

<b>HPR<sub>1</sub>R<sub>2</sub></b> at $\sqrt{s} \geq 5\text{GeV}$	<b>M=2.1206 ± 0.0094 [GeV]</b>		<b>H=0.2720 ± 0.0024 [mb]</b>		<b>FQ<sub>INT</sub> = 0.96</b>
	$\eta_1 = 0.4473 \pm 0.0077$		$\eta_2 = 0.5486 \pm 0.0049$		<b>FQ<sub>EXT</sub> = 0.96</b>
	$\delta = (3.063 \pm 0.014) \times 10^{-3}$		$\lambda = 1.624 \pm 0.033$		
<b>P[mb]</b>	<b>R<sub>1</sub>[mb]</b>	<b>R<sub>2</sub>[mb]</b>	<b>Beam/Target</b>	<b>Npt=1048</b>	<b><math>\chi^2/npt</math> by Groups</b>
34.41 ± 0.13	13.07 ± 0.17	7.394 ± 0.081	$\bar{p}(p)/p$	258	1.14
34.71 ± 0.17	12.52 ± 0.34	6.66 ± 0.15	$\bar{p}(p)/n$	67	0.48
34.7 ± 1.3	-46. ± 18.	-48. ± 18.	$\Sigma^-/p$	9	0.37
18.75 ± 0.11	9.56 ± 0.15	1.767 ± 0.030	$\pi^\mp/p$	183	1.02
16.36 ± 0.09	4.29 ± 0.13	3.408 ± 0.044	$K^\mp/p$	121	0.82
16.31 ± 0.10	3.70 ± 0.19	1.826 ± 0.068	$K^\mp/n$	64	0.58
	0.0139 ± 0.0011		$\gamma/p$	41	0.62
	$(-4. \pm 17.) \times 10^{-6}$		$\gamma/\gamma$	37	0.75
	0.0370 ± 0.0019		$\gamma/d$	13	0.9
64.45 ± 0.32	29.66 ± 0.39	14.94 ± 0.18	$\bar{p}(p)/d$	85	1.52
36.65 ± 0.26	18.75 ± 0.36	0.341 ± 0.091	$\pi^\mp/d$	92	0.72
32.06 ± 0.19	7.70 ± 0.31	5.616 ± 0.082	$K^\mp/d$	78	0.79

To construct the parameter scatter region we follow Section 39.4.2.2 of J. Beringer *et al.* (Particle Data Group), Phys. Rev. **D86**, 010001 (2012) and recent metrology JCGM 101:2008 recommendations and produce the direct Monte Carlo propagation of uncertainties from experimental data to the uncertainties of the best fit parameters. To do this we interpret the whole input data sample as statistically independent sample with total experimental uncertainty at each experimental data point being a Gaussian standard deviation. This technical assumption allows us to generate MC sampling of experimental data and to obtain at each MC trial new “biased” best fit parameters belonging to scatter region of the initial best fit parameters values. These biased best fit parameters constitute the MC-samples of cardinalities  $|MC_{cut}|$  at each  $\sqrt{s}$  cutoff and are the basis for construction of three 35-dimensional empirical parameter distributions.

In paper [19] the asymptotic bounds (Froissart, Martin) on the possible rise of the total collision cross sections in the form  $\log^2(s/s_0)$  was questioned in favour of possible faster rising forms. It was supported by the fits presented in [18] where the form  $\log^c(s/s_0)$  with adjustable  $c$  was tested on  $(\bar{p})pp$  data only and it was claimed that values of  $c$  obtained in number of different fits are statistically compatible with  $c \in [2.2, 2.4]$ .

We have performed our global fit with adjustable  $c$  to the total cross sections and available  $\rho$ -parameters (as of August 2015) including TOTEM data point at 8 TeV [20]. For this fit we have 36 adjustable parameters. Fit was done with all data at  $\sqrt{s} \geq 5$  GeV with  $FQ = 0.87$ . We have obtained value  $c = 1.98 \pm 0.01$  (Hessian error) which is in two standard deviation lower than  $c = 2$ (exact) and possibly could be tentatively interpreted as an indication to the slower universal rising total cross sections as it was proposed 45 years ago by Cheng and Wu in the form  $\log^2\left(\frac{(s/s_0)^a}{\log^2(s/s_0)}\right)$  in their seminal paper [21]. However, to notice this difference much experimental, theoretical, and modelling work has to be done.

In conclusion, the Heisenberg prediction of the universal  $\log^2(s/s_M)$  form of asymptotic rise of the hadronic collision total cross sections is still actual and should be tested in all aspects at available colliders operating with  $(\bar{p}, p, \text{nucl})$  beams and in experiments with cosmic rays.