Regular Article - Experimental Physics

Cross-sections of large-angle hadron production in proton–and pion–nucleus interactions V: lead nuclei and beam momenta from ±3 GeV/c to ±15 GeV/c

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Abstract We report on double-differential inclusive cross-sections of the production of secondary protons, charged pions, and deuterons, in the interactions with a 5% λ_{int} thick stationary lead target, of proton and pion beams with momentum from ±3 GeV/c to ±15 GeV/c. Results are given for secondary particles with production angles $20° < \theta < 125°$. Cross-sections on lead nuclei are compared with cross-sections on beryllium, copper, and tantalum nuclei.

1 Introduction

The HARP experiment arose from the realization that the inclusive differential cross-sections of hadron production in the interactions of few GeV/c protons with nuclei were known only within a factor of two to three, while more precise cross-sections are in demand for several reasons.

The 'neutrino factory' (see Ref. [1] and further references cited therein) is a serious contender for a future accelerator facility that addresses fundamental questions on neutrino oscillations. One of the neutrino factory's many technological challenges is the production of charged pions with sufficient

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intensity to achieve the required particle fluxes in the decay chain pions → muons → neutrinos. It is imperative that pion production cross-sections are under control.

Primarily with a view to the optimization of the design parameters of the proton driver of a neutrino factory, but also to the understanding of the underlying physics and the modelling of Monte Carlo generators of hadron–nucleus collisions, to flux predictions for conventional neutrino beams, and to more precise calculations of the atmospheric neutrino flux, the HARP experiment was designed to carry out a programme of systematic and precise (i.e., at the few per cent level) measurements of hadron production by protons and pions with momenta from 1.5 to 15 GeV/c, on a variety of target nuclei. A central goal were precise cross-sections of π^+ and π^- production on the heavy nuclei tantalum and lead.

The HARP detector combined a forward spectrometer with a large-angle spectrometer. The latter comprised a cylindrical Time Projection Chamber (TPC) around the target and an array of Resistive Plate Chambers (RPCs) that surrounded the TPC. The purpose of the TPC was track reconstruction and particle identification by dE/dx. The purpose of the RPCs was to complement the particle identification by time of flight.

The HARP experiment took data at the CERN Proton Synchrotron in 2001 and 2002.

This is the fifth of a series of cross-section papers with results from the HARP experiment. In the first paper, Ref. [2], we described the detector characteristics and our analysis algorithms, on the example of +8.9 GeV/c and −8.0 GeV/c

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beams impinging on a 5% λ_{int} Be target. The second paper [3] presented results for all beam momenta from this Be target. The third [4] and the fourth [5] paper, respectively, presented results from the interactions with a 5% λ_{int} tantalum and copper target. In this paper, we report on the large-angle production (polar angle θ in the range $20° < \theta < 125°$) of secondary protons and charged pions, and of deuterons, in the interactions with a 5% λ_{int} lead target of protons and pions with beam momenta of ±3.0, ±5.0, ±8.0, ±12.0, and ±15.0 GeV/c.

Our work involves only the HARP large-angle spectrometer.

2 The T9 proton and pion beams, and the target

The protons and pions were delivered by the T9 beam line in the East Hall of CERN's Proton Synchrotron. This beam line supports beam momenta between 1.5 GeV/c and 15 GeV/c, with a momentum bite $\Delta p/p \sim 1\%$.

The beam instrumentation, the definition of the beam particle trajectory, the cuts to select 'good' beam particles, and the muon and electron contaminations of the particle beams, are the same as described, e.g., in Ref. [5].

The target was a disc made of high-purity (99.99%) lead, with a radius of 15.1 mm and a thickness of 8.45 mm (5% λ_{int}). A target density of 11.35 g/cm^3 was used for the cross-section normalization.

The finite thickness of the target leads to a small attenuation of the number of incident beam particles. The attenuation factor is $f_{att} = 0.975$.

The size of the beam spot at the position of the target was several millimetres in diameter, determined by the setting of the beam optics and by multiple scattering. The nominal beam position[1] was at $x_{beam} = y_{beam} = 0$, however, excursions by several millimetres could occur.[2] A loose fiducial cut $\sqrt{x_{beam}^2 + y_{beam}^2} < 12$ mm ensured full beam acceptance.

3 Performance of the HARP large-angle detectors

Our calibration work on the HARP TPC and RPCs is described in detail in Refs. [6] and [7], and in references cited therein. In particular, we recall that static and dynamic TPC

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[1] A right-handed Cartesian and/or spherical polar coordinate system is employed; the z axis coincides with the beam line, with $+z$ pointing downstream; the coordinate origin is at the upstream end of the lead target, 500 mm downstream of the TPC's pad plane; looking downstream, the $+x$ coordinate points to the left and the $+y$ coordinate points up; the polar angle θ is the angle with respect to the $+z$ axis.

[2] The only relevant issue is that the trajectory of each individual beam particle is known, whether shifted or not, and therefore the amount of matter to be traversed by the secondary hadrons.

track distortions up to 10 mm have been corrected to better than 300 μm. TPC track distortions do not affect the precision of our cross-section measurements.

The resolution $\sigma(1/p_T)$ is typically 0.2 (GeV/c)$^{-1}$ and worsens towards small relative particle velocity β and small polar angle θ.

The absolute momentum scale is determined to be correct to better than 2%, both for positively and negatively charged particles.

The polar angle θ is measured in the TPC with a resolution of $\sim$9 mrad, for a representative angle of $\theta = 60°$. To this a multiple scattering error has to be added which is on the average $\sim$8 mrad for a proton with $p_T = 500$ MeV/c in the TPC gas and $\theta = 60°$, and $\sim$5 mrad for a pion with the same characteristics. The polar-angle scale is correct to better than 2 mrad.

The TPC measures dE/dx with a resolution of 16% for a track length of 300 mm.

The intrinsic efficiency of the RPCs that surround the TPC is better than 98%.

The intrinsic time resolution of the RPCs is 127 ps and the system time-of-flight resolution (that includes the jitter of the arrival time of the beam particle at the target) is 175 ps.

To separate measured particles into species, we assign on the basis of dE/dx and β to each particle a probability of being a proton, a pion (muon), or an electron, respectively. The probabilities add up to unity, so that the number of particles is conserved. These probabilities are used for weighting when entering tracks into plots or tables.

4 Monte Carlo simulation

We used the Geant4 tool kit [8, 9] for the simulation of the HARP large-angle spectrometer.

Geant4's QGSP_BIC physics list provided us with reasonably realistic spectra of secondaries from incoming beam protons with momentum less than 12 GeV/c. For the secondaries from beam protons at 12 and 15 GeV/c momentum, and from beam pions at all momenta, we found the standard physics lists of Geant4 unsuitable [10].

To overcome this problem, we built our own HARP_CDP physics list for the production of secondaries from incoming beam pions. It starts from Geant4's standard QBBC physics list, but the Quark–Gluon String Model is replaced by the FRITIOF string fragmentation model for kinetic energy $E > 6$ GeV; for $E < 6$ GeV, the Bertini Cascade is used for pions, and the Binary Cascade for protons; elastic and quasi-elastic scattering is disabled. Examples of the good performance of the HARP_CDP physics list are given in Ref. [10].

5 Systematic errors

The systematic uncertainty of our inclusive cross-sections is at the few-per-cent level, from errors in the normalization, in the momentum measurement, in particle identification, and in the corrections applied to the data.

The systematic error of the absolute flux normalization is in general 2%. This error arises from uncertainties in the target thickness, in the contribution of large-angle scattering of beam particles, in the attenuation of beam particles in the target, and in the subtraction of the muon and electron contaminations of the beam. Another contribution comes from the removal of events with an abnormally large number of TPC hits.[3] In the case of the lead target, we increased for reasons of uncertainties on the target shape the normalization uncertainty to 3%.

The systematic error of the track finding efficiency is taken as 1% which reflects differences between results from different persons who conducted eyeball scans. We also take the statistical errors of the parameters of a fit to scan results as systematic error into account [2]. The systematic error of the correction for losses from the requirement of at least 10 TPC clusters per track is taken as 20% of the correction which itself is in the range of 5% to 30%. This estimate arose from differences between the four TPC sectors that were used in our analysis, and from the observed variations with time.

The systematic error of the p_T scale is taken as 2% as discussed in Ref. [6]. For the data from the $+12$ GeV/c and $+15$ GeV/c beams, this error was doubled to account for a larger than usual uncertainty of the correction for dynamic TPC track distortions.

The systematic errors of the proton, pion, and electron abundances are taken as 10%. We stress that errors on abundances only lead to cross-section errors in case of a strong overlap of the resolution functions of both identification variables, dE/dx and β. The systematic error of the correction for migration, absorption of secondary protons and pions in materials, and for pion decay into muons, is taken as 20% of the correction, or 1% of the cross-section, whichever is larger. These estimates reflect our experience with remanent differences between data and Monte Carlo simulations after weighting Monte Carlo events with smooth functions with a view to reproducing the data simultaneously in several variables in the best possible way.

All systematic errors are propagated into the momentum spectra of secondaries and then added in quadrature.

[3]In less than 0.5% of the number of good events, because of apparatus malfunction, the number of TPC hits was much larger than possible for a physics event. Such events were considered unphysical and eliminated.

6 Cross-section results

In Tables 3–47, in the Appendix of this paper, we give the double-differential inclusive cross-sections d$^2\sigma$/dp dΩ for various combinations of incoming beam particle and secondary particle, including statistical and systematic errors. In each bin, the average momentum at the vertex and the average polar angle are also given.

The data of Tables 3–47 are available in ASCII format in Ref. [11].

Some bins in the tables are empty. Cross-sections are only given if the total error is not larger than the cross-section itself. Since our track reconstruction algorithm is optimized for tracks with p_T above $\sim$70 MeV/c in the TPC volume, we do not give cross-sections from tracks with p_T below this value. Because of the absorption of slow protons in the material between the vertex and the TPC gas, and with a view to keeping the correction for absorption losses below 30%, cross-sections from protons are limited to $p > 450$ MeV/c at the interaction vertex. Proton cross-sections are also not given if a 10% error on the proton energy loss in materials between the interaction vertex and the TPC volume leads to a momentum change larger than 2%. Since the proton energy loss is large in the lead target, particularly at polar angles close to 90 degrees, the latter condition imposes significant restrictions. Pion cross-sections are not given if pions are separated from protons by less than twice the time-of-flight resolution.

The large errors and/or absence of results from the $+12$ GeV/c and $+15$ GeV/c pion beams are caused by scarce statistics because the beam composition was dominated by protons.

We present in Figs. 1 to 7 what we consider salient features of our cross-sections.

Figure 1 shows the inclusive cross-sections of the production of protons, π^+'s, and π^-'s, from incoming protons between 3 GeV/c and 15 GeV/c momentum, as a function of their charge-signed p_T. The data refer to the polar-angle range $20° < \theta < 30°$. Figures 2 and 3 show the same for incoming π^+'s and π^-'s.

Figure 4 shows the inclusive cross-sections of the production of protons, π^+'s, and π^-'s, from incoming protons between 3 GeV/c and 15 GeV/c momentum, this time as a function of their charge-signed polar angle θ. The data refer to the p_T range $0.24 < p_T < 0.30$ GeV/c. In this p_T range pions populate nearly all polar angles, whereas protons are absorbed at large polar angle and thus escape measurement. Figures 5 and 6 show the same for incoming π^+'s and π^-'s.

In Fig. 7, we present the inclusive cross-sections of the production of secondary π^+'s and π^-'s, integrated over the momentum range $0.2 < p < 1.0$ GeV/c and the polar-angle range $30° < \theta < 90°$ in the forward hemisphere, as a function of the beam momentum.

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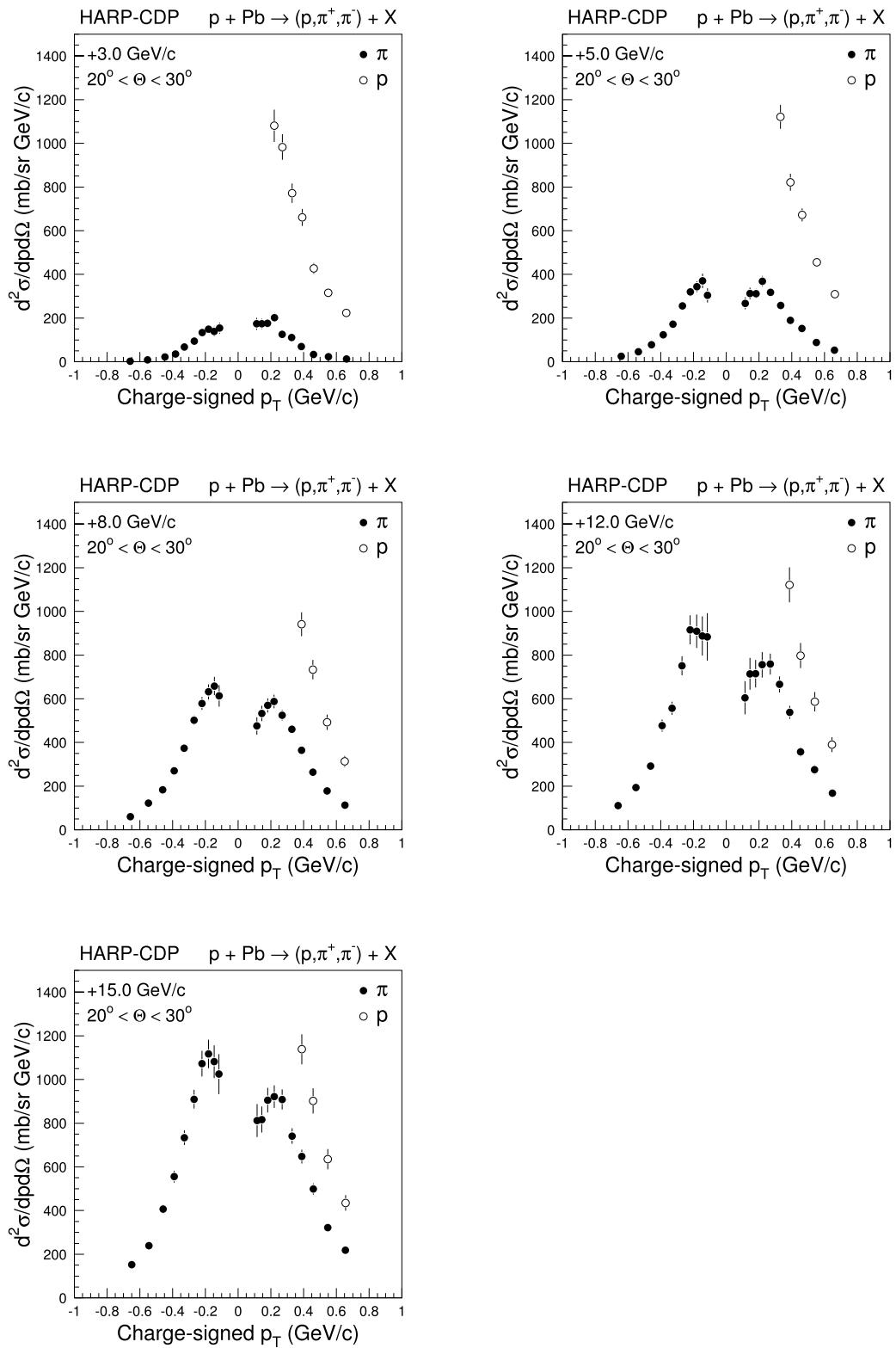
Fig. 1 Inclusive cross-sections of the production of secondary protons, π^+'s, and π^-'s, by protons on lead nuclei, in the polar-angle range $20° < \theta < 30°$, for different proton beam momenta, as a function of the charge-signed p_T of the secondaries; the shown errors are total errors

Fig. 2 Inclusive cross-sections of the production of secondary protons, π^+'s, and π^-'s, by π^+'s on lead nuclei, in the polar-angle range $20° < \theta < 30°$, for different π^+ beam momenta, as a function of the charge-signed p_T of the secondaries; the shown errors are total errors

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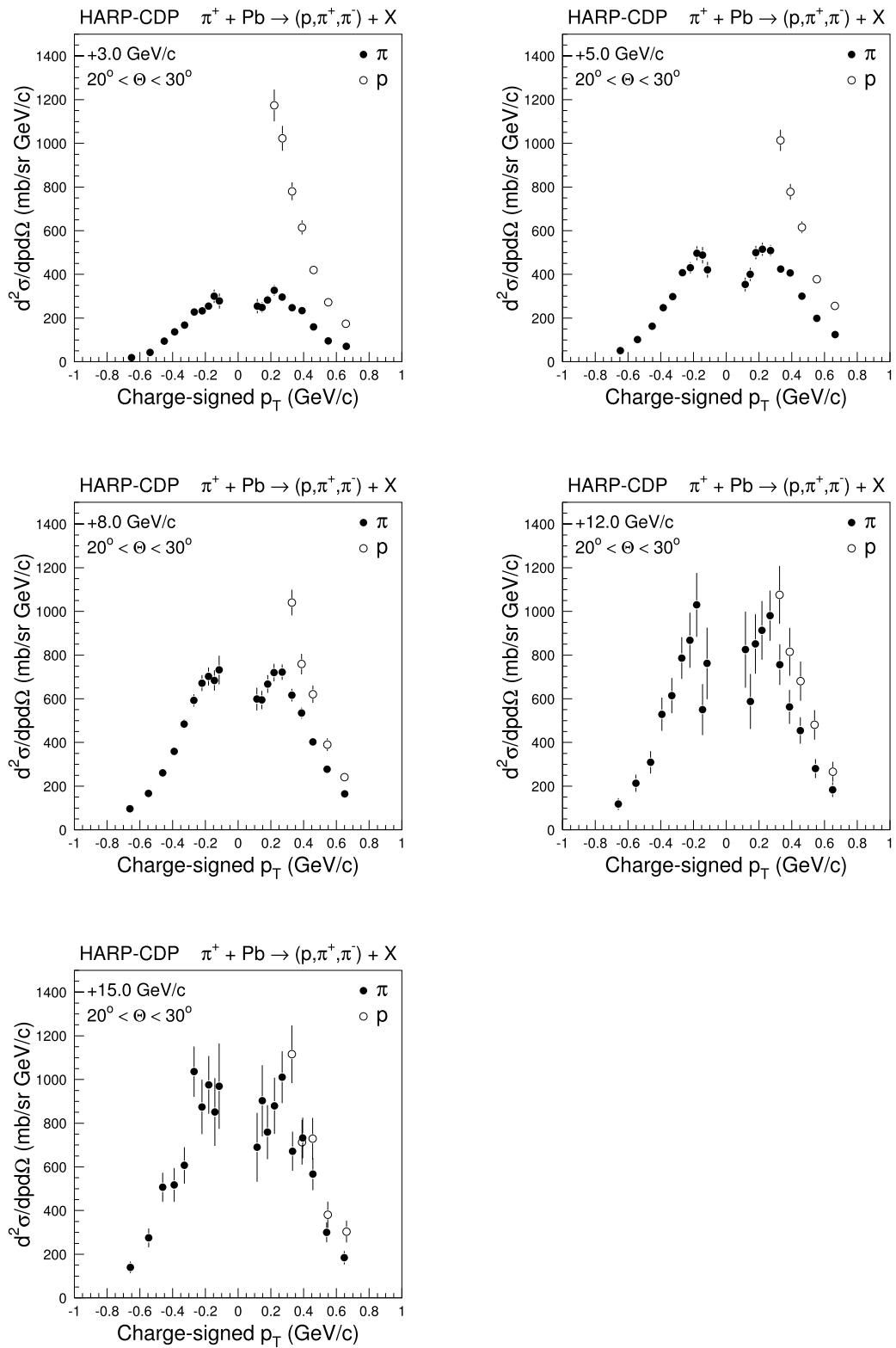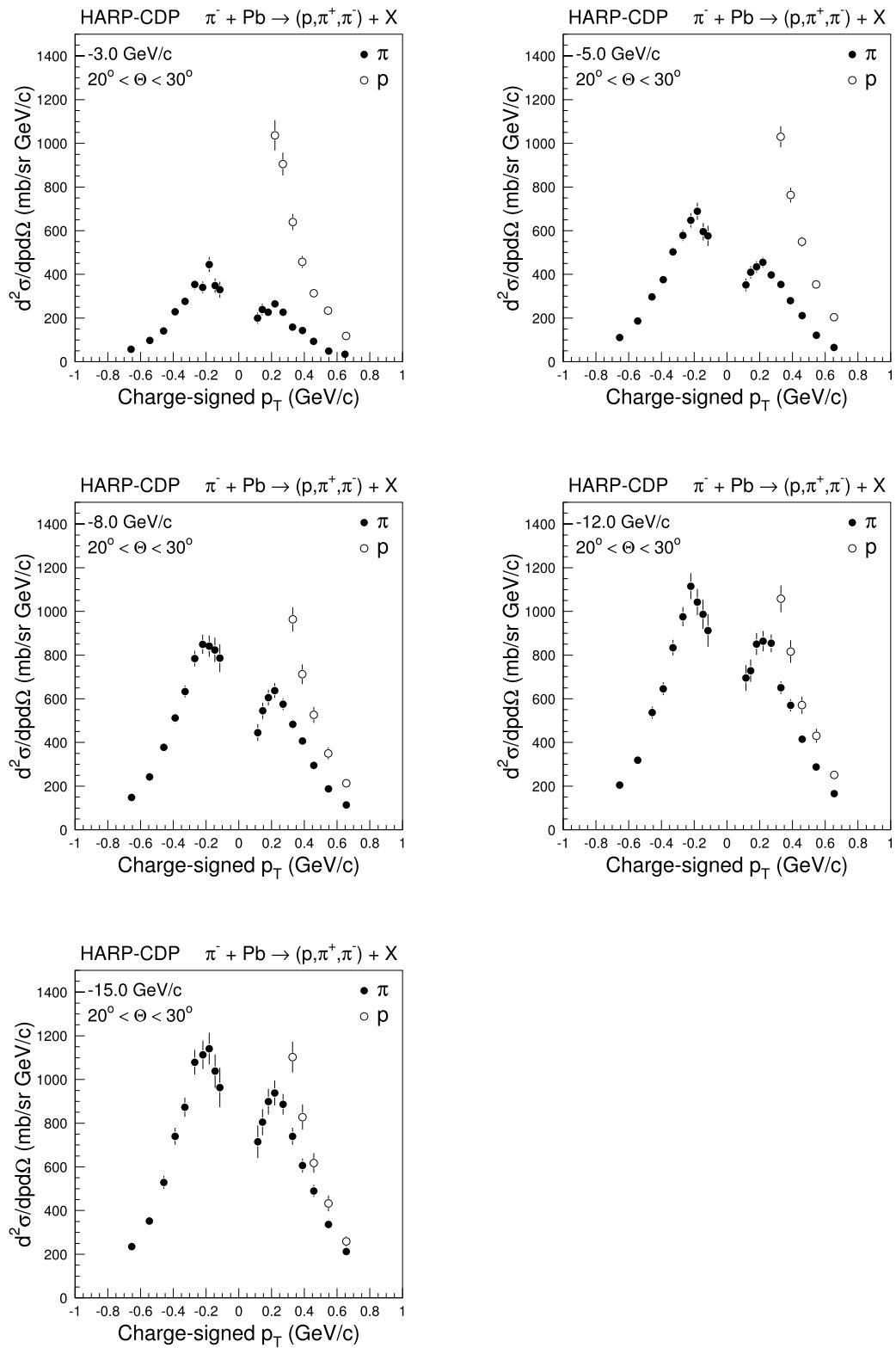
Fig. 3 Inclusive cross-sections of the production of secondary protons, π^+'s, and π^-'s, by π^-'s on lead nuclei, in the polar-angle range $20° < \theta < 30°$, for different π^- beam momenta, as a function of the charge-signed p_T of the secondaries; the shown errors are total errors
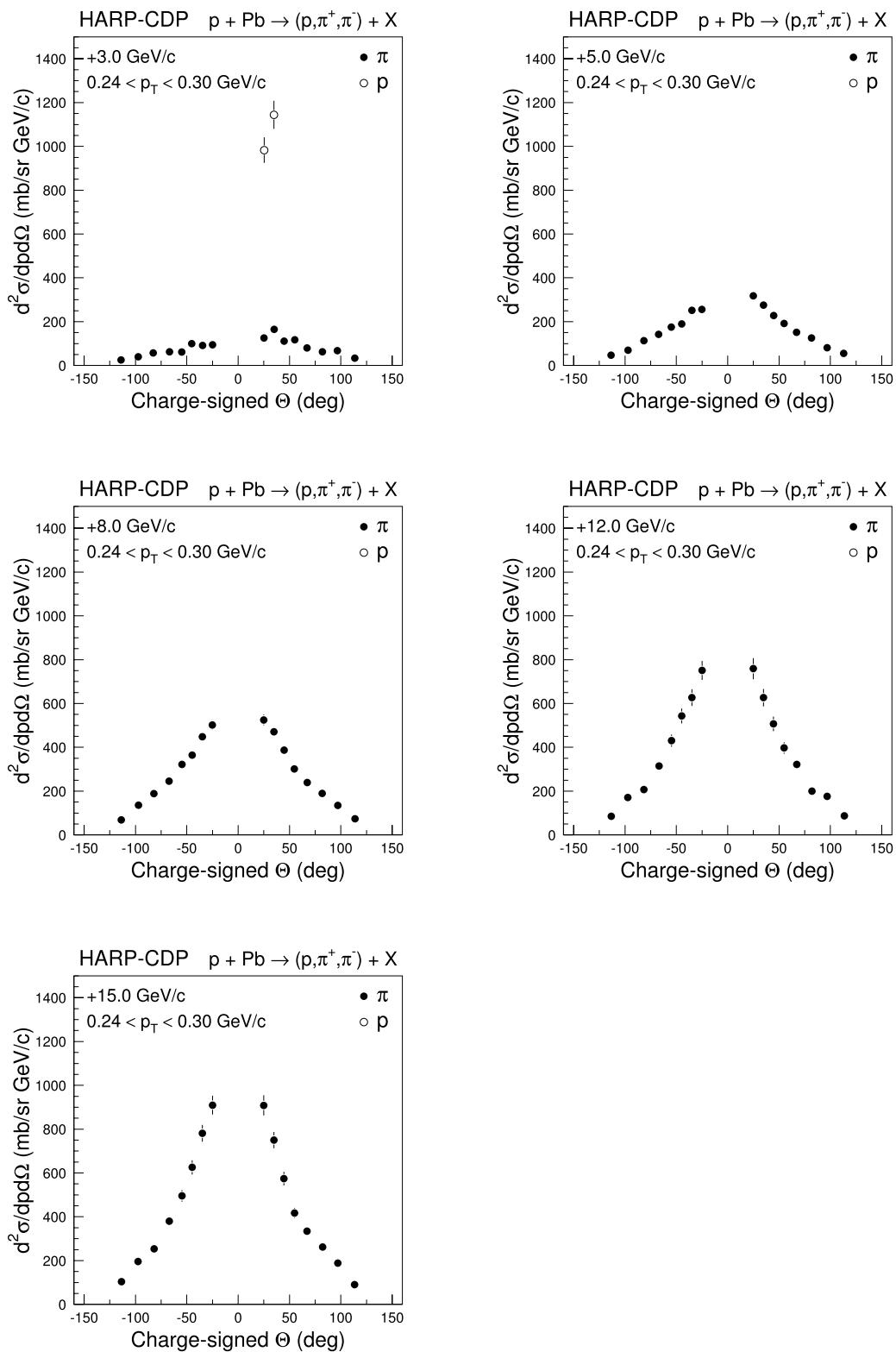
Fig. 4 Inclusive cross-sections of the production of secondary protons, π^+'s, and π^-'s, with p_T in the range 0.24–0.30 GeV/c, by protons on lead nuclei, for different proton beam momenta, as a function of the charge-signed polar angle θ of the secondaries; the shown errors are total errors

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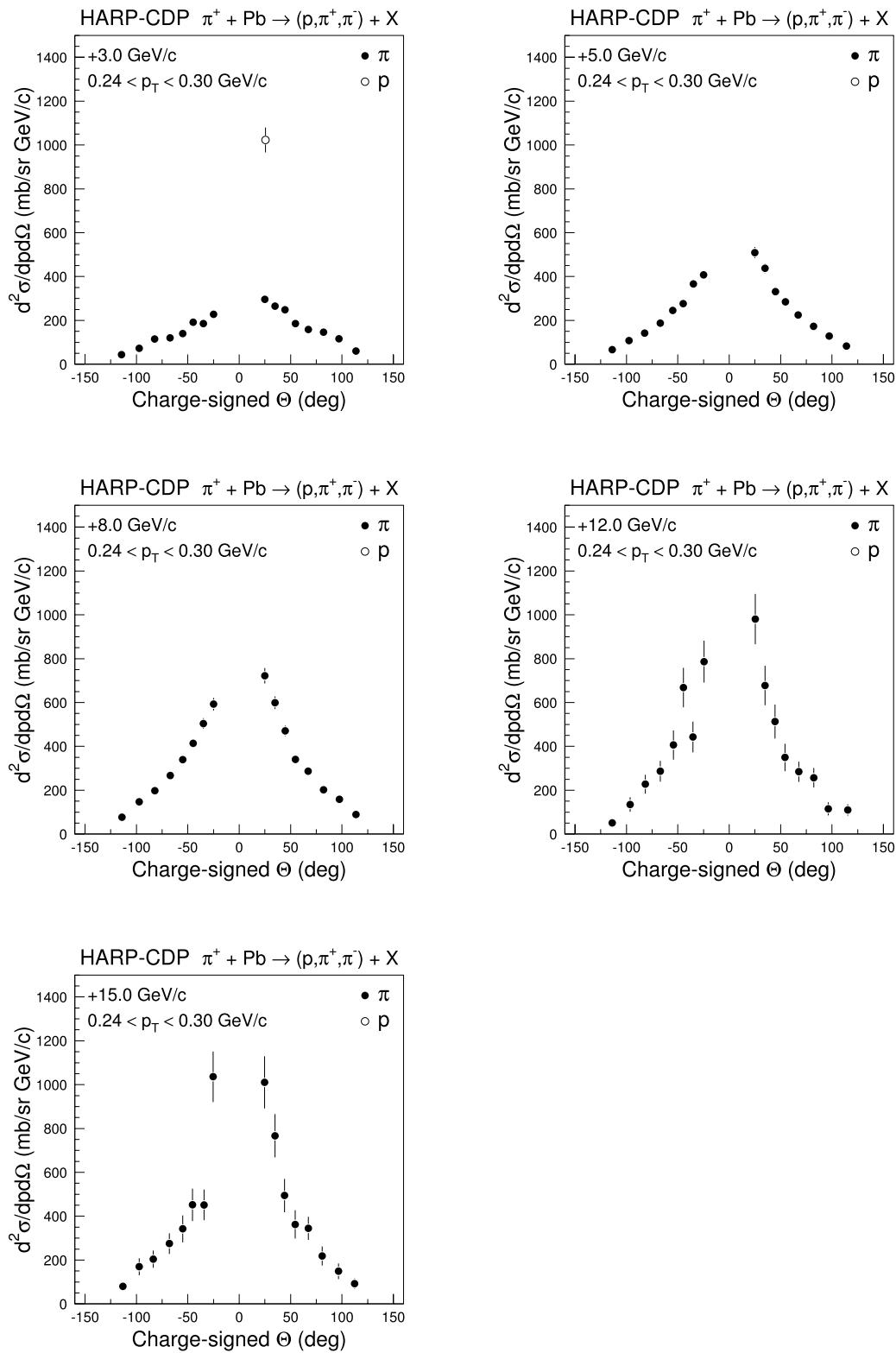
Fig. 5 Inclusive cross-sections of the production of secondary protons, π^+'s, and π^-'s, with p_T in the range 0.24–0.30 GeV/c, by π^+'s on lead nuclei, for different π^+ beam momenta, as a function of the charge-signed polar angle θ of the secondaries; the shown errors are total errors

Fig. 6 Inclusive cross-sections of the production of secondary protons, π^+'s, and π^-'s, with p_T in the range 0.24–0.30 GeV/c, by π^-'s on lead nuclei, for different π^- beam momenta, as a function of the charge-signed polar angle θ of the secondaries; the shown errors are total errors

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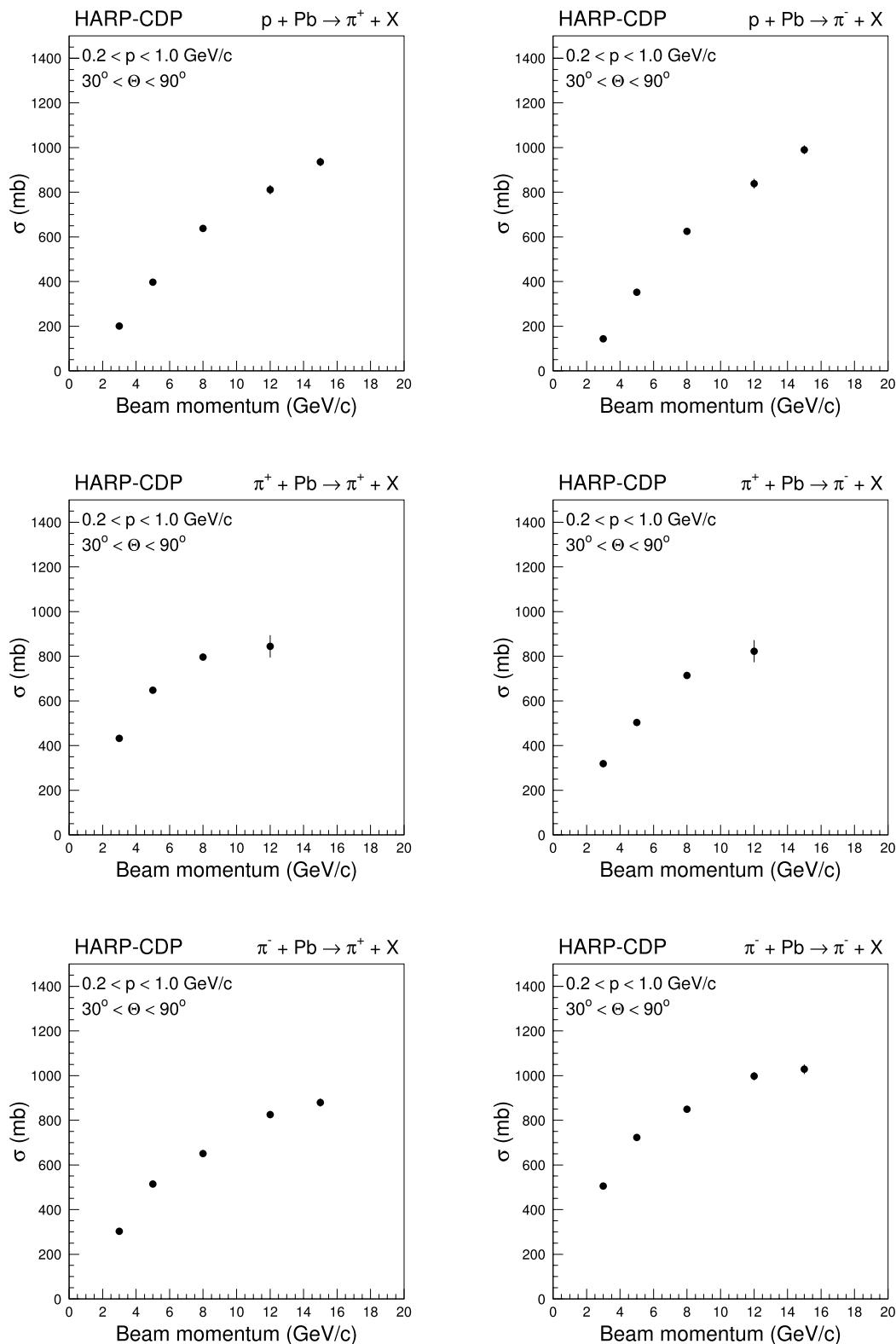
Fig. 7 Inclusive cross-sections of the production of secondary π^+'s and π^-'s, integrated over the momentum range $0.2 < p < 1.0$ GeV/c and the polar-angle range $30° < \theta < 90°$, from the interactions on lead nuclei of protons (*top row*), π^+'s (*middle row*), and π^-'s (*bottom row*), as a function of the beam momentum; the shown errors are total errors and mostly smaller than the symbol size

7 Deuteron production

Besides pions and protons, also deuterons are produced in sizeable quantities on lead nuclei. Up to momenta of about 1 GeV/c, deuterons are easily separated from protons by dE/dx.

Table 1 gives the deuteron-to-proton production ratio as a function of the momentum at the vertex, for 8 GeV/c beam protons, π^+'s, and π^-'s.[4] Cross-section ratios are not given if the data are scarce and the statistical error becomes comparable with the ratio itself—which is the case for deuterons at the high-momentum end of the spectrum.

The measured deuteron-to-proton production ratios are illustrated in Fig. 8, and compared with the predictions of Geant4's FRITIOF model. FRITIOF's predictions are shown for beam π^+'s.[5] FRITIOF largely underestimates deuteron production.
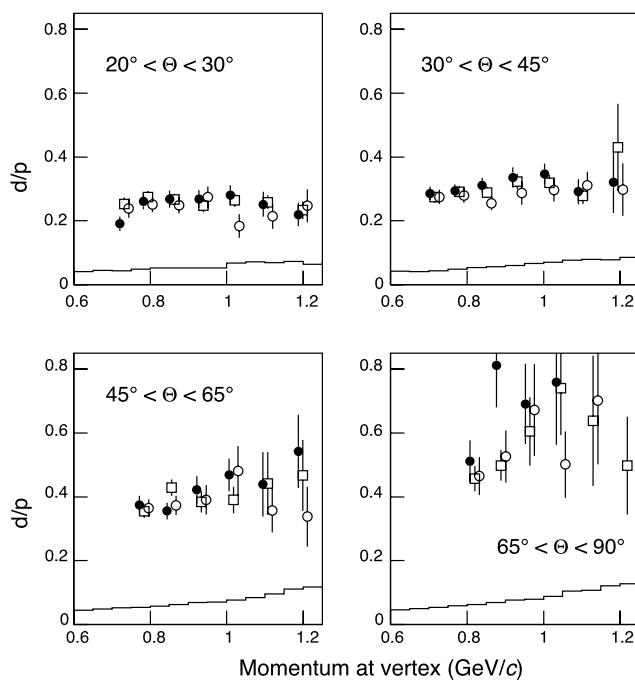
Fig. 8 Deuteron-to-proton production ratios for 8 GeV/c beam particles on lead nuclei, as a function of the momentum at the vertex, for four polar-angle regions; *open squares* denote beam protons, *open circles* beam π^+'s, and *full circles* beam π^-'s; the *full lines* denote predictions of Geant4's FRITIOF model for π^+ beam particles

[4]We observe no appreciable dependence of the deuteron-to-proton production ratio on beam momentum.

[5]There is virtually no difference between its predictions for incoming protons, π^+'s and π^-'s.

Table 1 Ratio of deuterons to protons produced by beam protons, π^+'s and π^-'s of 8 GeV/c momentum, as a function of the particle momentum p [GeV/c] at the vertex, for different bins of polar angle θ

p (GeV/c)	Beam p d/p	Beam π^+ d/p	Beam π^- d/p
$\theta = 20°–30°$			
0.732	0.253 ± 0.020	0.239 ± 0.030	0.191 ± 0.022
0.794	0.274 ± 0.019	0.251 ± 0.024	0.260 ± 0.024
0.863	0.267 ± 0.018	0.249 ± 0.025	0.268 ± 0.027
0.939	0.247 ± 0.020	0.274 ± 0.034	0.268 ± 0.028
1.021	0.264 ± 0.020	0.184 ± 0.037	0.281 ± 0.031
1.108	0.258 ± 0.021	0.214 ± 0.039	0.252 ± 0.039
1.199	0.233 ± 0.028	0.247 ± 0.052	0.220 ± 0.036
$\theta = 30°–45°$			
0.715	0.274 ± 0.017	0.275 ± 0.022	0.286 ± 0.021
0.780	0.291 ± 0.017	0.280 ± 0.023	0.294 ± 0.020
0.852	0.289 ± 0.017	0.255 ± 0.021	0.311 ± 0.023
0.931	0.323 ± 0.024	0.287 ± 0.037	0.336 ± 0.032
1.015	0.319 ± 0.024	0.296 ± 0.036	0.347 ± 0.032
1.103	0.278 ± 0.025	0.311 ± 0.042	0.291 ± 0.039
1.195	0.430 ± 0.136	0.298 ± 0.082	0.320 ± 0.095
$\theta = 45°–65°$			
0.784	0.355 ± 0.020	0.365 ± 0.027	0.374 ± 0.030
0.856	0.429 ± 0.026	0.373 ± 0.030	0.356 ± 0.026
0.934	0.384 ± 0.033	0.391 ± 0.046	0.422 ± 0.043
1.018	0.390 ± 0.042	0.481 ± 0.078	0.469 ± 0.051
1.107	0.442 ± 0.098	0.357 ± 0.069	0.439 ± 0.101
1.199	0.467 ± 0.111	0.338 ± 0.094	0.542 ± 0.115
$\theta = 65°–90°$			
0.820	0.457 ± 0.040	0.465 ± 0.059	0.512 ± 0.065
0.889	0.498 ± 0.048	0.526 ± 0.082	0.812 ± 0.132
0.964	0.605 ± 0.107	0.672 ± 0.143	0.691 ± 0.126
1.045	0.740 ± 0.147	0.501 ± 0.104	0.759 ± 0.196
1.130	0.638 ± 0.204	0.702 ± 0.201	
1.219	0.498 ± 0.153		
$\theta = 90° – 125°$			
0.817	0.578 ± 0.051	0.514 ± 0.057	0.596 ± 0.086
0.889	0.761 ± 0.105	0.692 ± 0.127	0.719 ± 0.110
0.965	0.906 ± 0.168	0.745 ± 0.194	0.905 ± 0.239
1.045	0.733 ± 0.136		

8 Comparison of charged-pion production on beryllium, copper, tantalum, and lead

Figure 9 presents a comparison between the inclusive cross-sections of π^+ and π^- production, integrated over the secondaries' momentum range $0.2 < p < 1.0$ GeV/c and

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Fig. 9 Inclusive cross-sections of π^+ and π^- production by protons (*open squares*), π^+'s (*open circles*), and π^-'s (*black circles*), as a function of $A^{2/3}$ for, from left to right, beryllium, copper, tantalum, and lead nuclei; the cross-sections are integrated over the momentum range $0.2 < p < 1.0$ GeV/c and the polar-angle range $30° < \theta < 90°$; the shown errors are total errors and often smaller than the symbol size
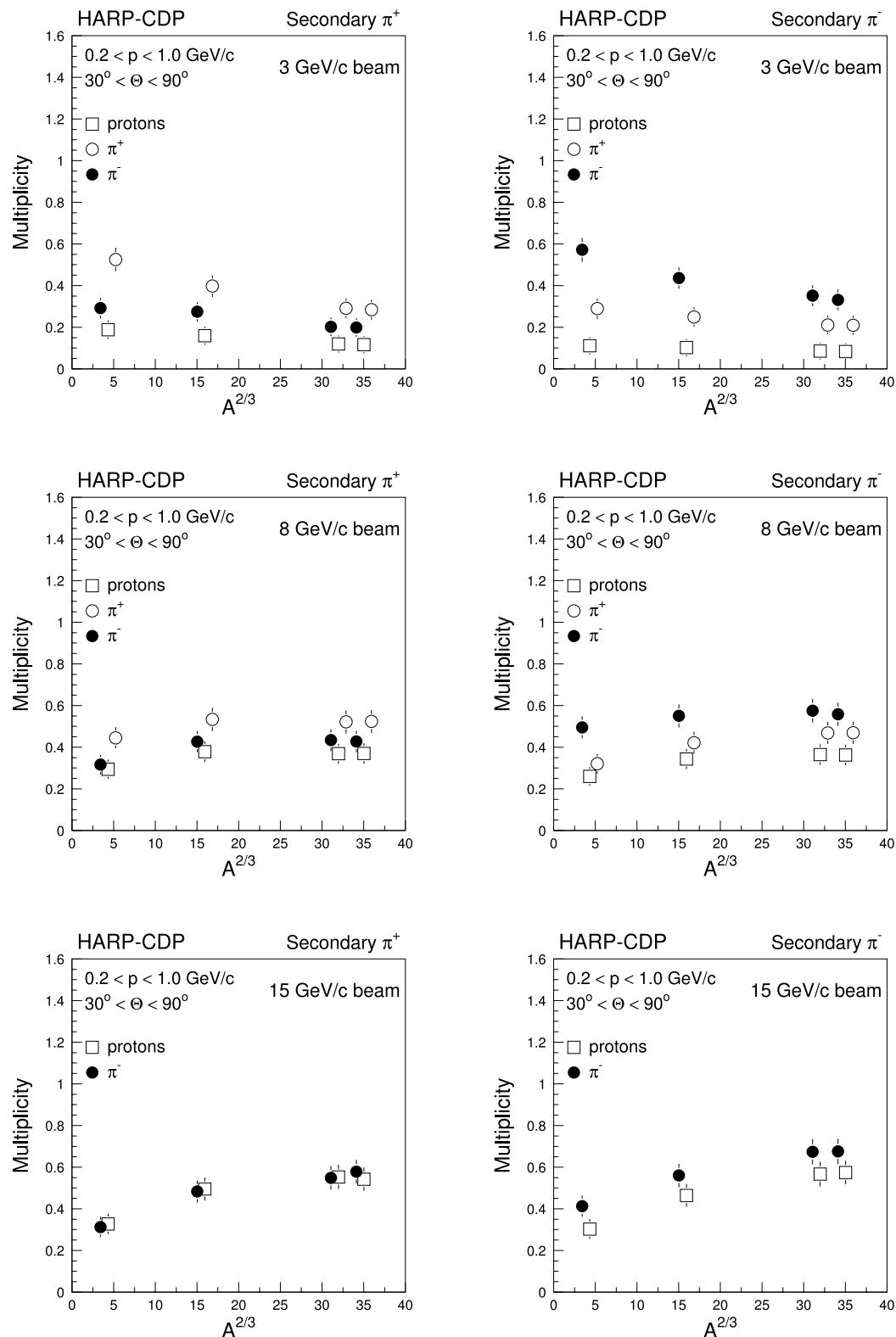
Fig. 10 Forward multiplicity of π^+'s and π^-'s produced by protons (*open squares*), π^+'s (*open circles*), and π^-'s (*black circles*), as a function of $A^{2/3}$ for, from left to right, beryllium, copper, tantalum, and lead nuclei; the forward multiplicity refers to the momentum range $0.2 < p < 1.0$ GeV/c and the polar-angle range $30° < \theta < 90°$ of secondary pions

polar-angle range $30° < \theta < 90°$, in the interactions of protons, π^+ and π^-, with beryllium ($A = 9.01$), copper ($A = 63.55$), tantalum ($A = 181.0$), and lead ($A = 207.2$) nuclei.[6] The comparison employs the scaling variable $A^{2/3}$ where A is the atomic number of the respective nucleus. We note the approximately linear dependence on this scaling variable. At low beam momentum, the slope exhibits a strong dependence on beam particle type, which tends to disappear with higher beam momentum.

Figure 10 compares the 'forward multiplicity' of secondary π^+'s and π^-'s in the interaction of protons and pions with beryllium, copper, tantalum, and lead target nuclei. The forward multiplicities are averaged over the momentum range $0.2 < p < 1.0$ GeV/c and the polar-angle range $30° < \theta < 90°$. They have been obtained by dividing the measured inclusive cross-section by the total cross-section inferred from the nuclear interaction lengths and pion interaction lengths, respectively, as published by the Particle Data Group [12] and reproduced in Table 2. The errors of the forward multiplicities are dominated by a 3% systematic uncertainty. The forward multiplicities display a 'leading particle effect' that mirrors the incoming beam particle. It is also interesting that the forward multiplicity decreases with the nuclear mass at low beam momentum but increases at high beam momentum. We interpret this as the effect of the nuclear medium on secondary pions from the primary interaction of the incoming beam particle. At low beam momentum, the secondary pions have low momentum and tend to fall below the 0.2 GeV/c threshold imposed in our analysis if there is more nuclear medium to be traversed before escape. At high beam momentum, the secondary pions have high enough momentum such that tertiary pions from the re-interaction of secondary pions in the nuclear medium tend to pass the 0.2 GeV/c threshold.

Figure 11 shows the increase of the inclusive cross-sections of π^+'s and π^-'s production by incoming protons of 8.0 GeV/c (in the case of beryllium target nuclei:

Table 2 Nuclear and pion interactions lengths used for the calculation of pion forward multiplicities

Nucleus	λ_{int}^{nucl} [g cm^{-2}]	λ_{int}^{pion} [g cm^{-2}]
Beryllium	77.8	109.9
Copper	137.3	165.9
Tantalum	191.0	217.7
Lead	199.6	226.2

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[6]The beryllium data with +8.9 GeV/c beam momentum [2, 3] have been scaled, by interpolation, to a beam momentum of +8.0 GeV/c.
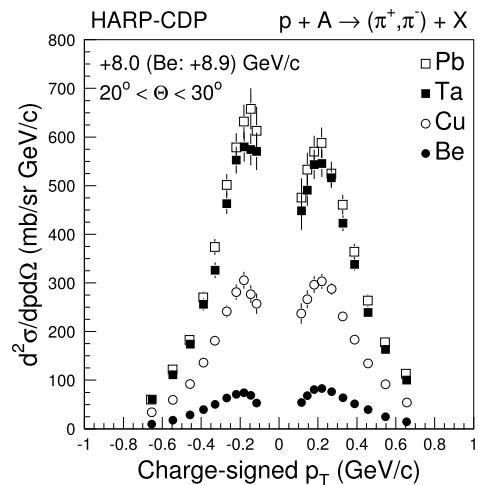
Fig. 11 Comparison of inclusive pion production cross-sections in the forward region between beryllium, copper, tantalum, and lead target nuclei, as a function of the pion momentum

+8.9 GeV/c) from the light beryllium nucleus to the heavy lead nucleus, for pions in the polar angle range $20° < \theta < 30°$. It is interesting to note that π^- production is slightly favoured on heavy nuclei, while π^+ production is slightly favoured on light nuclei.

9 Comparison of our results with results from the HARP Collaboration

Figure 12 shows the comparison of our cross-sections of $\pi^\pm$ production by protons, π^+'s and π^-'s of 8.0 GeV/c momentum, off lead nuclei, with the ones published by the HARP Collaboration [13, 14], in the polar-angle range $20° < \theta < 30°$. The latter cross-sections are plotted as published, while we expressed our cross-sections in the unit used by the HARP Collaboration. The errors shown are the published total errors.

Figure 13 shows the same comparison for beam particles of 3.0 GeV/c momentum.

The discrepancy between our results and those published by the HARP Collaboration is evident. We note the difference especially of the π^+ cross-section, and the difference in the reported momentum range. The discrepancy is even more serious as the same data set has been analysed by both groups.

We hold that the discrepancy is caused by problems in the HARP Collaboration's data analysis. They result primarily, but not exclusively, from a lack of understanding TPC track distortions and RPC timing signals. These problems, together with others that affect the HARP Collaboration's data analysis, are discussed in detail in Refs. [15–19] and summarized in the Appendix of Ref. [2].
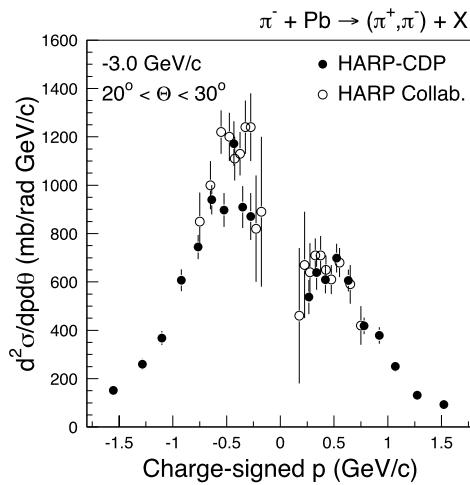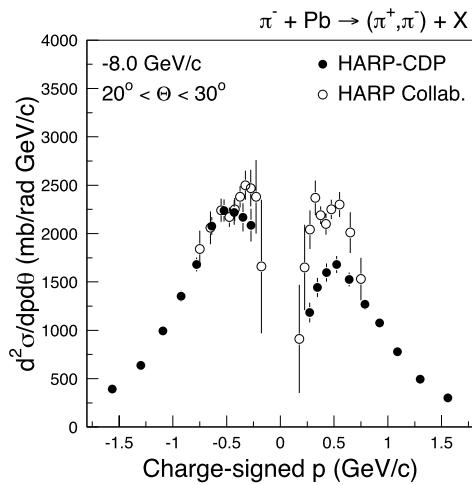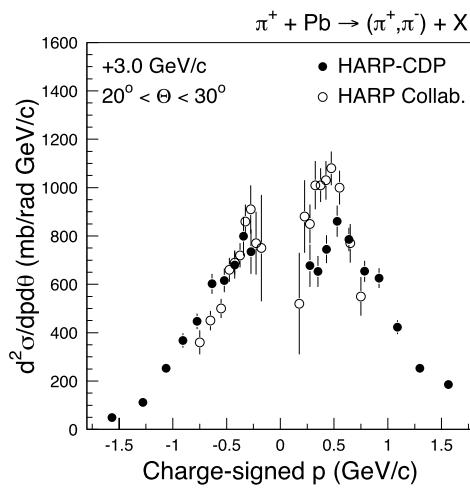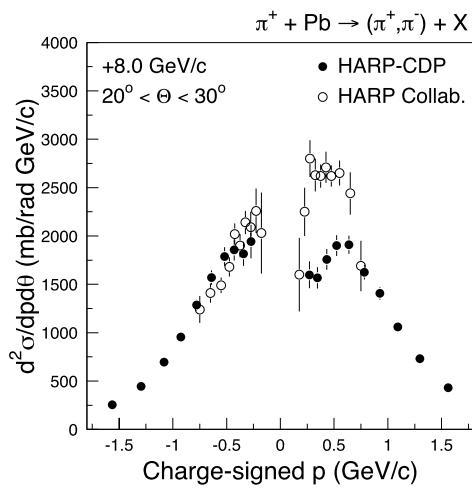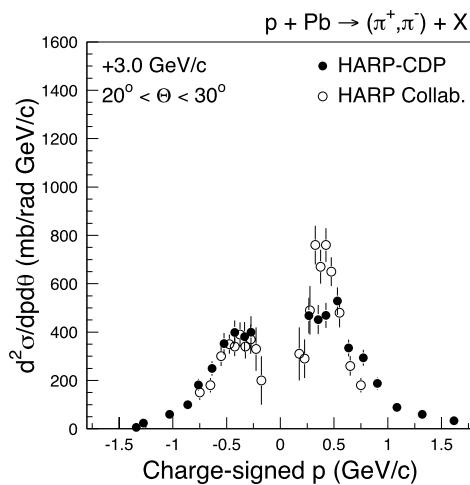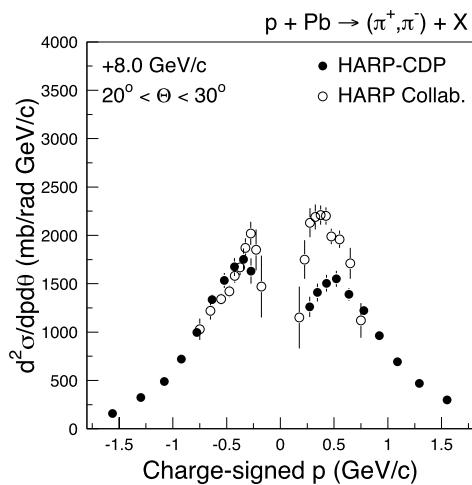
Fig. 12 Comparison of HARP–CDP cross-sections (*full circles*) of $\pi^{\pm}$ production by protons, π^{+}'s and π^{-}'s of 8.0 GeV/c momentum, off lead nuclei, with the cross-sections published by the HARP Collaboration (*open circles*)

Fig. 13 Comparison of HARP–CDP cross-sections (*full circles*) of $\pi^{\pm}$ production by protons, π^{+}'s and π^{-}'s of 3.0 GeV/c momentum, off lead nuclei, with the cross-sections published by the HARP Collaboration (*open circles*)

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10 Summary

From the analysis of data from the HARP large-angle spectrometer (polar angle θ in the range $20° < \theta < 125°$), double-differential cross-sections $d^2\sigma/dp\,d\Omega$ of the production of secondary protons, π^+'s, and π^-'s, and of deuterons, have been obtained. The incoming beam particles were protons and pions with momenta from ± 3 to ± 15 GeV/c, impinging on a 5% λ_{int} thick stationary lead target.

Our cross-sections for π^+ and π^- production disagree with results of the HARP Collaboration that were obtained from the same raw data. When designing the proton driver

of a neutrino factory with the HARP Collaboration's cross-sections, the neutrino flux will be different by a factor of up to two compared with a design based on HARP–CDP cross-sections.

Appendix: Cross-section tables

Table 3 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of protons in p + Pb → p + X interactions with +3.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

| p_T | $20 < \theta < 30$ | | | | | | | $30 < \theta < 40$ | | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.20–0.24	0.221	25.0	1080.57	±	44.47	±	59.20							
0.24–0.30	0.270	25.4	982.77	±	32.98	±	48.17	0.271	34.9	1144.09	±	35.81	±	53.14
0.30–0.36	0.330	25.4	771.52	±	28.90	±	34.09	0.329	35.1	971.58	±	32.23	±	40.49
0.36–0.42	0.392	25.1	661.02	±	27.03	±	27.84	0.391	35.2	791.06	±	29.30	±	30.23
0.42–0.50	0.461	25.2	427.67	±	18.56	±	16.41	0.461	35.3	626.14	±	22.60	±	22.60
0.50–0.60	0.550	25.0	315.32	±	14.24	±	12.54	0.550	35.1	471.97	±	17.65	±	18.16
0.60–0.72	0.660	25.0	223.54	±	11.06	±	10.80	0.658	35.0	284.32	±	12.36	±	12.45
0.72–0.90								0.807	35.3	141.03	±	7.11	±	8.12

| p_T | $40 < \theta < 50$ | | | | | | | $50 < \theta < 60$ | | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.30–0.36	0.328	45.2	1162.74	±	41.23	±	43.96							
0.36–0.42	0.387	45.1	904.48	±	30.96	±	32.24	0.386	55.1	977.44	±	31.15	±	34.38
0.42–0.50	0.455	45.3	717.56	±	24.17	±	24.87	0.455	55.2	780.51	±	24.70	±	27.37
0.50–0.60	0.544	45.3	493.50	±	17.91	±	18.11	0.544	55.2	581.45	±	19.37	±	22.47
0.60–0.72	0.652	45.0	332.38	±	13.60	±	15.33	0.650	55.1	354.27	±	13.87	±	16.61
0.72–0.90	0.788	45.2	180.21	±	7.98	±	10.14	0.789	54.7	175.54	±	8.01	±	10.78
0.90–1.25	1.019	44.8	49.79	±	2.68	±	4.45	1.023	54.6	39.65	±	2.33	±	3.85

| p_T | $60 < \theta < 75$ | | | | | | | $75 < \theta < 90$ | | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.50–0.60	0.540	67.8	550.87	±	14.86	±	22.37							
0.60–0.72	0.645	67.1	332.65	±	10.84	±	17.81	0.644	81.8	213.70	±	8.46	±	14.30
0.72–0.90	0.787	67.0	156.77	±	6.07	±	11.84	0.779	81.5	98.48	±	4.77	±	8.93
0.90–1.25	1.017	66.9	34.90	±	1.80	±	4.37	1.006	81.9	17.28	±	1.27	±	2.44

| p_T | $90 < \theta < 105$ | | | | | | | $105 < \theta < 125$ | | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.50–0.60								0.536	112.6	118.22	±	5.66	±	10.27
0.60–0.72	0.641	96.8	127.45	±	6.64	±	10.42	0.642	111.9	41.13	±	3.15	±	5.18
0.72–0.90	0.774	96.4	47.73	±	3.29	±	4.97	0.773	112.7	10.31	±	1.24	±	1.94
0.90–1.25	1.014	96.5	6.76	±	0.77	±	1.05	0.953	112.7	0.90	±	0.20	±	0.30

Table 4 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^+'s in p + Pb $\rightarrow \pi^+$ + X interactions with +3.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$20 < \theta < 30$						$30 < \theta < 40$					
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$			
0.10–0.13	0.114	25.4	173.87	±	23.08	±	14.76	0.118	34.7	133.86	±	18.73	±	10.57
0.13–0.16	0.145	24.4	173.82	±	20.31	±	11.23	0.146	34.6	162.11	±	18.99	±	10.88
0.16–0.20	0.180	25.0	176.63	±	16.85	±	9.76	0.181	34.9	154.98	±	15.53	±	8.90
0.20–0.24	0.221	24.6	201.66	±	18.68	±	10.90	0.222	34.6	190.61	±	17.72	±	9.92
0.24–0.30	0.268	25.0	125.61	±	11.59	±	5.68	0.271	35.0	164.28	±	13.36	±	7.46
0.30–0.36	0.326	25.0	110.73	±	11.06	±	5.47	0.328	34.8	119.35	±	11.13	±	5.26
0.36–0.42	0.386	25.3	69.74	±	8.54	±	3.45	0.390	34.4	88.04	±	9.48	±	4.07
0.42–0.50	0.460	25.1	33.05	±	4.85	±	1.78	0.461	34.7	50.93	±	6.22	±	2.54
0.50–0.60	0.551	24.7	22.89	±	3.29	±	1.51	0.552	34.3	29.35	±	3.99	±	1.76
0.60–0.72	0.662	24.2	13.16	±	1.84	±	1.18	0.661	34.5	15.21	±	2.32	±	1.23
0.72–0.90								0.801	34.9	11.52	±	1.77	±	1.42

p_T	$40 < \theta < 50$						$50 < \theta < 60$					
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$			
0.10–0.13	0.114	44.5	133.59	±	20.46	±	10.89						
0.13–0.16	0.145	45.4	144.28	±	18.88	±	9.56	0.145	54.9	163.11	±	20.49	±	11.16
0.16–0.20	0.181	44.7	112.95	±	13.52	±	6.55	0.180	54.5	134.01	±	14.31	±	7.66
0.20–0.24	0.220	44.3	112.62	±	13.27	±	5.93	0.218	55.0	128.37	±	14.47	±	6.96
0.24–0.30	0.265	44.8	111.10	±	10.91	±	5.09	0.268	55.1	116.74	±	11.30	±	5.55
0.30–0.36	0.329	44.7	95.42	±	10.16	±	4.25	0.331	55.0	75.40	±	9.02	±	3.43
0.36–0.42	0.389	44.2	57.67	±	7.81	±	2.71	0.386	55.0	71.18	±	8.93	±	3.52
0.42–0.50	0.455	45.1	42.84	±	5.84	±	2.11	0.456	54.9	48.05	±	6.34	±	2.58
0.50–0.60	0.543	46.1	28.34	±	4.21	±	1.68	0.552	54.1	26.59	±	4.06	±	1.64
0.60–0.72	0.650	44.5	16.48	±	2.75	±	1.27	0.656	53.8	12.70	±	2.53	±	1.04
0.72–0.90	0.783	43.5	9.00	±	1.51	±	0.97	0.781	55.3	5.40	±	1.22	±	0.59
0.90–1.25								1.006	55.2	2.49	±	0.50	±	0.42

p_T	$60 < \theta < 75$						$75 < \theta < 90$					
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$			
0.13–0.16	0.145	66.6	183.55	±	20.68	±	16.25	0.147	82.7	123.08	±	19.85	±	13.16
0.16–0.20	0.179	67.4	130.46	±	12.41	±	7.16	0.177	82.8	129.88	±	13.88	±	9.27
0.20–0.24	0.217	67.6	114.46	±	11.16	±	5.75	0.218	81.8	103.83	±	11.19	±	5.56
0.24–0.30	0.270	67.0	79.93	±	7.60	±	3.55	0.267	82.0	61.97	±	7.06	±	3.28
0.30–0.36	0.324	67.2	62.08	±	6.87	±	2.84	0.325	81.4	37.77	±	5.46	±	2.16
0.36–0.42	0.384	67.6	45.17	±	5.91	±	2.33	0.386	81.5	34.44	±	5.17	±	2.05
0.42–0.50	0.451	66.8	34.03	±	4.31	±	1.84	0.455	81.4	20.87	±	3.40	±	1.40
0.50–0.60	0.535	67.5	22.88	±	3.13	±	1.52	0.545	80.6	11.57	±	2.23	±	0.99
0.60–0.72	0.644	65.9	8.36	±	1.68	±	0.75	0.633	81.5	4.57	±	1.30	±	0.51
0.72–0.90	0.774	64.8	2.82	±	0.76	±	0.35	0.786	82.2	1.36	±	0.48	±	0.22
0.90–1.25	0.992	69.7	0.72	±	0.21	±	0.14	1.002	83.0	0.40	±	0.16	±	0.12

p_T	$90 < \theta < 105$						$105 < \theta < 125$					
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$			
0.13–0.16	0.148	97.4	132.68	±	19.16	±	12.82	0.146	115.3	175.84	±	18.20	±	16.32
0.16–0.20	0.178	97.7	120.07	±	12.69	±	6.84	0.177	114.2	102.85	±	10.17	±	5.27
0.20–0.24	0.216	97.7	74.40	±	9.59	±	4.01	0.218	114.2	52.16	±	6.77	±	2.59
0.24–0.30	0.266	96.6	67.61	±	7.38	±	3.61	0.259	113.6	33.43	±	4.34	±	1.88
0.30–0.36	0.324	98.2	31.34	±	4.77	±	1.83	0.327	112.3	11.94	±	2.63	±	0.87
0.36–0.42	0.381	96.2	18.64	±	3.88	±	1.43	0.380	115.0	11.02	±	2.46	±	1.03
0.42–0.50	0.454	94.4	9.83	±	2.34	±	0.87	0.443	114.0	3.77	±	1.22	±	0.46
0.50–0.60	0.528	96.8	4.26	±	1.38	±	0.51	0.527	108.8	1.81	±	0.80	±	0.30
0.60–0.72	0.646	97.4	2.68	±	0.95	±	0.46						
0.72–0.90	0.767	99.1	0.37	±	0.23	±	0.11	0.726	113.2	0.24	±	0.17	±	0.10

Table 5 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^-'s in p + Pb → π^- + X interactions with +3.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

| p_T | $20 < \theta < 30$ | | | | | | $30 < \theta < 40$ | | | | | |
	$\langle p_T \rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				$\langle p_T \rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$			
0.10–0.13	0.113	24.4	154.16	±	21.79	±	13.18	0.114	34.9	163.73	±	21.76	±	13.21
0.13–0.16	0.146	25.9	138.85	±	19.66	±	10.40	0.146	34.9	143.40	±	18.54	±	10.41
0.16–0.20	0.181	25.1	149.43	±	16.08	±	8.75	0.179	35.1	149.46	±	15.59	±	8.91
0.20–0.24	0.220	24.8	133.51	±	15.14	±	7.29	0.217	35.2	128.71	±	14.68	±	7.00
0.24–0.30	0.268	25.0	94.02	±	10.37	±	4.57	0.264	34.7	91.04	±	9.76	±	4.28
0.30–0.36	0.328	25.5	67.10	±	8.54	±	3.30	0.328	34.9	55.27	±	7.78	±	2.66
0.36–0.42	0.381	26.3	35.84	±	6.54	±	2.03	0.383	35.5	47.50	±	7.26	±	2.56
0.42–0.50	0.447	25.7	21.81	±	4.45	±	1.46	0.457	35.1	25.04	±	4.58	±	1.52
0.50–0.60	0.553	25.7	8.81	±	2.44	±	0.71	0.542	34.5	11.66	±	2.75	±	0.88
0.60–0.72	0.659	29.5	1.92	±	1.11	±	0.20	0.633	35.2	4.06	±	1.54	±	0.40
0.72–0.90								0.804	31.8	0.71	±	0.50	±	0.09

| p_T | $40 < \theta < 50$ | | | | | | $50 < \theta < 60$ | | | | | |
	$\langle p_T \rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				$\langle p_T \rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$			
0.10–0.13	0.114	45.6	178.50	±	24.48	±	14.55						
0.13–0.16	0.147	44.9	131.22	±	17.29	±	8.87	0.144	55.5	201.04	±	23.07	±	13.78
0.16–0.20	0.181	44.7	134.12	±	14.75	±	8.06	0.180	55.0	117.15	±	13.49	±	6.87
0.20–0.24	0.221	45.2	99.16	±	12.95	±	5.77	0.220	54.4	77.39	±	11.04	±	4.29
0.24–0.30	0.271	45.2	99.34	±	10.51	±	4.80	0.272	55.0	60.84	±	7.82	±	2.98
0.30–0.36	0.329	44.8	60.56	±	8.27	±	3.00	0.326	54.8	63.51	±	8.20	±	3.09
0.36–0.42	0.387	45.3	35.57	±	6.30	±	1.92	0.385	54.8	42.12	±	6.79	±	2.32
0.42–0.50	0.459	45.4	31.84	±	5.11	±	1.89	0.455	55.0	25.52	±	4.59	±	1.55
0.50–0.60	0.544	45.4	17.26	±	3.45	±	1.30	0.549	54.6	11.50	±	2.86	±	0.91
0.60–0.72	0.645	45.5	6.68	±	2.01	±	0.67	0.652	54.7	4.26	±	1.61	±	0.45
0.72–0.90	0.788	43.5	2.74	±	1.04	±	0.36	0.797	54.3	1.27	±	0.65	±	0.18
0.90–1.25								0.982	50.6	0.26	±	0.18	±	0.05

| p_T | $60 < \theta < 75$ | | | | | | $75 < \theta < 90$ | | | | | |
	$\langle p_T \rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				$\langle p_T \rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$			
0.13–0.16	0.147	67.5	195.04	±	20.25	±	13.72	0.142	80.2	260.18	±	117.90	±	35.93
0.16–0.20	0.181	67.2	133.93	±	12.48	±	7.10	0.180	81.8	136.50	±	13.90	±	9.08
0.20–0.24	0.221	67.2	96.43	±	10.50	±	5.08	0.219	82.3	96.33	±	10.89	±	5.24
0.24–0.30	0.268	66.8	62.05	±	6.75	±	2.91	0.269	82.8	56.77	±	6.81	±	3.12
0.30–0.36	0.330	67.6	51.79	±	6.44	±	2.80	0.330	83.3	30.56	±	4.81	±	1.67
0.36–0.42	0.393	66.8	31.39	±	4.92	±	1.77	0.388	80.7	17.83	±	3.72	±	1.19
0.42–0.50	0.461	66.9	17.27	±	3.15	±	1.08	0.455	80.7	15.17	±	3.03	±	1.22
0.50–0.60	0.554	68.8	13.54	±	2.54	±	1.12	0.550	80.4	5.24	±	1.58	±	0.54
0.60–0.72	0.655	67.0	5.91	±	1.53	±	0.66	0.681	80.9	2.77	±	1.05	±	0.39
0.72–0.90	0.846	69.1	1.49	±	0.61	±	0.22	0.807	84.3	0.78	±	0.39	±	0.17
0.90–1.25	1.059	67.1	0.11	±	0.08	±	0.03						

| p_T | $90 < \theta < 105$ | | | | | | $105 < \theta < 125$ | | | | | |
	$\langle p_T \rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				$\langle p_T \rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$			
0.13–0.16	0.146	98.1	208.53	±	27.71	±	32.17	0.144	114.6	156.07	±	16.50	±	11.15
0.16–0.20	0.177	97.5	110.78	±	12.95	±	7.37	0.180	113.4	79.18	±	8.88	±	4.19
0.20–0.24	0.218	97.2	49.87	±	7.73	±	2.59	0.217	114.1	39.68	±	6.12	±	2.45
0.24–0.30	0.266	97.2	39.77	±	5.63	±	2.27	0.266	114.0	25.67	±	3.85	±	1.76
0.30–0.36	0.330	98.2	20.72	±	4.14	±	1.53	0.339	112.3	10.58	±	2.49	±	0.94
0.36–0.42	0.385	96.6	14.98	±	3.44	±	1.29	0.393	114.7	8.59	±	2.22	±	0.97
0.42–0.50	0.450	97.7	4.24	±	1.60	±	0.45	0.470	113.5	2.37	±	0.97	±	0.33
0.50–0.60	0.553	96.8	2.45	±	1.09	±	0.34						
0.60–0.72	0.657	90.5	0.77	±	0.55	±	0.15						

Table 6 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of protons in $\pi^+ + Pb \rightarrow p + X$ interactions with +3.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$20 < \theta < 30$ $\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$	$30 < \theta < 40$ $\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$
0.20–0.24	0.220	25.4	1173.46 ± 35.63 ± 63.99			
0.24–0.30	0.270	25.5	1022.88 ± 25.40 ± 50.48	0.272	35.1	1257.69 ± 28.22 ± 58.79
0.30–0.36	0.329	25.5	780.49 ± 21.80 ± 34.85	0.330	35.1	1027.73 ± 24.85 ± 43.17
0.36–0.42	0.390	25.5	614.77 ± 19.53 ± 25.94	0.390	35.2	893.16 ± 23.21 ± 34.42
0.42–0.50	0.460	25.3	419.79 ± 13.59 ± 16.47	0.459	35.3	616.61 ± 16.66 ± 22.28
0.50–0.60	0.550	25.4	272.77 ± 9.77 ± 10.94	0.550	35.3	413.98 ± 12.23 ± 15.50
0.60–0.72	0.658	25.5	174.17 ± 7.15 ± 8.45	0.659	35.3	243.55 ± 8.44 ± 10.59
0.72–0.90				0.799	35.3	138.55 ± 5.09 ± 7.98

p_T	$40 < \theta < 50$ $\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$	$50 < \theta < 60$ $\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$
0.36–0.42	0.387	45.2	1013.99 ± 24.47 ± 36.51	0.387	55.1	1087.42 ± 24.71 ± 38.16
0.42–0.50	0.456	45.2	784.20 ± 18.79 ± 27.45	0.455	55.0	840.31 ± 19.18 ± 29.78
0.50–0.60	0.543	45.2	549.93 ± 14.05 ± 20.33	0.542	55.1	599.15 ± 14.71 ± 23.37
0.60–0.72	0.651	45.1	344.24 ± 10.26 ± 15.63	0.651	55.1	392.29 ± 10.90 ± 18.40
0.72–0.90	0.789	45.0	171.88 ± 5.74 ± 9.77	0.792	55.0	190.46 ± 6.22 ± 11.68
0.90–1.25	1.027	45.2	41.74 ± 1.81 ± 3.79	1.014	54.8	42.41 ± 1.79 ± 4.16

p_T	$60 < \theta < 75$ $\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$	$75 < \theta < 90$ $\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$
0.50–0.60	0.539	67.4	605.25 ± 11.69 ± 24.77			
0.60–0.72	0.644	67.4	365.83 ± 8.54 ± 19.68	0.645	81.9	266.06 ± 7.11 ± 17.83
0.72–0.90	0.781	67.2	166.05 ± 4.67 ± 12.57	0.781	81.9	114.63 ± 3.86 ± 10.40
0.90–1.25	1.007	66.9	39.92 ± 1.43 ± 5.01	1.008	81.7	24.47 ± 1.13 ± 3.45

p_T	$90 < \theta < 105$ $\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$	$105 < \theta < 125$ $\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$
0.50–0.60				0.537	113.1	187.76 ± 5.38 ± 16.13
0.60–0.72	0.642	97.4	186.28 ± 5.99 ± 15.21	0.642	112.6	72.58 ± 3.14 ± 9.09
0.72–0.90	0.779	96.8	77.93 ± 3.13 ± 8.09	0.776	112.5	21.28 ± 1.32 ± 3.97
0.90–1.25	0.991	96.4	10.65 ± 0.72 ± 1.65	1.003	112.2	2.22 ± 0.23 ± 0.71

Table 7 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^+'s in $\pi^+ + \text{Pb} \to \pi^+ + \text{X}$ interactions with $+3.0$ GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				
		$20<\theta<30$							$30<\theta<40$					
0.10–0.13	0.117	25.1	254.54	±	21.39	±	25.04	0.116	35.3	236.60	±	19.12	±	18.97
0.13–0.16	0.147	24.7	248.81	±	18.06	±	16.38	0.147	34.8	204.73	±	15.47	±	13.31
0.16–0.20	0.180	24.8	282.60	±	15.86	±	15.28	0.180	34.7	248.24	±	14.48	±	13.68
0.20–0.24	0.221	24.8	327.23	±	17.70	±	17.24	0.220	34.8	270.40	±	15.43	±	13.26
0.24–0.30	0.269	25.0	295.78	±	13.25	±	12.59	0.270	34.8	265.04	±	12.45	±	11.30
0.30–0.36	0.330	24.8	247.73	±	12.44	±	10.91	0.330	35.0	233.49	±	11.64	±	9.31
0.36–0.42	0.390	25.2	234.21	±	11.89	±	9.66	0.388	34.9	178.95	±	10.16	±	7.16
0.42–0.50	0.460	25.0	159.26	±	8.21	±	7.15	0.460	35.2	160.01	±	8.49	±	6.89
0.50–0.60	0.549	25.1	95.03	±	5.39	±	5.43	0.553	35.1	96.41	±	5.61	±	5.05
0.60–0.72	0.660	25.0	70.17	±	4.24	±	5.71	0.662	34.7	63.59	±	4.06	±	4.63
0.72–0.90								0.802	34.7	41.09	±	2.59	±	4.76
		$40<\theta<50$							$50<\theta<60$					
0.10–0.13	0.115	45.0	247.83	±	20.43	±	19.82							
0.13–0.16	0.144	45.0	224.49	±	16.68	±	14.23	0.145	55.3	221.73	±	17.03	±	14.46
0.16–0.20	0.179	45.2	217.61	±	13.63	±	12.02	0.179	54.9	202.26	±	12.93	±	10.98
0.20–0.24	0.219	44.8	205.92	±	13.16	±	10.17	0.219	54.7	215.81	±	13.68	±	10.84
0.24–0.30	0.269	44.6	248.30	±	12.04	±	10.68	0.269	54.7	185.70	±	10.60	±	8.33
0.30–0.36	0.326	45.1	183.14	±	10.43	±	7.40	0.328	54.9	131.88	±	8.81	±	5.40
0.36–0.42	0.389	44.9	185.47	±	10.52	±	7.65	0.390	54.7	143.79	±	9.43	±	6.40
0.42–0.50	0.456	45.0	126.14	±	7.47	±	5.42	0.455	54.9	125.69	±	7.70	±	6.02
0.50–0.60	0.547	45.0	87.36	±	5.54	±	4.52	0.546	54.8	83.40	±	5.46	±	4.52
0.60–0.72	0.652	44.7	65.28	±	4.30	±	4.49	0.649	54.8	55.64	±	4.12	±	4.07
0.72–0.90	0.786	44.4	31.36	±	2.32	±	3.08	0.792	54.4	26.74	±	2.24	±	2.62
0.90–1.25								1.026	54.9	8.30	±	0.78	±	1.26
		$60<\theta<75$							$75<\theta<90$					
0.13–0.16	0.146	67.7	229.18	±	16.59	±	16.27	0.146	82.0	225.52	±	21.38	±	37.42
0.16–0.20	0.179	67.5	239.96	±	12.25	±	12.66	0.179	82.4	231.46	±	13.39	±	15.06
0.20–0.24	0.219	66.9	206.00	±	11.12	±	9.75	0.217	82.2	174.60	±	10.75	±	8.85
0.24–0.30	0.267	67.4	158.61	±	7.97	±	6.68	0.266	82.1	145.64	±	8.08	±	7.50
0.30–0.36	0.326	67.0	122.51	±	7.14	±	5.28	0.326	81.7	95.95	±	6.62	±	5.35
0.36–0.42	0.386	67.3	108.89	±	6.87	±	5.28	0.386	81.2	74.19	±	5.65	±	4.01
0.42–0.50	0.452	67.2	84.97	±	5.14	±	4.20	0.451	81.5	54.15	±	4.17	±	3.27
0.50–0.60	0.538	66.5	55.66	±	3.64	±	3.36	0.543	81.8	47.54	±	3.52	±	3.64
0.60–0.72	0.646	67.1	35.97	±	2.70	±	2.93	0.642	81.4	28.36	±	2.47	±	2.77
0.72–0.90	0.789	67.1	16.32	±	1.47	±	1.84	0.776	82.1	8.06	±	0.95	±	1.06
0.90–1.25	1.017	66.6	3.69	±	0.38	±	0.65	0.994	81.0	1.53	±	0.23	±	0.33
		$90<\theta<105$							$105<\theta<125$					
0.13–0.16	0.147	98.0	207.12	±	19.48	±	25.47	0.145	115.2	187.48	±	12.10	±	10.55
0.16–0.20	0.179	98.0	205.33	±	12.46	±	11.74	0.179	113.9	180.34	±	9.72	±	8.09
0.20–0.24	0.221	97.4	150.38	±	10.13	±	7.66	0.218	113.5	106.32	±	7.15	±	4.71
0.24–0.30	0.267	97.0	115.93	±	7.25	±	5.92	0.265	113.5	60.29	±	4.32	±	2.94
0.30–0.36	0.326	97.2	74.73	±	5.56	±	3.77	0.326	114.3	49.43	±	3.91	±	3.06
0.36–0.42	0.387	97.1	50.53	±	4.75	±	3.37	0.385	113.8	30.43	±	3.04	±	2.39
0.42–0.50	0.454	97.3	33.14	±	3.19	±	2.53	0.454	112.8	19.43	±	2.10	±	1.95
0.50–0.60	0.538	96.3	24.80	±	2.51	±	2.50	0.533	112.3	7.15	±	1.16	±	0.95
0.60–0.72	0.644	95.4	11.13	±	1.48	±	1.48	0.636	113.3	2.68	±	0.61	±	0.48
0.72–0.90	0.778	95.9	3.05	±	0.53	±	0.58	0.765	110.2	0.67	±	0.20	±	0.18
0.90–1.25	0.986	95.1	0.33	±	0.09	±	0.11							

Table 8 Double-differential inclusive cross-section $\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$ [mb/(GeV/c sr)] of the production of π^-'s in $\pi^+ + \mathrm{Pb} \to \pi^- + \mathrm{X}$ interactions with $+3.0$ GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

| p_T | $20 < \theta < 30$ | | | | | | $30 < \theta < 40$ | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			
0.10–0.13	0.115	24.9	278.41	±	22.40	±	26.50	0.114	34.7	278.41	±	21.01	±	23.15
0.13–0.16	0.146	25.1	299.91	±	20.88	±	21.97	0.145	35.0	242.67	±	17.67	±	16.57
0.16–0.20	0.180	25.2	254.28	±	15.49	±	14.12	0.178	35.0	222.74	±	13.87	±	12.54
0.20–0.24	0.219	24.9	233.03	±	14.61	±	11.66	0.219	34.9	245.44	±	14.91	±	12.33
0.24–0.30	0.267	24.9	227.80	±	11.88	±	10.02	0.269	34.8	185.51	±	10.37	±	7.93
0.30–0.36	0.327	25.0	168.24	±	10.00	±	6.89	0.327	34.9	179.90	±	10.46	±	7.39
0.36–0.42	0.387	25.3	136.95	±	9.30	±	6.06	0.386	35.2	123.66	±	8.70	±	5.28
0.42–0.50	0.451	25.1	94.74	±	6.81	±	4.93	0.455	34.9	90.20	±	6.46	±	4.30
0.50–0.60	0.538	24.9	42.37	±	3.95	±	2.55	0.544	35.6	53.85	±	4.50	±	3.14
0.60–0.72	0.651	24.5	18.55	±	2.36	±	1.45	0.646	34.9	25.68	±	2.84	±	1.96
0.72–0.90								0.775	34.8	11.47	±	1.58	±	1.18

| p_T | $40 < \theta < 50$ | | | | | | $50 < \theta < 60$ | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			
0.10–0.13	0.116	45.4	249.23	±	21.35	±	20.98						
0.13–0.16	0.146	45.3	209.97	±	15.51	±	13.85	0.145	55.2	274.61	±	19.57	±	18.09
0.16–0.20	0.179	45.3	213.04	±	13.56	±	12.10	0.181	55.0	182.43	±	12.24	±	10.20
0.20–0.24	0.220	44.6	219.35	±	14.13	±	11.74	0.220	54.6	171.73	±	12.03	±	8.76
0.24–0.30	0.270	44.8	191.45	±	10.63	±	8.41	0.271	54.9	140.22	±	8.95	±	6.20
0.30–0.36	0.330	44.7	167.48	±	10.12	±	7.24	0.328	55.2	124.14	±	8.54	±	5.22
0.36–0.42	0.389	44.8	120.19	±	8.58	±	5.27	0.393	54.9	97.98	±	7.82	±	4.50
0.42–0.50	0.461	45.0	77.28	±	5.88	±	3.69	0.458	54.8	68.84	±	5.61	±	3.40
0.50–0.60	0.546	44.7	44.65	±	4.09	±	2.70	0.553	55.0	44.83	±	4.17	±	2.89
0.60–0.72	0.659	45.0	34.25	±	3.36	±	2.78	0.657	54.8	24.17	±	2.85	±	2.04
0.72–0.90	0.807	45.4	12.16	±	1.62	±	1.31	0.821	54.6	9.38	±	1.35	±	1.03
0.90–1.25								1.031	55.4	0.95	±	0.28	±	0.16

| p_T | $60 < \theta < 75$ | | | | | | $75 < \theta < 90$ | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			
0.13–0.16	0.145	67.4	284.88	±	18.06	±	19.00	0.147	81.9	255.67	±	21.55	±	26.37
0.16–0.20	0.179	67.1	195.82	±	11.08	±	10.08	0.179	82.5	212.71	±	13.09	±	13.67
0.20–0.24	0.221	67.2	169.76	±	10.27	±	8.65	0.220	81.8	163.11	±	10.48	±	8.74
0.24–0.30	0.271	67.2	120.78	±	7.03	±	5.38	0.269	82.2	114.63	±	7.25	±	6.33
0.30–0.36	0.333	66.3	98.39	±	6.56	±	5.04	0.331	82.6	70.24	±	5.50	±	3.51
0.36–0.42	0.392	66.8	73.64	±	5.62	±	3.68	0.395	81.4	46.13	±	4.50	±	2.70
0.42–0.50	0.460	66.9	55.78	±	4.21	±	3.03	0.461	81.7	46.07	±	3.94	±	3.19
0.50–0.60	0.551	66.8	45.08	±	3.44	±	3.11	0.556	81.6	23.66	±	2.52	±	2.01
0.60–0.72	0.660	67.2	19.40	±	2.08	±	1.75	0.667	82.7	9.78	±	1.46	±	1.07
0.72–0.90	0.813	68.0	5.62	±	0.87	±	0.66	0.793	80.8	2.81	±	0.55	±	0.43
0.90–1.25	1.060	69.8	0.80	±	0.19	±	0.15	1.024	80.9	0.20	±	0.08	±	0.06

| p_T | $90 < \theta < 105$ | | | | | | $105 < \theta < 125$ | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			
0.13–0.16	0.143	96.3	346.65	±	107.09	±	38.47	0.144	114.2	239.22	±	14.97	±	15.78
0.16–0.20	0.178	97.5	193.38	±	12.40	±	11.77	0.179	113.5	146.14	±	8.81	±	6.79
0.20–0.24	0.221	96.9	114.06	±	8.58	±	5.35	0.220	113.9	84.79	±	6.53	±	4.27
0.24–0.30	0.269	97.2	73.14	±	5.70	±	3.73	0.269	114.4	44.06	±	3.70	±	2.43
0.30–0.36	0.336	96.6	48.97	±	4.75	±	3.16	0.331	115.1	30.17	±	3.07	±	2.16
0.36–0.42	0.391	96.1	31.91	±	3.76	±	2.30	0.389	112.4	24.92	±	2.84	±	2.30
0.42–0.50	0.461	97.1	26.68	±	3.01	±	2.40	0.458	113.6	8.58	±	1.37	±	1.00
0.50–0.60	0.545	96.7	15.41	±	2.04	±	1.78	0.543	114.0	4.50	±	0.88	±	0.70
0.60–0.72	0.647	97.0	3.50	±	0.85	±	0.53	0.676	111.5	1.64	±	0.47	±	0.35
0.72–0.90	0.794	93.5	1.31	±	0.40	±	0.29	0.842	112.0	0.23	±	0.12	±	0.08
0.90–1.25	1.008	95.6	0.10	±	0.05	±	0.04						

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Table 9 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of protons in π^-+Pb $\rightarrow$ p + X interactions with -3.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$		$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$	
	$20 < \theta < 30$				**$30 < \theta < 40$**			
0.20–0.24	0.220	25.3	1036.61	$\pm$ 38.01 $\pm$ 58.62				
0.24–0.30	0.269	25.4	904.84	$\pm$ 27.62 $\pm$ 44.99	0.270	35.0	1143.55	$\pm$ 31.19 $\pm$ 53.55
0.30–0.36	0.329	25.4	639.72	$\pm$ 22.64 $\pm$ 28.63	0.329	35.1	928.68	$\pm$ 27.05 $\pm$ 39.07
0.36–0.42	0.388	25.5	457.19	$\pm$ 19.39 $\pm$ 19.45	0.390	35.4	732.42	$\pm$ 24.13 $\pm$ 28.30
0.42–0.50	0.458	25.5	313.85	$\pm$ 13.23 $\pm$ 12.49	0.457	35.2	519.98	$\pm$ 17.52 $\pm$ 18.89
0.50–0.60	0.545	25.2	234.13	$\pm$ 10.53 $\pm$ 9.76	0.546	35.3	356.56	$\pm$ 12.98 $\pm$ 13.29
0.60–0.72	0.655	25.4	118.52	$\pm$ 6.85 $\pm$ 5.93	0.652	35.6	193.89	$\pm$ 8.54 $\pm$ 8.55
0.72–0.90					0.797	35.6	98.87	$\pm$ 4.99 $\pm$ 5.77
	$40 < \theta < 50$				**$50 < \theta < 60$**			
0.30–0.36	0.329	45.1	1143.24	$\pm$ 29.98 $\pm$ 43.77				
0.36–0.42	0.389	45.0	902.26	$\pm$ 26.36 $\pm$ 32.58	0.389	55.1	974.16	$\pm$ 26.64 $\pm$ 35.22
0.42–0.50	0.457	45.1	706.76	$\pm$ 20.55 $\pm$ 24.82	0.458	55.1	737.12	$\pm$ 20.59 $\pm$ 26.21
0.50–0.60	0.548	45.1	452.38	$\pm$ 14.68 $\pm$ 16.79	0.548	55.1	521.79	$\pm$ 15.82 $\pm$ 20.42
0.60–0.72	0.654	45.0	261.67	$\pm$ 10.10 $\pm$ 11.45	0.655	55.1	303.83	$\pm$ 10.96 $\pm$ 14.24
0.72–0.90	0.797	45.2	131.12	$\pm$ 5.78 $\pm$ 7.51	0.799	55.0	145.46	$\pm$ 6.16 $\pm$ 8.81
0.90–1.25	1.023	45.0	30.16	$\pm$ 1.75 $\pm$ 2.82	1.026	55.0	33.93	$\pm$ 1.86 $\pm$ 3.32
	$60 < \theta < 75$				**$75 < \theta < 90$**			
0.50–0.60	0.550	67.5	487.76	$\pm$ 12.06 $\pm$ 20.01				
0.60–0.72	0.657	67.4	305.42	$\pm$ 8.93 $\pm$ 16.46	0.656	81.9	240.01	$\pm$ 7.87 $\pm$ 16.12
0.72–0.90	0.802	67.9	134.79	$\pm$ 4.80 $\pm$ 10.22	0.800	82.0	93.43	$\pm$ 4.00 $\pm$ 8.49
0.90–1.25	1.026	68.1	34.45	$\pm$ 1.56 $\pm$ 4.27	1.038	81.8	20.67	$\pm$ 1.18 $\pm$ 2.93
	$90 < \theta < 105$				**$105 < \theta < 125$**			
0.50–0.60					0.547	113.3	145.78	$\pm$ 5.48 $\pm$ 12.43
0.60–0.72	0.657	96.9	141.06	$\pm$ 5.98 $\pm$ 11.55	0.652	113.1	52.70	$\pm$ 3.02 $\pm$ 6.65
0.72–0.90	0.802	96.6	53.79	$\pm$ 3.00 $\pm$ 5.60	0.801	112.2	16.35	$\pm$ 1.36 $\pm$ 3.04
0.90–1.25	1.052	96.5	9.60	$\pm$ 0.77 $\pm$ 1.51	1.025	111.3	1.51	$\pm$ 0.22 $\pm$ 0.48

Table 10 Double-differential inclusive cross-section $\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$ [mb/(GeV/c sr)] of the production of π^+'s in $\pi^- + \mathrm{Pb} \to \pi^+ + \mathrm{X}$ interactions with -3.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

| p_T | $20 < \theta < 30$ | | | | | | $30 < \theta < 40$ | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			
0.10–0.13	0.114	25.3	199.86	±	20.55	±	16.27	0.116	34.6	173.51	±	17.68	±	13.80
0.13–0.16	0.144	25.2	239.05	±	21.35	±	16.65	0.146	34.8	202.69	±	18.12	±	13.23
0.16–0.20	0.180	25.3	226.94	±	17.01	±	12.59	0.181	35.2	200.62	±	15.08	±	11.16
0.20–0.24	0.221	24.8	264.59	±	17.87	±	13.58	0.220	34.5	200.00	±	15.47	±	10.11
0.24–0.30	0.270	25.2	226.29	±	13.54	±	10.05	0.267	34.5	195.23	±	12.35	±	8.53
0.30–0.36	0.328	24.9	158.29	±	11.04	±	6.56	0.329	34.9	178.03	±	11.88	±	7.54
0.36–0.42	0.389	25.0	142.88	±	10.88	±	6.91	0.388	35.2	154.81	±	11.06	±	6.49
0.42–0.50	0.456	25.2	93.77	±	7.27	±	4.52	0.458	35.1	119.13	±	8.54	±	5.80
0.50–0.60	0.549	25.6	48.55	±	4.32	±	2.94	0.543	35.3	56.09	±	4.93	±	3.07
0.60–0.72	0.648	25.2	34.56	±	3.37	±	2.92	0.653	35.2	40.49	±	3.78	±	3.21
0.72–0.90								0.788	35.1	17.27	±	1.85	±	1.94

| p_T | $40 < \theta < 50$ | | | | | | $50 < \theta < 60$ | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			
0.10–0.13	0.116	44.9	170.23	±	18.92	±	13.93						
0.13–0.16	0.146	45.2	166.14	±	15.61	±	11.27	0.144	54.7	167.84	±	17.33	±	11.31
0.16–0.20	0.180	45.0	162.03	±	13.47	±	9.09	0.182	54.6	190.44	±	15.13	±	10.55
0.20–0.24	0.218	44.9	183.75	±	14.81	±	9.63	0.219	54.8	179.05	±	13.92	±	9.16
0.24–0.30	0.270	45.3	144.66	±	10.43	±	6.40	0.266	54.9	132.97	±	10.46	±	6.46
0.30–0.36	0.331	44.7	147.26	±	10.82	±	6.22	0.329	54.9	117.67	±	9.43	±	5.03
0.36–0.42	0.389	44.7	113.02	±	9.42	±	4.82	0.390	54.6	84.04	±	8.36	±	4.09
0.42–0.50	0.456	44.8	87.23	±	7.35	±	4.31	0.455	55.6	78.85	±	7.17	±	4.40
0.50–0.60	0.546	45.0	54.95	±	5.14	±	3.08	0.547	54.6	39.20	±	4.18	±	2.26
0.60–0.72	0.659	44.5	32.40	±	3.42	±	2.32	0.649	54.9	27.94	±	3.55	±	2.56
0.72–0.90	0.791	44.6	12.08	±	1.48	±	1.23	0.791	54.6	11.24	±	1.56	±	1.13
0.90–1.25								1.038	54.5	3.40	±	0.51	±	0.55

| p_T | $60 < \theta < 75$ | | | | | | $75 < \theta < 90$ | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			
0.13–0.16	0.146	66.9	173.66	±	17.56	±	15.44	0.148	81.9	149.71	±	18.00	±	19.17
0.16–0.20	0.180	67.4	178.62	±	12.15	±	9.64	0.180	82.5	139.42	±	11.61	±	8.17
0.20–0.24	0.221	67.5	184.21	±	12.16	±	8.80	0.220	81.8	135.38	±	10.65	±	6.56
0.24–0.30	0.270	66.8	104.44	±	7.40	±	4.46	0.269	81.5	92.67	±	7.16	±	4.10
0.30–0.36	0.332	66.5	88.92	±	7.03	±	4.06	0.329	82.4	82.08	±	7.00	±	4.48
0.36–0.42	0.391	67.8	61.38	±	6.01	±	3.29	0.391	81.4	44.02	±	5.02	±	2.62
0.42–0.50	0.463	66.4	49.78	±	4.59	±	2.77	0.459	82.1	41.89	±	4.29	±	2.74
0.50–0.60	0.550	66.9	37.77	±	3.50	±	2.48	0.550	81.0	26.49	±	3.06	±	2.16
0.60–0.72	0.655	67.4	20.34	±	2.30	±	1.72	0.657	81.3	14.94	±	2.07	±	1.57
0.72–0.90	0.803	66.3	7.22	±	1.06	±	0.81	0.794	82.2	4.05	±	0.75	±	0.55
0.90–1.25	1.040	66.3	1.76	±	0.27	±	0.33	1.050	81.8	0.82	±	0.17	±	0.19

| p_T | $90 < \theta < 105$ | | | | | | $105 < \theta < 125$ | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			
0.13–0.16								0.144	115.0	183.33	±	16.18	±	18.12
0.16–0.20	0.181	98.0	156.94	±	12.23	±	8.54	0.179	115.0	135.46	±	9.80	±	6.67
0.20–0.24	0.220	97.6	145.48	±	12.00	±	9.41	0.220	114.3	92.11	±	7.86	±	4.43
0.24–0.30	0.269	97.4	71.89	±	6.49	±	3.44	0.268	114.8	43.66	±	4.17	±	2.21
0.30–0.36	0.331	97.8	52.11	±	5.42	±	2.85	0.327	114.0	31.10	±	3.56	±	1.99
0.36–0.42	0.391	96.6	26.26	±	3.68	±	1.71	0.392	114.0	21.58	±	2.96	±	1.78
0.42–0.50	0.461	98.0	24.62	±	3.11	±	1.95	0.461	113.4	13.14	±	1.89	±	1.38
0.50–0.60	0.548	96.1	19.06	±	2.72	±	2.20	0.542	111.8	3.85	±	1.04	±	0.55
0.60–0.72	0.664	96.7	5.18	±	1.09	±	0.72	0.665	113.8	0.90	±	0.33	±	0.18
0.72–0.90	0.799	96.5	1.26	±	0.40	±	0.24	0.786	112.9	0.29	±	0.14	±	0.11
0.90–1.25	0.993	97.6	0.18	±	0.07	±	0.07	1.086	113.0	0.05	±	0.03	±	0.03

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Table 11 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^-'s in $\pi^- + \text{Pb} \rightarrow \pi^- + \text{X}$ interactions with -3.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

| p_T | $20 < \theta < 30$ | | | | | | $30 < \theta < 40$ | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$			
0.10–0.13	0.116	24.8	329.80	±	26.94	±	25.21	0.115	35.0	288.03	±	24.24	±	22.21
0.13–0.16	0.145	24.5	349.22	±	25.16	±	21.63	0.145	34.9	340.55	±	23.99	±	21.51
0.16–0.20	0.181	24.8	445.45	±	24.55	±	24.82	0.182	35.1	358.63	±	21.27	±	19.29
0.20–0.24	0.220	24.8	340.41	±	21.03	±	16.43	0.220	34.9	346.22	±	20.32	±	16.38
0.24–0.30	0.269	25.0	354.12	±	17.38	±	14.79	0.271	34.9	310.34	±	16.01	±	12.83
0.30–0.36	0.328	25.4	276.24	±	15.22	±	10.61	0.329	34.8	299.49	±	15.89	±	12.01
0.36–0.42	0.389	25.0	228.46	±	13.96	±	9.54	0.390	34.9	214.15	±	13.17	±	8.43
0.42–0.50	0.459	24.6	140.59	±	9.15	±	6.21	0.455	34.7	173.43	±	10.28	±	7.47
0.50–0.60	0.543	25.0	97.75	±	7.00	±	5.37	0.544	34.9	116.11	±	7.56	±	6.16
0.60–0.72	0.658	25.1	56.98	±	4.90	±	4.07	0.654	34.8	66.64	±	5.32	±	4.69
0.72–0.90							0.800	34.7	36.47	±	3.36	±	3.62

| p_T | $40 < \theta < 50$ | | | | | | $50 < \theta < 60$ | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$			
0.10–0.13	0.115	45.0	356.79	±	28.85	±	28.40						
0.13–0.16	0.145	45.2	340.55	±	24.44	±	21.41	0.145	54.9	347.54	±	25.57	±	22.38
0.16–0.20	0.180	44.8	321.30	±	19.62	±	17.47	0.179	55.1	280.60	±	18.63	±	15.12
0.20–0.24	0.220	44.8	267.66	±	18.05	±	12.94	0.219	54.6	265.77	±	17.71	±	12.82
0.24–0.30	0.269	45.0	273.34	±	14.77	±	11.35	0.269	54.8	226.82	±	13.74	±	9.78
0.30–0.36	0.330	44.3	226.25	±	13.39	±	8.75	0.330	54.8	198.43	±	12.77	±	7.85
0.36–0.42	0.389	44.9	188.53	±	12.22	±	7.56	0.389	54.8	161.74	±	11.57	±	6.71
0.42–0.50	0.453	44.8	135.37	±	9.15	±	6.05	0.459	54.8	133.35	±	9.27	±	6.50
0.50–0.60	0.545	45.1	102.15	±	7.17	±	5.77	0.548	54.7	97.26	±	6.92	±	5.55
0.60–0.72	0.661	45.2	54.11	±	4.73	±	3.92	0.655	54.7	54.22	±	4.89	±	4.24
0.72–0.90	0.794	44.7	31.40	±	3.11	±	3.28	0.782	54.9	24.15	±	2.67	±	2.50
0.90–1.25							1.023	54.0	3.88	±	0.67	±	0.60

| p_T | $60 < \theta < 75$ | | | | | | $75 < \theta < 90$ | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$			
0.13–0.16	0.145	67.5	302.61	±	20.67	±	18.70	0.146	82.4	331.78	±	35.33	±	42.46
0.16–0.20	0.179	67.0	258.56	±	14.81	±	13.03	0.180	82.3	241.66	±	16.01	±	15.39
0.20–0.24	0.219	67.0	245.19	±	14.35	±	11.27	0.218	82.2	213.42	±	14.09	±	11.57
0.24–0.30	0.268	67.0	180.62	±	10.02	±	7.50	0.268	82.3	161.38	±	9.97	±	8.31
0.30–0.36	0.327	67.2	134.22	±	8.60	±	5.35	0.330	81.3	95.25	±	7.52	±	4.65
0.36–0.42	0.386	67.3	123.40	±	8.54	±	6.01	0.388	82.3	88.82	±	7.35	±	5.13
0.42–0.50	0.456	66.9	91.43	±	6.22	±	4.67	0.454	82.0	61.83	±	5.19	±	3.89
0.50–0.60	0.543	66.6	71.76	±	4.94	±	4.61	0.545	81.8	46.40	±	4.15	±	3.94
0.60–0.72	0.649	66.5	35.44	±	3.18	±	2.96	0.645	82.6	18.85	±	2.37	±	1.98
0.72–0.90	0.790	66.8	15.10	±	1.67	±	1.68	0.790	82.2	6.72	±	1.07	±	0.93
0.90–1.25	1.013	66.5	2.79	±	0.43	±	0.49	0.967	84.3	0.69	±	0.21	±	0.16

| p_T | $90 < \theta < 105$ | | | | | | $105 < \theta < 125$ | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$			
0.13–0.16	0.146	98.1	394.62	±	36.15	±	66.01	0.144	114.6	270.80	±	18.06	±	16.24
0.16–0.20	0.179	97.9	261.84	±	16.95	±	17.02	0.178	114.4	181.56	±	11.13	±	7.95
0.20–0.24	0.218	97.3	171.35	±	12.62	±	8.44	0.219	113.7	139.24	±	9.94	±	6.91
0.24–0.30	0.267	96.7	122.16	±	8.90	±	7.11	0.267	113.5	74.60	±	5.50	±	3.83
0.30–0.36	0.328	97.2	79.73	±	7.02	±	4.76	0.329	114.3	41.64	±	4.21	±	2.80
0.36–0.42	0.389	95.8	59.85	±	5.93	±	3.99	0.387	113.7	37.41	±	3.94	±	3.23
0.42–0.50	0.454	97.6	38.59	±	4.07	±	3.17	0.456	112.9	23.49	±	2.71	±	2.58
0.50–0.60	0.540	97.8	27.88	±	3.10	±	3.03	0.540	113.3	8.83	±	1.52	±	1.28
0.60–0.72	0.648	97.0	8.21	±	1.45	±	1.19	0.636	110.1	2.21	±	0.61	±	0.44
0.72–0.90	0.781	97.5	3.51	±	0.73	±	0.72	0.793	110.1	0.39	±	0.17	±	0.11
0.90–1.25	1.007	97.0	0.13	±	0.07	±	0.05						

Table 12 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of protons in p + Pb → p + X interactions with +5.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_T \rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$			$\langle p_T \rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$		
	$20 < \theta < 30$					**$30 < \theta < 40$**				
0.20–0.24	0.221	25.2	1546.26	± 35.88	± 85.10					
0.24–0.30	0.271	25.4	1341.53	± 25.91	± 65.52	0.271	35.2	1660.34	± 38.17	± 76.85
0.30–0.36	0.331	25.4	1120.95	± 23.51	± 49.21	0.332	35.2	1420.63	± 25.97	± 58.88
0.36–0.42	0.391	25.3	821.66	± 19.73	± 33.26	0.392	35.4	1208.68	± 24.28	± 45.79
0.42–0.50	0.463	25.3	672.62	± 15.51	± 25.66	0.462	35.1	889.94	± 17.93	± 31.55
0.50–0.60	0.553	25.4	455.76	± 11.22	± 17.65	0.553	35.1	634.92	± 13.54	± 23.26
0.60–0.72	0.664	25.3	309.06	± 8.44	± 13.80	0.665	35.1	398.12	± 9.63	± 16.91
0.72–0.90						0.814	35.0	207.83	± 5.60	± 11.72
	$40 < \theta < 50$					**$50 < \theta < 60$**				
0.30–0.36	0.328	45.1	1595.37	± 27.33	± 60.02					
0.36–0.42	0.387	45.2	1356.28	± 25.25	± 48.00	0.387	55.1	1368.86	± 24.53	± 49.03
0.42–0.50	0.455	45.1	1031.76	± 19.08	± 35.49	0.456	55.0	1123.53	± 19.85	± 39.15
0.50–0.60	0.543	45.1	771.29	± 14.93	± 28.04	0.542	55.1	811.44	± 15.21	± 31.21
0.60–0.72	0.650	45.1	460.91	± 10.48	± 19.75	0.650	55.2	484.81	± 10.90	± 22.86
0.72–0.90	0.793	45.1	237.44	± 6.10	± 13.32	0.791	54.9	239.58	± 6.10	± 14.34
0.90–1.25	1.022	44.9	69.61	± 2.25	± 5.86	1.016	55.1	63.57	± 2.10	± 5.69
	$60 < \theta < 75$					**$75 < \theta < 90$**				
0.50–0.60	0.540	67.5	739.95	± 11.40	± 30.03					
0.60–0.72	0.646	67.3	438.23	± 8.22	± 23.42	0.644	81.8	316.74	± 6.96	± 21.15
0.72–0.90	0.784	67.1	205.84	± 4.61	± 15.52	0.782	81.5	131.31	± 3.66	± 11.89
0.90–1.25	1.003	66.9	49.48	± 1.52	± 5.92	1.005	81.6	25.69	± 1.09	± 3.52
	$90 < \theta < 105$					**$105 < \theta < 125$**				
0.50–0.60						0.537	112.9	187.82	± 4.81	± 16.13
0.60–0.72	0.642	97.2	196.26	± 5.48	± 16.00	0.641	112.5	80.05	± 2.96	± 10.00
0.72–0.90	0.782	96.9	66.40	± 2.58	± 6.89	0.774	112.2	19.75	± 1.16	± 3.67
0.90–1.25	1.001	97.2	10.64	± 0.66	± 1.63	0.993	111.3	2.53	± 0.25	± 0.78

Table 13 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^+'s in p + Pb $\rightarrow \pi^+$ + X interactions with +5.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

	$20 < \theta < 30$							$30 < \theta < 40$					
p_T	$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$			
0.10–0.13	0.116	25.1	267.26	±	18.22	±	20.47	0.116	35.1	268.86	±	17.99	±	20.64
0.13–0.16	0.145	24.8	312.67	±	18.06	±	19.71	0.145	35.3	284.40	±	17.03	±	17.90
0.16–0.20	0.181	24.8	311.71	±	15.00	±	16.56	0.180	34.7	260.40	±	13.30	±	14.05
0.20–0.24	0.221	24.8	368.68	±	16.32	±	17.77	0.221	34.5	322.34	±	15.28	±	16.13
0.24–0.30	0.270	24.9	317.30	±	12.28	±	13.48	0.271	34.9	275.68	±	11.40	±	11.69
0.30–0.36	0.332	25.0	257.43	±	10.99	±	10.34	0.332	34.8	232.89	±	10.46	±	9.29
0.36–0.42	0.392	25.2	189.71	±	9.45	±	8.09	0.392	34.7	164.00	±	8.75	±	6.61
0.42–0.50	0.462	25.0	152.68	±	7.23	±	7.12	0.465	35.0	146.23	±	7.02	±	6.23
0.50–0.60	0.550	25.3	88.63	±	4.63	±	5.11	0.550	34.6	88.97	±	4.78	±	4.90
0.60–0.72	0.660	24.8	53.59	±	2.99	±	4.33	0.665	35.1	48.95	±	2.89	±	3.57
0.72–0.90								0.815	35.0	28.73	±	1.68	±	3.17

	$40 < \theta < 50$							$50 < \theta < 60$					
p_T	$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$			
0.10–0.13	0.114	44.8	283.27	±	19.20	±	22.10						
0.13–0.16	0.145	45.1	251.05	±	15.57	±	15.71	0.145	54.7	252.28	±	16.32	±	16.42
0.16–0.20	0.180	45.0	224.49	±	12.26	±	12.24	0.179	55.0	229.44	±	12.65	±	12.43
0.20–0.24	0.219	44.7	249.73	±	13.24	±	12.30	0.220	54.7	200.69	±	11.41	±	9.96
0.24–0.30	0.268	44.7	228.00	±	10.33	±	9.83	0.267	54.9	191.54	±	9.54	±	8.49
0.30–0.36	0.328	44.9	181.75	±	9.17	±	7.29	0.328	54.5	152.56	±	8.65	±	6.58
0.36–0.42	0.387	44.8	150.17	±	8.45	±	6.11	0.388	54.9	127.97	±	8.03	±	5.96
0.42–0.50	0.456	44.9	113.53	±	6.45	±	5.26	0.456	54.9	96.50	±	5.92	±	4.62
0.50–0.60	0.545	44.8	84.90	±	4.74	±	4.37	0.544	54.7	75.17	±	4.68	±	4.40
0.60–0.72	0.650	44.4	44.35	±	2.98	±	3.01	0.653	54.5	39.86	±	3.00	±	2.91
0.72–0.90	0.798	44.6	27.46	±	1.77	±	2.67	0.799	54.4	22.27	±	1.71	±	2.19
0.90–1.25								1.025	54.3	8.89	±	0.69	±	1.33

	$60 < \theta < 75$							$75 < \theta < 90$					
p_T	$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$			
0.13–0.16	0.144	67.5	233.50	±	14.75	±	16.80	0.147	81.7	219.58	±	18.30	±	32.11
0.16–0.20	0.180	67.2	229.13	±	10.67	±	12.10	0.180	81.7	189.65	±	10.61	±	11.49
0.20–0.24	0.219	67.1	167.52	±	8.86	±	7.84	0.219	82.1	167.95	±	9.73	±	10.28
0.24–0.30	0.268	67.1	151.55	±	7.04	±	6.70	0.268	81.7	125.52	±	6.57	±	5.80
0.30–0.36	0.326	67.1	113.75	±	6.16	±	5.21	0.325	82.1	76.96	±	5.14	±	3.65
0.36–0.42	0.387	66.9	83.87	±	5.14	±	3.69	0.386	82.2	44.99	±	3.93	±	2.48
0.42–0.50	0.454	66.7	71.68	±	4.26	±	3.88	0.453	82.3	38.40	±	3.10	±	2.38
0.50–0.60	0.545	66.6	44.50	±	2.94	±	2.89	0.539	81.8	28.64	±	2.42	±	2.27
0.60–0.72	0.649	66.0	26.13	±	2.02	±	2.21	0.648	81.5	13.97	±	1.51	±	1.42
0.72–0.90	0.788	66.3	13.37	±	1.09	±	1.49	0.773	80.5	6.93	±	0.82	±	0.92
0.90–1.25	1.025	65.9	3.26	±	0.31	±	0.55	0.998	82.7	0.95	±	0.15	±	0.20

	$90 < \theta < 105$							$105 < \theta < 125$					
p_T	$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$			
0.13–0.16	0.147	98.1	202.72	±	22.45	±	28.56	0.145	114.5	200.88	±	12.07	±	13.14
0.16–0.20	0.179	96.7	197.63	±	11.57	±	14.36	0.178	114.5	151.81	±	7.75	±	6.85
0.20–0.24	0.219	97.3	146.70	±	8.86	±	7.01	0.217	113.5	89.70	±	5.84	±	4.11
0.24–0.30	0.266	96.9	80.71	±	5.18	±	3.54	0.265	112.9	55.11	±	3.77	±	2.85
0.30–0.36	0.324	97.3	52.87	±	4.18	±	2.78	0.327	113.7	32.36	±	2.85	±	2.15
0.36–0.42	0.386	96.2	39.18	±	3.68	±	2.65	0.388	113.6	19.38	±	2.27	±	1.71
0.42–0.50	0.449	96.0	25.98	±	2.66	±	2.21	0.452	113.3	10.27	±	1.34	±	1.08
0.50–0.60	0.542	96.4	16.29	±	1.79	±	1.66	0.536	112.6	5.03	±	0.80	±	0.71
0.60–0.72	0.641	96.9	6.71	±	1.05	±	0.92	0.641	112.7	1.82	±	0.44	±	0.34
0.72–0.90	0.786	95.2	1.93	±	0.37	±	0.36	0.766	114.3	0.55	±	0.19	±	0.14
0.90–1.25	1.021	99.0	0.22	±	0.06	±	0.07	1.014	111.5	0.09	±	0.03	±	0.04

Table 14 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^-'s in p + Pb → π^- + X interactions with +5.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
	$20 < \theta < 30$							$30 < \theta < 40$						
0.10–0.13	0.115	25.1	304.24	±	20.03	±	25.56	0.115	35.0	301.50	±	19.73	±	24.42
0.13–0.16	0.145	24.9	370.87	±	20.48	±	25.97	0.145	34.7	283.30	±	16.74	±	18.22
0.16–0.20	0.179	24.9	343.71	±	16.20	±	18.99	0.180	35.0	301.63	±	14.71	±	16.56
0.20–0.24	0.219	25.0	320.21	±	15.29	±	15.28	0.218	34.8	268.43	±	13.72	±	12.99
0.24–0.30	0.267	25.1	256.11	±	11.20	±	10.86	0.268	34.9	251.66	±	11.00	±	10.63
0.30–0.36	0.325	25.0	172.19	±	9.07	±	6.95	0.327	34.9	183.77	±	9.33	±	7.32
0.36–0.42	0.385	25.0	123.56	±	7.79	±	5.39	0.386	34.8	152.87	±	8.75	±	6.76
0.42–0.50	0.456	25.3	77.99	±	5.40	±	3.82	0.452	34.9	95.78	±	5.88	±	4.45
0.50–0.60	0.536	25.2	45.54	±	3.72	±	2.85	0.543	35.3	57.91	±	4.11	±	3.36
0.60–0.72	0.641	25.8	25.29	±	2.44	±	2.04	0.647	35.3	26.96	±	2.54	±	2.06
0.72–0.90								0.787	35.8	9.91	±	1.26	±	1.01
	$40 < \theta < 50$							$50 < \theta < 60$						
0.10–0.13	0.116	44.9	355.68	±	22.33	±	29.10							
0.13–0.16	0.145	45.0	281.90	±	16.86	±	17.94	0.144	55.2	277.14	±	16.72	±	18.11
0.16–0.20	0.179	44.7	283.56	±	13.98	±	15.65	0.180	55.1	230.59	±	12.95	±	12.63
0.20–0.24	0.220	44.9	230.92	±	12.53	±	11.52	0.221	55.0	227.55	±	12.82	±	11.66
0.24–0.30	0.268	44.7	189.94	±	9.49	±	8.13	0.270	54.9	175.37	±	9.13	±	7.64
0.30–0.36	0.329	45.0	159.24	±	8.71	±	6.39	0.331	54.7	135.81	±	8.19	±	5.88
0.36–0.42	0.389	45.0	126.87	±	7.89	±	5.47	0.389	55.0	103.42	±	7.15	±	4.69
0.42–0.50	0.458	44.7	92.71	±	5.83	±	4.38	0.459	54.9	78.91	±	5.32	±	3.86
0.50–0.60	0.549	44.9	55.90	±	4.09	±	3.35	0.546	54.9	46.39	±	3.74	±	2.90
0.60–0.72	0.652	45.1	27.50	±	2.60	±	2.15	0.655	54.4	22.62	±	2.29	±	1.81
0.72–0.90	0.806	44.3	12.66	±	1.46	±	1.34	0.807	54.6	10.80	±	1.39	±	1.21
0.90–1.25								1.035	54.1	2.70	±	0.44	±	0.43
	$60 < \theta < 75$							$75 < \theta < 90$						
0.13–0.16	0.145	67.3	320.42	±	17.56	±	20.51	0.144	83.2	462.14	±	176.42	±	50.73
0.16–0.20	0.178	67.6	221.29	±	10.53	±	11.25	0.180	82.0	210.72	±	11.34	±	12.14
0.20–0.24	0.221	67.4	179.66	±	9.08	±	8.31	0.219	81.8	167.39	±	9.70	±	9.83
0.24–0.30	0.270	67.3	141.50	±	6.85	±	6.47	0.269	81.6	113.10	±	6.19	±	5.05
0.30–0.36	0.332	66.7	115.57	±	6.32	±	5.39	0.332	81.8	71.29	±	4.82	±	3.26
0.36–0.42	0.393	66.8	75.93	±	5.12	±	3.72	0.391	82.0	53.66	±	4.36	±	3.12
0.42–0.50	0.460	66.8	62.39	±	4.06	±	3.57	0.461	81.7	31.83	±	2.87	±	2.10
0.50–0.60	0.554	66.9	33.17	±	2.53	±	2.18	0.552	81.3	22.09	±	2.16	±	1.87
0.60–0.72	0.662	67.4	18.18	±	1.76	±	1.58	0.661	81.4	10.50	±	1.36	±	1.15
0.72–0.90	0.807	67.1	6.27	±	0.84	±	0.73	0.792	81.1	3.56	±	0.62	±	0.53
0.90–1.25	1.020	66.5	0.78	±	0.19	±	0.14	1.023	81.8	0.45	±	0.12	±	0.12
	$90 < \theta < 105$							$105 < \theta < 125$						
0.13–0.16								0.143	113.0	328.44	±	64.50	±	18.50
0.16–0.20	0.179	97.7	212.94	±	11.64	±	12.78	0.179	114.4	140.82	±	7.58	±	6.37
0.20–0.24	0.220	97.4	144.08	±	8.70	±	6.88	0.219	113.8	73.71	±	5.22	±	3.62
0.24–0.30	0.270	97.0	70.06	±	4.97	±	3.55	0.268	113.5	46.99	±	3.50	±	2.74
0.30–0.36	0.331	96.6	47.49	±	4.16	±	3.03	0.331	113.0	22.60	±	2.40	±	1.68
0.36–0.42	0.392	96.4	38.98	±	3.70	±	2.82	0.394	114.0	13.33	±	1.87	±	1.30
0.42–0.50	0.457	96.1	22.52	±	2.49	±	2.06	0.455	112.7	7.11	±	1.14	±	0.88
0.50–0.60	0.546	97.6	9.97	±	1.45	±	1.15	0.549	113.5	3.53	±	0.75	±	0.60
0.60–0.72	0.666	96.0	3.35	±	0.77	±	0.53	0.662	112.2	0.79	±	0.26	±	0.22
0.72–0.90	0.795	95.7	0.72	±	0.25	±	0.17							
0.90–1.25	1.072	94.5	0.06	±	0.03	±	0.04							

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Table 15 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of protons in $\pi^+ + Pb \rightarrow p + X$ interactions with +5.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
	$20 < \theta < 30$							$30 < \theta < 40$						
0.20–0.24	0.221	25.3	1522.87	±	32.36	±	83.96							
0.24–0.30	0.271	25.3	1303.21	±	22.73	±	64.06	0.272	35.1	1583.45	±	25.49	±	73.75
0.30–0.36	0.331	25.4	1013.62	±	19.71	±	44.88	0.331	35.1	1387.97	±	22.71	±	57.97
0.36–0.42	0.391	25.4	777.88	±	16.89	±	31.82	0.392	35.3	1130.04	±	20.69	±	43.20
0.42–0.50	0.461	25.5	615.47	±	13.00	±	23.78	0.462	35.3	852.25	±	15.50	±	30.54
0.50–0.60	0.553	25.4	377.71	±	8.80	±	14.85	0.553	35.2	612.54	±	11.68	±	22.41
0.60–0.72	0.663	25.5	255.24	±	6.55	±	11.59	0.664	35.2	361.09	±	7.98	±	15.52
0.72–0.90								0.812	35.0	176.23	±	4.43	±	10.03
	$40 < \theta < 50$							$50 < \theta < 60$						
0.30–0.36	0.328	45.2	1583.83	±	24.96	±	60.12							
0.36–0.42	0.387	45.1	1345.47	±	22.19	±	48.09	0.387	55.1	1419.21	±	22.05	±	52.23
0.42–0.50	0.456	45.2	1008.80	±	16.68	±	35.08	0.456	55.2	1153.76	±	17.84	±	40.62
0.50–0.60	0.543	45.2	717.96	±	12.74	±	26.39	0.543	55.1	749.16	±	12.96	±	29.09
0.60–0.72	0.650	45.2	439.67	±	9.01	±	19.02	0.650	55.1	478.28	±	9.59	±	22.79
0.72–0.90	0.789	45.1	224.20	±	5.20	±	12.65	0.790	55.0	220.49	±	5.17	±	13.26
0.90–1.25	1.019	45.1	61.16	±	1.84	±	5.17	1.014	55.0	55.37	±	1.72	±	4.96
	$60 < \theta < 75$							$75 < \theta < 90$						
0.50–0.60	0.539	67.6	756.09	±	10.21	±	30.97							
0.60–0.72	0.645	67.2	448.63	±	7.38	±	24.09	0.644	82.0	324.78	±	6.26	±	21.74
0.72–0.90	0.782	67.4	201.71	±	4.05	±	15.25	0.783	82.0	129.67	±	3.23	±	11.75
0.90–1.25	1.002	67.0	50.22	±	1.35	±	6.01	1.004	81.6	29.82	±	1.04	±	4.08
	$90 < \theta < 105$							$105 < \theta < 125$						
0.50–0.60								0.538	112.9	239.54	±	4.83	±	20.51
0.60–0.72	0.643	97.2	214.78	±	5.08	±	17.51	0.643	112.9	104.19	±	2.99	±	13.00
0.72–0.90	0.779	97.0	84.35	±	2.58	±	8.74	0.776	112.5	28.24	±	1.23	±	5.24
0.90–1.25	1.008	96.6	14.14	±	0.67	±	2.15	0.993	112.9	3.74	±	0.26	±	1.14

Table 16 Double-differential inclusive cross-section $\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$ [mb/(GeV/c sr)] of the production of π^+'s in $\pi^+ + \mathrm{Pb} \to \pi^+ + \mathrm{X}$ interactions with $+5.0$ GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$20 < \theta < 30$ $\langle p_\mathrm{T} \rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					$30 < \theta < 40$ $\langle p_\mathrm{T} \rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
0.10–0.13	0.115	25.1	353.96	±	18.10	±	25.81	0.115	34.8	361.56	±	18.86	±	28.29
0.13–0.16	0.146	24.6	400.01	±	18.06	±	24.76	0.146	35.0	355.45	±	16.65	±	22.03
0.16–0.20	0.181	24.7	499.68	±	16.81	±	26.06	0.181	34.9	375.28	±	14.13	±	19.78
0.20–0.24	0.221	24.8	515.12	±	17.06	±	24.30	0.222	34.8	437.90	±	15.86	±	21.44
0.24–0.30	0.271	24.8	509.34	±	13.76	±	21.16	0.272	34.9	437.28	±	12.74	±	18.07
0.30–0.36	0.332	24.8	424.23	±	12.42	±	16.36	0.332	34.8	366.68	±	11.64	±	14.02
0.36–0.42	0.391	25.0	406.93	±	12.40	±	16.65	0.391	34.9	320.76	±	10.94	±	12.24
0.42–0.50	0.462	24.8	300.02	±	9.01	±	13.46	0.462	34.8	258.56	±	8.39	±	10.46
0.50–0.60	0.553	25.0	199.21	±	6.23	±	11.01	0.554	34.9	185.17	±	6.24	±	9.75
0.60–0.72	0.665	25.0	124.05	±	4.24	±	9.69	0.662	34.7	106.78	±	3.91	±	7.52
0.72–0.90								0.811	34.8	57.25	±	2.24	±	6.20

p_T	$40 < \theta < 50$ $\langle p_\mathrm{T} \rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					$50 < \theta < 60$ $\langle p_\mathrm{T} \rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
0.10–0.13	0.115	45.0	331.16	±	18.95	±	26.72							
0.13–0.16	0.145	45.1	343.21	±	16.06	±	21.10	0.146	54.9	298.45	±	15.42	±	19.06
0.16–0.20	0.180	44.9	331.74	±	13.27	±	17.68	0.180	55.0	331.39	±	13.38	±	17.55
0.20–0.24	0.220	44.8	369.31	±	14.20	±	17.71	0.219	55.0	284.21	±	12.21	±	13.59
0.24–0.30	0.270	44.9	331.46	±	11.10	±	13.99	0.269	54.8	284.22	±	10.34	±	12.25
0.30–0.36	0.328	44.9	312.29	±	10.70	±	12.02	0.329	54.7	241.14	±	9.66	±	10.02
0.36–0.42	0.388	44.8	261.41	±	9.90	±	10.14	0.387	54.8	227.08	±	9.45	±	10.06
0.42–0.50	0.457	44.8	226.84	±	8.11	±	10.04	0.456	54.6	156.18	±	6.67	±	7.01
0.50–0.60	0.543	44.6	144.36	±	5.55	±	7.12	0.543	54.8	125.78	±	5.40	±	6.96
0.60–0.72	0.652	44.8	92.93	±	3.91	±	6.09	0.654	54.5	76.03	±	3.70	±	5.33
0.72–0.90	0.791	44.6	48.17	±	2.16	±	4.60	0.787	54.3	38.76	±	2.05	±	3.72
0.90–1.25								1.020	54.4	11.97	±	0.72	±	1.77

p_T	$60 < \theta < 75$ $\langle p_\mathrm{T} \rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					$75 < \theta < 90$ $\langle p_\mathrm{T} \rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
0.13–0.16	0.145	67.3	289.15	±	13.82	±	18.46	0.147	81.5	280.71	±	35.76	±	31.78
0.16–0.20	0.179	67.4	276.82	±	10.27	±	14.39	0.179	82.1	251.92	±	10.76	±	14.56
0.20–0.24	0.219	67.5	272.81	±	10.06	±	12.46	0.219	82.4	266.28	±	10.99	±	16.45
0.24–0.30	0.268	67.1	224.31	±	7.61	±	9.72	0.265	82.1	173.36	±	6.86	±	7.87
0.30–0.36	0.327	66.9	177.41	±	6.83	±	7.78	0.325	81.9	121.72	±	5.70	±	5.46
0.36–0.42	0.387	67.1	144.41	±	6.01	±	5.89	0.387	81.7	93.48	±	4.97	±	4.78
0.42–0.50	0.454	66.5	122.55	±	4.90	±	6.18	0.454	81.6	79.00	±	3.91	±	4.55
0.50–0.60	0.540	67.1	90.13	±	3.73	±	5.54	0.542	81.9	52.66	±	2.90	±	3.97
0.60–0.72	0.648	66.7	54.25	±	2.60	±	4.41	0.645	81.6	34.08	±	2.13	±	3.35
0.72–0.90	0.782	66.6	25.67	±	1.38	±	2.80	0.780	81.4	13.28	±	1.01	±	1.71
0.90–1.25	1.004	66.1	6.04	±	0.40	±	1.01	1.005	81.4	1.97	±	0.20	±	0.41

p_T	$90 < \theta < 105$ $\langle p_\mathrm{T} \rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					$105 < \theta < 125$ $\langle p_\mathrm{T} \rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
0.13–0.16								0.144	114.4	254.40	±	11.99	±	14.50
0.16–0.20	0.179	97.7	298.92	±	13.00	±	26.10	0.178	114.1	200.96	±	7.90	±	8.83
0.20–0.24	0.218	97.4	215.12	±	9.72	±	11.14	0.218	114.1	138.81	±	6.39	±	5.97
0.24–0.30	0.267	97.4	128.41	±	5.85	±	5.55	0.265	114.1	82.70	±	4.03	±	3.92
0.30–0.36	0.326	97.3	80.86	±	4.63	±	4.06	0.323	113.3	49.03	±	3.11	±	2.98
0.36–0.42	0.385	96.8	60.47	±	4.09	±	3.97	0.384	113.7	42.98	±	3.04	±	3.54
0.42–0.50	0.452	96.8	52.83	±	3.40	±	4.43	0.452	113.6	21.77	±	1.72	±	2.16
0.50–0.60	0.541	97.0	27.99	±	2.08	±	2.77	0.539	113.1	10.22	±	1.01	±	1.34
0.60–0.72	0.650	97.3	14.32	±	1.40	±	1.90	0.641	111.2	4.08	±	0.59	±	0.70
0.72–0.90	0.776	95.7	3.34	±	0.44	±	0.60	0.786	111.3	0.91	±	0.20	±	0.21
0.90–1.25	1.026	95.6	0.44	±	0.07	±	0.14	0.997	113.4	0.09	±	0.03	±	0.03

Table 17 Double-differential inclusive cross-section $\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$ [mb/(GeV/c sr)] of the production of π^-'s in $\pi^+ + \mathrm{Pb} \to \pi^- + \mathrm{X}$ interactions with $+5.0$ GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$20 < \theta < 30$ $\langle p_\mathrm{T} \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			$30 < \theta < 40$ $\langle p_\mathrm{T} \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$		
0.10–0.13	0.115	25.2	421.00	± 19.24	± 30.88	0.115	35.1	381.97	± 18.41	± 29.36
0.13–0.16	0.145	24.8	487.90	± 20.45	± 32.24	0.144	35.0	341.81	± 15.99	± 21.43
0.16–0.20	0.179	25.1	496.70	± 17.31	± 27.25	0.180	34.9	406.55	± 14.96	± 21.86
0.20–0.24	0.219	24.9	430.60	± 15.59	± 20.27	0.219	34.7	376.84	± 14.36	± 17.87
0.24–0.30	0.268	25.0	407.32	± 12.49	± 17.07	0.268	34.9	366.10	± 11.78	± 15.29
0.30–0.36	0.326	24.9	298.50	± 10.56	± 11.45	0.327	34.8	269.24	± 9.99	± 10.35
0.36–0.42	0.385	25.1	247.23	± 9.76	± 9.99	0.386	35.0	227.87	± 9.50	± 9.67
0.42–0.50	0.453	25.0	162.42	± 6.86	± 7.33	0.454	35.0	153.38	± 6.60	± 6.67
0.50–0.60	0.541	25.1	101.80	± 4.91	± 5.81	0.537	34.9	105.91	± 4.91	± 5.70
0.60–0.72	0.647	24.9	50.70	± 3.02	± 3.67	0.643	35.0	54.39	± 3.20	± 3.82
0.72–0.90						0.784	35.0	23.45	± 1.71	± 2.21

p_T	$40 < \theta < 50$ $\langle p_\mathrm{T} \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			$50 < \theta < 60$ $\langle p_\mathrm{T} \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$		
0.10–0.13	0.115	45.0	416.83	± 21.02	± 32.97					
0.13–0.16	0.145	44.9	396.86	± 17.54	± 24.88	0.145	54.8	351.62	± 16.46	± 22.75
0.16–0.20	0.180	44.8	323.81	± 13.23	± 17.52	0.179	54.9	299.33	± 12.94	± 16.20
0.20–0.24	0.220	44.9	306.91	± 12.84	± 14.90	0.221	54.7	263.45	± 12.06	± 13.09
0.24–0.30	0.271	44.9	276.61	± 10.19	± 11.61	0.270	54.9	245.14	± 9.53	± 10.31
0.30–0.36	0.331	44.5	231.80	± 9.29	± 8.99	0.331	54.8	193.73	± 8.62	± 8.07
0.36–0.42	0.391	44.8	185.15	± 8.45	± 7.69	0.391	54.8	170.22	± 8.17	± 7.39
0.42–0.50	0.461	44.8	134.03	± 6.21	± 6.05	0.460	54.8	122.15	± 5.89	± 5.69
0.50–0.60	0.547	45.0	89.20	± 4.57	± 5.08	0.552	54.9	79.09	± 4.33	± 4.74
0.60–0.72	0.655	44.7	53.98	± 3.20	± 3.97	0.661	54.7	39.40	± 2.71	± 2.98
0.72–0.90	0.800	45.0	25.30	± 1.84	± 2.54	0.793	54.4	20.86	± 1.74	± 2.24
0.90–1.25						1.041	54.9	4.15	± 0.50	± 0.62

p_T	$60 < \theta < 75$ $\langle p_\mathrm{T} \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			$75 < \theta < 90$ $\langle p_\mathrm{T} \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$		
0.13–0.16	0.145	67.6	351.64	± 15.41	± 22.18	0.147	82.3	348.67	± 22.02	± 40.01
0.16–0.20	0.179	67.6	302.95	± 10.97	± 15.31	0.179	82.2	302.99	± 11.99	± 17.75
0.20–0.24	0.220	67.3	218.09	± 8.81	± 9.88	0.221	81.9	231.39	± 10.21	± 14.32
0.24–0.30	0.272	67.0	187.21	± 6.98	± 8.35	0.270	82.3	141.53	± 6.13	± 6.13
0.30–0.36	0.329	66.8	146.62	± 6.28	± 6.62	0.331	81.7	92.61	± 4.87	± 4.03
0.36–0.42	0.391	67.0	125.70	± 5.83	± 5.97	0.390	81.6	81.51	± 4.76	± 4.57
0.42–0.50	0.461	67.1	93.31	± 4.41	± 5.27	0.461	82.0	52.66	± 3.30	± 3.40
0.50–0.60	0.550	67.2	55.55	± 2.93	± 3.52	0.550	81.5	37.89	± 2.54	± 3.16
0.60–0.72	0.663	66.7	33.25	± 2.12	± 2.82	0.660	81.6	17.49	± 1.57	± 1.86
0.72–0.90	0.811	66.9	13.79	± 1.12	± 1.55	0.803	81.6	6.98	± 0.78	± 0.97
0.90–1.25	1.041	67.4	3.05	± 0.33	± 0.51	0.977	81.5	0.60	± 0.12	± 0.14

p_T	$90 < \theta < 105$ $\langle p_\mathrm{T} \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			$105 < \theta < 125$ $\langle p_\mathrm{T} \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$		
0.13–0.16	0.146	97.8	386.00	± 23.59	± 47.48	0.145	114.5	288.85	± 13.06	± 19.15
0.16–0.20	0.180	97.2	253.81	± 11.20	± 14.98	0.178	113.8	179.87	± 7.67	± 7.96
0.20–0.24	0.220	97.8	180.56	± 8.77	± 8.69	0.219	113.9	100.59	± 5.39	± 4.59
0.24–0.30	0.269	97.5	108.14	± 5.49	± 5.32	0.270	113.8	66.82	± 3.65	± 3.55
0.30–0.36	0.332	97.3	77.29	± 4.70	± 4.66	0.330	113.5	43.65	± 2.94	± 3.01
0.36–0.42	0.393	97.6	54.65	± 3.89	± 3.76	0.390	113.0	25.57	± 2.30	± 2.30
0.42–0.50	0.460	97.0	36.39	± 2.82	± 3.22	0.461	112.7	17.25	± 1.58	± 1.95
0.50–0.60	0.548	96.4	23.04	± 1.98	± 2.56	0.549	111.0	7.50	± 0.99	± 1.12
0.60–0.72	0.664	96.8	8.24	± 1.07	± 1.20	0.654	110.9	2.07	± 0.39	± 0.43
0.72–0.90	0.800	97.3	2.27	± 0.41	± 0.45	0.780	111.0	0.45	± 0.14	± 0.13
0.90–1.25	1.058	95.6	0.22	± 0.06	± 0.08					

Table 18 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of protons in $\pi^- + \mathrm{Pb} \to \mathrm{p} + \mathrm{X}$ interactions with -5.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$ (20 < θ < 30)	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$ (30 < θ < 40)
0.20–0.24	0.220	25.3	1520.66 ± 25.88 ± 83.96			
0.24–0.30	0.269	25.4	1309.77 ± 18.48 ± 63.90	0.270	34.9	1499.20 ± 19.93 ± 69.44
0.30–0.36	0.329	25.4	1029.74 ± 16.19 ± 45.08	0.329	35.2	1325.78 ± 18.19 ± 54.90
0.36–0.42	0.389	25.4	763.05 ± 13.71 ± 30.68	0.388	35.1	1060.04 ± 16.14 ± 39.99
0.42–0.50	0.458	25.4	548.90 ± 10.00 ± 20.78	0.458	35.2	801.36 ± 12.19 ± 28.27
0.50–0.60	0.545	25.5	354.16 ± 7.15 ± 13.62	0.546	35.2	526.83 ± 8.79 ± 18.92
0.60–0.72	0.653	25.5	203.74 ± 4.83 ± 9.06	0.654	35.3	315.12 ± 6.14 ± 13.29
0.72–0.90				0.795	35.2	148.50 ± 3.37 ± 8.35

p_T	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$ (40 < θ < 50)	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$ (50 < θ < 60)
0.30–0.36	0.328	45.1	1470.74 ± 18.91 ± 55.39			
0.36–0.42	0.387	45.2	1259.94 ± 17.50 ± 44.52	0.387	55.1	1284.68 ± 17.20 ± 45.75
0.42–0.50	0.456	45.2	936.33 ± 13.11 ± 32.16	0.456	55.1	1012.41 ± 13.54 ± 35.31
0.50–0.60	0.542	45.2	663.18 ± 9.94 ± 24.04	0.543	54.9	701.92 ± 10.13 ± 26.99
0.60–0.72	0.651	45.1	398.33 ± 7.01 ± 16.99	0.650	55.1	445.64 ± 7.55 ± 21.05
0.72–0.90	0.790	45.2	194.16 ± 3.92 ± 10.84	0.790	55.1	213.54 ± 4.18 ± 12.73
0.90–1.25	1.019	45.3	54.87 ± 1.44 ± 4.60	1.017	55.1	52.10 ± 1.36 ± 4.67

p_T	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$ (60 < θ < 75)	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$ (75 < θ < 90)
0.50–0.60	0.548	67.6	689.62 ± 7.97 ± 27.99			
0.60–0.72	0.657	67.4	404.35 ± 5.72 ± 21.60	0.657	81.7	291.89 ± 4.84 ± 19.46
0.72–0.90	0.801	67.3	187.09 ± 3.20 ± 14.09	0.801	81.8	120.73 ± 2.54 ± 10.90
0.90–1.25	1.037	66.9	42.71 ± 1.02 ± 5.09	1.029	81.7	24.09 ± 0.74 ± 3.31

p_T	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$ (90 < θ < 105)	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$ (105 < θ < 125)
0.50–0.60				0.545	113.0	196.79 ± 3.58 ± 16.71
0.60–0.72	0.655	97.2	192.18 ± 3.93 ± 15.61	0.654	112.6	82.58 ± 2.18 ± 10.25
0.72–0.90	0.800	96.7	66.75 ± 1.88 ± 6.88	0.797	112.5	21.08 ± 0.85 ± 3.91
0.90–1.25	1.028	96.4	11.89 ± 0.50 ± 1.79	1.025	112.0	2.19 ± 0.15 ± 0.67

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Table 19 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^+'s in $\pi^- + Pb \rightarrow \pi^+ + X$ interactions with -5.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$						$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					
	20 < θ < 30								**30 < θ < 40**							
0.10–0.13	0.115	24.9	351.51	±	14.77	±	24.84		0.115	34.9	306.25	±	13.73	±	22.88
0.13–0.16	0.145	24.9	409.35	±	14.83	±	23.99		0.145	34.9	361.04	±	13.82	±	21.63
0.16–0.20	0.181	24.9	434.58	±	12.89	±	22.36		0.180	34.8	366.31	±	11.64	±	18.69
0.20–0.24	0.220	24.9	455.59	±	13.18	±	21.27		0.220	34.8	361.03	±	11.29	±	16.41
0.24–0.30	0.270	25.0	397.80	±	9.86	±	16.20		0.269	34.7	334.03	±	9.08	±	13.51
0.30–0.36	0.329	25.0	354.25	±	9.49	±	14.24		0.328	34.9	299.33	±	8.65	±	11.23
0.36–0.42	0.388	25.1	279.69	±	8.15	±	10.52		0.388	34.8	247.41	±	7.82	±	9.30
0.42–0.50	0.458	25.0	210.86	±	6.17	±	9.60		0.458	34.9	193.31	±	5.98	±	8.08
0.50–0.60	0.546	25.1	121.45	±	4.01	±	6.74		0.549	34.8	118.22	±	3.98	±	5.91
0.60–0.72	0.653	25.0	65.92	±	2.52	±	5.13		0.654	34.9	71.14	±	2.71	±	5.01
0.72–0.90									0.791	34.8	29.91	±	1.28	±	3.22
	40 < θ < 50								**50 < θ < 60**							
0.10–0.13	0.116	44.9	279.33	±	13.89	±	21.25								
0.13–0.16	0.145	45.0	327.26	±	13.30	±	19.60		0.144	55.1	276.27	±	12.37	±	17.15
0.16–0.20	0.180	44.8	311.46	±	10.49	±	16.06		0.179	54.8	277.65	±	9.84	±	14.24
0.20–0.24	0.219	44.9	303.90	±	10.50	±	14.03		0.219	55.0	257.19	±	9.59	±	11.71
0.24–0.30	0.269	44.8	282.99	±	8.32	±	11.39		0.269	54.9	235.29	±	7.63	±	9.52
0.30–0.36	0.328	44.9	238.24	±	7.64	±	8.85		0.329	54.7	197.78	±	7.01	±	7.51
0.36–0.42	0.387	44.6	205.85	±	7.22	±	7.98		0.389	54.7	162.83	±	6.48	±	6.77
0.42–0.50	0.456	44.6	165.90	±	5.66	±	7.21		0.456	54.7	135.70	±	5.17	±	6.32
0.50–0.60	0.543	44.8	97.91	±	3.79	±	4.89		0.544	54.9	88.87	±	3.64	±	4.64
0.60–0.72	0.653	44.6	61.14	±	2.64	±	4.03		0.651	54.6	51.07	±	2.47	±	3.50
0.72–0.90	0.789	44.6	28.19	±	1.36	±	2.70		0.793	54.6	26.98	±	1.40	±	2.56
0.90–1.25									1.018	54.6	6.39	±	0.40	±	0.96
	60 < θ < 75								**75 < θ < 90**							
0.13–0.16	0.147	67.0	242.66	±	10.24	±	15.57		0.146	82.3	236.05	±	23.55	±	31.94
0.16–0.20	0.180	67.2	249.55	±	7.93	±	12.72		0.181	82.1	243.32	±	8.66	±	14.36
0.20–0.24	0.220	67.2	228.81	±	7.51	±	10.16		0.220	82.1	220.71	±	7.99	±	11.88
0.24–0.30	0.269	67.0	199.54	±	5.84	±	8.28		0.268	82.0	149.98	±	5.20	±	6.31
0.30–0.36	0.330	67.0	144.09	±	4.99	±	5.81		0.330	82.0	103.44	±	4.32	±	4.74
0.36–0.42	0.391	66.8	106.81	±	4.30	±	4.53		0.390	81.7	79.68	±	3.76	±	3.90
0.42–0.50	0.461	66.6	93.03	±	3.50	±	4.68		0.462	81.9	59.44	±	2.84	±	3.51
0.50–0.60	0.550	66.9	60.34	±	2.47	±	3.61		0.549	82.0	37.26	±	1.97	±	2.69
0.60–0.72	0.659	66.5	33.74	±	1.66	±	2.70		0.655	81.8	20.76	±	1.34	±	2.02
0.72–0.90	0.802	66.7	14.67	±	0.84	±	1.59		0.800	81.9	7.67	±	0.59	±	0.97
0.90–1.25	1.041	66.7	3.15	±	0.22	±	0.54		1.026	80.6	1.44	±	0.15	±	0.29
	90 < θ < 105								**105 < θ < 125**							
0.13–0.16	0.144	99.2	363.80	±	101.44	±	56.63		0.146	114.6	217.40	±	8.77	±	12.43
0.16–0.20	0.180	97.5	244.60	±	9.22	±	17.18		0.179	114.2	169.75	±	5.87	±	7.22
0.20–0.24	0.219	97.2	179.99	±	7.17	±	8.31		0.219	113.7	106.36	±	4.48	±	4.35
0.24–0.30	0.267	97.3	107.88	±	4.38	±	4.36		0.269	113.5	59.95	±	2.79	±	2.73
0.30–0.36	0.329	96.9	66.05	±	3.42	±	3.18		0.328	113.9	36.69	±	2.18	±	2.17
0.36–0.42	0.391	97.5	57.13	±	3.21	±	3.51		0.389	113.8	27.69	±	1.92	±	2.11
0.42–0.50	0.460	97.1	38.79	±	2.29	±	2.95		0.457	112.8	15.87	±	1.23	±	1.53
0.50–0.60	0.547	96.7	22.74	±	1.60	±	2.31		0.546	113.5	7.27	±	0.72	±	0.92
0.60–0.72	0.659	96.4	8.75	±	0.82	±	1.11		0.649	112.4	1.87	±	0.28	±	0.33
0.72–0.90	0.802	96.9	2.75	±	0.31	±	0.50		0.788	109.9	0.54	±	0.12	±	0.12
0.90–1.25	1.043	95.7	0.24	±	0.04	±	0.07								

Table 20 Double-differential inclusive cross-section $\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$ [mb/(GeV/c sr)] of the production of π^-'s in $\pi^- + \mathrm{Pb} \to \pi^- + \mathrm{X}$ interactions with -5.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

| p_T | $20 < \theta < 30$ | | | | | | $30 < \theta < 40$ | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			
0.10–0.13	0.115	24.8	576.43	±	19.65	±	41.84	0.115	35.2	540.56	±	18.90	±	40.20
0.13–0.16	0.145	24.8	595.47	±	18.32	±	35.03	0.145	34.7	527.15	±	16.77	±	31.41
0.16–0.20	0.180	24.9	689.25	±	16.76	±	35.64	0.180	34.9	527.62	±	14.20	±	27.05
0.20–0.24	0.220	24.9	647.43	±	15.96	±	29.23	0.220	34.9	532.22	±	14.33	±	23.95
0.24–0.30	0.269	24.9	577.95	±	12.25	±	22.67	0.269	34.8	468.16	±	10.90	±	18.37
0.30–0.36	0.329	25.0	502.67	±	11.41	±	18.15	0.329	34.8	428.75	±	10.46	±	15.43
0.36–0.42	0.388	25.0	375.69	±	9.85	±	13.72	0.389	34.8	364.28	±	9.82	±	14.17
0.42–0.50	0.458	25.0	297.56	±	7.76	±	13.18	0.457	34.8	261.08	±	7.13	±	10.65
0.50–0.60	0.545	25.1	186.93	±	5.38	±	9.66	0.546	34.9	167.72	±	5.04	±	8.43
0.60–0.72	0.654	25.0	110.54	±	3.68	±	7.54	0.657	34.8	101.82	±	3.55	±	6.73
0.72–0.90								0.797	35.0	53.49	±	2.12	±	4.82

| p_T | $40 < \theta < 50$ | | | | | | $50 < \theta < 60$ | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			
0.10–0.13	0.115	45.0	531.24	±	19.82	±	41.25						
0.13–0.16	0.145	45.0	489.63	±	16.05	±	29.50	0.145	55.0	495.48	±	17.02	±	30.77
0.16–0.20	0.179	44.9	484.10	±	13.70	±	24.97	0.180	55.0	423.71	±	12.76	±	21.77
0.20–0.24	0.220	44.7	447.57	±	13.08	±	20.61	0.220	54.8	358.36	±	11.52	±	16.12
0.24–0.30	0.270	44.9	384.50	±	9.98	±	15.54	0.269	54.8	331.33	±	9.27	±	13.32
0.30–0.36	0.330	44.9	329.76	±	9.23	±	12.07	0.330	54.8	271.41	±	8.39	±	10.19
0.36–0.42	0.389	44.8	288.73	±	8.72	±	11.14	0.391	54.8	224.89	±	7.83	±	9.61
0.42–0.50	0.459	44.8	237.46	±	6.86	±	10.27	0.460	55.0	160.02	±	5.57	±	6.93
0.50–0.60	0.549	44.8	150.97	±	4.84	±	7.97	0.548	54.8	122.41	±	4.43	±	6.91
0.60–0.72	0.659	44.9	86.97	±	3.31	±	6.06	0.658	54.9	68.45	±	2.98	±	4.92
0.72–0.90	0.804	44.9	38.16	±	1.82	±	3.64	0.799	54.6	31.25	±	1.67	±	3.07
0.90–1.25								1.048	54.6	9.07	±	0.65	±	1.33

| p_T | $60 < \theta < 75$ | | | | | | $75 < \theta < 90$ | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			
0.13–0.16	0.145	67.2	427.10	±	14.10	±	26.27	0.144	82.8	596.48	±	140.04	±	81.54
0.16–0.20	0.179	67.5	390.30	±	10.29	±	19.06	0.179	82.3	351.41	±	10.89	±	22.28
0.20–0.24	0.219	67.0	327.09	±	9.22	±	13.96	0.219	82.2	280.74	±	9.23	±	15.66
0.24–0.30	0.267	67.1	258.29	±	6.75	±	10.22	0.267	81.8	200.66	±	6.22	±	9.66
0.30–0.36	0.329	67.1	199.34	±	6.05	±	8.63	0.327	81.8	134.82	±	4.96	±	5.85
0.36–0.42	0.387	67.1	149.07	±	5.16	±	6.31	0.386	81.7	107.94	±	4.43	±	5.38
0.42–0.50	0.456	66.6	118.01	±	3.98	±	5.90	0.456	81.9	83.85	±	3.39	±	5.07
0.50–0.60	0.544	66.9	83.94	±	3.01	±	5.26	0.542	81.8	52.40	±	2.42	±	4.11
0.60–0.72	0.650	67.0	50.77	±	2.16	±	4.19	0.648	81.8	29.18	±	1.67	±	3.01
0.72–0.90	0.787	66.7	22.38	±	1.17	±	2.46	0.786	81.6	9.89	±	0.76	±	1.31
0.90–1.25	1.010	66.9	4.71	±	0.34	±	0.75	1.024	81.8	1.22	±	0.15	±	0.25

| p_T | $90 < \theta < 105$ | | | | | | $105 < \theta < 125$ | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			
0.13–0.16	0.146	97.7	581.43	±	35.09	±	113.20	0.144	114.6	348.17	±	11.28	±	18.26
0.16–0.20	0.179	97.5	371.97	±	11.97	±	31.00	0.178	114.0	236.48	±	7.12	±	9.81
0.20–0.24	0.219	97.5	231.22	±	8.29	±	11.16	0.218	113.9	138.46	±	5.23	±	5.69
0.24–0.30	0.268	97.2	156.81	±	5.52	±	7.72	0.267	113.6	87.54	±	3.38	±	4.24
0.30–0.36	0.327	97.4	102.19	±	4.39	±	5.40	0.325	113.6	52.73	±	2.64	±	3.39
0.36–0.42	0.386	97.1	71.76	±	3.66	±	4.63	0.387	113.6	37.04	±	2.24	±	3.11
0.42–0.50	0.456	96.8	52.14	±	2.71	±	4.26	0.454	112.9	24.72	±	1.60	±	2.67
0.50–0.60	0.542	96.5	31.84	±	1.93	±	3.47	0.538	111.9	10.31	±	0.89	±	1.44
0.60–0.72	0.653	96.5	13.62	±	1.11	±	1.89	0.645	111.8	2.83	±	0.39	±	0.53
0.72–0.90	0.782	94.9	2.74	±	0.36	±	0.51	0.780	110.3	0.45	±	0.11	±	0.12
0.90–1.25	1.010	95.8	0.40	±	0.08	±	0.12	0.995	107.5	0.08	±	0.04	±	0.03

Table 21 Double-differential inclusive cross-section $\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$ [mb/(GeV/c sr)] of the production of protons in p + Pb → p + X interactions with +8.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	\multicolumn{7}{c}{$20 < \theta < 30$}	\multicolumn{7}{c}{$30 < \theta < 40$}
	$\langle p_T\rangle$	$\langle\theta\rangle$	\multicolumn{5}{c}{$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$}	$\langle p_T\rangle$	$\langle\theta\rangle$	\multicolumn{5}{c}{$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$}
0.20–0.24	0.220	25.1	1799.18	±	24.69	±	96.31							
0.24–0.30	0.268	25.3	1603.30	±	18.13	±	79.89	0.270	34.9	1913.62	±	20.34	±	87.99
0.30–0.36	0.328	25.3	1240.18	±	16.49	±	64.40	0.328	35.2	1636.48	±	17.77	±	68.67
0.36–0.42	0.387	25.3	941.24	±	14.55	±	52.63	0.388	35.1	1278.31	±	16.34	±	55.21
0.42–0.50	0.456	25.4	733.84	±	11.27	±	43.06	0.456	35.2	951.15	±	12.68	±	50.27
0.50–0.60	0.544	25.4	492.44	±	8.35	±	33.72	0.544	35.2	666.50	±	9.68	±	41.09
0.60–0.72	0.650	25.3	313.37	±	6.07	±	24.35	0.651	35.2	407.15	±	7.03	±	31.39
0.72–0.90								0.792	35.1	212.81	±	4.21	±	21.08

p_T	\multicolumn{7}{c}{$40 < \theta < 50$}	\multicolumn{7}{c}{$50 < \theta < 60$}
	$\langle p_T\rangle$	$\langle\theta\rangle$	\multicolumn{5}{c}{$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$}	$\langle p_T\rangle$	$\langle\theta\rangle$	\multicolumn{5}{c}{$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$}
0.30–0.36	0.328	45.1	1822.39	±	18.22	±	68.73							
0.36–0.42	0.387	45.1	1530.29	±	16.94	±	54.56	0.387	55.1	1597.72	±	16.86	±	58.17
0.42–0.50	0.456	45.1	1158.27	±	13.30	±	46.21	0.456	55.1	1239.36	±	13.12	±	44.09
0.50–0.60	0.544	45.1	762.50	±	10.28	±	44.98	0.544	55.1	846.17	±	10.25	±	39.52
0.60–0.72	0.650	45.1	476.84	±	7.67	±	35.55	0.651	55.0	500.81	±	7.82	±	36.47
0.72–0.90	0.791	45.0	243.51	±	4.59	±	23.79	0.792	55.0	241.77	±	4.61	±	23.59
0.90–1.25	1.019	45.0	70.31	±	1.78	±	9.95							

p_T	\multicolumn{7}{c}{$60 < \theta < 75$}	\multicolumn{7}{c}{$75 < \theta < 90$}
	$\langle p_T\rangle$	$\langle\theta\rangle$	\multicolumn{5}{c}{$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$}	$\langle p_T\rangle$	$\langle\theta\rangle$	\multicolumn{5}{c}{$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$}
0.50–0.60	0.543	67.4	840.85	±	7.80	±	36.53							
0.60–0.72	0.650	67.3	484.86	±	5.84	±	30.54	0.649	81.7	367.75	±	4.79	±	24.75
0.72–0.90	0.790	67.1	206.96	±	3.47	±	22.84	0.790	81.7	135.80	±	2.80	±	15.81

p_T	\multicolumn{7}{c}{$90 < \theta < 105$}	\multicolumn{7}{c}{$105 < \theta < 125$}
	$\langle p_T\rangle$	$\langle\theta\rangle$	\multicolumn{5}{c}{$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$}	$\langle p_T\rangle$	$\langle\theta\rangle$	\multicolumn{5}{c}{$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$}
0.50–0.60								0.540	112.8	219.95	±	3.45	±	19.47
0.60–0.72	0.648	97.1	238.05	±	3.86	±	19.43	0.646	112.5	81.91	±	2.17	±	11.22
0.72–0.90	0.787	96.8	73.42	±	2.11	±	9.85							

Table 22 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^+'s in p + Pb $\rightarrow \pi^+$ + X interactions with +8.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				
	$20<\theta<30$							$30<\theta<40$						
0.10–0.13	0.115	25.0	475.54	±	15.91	±	36.11	0.115	35.0	465.46	±	15.26	±	34.08
0.13–0.16	0.145	24.9	533.04	±	15.32	±	31.48	0.145	34.9	449.89	±	13.65	±	26.03
0.16–0.20	0.180	24.9	569.76	±	13.39	±	29.97	0.179	34.9	458.11	±	11.69	±	23.09
0.20–0.24	0.219	24.8	588.04	±	13.46	±	27.98	0.219	34.8	482.75	±	12.01	±	21.83
0.24–0.30	0.269	24.9	525.06	±	10.29	±	22.07	0.268	34.8	471.24	±	9.74	±	19.24
0.30–0.36	0.328	25.0	460.99	±	9.51	±	17.73	0.328	34.8	392.74	±	8.94	±	15.07
0.36–0.42	0.387	24.8	364.33	±	8.35	±	14.07	0.387	34.8	320.94	±	7.97	±	11.85
0.42–0.50	0.456	24.8	263.51	±	5.92	±	11.13	0.455	34.8	224.89	±	5.65	±	8.98
0.50–0.60	0.544	24.9	177.78	±	4.15	±	9.71	0.544	34.8	162.09	±	4.14	±	8.16
0.60–0.72	0.651	24.8	113.22	±	2.86	±	8.76	0.651	34.7	95.98	±	2.70	±	6.74
0.72–0.90								0.792	34.8	40.62	±	1.20	±	4.44

p_T	$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				
	$40<\theta<50$							$50<\theta<60$						
0.10–0.13	0.116	45.0	394.87	±	14.20	±	29.39							
0.13–0.16	0.145	45.0	419.86	±	12.94	±	24.55	0.145	55.0	343.25	±	11.78	±	20.98
0.16–0.20	0.180	44.9	424.59	±	11.06	±	21.40	0.180	55.1	379.28	±	10.39	±	19.05
0.20–0.24	0.219	44.9	410.22	±	10.99	±	18.47	0.219	54.9	356.43	±	10.18	±	15.76
0.24–0.30	0.269	44.7	387.49	±	8.82	±	15.80	0.269	54.8	301.22	±	7.83	±	12.43
0.30–0.36	0.329	44.8	311.71	±	7.97	±	12.15	0.327	54.7	235.02	±	6.92	±	9.21
0.36–0.42	0.387	44.7	253.52	±	7.12	±	9.53	0.387	54.7	197.71	±	6.34	±	7.69
0.42–0.50	0.457	44.8	196.67	±	5.37	±	7.82	0.456	54.6	152.07	±	4.71	±	6.35
0.50–0.60	0.545	44.8	123.07	±	3.65	±	6.00	0.545	54.8	101.71	±	3.47	±	5.26
0.60–0.72	0.651	44.6	79.92	±	2.56	±	5.18	0.653	54.5	54.51	±	2.16	±	3.70
0.72–0.90	0.793	44.6	36.27	±	1.26	±	3.48	0.791	54.7	25.75	±	1.13	±	2.44
0.90–1.25								1.016	54.4	6.16	±	0.29	±	1.00

p_T	$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				
	$60<\theta<75$							$75<\theta<90$						
0.13–0.16	0.146	67.3	298.46	±	9.94	±	18.60	0.147	81.9	290.66	±	14.66	±	52.64
0.16–0.20	0.179	67.1	316.73	±	7.82	±	15.91	0.179	81.9	252.92	±	7.34	±	12.38
0.20–0.24	0.219	67.1	300.79	±	7.60	±	13.03	0.219	82.3	245.17	±	7.07	±	10.38
0.24–0.30	0.269	67.3	239.10	±	5.69	±	9.63	0.267	81.9	189.42	±	5.18	±	8.36
0.30–0.36	0.328	67.1	183.53	±	5.07	±	7.67	0.326	81.7	112.55	±	4.03	±	5.12
0.36–0.42	0.388	67.0	139.08	±	4.38	±	5.99	0.387	82.1	88.77	±	3.58	±	4.47
0.42–0.50	0.457	66.8	94.03	±	3.07	±	4.36	0.455	82.0	61.06	±	2.50	±	3.38
0.50–0.60	0.545	66.8	64.80	±	2.26	±	3.82	0.543	81.9	38.94	±	1.76	±	2.76
0.60–0.72	0.652	66.8	34.57	±	1.43	±	2.72	0.652	81.5	20.93	±	1.15	±	1.96
0.72–0.90	0.792	66.2	14.45	±	0.69	±	1.57	0.790	80.7	6.01	±	0.43	±	0.78
0.90–1.25	1.007	66.4	2.90	±	0.16	±	0.53	1.011	81.2	1.37	±	0.12	±	0.28

p_T	$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				
	$90<\theta<105$							$105<\theta<125$						
0.13–0.16	0.145	97.3	409.37	±	93.19	±	57.57	0.145	114.5	202.65	±	6.70	±	11.34
0.16–0.20	0.179	97.5	222.62	±	6.86	±	10.39	0.178	114.2	169.97	±	4.90	±	7.45
0.20–0.24	0.219	97.4	187.04	±	6.17	±	7.49	0.218	113.7	123.03	±	4.27	±	4.87
0.24–0.30	0.266	97.1	134.63	±	4.38	±	5.96	0.266	113.9	73.61	±	2.77	±	3.31
0.30–0.36	0.327	97.2	83.16	±	3.46	±	4.10	0.328	113.4	41.95	±	2.07	±	2.45
0.36–0.42	0.387	97.2	53.81	±	2.74	±	3.13	0.388	114.2	25.63	±	1.60	±	1.94
0.42–0.50	0.455	96.7	37.44	±	1.94	±	2.73	0.457	112.1	16.48	±	1.11	±	1.60
0.50–0.60	0.541	96.7	18.52	±	1.21	±	1.79	0.540	113.1	6.47	±	0.59	±	0.82
0.60–0.72	0.645	96.3	7.35	±	0.64	±	0.95	0.656	110.9	2.83	±	0.35	±	0.47
0.72–0.90	0.782	95.7	3.31	±	0.33	±	0.58	0.796	112.6	0.51	±	0.10	±	0.12
0.90–1.25	1.030	95.5	0.26	±	0.04	±	0.07	1.039	113.7	0.05	±	0.02	±	0.02

Table 23 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^-'s in p + Pb $\rightarrow \pi^-$ + X interactions with +8.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$						$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					
	$20 < \theta < 30$								$30 < \theta < 40$							
0.10–0.13	0.115	25.1	613.06	±	17.58	±	45.98		0.116	34.9	563.08	±	16.53	±	42.10
0.13–0.16	0.145	25.1	658.16	±	16.63	±	38.41		0.145	34.9	591.57	±	15.38	±	34.96
0.16–0.20	0.180	24.9	631.65	±	13.69	±	32.12		0.180	34.8	554.12	±	12.72	±	28.12
0.20–0.24	0.220	25.0	578.87	±	13.00	±	26.06		0.220	34.8	483.36	±	11.80	±	21.53
0.24–0.30	0.269	25.1	501.72	±	9.88	±	19.97		0.269	34.9	447.95	±	9.26	±	17.42
0.30–0.36	0.329	25.1	373.98	±	8.52	±	13.83		0.330	34.8	355.14	±	8.33	±	12.92
0.36–0.42	0.390	25.1	269.98	±	7.14	±	9.85		0.390	34.9	286.02	±	7.45	±	10.40
0.42–0.50	0.460	25.2	182.98	±	5.08	±	7.55		0.459	34.9	188.21	±	5.19	±	7.58
0.50–0.60	0.548	25.0	122.01	±	3.74	±	6.40		0.547	35.0	111.48	±	3.49	±	5.62
0.60–0.72	0.658	24.9	59.86	±	2.29	±	4.11		0.659	34.8	57.97	±	2.25	±	3.87
0.72–0.90									0.802	35.2	27.55	±	1.24	±	2.55
	$40 < \theta < 50$								$50 < \theta < 60$							
0.10–0.13	0.115	45.1	526.67	±	16.57	±	39.96								
0.13–0.16	0.145	44.9	522.88	±	14.54	±	31.28		0.145	54.9	468.65	±	13.87	±	28.98
0.16–0.20	0.180	44.9	456.52	±	11.43	±	23.29		0.179	54.8	428.84	±	11.01	±	21.86
0.20–0.24	0.220	44.8	448.23	±	11.36	±	20.17		0.220	55.0	376.69	±	10.38	±	16.68
0.24–0.30	0.269	44.8	364.01	±	8.45	±	14.42		0.270	54.8	321.93	±	7.97	±	12.92
0.30–0.36	0.330	44.9	322.29	±	8.06	±	12.33		0.330	54.8	237.90	±	6.88	±	9.08
0.36–0.42	0.390	45.0	228.20	±	6.67	±	8.38		0.389	54.8	185.34	±	6.09	±	7.34
0.42–0.50	0.459	44.8	163.04	±	4.83	±	6.79		0.459	54.7	132.73	±	4.40	±	5.73
0.50–0.60	0.549	44.8	103.38	±	3.43	±	5.46		0.549	54.9	79.43	±	3.00	±	4.34
0.60–0.72	0.658	44.8	53.72	±	2.18	±	3.77		0.659	54.9	42.25	±	1.94	±	3.05
0.72–0.90	0.801	44.8	20.45	±	1.07	±	2.00		0.804	54.4	17.48	±	0.99	±	1.74
0.90–1.25									1.035	55.0	3.60	±	0.29	±	0.57
	$60 < \theta < 75$								$75 < \theta < 90$							
0.13–0.16	0.145	67.4	442.21	±	12.13	±	26.45		0.147	82.0	352.79	±	13.49	±	32.84
0.16–0.20	0.179	67.4	372.87	±	8.49	±	18.11		0.179	82.2	330.97	±	8.43	±	15.73
0.20–0.24	0.220	67.2	308.82	±	7.76	±	13.10		0.219	82.1	260.85	±	7.35	±	11.22
0.24–0.30	0.269	67.2	245.48	±	5.79	±	10.18		0.268	82.1	188.68	±	5.21	±	8.58
0.30–0.36	0.330	66.9	181.47	±	5.04	±	7.93		0.329	81.8	125.61	±	4.26	±	6.02
0.36–0.42	0.391	67.1	133.38	±	4.27	±	5.79		0.390	81.4	91.92	±	3.56	±	4.54
0.42–0.50	0.460	66.7	93.33	±	3.00	±	4.41		0.458	81.8	55.77	±	2.38	±	3.31
0.50–0.60	0.550	67.0	58.84	±	2.11	±	3.58		0.548	81.8	33.30	±	1.59	±	2.52
0.60–0.72	0.656	67.0	29.45	±	1.35	±	2.36		0.658	81.3	12.36	±	0.87	±	1.24
0.72–0.90	0.801	66.5	10.09	±	0.61	±	1.11		0.799	81.3	4.14	±	0.40	±	0.56
0.90–1.25	1.038	66.6	2.35	±	0.19	±	0.39		1.046	81.4	0.62	±	0.09	±	0.13
	$90 < \theta < 105$								$105 < \theta < 125$							
0.13–0.16	0.147	97.7	334.09	±	17.64	±	24.95		0.144	114.3	292.07	±	8.23	±	15.68
0.16–0.20	0.179	97.5	267.51	±	7.61	±	12.38		0.178	113.8	197.87	±	5.41	±	8.20
0.20–0.24	0.219	97.1	208.08	±	6.61	±	8.80		0.219	113.8	122.93	±	4.33	±	5.03
0.24–0.30	0.268	97.1	136.30	±	4.42	±	6.12		0.267	113.7	68.52	±	2.66	±	3.40
0.30–0.36	0.329	97.3	82.61	±	3.41	±	4.24		0.329	113.2	37.32	±	1.94	±	2.43
0.36–0.42	0.389	97.1	56.28	±	2.74	±	3.44		0.388	113.5	23.60	±	1.51	±	2.02
0.42–0.50	0.457	97.0	32.00	±	1.75	±	2.53		0.457	112.4	13.06	±	0.96	±	1.43
0.50–0.60	0.543	96.6	14.68	±	1.05	±	1.55		0.542	112.0	4.42	±	0.49	±	0.63
0.60–0.72	0.650	96.6	6.41	±	0.62	±	0.90		0.646	111.7	1.19	±	0.23	±	0.23
0.72–0.90	0.799	95.6	1.79	±	0.25	±	0.34		0.811	111.5	0.25	±	0.07	±	0.07
0.90–1.25	1.039	96.4	0.18	±	0.04	±	0.05		1.075	114.4	0.06	±	0.02	±	0.02

Table 24 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of protons in $\pi^+ + Pb \rightarrow p + X$ interactions with $+8.0$ GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$20 < \theta < 30$							$30 < \theta < 40$						
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.20–0.24	0.220	25.1	1577.36	±	32.63	±	86.29							
0.24–0.30	0.268	25.2	1339.90	±	23.64	±	67.43	0.270	34.9	1662.64	±	26.00	±	77.33
0.30–0.36	0.328	25.3	1040.65	±	21.55	±	54.61	0.328	35.1	1410.62	±	23.55	±	60.03
0.36–0.42	0.387	25.4	758.87	±	18.64	±	42.96	0.388	35.1	1155.84	±	22.22	±	50.83
0.42–0.50	0.456	25.4	620.93	±	14.71	±	36.84	0.456	35.2	817.06	±	16.79	±	44.07
0.50–0.60	0.544	25.4	390.49	±	10.49	±	26.94	0.544	35.2	576.99	±	12.84	±	35.99
0.60–0.72	0.649	25.3	241.61	±	7.43	±	18.88	0.650	35.2	328.53	±	8.97	±	25.48
0.72–0.90								0.792	35.2	173.63	±	5.36	±	17.24

p_T	$40 < \theta < 50$							$50 < \theta < 60$						
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.30–0.36	0.328	45.1	1657.35	±	24.73	±	64.67							
0.36–0.42	0.387	45.1	1310.76	±	22.45	±	47.67	0.388	55.1	1426.78	±	22.60	±	53.58
0.42–0.50	0.456	45.2	988.18	±	17.62	±	40.29	0.456	55.0	1101.05	±	17.71	±	39.96
0.50–0.60	0.543	45.1	653.44	±	13.63	±	39.23	0.545	55.0	726.98	±	13.60	±	34.55
0.60–0.72	0.650	45.1	409.30	±	10.15	±	30.77	0.651	54.9	425.63	±	10.33	±	31.40
0.72–0.90	0.793	45.1	199.54	±	5.92	±	19.57	0.791	55.0	203.56	±	6.04	±	19.99
0.90–1.25	1.023	45.1	53.98	±	2.21	±	7.65							

p_T	$60 < \theta < 75$							$75 < \theta < 90$						
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.50–0.60	0.543	67.6	745.16	±	10.52	±	32.92							
0.60–0.72	0.650	67.2	426.57	±	7.84	±	27.15	0.648	81.9	320.12	±	6.39	±	21.66
0.72–0.90	0.790	67.2	179.56	±	4.64	±	20.08	0.789	81.8	119.35	±	3.76	±	14.07

p_T	$90 < \theta < 105$							$105 < \theta < 125$						
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.50–0.60								0.539	113.1	220.46	±	4.95	±	19.60
0.60–0.72	0.648	97.0	237.39	±	5.51	±	19.45	0.646	112.8	82.35	±	3.12	±	11.33
0.72–0.90	0.788	96.8	69.66	±	2.94	±	9.37							

Table 25 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^+'s in $\pi^+ + \text{Pb} \to \pi^+ + \text{X}$ interactions with +8.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
	$20 < \theta < 30$							$30 < \theta < 40$						
0.10–0.13	0.115	25.2	598.56	±	25.87	±	45.31	0.115	35.0	518.85	±	22.91	±	38.11
0.13–0.16	0.145	24.8	594.54	±	23.02	±	34.88	0.146	34.9	532.85	±	21.36	±	31.16
0.16–0.20	0.180	24.8	667.67	±	20.74	±	35.42	0.179	34.9	599.39	±	19.19	±	30.36
0.20–0.24	0.220	24.9	719.83	±	21.23	±	34.53	0.219	34.8	565.75	±	18.64	±	25.69
0.24–0.30	0.269	24.9	721.86	±	17.28	±	30.58	0.269	34.7	599.22	±	15.73	±	24.62
0.30–0.36	0.328	24.8	616.66	±	15.76	±	23.87	0.328	34.9	500.34	±	14.44	±	19.40
0.36–0.42	0.388	24.8	534.41	±	14.56	±	20.70	0.387	34.7	416.76	±	13.02	±	15.55
0.42–0.50	0.456	24.7	403.06	±	10.60	±	17.07	0.457	34.8	333.64	±	9.93	±	13.38
0.50–0.60	0.544	24.8	277.81	±	7.60	±	15.17	0.545	34.7	218.30	±	6.95	±	11.00
0.60–0.72	0.651	24.6	164.45	±	5.04	±	12.71	0.652	34.8	131.49	±	4.67	±	9.21
0.72–0.90								0.794	34.7	60.39	±	2.23	±	6.57
	$40 < \theta < 50$							$50 < \theta < 60$						
0.10–0.13	0.115	45.1	460.75	±	22.62	±	35.59							
0.13–0.16	0.145	44.7	477.40	±	19.98	±	28.03	0.145	55.0	364.16	±	17.65	±	22.32
0.16–0.20	0.179	44.9	507.08	±	17.52	±	25.69	0.180	54.8	419.68	±	15.57	±	21.19
0.20–0.24	0.219	44.7	487.57	±	17.05	±	22.05	0.220	54.9	394.93	±	15.38	±	17.54
0.24–0.30	0.270	44.8	470.60	±	13.94	±	19.40	0.268	54.6	340.57	±	11.95	±	14.16
0.30–0.36	0.328	44.7	425.45	±	13.36	±	16.94	0.328	54.6	301.91	±	11.31	±	12.03
0.36–0.42	0.387	44.7	335.83	±	11.83	±	12.87	0.388	54.7	242.16	±	10.05	±	9.59
0.42–0.50	0.456	44.5	252.26	±	8.78	±	10.16	0.455	54.8	193.44	±	7.65	±	8.08
0.50–0.60	0.544	44.8	171.72	±	6.27	±	8.38	0.544	54.8	136.96	±	5.82	±	7.12
0.60–0.72	0.652	44.6	103.48	±	4.26	±	6.69	0.654	54.7	72.30	±	3.60	±	4.89
0.72–0.90	0.791	44.6	48.46	±	2.16	±	4.64	0.794	54.4	35.36	±	1.92	±	3.33
0.90–1.25								1.019	54.7	7.75	±	0.50	±	1.24
	$60 < \theta < 75$							$75 < \theta < 90$						
0.13–0.16	0.146	67.1	322.06	±	14.63	±	20.02	0.146	82.3	250.30	±	17.20	±	26.05
0.16–0.20	0.180	67.4	358.58	±	11.93	±	18.11	0.180	82.1	284.58	±	11.10	±	14.02
0.20–0.24	0.219	67.2	351.75	±	11.81	±	15.34	0.220	81.9	269.96	±	10.54	±	11.39
0.24–0.30	0.267	67.0	287.26	±	8.89	±	11.50	0.266	82.0	201.76	±	7.66	±	8.95
0.30–0.36	0.328	67.1	224.65	±	8.01	±	9.32	0.328	82.1	148.10	±	6.63	±	6.76
0.36–0.42	0.388	67.0	169.99	±	6.95	±	7.31	0.387	82.3	111.61	±	5.76	±	5.59
0.42–0.50	0.456	66.9	133.04	±	5.25	±	6.16	0.457	81.7	74.77	±	3.95	±	4.11
0.50–0.60	0.543	66.7	89.43	±	3.81	±	5.25	0.544	81.7	48.87	±	2.82	±	3.43
0.60–0.72	0.650	66.9	48.86	±	2.46	±	3.82	0.651	81.5	25.50	±	1.83	±	2.36
0.72–0.90	0.789	67.0	20.55	±	1.22	±	2.22	0.785	81.7	10.63	±	0.86	±	1.37
0.90–1.25	1.019	66.3	4.13	±	0.29	±	0.75	1.006	81.3	1.76	±	0.20	±	0.36
	$90 < \theta < 105$							$105 < \theta < 125$						
0.13–0.16	0.146	98.4	292.40	±	24.28	±	28.77	0.144	115.2	228.88	±	10.51	±	12.24
0.16–0.20	0.179	97.6	272.52	±	11.17	±	13.25	0.179	114.3	193.56	±	7.60	±	8.17
0.20–0.24	0.219	97.4	211.61	±	9.48	±	8.68	0.218	113.7	150.32	±	6.76	±	5.94
0.24–0.30	0.268	97.5	158.42	±	6.98	±	8.12	0.266	113.7	89.38	±	4.37	±	4.01
0.30–0.36	0.328	97.3	99.92	±	5.54	±	5.48	0.327	114.3	48.22	±	3.16	±	2.79
0.36–0.42	0.387	96.9	74.21	±	4.67	±	4.48	0.387	114.0	35.61	±	2.72	±	2.66
0.42–0.50	0.454	97.3	47.57	±	3.14	±	3.45	0.455	113.0	22.42	±	1.85	±	2.15
0.50–0.60	0.541	96.5	25.88	±	2.06	±	2.48	0.541	113.5	8.29	±	0.96	±	1.04
0.60–0.72	0.645	97.3	11.31	±	1.14	±	1.45	0.650	113.5	2.74	±	0.48	±	0.45
0.72–0.90	0.801	95.7	4.62	±	0.56	±	0.79	0.785	110.3	0.66	±	0.16	±	0.15
0.90–1.25	1.021	95.8	0.53	±	0.10	±	0.14	1.074	113.7	0.09	±	0.03	±	0.03

Table 26 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^-'s in $\pi^+ + \text{Pb} \to \pi^- + \text{X}$ interactions with $+8.0$ GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				
	$20 < \theta < 30$							$30 < \theta < 40$						
0.10–0.13	0.116	25.0	732.00	±	28.25	±	59.53	0.116	35.0	637.89	±	25.63	±	49.22
0.13–0.16	0.145	25.0	684.04	±	23.99	±	40.15	0.145	34.7	643.57	±	22.93	±	38.17
0.16–0.20	0.181	24.9	702.65	±	20.61	±	36.12	0.180	34.9	580.40	±	18.59	±	29.64
0.20–0.24	0.220	25.1	671.48	±	20.06	±	30.68	0.221	35.0	567.56	±	18.31	±	25.51
0.24–0.30	0.270	24.9	592.71	±	15.29	±	24.04	0.269	34.8	504.32	±	14.11	±	19.84
0.30–0.36	0.330	25.0	484.15	±	13.86	±	18.26	0.330	34.9	455.32	±	13.53	±	16.88
0.36–0.42	0.391	25.0	359.55	±	11.77	±	13.18	0.391	35.0	340.63	±	11.68	±	12.54
0.42–0.50	0.460	25.1	261.33	±	8.68	±	10.79	0.460	35.1	244.14	±	8.50	±	9.87
0.50–0.60	0.548	25.0	166.98	±	6.26	±	8.76	0.549	35.1	149.42	±	5.80	±	7.53
0.60–0.72	0.660	25.0	96.15	±	4.19	±	6.57	0.660	34.7	76.15	±	3.70	±	5.05
0.72–0.90								0.804	35.0	34.87	±	2.00	±	3.20

p_T	$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				
	$40 < \theta < 50$							$50 < \theta < 60$						
0.10–0.13	0.116	44.9	598.58	±	25.15	±	45.53							
0.13–0.16	0.146	45.0	535.31	±	20.91	±	32.14	0.145	55.2	509.70	±	20.65	±	31.63
0.16–0.20	0.180	44.9	527.25	±	17.65	±	27.05	0.180	55.0	422.44	±	15.58	±	21.65
0.20–0.24	0.220	44.8	468.90	±	16.57	±	21.25	0.221	54.8	431.10	±	15.91	±	19.21
0.24–0.30	0.270	44.8	413.99	±	12.89	±	16.66	0.268	54.8	339.16	±	11.66	±	13.74
0.30–0.36	0.330	45.0	349.55	±	12.05	±	13.58	0.330	54.8	269.90	±	10.50	±	10.41
0.36–0.42	0.391	44.7	267.39	±	10.34	±	9.91	0.391	55.0	207.52	±	9.24	±	8.29
0.42–0.50	0.461	44.8	191.18	±	7.49	±	7.99	0.459	54.7	163.32	±	6.99	±	7.07
0.50–0.60	0.550	44.8	126.85	±	5.45	±	6.69	0.548	54.8	99.90	±	4.82	±	5.45
0.60–0.72	0.658	44.7	69.90	±	3.55	±	4.88	0.663	55.0	53.54	±	3.13	±	3.85
0.72–0.90	0.802	44.8	26.80	±	1.75	±	2.60	0.801	54.7	20.04	±	1.53	±	1.98
0.90–1.25								1.043	54.6	4.49	±	0.46	±	0.70

p_T	$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				
	$60 < \theta < 75$							$75 < \theta < 90$						
0.13–0.16	0.145	67.2	444.01	±	17.02	±	26.69	0.147	81.9	455.74	±	24.03	±	52.15
0.16–0.20	0.180	67.3	399.98	±	12.57	±	19.57	0.180	82.1	323.49	±	11.93	±	15.50
0.20–0.24	0.220	67.5	335.74	±	11.59	±	14.35	0.219	82.2	267.52	±	10.63	±	11.73
0.24–0.30	0.269	67.0	266.62	±	8.61	±	11.19	0.268	82.1	197.81	±	7.67	±	9.29
0.30–0.36	0.330	66.9	208.65	±	7.76	±	9.30	0.330	81.6	144.37	±	6.55	±	7.21
0.36–0.42	0.390	67.1	166.38	±	6.85	±	7.35	0.389	81.7	106.38	±	5.52	±	5.36
0.42–0.50	0.461	66.8	105.31	±	4.58	±	4.99	0.462	82.0	65.72	±	3.72	±	3.92
0.50–0.60	0.549	66.6	68.18	±	3.24	±	4.14	0.547	81.4	38.46	±	2.45	±	2.89
0.60–0.72	0.654	66.8	38.25	±	2.21	±	3.06	0.658	81.7	23.54	±	1.72	±	2.32
0.72–0.90	0.803	67.4	13.65	±	1.02	±	1.49	0.799	80.7	6.94	±	0.73	±	0.93
0.90–1.25	1.028	66.5	3.07	±	0.32	±	0.51	1.008	81.3	1.25	±	0.19	±	0.26

p_T	$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				
	$90 < \theta < 105$							$105 < \theta < 125$						
0.13–0.16	0.147	98.0	377.67	±	22.19	±	30.34	0.145	114.6	282.59	±	11.71	±	15.38
0.16–0.20	0.179	97.5	283.54	±	11.28	±	13.24	0.179	114.1	203.27	±	7.82	±	8.52
0.20–0.24	0.220	97.0	221.50	±	9.81	±	9.59	0.219	113.4	145.94	±	6.72	±	5.98
0.24–0.30	0.268	97.2	146.79	±	6.61	±	6.87	0.269	114.0	76.78	±	4.01	±	3.76
0.30–0.36	0.329	96.9	83.86	±	4.96	±	4.44	0.328	113.5	43.98	±	3.01	±	2.85
0.36–0.42	0.391	97.2	61.89	±	4.14	±	3.79	0.389	114.0	27.91	±	2.34	±	2.36
0.42–0.50	0.459	97.2	42.67	±	2.90	±	3.34	0.457	113.1	19.21	±	1.66	±	2.08
0.50–0.60	0.546	96.3	19.37	±	1.73	±	2.02	0.547	112.2	6.48	±	0.85	±	0.91
0.60–0.72	0.659	96.3	7.81	±	0.97	±	1.08	0.653	110.0	2.66	±	0.49	±	0.49
0.72–0.90	0.804	97.7	2.52	±	0.42	±	0.47	0.822	111.2	0.36	±	0.13	±	0.09
0.90–1.25	1.015	94.2	0.33	±	0.09	±	0.10							

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Table 27 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of protons in $\pi^- + Pb \rightarrow p + X$ interactions with -8.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$			
	$20 < \theta < 30$						$30 < \theta < 40$					
0.20–0.24	0.220	25.2	1410.32	±	26.90	±	76.35					
0.24–0.30	0.269	25.2	1215.58	±	19.57	±	61.45	0.271	34.8	1443.12	±	21.08	±	67.14
0.30–0.36	0.329	25.4	963.68	±	18.30	±	52.08	0.329	35.1	1247.99	±	19.46	±	53.30
0.36–0.42	0.388	25.4	712.49	±	16.07	±	41.76	0.389	35.1	978.06	±	18.09	±	45.02
0.42–0.50	0.458	25.3	526.32	±	12.03	±	34.54	0.458	35.2	725.32	±	14.05	±	41.25
0.50–0.60	0.546	25.4	350.15	±	8.76	±	25.84	0.547	35.3	484.28	±	10.43	±	32.39
0.60–0.72	0.656	25.5	213.10	±	6.33	±	18.31	0.656	35.2	301.13	±	7.62	±	23.84
0.72–0.90								0.799	35.1	147.79	±	4.42	±	15.40
	$40 < \theta < 50$						$50 < \theta < 60$					
0.30–0.36	0.330	45.1	1468.89	±	22.26	±	55.70					
0.36–0.42	0.391	45.1	1165.76	±	18.47	±	42.44	0.390	55.1	1238.33	±	18.29	±	47.55
0.42–0.50	0.461	45.1	868.47	±	14.57	±	36.76	0.460	55.1	964.41	±	14.55	±	34.97
0.50–0.60	0.549	45.2	565.35	±	11.09	±	34.23	0.549	55.1	641.96	±	11.27	±	31.05
0.60–0.72	0.658	45.0	353.23	±	8.36	±	28.21	0.659	55.0	381.51	±	8.60	±	28.90
0.72–0.90	0.805	45.0	173.45	±	4.97	±	18.48	0.804	55.0	184.46	±	5.09	±	18.83
	$60 < \theta < 75$						$75 < \theta < 90$					
0.50–0.60	0.542	67.5	664.61	±	8.68	±	29.70					
0.60–0.72	0.650	67.3	356.69	±	6.36	±	23.65	0.649	81.7	298.46	±	5.44	±	20.28
0.72–0.90	0.790	66.9	149.98	±	3.79	±	17.87	0.790	81.8	93.57	±	2.97	±	11.74
	$90 < \theta < 105$						$105 < \theta < 125$					
0.50–0.60								0.539	113.0	183.14	±	3.92	±	16.39
0.60–0.72	0.646	97.2	184.35	±	4.27	±	15.17	0.646	113.0	62.65	±	2.39	±	8.86
0.72–0.90	0.788	97.0	51.51	±	2.23	±	7.47					

Table 28 Double-differential inclusive cross-section d$^2\sigma$/dp dΩ [mb/(GeV/c sr)] of the production of π^+'s in $\pi^- + \mathrm{Pb} \to \pi^+ + \mathrm{X}$ interactions with -8.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$20<\theta<30$ d$^2\sigma$/dp dΩ					$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$30<\theta<40$ d$^2\sigma$/dp dΩ				
0.10–0.13	0.115	25.0	445.45	±	18.42	±	33.60	0.116	34.8	447.86	±	18.22	±	33.11
0.13–0.16	0.146	24.9	545.34	±	18.74	±	32.56	0.146	35.1	492.93	±	17.44	±	28.67
0.16–0.20	0.180	24.8	605.65	±	16.55	±	31.39	0.180	34.9	498.18	±	14.83	±	24.99
0.20–0.24	0.220	24.8	637.81	±	16.73	±	29.25	0.220	34.7	527.06	±	15.22	±	23.56
0.24–0.30	0.270	24.9	575.62	±	12.99	±	23.61	0.269	34.9	462.25	±	11.75	±	18.65
0.30–0.36	0.329	24.7	483.17	±	11.82	±	18.49	0.329	34.8	418.76	±	11.20	±	15.61
0.36–0.42	0.389	24.9	407.06	±	10.73	±	15.34	0.389	34.9	353.85	±	10.29	±	13.19
0.42–0.50	0.458	24.9	294.94	±	7.64	±	12.25	0.458	34.7	250.44	±	7.28	±	9.73
0.50–0.60	0.547	24.9	187.42	±	5.21	±	10.16	0.547	34.7	160.87	±	5.03	±	7.92
0.60–0.72	0.656	24.9	113.58	±	3.49	±	8.75	0.656	34.7	93.15	±	3.34	±	6.43
0.72–0.90								0.797	34.8	43.28	±	1.61	±	4.64

p_T	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$40<\theta<50$ d$^2\sigma$/dp dΩ					$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$50<\theta<60$ d$^2\sigma$/dp dΩ				
0.10–0.13	0.117	45.2	383.75	±	18.01	±	30.31							
0.13–0.16	0.146	44.9	431.47	±	16.38	±	25.34	0.146	54.7	371.44	±	15.43	±	22.77
0.16–0.20	0.181	44.9	383.64	±	12.73	±	19.41	0.180	55.0	333.91	±	11.79	±	16.88
0.20–0.24	0.221	44.7	396.81	±	13.06	±	17.81	0.220	54.9	336.13	±	12.09	±	14.91
0.24–0.30	0.271	44.9	357.39	±	10.36	±	14.73	0.271	54.9	291.50	±	9.36	±	11.78
0.30–0.36	0.330	44.8	317.80	±	9.79	±	12.10	0.331	54.8	249.18	±	8.80	±	10.15
0.36–0.42	0.391	44.9	259.63	±	8.88	±	9.83	0.391	54.9	215.36	±	8.14	±	8.63
0.42–0.50	0.460	44.8	205.79	±	6.68	±	8.02	0.462	54.7	160.09	±	5.96	±	6.55
0.50–0.60	0.549	44.7	126.90	±	4.56	±	6.02	0.550	54.8	110.18	±	4.34	±	5.53
0.60–0.72	0.659	45.1	81.48	±	3.16	±	5.17	0.660	54.6	60.05	±	2.79	±	3.99
0.72–0.90	0.800	44.5	32.73	±	1.46	±	3.12	0.803	54.6	26.74	±	1.35	±	2.56
0.90–1.25								1.039	54.5	7.30	±	0.42	±	1.15

p_T	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$60<\theta<75$ d$^2\sigma$/dp dΩ					$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$75<\theta<90$ d$^2\sigma$/dp dΩ				
0.13–0.16	0.145	67.1	299.56	±	12.47	±	18.82	0.147	82.2	216.27	±	12.82	±	16.26
0.16–0.20	0.180	67.2	323.14	±	9.72	±	16.34	0.179	82.3	266.79	±	9.39	±	13.13
0.20–0.24	0.219	67.3	292.96	±	9.29	±	12.79	0.219	81.8	218.03	±	8.19	±	9.21
0.24–0.30	0.268	67.0	227.43	±	6.84	±	9.37	0.266	81.7	178.36	±	6.26	±	8.11
0.30–0.36	0.327	67.3	185.84	±	6.31	±	8.13	0.327	81.8	132.41	±	5.44	±	6.34
0.36–0.42	0.387	67.2	138.91	±	5.41	±	6.10	0.388	81.6	89.35	±	4.34	±	4.29
0.42–0.50	0.457	66.7	99.43	±	3.85	±	4.55	0.457	81.4	68.28	±	3.25	±	3.76
0.50–0.60	0.544	66.7	68.42	±	2.79	±	3.96	0.544	81.6	45.09	±	2.26	±	3.13
0.60–0.72	0.651	66.6	41.01	±	1.91	±	3.17	0.652	81.7	20.99	±	1.36	±	1.93
0.72–0.90	0.792	66.7	16.46	±	0.90	±	1.78	0.791	81.1	7.24	±	0.58	±	0.93
0.90–1.25	1.013	66.3	3.34	±	0.23	±	0.58	1.016	80.6	1.48	±	0.15	±	0.30

p_T	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$90<\theta<105$ d$^2\sigma$/dp dΩ					$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$105<\theta<125$ d$^2\sigma$/dp dΩ				
0.13–0.16	0.147	98.0	232.06	±	13.93	±	19.53	0.145	114.8	181.28	±	7.93	±	9.76
0.16–0.20	0.179	97.1	211.11	±	8.35	±	9.92	0.179	114.6	144.06	±	5.66	±	6.11
0.20–0.24	0.219	97.5	181.72	±	7.48	±	7.30	0.217	113.7	117.98	±	5.24	±	4.72
0.24–0.30	0.268	97.2	125.42	±	5.21	±	5.29	0.265	113.4	72.43	±	3.38	±	3.28
0.30–0.36	0.327	96.9	89.32	±	4.39	±	4.28	0.326	113.9	45.31	±	2.64	±	2.62
0.36–0.42	0.387	96.8	51.81	±	3.30	±	3.02	0.388	113.8	25.79	±	1.95	±	1.93
0.42–0.50	0.453	97.2	42.53	±	2.53	±	3.06	0.453	112.4	16.18	±	1.29	±	1.55
0.50–0.60	0.541	96.9	21.05	±	1.59	±	2.01	0.540	112.2	7.74	±	0.80	±	0.97
0.60–0.72	0.651	96.9	10.86	±	0.97	±	1.37	0.646	111.5	2.57	±	0.39	±	0.42
0.72–0.90	0.784	96.4	2.82	±	0.36	±	0.48	0.791	111.6	0.58	±	0.13	±	0.13
0.90–1.25	1.025	94.5	0.59	±	0.09	±	0.16	1.016	111.9	0.04	±	0.02	±	0.02

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Table 29 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^-'s in $\pi^- + \mathrm{Pb} \to \pi^- + \mathrm{X}$ interactions with -8.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				
	$20 < \theta < 30$							$30 < \theta < 40$						
0.10–0.13	0.115	25.0	785.92	±	25.20	±	58.30	0.115	34.8	680.50	±	23.27	±	51.52
0.13–0.16	0.146	24.7	823.91	±	23.64	±	50.28	0.145	34.9	672.13	±	20.84	±	39.74
0.16–0.20	0.180	24.8	840.88	±	20.10	±	43.88	0.180	34.7	674.93	±	17.63	±	34.36
0.20–0.24	0.220	24.8	848.90	±	19.86	±	38.73	0.220	34.9	700.27	±	17.81	±	31.28
0.24–0.30	0.269	24.9	784.18	±	15.55	±	31.38	0.269	34.8	632.89	±	13.95	±	25.01
0.30–0.36	0.329	25.0	633.35	±	13.99	±	23.45	0.329	34.8	532.41	±	12.85	±	19.37
0.36–0.42	0.389	24.9	511.76	±	12.40	±	18.56	0.389	34.7	431.47	±	11.54	±	15.75
0.42–0.50	0.458	24.8	377.54	±	9.24	±	15.67	0.458	34.8	312.10	±	8.38	±	12.53
0.50–0.60	0.545	24.8	242.49	±	6.50	±	12.48	0.547	34.8	192.94	±	5.79	±	9.66
0.60–0.72	0.655	24.8	148.56	±	4.63	±	10.09	0.654	34.8	117.10	±	4.20	±	7.71
0.72–0.90								0.800	34.8	45.12	±	1.96	±	4.18
	$40 < \theta < 50$							$50 < \theta < 60$						
0.10–0.13	0.115	45.3	613.95	±	22.36	±	46.58							
0.13–0.16	0.145	44.7	562.33	±	18.89	±	33.67	0.145	54.9	508.27	±	18.04	±	31.45
0.16–0.20	0.179	44.9	599.87	±	16.62	±	30.68	0.179	55.0	495.96	±	14.93	±	25.34
0.20–0.24	0.219	44.7	584.65	±	16.32	±	26.35	0.219	54.8	435.58	±	14.08	±	19.30
0.24–0.30	0.268	44.7	518.06	±	12.86	±	21.84	0.269	54.8	396.54	±	11.15	±	15.88
0.30–0.36	0.327	44.8	410.55	±	11.27	±	15.02	0.329	54.9	317.23	±	10.05	±	12.44
0.36–0.42	0.387	44.8	341.94	±	10.30	±	12.72	0.387	54.7	265.51	±	9.26	±	10.89
0.42–0.50	0.456	44.8	253.01	±	7.59	±	10.49	0.456	54.8	193.99	±	6.65	±	8.31
0.50–0.60	0.543	44.9	163.45	±	5.37	±	8.56	0.542	54.8	125.58	±	4.75	±	6.79
0.60–0.72	0.649	44.6	88.57	±	3.58	±	6.13	0.648	54.8	66.63	±	3.11	±	4.74
0.72–0.90	0.791	45.1	38.44	±	1.86	±	3.69	0.794	54.9	30.79	±	1.68	±	3.00
0.90–1.25								1.018	54.6	7.42	±	0.52	±	1.15
	$60 < \theta < 75$							$75 < \theta < 90$						
0.13–0.16	0.146	67.1	491.44	±	15.90	±	29.46	0.146	81.2	504.22	±	121.49	±	48.91
0.16–0.20	0.180	67.3	430.17	±	11.55	±	20.98	0.180	82.1	366.84	±	11.38	±	18.50
0.20–0.24	0.220	67.1	365.60	±	10.63	±	15.48	0.220	82.0	286.57	±	9.67	±	12.60
0.24–0.30	0.270	67.1	301.84	±	8.10	±	12.93	0.269	81.7	229.73	±	7.23	±	10.82
0.30–0.36	0.330	66.7	241.09	±	7.30	±	10.65	0.329	81.9	161.92	±	6.07	±	7.89
0.36–0.42	0.391	66.9	182.22	±	6.26	±	7.78	0.390	81.7	117.36	±	5.17	±	6.34
0.42–0.50	0.460	67.0	133.82	±	4.58	±	6.38	0.459	81.8	82.45	±	3.61	±	4.76
0.50–0.60	0.549	66.9	87.56	±	3.26	±	5.27	0.549	81.5	52.91	±	2.56	±	3.94
0.60–0.72	0.660	67.1	44.55	±	2.09	±	3.53	0.657	81.4	26.47	±	1.60	±	2.60
0.72–0.90	0.803	67.3	22.45	±	1.16	±	2.42	0.801	82.0	9.36	±	0.74	±	1.25
0.90–1.25	1.031	67.4	4.55	±	0.34	±	0.75	1.032	81.3	1.79	±	0.20	±	0.36
	$90 < \theta < 105$							$105 < \theta < 125$						
0.13–0.16	0.145	96.3	440.08	±	112.47	±	32.83	0.145	114.7	268.23	±	9.50	±	15.45
0.16–0.20	0.180	97.5	314.71	±	10.37	±	14.60	0.179	113.7	214.26	±	7.06	±	8.91
0.20–0.24	0.219	97.5	237.03	±	8.89	±	10.15	0.219	113.8	146.13	±	5.90	±	5.91
0.24–0.30	0.270	97.2	176.95	±	6.43	±	8.80	0.268	113.7	94.31	±	3.92	±	4.58
0.30–0.36	0.329	97.1	114.11	±	5.10	±	6.13	0.329	114.1	56.98	±	3.00	±	3.63
0.36–0.42	0.388	97.2	76.28	±	4.07	±	4.68	0.391	114.2	38.71	±	2.42	±	3.22
0.42–0.50	0.462	96.6	51.53	±	2.84	±	4.01	0.463	112.3	20.78	±	1.52	±	2.21
0.50–0.60	0.544	96.7	27.53	±	1.84	±	2.84	0.541	112.5	10.68	±	0.97	±	1.48
0.60–0.72	0.655	96.6	12.14	±	1.07	±	1.66	0.652	112.6	2.79	±	0.45	±	0.50
0.72–0.90	0.798	95.9	3.51	±	0.44	±	0.65	0.790	111.5	0.54	±	0.13	±	0.14
0.90–1.25	1.050	95.2	0.61	±	0.11	±	0.17	1.020	110.8	0.05	±	0.02	±	0.02

Table 30 Double-differential inclusive cross-section $\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$ [mb/(GeV/c sr)] of the production of protons in p + Pb → p + X interactions with +12.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

| p_T | $20 < \theta < 30$ | | | | | | | $30 < \theta < 40$ | | | | | | |
	$\langle p_\mathrm{T} \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					$\langle p_\mathrm{T} \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
0.20–0.24	0.220	25.3	2054.62	±	55.18	±	182.16							
0.24–0.30	0.268	25.2	1748.29	±	40.78	±	136.31	0.269	34.9	2042.12	±	43.60	±	143.99
0.30–0.36	0.327	25.3	1389.93	±	37.36	±	95.96	0.326	35.1	1728.84	±	38.93	±	100.46
0.36–0.42	0.385	25.3	1121.62	±	34.20	±	72.10	0.386	35.1	1412.55	±	36.58	±	72.68
0.42–0.50	0.454	25.3	797.60	±	25.19	±	51.56	0.454	35.0	1030.96	±	28.17	±	54.94
0.50–0.60	0.540	25.3	586.36	±	19.36	±	40.16	0.541	35.1	783.42	±	22.28	±	48.36
0.60–0.72	0.646	25.3	390.22	±	14.25	±	31.31	0.648	35.2	477.19	±	16.47	±	41.08
0.72–0.90								0.787	35.0	252.26	±	9.80	±	31.33

| p_T | $40 < \theta < 50$ | | | | | | | $50 < \theta < 60$ | | | | | | |
	$\langle p_\mathrm{T} \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					$\langle p_\mathrm{T} \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
0.30–0.36	0.329	44.9	1937.55	±	40.70	±	89.16							
0.36–0.42	0.389	45.1	1638.94	±	38.11	±	63.59	0.389	55.0	1685.30	±	36.51	±	63.11
0.42–0.50	0.459	45.0	1240.31	±	29.20	±	49.82	0.458	55.0	1336.71	±	29.18	±	50.64
0.50–0.60	0.547	45.1	875.62	±	23.75	±	54.46	0.548	55.1	896.06	±	22.59	±	49.47
0.60–0.72	0.656	45.0	559.62	±	17.63	±	46.89	0.655	54.8	545.52	±	17.23	±	47.21
0.72–0.90	0.800	45.1	301.78	±	11.04	±	36.98	0.799	55.0	306.79	±	11.16	±	39.26
0.90–1.25	1.032	45.0	90.65	±	4.36	±	17.23	1.036	54.9	86.46	±	4.29	±	17.39

| p_T | $60 < \theta < 75$ | | | | | | | $75 < \theta < 90$ | | | | | | |
	$\langle p_\mathrm{T} \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					$\langle p_\mathrm{T} \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
0.50–0.60	0.544	67.4	905.79	±	17.39	±	52.32							
0.60–0.72	0.651	67.3	581.10	±	13.76	±	55.12	0.648	81.7	415.93	±	10.97	±	49.89
0.72–0.90	0.793	67.1	259.53	±	8.42	±	41.30	0.790	81.6	159.57	±	6.43	±	29.53
0.90–1.25								1.019	81.2	37.36	±	2.40	±	10.74

| p_T | $90 < \theta < 105$ | | | | | | | $105 < \theta < 125$ | | | | | | |
	$\langle p_\mathrm{T} \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					$\langle p_\mathrm{T} \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
0.50–0.60								0.540	113.1	256.79	±	7.97	±	40.34
0.60–0.72	0.648	97.1	284.57	±	9.05	±	43.09	0.646	112.9	104.57	±	5.21	±	25.88
0.72–0.90	0.787	96.5	89.08	±	4.97	±	19.14							

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Table 31 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^+'s in p + Pb $\rightarrow$ π^+ + X interactions with +12.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	\multicolumn{7}{l}{$20 < \theta < 30$}	\multicolumn{7}{l}{$30 < \theta < 40$}
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.10–0.13	0.114	25.1	604.40	±	38.67	±	65.31	0.115	34.8	558.19	±	35.04	±	57.07
0.13–0.16	0.144	24.7	713.90	±	37.44	±	62.60	0.144	34.9	548.37	±	31.72	±	46.83
0.16–0.20	0.179	24.7	714.65	±	31.73	±	54.88	0.179	34.6	639.65	±	29.05	±	46.96
0.20–0.24	0.219	25.0	755.95	±	31.86	±	48.81	0.219	34.7	649.06	±	29.49	±	40.62
0.24–0.30	0.269	24.8	758.84	±	26.28	±	40.26	0.269	34.8	626.54	±	23.82	±	31.55
0.30–0.36	0.326	24.8	665.78	±	24.23	±	28.04	0.327	34.8	557.38	±	22.36	±	22.23
0.36–0.42	0.387	24.9	537.80	±	21.30	±	20.72	0.386	34.6	418.98	±	19.32	±	15.91
0.42–0.50	0.454	24.8	357.38	±	14.81	±	16.90	0.455	34.8	285.32	±	13.49	±	13.37
0.50–0.60	0.540	25.0	275.66	±	11.09	±	19.35	0.541	34.8	224.46	±	10.30	±	15.49
0.60–0.72	0.648	24.8	167.78	±	7.33	±	17.82	0.649	34.9	143.02	±	7.19	±	14.80
0.72–0.90								0.786	34.8	67.76	±	3.57	±	10.74

p_T	\multicolumn{7}{l}{$40 < \theta < 50$}	\multicolumn{7}{l}{$50 < \theta < 60$}
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.10–0.13	0.116	44.9	475.20	±	32.79	±	49.38							
0.13–0.16	0.145	45.2	479.31	±	28.33	±	41.39	0.146	54.9	396.41	±	26.67	±	34.15
0.16–0.20	0.179	44.7	531.77	±	26.43	±	38.98	0.179	54.9	418.56	±	22.91	±	29.75
0.20–0.24	0.219	44.9	488.31	±	25.37	±	30.29	0.221	54.5	419.48	±	23.18	±	24.80
0.24–0.30	0.269	44.6	506.91	±	21.45	±	25.32	0.269	54.9	397.23	±	18.82	±	18.57
0.30–0.36	0.329	44.9	437.70	±	20.24	±	18.34	0.330	54.7	323.97	±	17.29	±	13.10
0.36–0.42	0.389	44.8	325.85	±	17.06	±	12.57	0.391	54.9	250.64	±	15.32	±	10.99
0.42–0.50	0.459	44.8	263.03	±	13.23	±	12.72	0.460	54.8	192.97	±	11.21	±	10.55
0.50–0.60	0.546	44.6	166.07	±	9.07	±	11.87	0.547	54.9	142.56	±	8.73	±	11.33
0.60–0.72	0.654	44.7	95.58	±	5.87	±	10.04	0.653	54.5	63.94	±	4.93	±	7.40
0.72–0.90	0.794	44.5	51.06	±	3.30	±	8.00	0.795	54.6	34.26	±	2.78	±	5.74
0.90–1.25								1.029	54.6	7.28	±	0.71	±	1.95

p_T	\multicolumn{7}{l}{$60 < \theta < 75$}	\multicolumn{7}{l}{$75 < \theta < 90$}
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.13–0.16	0.145	66.8	362.22	±	23.04	±	32.38	0.148	83.1	274.31	±	51.52	±	29.36
0.16–0.20	0.179	66.8	384.70	±	18.35	±	27.57	0.179	82.0	274.36	±	16.17	±	18.08
0.20–0.24	0.220	66.9	344.06	±	17.15	±	19.85	0.219	82.0	252.73	±	15.11	±	13.17
0.24–0.30	0.268	67.2	322.29	±	14.09	±	14.99	0.269	82.0	199.96	±	11.24	±	9.00
0.30–0.36	0.328	66.5	219.43	±	11.71	±	9.26	0.327	81.6	163.08	±	10.36	±	8.23
0.36–0.42	0.388	66.6	150.16	±	9.65	±	7.32	0.387	81.8	118.72	±	8.80	±	7.58
0.42–0.50	0.457	66.3	126.69	±	7.61	±	8.38	0.458	81.9	74.08	±	5.83	±	6.44
0.50–0.60	0.541	66.7	82.33	±	5.33	±	8.08	0.544	81.6	45.86	±	4.01	±	5.72
0.60–0.72	0.654	66.8	41.72	±	3.37	±	5.86	0.646	81.8	21.85	±	2.43	±	3.79
0.72–0.90	0.787	66.0	20.49	±	1.81	±	4.11	0.798	81.0	8.16	±	1.13	±	1.97
0.90–1.25	1.009	66.4	3.52	±	0.40	±	1.11	1.003	82.1	1.34	±	0.23	±	0.50

p_T	\multicolumn{7}{l}{$90 < \theta < 105$}	\multicolumn{7}{l}{$105 < \theta < 125$}
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.13–0.16	0.146	97.2	263.75	±	24.07	±	25.61	0.145	114.8	216.28	±	14.56	±	14.32
0.16–0.20	0.179	97.3	255.59	±	15.86	±	15.07	0.178	114.1	219.83	±	11.89	±	10.26
0.20–0.24	0.218	97.5	260.97	±	15.60	±	11.91	0.218	114.1	134.61	±	9.43	±	5.93
0.24–0.30	0.267	96.9	175.98	±	10.67	±	8.27	0.265	113.6	86.86	±	6.40	±	5.36
0.30–0.36	0.327	96.8	87.10	±	7.47	±	5.61	0.325	114.0	46.78	±	4.64	±	4.49
0.36–0.42	0.387	96.8	69.40	±	6.79	±	6.58	0.388	113.0	30.75	±	3.75	±	4.12
0.42–0.50	0.456	96.9	43.39	±	4.40	±	5.62	0.455	114.5	13.56	±	2.04	±	2.43
0.50–0.60	0.539	96.9	25.33	±	3.05	±	4.54	0.544	113.2	9.66	±	1.62	±	2.30
0.60–0.72	0.659	96.2	10.99	±	1.64	±	2.68	0.651	113.0	3.56	±	0.81	±	1.12
0.72–0.90	0.802	96.9	3.19	±	0.68	±	1.06	0.793	111.4	1.33	±	0.35	±	0.57
0.90–1.25	1.034	94.7	0.37	±	0.12	±	0.18	0.998	109.2	0.07	±	0.04	±	0.04

Table 32 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^-'s in p + Pb → π^- + X interactions with +12.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
		$20 < \theta < 30$							$30 < \theta < 40$					
0.10–0.13	0.116	24.6	883.23	±	45.90	±	98.07	0.116	34.8	744.14	±	40.77	±	80.89
0.13–0.16	0.146	24.8	887.44	±	41.26	±	79.47	0.145	34.8	707.86	±	35.74	±	62.81
0.16–0.20	0.180	25.2	909.55	±	35.03	±	68.10	0.180	34.8	743.20	±	31.25	±	55.65
0.20–0.24	0.221	24.9	915.84	±	34.76	±	56.78	0.221	34.8	671.16	±	29.81	±	41.74
0.24–0.30	0.271	25.0	750.99	±	25.38	±	35.29	0.271	34.9	627.06	±	23.65	±	30.33
0.30–0.36	0.331	24.8	556.93	±	21.66	±	20.65	0.331	34.7	530.65	±	21.68	±	20.01
0.36–0.42	0.391	25.0	476.86	±	20.47	±	19.38	0.392	34.8	395.17	±	18.71	±	15.52
0.42–0.50	0.463	25.1	292.42	±	13.73	±	16.10	0.463	35.0	280.41	±	13.52	±	14.86
0.50–0.60	0.552	24.9	193.99	±	9.87	±	16.16	0.551	34.6	170.27	±	9.22	±	13.62
0.60–0.72	0.661	25.2	110.99	±	6.68	±	13.52	0.660	34.8	90.86	±	5.95	±	10.69
0.72–0.90								0.804	34.9	41.72	±	3.28	±	7.11
		$40 < \theta < 50$							$50 < \theta < 60$					
0.10–0.13	0.115	45.2	754.20	±	44.11	±	83.71							
0.13–0.16	0.146	45.0	662.89	±	34.51	±	59.47	0.145	54.8	593.40	±	33.22	±	52.45
0.16–0.20	0.179	44.9	607.26	±	27.65	±	45.68	0.180	54.8	562.52	±	26.97	±	40.82
0.20–0.24	0.220	44.7	568.35	±	27.04	±	35.24	0.219	54.8	462.37	±	24.17	±	27.34
0.24–0.30	0.268	44.8	543.21	±	22.08	±	26.22	0.269	54.7	430.70	±	19.63	±	19.90
0.30–0.36	0.329	44.9	405.08	±	19.02	±	15.54	0.327	54.7	351.85	±	17.91	±	13.97
0.36–0.42	0.390	44.6	319.24	±	16.75	±	13.03	0.389	54.4	261.53	±	15.14	±	11.33
0.42–0.50	0.457	44.9	226.36	±	12.11	±	12.85	0.459	55.1	170.46	±	10.55	±	10.32
0.50–0.60	0.545	45.0	133.31	±	8.15	±	11.43	0.546	54.5	114.34	±	7.76	±	10.28
0.60–0.72	0.661	44.9	77.83	±	5.68	±	9.72	0.650	54.4	60.75	±	4.98	±	7.86
0.72–0.90	0.801	44.4	30.63	±	2.80	±	5.54	0.801	54.1	21.38	±	2.27	±	3.98
0.90–1.25								1.045	54.9	4.96	±	0.68	±	1.46
		$60 < \theta < 75$							$75 < \theta < 90$					
0.13–0.16	0.145	67.1	611.95	±	30.10	±	51.04	0.146	82.8	461.16	±	31.47	±	44.94
0.16–0.20	0.180	67.2	447.67	±	19.33	±	29.71	0.180	81.8	420.57	±	20.16	±	25.76
0.20–0.24	0.219	67.0	412.05	±	18.89	±	21.80	0.219	82.1	334.73	±	17.84	±	17.00
0.24–0.30	0.267	66.9	314.82	±	13.98	±	14.10	0.269	81.6	207.42	±	11.54	±	9.48
0.30–0.36	0.329	67.0	242.55	±	12.19	±	9.96	0.332	82.1	156.49	±	10.21	±	8.80
0.36–0.42	0.391	66.8	188.57	±	10.72	±	9.82	0.391	81.4	102.31	±	8.01	±	7.15
0.42–0.50	0.457	66.7	135.10	±	7.80	±	9.74	0.460	81.9	73.21	±	5.81	±	7.10
0.50–0.60	0.549	66.5	71.77	±	4.88	±	7.50	0.549	81.6	38.56	±	3.60	±	5.25
0.60–0.72	0.653	67.2	44.38	±	3.55	±	6.52	0.653	81.7	21.34	±	2.52	±	3.99
0.72–0.90	0.797	66.1	12.20	±	1.42	±	2.53	0.793	80.7	7.08	±	1.08	±	1.83
0.90–1.25	1.052	67.3	1.68	±	0.32	±	0.54	1.028	80.9	0.93	±	0.23	±	0.37
		$90 < \theta < 105$							$105 < \theta < 125$					
0.13–0.16	0.146	97.9	433.95	±	30.39	±	37.39	0.144	114.0	394.61	±	22.13	±	24.52
0.16–0.20	0.179	97.5	359.22	±	19.25	±	21.43	0.178	114.0	265.68	±	13.81	±	11.52
0.20–0.24	0.220	96.9	264.10	±	16.15	±	13.56	0.219	113.2	175.03	±	11.15	±	8.60
0.24–0.30	0.270	97.2	170.85	±	10.73	±	9.37	0.265	113.3	84.79	±	6.34	±	6.21
0.30–0.36	0.327	96.7	101.69	±	8.29	±	7.80	0.329	113.4	56.58	±	5.09	±	6.35
0.36–0.42	0.390	96.7	70.41	±	6.75	±	7.38	0.387	114.2	29.17	±	3.52	±	4.53
0.42–0.50	0.455	96.2	42.54	±	4.37	±	6.12	0.456	113.0	14.89	±	2.19	±	3.06
0.50–0.60	0.551	96.5	23.18	±	2.87	±	4.60	0.540	111.0	6.78	±	1.26	±	1.85
0.60–0.72	0.647	96.7	12.13	±	1.81	±	3.24	0.697	110.0	0.83	±	0.41	±	0.30
0.72–0.90	0.787	95.4	2.55	±	0.60	±	0.93	0.796	107.8	0.69	±	0.24	±	0.34
0.90–1.25	1.057	97.5	0.89	±	0.25	±	0.48							

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Table 33 Double-differential inclusive cross-section $\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$ [mb/(GeV/c sr)] of the production of protons in $\pi^+ + \mathrm{Pb} \to \mathrm{p} + \mathrm{X}$ interactions with $+12.0$ GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

| p_T | $20 < \theta < 30$ | | | | | | $30 < \theta < 40$ | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				$\langle p_T \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			
0.24–0.30	0.267	25.4	1482.78	±	125.16	±	116.63	0.268	34.8	1888.07	±	141.33	±	134.89
0.30–0.36	0.326	25.0	1075.74	±	109.21	±	75.31	0.329	35.2	1613.97	±	124.97	±	95.71
0.36–0.42	0.387	25.2	815.40	±	96.41	±	52.68	0.385	35.0	1247.54	±	115.19	±	66.32
0.42–0.50	0.453	25.5	680.81	±	77.80	±	45.06	0.453	35.1	843.79	±	86.16	±	47.76
0.50–0.60	0.538	25.5	481.06	±	59.15	±	32.88	0.541	34.9	631.96	±	68.31	±	43.74
0.60–0.72	0.650	25.3	266.15	±	38.94	±	22.84	0.646	35.3	339.39	±	45.80	±	29.45
0.72–0.90							0.788	35.1	152.09	±	25.39	±	19.57

| p_T | $40 < \theta < 50$ | | | | | | $50 < \theta < 60$ | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				$\langle p_T \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			
0.30–0.36	0.328	45.3	1597.07	±	122.71	±	76.72						
0.36–0.42	0.389	45.5	1370.30	±	117.79	±	55.54	0.389	54.7	1569.59	±	118.60	±	62.95
0.42–0.50	0.458	45.0	872.24	±	83.01	±	35.78	0.460	54.9	1190.38	±	93.42	±	47.35
0.50–0.60	0.545	44.9	712.47	±	71.66	±	46.21	0.552	55.1	700.75	±	68.01	±	40.13
0.60–0.72	0.661	44.9	360.87	±	47.66	±	30.63	0.660	55.2	473.86	±	55.00	±	42.36
0.72–0.90	0.798	44.5	192.14	±	29.28	±	23.45	0.795	55.1	263.76	±	34.46	±	33.77
0.90–1.25	1.020	44.3	83.33	±	14.15	±	15.99	1.060	55.2	70.63	±	13.21	±	14.27

| p_T | $60 < \theta < 75$ | | | | | | $75 < \theta < 90$ | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				$\langle p_T \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			
0.50–0.60	0.546	67.1	704.98	±	52.13	±	40.79						
0.60–0.72	0.652	68.3	425.68	±	39.92	±	40.97	0.652	82.1	325.97	±	32.74	±	39.26
0.72–0.90	0.789	67.0	211.36	±	25.43	±	33.13	0.792	82.1	161.63	±	21.96	±	29.68

| p_T | $90 < \theta < 105$ | | | | | | $105 < \theta < 125$ | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				$\langle p_T \rangle$	$\langle \theta \rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$			
0.50–0.60							0.542	111.5	252.59	±	26.99	±	39.90
0.60–0.72	0.653	97.2	264.14	±	29.64	±	40.23	0.644	112.5	86.34	±	16.31	±	21.55
0.72–0.90	0.785	96.0	66.24	±	14.45	±	14.19	0.787	111.8	27.41	±	8.27	±	10.36

Table 34 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^+'s in $\pi^+ + \text{Pb} \to \pi^+ + \text{X}$ interactions with +12.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$	±		±		$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$	±		±	
	20 < θ < 30							30 < θ < 40						
0.10–0.13	0.117	24.2	825.09	±	149.13	±	89.42	0.119	35.1	418.95	±	98.54	±	43.45
0.13–0.16	0.148	23.7	587.34	±	114.38	±	53.14	0.144	35.0	493.83	±	102.52	±	43.88
0.16–0.20	0.178	25.4	850.83	±	119.12	±	66.14	0.179	34.1	765.14	±	106.33	±	57.48
0.20–0.24	0.218	24.9	913.65	±	119.72	±	60.76	0.219	34.5	723.00	±	105.55	±	46.62
0.24–0.30	0.268	25.3	980.38	±	102.13	±	52.90	0.266	34.9	677.62	±	82.60	±	34.85
0.30–0.36	0.326	24.6	755.92	±	87.18	±	32.74	0.325	34.1	511.87	±	71.40	±	21.57
0.36–0.42	0.385	24.9	562.61	±	74.13	±	23.18	0.389	35.2	462.10	±	69.01	±	18.83
0.42–0.50	0.452	24.3	454.63	±	55.99	±	22.55	0.457	34.9	370.95	±	52.64	±	18.32
0.50–0.60	0.545	25.0	280.96	±	38.51	±	20.26	0.540	34.5	244.11	±	36.43	±	17.47
0.60–0.72	0.649	25.0	183.85	±	26.61	±	19.87	0.651	34.3	159.44	±	26.18	±	16.90
0.72–0.90								0.790	35.1	55.40	±	10.85	±	8.91

p_T	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$	±		±		$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$	±		±	
	40 < θ < 50							50 < θ < 60						
0.10–0.13	0.114	45.0	657.86	±	137.98	±	68.85							
0.13–0.16	0.145	45.5	504.45	±	103.58	±	44.89	0.146	54.9	478.73	±	106.45	±	43.69
0.16–0.20	0.180	44.8	527.24	±	91.70	±	40.54	0.178	54.8	485.25	±	82.73	±	36.16
0.20–0.24	0.219	45.2	329.51	±	69.19	±	21.09	0.220	54.5	404.04	±	77.85	±	25.37
0.24–0.30	0.272	44.7	513.13	±	73.09	±	26.31	0.269	54.2	349.33	±	59.94	±	17.08
0.30–0.36	0.331	44.1	392.02	±	64.27	±	16.51	0.328	54.7	335.81	±	58.11	±	13.99
0.36–0.42	0.389	44.2	351.29	±	60.28	±	14.79	0.394	54.1	268.46	±	53.02	±	12.46
0.42–0.50	0.458	44.9	291.25	±	46.83	±	14.94	0.459	53.9	168.12	±	35.23	±	9.85
0.50–0.60	0.540	44.4	185.78	±	32.84	±	13.84	0.546	54.8	155.54	±	31.45	±	12.99
0.60–0.72	0.662	44.9	100.37	±	20.62	±	10.92	0.654	55.0	66.18	±	17.36	±	7.92
0.72–0.90	0.794	45.0	34.00	±	8.89	±	5.47	0.784	53.9	28.94	±	7.66	±	5.09
0.90–1.25								1.046	54.5	6.32	±	2.21	±	1.74

p_T	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$	±		±		$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$	±		±	
	60 < θ < 75							75 < θ < 90						
0.13–0.16	0.146	68.3	229.13	±	61.49	±	20.74	0.152	81.9	159.95	±	58.22	±	15.72
0.16–0.20	0.181	67.6	355.30	±	61.57	±	26.81	0.181	82.3	372.58	±	65.39	±	25.78
0.20–0.24	0.223	67.2	469.05	±	70.56	±	28.83	0.221	81.8	292.47	±	54.80	±	16.78
0.24–0.30	0.266	67.7	284.24	±	44.29	±	13.85	0.270	82.2	256.88	±	42.69	±	12.10
0.30–0.36	0.334	67.0	247.66	±	42.61	±	11.34	0.325	83.1	139.79	±	31.94	±	7.16
0.36–0.42	0.379	65.0	119.79	±	28.25	±	6.11	0.388	80.9	114.57	±	27.78	±	7.31
0.42–0.50	0.461	66.5	133.42	±	25.98	±	9.20	0.458	80.1	92.14	±	22.04	±	8.28
0.50–0.60	0.549	65.9	102.91	±	20.31	±	10.42	0.532	82.1	55.69	±	14.82	±	7.13
0.60–0.72	0.653	67.2	60.42	±	14.18	±	8.72	0.657	81.1	23.11	±	8.59	±	4.14
0.72–0.90	0.820	67.0	16.35	±	5.51	±	3.36	0.814	81.5	1.41	±	0.74	±	0.35
0.90–1.25	1.034	67.4	4.82	±	1.75	±	1.57	0.985	81.8	1.53	±	0.95	±	0.60

p_T	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$	±		±		$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$	±		±	
	90 < θ < 105							105 < θ < 125						
0.13–0.16	0.146	97.1	229.04	±	69.15	±	20.50	0.145	113.5	218.05	±	49.72	±	15.55
0.16–0.20	0.177	99.4	244.44	±	54.19	±	15.74	0.178	113.8	175.50	±	39.18	±	9.30
0.20–0.24	0.222	97.9	275.30	±	54.47	±	14.02	0.219	115.3	137.57	±	32.74	±	7.20
0.24–0.30	0.268	96.5	115.07	±	29.52	±	5.64	0.271	115.4	109.61	±	24.70	±	7.53
0.30–0.36	0.328	97.4	83.09	±	24.56	±	5.53	0.338	112.5	51.45	±	16.56	±	5.10
0.36–0.42	0.394	98.3	87.06	±	25.13	±	8.39	0.372	111.7	15.38	±	9.27	±	2.11
0.42–0.50	0.457	97.4	75.70	±	19.51	±	10.01	0.443	113.4	25.76	±	9.51	±	4.76
0.50–0.60	0.541	97.0	31.17	±	11.17	±	5.73	0.559	115.3	5.22	±	3.43	±	1.27
0.60–0.72	0.658	97.7	11.25	±	5.46	±	2.84							
0.72–0.90	0.798	94.3	5.47	±	3.20	±	1.86							

Table 35 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^-'s in $\pi^+ + \mathrm{Pb} \to \pi^- + \mathrm{X}$ interactions with $+12.0$ GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$20 < \theta < 30$ $\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$30 < \theta < 40$ $\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.10–0.13	0.117	25.1	762.30	±	141.20	±	83.29	0.117	35.3	588.84	±	116.31	±	63.18
0.13–0.16	0.145	24.8	550.43	±	105.72	±	49.70	0.145	35.3	756.27	±	131.88	±	69.01
0.16–0.20	0.181	24.6	1029.75	±	124.02	±	78.33	0.182	35.6	769.30	±	108.26	±	58.94
0.20–0.24	0.222	24.9	868.07	±	113.74	±	55.07	0.221	34.8	699.85	±	104.11	±	44.57
0.24–0.30	0.271	24.4	786.44	±	87.69	±	38.12	0.269	35.4	443.06	±	66.67	±	21.92
0.30–0.36	0.333	24.1	614.56	±	76.72	±	24.10	0.331	34.5	523.73	±	72.61	±	20.90
0.36–0.42	0.393	24.6	529.08	±	72.46	±	22.24	0.388	35.5	304.59	±	56.14	±	12.91
0.42–0.50	0.462	25.1	309.18	±	48.12	±	17.72	0.463	34.1	267.26	±	43.99	±	15.04
0.50–0.60	0.551	24.3	213.71	±	34.73	±	18.21	0.545	35.0	142.41	±	28.02	±	11.91
0.60–0.72	0.658	24.3	118.22	±	22.76	±	14.71	0.660	35.7	106.75	±	22.77	±	13.01
0.72–0.90								0.809	34.5	53.64	±	12.31	±	9.53

p_T	$40 < \theta < 50$ $\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$50 < \theta < 60$ $\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.10–0.13	0.118	45.6	713.73	±	145.22	±	79.16							
0.13–0.16	0.144	45.4	647.07	±	119.02	±	59.57	0.146	55.4	525.57	±	108.31	±	48.50
0.16–0.20	0.182	44.4	517.94	±	87.87	±	40.06	0.177	56.2	611.74	±	99.39	±	46.14
0.20–0.24	0.221	44.4	765.81	±	104.89	±	48.91	0.220	55.2	385.89	±	73.71	±	23.90
0.24–0.30	0.267	44.7	668.37	±	83.23	±	33.82	0.271	54.3	406.25	±	63.86	±	19.29
0.30–0.36	0.327	44.8	388.87	±	61.55	±	15.59	0.326	53.9	333.68	±	56.55	±	13.58
0.36–0.42	0.382	45.3	235.65	±	49.07	±	10.51	0.387	54.6	294.95	±	54.85	±	13.81
0.42–0.50	0.459	45.1	216.13	±	39.68	±	12.97	0.459	55.0	194.75	±	38.22	±	12.50
0.50–0.60	0.536	44.0	100.83	±	23.39	±	9.06	0.545	54.4	70.05	±	20.23	±	6.59
0.60–0.72	0.663	45.5	76.73	±	19.23	±	9.98	0.635	54.2	91.39	±	19.52	±	12.64
0.72–0.90	0.783	43.5	19.32	±	6.84	±	3.73	0.783	55.4	17.67	±	7.22	±	3.39
0.90–1.25								1.003	53.9	7.73	±	2.92	±	2.36

p_T	$60 < \theta < 75$ $\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$75 < \theta < 90$ $\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.13–0.16	0.147	67.7	435.86	±	94.48	±	39.16	0.146	81.3	278.79	±	76.77	±	24.39
0.16–0.20	0.179	68.1	472.85	±	69.72	±	32.83	0.178	82.4	395.69	±	66.69	±	26.78
0.20–0.24	0.217	65.9	298.42	±	54.90	±	17.04	0.222	82.1	405.12	±	68.55	±	24.90
0.24–0.30	0.268	67.0	287.12	±	45.67	±	13.81	0.268	81.6	227.41	±	41.00	±	11.26
0.30–0.36	0.326	66.3	248.29	±	41.45	±	10.45	0.329	81.5	154.23	±	33.80	±	8.89
0.36–0.42	0.392	67.9	222.67	±	39.87	±	12.24	0.382	82.8	139.01	±	31.33	±	10.10
0.42–0.50	0.462	67.1	135.76	±	26.16	±	10.13	0.456	83.3	46.16	±	15.39	±	4.63
0.50–0.60	0.540	67.2	56.69	±	14.73	±	6.11	0.539	83.3	52.84	±	14.13	±	7.44
0.60–0.72	0.668	65.6	51.04	±	12.82	±	7.73	0.665	80.5	24.76	±	9.36	±	4.79
0.72–0.90	0.829	65.6	17.28	±	5.47	±	3.74	0.790	82.3	8.77	±	3.94	±	2.37
0.90–1.25	1.135	62.0	2.41	±	1.39	±	0.79	1.091	82.6	2.15	±	1.07	±	0.93

p_T	$90 < \theta < 105$ $\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$105 < \theta < 125$ $\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.13–0.16	0.147	98.4	326.83	±	77.88	±	27.06	0.145	114.1	292.86	±	60.34	±	18.74
0.16–0.20	0.177	96.2	255.74	±	55.22	±	16.18	0.183	112.4	274.70	±	48.21	±	13.46
0.20–0.24	0.221	95.7	284.45	±	57.56	±	16.07	0.221	114.2	127.98	±	32.14	±	7.03
0.24–0.30	0.266	96.5	134.93	±	31.86	±	7.55	0.262	113.9	51.08	±	16.20	±	3.89
0.30–0.36	0.328	98.6	104.18	±	28.08	±	8.29	0.329	113.2	43.43	±	15.36	±	5.09
0.36–0.42	0.389	96.2	53.76	±	19.37	±	5.84	0.408	113.7	15.03	±	8.68	±	2.44
0.42–0.50	0.457	95.7	59.81	±	17.27	±	8.98	0.460	116.2	20.18	±	8.29	±	4.34
0.50–0.60	0.561	100.2	11.52	±	6.68	±	2.39							
0.60–0.72	0.667	93.5	22.79	±	8.62	±	6.36	0.640	112.1	4.99	±	3.53	±	1.92

Table 36 Double-differential inclusive cross-section $\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$ [mb/(GeV/c sr)] of the production of protons in $\pi^- + \mathrm{Pb} \to \mathrm{p} + \mathrm{X}$ interactions with -12.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

| p_T | $20 < \theta < 30$ | | | | | | | $30 < \theta < 40$ | | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
0.20–0.24	0.220	25.3	1561.36	±	37.02	±	85.30							
0.24–0.30	0.269	25.3	1352.18	±	24.60	±	68.82	0.271	34.9	1644.02	±	27.47	±	77.28
0.30–0.36	0.329	25.3	1057.70	±	22.79	±	57.50	0.329	35.1	1417.20	±	24.78	±	61.01
0.36–0.42	0.388	25.3	816.19	±	20.43	±	47.88	0.389	35.1	1070.04	±	22.23	±	49.32
0.42–0.50	0.457	25.4	570.78	±	14.59	±	36.88	0.459	35.1	793.74	±	17.27	±	44.15
0.50–0.60	0.545	25.4	430.55	±	11.51	±	29.67	0.546	35.2	543.29	±	12.92	±	34.91
0.60–0.72	0.655	25.4	251.86	±	7.97	±	20.14	0.654	35.2	332.73	±	9.54	±	27.97
0.72–0.90								0.798	35.1	169.91	±	5.57	±	17.57

| p_T | $40 < \theta < 50$ | | | | | | | $50 < \theta < 60$ | | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
0.30–0.36	0.330	45.0	1617.96	±	26.11	±	62.35							
0.36–0.42	0.390	45.1	1300.28	±	23.47	±	48.13	0.389	55.2	1311.24	±	22.33	±	52.80
0.42–0.50	0.458	45.1	944.75	±	17.90	±	39.06	0.458	55.0	1049.96	±	18.05	±	38.87
0.50–0.60	0.547	45.1	625.10	±	14.01	±	38.89	0.547	55.0	673.87	±	13.70	±	33.38
0.60–0.72	0.654	45.1	395.67	±	10.45	±	30.78	0.655	54.9	414.78	±	10.64	±	31.27
0.72–0.90	0.798	44.9	194.34	±	6.12	±	19.81	0.797	55.0	191.32	±	6.18	±	20.10

| p_T | $60 < \theta < 75$ | | | | | | | $75 < \theta < 90$ | | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
0.50–0.60	0.543	67.5	706.70	±	10.70	±	31.82							
0.60–0.72	0.650	67.4	391.58	±	7.91	±	26.30	0.649	81.9	331.91	±	6.81	±	22.60
0.72–0.90	0.790	67.1	171.57	±	4.85	±	20.23	0.789	81.8	114.90	±	3.84	±	13.39

| p_T | $90 < \theta < 105$ | | | | | | | $105 < \theta < 125$ | | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
0.50–0.60								0.539	113.0	198.88	±	4.90	±	18.12
0.60–0.72	0.649	97.2	215.15	±	5.53	±	17.77	0.646	113.0	68.68	±	3.01	±	9.76
0.72–0.90	0.786	96.8	63.83	±	2.98	±	8.99							

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Table 37 Double-differential inclusive cross-section $\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$ [mb/(GeV/c sr)] of the production of π^+'s in $\pi^- + \mathrm{Pb} \to \pi^+ + \mathrm{X}$ interactions with -12.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
	$20<\theta<30$							$30<\theta<40$						
0.10–0.13	0.116	24.9	694.73	$\pm$	27.58	$\pm$	52.08	0.116	35.0	564.45	$\pm$	23.89	$\pm$	41.72
0.13–0.16	0.145	24.8	728.73	$\pm$	25.89	$\pm$	44.16	0.145	34.7	612.31	$\pm$	23.63	$\pm$	37.18
0.16–0.20	0.180	24.8	850.58	$\pm$	23.54	$\pm$	44.26	0.180	35.0	644.21	$\pm$	19.97	$\pm$	32.96
0.20–0.24	0.220	24.9	863.95	$\pm$	23.47	$\pm$	40.04	0.219	34.7	667.02	$\pm$	20.37	$\pm$	30.50
0.24–0.30	0.270	24.8	853.99	$\pm$	19.03	$\pm$	36.05	0.269	34.8	650.14	$\pm$	16.61	$\pm$	26.59
0.30–0.36	0.329	24.8	650.91	$\pm$	16.16	$\pm$	24.74	0.329	34.8	558.14	$\pm$	15.33	$\pm$	20.92
0.36–0.42	0.389	24.7	570.36	$\pm$	15.36	$\pm$	23.26	0.389	34.9	437.93	$\pm$	13.68	$\pm$	16.77
0.42–0.50	0.459	24.8	415.05	$\pm$	10.84	$\pm$	17.63	0.458	34.7	347.91	$\pm$	10.25	$\pm$	13.94
0.50–0.60	0.545	24.8	288.03	$\pm$	7.64	$\pm$	15.88	0.547	34.8	222.92	$\pm$	6.94	$\pm$	11.27
0.60–0.72	0.655	25.0	166.05	$\pm$	5.09	$\pm$	12.93	0.654	34.8	139.95	$\pm$	4.80	$\pm$	9.84
0.72–0.90								0.797	34.8	59.95	$\pm$	2.21	$\pm$	6.60
	$40<\theta<50$							$50<\theta<60$						
0.10–0.13	0.116	45.0	454.33	$\pm$	22.76	$\pm$	34.91							
0.13–0.16	0.146	45.2	523.84	$\pm$	21.82	$\pm$	32.07	0.146	55.0	442.12	$\pm$	19.96	$\pm$	27.91
0.16–0.20	0.180	45.0	533.31	$\pm$	18.08	$\pm$	27.64	0.180	54.9	396.79	$\pm$	15.08	$\pm$	20.84
0.20–0.24	0.220	44.9	504.86	$\pm$	17.59	$\pm$	23.31	0.220	54.8	438.32	$\pm$	16.63	$\pm$	20.15
0.24–0.30	0.269	44.7	513.60	$\pm$	14.87	$\pm$	21.36	0.268	54.7	385.47	$\pm$	13.08	$\pm$	16.78
0.30–0.36	0.329	44.8	415.09	$\pm$	13.31	$\pm$	15.96	0.329	54.7	324.85	$\pm$	11.89	$\pm$	12.95
0.36–0.42	0.389	44.7	369.39	$\pm$	12.73	$\pm$	15.23	0.389	54.6	273.90	$\pm$	10.85	$\pm$	10.88
0.42–0.50	0.459	44.6	239.07	$\pm$	8.39	$\pm$	9.72	0.459	54.7	188.99	$\pm$	7.84	$\pm$	8.49
0.50–0.60	0.548	44.5	163.22	$\pm$	6.15	$\pm$	8.02	0.547	54.7	134.32	$\pm$	5.69	$\pm$	7.03
0.60–0.72	0.656	44.6	97.40	$\pm$	4.02	$\pm$	6.39	0.656	54.4	81.59	$\pm$	3.96	$\pm$	5.62
0.72–0.90	0.796	44.4	42.95	$\pm$	1.96	$\pm$	4.24	0.795	54.5	29.94	$\pm$	1.69	$\pm$	2.97
0.90–1.25								1.034	54.4	9.07	$\pm$	0.56	$\pm$	1.45
	$60<\theta<75$							$75<\theta<90$						
0.13–0.16	0.146	67.0	302.59	$\pm$	14.42	$\pm$	19.32	0.147	81.9	299.41	$\pm$	20.21	$\pm$	34.46
0.16–0.20	0.179	67.2	360.43	$\pm$	12.28	$\pm$	18.69	0.180	82.3	281.41	$\pm$	11.31	$\pm$	14.32
0.20–0.24	0.219	67.5	344.75	$\pm$	11.98	$\pm$	15.57	0.220	82.0	267.41	$\pm$	11.00	$\pm$	12.11
0.24–0.30	0.268	67.1	285.75	$\pm$	9.21	$\pm$	12.14	0.267	82.0	213.68	$\pm$	8.23	$\pm$	10.33
0.30–0.36	0.328	66.8	222.42	$\pm$	8.15	$\pm$	9.31	0.328	82.0	138.84	$\pm$	6.56	$\pm$	6.40
0.36–0.42	0.387	67.0	184.40	$\pm$	7.47	$\pm$	8.29	0.387	82.1	101.26	$\pm$	5.55	$\pm$	5.05
0.42–0.50	0.456	66.9	129.95	$\pm$	5.23	$\pm$	6.06	0.456	81.7	75.70	$\pm$	4.10	$\pm$	4.39
0.50–0.60	0.545	66.8	86.71	$\pm$	3.73	$\pm$	5.16	0.545	81.7	48.97	$\pm$	2.87	$\pm$	3.52
0.60–0.72	0.651	66.5	45.91	$\pm$	2.41	$\pm$	3.63	0.653	81.6	20.32	$\pm$	1.58	$\pm$	1.94
0.72–0.90	0.786	66.4	18.34	$\pm$	1.17	$\pm$	2.01	0.789	81.0	9.79	$\pm$	0.80	$\pm$	1.32
0.90–1.25	1.020	66.7	4.41	$\pm$	0.32	$\pm$	0.80	1.013	81.1	1.62	$\pm$	0.18	$\pm$	0.34
	$90<\theta<105$							$105<\theta<125$						
0.13–0.16	0.147	97.7	267.13	$\pm$	17.84	$\pm$	23.67	0.144	114.7	214.23	$\pm$	10.36	$\pm$	12.53
0.16–0.20	0.179	97.3	241.03	$\pm$	10.48	$\pm$	11.87	0.179	114.0	175.81	$\pm$	7.31	$\pm$	8.56
0.20–0.24	0.218	97.3	218.18	$\pm$	10.05	$\pm$	9.69	0.218	113.5	142.26	$\pm$	6.90	$\pm$	6.14
0.24–0.30	0.267	97.0	150.79	$\pm$	6.80	$\pm$	6.55	0.266	113.7	82.55	$\pm$	4.32	$\pm$	3.96
0.30–0.36	0.329	96.9	102.95	$\pm$	5.81	$\pm$	5.94	0.325	114.3	46.03	$\pm$	3.12	$\pm$	2.80
0.36–0.42	0.387	97.1	68.88	$\pm$	4.63	$\pm$	4.41	0.385	113.5	38.68	$\pm$	2.89	$\pm$	3.04
0.42–0.50	0.455	97.1	40.02	$\pm$	2.91	$\pm$	3.04	0.454	113.2	18.85	$\pm$	1.67	$\pm$	1.89
0.50–0.60	0.542	96.5	27.70	$\pm$	2.11	$\pm$	2.78	0.539	112.3	6.48	$\pm$	0.84	$\pm$	0.87
0.60–0.72	0.645	96.0	10.72	$\pm$	1.10	$\pm$	1.46	0.652	113.8	3.08	$\pm$	0.50	$\pm$	0.55
0.72–0.90	0.784	97.4	4.52	$\pm$	0.58	$\pm$	0.82	0.766	113.7	0.57	$\pm$	0.15	$\pm$	0.15
0.90–1.25	1.017	96.2	0.55	$\pm$	0.11	$\pm$	0.16	0.985	111.1	0.09	$\pm$	0.03	$\pm$	0.04

Table 38 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^-'s in $\pi^- + \text{Pb} \to \pi^- + \text{X}$ interactions with -12.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	— $20 < \theta < 30$				$30 < \theta < 40$		
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$		$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$
0.10–0.13	0.116	24.9	912.65 ± 31.95 ± 67.94		0.116	34.9	734.11 ± 27.98 ± 55.07
0.13–0.16	0.146	24.9	986.82 ± 30.86 ± 60.04		0.145	34.8	796.54 ± 26.94 ± 47.88
0.16–0.20	0.180	24.8	1042.88 ± 26.50 ± 54.01		0.180	34.9	811.36 ± 22.82 ± 41.98
0.20–0.24	0.220	24.8	1115.51 ± 27.53 ± 53.24		0.219	34.8	836.67 ± 23.24 ± 38.14
0.24–0.30	0.269	24.7	975.78 ± 20.55 ± 38.91		0.270	34.7	796.12 ± 18.71 ± 32.20
0.30–0.36	0.329	24.8	834.20 ± 19.01 ± 30.71		0.329	34.8	627.48 ± 16.48 ± 23.04
0.36–0.42	0.389	25.0	645.84 ± 16.74 ± 24.02		0.388	34.8	512.96 ± 14.98 ± 19.04
0.42–0.50	0.457	24.8	536.58 ± 13.44 ± 23.65		0.458	34.8	379.92 ± 11.01 ± 15.65
0.50–0.60	0.545	24.8	319.14 ± 8.92 ± 16.65		0.547	34.8	247.56 ± 7.91 ± 12.65
0.60–0.72	0.654	24.8	204.58 ± 6.58 ± 14.03		0.652	35.0	137.15 ± 5.18 ± 9.26
0.72–0.90					0.797	35.1	77.34 ± 3.28 ± 7.06

p_T	$40 < \theta < 50$				$50 < \theta < 60$		
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$		$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$
0.10–0.13	0.116	44.9	681.51 ± 28.14 ± 52.53				
0.13–0.16	0.145	45.0	691.24 ± 24.97 ± 42.15		0.145	54.8	594.09 ± 23.21 ± 37.58
0.16–0.20	0.180	44.9	690.75 ± 21.24 ± 36.00		0.179	55.0	585.93 ± 19.49 ± 30.61
0.20–0.24	0.220	44.8	680.74 ± 21.03 ± 31.45		0.220	54.8	561.48 ± 19.29 ± 25.87
0.24–0.30	0.269	44.7	583.92 ± 16.10 ± 24.08		0.269	54.7	451.64 ± 14.09 ± 18.17
0.30–0.36	0.329	44.7	484.82 ± 14.67 ± 18.44		0.328	54.8	402.34 ± 13.59 ± 16.63
0.36–0.42	0.388	44.6	397.96 ± 13.17 ± 15.10		0.389	54.8	306.35 ± 11.68 ± 12.31
0.42–0.50	0.458	44.9	303.42 ± 9.85 ± 12.95		0.458	54.7	216.77 ± 8.41 ± 9.60
0.50–0.60	0.545	44.9	190.32 ± 6.89 ± 10.19		0.546	54.8	150.52 ± 6.18 ± 8.36
0.60–0.72	0.654	44.7	108.50 ± 4.64 ± 7.65		0.650	54.6	77.25 ± 3.92 ± 5.65
0.72–0.90	0.793	44.9	51.92 ± 2.60 ± 5.02		0.793	54.6	33.16 ± 2.03 ± 3.33
0.90–1.25					1.020	54.1	7.95 ± 0.64 ± 1.25

p_T	$60 < \theta < 75$				$75 < \theta < 90$		
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$		$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$
0.13–0.16	0.146	67.4	532.07 ± 20.14 ± 32.66		0.147	81.8	444.14 ± 24.11 ± 56.10
0.16–0.20	0.180	67.4	454.29 ± 14.18 ± 22.64		0.180	82.4	385.77 ± 13.89 ± 19.65
0.20–0.24	0.219	67.0	439.02 ± 13.79 ± 19.13		0.220	82.0	330.85 ± 12.56 ± 15.55
0.24–0.30	0.270	66.9	366.92 ± 10.70 ± 16.28		0.268	81.7	252.67 ± 8.96 ± 11.53
0.30–0.36	0.330	66.8	275.69 ± 9.24 ± 11.82		0.329	82.2	186.11 ± 7.87 ± 9.81
0.36–0.42	0.389	66.9	206.69 ± 8.02 ± 9.52		0.389	81.7	136.52 ± 6.62 ± 7.38
0.42–0.50	0.460	66.9	150.38 ± 5.74 ± 7.28		0.462	81.8	94.85 ± 4.67 ± 5.79
0.50–0.60	0.550	66.8	102.28 ± 4.21 ± 6.31		0.549	81.9	54.06 ± 3.04 ± 4.16
0.60–0.72	0.659	66.9	54.08 ± 2.71 ± 4.38		0.658	81.7	29.45 ± 2.01 ± 2.98
0.72–0.90	0.801	67.0	21.96 ± 1.36 ± 2.42		0.793	81.1	9.73 ± 0.92 ± 1.32
0.90–1.25	1.037	66.0	4.18 ± 0.36 ± 0.74		1.037	81.4	1.55 ± 0.23 ± 0.32

p_T	$90 < \theta < 105$				$105 < \theta < 125$		
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$		$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$
0.13–0.16					0.144	114.2	312.48 ± 12.40 ± 18.63
0.16–0.20	0.179	97.4	342.30 ± 12.96 ± 16.47		0.178	113.8	231.94 ± 8.69 ± 10.39
0.20–0.24	0.219	97.7	279.14 ± 11.65 ± 13.05		0.219	113.4	157.83 ± 7.48 ± 6.92
0.24–0.30	0.269	97.2	188.74 ± 7.88 ± 9.15		0.268	113.6	94.78 ± 4.67 ± 4.77
0.30–0.36	0.329	96.9	127.46 ± 6.38 ± 6.79		0.327	113.6	55.01 ± 3.52 ± 3.66
0.36–0.42	0.389	96.9	83.17 ± 4.97 ± 5.22		0.389	113.1	39.28 ± 2.90 ± 3.40
0.42–0.50	0.459	96.8	53.48 ± 3.47 ± 4.32		0.454	112.7	20.23 ± 1.78 ± 2.24
0.50–0.60	0.545	96.2	30.23 ± 2.30 ± 3.23		0.546	111.4	10.47 ± 1.14 ± 1.50
0.60–0.72	0.643	97.2	10.55 ± 1.19 ± 1.49		0.649	112.0	3.02 ± 0.53 ± 0.58
0.72–0.90	0.783	97.2	4.42 ± 0.58 ± 0.86		0.783	112.8	0.72 ± 0.18 ± 0.19
0.90–1.25	1.069	95.3	0.47 ± 0.13 ± 0.13		0.993	111.3	0.08 ± 0.03 ± 0.03

Table 39 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of protons in p + Pb → p + X interactions with +15.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

| p_T | $20 < \theta < 30$ | | | | | | | $30 < \theta < 40$ | | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.20–0.24	0.220	25.1	1997.04	±	45.03	±	107.86							
0.24–0.30	0.270	25.3	1828.93	±	34.32	±	91.81	0.271	34.9	2040.01	±	35.67	±	94.46
0.30–0.36	0.329	25.3	1490.25	±	31.94	±	76.47	0.329	35.1	1903.46	±	33.99	±	80.38
0.36–0.42	0.389	25.2	1138.32	±	28.24	±	62.84	0.389	35.2	1510.05	±	31.67	±	66.41
0.42–0.50	0.458	25.3	902.20	±	21.80	±	53.64	0.458	35.1	1107.24	±	24.02	±	58.41
0.50–0.60	0.547	25.3	635.32	±	16.58	±	43.84	0.547	35.1	809.71	±	18.62	±	49.90
0.60–0.72	0.656	25.3	435.12	±	12.39	±	33.48	0.655	35.1	513.69	±	14.02	±	39.68
0.72–0.90								0.800	35.2	284.55	±	8.66	±	28.71

| p_T | $40 < \theta < 50$ | | | | | | | $50 < \theta < 60$ | | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.30–0.36	0.329	45.0	1983.19	±	33.61	±	75.06							
0.36–0.42	0.389	45.1	1724.27	±	31.85	±	62.09	0.389	55.0	1777.49	±	31.25	±	63.97
0.42–0.50	0.458	45.0	1294.76	±	25.10	±	55.14	0.458	55.0	1364.78	±	24.30	±	48.66
0.50–0.60	0.547	45.1	876.68	±	19.54	±	52.45	0.547	55.0	946.25	±	19.20	±	44.19
0.60–0.72	0.656	45.1	586.92	±	15.01	±	43.15	0.655	55.0	593.95	±	14.82	±	41.57
0.72–0.90	0.798	45.0	305.90	±	9.11	±	29.97	0.801	55.0	309.55	±	9.20	±	30.15
0.90–1.25								1.040	54.9	86.38	±	3.58	±	12.81

| p_T | $60 < \theta < 75$ | | | | | | | $75 < \theta < 90$ | | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.50–0.60	0.552	67.5	942.44	±	14.58	±	41.25							
0.60–0.72	0.663	67.4	566.45	±	11.18	±	35.27	0.662	81.8	420.09	±	9.13	±	28.37
0.72–0.90	0.810	67.0	244.18	±	6.65	±	26.41	0.807	81.8	150.63	±	5.16	±	16.85
0.90–1.25	1.046	66.9	66.22	±	2.62	±	10.84							

| p_T | $90 < \theta < 105$ | | | | | | | $105 < \theta < 125$ | | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.50–0.60								0.549	113.1	252.27	±	6.52	±	22.53
0.60–0.72	0.660	97.0	272.19	±	7.28	±	22.30	0.660	112.9	90.23	±	3.99	±	12.27
0.72–0.90	0.804	96.5	80.29	±	3.88	±	10.88							

Table 40 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^+'s in p + Pb → π^+ + X interactions with +15.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				
	20 < θ < 30							30 < θ < 40						
0.10–0.13	0.116	24.7	811.90	±	37.08	±	65.78	0.116	34.9	619.12	±	30.95	±	47.56
0.13–0.16	0.145	24.8	816.60	±	33.26	±	48.87	0.146	34.8	705.71	±	29.95	±	41.53
0.16–0.20	0.181	24.8	905.51	±	29.56	±	48.04	0.180	34.8	721.67	±	25.74	±	36.90
0.20–0.24	0.220	24.8	921.44	±	29.12	±	42.99	0.220	34.7	744.94	±	26.40	±	34.69
0.24–0.30	0.269	24.8	908.70	±	23.80	±	38.93	0.269	34.8	750.17	±	21.55	±	30.69
0.30–0.36	0.329	24.9	740.85	±	21.17	±	28.76	0.329	34.7	637.43	±	20.07	±	25.15
0.36–0.42	0.389	24.7	647.59	±	19.53	±	24.78	0.388	34.8	482.06	±	16.93	±	18.14
0.42–0.50	0.460	24.8	498.92	±	14.36	±	21.15	0.458	34.7	391.88	±	13.29	±	16.02
0.50–0.60	0.548	24.8	321.41	±	9.95	±	17.65	0.548	34.6	248.63	±	8.90	±	12.75
0.60–0.72	0.655	24.9	218.60	±	7.17	±	17.07	0.652	34.7	163.19	±	6.31	±	11.62
0.72–0.90								0.799	34.8	80.87	±	3.21	±	8.81

p_T	$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				
	40 < θ < 50							50 < θ < 60						
0.10–0.13	0.116	45.5	516.60	±	29.38	±	40.66							
0.13–0.16	0.145	45.0	644.62	±	28.19	±	38.47	0.145	54.7	504.96	±	25.06	±	31.70
0.16–0.20	0.180	44.7	600.33	±	23.06	±	30.80	0.180	54.9	467.53	±	19.80	±	24.02
0.20–0.24	0.220	44.7	622.97	±	23.61	±	28.67	0.220	54.7	546.13	±	21.87	±	24.84
0.24–0.30	0.269	44.6	574.12	±	18.96	±	24.04	0.269	54.8	416.83	±	16.12	±	17.54
0.30–0.36	0.330	44.8	460.90	±	17.07	±	18.55	0.329	54.6	360.17	±	15.18	±	14.90
0.36–0.42	0.389	44.8	385.48	±	15.17	±	14.62	0.389	54.8	304.18	±	13.87	±	12.10
0.42–0.50	0.457	44.7	293.62	±	11.59	±	12.01	0.459	54.8	200.22	±	9.57	±	8.57
0.50–0.60	0.547	44.7	213.04	±	8.70	±	10.65	0.546	54.5	131.46	±	6.76	±	6.92
0.60–0.72	0.657	44.5	113.35	±	5.30	±	7.53	0.656	54.7	92.20	±	5.06	±	6.39
0.72–0.90	0.801	44.7	56.44	±	2.77	±	5.55	0.797	54.6	38.57	±	2.39	±	3.81
0.90–1.25								1.032	54.4	10.38	±	0.70	±	1.72

p_T	$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				
	60 < θ < 75							75 < θ < 90						
0.13–0.16	0.147	67.1	421.22	±	21.00	±	27.72	0.148	82.6	406.41	±	30.16	±	80.32
0.16–0.20	0.181	67.0	425.53	±	15.79	±	21.82	0.181	82.1	337.04	±	14.90	±	17.06
0.20–0.24	0.221	67.4	369.94	±	14.82	±	16.47	0.220	82.2	299.55	±	13.41	±	13.01
0.24–0.30	0.270	67.1	334.29	±	11.76	±	13.42	0.269	82.2	261.70	±	10.81	±	12.53
0.30–0.36	0.332	66.7	251.54	±	10.53	±	11.21	0.330	81.7	177.81	±	8.97	±	8.63
0.36–0.42	0.392	66.8	198.32	±	9.07	±	8.11	0.392	81.7	118.44	±	7.30	±	6.33
0.42–0.50	0.463	66.7	149.90	±	6.82	±	7.13	0.462	81.5	87.09	±	5.22	±	4.92
0.50–0.60	0.554	66.8	82.39	±	4.48	±	4.96	0.552	81.8	47.20	±	3.38	±	3.43
0.60–0.72	0.665	67.0	47.95	±	2.90	±	3.90	0.665	81.4	22.94	±	2.05	±	2.21
0.72–0.90	0.808	66.3	21.06	±	1.46	±	2.38	0.821	81.7	7.71	±	0.90	±	1.02
0.90–1.25	1.039	65.4	4.21	±	0.37	±	0.76	1.059	81.0	1.53	±	0.21	±	0.34

p_T	$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				
	90 < θ < 105							105 < θ < 125						
0.13–0.16	0.147	97.9	462.45	±	32.67	±	75.61	0.145	114.2	271.34	±	13.95	±	15.17
0.16–0.20	0.182	97.3	288.76	±	13.49	±	13.96	0.180	114.3	198.12	±	9.05	±	9.81
0.20–0.24	0.220	97.4	265.43	±	12.85	±	11.22	0.220	113.8	163.34	±	8.69	±	6.88
0.24–0.30	0.269	97.0	188.68	±	9.23	±	9.34	0.268	113.5	90.35	±	5.38	±	4.23
0.30–0.36	0.330	96.4	96.71	±	6.50	±	4.91	0.330	113.9	54.89	±	4.21	±	3.39
0.36–0.42	0.390	96.7	79.17	±	5.83	±	4.76	0.391	113.0	28.39	±	2.93	±	2.26
0.42–0.50	0.460	96.4	51.43	±	4.00	±	3.87	0.464	113.3	20.98	±	2.18	±	2.12
0.50–0.60	0.553	96.3	27.31	±	2.51	±	2.72	0.550	113.6	10.25	±	1.32	±	1.36
0.60–0.72	0.661	96.6	12.51	±	1.46	±	1.68	0.648	110.5	3.22	±	0.63	±	0.57
0.72–0.90	0.808	97.3	3.37	±	0.55	±	0.63	0.808	109.1	0.76	±	0.23	±	0.18
0.90–1.25	1.031	95.2	0.71	±	0.15	±	0.20	1.040	114.2	0.15	±	0.05	±	0.06

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Table 41 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^-'s in p + Pb $\rightarrow \pi^-$ + X interactions with +15.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
	$20 < \theta < 30$							$30 < \theta < 40$						
0.10–0.13	0.116	24.9	1024.71	±	40.38	±	81.98	0.116	35.1	862.29	±	36.06	±	66.92
0.13–0.16	0.146	24.7	1081.67	±	37.37	±	64.97	0.145	34.8	904.11	±	33.28	±	54.14
0.16–0.20	0.181	24.7	1116.96	±	31.77	±	56.84	0.180	34.8	869.89	±	27.84	±	44.68
0.20–0.24	0.220	24.8	1072.51	±	31.33	±	49.58	0.219	34.7	853.04	±	27.69	±	38.54
0.24–0.30	0.269	24.9	909.74	±	23.32	±	36.28	0.269	34.9	781.19	±	21.83	±	31.05
0.30–0.36	0.328	24.9	733.79	±	20.90	±	26.67	0.328	34.7	598.02	±	18.83	±	21.64
0.36–0.42	0.390	24.9	555.13	±	18.10	±	20.40	0.388	34.8	511.13	±	17.58	±	18.72
0.42–0.50	0.458	25.0	406.64	±	13.29	±	16.82	0.456	34.9	338.24	±	12.27	±	13.80
0.50–0.60	0.545	25.0	239.71	±	9.06	±	12.46	0.545	34.8	222.14	±	8.81	±	11.30
0.60–0.72	0.649	25.0	152.16	±	6.56	±	10.43	0.652	34.9	112.51	±	5.34	±	7.96
0.72–0.90								0.801	35.0	54.68	±	3.15	±	5.02
	$40 < \theta < 50$							$50 < \theta < 60$						
0.10–0.13	0.116	45.1	739.42	±	35.38	±	57.81							
0.13–0.16	0.145	44.9	790.53	±	30.99	±	48.05	0.145	55.0	694.39	±	30.44	±	43.69
0.16–0.20	0.179	44.9	735.41	±	25.38	±	38.07	0.180	55.0	618.38	±	23.25	±	32.09
0.20–0.24	0.219	44.9	660.04	±	24.35	±	30.42	0.219	54.8	571.33	±	22.63	±	25.96
0.24–0.30	0.269	44.8	625.40	±	19.51	±	25.44	0.269	54.8	495.36	±	17.39	±	20.04
0.30–0.36	0.329	44.9	482.98	±	17.00	±	17.66	0.329	54.7	360.97	±	15.08	±	14.40
0.36–0.42	0.389	44.9	384.59	±	15.49	±	15.00	0.387	54.7	285.95	±	13.07	±	11.10
0.42–0.50	0.458	44.8	273.71	±	10.89	±	11.57	0.460	55.0	225.52	±	10.22	±	9.97
0.50–0.60	0.546	44.9	154.03	±	7.27	±	8.22	0.547	54.6	137.20	±	6.80	±	7.61
0.60–0.72	0.653	44.8	100.47	±	5.33	±	7.10	0.657	54.6	73.25	±	4.56	±	5.35
0.72–0.90	0.805	44.6	40.89	±	2.64	±	4.05	0.789	54.5	29.81	±	2.29	±	3.00
0.90–1.25								1.018	54.4	6.91	±	0.68	±	1.12
	$60 < \theta < 75$							$75 < \theta < 90$						
0.13–0.16	0.145	67.0	629.94	±	29.51	±	38.37	0.145	81.9	533.43	±	37.79	±	48.02
0.16–0.20	0.179	67.2	508.38	±	17.47	±	25.12	0.179	82.1	453.58	±	17.56	±	22.95
0.20–0.24	0.219	67.3	415.78	±	15.80	±	17.98	0.219	81.7	333.27	±	14.46	±	14.56
0.24–0.30	0.267	67.1	379.39	±	12.73	±	16.57	0.267	81.8	253.74	±	10.57	±	11.62
0.30–0.36	0.326	67.3	294.87	±	11.35	±	12.88	0.326	81.9	174.76	±	9.00	±	9.44
0.36–0.42	0.386	67.0	201.43	±	9.38	±	9.32	0.385	81.8	130.60	±	7.52	±	6.67
0.42–0.50	0.454	66.8	153.98	±	6.82	±	7.40	0.452	81.7	78.16	±	4.90	±	4.61
0.50–0.60	0.541	66.9	89.98	±	4.64	±	5.54	0.539	81.3	52.78	±	3.58	±	4.06
0.60–0.72	0.644	66.7	48.09	±	3.05	±	3.90	0.639	81.8	28.50	±	2.32	±	2.89
0.72–0.90	0.789	66.7	17.73	±	1.40	±	2.01	0.775	80.9	10.80	±	1.11	±	1.50
0.90–1.25	1.014	67.2	4.15	±	0.43	±	0.73	0.978	81.8	1.26	±	0.23	±	0.27
	$90 < \theta < 105$							$105 < \theta < 125$						
0.13–0.16								0.144	114.5	347.25	±	15.26	±	21.05
0.16–0.20	0.178	97.2	370.34	±	15.68	±	17.66	0.177	114.1	265.36	±	10.93	±	11.86
0.20–0.24	0.218	97.1	278.08	±	13.66	±	13.27	0.217	113.7	154.01	±	8.49	±	6.69
0.24–0.30	0.267	97.5	195.33	±	9.31	±	9.38	0.266	113.6	103.28	±	5.78	±	5.28
0.30–0.36	0.325	96.7	106.23	±	6.87	±	5.77	0.325	113.2	56.49	±	4.23	±	3.85
0.36–0.42	0.386	97.1	86.24	±	6.09	±	5.62	0.384	113.1	36.58	±	3.29	±	3.27
0.42–0.50	0.449	96.8	47.96	±	3.75	±	3.91	0.451	112.8	24.32	±	2.37	±	2.74
0.50–0.60	0.538	96.8	29.46	±	2.71	±	3.17	0.524	113.2	7.31	±	1.11	±	1.08
0.60–0.72	0.640	96.0	10.35	±	1.34	±	1.49	0.626	111.5	3.67	±	0.71	±	0.72
0.72–0.90	0.779	95.8	2.65	±	0.51	±	0.53	0.744	114.7	0.64	±	0.22	±	0.17
0.90–1.25	0.980	95.8	0.36	±	0.12	±	0.11							

Table 42 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of protons in $\pi^+ + Pb \rightarrow p + X$ interactions with +15.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$20 < \theta < 30$							$30 < \theta < 40$						
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.24–0.30	0.271	25.5	1525.54	±	129.60	±	89.00	0.271	34.7	1655.83	±	134.14	±	91.03
0.30–0.36	0.328	24.9	1115.54	±	114.00	±	67.07	0.328	35.5	1529.06	±	127.81	±	79.21
0.36–0.42	0.391	24.9	712.58	±	91.47	±	45.90	0.389	35.5	1170.48	±	116.63	±	62.28
0.42–0.50	0.455	25.2	729.16	±	81.94	±	48.96	0.461	35.1	852.50	±	87.18	±	50.95
0.50–0.60	0.548	24.8	381.30	±	52.22	±	29.37	0.546	35.0	494.05	±	59.68	±	33.97
0.60–0.72	0.662	24.9	303.77	±	42.56	±	26.98	0.654	34.8	405.01	±	51.52	±	32.30
0.72–0.90								0.794	35.1	170.08	±	27.92	±	19.09

p_T	$40 < \theta < 50$							$50 < \theta < 60$						
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.30–0.36	0.330	45.5	1646.35	±	128.18	±	79.30							
0.36–0.42	0.389	44.9	1390.94	±	119.50	±	65.21	0.390	54.8	1473.87	±	118.02	±	69.08
0.42–0.50	0.460	45.0	839.57	±	84.22	±	43.70	0.458	54.6	1141.26	±	92.13	±	52.98
0.50–0.60	0.549	45.0	689.65	±	72.26	±	47.48	0.546	54.9	781.09	±	72.22	±	41.98
0.60–0.72	0.652	45.3	451.92	±	55.27	±	35.45	0.655	55.0	455.24	±	54.58	±	35.39
0.72–0.90	0.800	45.1	226.89	±	32.65	±	23.32	0.801	54.8	273.38	±	35.97	±	28.02
0.90–1.25	1.031	45.0	69.62	±	12.91	±	9.96							

p_T	$60 < \theta < 75$							$75 < \theta < 90$						
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.50–0.60	0.549	67.5	675.30	±	51.73	±	35.74							
0.60–0.72	0.663	67.2	411.73	±	40.07	±	28.43	0.663	82.0	358.72	±	35.26	±	26.50
0.72–0.90	0.807	66.3	157.96	±	22.17	±	17.49	0.815	81.7	123.10	±	19.65	±	14.27
0.90–1.25	1.052	66.9	53.40	±	9.82	±	8.92							

p_T	$90 < \theta < 105$							$105 < \theta < 125$						
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.50–0.60								0.548	114.0	176.37	±	23.33	±	16.59
0.60–0.72	0.663	96.4	176.07	±	24.66	±	15.46	0.661	113.6	88.14	±	16.21	±	12.02
0.72–0.90	0.789	96.4	72.12	±	15.03	±	9.67	0.822	110.3	22.80	±	7.58	±	4.80

Table 43 Double-differential inclusive cross-section $\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$ [mb/(GeV/c sr)] of the production of π^+'s in $\pi^+ + \mathrm{Pb} \to \pi^+ + \mathrm{X}$ interactions with $+15.0$ GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					p_T	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
	$20<\theta<30$								$30<\theta<40$						
0.10–0.13	0.116	24.8	689.73	±	145.72	±	60.22	0.115	34.6	774.02	±	144.80	±	71.99
0.13–0.16	0.147	24.8	902.75	±	150.19	±	62.71	0.147	35.0	714.40	±	128.94	±	49.43
0.16–0.20	0.180	25.1	758.99	±	115.12	±	45.50	0.181	34.4	580.93	±	93.17	±	35.03
0.20–0.24	0.222	25.2	879.52	±	118.81	±	48.90	0.220	34.5	824.52	±	117.61	±	46.32
0.24–0.30	0.269	24.8	1010.44	±	105.63	±	53.76	0.271	34.8	766.86	±	90.82	±	38.85
0.30–0.36	0.333	24.4	671.55	±	83.17	±	32.75	0.328	35.1	572.16	±	78.00	±	28.00
0.36–0.42	0.394	24.6	732.63	±	86.04	±	36.10	0.391	34.7	504.66	±	73.24	±	24.97
0.42–0.50	0.457	24.7	566.56	±	66.47	±	30.08	0.458	33.9	328.36	±	50.31	±	17.33
0.50–0.60	0.541	25.0	300.26	±	41.48	±	19.33	0.551	35.2	213.99	±	34.57	±	13.51
0.60–0.72	0.648	24.4	183.99	±	26.20	±	15.82	0.656	33.6	132.17	±	23.44	±	10.90
0.72–0.90								0.792	34.4	81.45	±	15.28	±	9.67

p_T	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					p_T	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
	$40<\theta<50$								$50<\theta<60$						
0.10–0.13	0.115	45.6	448.36	±	120.41	±	46.72							
0.13–0.16	0.146	46.0	604.63	±	110.21	±	42.52	0.145	55.2	656.79	±	121.21	±	48.59
0.16–0.20	0.182	44.4	575.13	±	95.20	±	35.15	0.176	55.0	307.57	±	66.17	±	19.05
0.20–0.24	0.223	45.0	415.03	±	79.29	±	23.21	0.222	54.7	349.76	±	72.29	±	19.71
0.24–0.30	0.269	44.1	494.23	±	71.93	±	25.12	0.274	54.4	362.53	±	61.91	±	18.64
0.30–0.36	0.329	45.4	474.27	±	72.22	±	23.44	0.325	54.6	265.43	±	53.01	±	13.19
0.36–0.42	0.383	45.0	339.96	±	59.51	±	16.99	0.391	55.1	322.10	±	59.52	±	16.84
0.42–0.50	0.454	45.0	288.03	±	47.01	±	15.48	0.446	54.6	263.04	±	46.11	±	14.62
0.50–0.60	0.549	45.6	169.63	±	32.35	±	10.69	0.540	56.1	123.08	±	26.91	±	8.37
0.60–0.72	0.657	44.1	140.30	±	26.93	±	11.29	0.664	54.9	101.46	±	23.00	±	8.45
0.72–0.90	0.793	45.1	52.63	±	11.20	±	5.92	0.797	54.1	22.36	±	7.18	±	2.70
0.90–1.25								1.005	53.6	8.32	±	3.02	±	1.52

p_T	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					p_T	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
	$60<\theta<75$								$75<\theta<90$						
0.13–0.16	0.146	66.7	355.23	±	74.33	±	25.72	0.151	83.7	421.28	±	96.96	±	30.73
0.16–0.20	0.182	66.7	317.57	±	56.57	±	19.46	0.183	82.5	345.82	±	63.95	±	21.09
0.20–0.24	0.218	67.7	389.18	±	63.53	±	21.66	0.222	84.2	258.41	±	52.57	±	14.34
0.24–0.30	0.268	67.3	344.22	±	49.76	±	17.38	0.269	80.6	218.49	±	41.62	±	12.80
0.30–0.36	0.330	66.4	286.85	±	46.28	±	14.42	0.330	81.5	134.09	±	32.49	±	7.69
0.36–0.42	0.391	65.7	213.59	±	38.69	±	11.12	0.396	82.9	109.94	±	29.44	±	7.02
0.42–0.50	0.463	65.6	147.47	±	28.19	±	8.68	0.461	81.6	70.43	±	19.56	±	4.96
0.50–0.60	0.551	68.2	103.65	±	21.68	±	7.52	0.558	80.9	43.17	±	13.64	±	3.89
0.60–0.72	0.649	65.8	38.57	±	10.81	±	3.76	0.678	80.2	21.88	±	8.43	±	2.61
0.72–0.90	0.809	67.1	21.20	±	6.21	±	2.89	0.851	82.2	5.60	±	3.00	±	0.96
0.90–1.25	1.035	65.7	2.25	±	0.94	±	0.47							

p_T	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					p_T	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
	$90<\theta<105$								$105<\theta<125$						
0.13–0.16	0.154	98.9	124.56	±	48.73	±	9.10	0.145	113.8	317.85	±	65.00	±	22.89
0.16–0.20	0.182	96.9	277.85	±	55.56	±	16.76	0.178	114.8	246.77	±	43.54	±	14.23
0.20–0.24	0.217	96.5	266.22	±	54.60	±	14.91	0.217	114.2	106.68	±	29.60	±	6.16
0.24–0.30	0.272	96.5	148.91	±	34.41	±	9.26	0.269	112.3	92.53	±	22.54	±	5.55
0.30–0.36	0.330	97.9	80.77	±	25.20	±	5.16	0.338	116.7	70.97	±	19.74	±	5.35
0.36–0.42	0.395	95.9	59.20	±	20.07	±	4.49	0.399	114.2	44.48	±	15.69	±	4.32
0.42–0.50	0.465	97.6	44.33	±	15.76	±	4.17	0.433	116.0	18.00	±	8.53	±	2.18
0.50–0.60	0.553	95.3	33.59	±	11.86	±	4.26	0.560	111.5	9.14	±	4.84	±	1.63
0.60–0.72	0.678	100.1	10.01	±	5.29	±	1.79							
0.72–0.90	0.836	96.8	0.16	±	0.09	±	0.04							

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Table 44 Double-differential inclusive cross-section $\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$ [mb/(GeV/c sr)] of the production of π^-'s in $\pi^+ + \mathrm{Pb} \to \pi^- + \mathrm{X}$ interactions with +15.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

p_T	$20 < \theta < 30$ $\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					p_T	$30 < \theta < 40$ $\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
0.10–0.13	0.116	24.4	969.05	±	172.25	±	92.45	0.10–0.13	0.116	35.3	516.78	±	109.01	±	44.66
0.13–0.16	0.141	25.5	850.90	±	143.04	±	60.17	0.13–0.16	0.147	34.8	633.59	±	112.81	±	43.88
0.16–0.20	0.180	24.4	975.29	±	119.15	±	57.85	0.16–0.20	0.178	34.2	722.34	±	102.45	±	43.58
0.20–0.24	0.221	25.1	874.27	±	114.93	±	48.08	0.20–0.24	0.221	34.4	791.37	±	107.92	±	43.43
0.24–0.30	0.269	25.3	1035.96	±	103.36	±	51.00	0.24–0.30	0.270	34.3	451.35	±	66.11	±	22.42
0.30–0.36	0.329	24.8	607.03	±	77.90	±	28.71	0.30–0.36	0.329	35.6	447.27	±	68.27	±	21.42
0.36–0.42	0.391	24.9	517.07	±	73.48	±	25.40	0.36–0.42	0.390	35.5	390.33	±	63.05	±	19.30
0.42–0.50	0.460	25.0	506.60	±	61.32	±	26.60	0.42–0.50	0.464	34.4	302.75	±	46.63	±	16.17
0.50–0.60	0.546	24.2	274.93	±	38.95	±	17.17	0.50–0.60	0.542	34.6	165.30	±	32.09	±	10.56
0.60–0.72	0.658	23.5	139.97	±	25.08	±	10.92	0.60–0.72	0.654	34.6	103.34	±	21.50	±	8.60
0.72–0.90								0.72–0.90	0.787	34.7	50.53	±	12.26	±	5.62

p_T	$40 < \theta < 50$ $\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					p_T	$50 < \theta < 60$ $\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
0.10–0.13	0.114	45.2	636.33	±	127.27	±	54.68								
0.13–0.16	0.145	44.9	551.41	±	105.09	±	39.03	0.13–0.16	0.143	54.6	647.94	±	122.97	±	47.31
0.16–0.20	0.180	44.1	547.13	±	85.96	±	33.76	0.16–0.20	0.180	54.9	708.17	±	101.03	±	44.25
0.20–0.24	0.221	44.3	382.74	±	74.40	±	21.60	0.20–0.24	0.222	54.9	549.64	±	91.50	±	31.42
0.24–0.30	0.271	45.4	451.77	±	70.13	±	23.52	0.24–0.30	0.262	54.9	342.39	±	59.17	±	17.44
0.30–0.36	0.330	44.7	414.52	±	65.54	±	20.23	0.30–0.36	0.329	54.3	310.78	±	56.75	±	15.73
0.36–0.42	0.385	44.7	357.13	±	61.45	±	18.18	0.36–0.42	0.388	53.5	199.18	±	44.86	±	10.50
0.42–0.50	0.451	45.7	206.81	±	39.39	±	11.64	0.42–0.50	0.461	54.5	208.42	±	40.22	±	12.19
0.50–0.60	0.544	44.0	143.07	±	28.64	±	9.78	0.50–0.60	0.542	54.3	152.63	±	29.40	±	11.13
0.60–0.72	0.670	43.8	100.71	±	21.40	±	8.94	0.60–0.72	0.653	54.8	46.40	±	14.70	±	4.35
0.72–0.90	0.797	44.9	35.81	±	10.34	±	4.38	0.72–0.90	0.800	54.7	43.90	±	11.34	±	5.69
0.90–1.25								0.90–1.25	1.037	55.0	9.11	±	3.09	±	2.07

p_T	$60 < \theta < 75$ $\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					p_T	$75 < \theta < 90$ $\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
0.13–0.16	0.141	67.6	471.16	±	91.65	±	33.29	0.13–0.16	0.151	80.3	169.93	±	65.20	±	22.37
0.16–0.20	0.180	67.2	480.59	±	70.30	±	28.77	0.16–0.20	0.183	80.5	282.63	±	57.54	±	18.90
0.20–0.24	0.220	67.3	290.83	±	54.58	±	15.82	0.20–0.24	0.221	80.8	287.69	±	55.17	±	16.35
0.24–0.30	0.265	67.9	275.05	±	44.90	±	14.49	0.24–0.30	0.262	83.6	203.96	±	38.01	±	10.79
0.30–0.36	0.329	66.6	231.40	±	40.86	±	11.59	0.30–0.36	0.322	81.3	219.85	±	40.32	±	11.93
0.36–0.42	0.392	67.7	138.50	±	32.05	±	7.69	0.36–0.42	0.391	79.5	35.44	±	15.89	±	2.15
0.42–0.50	0.451	67.5	142.74	±	26.74	±	8.56	0.42–0.50	0.450	81.6	79.89	±	20.26	±	5.73
0.50–0.60	0.541	67.3	65.53	±	16.40	±	4.85	0.50–0.60	0.552	80.0	65.33	±	16.35	±	6.01
0.60–0.72	0.640	67.4	36.28	±	10.94	±	3.52	0.60–0.72	0.638	81.9	14.05	±	7.03	±	1.69
0.72–0.90	0.797	68.8	14.96	±	5.66	±	1.94	0.72–0.90	0.746	83.1	7.92	±	3.96	±	1.33
0.90–1.25	0.958	68.2	2.03	±	1.18	±	0.45								

p_T	$90 < \theta < 105$ $\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$					p_T	$105 < \theta < 125$ $\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$\mathrm{d}^2\sigma/\mathrm{d}p\,\mathrm{d}\Omega$				
0.13–0.16	0.143	96.9	489.17	±	118.23	±	35.89	0.13–0.16	0.143	115.0	346.47	±	62.53	±	23.81
0.16–0.20	0.175	97.4	333.66	±	64.13	±	22.37	0.16–0.20	0.179	112.5	191.71	±	38.75	±	10.82
0.20–0.24	0.220	97.6	293.32	±	59.28	±	21.27	0.20–0.24	0.217	113.1	104.87	±	28.58	±	5.96
0.24–0.30	0.270	97.2	169.44	±	36.46	±	12.06	0.24–0.30	0.263	113.2	80.25	±	20.40	±	4.97
0.30–0.36	0.330	99.3	58.41	±	20.86	±	4.26	0.30–0.36	0.334	113.6	49.69	±	15.77	±	3.99
0.36–0.42	0.403	93.6	55.20	±	20.87	±	4.85	0.36–0.42	0.387	114.3	46.84	±	15.63	±	4.98
0.42–0.50	0.442	95.7	43.48	±	15.37	±	4.63	0.42–0.50	0.470	113.4	12.40	±	7.17	±	1.65
0.50–0.60	0.532	96.0	46.99	±	14.39	±	6.70	0.50–0.60	0.523	110.2	6.15	±	4.35	±	1.09
0.60–0.72								0.60–0.72	0.628	107.4	7.72	±	4.46	±	1.94

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Table 45 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of protons in $\pi^- + Pb \rightarrow p + X$ interactions with -15.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

| p_T | $20 < \theta < 30$ | | | | | | | $30 < \theta < 40$ | | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.20–0.24	0.220	25.3	1549.83	±	35.46	±	94.20							
0.24–0.30	0.270	25.3	1367.46	±	26.04	±	78.55	0.270	34.9	1622.62	±	29.68	±	87.73
0.30–0.36	0.328	25.3	1102.55	±	24.34	±	65.93	0.329	35.0	1389.22	±	25.56	±	70.32
0.36–0.42	0.389	25.3	828.05	±	21.45	±	53.06	0.390	35.1	1083.75	±	23.85	±	58.90
0.42–0.50	0.458	25.3	617.74	±	15.87	±	42.06	0.458	35.1	815.77	±	18.39	±	51.49
0.50–0.60	0.547	25.4	432.61	±	12.17	±	34.50	0.547	35.1	575.35	±	14.09	±	39.72
0.60–0.72	0.657	25.4	259.12	±	8.39	±	22.87	0.655	35.0	360.20	±	10.27	±	30.08
0.72–0.90								0.799	35.0	181.35	±	6.01	±	19.58

| p_T | $40 < \theta < 50$ | | | | | | | $50 < \theta < 60$ | | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.30–0.36	0.327	45.0	1499.32	±	26.10	±	70.30							
0.36–0.42	0.386	45.1	1212.11	±	23.52	±	55.12	0.386	55.1	1289.80	±	23.57	±	59.54
0.42–0.50	0.454	45.1	946.30	±	18.92	±	47.74	0.454	55.0	1065.54	±	19.06	±	48.52
0.50–0.60	0.541	45.1	653.88	±	14.87	±	43.13	0.541	55.1	694.52	±	14.60	±	38.36
0.60–0.72	0.647	45.1	433.70	±	11.55	±	35.15	0.647	54.9	426.53	±	11.19	±	33.34
0.72–0.90	0.785	45.1	204.98	±	6.62	±	21.98	0.787	55.1	210.18	±	6.92	±	23.15

| p_T | $60 < \theta < 75$ | | | | | | | $75 < \theta < 90$ | | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.50–0.60	0.545	67.5	661.72	±	10.80	±	34.75							
0.60–0.72	0.655	67.2	398.42	±	8.43	±	28.29	0.652	81.9	331.81	±	7.23	±	24.28
0.72–0.90	0.799	67.1	167.31	±	4.99	±	20.30	0.794	81.7	115.34	±	4.05	±	14.19

| p_T | $90 < \theta < 105$ | | | | | | | $105 < \theta < 125$ | | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$				
0.50–0.60								0.543	112.9	199.14	±	5.08	±	18.81
0.60–0.72	0.652	96.9	206.83	±	5.65	±	17.95	0.651	113.0	69.66	±	3.21	±	10.14
0.72–0.90	0.792	96.6	63.19	±	3.16	±	9.28							

Table 46 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^+'s in $\pi^- + \mathrm{Pb} \to \pi^+ + \mathrm{X}$ interactions with -15.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

| p_T | $20 < \theta < 30$ | | | | | | | $30 < \theta < 40$ | | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				
0.10–0.13	0.116	24.8	714.74	±	30.68	±	67.65	0.116	34.7	639.69	±	27.45	±	53.66
0.13–0.16	0.145	24.7	804.42	±	28.49	±	52.75	0.145	34.9	676.59	±	25.53	±	43.72
0.16–0.20	0.180	24.7	899.20	±	25.24	±	53.08	0.180	34.8	674.09	±	21.30	±	38.76
0.20–0.24	0.220	24.9	938.47	±	25.71	±	50.94	0.220	34.8	663.22	±	21.08	±	35.02
0.24–0.30	0.270	24.7	886.52	±	20.01	±	43.35	0.269	34.6	679.40	±	17.78	±	33.28
0.30–0.36	0.329	24.8	739.95	±	18.10	±	34.21	0.329	34.7	589.63	±	16.40	±	27.02
0.36–0.42	0.389	24.8	606.44	±	16.25	±	27.97	0.388	34.8	519.26	±	15.45	±	23.63
0.42–0.50	0.458	24.6	489.86	±	12.22	±	24.42	0.458	34.7	402.90	±	11.47	±	19.25
0.50–0.60	0.547	24.7	336.59	±	8.84	±	20.48	0.547	34.7	237.05	±	7.47	±	13.46
0.60–0.72	0.657	24.8	212.33	±	6.26	±	17.52	0.655	34.6	147.05	±	5.14	±	10.99
0.72–0.90								0.795	34.8	63.64	±	2.37	±	7.16

| p_T | $40 < \theta < 50$ | | | | | | | $50 < \theta < 60$ | | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				
0.10–0.13	0.115	44.9	487.80	±	24.21	±	39.21							
0.13–0.16	0.144	45.0	499.67	±	21.33	±	32.70	0.145	54.9	440.57	±	20.77	±	29.98
0.16–0.20	0.179	44.9	559.72	±	19.44	±	32.44	0.180	54.7	434.72	±	16.69	±	25.28
0.20–0.24	0.219	44.9	551.81	±	19.40	±	29.31	0.219	55.0	449.91	±	17.32	±	23.81
0.24–0.30	0.268	44.7	555.88	±	16.13	±	27.28	0.268	54.7	416.72	±	14.01	±	20.49
0.30–0.36	0.327	44.7	458.62	±	14.75	±	21.68	0.326	54.8	349.80	±	13.00	±	16.88
0.36–0.42	0.386	44.7	364.61	±	13.12	±	16.92	0.386	54.7	252.21	±	10.84	±	11.99
0.42–0.50	0.455	44.6	276.97	±	9.58	±	13.31	0.455	55.0	208.72	±	8.47	±	10.44
0.50–0.60	0.542	44.9	187.56	±	7.05	±	10.39	0.541	54.9	128.17	±	5.74	±	7.46
0.60–0.72	0.648	44.9	117.91	±	4.71	±	8.29	0.647	54.9	90.87	±	4.47	±	6.68
0.72–0.90	0.785	44.7	54.84	±	2.36	±	5.57	0.783	54.9	34.52	±	1.97	±	3.47
0.90–1.25								1.005	54.2	7.44	±	0.49	±	1.28

| p_T | $60 < \theta < 75$ | | | | | | | $75 < \theta < 90$ | | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				
0.13–0.16	0.146	67.1	374.48	±	17.25	±	27.25	0.147	81.8	378.86	±	26.28	±	83.00
0.16–0.20	0.180	67.1	364.31	±	12.68	±	21.16	0.179	82.2	295.55	±	12.35	±	17.30
0.20–0.24	0.219	67.0	335.56	±	12.28	±	17.52	0.220	82.0	267.14	±	11.41	±	13.98
0.24–0.30	0.269	67.2	306.71	±	9.93	±	15.00	0.267	82.1	207.34	±	8.40	±	10.90
0.30–0.36	0.328	66.9	261.78	±	9.32	±	13.02	0.328	82.0	149.44	±	7.12	±	7.80
0.36–0.42	0.390	66.9	194.68	±	8.00	±	9.98	0.388	81.6	105.77	±	5.88	±	5.80
0.42–0.50	0.460	66.9	127.66	±	5.40	±	6.81	0.457	81.8	76.52	±	4.24	±	4.71
0.50–0.60	0.549	66.5	96.11	±	4.17	±	6.23	0.546	81.2	49.14	±	2.96	±	3.75
0.60–0.72	0.657	66.9	49.94	±	2.62	±	4.15	0.650	82.0	22.39	±	1.73	±	2.20
0.72–0.90	0.797	66.6	19.24	±	1.19	±	2.21	0.789	80.9	8.83	±	0.84	±	1.17
0.90–1.25	1.031	65.8	4.17	±	0.32	±	0.76	1.039	81.7	1.48	±	0.17	±	0.33

| p_T | $90 < \theta < 105$ | | | | | | | $105 < \theta < 125$ | | | | | | |
	$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_\mathrm{T}\rangle$	$\langle\theta\rangle$	$d^2\sigma/dp\,d\Omega$				
0.13–0.16	0.146	97.9	270.35	±	29.34	±	21.42	0.145	114.3	262.96	±	13.24	±	18.58
0.16–0.20	0.181	97.4	286.62	±	12.48	±	16.77	0.180	114.1	202.68	±	8.87	±	10.44
0.20–0.24	0.220	97.3	238.96	±	11.02	±	12.50	0.219	114.1	118.03	±	6.51	±	5.92
0.24–0.30	0.267	97.2	167.30	±	7.77	±	9.55	0.267	113.9	83.93	±	4.58	±	4.60
0.30–0.36	0.328	96.8	94.04	±	5.71	±	5.55	0.326	114.3	52.01	±	3.56	±	3.49
0.36–0.42	0.389	96.5	73.98	±	4.99	±	5.01	0.388	114.6	28.25	±	2.49	±	2.33
0.42–0.50	0.457	96.9	47.78	±	3.35	±	3.79	0.456	112.8	19.33	±	1.79	±	1.98
0.50–0.60	0.546	96.6	26.35	±	2.23	±	2.69	0.549	112.7	7.95	±	1.01	±	1.05
0.60–0.72	0.650	96.4	12.90	±	1.31	±	1.72	0.650	110.9	3.49	±	0.54	±	0.62
0.72–0.90	0.790	95.7	4.33	±	0.58	±	0.76	0.775	112.7	0.68	±	0.17	±	0.16
0.90–1.25	1.015	95.6	0.83	±	0.14	±	0.23	1.054	112.0	0.08	±	0.03	±	0.03

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Table 47 Double-differential inclusive cross-section $d^2\sigma/dp\,d\Omega$ [mb/(GeV/c sr)] of the production of π^-'s in $\pi^- + \text{Pb} \rightarrow \pi^- + \text{X}$ interactions with -15.0 GeV/c beam momentum; the first error is statistical, the second systematic; p_T in GeV/c, polar angle θ in degrees

| p_T | $20 < \theta < 30$ | | | | | | | $30 < \theta < 40$ | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$			
0.10–0.13	0.116	24.7	963.48	±	35.28	±	83.62	0.116	34.7	781.41	±	30.88	±	64.52
0.13–0.16	0.145	24.8	1038.63	±	32.96	±	68.89	0.145	34.9	865.02	±	29.17	±	56.73
0.16–0.20	0.180	24.8	1141.21	±	29.10	±	66.91	0.180	34.8	869.33	±	24.86	±	50.50
0.20–0.24	0.219	24.9	1113.02	±	28.27	±	59.00	0.220	34.9	878.08	±	25.19	±	46.46
0.24–0.30	0.269	24.8	1079.12	±	22.60	±	51.80	0.269	34.8	779.18	±	19.30	±	37.60
0.30–0.36	0.329	24.8	873.00	±	20.26	±	39.66	0.329	34.8	674.74	±	17.84	±	30.55
0.36–0.42	0.389	24.8	740.12	±	18.68	±	33.75	0.389	34.6	559.03	±	16.25	±	25.45
0.42–0.50	0.458	25.0	529.15	±	13.63	±	26.11	0.457	34.9	415.38	±	12.07	±	20.29
0.50–0.60	0.546	24.7	351.43	±	9.71	±	20.51	0.545	34.8	281.30	±	8.91	±	16.12
0.60–0.72	0.653	24.8	234.58	±	7.52	±	17.29	0.651	34.8	141.60	±	5.38	±	10.50
0.72–0.90								0.801	34.7	76.80	±	3.43	±	7.25

| p_T | $40 < \theta < 50$ | | | | | | | $50 < \theta < 60$ | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$			
0.10–0.13	0.116	45.0	706.28	±	29.99	±	58.10						
0.13–0.16	0.145	44.8	688.97	±	25.39	±	45.76	0.145	55.1	610.62	±	24.36	±	41.74
0.16–0.20	0.181	44.8	687.43	±	21.63	±	40.19	0.181	54.9	621.09	±	21.09	±	36.31
0.20–0.24	0.221	44.9	674.72	±	21.95	±	35.97	0.221	54.9	535.87	±	19.36	±	28.28
0.24–0.30	0.271	44.7	625.20	±	17.41	±	30.71	0.270	55.0	506.10	±	15.83	±	25.52
0.30–0.36	0.333	44.7	486.68	±	15.27	±	22.43	0.331	54.8	396.96	±	14.09	±	19.29
0.36–0.42	0.392	44.8	426.47	±	14.31	±	19.81	0.391	54.7	298.41	±	12.10	±	14.43
0.42–0.50	0.462	44.9	320.91	±	10.66	±	16.10	0.461	54.8	218.24	±	8.75	±	11.26
0.50–0.60	0.553	44.7	199.30	±	7.40	±	11.88	0.550	54.7	143.07	±	6.29	±	8.79
0.60–0.72	0.663	44.9	116.59	±	5.16	±	8.75	0.663	54.7	84.89	±	4.43	±	6.56
0.72–0.90	0.808	44.8	52.38	±	2.67	±	5.33	0.802	54.6	34.31	±	2.14	±	3.60
0.90–1.25								1.047	54.7	8.13	±	0.65	±	1.34

| p_T | $60 < \theta < 75$ | | | | | | | $75 < \theta < 90$ | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$			
0.13–0.16	0.145	67.3	519.33	±	20.28	±	34.55	0.147	81.6	446.25	±	24.42	±	53.76
0.16–0.20	0.179	67.0	508.76	±	15.39	±	28.67	0.179	82.1	386.03	±	14.41	±	22.13
0.20–0.24	0.219	67.3	419.76	±	14.11	±	21.36	0.220	81.8	337.48	±	13.07	±	17.41
0.24–0.30	0.268	67.1	359.80	±	10.96	±	17.90	0.268	81.7	250.22	±	9.44	±	13.69
0.30–0.36	0.329	66.9	286.95	±	9.88	±	14.38	0.328	81.5	183.00	±	8.05	±	10.08
0.36–0.42	0.389	67.0	206.41	±	8.36	±	10.72	0.390	81.9	127.20	±	6.59	±	7.27
0.42–0.50	0.457	66.4	162.50	±	6.21	±	8.93	0.457	81.8	93.68	±	4.81	±	6.08
0.50–0.60	0.548	66.8	107.94	±	4.51	±	7.22	0.544	82.1	55.17	±	3.19	±	4.46
0.60–0.72	0.653	67.2	55.63	±	2.90	±	4.72	0.650	81.4	27.79	±	2.03	±	2.89
0.72–0.90	0.800	67.2	22.49	±	1.43	±	2.56	0.794	80.8	7.46	±	0.82	±	1.04
0.90–1.25	1.027	66.3	4.33	±	0.41	±	0.74	1.014	81.1	1.56	±	0.23	±	0.33

| p_T | $90 < \theta < 105$ | | | | | | | $105 < \theta < 125$ | | | | | |
	$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$					$\langle p_T \rangle$	$\langle \theta \rangle$	$d^2\sigma/dp\,d\Omega$			
0.13–0.16	0.146	97.4	371.19	±	22.13	±	28.30	0.144	113.1	453.44	±	85.41	±	28.11
0.16–0.20	0.179	97.6	364.25	±	14.66	±	22.41	0.178	113.6	235.18	±	9.31	±	11.90
0.20–0.24	0.219	97.1	290.32	±	12.37	±	15.47	0.218	113.7	162.79	±	7.83	±	8.20
0.24–0.30	0.267	96.8	196.99	±	8.53	±	11.36	0.267	113.6	94.69	±	4.91	±	5.42
0.30–0.36	0.329	96.9	128.58	±	6.91	±	8.44	0.329	113.5	56.69	±	3.71	±	4.06
0.36–0.42	0.389	96.6	77.92	±	5.20	±	5.49	0.387	113.2	35.18	±	2.92	±	3.18
0.42–0.50	0.458	96.8	51.83	±	3.52	±	4.40	0.456	113.5	20.48	±	1.88	±	2.32
0.50–0.60	0.538	96.6	29.22	±	2.35	±	3.21	0.547	111.4	10.06	±	1.16	±	1.47
0.60–0.72	0.652	96.4	14.53	±	1.50	±	2.08	0.640	111.1	2.74	±	0.53	±	0.53
0.72–0.90	0.783	95.1	3.49	±	0.54	±	0.68	0.792	113.0	0.58	±	0.18	±	0.15
0.90–1.25	1.026	95.8	0.36	±	0.10	±	0.11	1.020	108.5	0.06	±	0.03	±	0.03

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