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Erratum

Erratum to: Charged hadron fragmentation functions from collider data

NNPDF Collaboration

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We correct an error in the implementation of the rapidity range for the ALICE data included in NNFF1.1h [1], which affects our determination of unidentified charged-hadron fragmentation functions.

In [1] we presented NNFF1.1h, a new determination of unidentified charged-hadron fragmentation functions (FFs). To provide stringent constraints on the extractions of the FFs, we included various pp (and $p\bar{p}$) measurements from Tevatron (CDF [2,3]) and the LHC (CMS [4,5] and ALICE [6]). The covered rapidity range for ALICE data is $|\eta| < 0.8$, as reported in [1]. However, we found a mistake in our implementation which translated into an erroneous rapidity range of $|\eta| < 1$. We have now corrected this error and we have repeated the analysis presented in [1]. Though the error affects all figures and tables shown in [1] (Tables 1, 2, 3 and Figs. 1, 2, 3, 4, 5, 6, 7, 8), as reported below, we find that the impact of the wrong rapidity bound in the ALICE data is marginal and does not modify the conclusions of [1].

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Table 1 The data set included in the NNFF1.1h analysis. For each hadron collider experiment, we indicate the publication reference, the centre-of-mass energy $\sqrt{s}$, the number of data points included after (before) kinematic cuts $N_{\rm dat}$, the χ^2 per number of data points before (after) reweighting, $\chi^2_{\rm in}/N_{\rm dat}$ ($\chi^2_{\rm rw}/N_{\rm dat}$), the number of effective replicas after reweighting, $N_{\rm eff}$, and the modal value of the $\mathcal{P}(\alpha)$ distribution in the range $\alpha \in [0.5, 4]$, argmax $\mathcal{P}(\alpha)$. For SIA experiments, see Table 1 in [8]

Process	Experiment	Ref.	$\sqrt{s}$ [TeV]	$N_{\rm dat}$	$\chi^2_{\rm in}/N_{\rm dat}$	$\chi^2_{\rm rw}/N_{\rm dat}$	$N_{\rm eff}$	argmax $\mathcal{P}(\alpha)$
SIA	Various, see Table 1 in [8]			471 (527)	0.83	0.83	–	–
pp	CDF	[2]	1.80	2 (49)	3.33	0.11	1419	0.49
		[3]	1.96	50 (230)	2.92	1.24	741	1.15
	CMS	[4]	0.90	7 (20)	4.19	0.78	1208	0.96
		[5]	2.76	9 (22)	10.5	0.86	583	0.92
		[4]	7.00	14 (27)	12.3	1.06	397	0.81
	ALICE	[6]	0.90	11 (54)	7.28	1.16	1004	0.91
		[6]	2.76	17 (60)	20.7	0.57	379	0.60
		[6]	7.00	22 (65)	8.93	0.75	421	0.71
				603 (1054)	2.43	0.86	448	0.97

Table 2 The values of the χ^2 per data point, $\chi^2_{\rm rw}/N_{\rm dat}$, and the number of data points after cuts, $N_{\rm dat}$, for the *pp* experiments included in the fit (and their total) for a range of values of the kinematic cut $p^h_{T,\rm cut}$. Our baseline is $p^h_{T,\rm cut} = 7$ GeV

	$p^h_{T,\rm cut}$	5 GeV		6 GeV		7 GeV		8 GeV		9 GeV		10 GeV	
Experiment	$\sqrt{s}$ [TeV]	$\frac{\chi^2_{\rm rw}}{N_{\rm dat}}$	$N_{\rm dat}$	$\frac{\chi^2_{\rm rw}}{N_{\rm dat}}$	$N_{\rm dat}$	$\frac{\chi^2_{\rm rw}}{N_{\rm dat}}$	$N_{\rm dat}$	$\frac{\chi^2_{\rm rw}}{N_{\rm dat}}$	$N_{\rm dat}$	$\frac{\chi^2_{\rm rw}}{N_{\rm dat}}$	$N_{\rm dat}$	$\frac{\chi^2_{\rm rw}}{N_{\rm dat}}$	$N_{\rm dat}$
CDF	1.80	1.18	7	0.25	4	0.11	2	0.15	1	—	—	—	—
	1.96	1.43	60	1.31	55	1.24	50	1.19	45	1.13	40	1.13	35
CMS	0.90	1.21	10	0.80	8	0.78	7	0.79	7	0.88	6	0.89	6
	2.76	0.93	11	0.88	10	0.86	9	0.88	9	0.96	8	0.95	8
	7.00	0.99	17	1.04	15	1.06	14	1.08	14	1.10	13	1.08	13
ALICE	0.90	1.51	15	1.23	13	1.16	11	1.11	10	1.04	9	1.10	8
	2.76	0.35	21	0.52	19	0.57	17	0.61	16	0.64	15	0.65	14
	7.00	0.67	26	0.71	24	0.75	22	0.79	21	0.81	20	0.82	19
Total		1.08	167	0.99	148	0.98	132	0.97	123	0.97	111	0.97	103

Table 3 The momentum fraction for the gluon, u^+, $d^+ + s^+$, c^+ and b^+ FF combinations computed at $Q = 5$ GeV and $z_{\rm min} = 0.01$ for the unidentified charged hadron FFs from NNFF1.1h and for the sum of charged pion, kaon and proton/antiproton FFs from NNFF1.0

$Q = 5$ GeV i	NNFF1.1h $M_i^{h^\pm}(Q)$	NNFF1.0 $M_i^{\rm light}(Q)$
g	0.86 ± 0.06	0.80 ± 0.18
u^+	1.22 ± 0.07	1.42 ± 0.12
$d^+ + s^+$	2.07 ± 0.08	2.07 ± 0.27
c^+	1.09 ± 0.03	1.01 ± 0.08
b^+	1.06 ± 0.03	0.98 ± 0.08

The updated and corrected NNFF1.1h set is available through LHAPDF [7]. We are grateful to Aleksas Mazeliauskas for various discussions and comparisons which helped us identify the issue with the implementation of ALICE data.

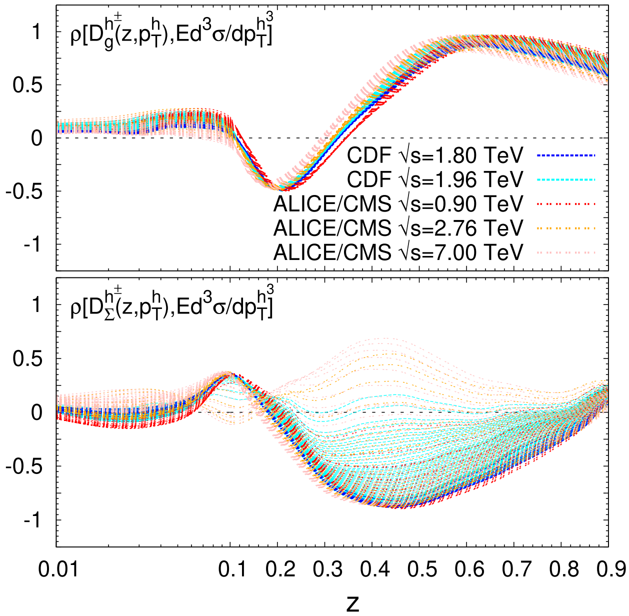

Fig. 1 The correlation coefficient ρ between the gluon (top) and the singlet (bottom) FFs from NNFF1.0h and the pp data. Each data point corresponds to a separate curve; FFs are evaluated at a scale μ equal to the p_T^h of that point

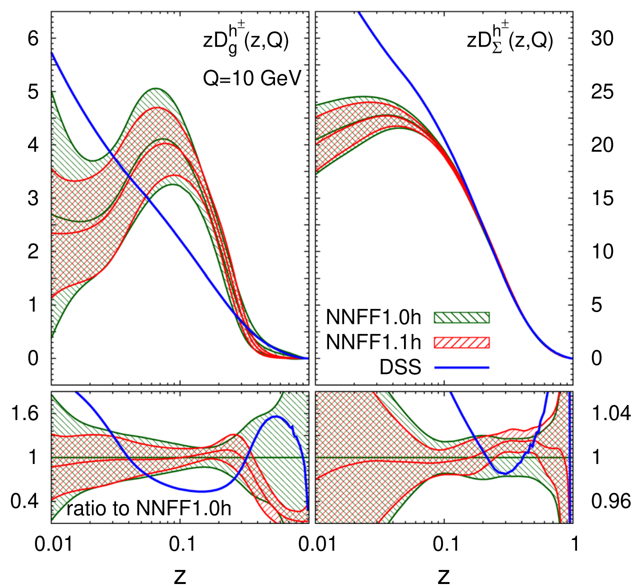

Fig. 2 The gluon (left) and singlet (right) FFs for the unidentified charged hadrons from NNFF1.0h, NNFF1.1h, and DSS at $Q = 10$ GeV; the bands indicate the one-σ uncertainties. The ratio to NNFF1.0h is displayed in the bottom panels

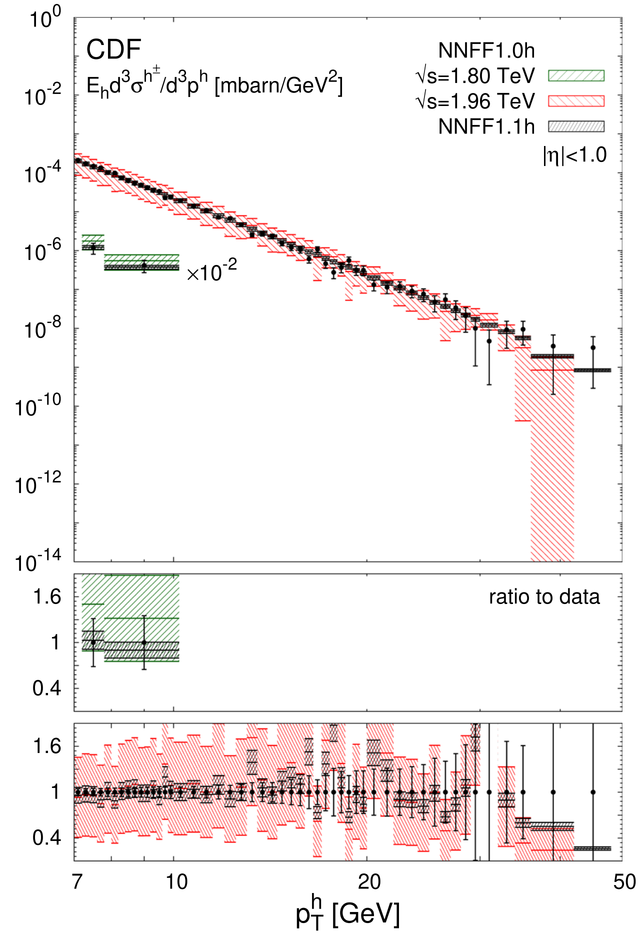

Fig. 3 The differential cross section for the inclusive charged hadron spectra measured by CDF in proton-antiproton collisions at different centre-of-mass energies over the rapidity range $|\eta| < 1$. The data is compared to the NLO predictions obtained with NNFF1.0h and NNFF1.1h. The corresponding theory/data ratio is shown in the lower panels. The bands include the one-σ FF uncertainty only. We show the sum in quadrature of the uncorrelated uncertainties on the data points, while correlated systematic errors are taken into account via shifts of the theoretical predictions (see text)

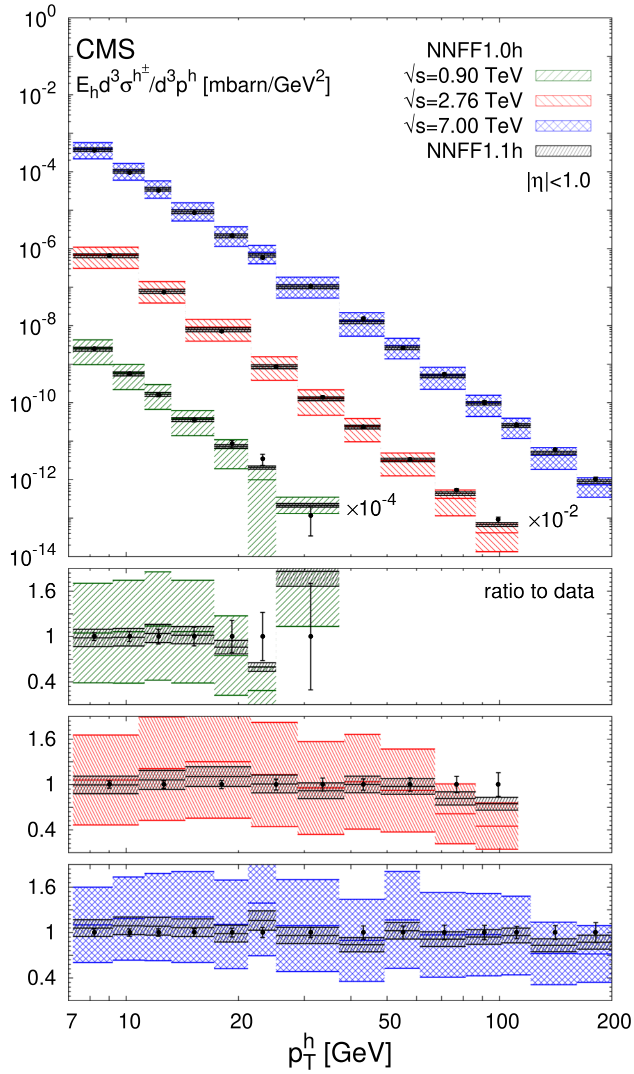

Fig. 4 Same as Fig. 3 for the (proton–proton) CMS data sets

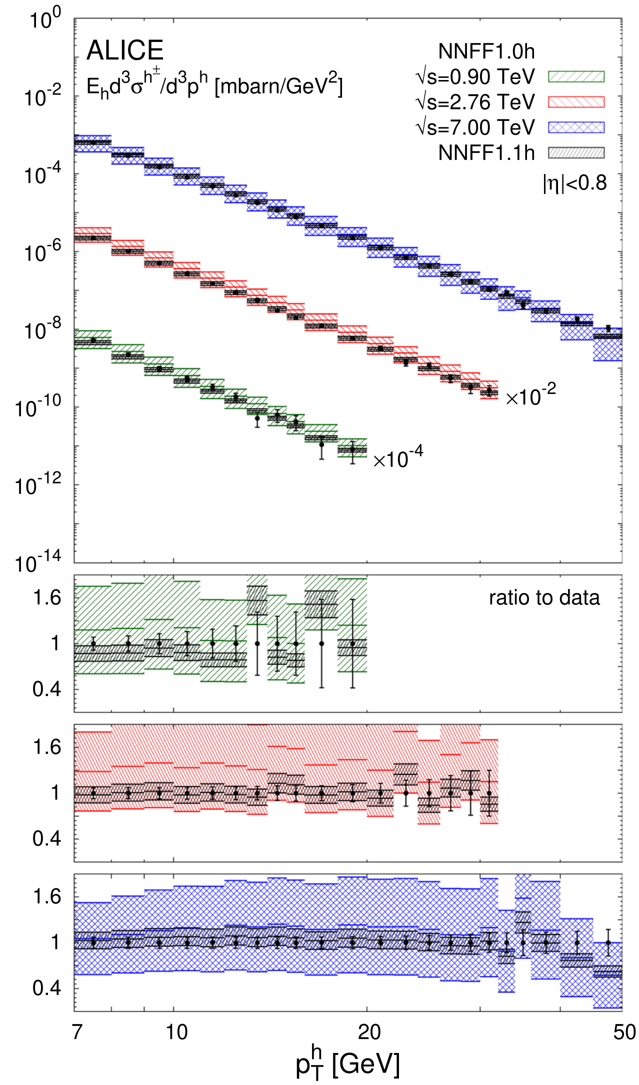

Fig. 5 Same as Fig. 4 for the ALICE data sets

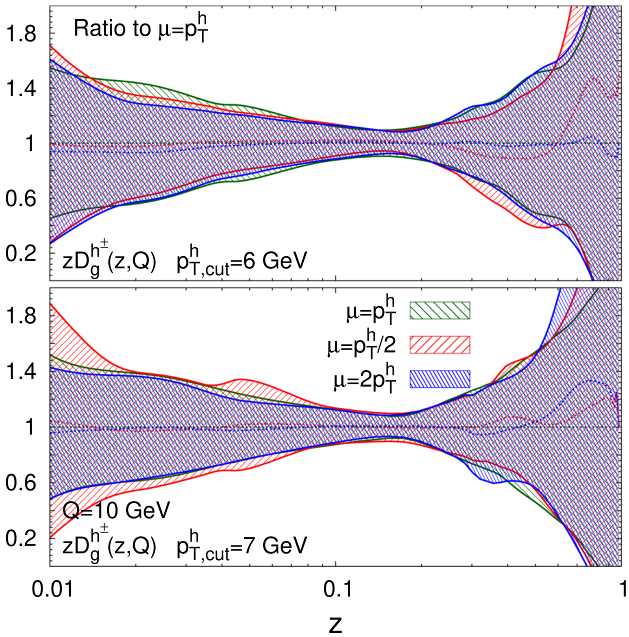

Fig. 6 Comparison of the gluon FF at $Q = 10$ GeV for the fits performed setting the scale μ to p_T^h, $2p_T^h$ or $p_T^h/2$ for $p_{T,\mathrm{cut}}^h = 6$ GeV (upper) and the baseline $p_{T,\mathrm{cut}}^h = 7$ GeV (lower plot), normalised to the $\mu = p_T^h$ result

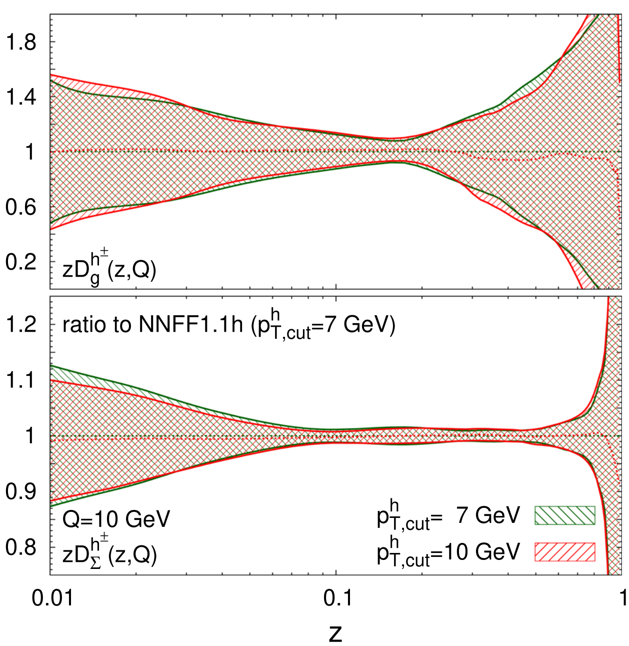

Fig. 7 Comparison of the gluon (upper) and singlet (lower plot) FFs at $Q = 10$ GeV for the NNFF1.1h fits with $p_{T,\mathrm{cut}}^h = 7$ GeV and $p_{T,\mathrm{cut}}^h = 10$ GeV, normalised to the former

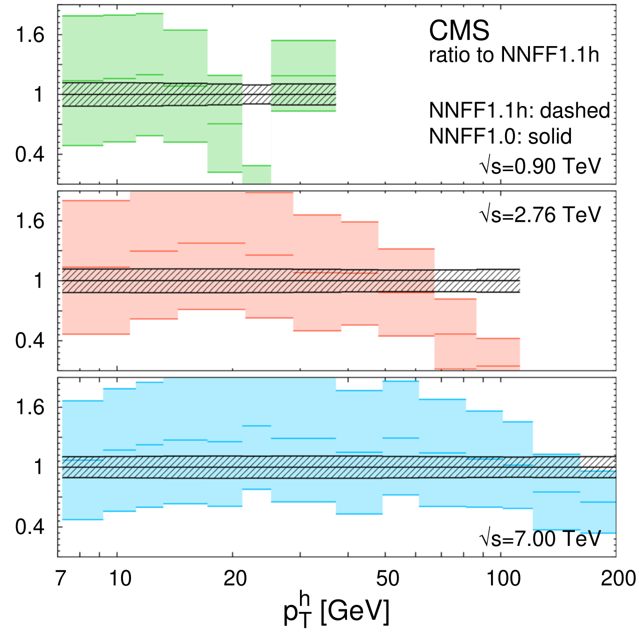

Fig. 8 Theoretical predictions for the differential cross sections in pp collisions computed at NLO in the kinematic bins measured by CMS. We compare the predictions obtained from the unidentified charged hadron in the NNFF1.1h set with those obtained from the sum of charged pions, kaons and protons/antiprotons in the NNFF1.0 set. Predictions are normalised to NNFF1.1h

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