

$$\left\{ \begin{array}{l}
\sigma_{pp} = Z_{pp} + B_{pp} \ln^2 \left(\frac{s}{s_0} \right) + (Y_1^{pp} - Y_2^{pp}) s^{-\eta}, \\
\sigma_{\bar{p}p} = Z_{pp} + B_{pp} \ln^2 \left(\frac{s}{s_0} \right) + (Y_1^{pp} + Y_2^{pp}) s^{-\eta}, \\
\sigma_{\pi^+p} = Z_{\pi p} + B_{\pi p} \ln^2 \left(\frac{s}{s_0} \right) + (Y_1^{\pi p} - Y_2^{\pi p}) s^{-\eta}, \\
\sigma_{\pi^-p} = Z_{\pi p} + B_{\pi p} \ln^2 \left(\frac{s}{s_0} \right) + (Y_1^{\pi p} + Y_2^{\pi p}) s^{-\eta}, \\
\sigma_{K^+p} = Z_{Kp} + B_{Kp} \ln^2 \left(\frac{s}{s_0} \right) + (Y_1^{Kp} - Y_2^{Kp}) s^{-\eta}, \\
\sigma_{K^-p} = Z_{Kp} + B_{Kp} \ln^2 \left(\frac{s}{s_0} \right) + (Y_1^{Kp} + Y_2^{Kp}) s^{-\eta}, \\
\sigma_{\gamma p} = \delta \left[Z_{pp} + B_{pp} \ln^2 \left(\frac{s}{s_0} \right) \right] + Y_1^{\gamma p} s^{-\eta}, \\
\sigma_{\gamma\gamma} = \delta^2 \left[Z_{pp} + B_{pp} \ln^2 \left(\frac{s}{s_0} \right) \right] + Y_1^{\gamma\gamma} s^{-\eta}, \\
\sigma_{\Sigma^-p} = Z_{\Sigma p} + B_{\Sigma p} \ln^2 \left(\frac{s}{s_0} \right) + Y_1^{\Sigma p} s^{-\eta}. \quad \blacksquare \\
\rho_{pp}\sigma_{pp} = \pi B_{pp} \ln \left(\frac{s}{s_0} \right) - \frac{Y_1^{pp} s^{-\eta}}{\tan \left[\frac{1-\eta}{2} \pi \right]} - \frac{Y_2^{pp} s^{-\eta}}{\cot \left[\frac{1-\eta}{2} \pi \right]}, \\
\rho_{\bar{p}p}\sigma_{\bar{p}p} = \pi B_{pp} \ln \left(\frac{s}{s_0} \right) - \frac{Y_1^{pp} s^{-\eta}}{\tan \left[\frac{1-\eta}{2} \pi \right]} + \frac{Y_2^{pp} s^{-\eta}}{\cot \left[\frac{1-\eta}{2} \pi \right]}, \\
\rho_{\pi^+p}\sigma_{\pi^+p} = \pi B_{\pi p} \ln \left(\frac{s}{s_0} \right) - \frac{Y_1^{\pi p} s^{-\eta}}{\tan \left[\frac{1-\eta}{2} \pi \right]} - \frac{Y_2^{\pi p} s^{-\eta}}{\cot \left[\frac{1-\eta}{2} \pi \right]}, \\
\rho_{\pi^-p}\sigma_{\pi^-p} = \pi B_{\pi p} \ln \left(\frac{s}{s_0} \right) - \frac{Y_1^{\pi p} s^{-\eta}}{\tan \left[\frac{1-\eta}{2} \pi \right]} + \frac{Y_2^{\pi p} s^{-\eta}}{\cot \left[\frac{1-\eta}{2} \pi \right]}, \\
\rho_{K^+p}\sigma_{K^+p} = \pi B_{Kp} \ln \left(\frac{s}{s_0} \right) - \frac{Y_1^{Kp} s^{-\eta}}{\tan \left[\frac{1-\eta}{2} \pi \right]} - \frac{Y_2^{Kp} s^{-\eta}}{\cot \left[\frac{1-\eta}{2} \pi \right]}, \\
\rho_{K^-p}\sigma_{K^-p} = \pi B_{Kp} \ln \left(\frac{s}{s_0} \right) - \frac{Y_1^{Kp} s^{-\eta}}{\tan \left[\frac{1-\eta}{2} \pi \right]} + \frac{Y_2^{Kp} s^{-\eta}}{\cot \left[\frac{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 20 parameters used:

$$\begin{aligned}
 \eta, \delta & - \text{dimensionless} \\
 s_0 & - [\text{GeV}^2] \\
 Z_{pp}, Z_{\pi p}, Z_{Kp}, Z_{\Sigma p}, B_{pp}, B_{\pi p}, B_{Kp}, B_{\Sigma p} & - [\text{mb}] \\
 Y_{1,2}^{pp}, Y_{1,2}^{\pi p}, Y_{1,2}^{Kp}, Y_1^{\Sigma p}, Y_1^{\gamma p}, Y_1^{\gamma\gamma} & - [\text{mb}]
 \end{aligned}$$

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

$E_{\text{cm}}^{\text{min}}$ [GeV]	3	4	5	6	7	8	9	10
N_{dof} : ρ excluded	706	561	487	414	349	311	265	210
N_{dof} : ρ included	884	722	628	549	478	433	377	309
χ^2/dof : ρ excluded	1.24	0.99	0.82	0.79	0.83	0.84	0.83	0.73
χ^2/dof : ρ included	1.92	1.23	1.00 ⁻	1.00 ⁻	0.99	0.94	0.93	0.92

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

			χ^2/dof	=	0.9986
			CL[%]	=	50.41
	\sqrt{s} of the starting point in [GeV]	Number of data points	Name of value	Numerical value	Error value
Breakdown of the CS data sample			s_0	55.768319	8.6418541
pp :	5.00963	112	η	0.53323572	0.0086874031
$\bar{p}p$:	5.1569	59	Z_{pp}	37.276058	0.25450475
π^+p :	5.21275	50	$Z_{\pi p}$	22.251442	0.22217687
π^-p :	5.02954	106	Z_{Kp}	19.065862	0.21545386
K^+p :	5.12707	40	$Z_{\Sigma p}$	31.78409	1.0756619
K^-p :	5.10875	63	δ	0.003026178	0.000017802925
Σ^-p :	6.12189	9	B_{pp}	0.33436876	0.012366471
γp :	5.01008	38	$B_{\pi p}$	0.34645775	0.019965662
$\gamma\gamma$:	5.	30	B_{Kp}	0.3523685	0.025765461
Breakdown of the ρ data sample			$B_{\Sigma p}$	0.55517805	0.1256545
pp :	5.30542	74	Y_{pp1}	42.915501	2.0356375
$\bar{p}p$:	11.5382	11	Y_{pp2}	31.143403	1.2267345
π^+p :	8.98072	8	$Y_{\pi p1}$	15.167946	1.685057
π^-p :	7.56285	30	$Y_{\pi p2}$	5.5664443	0.2126837
K^+p :	5.21771	10	Y_{Kp1}	1.0243323	1.8182457
K^-p :	5.23565	8	Y_{Kp2}	12.744863	0.4981438
			$Y_{\Sigma p1}$	12.399963	13.885885
			$Y_{\gamma p1}$	0.014918353	0.0092437957
			$Y_{\gamma\gamma1}$	-0.00019815563	0.00012764446

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 ^d PL2(20)	2.185	50.41	81.74	18.21	30.86	0.900	0.265	0.407

Repository:

computer - NPT1

directory - d:\MathemD\Kolja\Evela\Gauron\ (RR)dPL2(20)

Appendix (RR)^dPL2(20) (N^o24) 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	0.86	1.24	0.78	0.85	0.71	0.61	0.43	0.64	0.68

	ρ data					
Reaction	pp	$\bar{p}p$	π^+p	π^-p	K^+p	K^-p
χ^2 /NoP	1.93	0.58	1.52	1.16	0.79	0.94

Appendix (RR)^dPL2(20) (N^o=24) Correlation matrix

	s_0	η	Z_{pp}	$Z_{\pi p}$	Z_{Kp}	$Z_{\Sigma p}$	δ	B_{pp}	$B_{\pi p}$	B_{Kp}	$B_{\Sigma p}$	Y_{pp1}	Y_{pp2}	$Y_{\pi p1}$	$Y_{\pi p2}$	Y_{Kp1}	Y_{Kp2}	$Y_{\Sigma p1}$	$Y_{\Sigma p2}$	$Y_{\gamma p1}$	$Y_{\gamma p2}$
s_0	100	33.3	96.6	97	93.8	33.8	-8.05	91.8	89.1	82.3	20.3	-74.2	32.7	-96.8	24.4	-92.8	30.9	-21.2	-61.5	-13.2	
η	33.3	100	44	45.2	31.7	12.8	-11.7	21.4	21.7	27.1	6.16	32.2	97.2	-19.1	87.3	-29.5	94.1	-5.27	-18.4	-7.05	
Z_{pp}	96.6	44	100	95.4	90.6	32.9	-13.4	81.1	85	79.4	19.5	-69.9	42.4	-91.7	34.1	-89.4	41.1	-20.2	-60.2	-12.5	
$Z_{\pi p}$	97	45.2	95.4	100	91.1	33	-9.13	87.8	78.6	79.8	19.6	-63.8	44.3	-96	33.6	-89.9	42.2	-20.3	-59.4	-13.2	
Z_{Kp}	93.8	31.7	90.6	91.1	100	31.7	-7.6	86	83.5	60.2	19	-69.3	31.2	-90.7	23.3	-99.5	28.1	-19.9	-57.7	-12.4	
$Z_{\Sigma p}$	33.8	12.8	32.9	33	31.7	100	-2.88	30.9	30	27.8	-68.7	-24.1	12.6	-32.5	9.61	-31.4	11.9	-97.2	-20.8	-4.52	
δ	-8.05	-11.7	-13.4	-9.13	-7.6	-2.88	100	-2.4	-6.37	-6.6	-1.57	5.16	-10.8	6.46	-10	7.33	-11	1.53	-66.7	-30.3	
B_{pp}	91.8	21.4	81.1	87.8	86	30.9	-2.4	100	82.6	75.6	18.7	-67.1	22.1	-90.3	14.2	-85.4	19.7	-19.7	-54.6	-12.3	
$B_{\pi p}$	89.1	21.7	85	78.6	83.5	30	-6.37	82.6	100	73.3	18.1	-71.2	21.4	-81.1	17.4	-82.8	20.1	-19.1	-55	-11.6	
B_{Kp}	82.3	27.1	79.4	79.8	60.2	27.8	-6.6	75.6	73.3	100	16.7	-61.2	26.6	-79.7	19.8	-59.7	27.7	-17.5	-50.6	-10.9	
$B_{\Sigma p}$	20.3	6.16	19.5	19.6	16.7	100	-1.57	18.7	18.1	16.7	100	-15.4	6.07	-19.7	4.42	-18.8	5.72	65.6	-12.5	-2.66	
Y_{pp1}	-74.2	32.2	-69.9	-63.8	-69.3	-24.1	5.16	-67.1	71.2	-61.2	-15.4	100	34.1	80.3	32.6	69.8	30.6	16.9	48.1	7.46	
Y_{pp2}	32.7	97.2	42.4	44.3	31.2	12.6	-10.8	22.1	21.4	26.6	6.07	34.1	100	-18.9	84.8	-29	91.4	-5.2	-18	-6.97	
$Y_{\pi p1}$	-96.8	-19.1	-91.7	-96	-90.7	-32.5	6.46	-90.3	-81.1	-79.7	-19.7	80.3	-18.9	100	-11.5	90.1	-17.5	20.8	59.9	12.4	
$Y_{\pi p2}$	24.4	87.3	34.1	33.6	23.3	9.61	-10	14.2	17.4	19.8	4.42	32.6	84.8	-11.5	100	-21.3	82.2	-3.57	-13.2	-5.58	
Y_{Kp1}	-92.8	-29.5	-89.4	-89.9	-99.5	-31.4	7.33	-85.4	-82.8	-59.7	-18.8	69.8	-29	90.1	-21.3	100	-26.8	19.7	57.1	12.2	
Y_{Kp2}	30.9	94.1	41.1	42.2	28.1	11.9	-11	19.7	20.1	27.7	5.72	30.6	91.4	-17.5	82.2	-26.8	100	-4.87	-17.1	-6.58	
$Y_{\Sigma p1}$	-21.2	-5.27	-20.2	-20.3	-19.9	-97.2	1.53	-19.7	-19.1	-17.5	65.6	16.9	-5.2	20.8	-3.57	19.7	-4.87	100	13.1	2.76	
$Y_{\Sigma p2}$	-61.5	-18.4	-60.2	-59.4	-57.7	-20.8	-66.7	-54.6	-55	-50.6	-12.5	48.1	-18	59.9	-13.2	57.1	-17.1	13.1	100	31.7	
$Y_{\gamma p1}$	-13.2	-7.05	-12.5	-13.2	-12.4	-4.52	-30.3	-12.3	-11.6	-10.9	-2.66	7.46	-6.97	12.4	-5.58	12.2	-6.58	2.76	31.7	100	
$Y_{\gamma p2}$																					

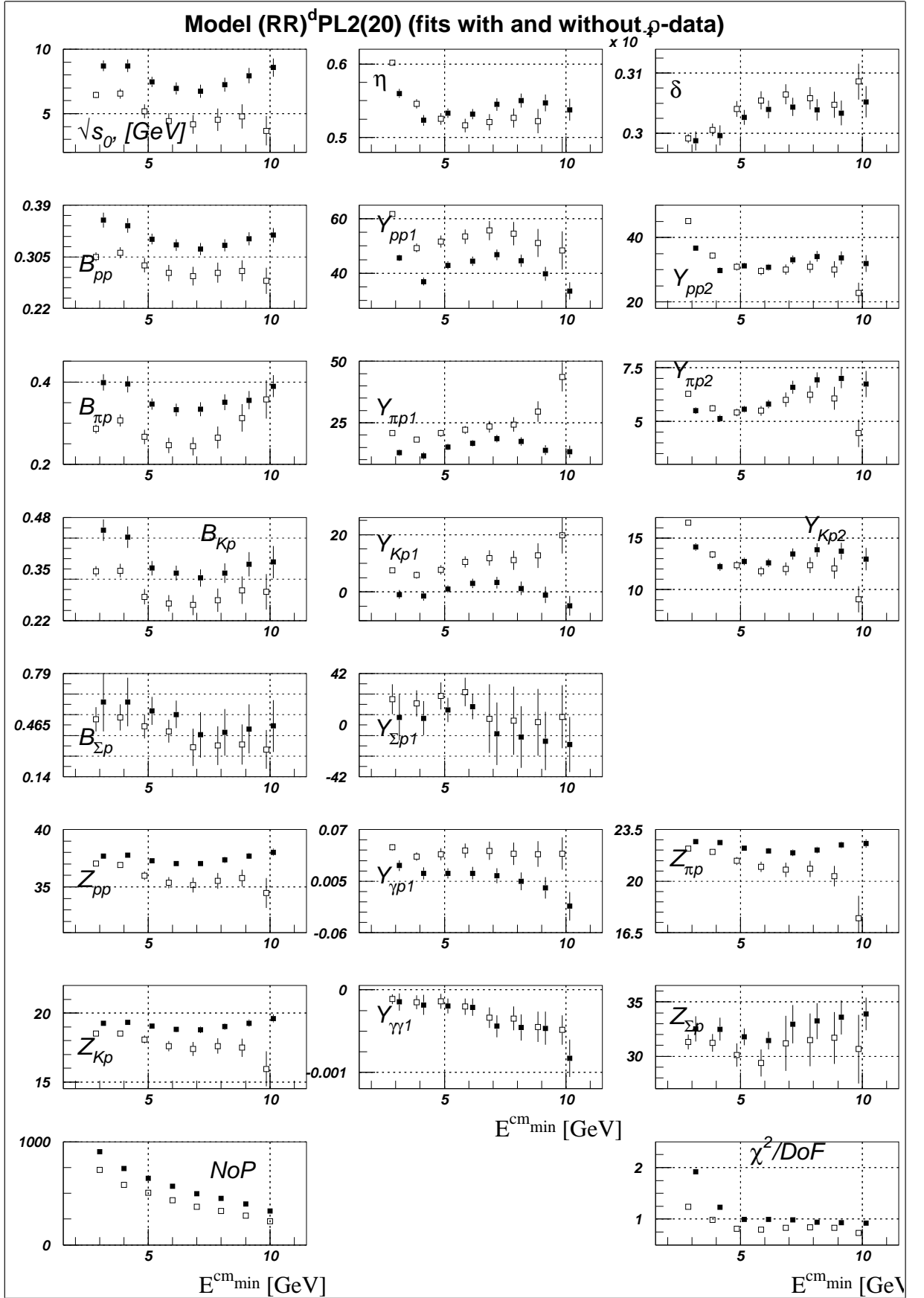


Figure 16: Bold (empty) symbol marks fits with (without) ρ data and are shifted to the right (left) in energy slightly for the cleareness

