ОБЪЕДИНЕННЫЙ
ИНСТИТУТ
ЯДЕРНЫХ
ИССЛЕДОВАНИЙ

ДУБНА

E2 - 11581

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Submitted to the XIX International Conference on High Energy Physics (Tokyo, 1978)

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Амаглобели Н.С. и др. **E2 - 11581**

Степени убывания инклюзивных сечений при больших поперечных импульсах

На основе совокупности мировых экспериментальных данных анализируется степенной закон $p_T^{-N}(1-x_T)^M$ убывания одночастичных инклюзивных спектров при больших поперечных импульсах. Полученные результаты демонстрируют зависимость фитируемых параметров N и M от области изменения p_T, x_T и θ.

Работа выполнена в Лаборатории теоретической физики ОИЯИ.

Препринт Объединенного института ядерных исследований. Дубна 1978

Amaglobeli N.S. et al. **E2 - 11581**

Power Falloff Behaviour of the High p_T Inclusive Cross Sections

Power behaviour $p_T^{-N}(1-x_T)^M$ of single particles inclusive spectra at large transverse momentum is analyzed on the basis of the recent world experimental data. The results obtained demonstrate the dependence of fitted parameters N and M on the range of variables p_T, x_T and θ.

The investigation has been performed at the Laboratory of Theoretical Physics, JINR.

Preprint of the Joint Institute for Nuclear Research. Dubna 1978

The observed inverse power dependence of the inclusive hadron spectra at large transverse momenta allows one to connect the dynamics of these processes with the constituent structure of interacting hadrons. In fact, the experimental evidences like a jet structure a.o. lead to the picture that the production of high p_T particles in a collision of two highly energetic hadrons involves a large angle two-body scattering of constituents of two incident hadrons. In this approach the invariant cross section for producing a large p_T hadron has the following form[1,2]:

$$E\, d\sigma/d^3p(AB\to C+x) = \Sigma \iint_{\min} F_A(x)F_B(y)\frac{d\hat{\sigma}}{d\hat{t}}(ab\to cd)\times$$
$$\times D_C(z)\frac{dx\,dy}{x\cdot y\cdot z}.$$

If the elastic constituent cross section $d\hat{\sigma}/d\hat{t}$ behaves as $\hat{s}^{-N/2}\cdot f(\hat{t}/\hat{s})$, according to the dimensional counting rules[3,4], then the former distribution behaves as

$$E\, d\sigma/d^3p(AB\to C) = \Sigma\, p_T^{-N} f(x_T, \theta), \qquad (1)$$

where the value of the power exponent N and the dimensionless scaling function $f(x_T, \theta = \text{fixed}) \sim (1-x_T)^M$ are specified by the structure of hadrons A, B, C, i.e., depend on the number of their constituents a, b, c, d, which scatter to the large angles and define a given inclusive reaction.

When a, b, c, d are quarks, dimensional quark counting gives p_T^{-4} law (e.g., scattering of quarks via vector gluon exchange[4,5]). In the case when a, b, c, d permit the existence of states with hadronic quantum numbers, DQC leads to the values $N \geq 8, 12$ for meson and for baryon production, respectively[6].

In this note we focus attention to the experimental results in high p_T hadron production[7,8]. Our aim is to study single particle spectra (1) and their dependence on N. The existing experimental material is available in the form of tables of the invariant cross sections. Besides, some papers give the fitting parameters N and M. We present in tables 1 and 2 a compilation of published values of these parameters obtained in various experiments

$$E\,d\sigma/d^3p\,(AB \to C) = A p_T^{-N}\,(1 - X_T)^M$$

Table 1

AB → C	P_T^* GeV/C	N	M	$\chi^2/N.d.f.$
I. CCRS (1973)[9] pp → π^0	2.5	8.24±0.70		141/88
2. ACHM (1973)[10] pp → π^0	2.0	7.2±0.2		
3. CCRS (1976)[11]				
pp → π^+	3.3	7.50±0.17	15.4±1.2	72/63
π^-	3.3	7.86±0.30	16.1±1.2	70/64
π^0	3.3	8.62±0.04	12.6±0.2	248/167
4. CP (1976)[12]				
pp → π^+	3.0	8.2±0.5	9.0±0.5	15/6
π^-	4.6	8.5±0.5	9.9±0.5	2/6
K^+	0.3	8,4	8,8	
K^-	(X_T)	8,9	11,7	
p		11,7	6,8	
$\bar{p}$		11,9	8,0	
($\bar{p}$)		(8.8)	(14.2)	

We shall use also the fits from refs.[17,18].

$$E\,d\sigma/d^3p(AB \to C) = A(p_T^2 + m^2)^{-n}\,(1 - x_T)^M \qquad (2)$$

Table 2

AB → C	P_T^* GeV/C	n (m^2 (GeV/c)²)	M	$\chi^2/N.d.f.$
I. BS (1974)[13] pp → π	0.1	2.0±0.2 (0.4±0.02)		95/44
	1.2	4.0 (1.0)		20/10
2. BS (1975)[14] pp → π^+	1.0	3.85±0.06 (0.86±0.02)	11.0±0.7	532/198
π^-	1.0	3.89±0.07 (0.89±0.02)	11.9±0.7	604/199
K^+	1.0	4.36±0.15 (1.30±0.04)	9.0±1.0	245/107
K^-	1.0	4.38±0.18 (1.33±0.08)	12.2±1.1	198/107
p	1.0	5.19±0.17 (1.35±0.05)	7.3±0.9	133/110
$\bar{p}$	1.0	4.55±0.05 (1.08±0.05)	14.0±0.4	287/110
3. BNL-CIT-LBL (1976)[15] pp → π^0	1.0	5.4±0.2 (2.3±0.3)	7.1±0.4	23/14
$\pi^- p \to \pi^0$	1.0	5.0±0.1 (1.8±0.3)	5.5±0.3	44/35
4. BNL-CIT-LBL (1977)[16]	$x_\parallel \leq$			
pp → π^0	0.8	4.9±0.06 (0.81±0.04)	4.42±0.50	306/143
$\pi^- p \to \pi^0$		5.06±0.06 (0.97±0.04)	3.13±0.01	271/132
$\pi^+ p \to \pi^0$		5.00±0.07 (0.95±0.04)	3.29±0.10	325/130

Comments

a. In the limited measured interval of p_T, it is difficult to distinguish between functional forms $(p_T^2 + m^2)^{-n}$, $n = 5$ and p_T^{-N}, $N = 8$. The power exponent N up to values of $p_T = (7 \div 8)$ *GeV/c* is lower, than the effective exponent 2n.

$$2n = N(1 + m^2/p_T^2)$$

b. Cross sections indicate strong sensitivity of parameters N and M on the range of variables $p_T(x_T)$*.

c. The FNAL-ISR measurements on π-production are not compatible with the single term fits (1) and (2) at the fixed value $N\approx8$[17]. The corresponding values of $\chi^2/N_{d.f.}$ are 426/12 for π^+ and 373/14 for π^- production.

d. On the p_T^{-12} behaviour in proton (antiproton) production. The only published[14] values of parameters $n(p)\approx5.17\pm0.17$ and $m^2\approx1.35\pm0.05$ in range $p_T=(1\div5)$ *GeV/c* correspond effectively to $N(p)\approx7\div9$. Unfortunately, the values $N(p)\approx11.7$, $N(\bar{p})\approx11.9(8.8)$ cited in refs.[12, 19] are given without the tables of the corresponding cross sections, uncertainties and values of χ^2-criteria that is why this question is still open. Note, that the value $N\approx12$ used often in literature corresponds to the model prediction of CIM only[16].

e. Indications of the behaviour p_T^{-4}:

i) Fit in a wide p_T interval beginning from the small values of x_T in measurements of BS-group at ISR[13].

ii) $p_T^{-(5\pm1)}$ dependence of the cross section in radial scaling analysis[18] of FNAL-ISR experiments at low x_R.

iii) Cosmic ray experiments on high p_T particle production. Measured interval $p_T\approx(2\div15)$ *GeV/c*[21].

iv) Decrease of the exponent N in the preliminary data of CCOR and CSZ groups at CERN ISR $p_T\approx(6\div13)$ *GeV/c*[8,22].

In spite of the problem in distinguishing the validity of p_T^{-8} or p_T^{-4} behaviour from the existing experimental data, the character of data presentation permits a more detailed analysis to reveal their overall trends. In particular, the aforesaid problem needs the classification of the whole set of world data, according to various regions of measured $p_T(x_T)$ range and emission angle θ, which provides a more clear differentiation between various p_T^{-N} regimes.

In this note we present a fitting procedure for the whole available experimental data on the production spectra according to the inverse power behaviour (1) and (2)*). For each set of the data we look for the minimum χ^2 - for various initial values of $p_T=p_T^*$ ($p_T^*\geq1.$ *GeV/c*, 2. *GeV/c*,...). Besides in each case the fits were made with the fixed values of $N=8$ (7) for meson and $N=12$ for baryon production, respectively. The results obtained are presented in *tables 3-8*.

Notes to the tables 3-8

a) Invariant cross sections are in units *mb/(GeV/c)*^{2}.

b) Numbers I, II, III correspond to the fits by eq. (1), eq. (2) (the free parameters: A, N(n), m, M) and by eq. (1) with the fixed values of N, respectively.

c) The values of $p_T^*\geq1.$ *GeV/c*, 2. *GeV/c*, etc. correspond to the lowest transverse momenta defining the beginning of the fitted region.

d) The published values of the fitted parameters are contoured by the full lines.

e) $\Sigma\theta$, $\Sigma\pi^{\pm}$ correspond to the simultaneous fits of the data for all angles and types of particles.

Thus except for the values of parameters in a given interval of transverse momentum this procedure allows one to get the spectrum of power exponents N and M corresponding to the alternating initial conditions $p_T=p_{T\,i}^*$. Therefore, there arises a possibility of studying the dependence of exponents N and M as functions of $p_T(x_T)$ and θ variables.**)

We proceed now with some conclusions from the analysis carried out.

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* Note, that the relaxing of $n\approx n(x_T)$ dependence as was mentioned in refs.[12,19], does not concern the region of small (ISR) x_T. Moreover, fits[17,18] used the old data[20], i.e., effectively high values of n.

*) We use as a scaling variable a reduced momentum $\bar{x}=x_T/\sin\theta\simeq x_R$.

**) In the case of coincidence of the fitted interval with that used in the experimental papers, the resulting parameters coincide with those given by the authors of relevant experimental works.

Table 3

AB → C	$p_\perp^*$ Gev/c	A	N (m^2(Cev/c)^2)	M	χ^2/Ndf.
1. CCRS(1973)/11/ pp → π^0, θ=90°	2,5	I,54±0,I0	8,2±0,7		141/88
2. ACHM(1975)/12/ pp → π^0 θ=90° I	I,0	0,46±0,0I	6,7±0,I	8,I±0,2	479/I36
	2,0	I,37±0,II	7,3±0,I	8,2±0,2	232/II2
	2,0	-	7,2±0,2	-	-
	3,0	I,09±0,I4	7,2±0,I	8,4±0,2	2II/92
	4,0	0,47±0,I0	6,7±0,3	8,4±0,3	I73/67
	5,0	0,33±0,I3	6,6±0,3	7,5±0,5	53/44
	6,0	0,25±0,37	6,8±0,9	5,6±I,3	I2/2I
θ=53° I	I,0	0,75±0,03	6,0±0,I	I2,0±0,4	272/78
	2,0	I,79±0,I5	6,9±0,I	I0,2±0,3	I36/63
	3,0	I,06±0,I2	6,6±0,I	9,8±0,3	I76/5I
	4,0	0,I4±0,03	5,4±0,2	9,7±0,4	I32/36
	5,0	0,02±0,02	5,I±0,7	6,4±0,9	I8/I9
θ=90°, 53° I	I,0		6,6±0,I	8,2±0,2	I709/2I4
	2,0		7,4±0,I	8,4±0,2	972/I75
	2,0		7,2±0,2	-	-
	3,0		7,5±0,I	8,4±0,2	896/I43
	4,0		7,I±0,I	8,2±0,2	6II/I03
	5,0		6,8±0,2	6,8±0,4	I22/63
θ =90° II	I,0	2,57±0,34	3,8±0,I (0,9±0,I)^2	8,I±0,2	283/I36
θ =53° II	I,0	3,65±0,58	3,6±0,I (0,9±0,I)^2	I0,3±0,3	I5I/78
θ =90° III	I,0	0,36±0,0I	8	0,9±0,I	I747/I36
	2,0	2,72±0,I4	8	7,2±0,2	366/II2
	3,0	3,43±0,20	8	8,0±0,2	305/92
	4,0	3,6I±0,26	8	8,0±0,3	270/67
	5,0	3,I3±0,35	8	6,9±0,4	84/44
	6,0	I,30±0,62	8	4,5±I,I	I4/2I
θ =90° III	I,0	0,45±0,0I	7	6,2±0,I	579/I36
	2,0	0,92±0,05	7	8,7±0,2	262/II2
	3,0	0,86±0,005	7	8,5±0,2	2I5/92
	4,0	0,78±0,06	7	8,2±0,3	I79/67
	5,0	0,62±0,07	7	7,9±0,4	55/44
	6,0	0,36±0,I2	7	5,4±I,I	I2/2I
θ=53° III	I,0	0,67±0,002	8	I,4±0,I	2243/78
	2,0	4,28±0,20	8	7,4±0,2	322/63
	3,0	4,I3±0,2	8	7,3±0,2	337/5I
	4,0	3,40±0,II	8	6,8±0,3	338/36
	5,0	I,9I±0,30	8	4,3±0,5	38/I9
θ =53° III	I,0	0,72±0,02	7	6,I±0,I	683/78
	2,0	I,96±0,I0	7	9,8±0,2	I36/63
	3,0	I,53±0,06	7	8,9±0,2	I88/5I
	4,0	0,95±0,06	7	7,6±0,3	2IC/36
	5,0	I,8I±0,57	7	9,I±I,0	23/I9
3. CCRS(1976)/13/ pp → π^0 θ =90° I	2,46	I2,9±0,4	8,8±0,I	9,0±0,I	754/I8I
	2,46	I4,2±0,8	8,6±0,I	exp-I2,6 $x_\perp$	249/I67
	3,0	9,9±0,5	8,5±0,I	I0,2±0,2	404/I5I
	4,0	6,40±I,20	8,2±0,2	I0,2±0,4	296/I00
	5,0	I,35±8,5	I0,I±0,4	I0,I±0,8	I75/55
	6,0	0,24±0,80	5,8±0,I	I5,9±I,0	30/25
θ =90° III	2,46	5,7±0,I	8	II,3±0,I	I400/I8I
	3,0	6,6±0,I	8	II,6±0,I	50I/I5I
	4,0	5,I±0,3	8	I0,6±0,2	298/I00
	5,0	8,4±I,4	8	I,24±0,6	200/55
	6,0	I0,0±8,3	8	I4,8±2,7	33/26
4. BNL-CIT-LBL (1976)/17/ pp → π^0 θ =90° I	I,0	I,2±0,I	6,3±0,2	9,3±0,5	290/I8
	2,0	I,8±0,4	8,6±0,2	7,5±0,5	I3/8

AB → C	$p_\perp^*$ Gev/c	A	N (m(Gev/c))^2	M	χ^2/Nd.f.
θ=90° II	I,0	2,6±I,5	5,4±0,2 (I,5±0,I)^2	7,I±0,4	22I/I8
	2,0		5,6±I,0 (I,6±0,7)^2	7,7±0,5	7/8
	–	–	5,4±0,2 (2,3±0,3	7,I±0,4	23/I4
θ=90° III	I,0	0,70±0,03	8	3,9±0,I	4I5/I8
	2,0	6,0±0,9	8	8,5±0,3	20/8
5. BNL-CIT-LBL (1977)/18/					
pp → π^0 θ=90° II	$x_\parallel$< 0,8	–	4,9±0,I 0,8±0,I	4,4±0,3	306/I42

Table 4

AB → C		$p_\perp^*$ Gev/c	A	N (m(Gev/c))^2	M	χ^2/Nd.f.
1. BS(1973)/25/ pp → $\pi^\pm$ θ=90° I		I,5 √s =44	2,I5±0,I7	8,2±0,I	–	503/I3
		=53	2,04±0,I0	8,I±0,I	–	5I3/I4
2. BS(1974)/26/ pp → $\pi^\pm$ θ=90° II		√s =63	3,7I±0,65	2,0±0,2 (0.4±0,I)^2	exp	95/44
3. BS(1975)/26/ pp → $\pi^\pm$						
θ=90° I	π^+	I,0	I,I±0,I	6,6±0,I	8,2±0,3	504/3I
	π^-	I,0	I,0±0,I	6,5±0,I	9,I±0,3	5I4/3I
	π^+	2,0	3,5±0,4	7,7±0,I	9,I±0,6	I2/II
	π^-	2,0	3,2±0,3	7,7±0,3	9,9±0,I	32/II
θ=60°	π^+	I,0	I,3±0,I	6,I±0,I	II,2±0,7	72/I3
θ=40°	π^+	I,0	I,3±0,I	5,3±0,I	II,2±0,[illegible]	49/I3
	π^-	I,0	I,5±0,I	5,I±0,I	I4,9±I,0	43/I3
θ=90° II	π^+	I,0	I9,5±4,6	4,5±0,I (I,I±0,I)^2	7,2±0,3	76/3I
	π^-	I,0	22,0±5,0	4,5±0,I (I,I±0,I)^2	8,I±0,3	80/3I
	π^+	2,0	6,6±6,0	4,I±0,4 (0.6±0,6)^2	9,I±0,6	I3/II
	π^-	2,0	45±75	4,6±0,5 (I,3±0,4)^2	9,9±0,6	29/II
θ= 60° II	π^+	I,0	I2,0±6,0	4,0±0,2 (I,0±0,I)^2	I0,5±0,2	3I/I3
θ=40° II	π^+	I,0	5,5±I,8	3,6±0,2 (0,8±0,I)^2	8,3±I,I	I0/I3
	π^-	I,0	7,4±2,8	3,6±0,2 (0,9±0,I)^2	II,8±I,2	6I/I3
Σθ II	π^+	I,2		2,0 (m^2)		
	π^-	I,2		4,0 (m^2)		
θ=90° III	π^+	I,0	0,9±0,I	8	-0,2±0,2	206/3I
	π^-	I,0	0,9±0,I	8	0,4±0,2	I995/3I
	π^+	2,0	4,5±0,3	8	8,5±0,5	22/II
	π^-	2,0	4,3±0,3	8	9,2±0,5	40/II
θ=60° III	π^+	I,0	I,3±0,I	8	-I,2±0,4	6II/I3
θ=40° III	π^+	I,0	0,5±0,I	8	-7,3±0,3	463/I3
	π^-	I,0	0,5±0,I	8	-5,2±0,3	476/I3
4. BS(1975)/16/ pp → $\pi^\pm$						
θ=90° I	π^+	I,0	I,I±0,I	6,7±0,I	7,8±0,3	705/50
	π^-	I,0	I,0±0,I	6,8±0,I	8,0±0,3	828/50
	π^+	2,0	3,7±0,3	7,7±0,I	9,3±0,4	27/I8
	π^-	2,0	3,9±0,4	7,8±0,5	I0,0±0,5	87/I8
θ=60° I	π^+	I,0	I,3±0,I	5,9±0,I	I2,I±0,5	I72/46
	π^-	I,0	I,3±0,I	5,8±0,I	I4,I±0,6	I76/46
	π^+	2,0	2,5±0,3	6,9±0,2	I0,9±I,I	I5/I8
	π^-	2,0	2,6±0,4	6,5±0,2	I4,8±I,2	30/I7

AB → C		$p_\perp^*$ Gev/c	A	N (m(Gev/c))^2	M	χ^2/Nd.f
θ=40° I	π^+	I,0	I,4±0,I	5,2±0,I	I2,6±0,9	I30/30
	π^-	I,0	I,5±0,I	5,2±0,I	I4,2±0,9	I25/30
	π^+	2,0	3,5±0,6	6,6±0,4	6,2±I,7	I2/I2
	π^-	2,0	2,I±0,4	6,I±0,5	I2,4±I,9	I2/I2
θ=90° II	π^+	I,0	I6,5±3,I	4,4±0,I (I,I±0,I)^2	7,0±0,3	2I0/50
	π^-	I,0	25,0±5,4	4,6±0,I (I,2±0,I)^2	7,7±0,3	280/50
	π^+	2,0	45±50	4,7±0,4 (I,3±0,3)^2	9,9±0,5	83/I8
θ=60° II	π^+	I,0	8,I±2,I	3,8±0,I (0,9±0,I)^2	I0,8±0,5	62/46
	π^-	I,0	6,4±I,6	3,7±0,I (0,9±0,I)^2	I2,5±0,6	95/46
	π^+	2,0	4,8±6,6	3,7±0,5 (0,7±0,6)^2	I0,8±I,I	I5/I8
	π^-	2,0	40±90	4,2±0,7 (I,3±0,5)^2	I4,4±I,2	27/I7
θ=40° II	π^+	I,0	I0,7±3,4	3,9±0,2 (I,0±0,I)^2	7,6±0,I	37/30
	π^-	I,0	II,0±4,0	4,0±0,2 (I,0±0,I)^2	9,0±I,I	5I/30
	π^+	2,0	–	4,0±2,I (I,9±0,9)^2	5,9±I,8	24/I2
	π^-	2,0	–	3,8±I,4 (I,2±I,2)^2	I2,2±2,I	I4/I2
Σθ II	π^+	I,0	–	3,9±0,I (0,8±0,I)	II,0±0,7	532/I98
	π^-	I,0	–	3,9±0,I (0,9±0,I)	I2,0±0,7	604/I99
θ=90° III	π^+	I,0	I,I±0,I	8	I,3±0,2	2089/50
	π^-	I,0	I,0±0,I	8	I,5±0,2	I883/50
	π^+	2,0	4,7±0,2	8	9,3±0,4	36I/I8
	π^-	2,0	4,5±0,2	8	9,5±0,4	90/I8

AB → C		$p_\perp^*$ Gev/c	A	N (m(Gev/c))^2	M	χ^2/Nd.f.
θ=60° III	π^+	I,0	I,0±0,I	8	–0,4±0,3	I3I7/46
	π^-	I,0	I,0±0,I	8	I,I±0,3	I6II/I6
	π^+	2,0	4,3±0,4	8	7,8±0,7	44/I8
	π^-	2,0	5,3±0,6	8	I0,4±0,8	72/I7
θ=40° III	π^+	I,0	0,6±0,I	8	–5,9±0,2	692/30
	π^-	I,0	0,6±0,I	8	–4,3±0,3	607/30
	π^+	2,0	3,9±0,6	8	4,5±0,9	I3/I2
	π^-	2,0	3,2±0,6	8	5,3±I,I	28/I2
Σθ II, III	π^+	I,0	8,I±0,5	4 (0,90±0,0I)	9,7±0,4	537/I94
	π^-	I,0	8,2±0,6	4 (0,92±0,0I)	II,0±0,4	606/200
5. CCRS(1976)/13/ pp → $\pi^\pm$						
θ=90° I	π^+	3,35	6,I±0,8	8,4±0,2	I0,4±I,0	205/6I
	π^-	3,35	7,9±2,0	7,8±0,3	I7,I±0,8	98/64
	π^+	4,0	4,3±I,5	9,0±0,4	4,3±I,4	I48/4I
	π^-	4,0	I,4±0,9	7,0±0,5	I5,0±I,5	36/43
	π^+	5,0		5,I±0,7	6,9±2,0	49/I5
	π^-	5,0		3,9±2,7	I4,7±2,7	I2/I5
	π^+	3,35	–	7,5±0,2	I5,4±I,2	72/63
	π^-	3,35	–	7,9±0,3	I6,I±I,2	70/64
θ=90° III	π^+	3,35	4,8±0,4	8	I2,4±0,4	209/6I
	π^-	3,35	9,3±0,6	8	I6,9±0,5	99/64
	π^+	4,0	4,6±0,3	8	7,4±I,0	I57/40
	π^-	4,0	4,9±I,I	8	I3,3±I,2	40/43
	π^+	5,0	0,4±0,I	8	0,8±I,I	68/I5
	π^-	5,0	3,2±I,9	8	II,0±2,3	20/I5
6. CP(1977)/14/ pp → $\pi^\pm$						
θ=90° I	π^+	I,0	2,0±0,I	7,2±0,I	I0,3±0,2	279/I9
	π^-	I,0	2,2±0,I	7,2±0,I	II,5±0,2	3I9/I9
	π^+	2,0	7,3±0,7	8,4±0,I	9,0±0,2	349/I5
	π^-	2,0	8,3±0,9	8,8±0,2	8,9±0,4	95/I5

AB → C		$p_\perp^*$ Gev/c	A	N (m(Gev/c))^2	M	χ^2/Nd.f.
	π^+	3,0	I0,8±I,3	8,6±0,I	9,0±0,2	I3/I2
	π^-	$x_\perp \geq$ 0,35		9,2±0,2	9,0±0,5	58/I4
	π^+			8,2±0,2	9,0±0,2	I4/9
	π^-			8,5±0,5	I0,0±0,3	3/9
	π^+	$x_\perp \geq$ 0,35		8,2±0,5	9,0±0,5	I5/6
	π^-			8,5±0,5	9,9±0,5	2I/6
θ=90° III	π^+	I,0	2,4±0,I	8	8,I±0,I	478/I9
	π^-	I,0	2,3±0,I	8	9,3±0,I	490/I9
	π^+	2,0	5,±0,3	8	9,5±0,I	52/I5
	π^-	2,0	5,6±0,4	8	I0,6±0,2	II8/I5
	π^+	3,0	7,9±I,I	8	II,4±0,4	I02/I4
7. (1976)/19/ pp → $\pi^\pm$	π^+	I,5		7,6	9,0	I24/22
	π^-	I,5		8,0	9,I	426/I2

Table 5

1. BS(1975)/26/ pp → p					
θ=90° I	I,0	0,3±0,I	7,0±0,I	3,6±0,6	407/3I
	2,0	2,0±0,4	8,7±4,0	4,0±0,9	5/II
θ=60° I	I,0	0,6±0,I	6,8±0,2	7,3±I,2	90/I3
θ=40° I	I,0	0,5±0,I	5,5±0,2	8,7±I,5	66/I3
θ=90° II	I,0	II3±63	5,7±0,2 (I,5±0,I)^2	3,4±0,5	52/3I
	2,0	I2±29	4,9±0,8 (I,0±0,7)^2	3,7±0,9	4/II
θ=60° II	I,0	I97±3I5	5,6±0,6 (I,6±0,2)^2	6,7±I,2	40/I3
θ=40° II	I,0	I9±I6	4,8±0,4 (I,2±0,I)^2	3,2±I,8	I0/I3
θ=90° III	I,0	0,4±0,I	I2	-I,4±I,0	2508/3I
	2,0	45±5	I2	4,6±0,8	202/II
θ=60° III	I,0	0,8±0,I	I2	-II,9±I,I	I054/I3
θ=40° III	I,0	0,0I±0,00I	I2	-33,6±0,4	708/I3

AB → C	$p_\perp^*$ Gev/c	A	N (m(Gev/c))^2	M	χ^2/Nd.f.
θ=90° III	I,0	0,2±0,I	8	-3,4±0,3	667/3I
	2,0	I,0±0,I	8	4,6±0,9	20/II
θ=60° III	I,0	0,5±0,I	8	-0,2±0,7	I72/I3
θ=40° III	I,0	0,2±0,I	8	-7,9±0,4	I93/I3
2. BS(1975)/16/ pp → p					
θ=90° I	I,0	0,3±0,I	6,7±0,I	5,I±0,5	52I/40
	2,0	3,4±0,8	9,2±0,2	4,5±0,5	32/II
	3,0	2,4±I,8	8,4±0,8	8,5±I,3	I6/6
θ=72° I	I,0	0,4±0,I	6,3±0,2	7,4±I,2	49/20
θ=58° I	2,0	5±4	8,9±0,8	8,4±2,7	II/I0
θ=39° I	I,0	I,0±0,I	6,5±0,3	8,9±I,8	2I/I7
	2,0	I,6±0,5	7,5±0,8	6,3±2,9	I0/I0
θ=90° III	I,0	0,I±0,I	I2	-I2,7±0,7	2600/40
	2,0	38±3	I2	3,8±0,5	I66/II
	3,0	I24±20	I2	8,0±I,2	I3/6
θ=72° III	I,0	I,2±0,I	I2	-7,3±I,3	8I9/20
θ=58° III	2,0	I20±45	I2	9,3±2,6	20/I0
θ=39° III	I,0	0,6±0,I	I2	-I,92±0,8	228/I7
	2,0	4,9±I,4	I2	-8,9±I,6	38/I0
Σθ II	I,0		5,2±0,2 (I,4±0,I)	7,3±0,9	233/II0
3. CP(1976)/15/ pp → p θ=90° I	$x_\perp \geq$ 0,3	-	II,7	6,8	-

Table 6

AB → C	$p_\perp^*$ Gev/c	A	N (m(Gev/c))^2	M	χ^2/Nd.f.
i. BS(1975)$^{/26/}$					
pp → $\bar{p}$					
$\theta=90^0$ I	I,0	0,5±0,I	6,2±0,I	I9,0±I,0	289/3I
	2,0	2,5±0,6	8,7±0,3	II,2±I,3	3/II
$\theta=60^0$ I	I,0	0,9±0,I	6,5±0,3	I9,I±2,I	29/I3
$\theta=40^0$ I	I,0	0,8±0,2	5,I±0,4	35,2±4,6	23/I3
$\theta=90^0$ II	2,0	I2±20	4,4±0,7 (I,I±0,3)^2	22,0±2,5	25/II
$\theta=60^0$ II	I,0	I2±I9	4,4±0,6 (I,I±0,3)^2	I8,5±2,I	23/I3
$\theta=40^0$ II	I,0	6±8	3,8±0,6 (I,0±0,3)^2	I9,2±3,3	23/I3
$\Sigma\theta$ II	I,0	–	4,6±0,I (I,I±0,I)	I4,0±0,4	287/II0
$\theta=90^0$ III	I,0	0,3±0,02	8	4,2±0,6	700/3I
	2,0	I,5±0,2	8	I3,0±I,3	I0/II
$\theta=60^0$ III	I,0	0,9±0,I	8	I0,9±I,2	64/I3
$\theta=40^0$ III	I,0	0,20±0,02	8	0,I8±0,9	86/I3
$\theta=90^0$ III	I,0	0,8±0,I	I2	I3,9 ±I,7	I743/3I
	2,0	38±5	I2	9,6±I,I	9I/II
$\theta=60^0$ III	I,0	I,3±0,2	I2	-I7,7±I,6	359/3I
$\theta=40^0$ III	I,0		I2	-28,0±0,9	287/I3
2. BS(1975)$^{/16/}$					
pp → $\bar{p}$					
$\theta=90^0$ I	2,0	2,4±0,6	9,7±0,3	II,7±I,3	6/I3
	3,0	I,0±0,8	7,7±0,8	I3,4±2,9	3/6
$\theta=72^0$ I	I,0	0,5±0,I	6,0±0,3	22,I±2,4	39/2I
$\theta=60^0$ I	2,0	I,3±I,7	7,4±2,I	I6,4±8,I	4/8

AB → C	$p_\perp^*$ Gev/c	A	N (m(Gev/c))^2	M	χ^2/Nd.f.
$\theta=40^0$ I	I,0	0,8±0,2	7,0±0,7	I3,2±3,8	II/I7
	2,0	0,3±0,2	5,3±I,5	I5,6±6,I	4/I0
$\theta=90^0$ III	2,0	I,6±0,3	8	I3,5±I,2	II3/I3
	3,0	I,3±0,5	8	I3,0±2,3	2/6
$\theta=72^0$ III	I,0	I,0±0,I	8	I2,2±I,5	88/2I
$\theta=60^0$ III	2,0	I,8±I,3	8	I4,6±5,0	34/8
$\theta=40^0$ III	I,0	0,8±0,2	8	7,8±I,9	I3/I7
	2,0	0,6±0,4	8	6,3±3,6	7/I0
$\theta=90^0$ III	2,0	32±5	I2	I3,5±I,2	I0I/I3
	3,0	94±33	I2	II,7±2,6	I8/8
$\theta=72^0$ III	I,0	I,I±0,I	I2	-3,8±I,7	374/2I
$\theta=60^0$ III	2,0	2I±I8	I2	4,7±6,2	7/8
$\theta=40^0$ III	I,0	0,5±0,I	I2	-I3,4±I,9	5I/I7
	2,0	I,2±0,8	I2	-9,I±3,9	I9/I0
3. CP(1976)$^{/14/}$	$x_\perp \geq$		II,9	8,0	
pp → $\bar{p}$ I	0,3		8,8	I4,2	

Table 7

1. BS(1975)$^{/26/}$					
pp → $K^\pm$					
$\theta=90^0$ I K^-	I,0	0,20±0,0I	5,6±0,I	I4,2±0,8	233/3I
K^+	2,0	0,8±0,I	7,3±0,2	7,4±0,8	29/II
K^-	2,0	0,9±0,2	7,3±0,2	II,8±I,I	I2/II
$\theta=60^0$ I K^+	I,0	0,2±0,0I	5,2±0,2	8,I±I,0	93/I3
K^-	I,0	0,3±0,03	5,4±0,2	I5,2±I,8	65/I3
$\theta=40^0$ I K^+	I,0	0,3±0,03	4,4±0,2	I3,4±I,7	32/I3
K^-	I,0	0,3±0,04	4,6±0,3	I6,3±2,2	30/I3
$\theta=90^0$ II K^-	I,0	3I±20	4,8±0,2 (I,5±0,I)^2	I0,8±0,7	42/3I

AB → C	$p_\perp^*$ Gev/c	A	N (m(Gev/c))^2	M	χ^2/Nd.f.
K^+	2,0	502±I77I	5,6±I,0 (2,I±0,5)^2	7,0±0,8	22/II
K^-	2,0	6±I7	4,5±0,8 (I,2±0,8)^2	II,7±I,I	II/II
$\theta=60^0$ II K^+	I,0	8I8±2230	5,7±0,9 (2,0±0,3)^2	9,0±I,4	48/I3
K^-	I,0	I47±377	5,0±0,9 (I,8±0,4)^2	I5,I±I,8	35/I3
$\theta=40^0$ II K^+	I,0	4,6±4,0	3,6±0,4 (I,2±0,2)^2	I0,0±I,9	9/I3
K^-	I,0	6,9±9,0	4,0±0,6 (I,2±0,2)^2	I2,5±2,6	I8/I3
$\theta=90^0$III K^-	I,0	0,I4±0,0I	8	-2,0±0,5	II77/3I
K^+	2,0	I,3±0,I	8	6,I±0,7	49/II
K^-	2,0	I,5±0,2	8	I0,2±0,9	24/II
$\theta=60^0$III K^+	I,0	0,2±0,02	8	-5,0±0,7	4I9/I3
K^-	I,0	0,2±0,02	8	0,3±0,9	233/I3
$\theta=40^0$III K^+	I,0	0,I±0,0I	8	-6,6±0,6	I37/I3
$\Sigma\theta$ II K^+	I,0	–	4,4±0,2 (I,3±0,I)	9,0±I,0	245/I07
K^-	I,0	–	4,4±0,2 (I,3±0,I)	I2,2±I,I	I48/I07
2. BS(1975)/16/					
pp → $K^\pm$					
$\theta=90^0$ I K^+	I,0	0,2±0,0I	6,0±0,I	9,0±0,6	354/33
K^-	I,0	0,3±0,0I	5,6±0,I	I6,2±0,9	256/33
K^+	2,0	0,8±0,I	7,3±0,2	7,4±0,7	3I/I3
K^-	2,0	I,I±0,2	7,3±0,2	I3,4±I,I	25/I2
$\theta=60^0$ I K^+	I,0	0,3±0,02	5,4±0,2	II,6±I,2	2I6/3I
K^-	I,0	0,3±0,02	5,0±0,2	I7,5±I,7	99/30
K^+	2,0	0,7±0,2	6,6±0,4	I0,4±I,7	75/I4
K^-	2,0	0,8±0,3	5,9±0,5	I9,I±2,7	7/I3

AB → C	$p_\perp^*$ Gev/c	A	N (m(Gev/c))^2	M	χ^2/Nd.f.
$\theta=40^0$ I K^+	I,0	0,4±0,04	4,2±0,2	I5,2±I,6	35/25
K^-	I,0	0,3±0,04	4,4±0,3	I6,9±2,2	39/25
K^+	2,0	I,4±0,5	6,6±0,7	I0,6±2,9	3/I0
K^-	2,0	0,5±0,3	5,0±I,I	I7,6±4,2	II/I0
$\theta=90^0$ II K^+	I,0		4,7±0,2 (I,4±0,I)^2	6,7±0,5	69/33
K^-	I,0		5,I±0,3 (I,7±0,I)^2	I2,0±0,7	62/34
K^+	2,0		5,3±0,8 (2,0±0,5)	7,5±0,7	2I/I3
K^-	2,0		4,0±0,8 (0,9±0,I)^2	I3,4±0,8	25/I2
$\theta=60^0$ II K^+	I,0		6,6±I,I (2,3±0,4)^2	I0,0±I,I	I22/3I
K^-	I,0		5,3±I,0 (2,0±0,4)^2	I6,3±I,6	44/30
K^+	2,0		3,6±I,I (0,8±I,4)^2	I0,4±I,7	75/I4
$\theta=40^0$ II K^+	I,0		3,6±0,5 (I,2±0,2)^2	II,4±2,0	I8/25
K^-	I,0		3,6±0,6 (I,2±0,2)^2	I3,5±2,5	27/25
K^+	2,0		3,9±2,4 (I,0±I,9)^2	I0,4±3,0	3/I0
$\theta=90^0$III K^+	I,0		8	-2,35±0,4	I398/35
K^-	I,0		8	I,0±0,5	II50/34
K^+	2,0		8	6,I±0,6	52/I3
K^-	2,0		8	II,7±0,9	34/I2
$\theta=60^0$III K^+	I,0		8	-2,5±I,2	553/3I
K^-	I,0		8	0,6±0,7	337/30
K^+	2,0		8	7,3±I,2	92/I4
K^-	2,0		8	I3,4±I,9	27/I3

AB → C	$p_\perp^*$ Gev/c	A	N $(m(Gev/c))^2$	M	χ^2/Ndf
$\theta=40^0$ III K^+	I,0		8	-8,4±0,5	272/25
K^-	I,0		8	-6,4±0,6	I52/25
K^+	2,0		8	6,I±I,6	6/I0
K^-	2,0		8	7,8±2,6	I8/I0
3. CP(1976)/14/	$x_\perp >$		8,4	8,8	
$pp \to K^\pm$ $\theta=90^0$, I	0,3		8,9	9,9±0,5	

Table 8

1. BNL-CIT-LBL (1976)/17/ $\pi^\pm p \to \pi^0$					
$\theta=90^0$ I π^+	I,0	0,6±0,03	6,0±0,I	8,2±0,4	202/20
π^-	I,0	0,6±0,03	6,2±0,I	7,8±0,4	220/20
π^+	2,0	I,5±0,2	7,8±0,2	5,4±0,4	25/9
π^-	2,0	2,6±0,4	8,4±0,2	5,4±0,4	2I/I0
$\theta=90^0$ II π^+	I,0	I0±3	4,4±0,I (I,I±0,I)	5,7±0,3	3I/I9
π^-	I,0	36±I7	5,0±0,2 $(I,3±0,I)^2$	5,5±0,4	I8/20
π^+	2,0	-	4,0±0,3 $(0,5±0,9)^2$	5,4±0,4	25/9
π^-	2,0	53±30	5,0±I,9 $(I,5±I,2)^2$	5,6±0,4	4/I0
$\theta=90^0$ II $\Sigma\pi^\pm$	?		5,0±0,I (I,8±0,2)	5,5±0,3	44/35
$\theta=90^0$ III π^+	I,0	0,4±0,0I	8	2,24±0,I	400/I9
π^-	I,0	0,4±0,02	8	2,5±0,I	380/I9
π^+	2,0	I,6±0,2	8	5,0±0,2	27/I9
π^-	2,0	2,9±0,3	8	6,0±0,3	25/I0
2. BNL-CIT-LBL (1977)/18/ π^+	$x_\parallel <$		5,0±0,I (I,0±0,I)	3,3±0,I	325/I30
$\pi^\pm p \to \pi^0$ π^-	0,8		5,I±0,I (I,0±0,I)	3,I±0,I	27I/I32

i) Unless we restrict ourselves to a certain interval of transverse momentum (within the accuracy defined by the experimental uncertainties) the stable values of exponents N(M) do not exist. Particularly, in the whole range of p_T, there are no stable N=8 (mesons) and N=12 (baryons) values, respectively. Furthermore, the case III for the fixed values N=8(12) worsens significantly χ^2-criteria in comparison to the corresponding fits I and II*).

ii) Angular dependence $N(\theta)$. The present analysis allows one to make a conclusion about the sensitivity of the parameters N(M) to the values of emission angle θ. In particular, the results III-VIII show the tendency of the data to lower the exponent N with decreasing θ. In accordance with the correspondence principle/25/ this regime is accompanied by the increase of the corresponding values of M and the sum N+M is approximately constant. This phenomenon is present in all the reactions on meson and baryon production $pp \to \pi^\pm, K^\pm, p^\pm$. The attempts of data fitting in the case $\Sigma\theta$, i.e., for all angles simultaneously, makes the χ^2-criteria noticeably worse in comparison with those for the fixed angles.

iii) Indication of the change in the power regime of cross-sections within the interval $p_T = p_T^* = (1.\div 2)GeV/c$. This conclusion follows from the difference in the boundary values of N in passing from $p_T^* = 1.$ *GeV/c* to $p_T^* = 2.$ *GeV/c*, which is accompanied by worsening of $\chi^2/N_{d.f.}$.

$$N(p_T^* \geq 1.) < N(p_T^* \geq 2.)$$

$$\chi^2/N_{d.f.}(p_T^* \geq 1.) = k\,\chi^2/N_{d.f.}(p_T^* \geq 2.),\ k=3\div 15$$

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*) These conclusions are based on the cases of normal description of the data, i.e., by the stability of the normalization and small A-N(M) correlations.

In conclusion we should like to emphasize that the performed analysis points out the necessity to treat carefully the power law exponents N(M) as the hadronic constituent numbers. In the case of the inclusive production the parameters N(M) show the dependence on the range of kinematic variables specifying interaction of hadrons and their constituents. This especially concerns the model statements of CIM[6] about the values $N=8$ ($AB\to$ mesons and $N=12$ ($AB\to$ baryons). Furthermore, the analysis shows that the possible screening of the p_T^{-4} law affected by different nonscaling origins does not contradict to the recent experimental results at the available energies and transverse momenta.

The authors gratefully acknowledge helpful discussions with Yu.M.Kazarinov and S.C.Mavrodiev and are indebted to L.T.Akhobadze and T.G.Makharadze for their help in numerical calculations.

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Received by Publishing Department
on May 18 1978.