{\pi p} s^{-\eta_1} + Y_2^{\pi p} s^{-\eta_2}, \\
\sigma_{K^+p} &= \lambda_{Kp}(A + B\ln s) + Y_1^{Kp} s^{-\eta_1} - Y_2^{Kp} s^{-\eta_2}, \\
\sigma_{K^-p} &= \lambda_{Kp}(A + B\ln s) + Y_1^{Kp} s^{-\eta_1} + Y_2^{Kp} s^{-\eta_2}, \\
\sigma_{\gamma p} &= \lambda_{\gamma p}(A + B\ln s) + Y_1^{\gamma p} s^{-\eta_1}, \\
\sigma_{\gamma\gamma} &= \lambda_{\gamma\gamma}(A + B\ln s) + Y_1^{\gamma\gamma} s^{-\eta_1}, \\
\sigma_{\Sigma^-p} &= \lambda_{\Sigma p}(A + B\ln s) + Y_1^{\Sigma p} s^{-\eta_1} - Y_2^{\Sigma p} s^{-\eta_2}. \quad \blacksquare
\end{cases}
$$

$$
\begin{cases}
\rho_{pp}\sigma_{pp} &= \dfrac{\pi B}{2} - \dfrac{Y_1^{pp} s^{-\eta_1}}{\tan\left[\dfrac{1-\eta_1}{2}\pi\right]} - \dfrac{Y_2^{pp} s^{-\eta_2}}{\cot\left[\dfrac{1-\eta_2}{2}\pi\right]}, \\
\rho_{\bar{p}p}\sigma_{\bar{p}p} &= \dfrac{\pi B}{2} - \dfrac{Y_1^{pp} s^{-\eta_1}}{\tan\left[\dfrac{1-\eta_1}{2}\pi\right]} + \dfrac{Y_2^{pp} s^{-\eta_2}}{\cot\left[\dfrac{1-\eta_2}{2}\pi\right]}, \\
\rho_{\pi^+p}\sigma_{\pi^+p} &= \dfrac{\pi \lambda_{\pi p} B}{2} - \dfrac{Y_1^{\pi p} s^{-\eta_1}}{\tan\left[\dfrac{1-\eta_1}{2}\pi\right]} - \dfrac{Y_2^{\pi p} s^{-\eta_2}}{\cot\left[\dfrac{1-\eta_2}{2}\pi\right]}, \\
\rho_{\pi^-p}\sigma_{\pi^-p} &= \dfrac{\pi \lambda_{\pi p} B}{2} - \dfrac{Y_1^{\pi p} s^{-\eta_1}}{\tan\left[\dfrac{1-\eta_1}{2}\pi\right]} + \dfrac{Y_2^{\pi p} s^{-\eta_2}}{\cot\left[\dfrac{1-\eta_2}{2}\pi\right]}, \\
\rho_{K^+p}\sigma_{K^+p} &= \dfrac{\pi \lambda_{Kp} B}{2} - \dfrac{Y_1^{Kp} s^{-\eta_1}}{\tan\left[\dfrac{1-\eta_1}{2}\pi\right]} - \dfrac{Y_2^{Kp} s^{-\eta_2}}{\cot\left[\dfrac{1-\eta_2}{2}\pi\right]}, \\
\rho_{K^-p}\sigma_{K^-p} &= \dfrac{\pi \lambda_{Kp} B}{2} - \dfrac{Y_1^{Kp} s^{-\eta_1}}{\tan\left[\dfrac{1-\eta_1}{2}\pi\right]} + \dfrac{Y_2^{Kp} s^{-\eta_2}}{\cot\left[\dfrac{1-\eta_2}{2}\pi\right]},
\end{cases}
$$

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

Adjustable parameters naming. In total 19 parameters used:

$$\eta_1, \eta_2, \lambda_{\pi p}, \lambda_{Kp}, \lambda_{\Sigma p}, \lambda_{\gamma p}, \lambda_{\gamma\gamma} \quad - \quad \text{dimensionless}$$
$$A, B, Y_{1,2}^{pp}, Y_{1,2}^{\pi p}, Y_{1,2}^{Kp}, Y_{1,2}^{\Sigma p}, Y_1^{\gamma p}, Y_1^{\gamma\gamma} \quad - \quad [\text{mb}]$$

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	707	562	488	415	350	312	266	211
N_{dof}: ρ included	885	723	629	550	479	434	378	310
χ^2/dof: ρ excluded	1.31	0.96	0.82	0.80	0.85	0.85	0.86	0.85
χ^2/dof: ρ included	1.61	1.10	0.97	0.97	1.00^+	0.96	0.94	0.93

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:	5.00963	112
$\bar{p}p$:	5.1569	59
π^+p:	5.21275	50
π^-p:	5.02954	106
K^+p:	5.12707	40
K^-p:	5.10875	63
Σ^-p:	6.12189	9
γp:	5.01008	38
$\gamma\gamma$:	5.	30
Breakdown of the ρ data sample		
pp:	5.30542	74
$\bar{p}p$:	11.5382	11
π^+p:	8.98072	8
π^-p:	7.56285	30
K^+p:	5.21771	10
K^-p:	5.23565	8

χ^2/dof	=	**0.96**
CL[%]	=	73.37
Name of value	Numerical value	Error value
η_1	0.20882981	0.0079614232
η_2	0.54453128	0.0063019647
A	-30.265138	3.5910289
B	6.7106141	0.22385882
$\lambda_{\pi p}$	0.68327599	0.0044808709
λ_{Kp}	0.64286874	0.0072794518
$\lambda_{\Sigma p}$	1.0592424	0.056297244
$\lambda_{\gamma p}$	0.0035618445	0.000047918883
$\lambda_{\gamma\gamma}$	9.374557E-06	5.2133847E-07
Y_{pp1}	105.82114	2.9176709
Y_{pp2}	33.358907	0.95687062
$Y_{\pi p1}$	60.857618	2.3785275
$Y_{\pi p2}$	5.7873973	0.16186994
Y_{Kp1}	49.287574	2.5110257
Y_{Kp2}	13.422998	0.37896917
$Y_{\Sigma p1}$	82.396912	6.4347176
$Y_{\Sigma p2}$	-10.218457	22.394595
$Y_{\gamma p1}$	0.29228378	0.013276189
$Y_{\gamma\gamma 1}$	0.00081381593	0.000039711574

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
RRL(19)	1.825	73.37	81.09	16.63	32.40	0.784	0.289	1.302

Repository:

computer - **NPT1**

`directory - d:\MathemD\Kolja\Evela\Gauron\(RR)L(19)`

Appendix RRL(19) (№4) 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	0.88	0.99	0.98	0.82	0.73	0.63	0.41	0.7	0.53

	ρ data					
Reaction	pp	$\bar{p}p$	π^+p	π^-p	K^+p	K^-p
χ^2/NoP	1.56	0.46	1.88	1.39	1.26	1.22

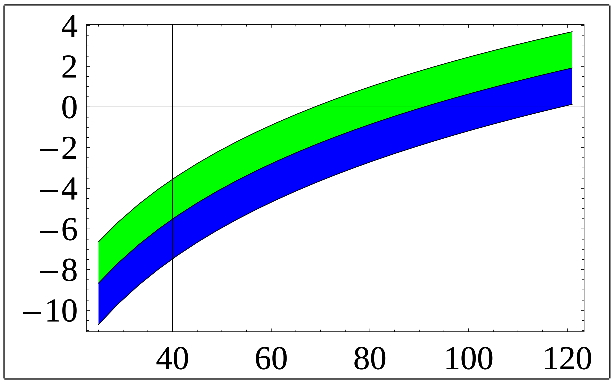


Figure 5: Pomeron contribution for pp, [mb] (Axis X – s [GeV^2])

	η_1	η_2	A	B	$\lambda_{\pi p}$	λ_{Kp}	$\lambda_{\Sigma p}$	$\lambda_{\gamma p}$	$\lambda_{\gamma\gamma}$	Y_{pp1}	Y_{pp2}	$Y_{\pi p1}$	$Y_{\pi p2}$	Y_{Kp1}	Y_{Kp2}	$Y_{\Sigma p1}$	$Y_{\Sigma p2}$	$Y_{\gamma p1}$	$Y_{\gamma\gamma 1}$
η_1	100	24.6	**98.8**	**-97.2**	-87.3	**-94.7**	-11.9	-63	-10.8	**-95.9**	26.2	**-97.3**	23.6	**-97.8**	22.5	-66.6	5.72	**-97.5**	-81.4
η_2	24.6	100	20.2	-19.1	1.71	-12.3	-2.42	-5.23	-1.12	-14.3	**97.4**	-16.5	88.3	-17.5	**94.4**	-10.5	0.482	-17.1	-14
A	98.8	20.2	100	**-99.6**	**-90.2**	**-95.5**	-11.4	-64.2	-10.6	**-99.1**	21.1	**-99.7**	19.2	**-99.8**	18.1	-68.4	6.25	**-99.7**	-83.4
B	-97.2	-19.1	**-99.6**	100	89.9	**94.5**	10.9	63.8	10.4	**99.7**	-19.9	**99.9**	-18.1	**99.8**	-17.1	68.6	-6.45	**99.8**	83.5
$\lambda_{\pi p}$	-87.3	1.71	**-90.2**	89.9	100	**90.6**	10.6	62.3	10.3	**91.9**	2.11	**91.5**	0.865	**91.3**	2.56	63	-6.04	**91.3**	76.5
λ_{Kp}	-94.7	-12.3	**-95.5**	**94.5**	**90.6**	100	11.4	63.5	10.7	**94.9**	-12.8	**95.3**	-12.4	**95.5**	-10	65.5	-5.93	**95.4**	79.8
$\lambda_{\Sigma p}$	-11.9	-2.42	-11.4	10.9	10.6	11.4	100	7.59	1.37	10.8	-2.6	11	-2.43	11.2	-2.22	-58.4	86.4	11.1	9.26
$\lambda_{\gamma p}$	-63	-5.23	-64.2	63.8	62.3	63.5	7.59	100	7.22	64.4	-5.3	64.5	-5.53	64.5	-4.32	44.4	-4.11	64	53.9
$\lambda_{\gamma\gamma}$	-10.8	-1.12	-10.6	10.4	10.3	10.7	1.37	7.22	100	10.4	-1.19	10.5	-1.21	10.6	-0.977	7.24	-0.622	10.6	-12.6
Y_{pp1}	-95.9	-14.3	**-99.1**	**99.7**	**91.9**	**94.9**	10.8	64.4	10.4	100	-14.4	**99.9**	-13.7	**99.7**	-12.5	68.7	-6.58	**99.7**	83.5
Y_{pp2}	26.2	**97.4**	21.1	-19.9	2.11	-12.8	-2.6	-5.3	-1.19	-14.4	100	-17.1	86.2	-18.1	**92**	-10.8	0.4	-17.7	-14.5
$Y_{\pi p1}$	-97.3	-16.5	**-99.7**	**99.9**	**91.5**	**95.3**	11	64.5	10.5	**99.9**	-17.1	100	-16	100	-14.6	68.7	-6.46	**99.9**	83.6
$Y_{\pi p2}$	23.6	88.3	19.2	-18.1	0.865	-12.4	-2.43	-5.53	-1.21	-13.7	86.2	-16	100	-16.7	83.4	-10.1	0.431	-16.3	-13.4
Y_{Kp1}	-97.8	-17.5	**-99.8**	**99.8**	**91.3**	**95.5**	11.2	64.5	10.6	**99.7**	-18.1	100	-16.7	100	-15.6	68.7	-6.4	**99.9**	83.6
Y_{Kp2}	22.5	**94.4**	18.1	-17.1	2.56	-10	-2.22	-4.32	-0.977	-12.5	**92**	-14.6	83.4	-15.6	100	-9.19	0.371	-15.1	-12.4
$Y_{\Sigma p1}$	-66.6	-10.5	-68.4	68.6	63	65.5	-58.4	44.4	7.24	68.7	-10.8	68.7	-10.1	68.7	-9.19	100	-76.5	68.7	57.5
$Y_{\Sigma p2}$	5.72	0.482	6.25	-6.45	-6.04	-5.93	86.4	-4.11	-0.622	-6.58	0.4	-6.46	0.431	-6.4	0.371	-76.5	100	-6.43	-5.4
$Y_{\gamma p1}$	-97.5	-17.1	**-99.7**	**99.8**	**91.3**	**95.4**	11.1	64	10.6	**99.7**	-17.7	**99.9**	-16.3	**99.9**	-15.1	68.7	-6.43	100	83.6
$Y_{\gamma\gamma 1}$	-81.4	-14	-83.4	83.5	76.5	79.8	9.26	53.9	-12.6	83.5	-14.5	83.6	-13.4	83.6	-12.4	57.5	-5.4	83.6	100

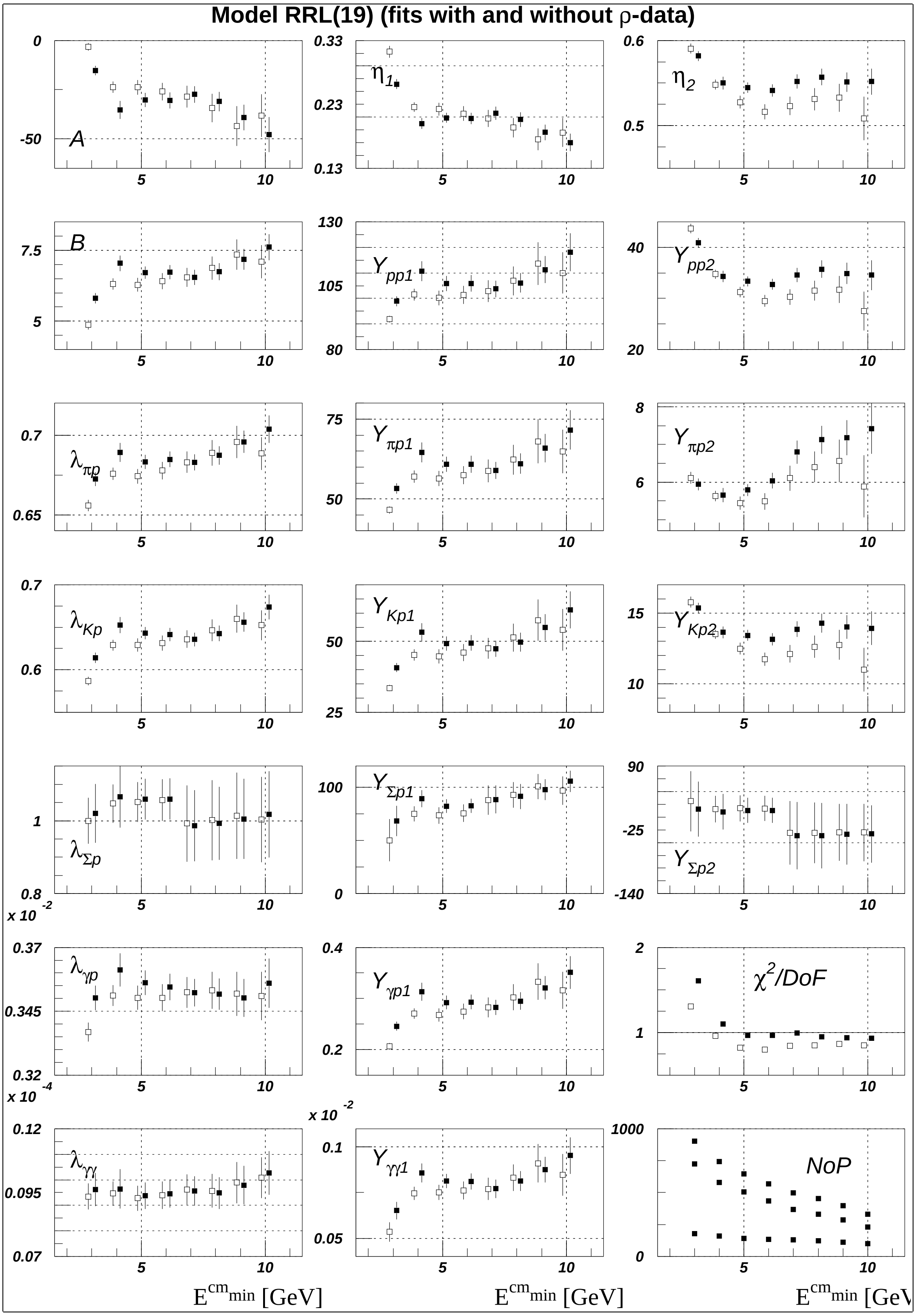
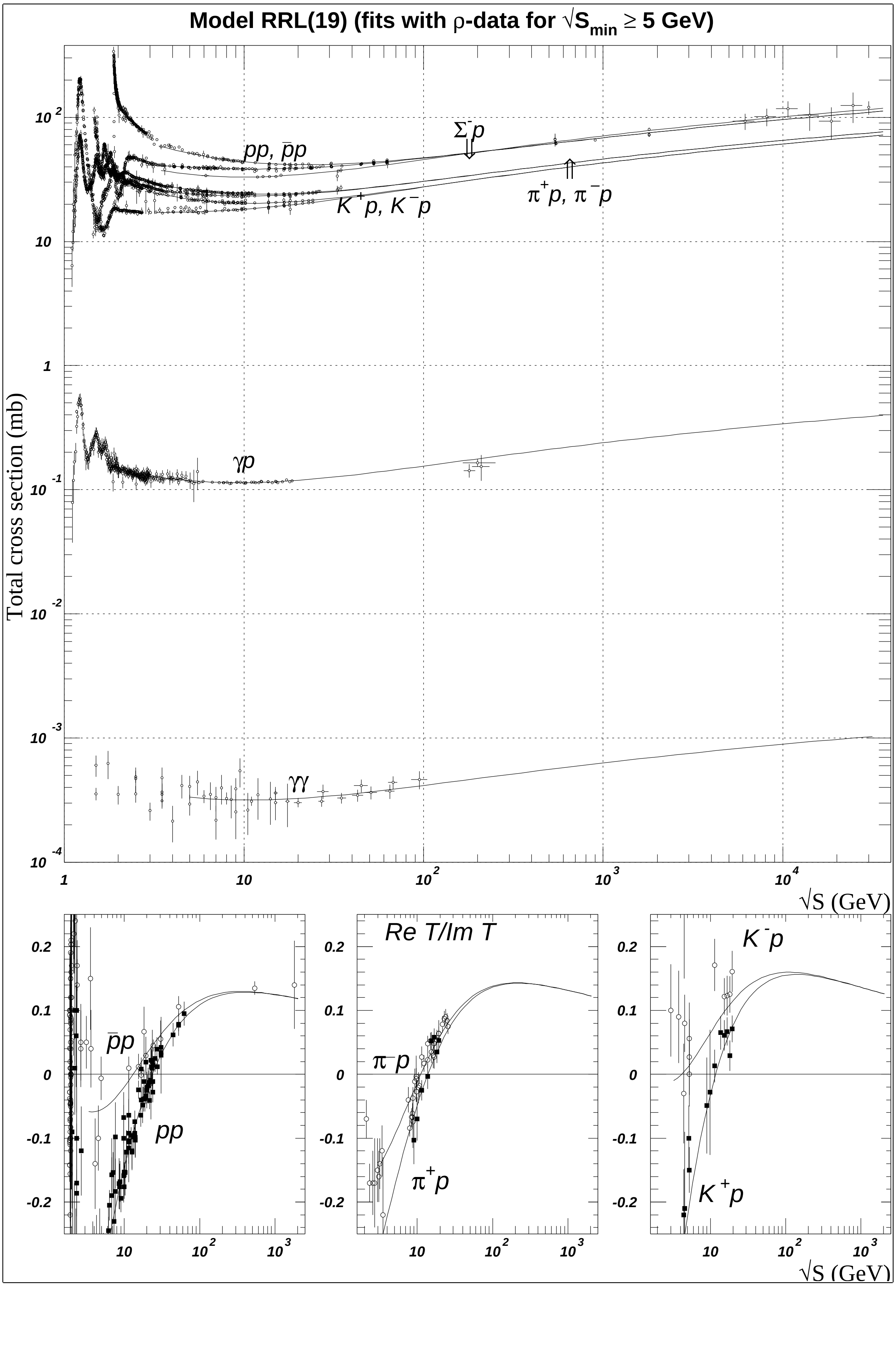


Figure 6: Bold (empty) symbol marks fits with (without) $\boldsymbol{\rho}$ data and are shifted to the right (left) in energy slightly for the cleareness


Model RRL(19) (fits with ρ-data for √S_min ≥ 5 GeV)
Total cross section (mb)
pp, p̄p
Σ⁻p
π⁺p, π⁻p
K⁺p, K⁻p
γp
γγ
√S (GeV)
Re T/Im T
p̄p
pp
π⁻p
π⁺p
K⁻p
K⁺p
√S (GeV)