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G. I. Kopylov

THE SIMULATING OF P-P INTERACTION AT 10 BEV

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Abstract

Simplified methods of numerical simulating the reactions involving 5-6 secondary particles is described, the isobar model is being taken into account. The table of random stars for p-p interaction at 10 Bev containing 201 stars in the center of mass system and in the laboratory system is given.

I.

A method of constructing a table of random stars is given in[1]. It needs an electronic computer. An attempt was made of constructing such a table using the hand calculation to study the possibilities of this method. We succeeded in doing it for the reaction of pp interaction at 10 Bev basing in the following assumptions: α) the isobar model of the multiple production is considered to be correct; β) the reactions involving more than 6 secondary particles are not taken into account; γ) in some cases the mass of a pion is considered equal to zero. Besides the table of 201 random stars the simplified methods of its constructing are given in this paper.

The analysis of data from the table will be made in another paper.

All the notations are taken from[1].

1. Basic formulae

The preliminary calculations have shown that the methods of constructing the table from[1] when there are more than 4 secondary particles becomes not effective for the hand calculation.

The necessity of too frequent rejection of the sets of the momentum components which do not satisfy the inequalities (2.18) leads to many useless calculations. To increase the efficiency of the methods it is necessary to decrease the number of the limitations on the momenta of the particles. So, e.g., if there are five secondary particles, the inequality (2.18) in rejection technique is verified twice(after the sampling of the momenta of the second and the third particles.) Instead of this one may restrict oneself by single rejection after the sampling of the second particle momentum. One should try to choose of the momentum the third particle using the direct method (method B from [1]). A direct method is more difficult than the rejection technique but it does not require the rejection of the values of the momentum components already chosen.

The direct method can be applied to the sampling of the momenta only if one makes use of the assumptions α) and γ). Let us pass to the derivation of the corresponding formulas.

We start from the formula for the statistical weight of the system of n particles

$$S_n(E,\vec{P}) = \int d\vec{p}_1\, d\vec{p}_2 \ldots d\vec{p}_{n-2}\, S_2(E_{n-1}, \vec{P}_{n-1}) \tag{1}$$

where (see (2.25))

$$S_2 = \frac{4}{3}\pi p^*_{n-1} \frac{3E^*_{n-1}E^*_n E^2_{n-1} - p^{*2}_{n-1}P^2_{n-1}}{M^3_{n-1}} \tag{2}$$

Write (1) in the form of a chain of the recursion formulae .

$$S_{\nu+1}(E_{n-\nu}, \vec{P}_{n-\nu}) = \int d\vec{p}_{n-\nu}\, S_\nu(E_{n-\nu+1}, \vec{P}_{n-\nu+1}), \tag{3}$$

where it is assumed that $E_1 = E$, $\vec{P}_1 = \vec{P}$, whereas $\nu\,(\nu=2,3,\ldots,n-1)$ are integers. The limits of the integration in (3) may be found quite simply if $m_{n-\nu}=0$. In this case (3) is convenient to be written as follows:

$$S_{\nu+1}(E_{n-\nu}, \vec{P}_{n-\nu}) = 2\pi\int_{-1}^{1} d\eta_{n-\nu}\, \Lambda_\nu(E_{n-\nu}, \vec{P}_{n-\nu}, \eta_{n-\nu}), \tag{4}$$

where

$$\Lambda_\nu = \int_0^{\Pi_\nu} p^2_{n-\nu}\, S_\nu(E_{n-\nu} - e_{n-\nu},\ \vec{P}_{n-\nu} + \vec{p}_{n-\nu})\, dp_{n-\nu}, \tag{5}$$

whereas

$$\Pi_\nu = \frac{M^2_{n-\nu}}{2(E_{n-\nu} + P_{n-\nu}\eta_{n-\nu})} \equiv \frac{M^2_{n-\nu}}{2U_{n-\nu}}. \tag{6}$$

Let the distribution over $\vec{p}_1,\ldots\vec{p}_{n-\nu+1}$ with the required density $S_{\nu+1}$ be fulfilled in some way. Then it follows from (4) that $\Lambda_\nu(E_{n-\nu},\vec{P}_{n-\nu},\eta_{n-\nu})$ presents density of the distribution (not normalized) over $\vec{p}_1,\ldots,\vec{p}_{n-\nu+1},\eta_{n-\nu}$. It follows from (5) that the density of the distribution over $\vec{p}_1,\ldots,\vec{p}_{n-\nu-1},\ \eta_{n-\nu},\ p_{n-\nu}$ is $p^2_{n-\nu}\, S_\nu(E_{n-\nu+1},\vec{P}_{n-\nu+1})$.

Further we shall designate through α the random numbers uniformly distributed in (0,1). Making use of the direct method of sampling (see [1], page 8), for the sampling $\eta_{n-\nu}$ we obtain the equation

$$2\pi\int_{-1}^{\eta_{n-\nu}} d\eta_{n-\nu}\,\Lambda_\nu = 2\pi\alpha\int_{-1}^{1} d\eta_{n-\nu}\,\Lambda_\nu \equiv \alpha S_{\nu+1}, \tag{7}$$

whereas for the sampling $p_{n-\nu}$ - the equation

$$\int_0^{p_{n-\nu}} dp_{n-\nu}\cdot p^2_{n-\nu}\cdot S_\nu = \alpha\int_0^{\Pi_\nu} dp_{n-\nu}\cdot p^2_{n-\nu}\, S_\nu \equiv \alpha\Lambda_\nu \tag{8}$$

Introduce the following notations:

$$E_{n-\nu} + P_{n-\nu}\,\eta_{n-\nu} = U_{n-\nu}\,, \tag{9}$$

$$2\pi \int \Lambda_\nu \, d\eta_{n-\nu} = \bar{\Lambda}_\nu\,(\eta_{n-\nu}), \tag{10}$$

$$\int dp_{n-\nu} \cdot p_{n-\nu}^2\, S_\nu = \bar{S}_\nu\,(p_{n-\nu}, \eta_{n-\nu}) \tag{11}$$

(in (10) and (11) are omitted $E_{n-\nu}$ and $\vec{p}_{n-\nu}$ among the arguments Λ_ν and S_ν). Then the equations (7) and (8) may be finally rewritten in the form:

$$\bar{\Lambda}_\nu\,(\eta_{n-\nu}) = \alpha\,\bar{\Lambda}_\nu\,(1) + (1-\alpha)\,\bar{\Lambda}_\nu\,(-1), \tag{7'}$$

$$\bar{S}_\nu\,(p_{n-\nu}, U_{n-\nu}) = \alpha\,\bar{S}_\nu\,(\Pi_\nu\,, U_{n-\nu})\,. \tag{8'}$$

To make use of the formulas (7') and (8') for the sampling $\eta_{n-\nu}$ and $p_{n-\nu}$ it is necessary to know the concrete form of the functions $\bar{\Lambda}_\nu$ and $\bar{S}_\nu$. We shall present the corresponding expressions for $\nu = 2$ and $\nu = 3$ under the assumption $m_{n-1} = m_n = 0$. Then the initial formula - the expression for S_2 - is of the form:

$$S_2 = \frac{\pi}{6}\,(3E_{n-1}^2 - P_{n-1}^2). \tag{12}$$

$\nu = 2.$ Assume $m_{n-2} = 0$. From (11) and (12) we obtain

$$\bar{S}_2(p, u) = \frac{\pi}{6}\left(\frac{2E^2+M^2}{3} - \frac{2E+U}{2}\,p + \frac{2}{5}\,p^2\right)p^3 \tag{13}$$

(the index n-2 is meant everywhere in the magnitudes without it).

Then it follows from (5)

$$\Lambda_2(\eta) \equiv \bar{S}_2\,(\Pi_2, U) = \frac{\pi}{6}\left(\frac{8E^2+M^2}{12} - E\,\Pi_2 + \frac{2}{5}\,\Pi_2^2\right)\Pi_2^3 \tag{14}$$

while from (10)

$$\bar{\Lambda}_2(\eta) = \frac{\pi^2}{3}\,\frac{M^2}{2p}\left(\frac{8E^2+M^2}{24} - \frac{E\,\Pi_2}{3} + \frac{\Pi_2^2}{10}\right)\Pi_2^2\ . \tag{15}$$

Finally, from (4)

$$\mathcal{S}_3(E,P) \equiv \bar{\Lambda}_2(1) - \bar{\Lambda}_2(-1) = \frac{\pi^2}{240} EM^2(7E^2-3P^2) . \qquad (16)$$

$\nu=3$. In the same order as for $\nu=2$, can be obtained[1]:

$$\bar{\mathcal{S}}_3(p,u) = \frac{\pi^2}{240}\left\{ \frac{EM^2(4E^2+3M^2)}{3} - \frac{3M^2(M^2+4E^2)+4uE(3M^2+2E^2)}{4}\,p + \right.$$

$$\left. + \frac{12}{5}\left[EM^2+(2E^2+M^2)u+Eu^2\right]p^2 - \frac{2}{3}(M^2+6Eu+3u^2)p^3 + \frac{8}{7}up^4 \right\} p^3 ;$$

$$\Lambda_3(\eta) = \frac{\pi^2}{240}\cdot\frac{M^2}{2}\left[\frac{(10E^2+3M^2)E}{15} - \frac{12E^2+M^2}{10}\Pi_3 + \frac{4}{5}E\Pi_3^2 - \frac{4}{21}\Pi_3^3\right)\Pi_3^3 ; \qquad (18)$$

$$\bar{\Lambda}_3(\eta) = \frac{\pi^3}{120}\,\frac{M^4}{20P}\left(\frac{10E^2+3M^2}{6}E - \frac{12E^2+M^2}{6}\Pi_3 + E\Pi_3^2 - \frac{4}{21}\Pi_3^3\right)\Pi_3^2 ; \qquad (19)$$

$$\mathcal{S}_4(E,\vec{P}) = \frac{\pi^3}{2\cdot 8!} M^4(33E^4-18E^2P^2+P^4) . \qquad (20)$$

One may get the formulas for an arbitrary ν using the same method as used in [2] for $S_\nu(E_{n-\nu+1},0)$. The obtained expressions are, however, too big, we do not intend to present them here. We write down only the formula for $S_\nu(E_{n-\nu+1},\vec{P}_{n-\nu+1})$ (the index is omitted);

$$S_\nu(E,\vec{P}) = -\frac{(2\pi)^{\nu-1}}{(2\nu-1)!}\,\frac{1}{2}\,\frac{d}{dP^2}\sum_{m=0}^{2\nu+1}\frac{(2\nu+m-1)!}{(2\nu-m-1)!\,(\nu+m-1)!\,(2m)!!}\times$$
$$\times\left[(E-P)^{\nu+m-1} - (-1)^{2\nu-m-1}(E+P)^{\nu+m-1}\right]P^{2\nu-m-1} \qquad (21)$$

Further we shall need the magnitudes of the maximum of the function

$$\Phi_\nu = \mathcal{S}_\nu \prod_{i=1}^{n-\nu} p_i^2 \qquad (22)$$

Since Φ_ν depends upon $\vartheta_2,\dots,\vartheta_{n-\nu}$ only through $P^2_{n-\nu+1}$, then one of the equations determining the position of the maximum, is of the form:

$$P_{n-\nu+1} = 0 \qquad (23)$$

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1) The index n-3 is everywhere meant in the magnitudes without an index.

It follows from here, by the way, that there exists an infinite set of the values ν_i, which maximized Φ_ν.

On the other hand, Φ_ν depends upon $p_1, \dots, p_{n-\nu}$ both through $E_{n-\nu+1}$, $\vec{P}_{n-\nu+1}$ and directly. This leads to the following system of the equations

$$\frac{p_1^2}{e_1} = \frac{p_2^2}{e_2} = \dots = \frac{p_{n-\nu}^2}{e_{n-\nu}} = \frac{2}{3\nu-4} E_{n-\nu+1} \tag{24}$$

It is convenient to solve it using the iteration method. If we assume as a first approximation, for instance, its solution when $m_1 = \dots = m_{n-\nu} = \frac{1}{n-\nu}\sum_1^{n-\nu} m_i$ i.e. the positive root $e = e^{(0)}$ of the quadratic equation

$$e^2\left[1 + \frac{2(n-\nu)}{3\nu-4}\right] - \frac{2}{3\nu-4} E e - \frac{1}{n-\nu}\sum_1^{n-\nu} m_i = 0, \tag{25}$$

it is necessary to calculate $\tilde{X}_i = \frac{p_i^2}{e_i} - \frac{2}{3\nu-4} E_{n-\nu+1}$

at $e_i = e^{(0)}$. Then one may determine the correction for the previous approximation from the linear system

$$\sum_{j=1}^{n-\nu} \left[\frac{2}{3\nu-4} + \left(1 + \frac{m_i^2}{e_i^2}\right)\delta_{ij}\right] de_j = -\tilde{X}_i^{(0)}. \tag{26}$$

Let us designate the roots (24) through $\bar{e}_i$.

The magnitude of the maximum Φ_ν is as follows:

$$\Phi_{\nu_{max}} = \frac{\pi^{\nu-1}}{2^{\nu-1}}(2\pi)^{n-\nu}\left(\frac{2}{3\nu-4}\right)^{n-\nu} \cdot \frac{(4\nu-4)!\,(2\nu-1)}{[(2\nu-1)!]^2\,(3\nu-4)!} \bar{E}_{n-\nu+1}^{\,n+2\nu-4} \cdot \prod_{i=1}^{n-\nu} \bar{e}_i \tag{27}$$

(formula (3.16) is used from[2]; $\bar{E}_{n-\nu+1} \equiv E - \sum_1^{n-\nu} \bar{e}_i$).

Note that at great ν the surface Φ_ν has a sharp peak in the point of the maximum. This restricts the efficiency of the proposed method.

2. Methods of Sampling

Formulas (13)-(16) make it possible to get 5-particle stars, whereas formulas (13)-(20) - 6-particle ones. Let us describe the procedure of the sampling of 6-particle stars in more detail.

1. p_1 and p_2 respectively in $(0, \tilde{p}_{1\,max})$, $(0, \tilde{p}_{2\,max})$ are picked uniformly. So is η_2 in $(-1, +1)$. Only such values of the numbers p_1, p_2, η_2 are left for which $M_3 \geq \mu_2$.

2. Φ_4 is calculated by (20), (22) and compared with a random number α from the interval $(0, \Phi_{4\,max})$. Only such sets of p_1, p_2, η_2 for which $\Phi_4 \geq \alpha$, are left.

The further procedure of the sampling is carried out without a rejection. Therefore, the calculations according to the points 1 and 2 are repeated until a necessary number of sets is obtained.

3. The equation (7') where (19) is substituted, is being solved with respect to Π_3. From (6) one may find u_3 and η_3 .

4. The system (8') (17) with respect to P_3 is being solved.

After the calculations according to the points 3-4 the momentum of the third particle $\vec{p}_3$ is wholly defined. Therefore, it is possible to determine E_4, P_4, M_4. It is not necessary to check the inequality $M_4 \geq \mu_3$, it must be fulfilled automatically. (Note that now $\mu_3 = \mu_4 = \mu_5 = \mu_6 = 0$).

Then one passes to the sampling of the components $\vec{p}_4$.

5. (7')-(15) are being solved with respect to Π_2; η_4 and u_4 are calculated.

6. (8')-(13) are being solved with respect to p_4; E_5 and P_5 are calculated.

Thus, the components $\vec{p}_4$ are determined. The sampling of the module of the momentum p_5 is made as is shown in[1], i.e.

7. The equation (2.27) is being solved, from where e_5 is found, then p_5. The remaining components of the 5 and 6 particles may be found from the laws energy and momentum conservation

$$\eta_5 = \frac{E_6^2 - m_6^2 - P_5^2 - p_5^2}{2P_5 p_5} = \frac{M_5^2 + m_5^2 - m_6^2 - 2E_5 e_5}{2P_5 p_5} \tag{28}$$

$$\vec{p}_6 = -\sum_{i=1}^{5} \vec{p}_i \tag{29}$$

When the stars with $n = 5$ are sampled the points 3 - 4 are omitted, while in the points 5-7 the indeces in all magnitudes are decreased by a unit.

When the stars with $n = 4$ are sampled after point 2 immediately follows 7, with the decrease of all the indeces by two.

The sampling of the stars with $n = 3$ is given in[1].

Before enumerating further operations with the obtained sets $p_1,\dots,p_{n-1},\eta_2,\dots,\eta_{n-1}$ the following should be noted.

The inequality $M_4 \geq \mu_3$ is fulfilled practically in a great majority of cases after the calculations by 4. It is so even if in the calculation of E_4 we assume $m_3 \neq 0$ and in the calculation of μ_3 assume $m_4, m_5, m_6 \neq 0$. The same holds for the fulfillment of other similar inequalities. Therefore, though the formulae of the previous paragraph were derived under the assumption that the mass of a pion is equal to zero the mass of a pion was not practically neglected in tha calculations. Only in several (five-six) events this has led to imaginary values of M_l or to the violation of the inequalities of $M_4 \geq \mu_3$

type. In these cases the calculation was made with $m_{n-\nu}=0$ for the second time. The use at $m_{n-\nu}\neq 0$ of the formulas correct at $m_{n-\nu}=0$ would, evidently, distort in some way the characteristics of the low energy pions containing in the table. This distortion, however, must be small. At the same time the condition $m_{n-\nu}\neq 0$ made it possible to avoid the difference in the characteristics of the mesons produced in the reactions with n = 5-6 as well as in the reactions with n = 3-4 (in the latter ones the condition $m_{n-\nu}=0$ is not obligatory).

Note also, that the indeces 1 and 2 should be given to heavy secondary particles, while other indeces are meant for the light ones. The reactions involving more than two secondary baryons cannot be chosen using this method by means of the hand calculation.

The efficiency of this method of the sampling is characterized by Table 1. Roughly speaking, this method makes it possible to keep the efficiency at a level of 10% with the increase of a number of partioles.

Enumerate further operations with the quantities $p_1,\dots,p_{n-1}$, $\eta_2,\dots,\eta_{n-1}$.

8. η_1 in $(-1,1)$ and $\varphi_1,\dots,\varphi_{n-1}$ in $(0,2\pi)$ are picked. The components of the momenta in the rectiangular coordinate system are calculated by the formulas (2.9)-(2.12). At this to check the calculations the formulas

$$\left.\begin{array}{c} x_k^2+y_k^2+z_k^2=p_k^2, \\ X_k^2+Y_k^2+Z_k^2=P_k^2, \\ X_{k+1}=X_k+x_k, \quad Y_{k+1}=Y_k+y_k, \; Z_{k+1}=Z_k+z_k \end{array}\right\} \qquad (30)$$

are used.

9. The rectiangular components $\vec{p}_n$ are calculated by (29). As a oontrol calculation the verification of the fulfillment of the law of energy conservation is used.

10. If an isobar is produced in the reaction the sampling of the isobar decay should be also made. When making the table it was assumed that: 1) the mass of the isobars is constant and equal to 1.24 Bev/c^2; 2) the products of the isobar decay are distributed in the space isotropically. Both these assumptions may be easily replaced by other ones more real.

Under the assumption I the characteristics of the decay in the system of reference where the isobar rests are the constants. Having chosen uniformly in (-1,1) the cosine η^* of the emergence angle of a nucleon we obtain the longitudinal and transverse nucleon momentum by the formulas

$$\left.\begin{array}{l} p_{N\uparrow}=p^*\sqrt{1-\eta^{*2}} \equiv 0{,}233\sqrt{1-\eta^{*2}} \\ p_{N\rightarrow}=\dfrac{e_{N'}\,p^*\eta^*+p_{N'}e_N^*}{m_{N'}} \equiv 0{,}188\,e_{N'}\eta^*+0{,}781\,p_{N'} \end{array}\right. \qquad (31)$$

(the quantities with the index N' are referred to an isobar).

It is simply to get from here in the L-system the emergence angle of a nucleon with respect to the initial direction of an isobar (characterized by the vector $\{x_{N'}, y_{N'}, z_{N'}\}$).

Having chosen uniformly in (0,2 π) the azimuth φ^* of the direction of the nucleon emergence one may make use of the formulas (2.9)-(2.12)for obtaining the components of the nucleon momentum in the L-system. The substitution leads to the following sequence of the formulas convenient for the calculation:

$$p_N^2 = p_{N\to}^2 + p_{N\uparrow}^2 ; \qquad R_{N'}^2 = x_{N'}^2 + y_{N'}^2 ; \tag{32_{1-2}}$$

$$u = \frac{x_{N'}}{p_{N'}} ; \; v = \frac{y_{N'}}{p_{N'}} ; \; w = \frac{z_{N'}}{p_{N'}} \cos\varphi^* ; \; \xi = \frac{x_{N'}}{R_{N'}} ; \; \zeta = \frac{y_{N'}}{R_{N'}} ; \tag{33_{1-5}}$$

$$\left.\begin{aligned} A_N &= w\xi - \zeta \sin\varphi^* ; \\ B_N &= w\zeta + \xi \sin\varphi^* ; \\ C_N &= (R_{N'}/p_{N'})\cos\varphi^* ; \end{aligned}\right\} \tag{34_{1-3}}$$

Control:

$$A_N^2 + B_N^2 + C_N^2 = 1 ; \tag{35}$$

$$\begin{aligned} x_N &= u p_{N\to} + A_N p_{N\uparrow} ; \\ y_N &= v p_{N\to} + B_N p_{N\uparrow} ; \\ z_N &= w p_{N\to} - C_N p_{N\uparrow} ; \end{aligned} \tag{36_{1-3}}$$

Control: $x_N^2 + y_N^2 + z_N^2 = p_N^2$

It is convenient to calculate the components of the pion momentum by formulae

$$\vec{p}_\pi = \vec{p}_{N'} - \vec{p}_N \tag{37}$$

Control:

$$e_N + e_\pi = e_{N'} \tag{38}$$

11. Finally, the momenta of the particles are transformed in L-system.

3. Distribution by Charge States

Simplified methods for sampling the stars for different reactions is described in the previous paragraphs. Now there remains to enumerate those reactions which were taken into account in the course of the tabulation and to give the used distributions by the charge states.

At 10 Bev in p-p interactions both multiple production of pions and the production of antiparticles and strange particles may occur. The latter process on the photographs may be separated from the other ones. Therefore only the production processes of pions and antinucleons are included into the table. The statistical weights of these processes at at $T_{p\,kin.}$ = 10 Bev are given in Table 2. The unpublished calculations which are the basis of paper[3]* were used there.

When making the table of random stars we restricted ourselves by the first 14 reactions from Table 2, i.e. by the reactions $pp \to NNn\pi, N'Nn\pi, N'N'n\pi \ (n = 1 \div 4)$ and reactions $pp \to 3N\tilde{N}(\tilde{N}')$. The rejected reactions of elastic scattering, of the production of more than 4 mesons and some other are less than 4% of the weight of the reactions taken into account.

Starting from the general length of the table consisting of 200 lines the number of lines for each reaction was taken proportional to its statistical weight (Table 2).

One could not resort to a more correct procedure of the random sampling of the number of lines (see § 3 from[1]). At this the necessity of including the reactions with 7 secondary particles might appear but their sampling cannot be realized by the hand calculation.

Thus, the number of lines for each reaction does not fluctuate with respect to the value expected by the isobar model.

Each of the reactions included into the table may be concretely realized by different charge states. So, for instance, the reaction $pp \to N'N\pi$ may have 8 realizations:

$$p^+p\pi^-, \ p^+n\pi^0, \ p^0p\pi^0, \ p^0n\pi^+, \ p^-p\pi^+, \ n^+n\pi^+, \ n^+p\pi^0, \ n^0p\pi^+$$

(p^+, for instance, designates an isobar disintegrated into p and π^+). The number of lines for each charged state has been already randomly chosen. The statistical weights of the states were calculated starting from the assumption about the equal probability of each isotopic state[4,5]. The charge distributions from [5] are not applicable for the table of random stars since there the isobar decay has been already taken into account. Therefore, the calculation of the charge distribution had to be carried out a new for all the reactions where the isobars appear. The methods used in the calculations in general coincide with those stated in[5].

They are as follows.

Let the formula be obtained which presents the probability that the system with the isotopic spin T and its Z-component t is composed of two subsystems: the subsystem of two nucleons (isobars) in the state (T_1, t_1) and the subsystem of the n-mesons with a definite sign.

We shall write it in the form

$$(T,t) = \sum_i C_i^{(n)} (T_i, t_i; n\pi). \qquad (39)$$

Here $C_i^{(n)}$ are the probabilities (unnormalized). To obtain an analogous formula with (n+1) mesons from here it is sufficient to have some formulas of the form

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* The author expresses his gratitude to V.S. Barashenkov and V.M. Maltsev for the data which they kindly gave him.

$$(T,t)=\sum_{K} C_K^{(1)}(T_K,t_K;\pi) \qquad (40)$$

for all $T=T_i$ and $t=t_i$. Substituting (40) into (39) it is possible to obtain the formula we were looking for by multiplying and summing $C^{(n)}$ and $C^{(1)}$

$$(T,t)=\sum_{i} C_i^{(n)} \sum_{K} C_K^{(1)}(T_K,t_K;(n+1)\pi) \qquad (39')$$

If in addition one has a set of formulas which present the probability of different charge states of the sybsystem NN or N'N or N'N' in the state (T_K, t_K) then from the formulas of (39') type we obtain the probabilities of different charge states of the system involving 2 nucleons (isobars) and (n + 1) mesons.

The coefficients from formula (40) are given in table3. Those from (39) obtained in the transition from n to n + 1 are given (for n from 1 up to 4) in table 4. Table 5 contains the probabilities that the subsystems (T,t) are in different charge states. The substitution of the ooefficients from Table 5 into Table 4 gives respective(unnormalized) probabilities of different oharged states. They are presented in Table 6. It was used for the sampling of the distribution by the charge states inside each reaction (according to the methods used in § 3|1|

In accordance with the results of the sampling in eaoh random star the data concerning neutral particles were crossed out.

4. Table of Random Stars

The data concerning only charged particles are included into the table presented in this paper. The stars are shuffled at random. The following data on stars are given in the table: the observed particles (p-proton, ± - $\pi^{\pm}$), the momentum components in the center of mass system (p_x^*, p_y^*, p_z^*), the momentum p^* in the center-of-mass system, Z-component of the momentum p_z and the momentum P in the L-system. The center-of-mass system is oonsidered to move along the axis Z of the L-system. It was assumed in the calculations that the incident protons have the kinetic energy T = 10 Bev, the mass of a nucleon is taken equal to 0,94 Bev/c^2, the mass of a meson 0,14 Bev/c^2. The figures are given in Mev/C. The accuracy up to 1 Mev/c for the magnitudes less than 1000, and 10 Mev/c for the magnitudes more than 1000 (in the caloulations the accuracy was 4-5 signs). The random numbers were taken from |6|.

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TABLE OF RANDOM STARS

The number Particle	p_x^*	p_y^*	p_z^*	p^*	p_z	p
1. p	+ 54	− 41	+ 397	403	3360	3360
+	+ 655	+ 271	− 404	816	892	1140
2. p	− 298	− 19	+ 132	326	2630	2640
−	+ 98	− 12	− 200	223	104	143
−	+ 89	− 153	− 199	266	194	263
+	− 245	− 349	+ 511	665	2850	2880
+	− 455	+ 199	+ 66	501	1370	1450
+	+ 881	+ 280	− 400	1007	1340	1630
3. p	− 234	− 177	+ 48	298	2400	2410
−	− 77	+ 73	− 78	132	248	270
+	+ 45	+ 98	− 4	108	239	262
+	− 90	+ 165	− 10	188	408	449
4. p	− 653	−1143	+ 206	1332	4280	4480
+	− 135	− 50	− 170	223	179	230
5. p	+ 136	+ 263	− 191	352	1840	1860
+	− 40	− 84	− 973	977	− 205	225
6. p	−1367	− 342	− 33	1410	3820	4080
+	− 60	+ 84	− 138	172	166	195
−	+ 253	+ 562	− 5	617	1450	1580
+	+ 325	+ 113	+ 165	382	1350	1390
7. +	+ 111	+ 88	− 248	286	112	181
+	− 266	+ 272	− 546	666	198	429
8. p	+ 530	− 454	+ 191	724	3220	3290
p	+ 668	+ 507	+ 140	850	3280	3380
−	− 153	− 169	+ 28	230	691	728
+	− 467	− 304	+ 578	803	3330	3380
9. p	−1060	+ 531	− 778	1418	1970	2300
+	+ 247	− 357	+ 365	567	2260	2310
−	+ 707	+ 309	+ 117	780	2120	2260
+	+ 2	− 77	− 198	212	90	118
10. p	− 306	+ 117	− 110	346	2030	2060
+	− 54	− 18	− 336	341	4	57
−	+ 51	− 186	+ 797	820	3920	3930
+	+ 336	− 327	+ 179	502	1650	1720
11. p	− 122	+ 241	− 12	270	2230	2240
+	− 138	− 25	− 275	309	90	167
−	− 688	− 441	+ 15	816	1950	2110
+	+ 220	+ 348	+ 702	814	3670	3700

The number Particle	p_x^*	p_y^*	p_z^*	p^*	p_z	p
12. p	− 410	+ 224	− 417	626	1560	1630
+	− 150	+ 11	+ 309	344	1630	1640
−	− 230	− 343	− 319	522	446	607
+	− 223	− 249	− 540	630	130	359
13. p	− 418	− 907	+ 386	1071	4260	4370
+	− 50	− 64	− 168	186	116	142
+	+ 7	− 248	− 170	301	339	420
−	− 105	+ 439	+ 320	553	2120	2170
−	+ 161	+ 41	+ 227	281	1300	1310
+	+ 423	+ 231	+ 176	513	1670	1740
14. p	− 493	− 527	− 246	762	2170	2290
−	− 270	+ 95	+ 44	290	854	901
+	+ 543	− 73	− 14	548	1270	1380
+	+ 171	− 4	− 3	171	387	423
15. p	+ 348	− 274	+ 451	632	3750	3770
p	− 291	+ 45	+ 634	699	4290	4300
+	+ 111	+ 75	− 142	195	197	238
−	− 509	− 414	− 138	670	1230	1400
16. p	−1196	+ 296	+ 594	1367	5320	5460
+	− 95	+ 134	+ 345	382	1810	1810
−	+ 130	− 367	− 152	418	635	745
+	+ 196	+ 110	− 310	383	161	277
17. p	− 823	− 438	− 770	1209	1600	1850
−	+ 347	− 61	+ 168	390	1380	1420
+	+ 326	+ 3	+ 67	333	1000	1060
+	− 726	− 298	− 045	786	1730	1900
18. +	+ 129	+ 783	+ 431	903	3190	3290
+	− 318	+ 139	+ 508	615	2740	2760
19. p	− 899	− 855	+1627	2046	9290	9370
+	+ 147	+ 76	− 170	237	206	264
20 p	− 652	+1133	+1184	1764	7590	7700
+	+ 66	− 494	−1092	1201	43	501
21. p	− 710	+ 151	− 602	944	1560	1720
p	− 191	− 426	+ 478	668	3860	3890
+	+ 79	+ 180	− 155	250	272	336
+	− 205	− 238	+ 494	585	2630	2650
−	+ 714	− 20	+ 142	728	2070	2190
−	+ 313	+ 353	− 357	592	505	691

	p_x^*	p_y^*	p_z^*	p^*	p_z	p
22. p	+ 30	+ 694	– 170	715	2300	2400
+	+ 76	+ 489	+ 152	517	1620	1690
+	– 42	+ 266	– 62	276	560	620
–	+ 510	–1493	– 69	1579	3490	3830
23. p	+ 63	– 144	+ 337	372	3180	3190
+	+ 298	– 77	– 17	308	737	799
24. p	+ 262	+ 490	+ 19	556	2570	2630
p	+ 698	+ 109	+ 562	902	4420	4470
–	– 406	– 116	+ 14	423	1060	1140
+	– 258	– 213	+ 90	346	1090	1140
25. p	– 149	– 187	+ 265	357	2980	2990
–	+ 159	– 90	– 94	205	336	382
+	+ 491	– 309	+ 554	802	3270	3320
+	– 414	+ 156	+ 112	457	1380	1450
26. p	– 39	+ 399	+ 471	618	3780	3800
p	+ 607	+ 235	– 276	707	2020	2120
+	– 102	+ 188	+ 500	544	2550	2560
–	– 474	– 172	– 508	716	406	647
27. p	+ 434	– 706	– 136	840	2570	2700
+	+ 194	+ 82	+ 77	224	803	830
+	– 430	– 112	+ 28	446	1150	1230
–	+ 316	+ 139	+ 208	402	1500	1540
28. +	+ 137	+ 23	+ 56	150	614	630
–	+ 139	– 316	+ 45	348	978	1037
+	+ 366	+ 63	– 358	516	334	499
+	+ 380	– 229	+ 416	608	2490	2530
29. p	– 204	– 884	– 69	910	2840	2990
+	– 104	– 245	– 323	419	206	337
30. p	+ 709	– 883	– 622	1292	2120	2400
p	– 186	+ 38	– 251	315	1660	1670
+	+ 426	+ 173	+ 224	512	1790	1850
–	– 378	+ 579	+ 573	898	3540	3600
31. p	+ 6	– 428	– 58	432	2240	2280
–	+ 7	– 400	+ 184	440	1530	1580
+	+ 515	– 11	– 246	571	731	894
+	– 247	+ 459	+ 391	652	2520	2570
32. p	–1180	+ 520	– 223	1308	3160	3410
–	+ 461	– 448	– 160	663	1160	1330
+	– 111	– 83	+ 141	198	916	926
+	+ 537	+ 228	+ 150	602	1800	1900

	p_x^*	p_y^*	p_z^*	p^*	p_z	p
33. p	– 170	– 370	+ 10	407	2390	2420
+	+ 71	+ 79	+ 917	923	4460	4460
34. p	+ 81	+ 736	+ 197	766	3290	3380
p	+ 55	+ 129	– 730	744	929	940
35. +	– 354	+ 174	– 38	396	876	951
+	– 389	– 372	– 632	829	351	643
36. +	+ 272	– 162	+ 46	320	923	976
+	+1047	+ 752	– 550	1402	1870	2270
37. p	– 129	– 609	+ 247	670	3280	3340
+	+ 206	+ 12	+ 18	207	622	655
–	+ 559	+ 15	– 345	657	683	883
+	–1296	+ 262	+ 446	1395	4360	4550
38. p	+ 315	– 496	– 95	596	2330	2400
p	– 339	– 113	+ 159	391	2750	2770
+	+ 949	– 64	– 4	952	2210	2400
–	– 788	+ 965	– 166	1257	2500	2790
39. p	–1284	– 385	– 506	1433	2680	2980
p	+ 954	+ 450	– 235	1081	4140	4280
+	– 64	+ 43	+ 107	132	714	718
–	+ 394	– 108	+ 633	754	3360	3390
40. p	+ 2	+ 123	+ 553	566	3920	3920
p	– 832	+ 861	– 457	1281	2520	2790
+	– 66	– 255	+ 224	346	1430	1450
–	+ 279	– 125	+ 232	384	1530	1560
–	+ 309	– 282	– 645	769	181	456
+	+ 307	– 321	+ 93	454	1330	1400
41. p	+ 502	+1120	+ 402	1292	4700	4860
p	– 755	–1140	– 516	1464	2720	3040
+	+ 201	+ 218	– 174	344	420	514
+	+ 268	– 406	+ 211	530	1800	1860
–	–109	+ 15	+ 100	148	721	729
–	– 107	+ 196	– 24	224	551	595
42. p	+ 77	+ 106	– 443	462	1300	1310
–	+ 162	+ 342	+ 128	400	1300	1350
+	– 186	– 35	+ 84	208	790	812
+	– 158	– 301	+ 249	421	1650	1680
–	– 37	– 220	+ 614	652	3080	3090
+	+ 17	– 144	+ 148	207	948	959

	p_x^*	p_y^*	p_z^*	p^*	p_z	p
43. p	- 18	+ 18	- 572	572	1100	1100
p	+ 351	+ 648	+ 689	1009	4910	4970
-	+ 265	- 101	- 316	424	236	369
+	+ 145	+ 184	+ 96	253	911	942
44. p	- 794	+ 1	+ 79	798	3040	3140
p	+ 186	+ 780	- 138	814	2520	2640
-	+ 14	- 89	- 170	192	122	152
+	+ 194	+ 90	- 554	593	15	214
45. p	- 382	+ 8	+ 74	390	2530	2560
+	- 84	- 241	+ 138	293	1090	1120
+	- 574	+ 552	+ 783	1117	4560	4630
-	+ 632	- 168	- 716	970	460	799
46. +	- 126	+ 86	- 17	154	437	463
+	- 69	- 831	- 214	861	1470	1690
47. p	+ 404	+ 372	+1017	1156	5990	6020
p	+ 10	- 433	- 59	437	2240	2280
+	+ 191	+ 95	- 100	236	381	436
-	- 337	- 174	- 635	740	141	405
48. p	- 445	- 569	+ 141	736	3110	3190
+	+ 341	+ 308	- 521	695	326	564
49. p	+ 739	+ 262	+ 20	784	2880	2980
p	- 51	+ 28	+ 101	117	2440	2440
+	+ 228	+ 75	+ 312	394	1750	1770
+	- 574	- 344	+ 213	703	2190	2290
-	- 433	+ 28	- 560	708	258	505
-	+ 250	+ 210	- 72	334	656	733
50. p	- 219	+ 372	- 392	582	1570	1620
p	+ 483	- 50	- 405	632	1600	1670
+	+ 116	+ 117	+ 136	214	932	946
-	- 330	- 424	- 682	868	316	623
51. +	- 182	+ 62	- 114	224	322	375
+	+ 16	- 547	- 171	573	931	1080
-	+ 224	+ 243	+ 262	422	1680	1720
+	- 424	+ 895	+ 372	1058	3400	3540
52. p	+ 155	+ 327	- 469	592	1380	1430
+	+ 49	+ 192	- 509	547	22	199
+	- 331	- 163	+ 255	449	1720	1760
-	+ 613	- 383	+1208	1408	6300	6340

	p_x^*	p_y^*	p_z^*	p^*	p_z	p
53. p	+ 122	+ 157	- 595	627	1110	1130
+	- 242	- 873	- 448	1010	1230	1530
54. p	- 406	-1413	- 870	1708	2310	2740
-	+ 144	+ 64	- 125	201	250	295
+	+ 53	- 74	+ 62	111	568	575
+	- 300	+ 143	+ 521	618	2770	2790
55. p	- 73	+ 616	+1238	1385	6980	7000
+	- 854	- 776	- 649	1324	1440	1840
56. p	+ 495	+ 492	-1007	1225	1030	1240
+	- 604	+ 171	+ 859	1063	4640	4680
57. p	- 76	-1031	+ 466	1134	4570	4680
-	- 147	+ 274	- 53	316	664	733
+	+ 14	+ 414	+ 183	453	1560	1610
+	+ 282	+ 225	- 702	789	85	370
58. p	+ 422	+ 285	+ 274	578	3240	3280
+	- 799	- 588	+ 899	1339	5360	5460
59. p	- 326	-1342	+ 384	1433	4920	5110
p	+ 117	+ 559	- 481	746	1560	1660
+	+ 337	+ 481	+ 186	616	1930	2010
-	- 180	+ 693	+ 66	719	1860	1990
60. p	+ 37	- 432	+ 145	457	2780	2810
+	- 201	- 30	+ 236	312	1380	1400
61. p	- 622	+ 320	+ 358	786	3730	3790
+	+ 12	+ 177	- 131	221	274	327
62. p	- 52	+ 192	+ 303	371	3090	3100
p	+ 45	- 18	- 629	631	1030	1030
-	+ 151	- 172	+ 48	246	774	807
+	+ 594	+ 812	- 19	1006	2300	2510
-	- 129	- 455	+ 266	542	1960	2020
+	- 610	- 359	+ 31	708	1750	1890
63. p	-1063	+ 209	- 472	1181	2300	2540
+	+ 31	- 304	+ 479	568	2550	2570
-	+ 8	+ 41	+ 118	125	734	735
+	+ 485	+ 242	+ 432	693	2720	2770
64. p	- 290	- 563	- 62	637	2460	2540
-	+ 365	- 249	+ 252	509	1850	1900
+	- 125	+ 152	+ 73	210	768	793
+	- 168	+ 52	- 93	199	329	373
-	+ 289	+ 363	- 558	726	303	554
+	- 548	+ 235	- 164	618	1050	1210

	p_x^*	p_y^*	p_z^*	p^*	p_z	p
65. p	- 679	- 508	- 71	857	2750	2880
+	+ 49	- 10	- 187	193	81	95
-	+ 318	- 356	+ 106	488	1440	1520
+	- 79	- 220	+ 450	507	2340	2360
66. p	+ 615	- 616	- 213	897	2460	2610
p	- 542	- 464	- 749	1035	1340	1520
+	+ 350	+ 187	+ 373	545	2240	2270
-	- 151	+ 347	- 33	380	852	932
67. p	+ 359	+ 462	- 72	590	2380	2450
+	- 383	+ 472	- 139	624	1130	1280
-	- 127	+ 147	+ 8	194	469	508
+	+ 129	+ 184	- 89	241	333	402
68. p	- 441	- 78	- 700	831	1135	1220
p	+ 427	+1113	+ 804	1438	5980	6100
+	- 261	- 155	- 608	679	72	312
-	+ 275	- 879	+ 503	1050	3710	3820
69. p	- 311	+ 532	- 155	636	2230	2310
+	- 296	- 64	- 29	304	700	763
+	+ 111	- 39	- 160	198	160	199
-	- 620	- 473	+ 76	783	2030	2170
70. p	- 267	+ 542	- 338	693	1840	1940
+	- 407	+ 293	- 103	512	966	1090
-	+ 190	- 238	+ 140	335	1100	1150
+	+ 496	+ 510	+ 877	1129	4830	4880
71. p	- 799	+ 84	+ 422	908	4130	4210
+	+1511	-1022	+ 7	1824	4240	4610
72. p	+ 33	- 120	- 203	238	1730	1730
-	+ 235	- 120	+ 34	266	780	823
+	+ 120	+ 155	- 283	344	147	245
+	+ 227	+ 383	- 84	453	885	991
73. p	+ 668	- 841	- 515	1191	2210	2450
p	- 380	- 526	- 629	904	1420	1570
+	- 44	+ 291	+ 560	632	2900	2920
-	- 245	+1076	+ 585	1249	4370	4510
74. p	+ 94	+ 220	+ 224	328	2860	2870
p	+ 429	- 203	+ 848	973	5250	5280
75. p	- 26	- 191	- 356	405	1470	1480
+	-1504	- 335	+ 327	1575	4470	4730

	p_x^*	p_y^*	p_z^*	p^*	p_z	p
76. p	+1053	- 145	- 121	1070	2980	3170
p	- 515	+ 648	- 419	928	1990	2160
-	- 265	- 309	+1174	1242	5830	5850
+	- 273	- 194	- 634	717	90	346
77. p	- 524	+ 889	+ 17	1032	3260	3420
+	- 353	- 802	- 748	1152	798	1180
78. p	+ 578	- 658	+ 307	928	3820	3920
+	- 188	- 474	+ 683	852	3710	3740
79. p	+ 379	- 927	- 354	1062	2380	2580
p	- 403	+ 181	+ 75	449	2590	2630
+	+ 203	- 82	+ 142	261	1040	1060
-	- 404	+ 252	+ 138	496	1540	1610
+	+ 249	+ 46	- 391	466	140	290
-	+ 192	+ 347	- 54	400	843	932
80. p	+ 226	+ 49	+ 472	526	3670	3680
+	- 92	- 370	+ 152	410	1380	1440
+	+ 48	+ 6	- 957	958	- 171	178
-	+ 285	+ 324	- 504	664	297	523
81. p	+ 80	+ 121	+ 404	429	3400	3404
-	+ 121	+ 174	- 123	245	341	401
+	- 111	- 145	- 89	203	345	390
+	+ 238	+ 67	- 502	560	71	257
+	+ 293	+ 104	+ 185	362	1360	1400
-	-1037	+ 87	+ 265	1073	3160	3330
82. p	+ 864	+ 328	- 378	998	2210	2400
+	- 513	-1211	+1088	1707	6690	6820
83. p	- 406	+ 452	+ 93	614	2820	2890
p	- 230	- 417	+ 548	726	4120	4140
+	+ 339	- 674	- 176	773	1370	1560
-	- 104	+ 494	- 49	507	1090	1200
84. +	+ 31	+ 407	- 75	415	822	918
+	- 363	+ 304	+1429	1505	7080	7100
85. p	+ 584	- 387	+ 510	867	4230	4290
p	- 779	+ 177	- 326	863	2120	2270
+	+ 745	+ 675	- 380	1075	1540	1840
-	- 348	- 241	+ 475	637	2700	2730
86. p	- 484	- 118	+ 627	801	4420	4450
-	- 164	- 143	+ 45	222	720	752
+	+ 459	+1387	+ 105	1465	3658	3940
+	+ 63	- 128	- 63	+ 156	316	347

	p_x^*	p_y^*	p_z^*	p^*	p_z	p
87. p	+ 438	+ 372	− 294	646	1890	1980
+	− 7	+ 275	− 327	428	216	350
−	− 23	+ 270	+ 84	283	940	978
+	+ 98	− 476	+ 123	502	1510	1590
88. +	+ 611	+ 185	−1022	1205	231	679
+	− 499	+ 462	+ 674	957	3930	3990
89. p	− 239	− 718	−1028	1277	1070	1310
+	+ 113	+ 6	+ 457	471	2280	2290
+	− 6	+ 363	+ 171	402	1410	1460
−	− 82	+ 292	+ 54	308	919	967
90. p	− 7	+ 277	− 207	346	1790	1812
p	− 295	− 63	+ 72	311	2460	2480
+	+ 255	+ 155	− 240	383	338	451
−	+ 467	− 189	− 544	741	372	626
−	− 274	− 229	+ 702	788	3600	3630
+	+ 244	+ 137	+ 51	284	862	906
91. p	− 288	+ 582	− 244	694	2080	2180
+	+ 80	+ 117	− 104	176	258	294
−	+ 426	+ 406	+ 208	624	2000	2080
+	+ 199	− 903	− 669	1141	988	1350
92. p	+ 782	− 68	+ 192	808	3340	3430
p	− 280	− 74	− 226	367	1770	1790
+	+ 19	− 17	+ 278	279	1420	1420
−	−1217	+ 257	+ 272	1274	3640	3850
93. p	+ 130	− 41	+ 340	366	3180	3180
+	+ 260	− 139	+ 333	444	1910	1940
94. p	+ 439	− 328	+ 299	624	3360	3400
p	− 89	+ 439	− 235	506	1870	1920
95. p	+ 922	+ 120	+1045	1399	6520	6580
+	+ 30	− 6	+ 189	191	1020	1020
−	− 554	+ 469	− 674	990	612	949
+	− 165	− 312	+ 44	356	929	993
96. p	− 544	− 430	+ 493	851	4160	4220
p	+ 108	− 437	− 684	819	1160	1240
−	− 315	− 491	+ 42	584	1490	1600
+	+ 541	+ 811	− 11	975	2240	2450
97. p	− 294	+ 89	+ 530	612	3920	3930
p	+ 106	− 119	− 489	514	1240	1250
+	− 124	− 248	+ 324	426	1850	1870
−	+ 908	− 189	− 767	1204	870	1270

	p_x^*	p_y^*	p_z^*	p^*	p_z	p
98. p	− 426	− 790	− 594	1077	1800	2010
−	− 33	+ 326	− 76	336	649	727
+	+ 457	+ 64	+ 575	737	3180	3210
+	− 225	+ 35	+ 148	272	1080	1100
99. p	− 413	− 264	+ 468	678	3850	3880
+	− 186	+ 11	+ 475	511	2420	2430
−	+ 154	+ 311	+ 123	368	1220	1270
+	− 120	− 972	− 447	1076	1380	1690
100. p	+ 219	− 426	− 443	652	1530	1600
−	+ 92	− 550	+ 202	593	1880	1960
+	− 52	+1246	− 439	1323	1950	2310
+	+ 17	+ 312	− 48	316	602	678
101. p	− 51	− 574	+ 716	919	4830	4860
p	+ 935	+ 362	− 431	1091	2240	2450
−	− 136	− 191	+ 594	638	3000	3010
+	− 673	+ 282	− 824	1100	487	877
102. p	− 305	− 715	+ 0	778	2820	2920
+	+ 127	− 461	− 22	479	1100	1200
+	+ 40	− 8	− 30	51	268	271
−	+ 982	+ 518	+ 383	1175	3690	3860
103. p	+ 435	− 70	− 664	797	1180	1260
+	− 32	+ 199	− 21	203	515	553
−	− 0	+ 180	+ 52	187	671	695
+	− 511	− 113	− 315	611	654	838
104. p	− 178	+ 78	+ 675	703	4400	4410
+	+ 120	+ 627	− 313	711	886	1090
105. p	− 73	+ 196	+ 306	371	3100	3110
−	+ 524	− 2	+ 2	524	1260	1360
+	+ 195	+ 148	− 99	264	441	504
+	− 108	+ 63	+ 196	232	1120	1130
−	− 960	− 141	+ 152	982	2670	2840
+	− 206	− 283	− 188	397	499	609
106. p	− 467	+ 121	− 70	487	2270	2320
p	− 450	+ 584	+ 315	802	3640	3720
+	− 272	+ 168	+ 125	343	1170	1210
−	+1372	− 784	− 624	1699	2360	2840
107. p	− 236	+ 47	− 425	488	1380	1400
+	− 119	− 189	+ 94	242	882	910
+	− 51	+ 312	− 52	320	677	747
−	+ 36	+ 687	+ 514	859	3300	3370

	p_x^*	p_y^*	p_z^*	p^*	p_z	p
108. p	+ 340	+ 87	- 136	377	1990	2020
p	+ 532	+ 269	+ 348	690	3560	3610
+	- 210	+ 552	- 814	1006	296	660
-	- 558	- 574	- 9	801	1850	2020
109. p	+ 388	- 139	- 590	720	1250	1310
p	+ 60	- 768	+ 322	835	3710	3790
+	- 153	- 112	- 297	353	128	229
-	- 9	+ 371	- 48	374	800	882
-	- 301	+ 262	- 289	493	455	605
+	+ 15	+ 386	+ 903	982	4560	4580
110. p	+ 115	- 936	- 60	945	2920	3070
-	+ 100	+ 319	- 112	353	595	682
+	+ 449	- 794	- 57	914	1990	2190
+	- 252	+ 407	+ 23	480	1210	1300
111. p	- 170	+ 92	- 627	657	1070	1090
-	+ 67	- 88	+ 74	133	631	641
+	+ 188	- 119	- 320	390	153	270
+	+ 980	- 109	- 289	1028	1670	1940
112. p	+ 580	- 598	+ 269	875	3640	3730
+	- 112	- 113	+ 199	255	1170	1180
+	+ 130	+ 137	- 282	340	140	235
-	- 536	- 188	- 498	755	520	770
113. p	- 702	+ 235	- 243	779	2210	2330
+	- 311	+ 322	- 311	545	517	684
-	+ 226	- 73	- 37	240	548	597
+	- 266	- 42	- 9	269	598	656
-	+ 454	+ 136	+ 147	496	1510	1590
+	+ 585	+ 169	- 12	609	1380	1500
114. p	- 87	+ 440	+ 61	453	2560	2600
+	+ 205	+ 130	+ 217	326	1360	1380
-	- 248	- 201	+ 73	327	1000	1060
+	+ 164	- 808	- 134	835	1620	1810
115. p	+ 643	+ 80	- 386	754	1810	1920
+	+ 343	+ 41	- 994	1052	- 49	349
116. p	- 462	-1287	- 353	1413	3030	3320
+	- 93	- 190	+ 190	285	1210	1230
117. p	+ 133	+ 564	+ 604	837	4420	4460
p	+ 333	+ 284	+ 607	748	4300	4320
+	- 46	- 133	+ 24	142	522	541
-	+ 399	+ 36	- 38	402	887	973
118. p	+ 442	- 31	- 641	779	1210	1290

	p_x^*	p_y^*	p_z^*	p^*	p_z	p
119. p	+ 197	- 870	+ 286	937	3780	3880
+	+ 291	- 96	+ 187	359	1360	1390
-	- 6	+ 293	+ 738	794	3720	3730
+	- 599	+ 186	- 883	1083	299	695
120. p	- 315	+ 392	- 339	607	1730	1800
p	+ 701	- 696	- 84	991	2940	3100
+	- 327	+ 837	- 23	899	2040	2230
-	+ 52	- 260	+ 17	266	735	781
121. p	+ 149	- 294	+ 393	513	3460	3470
p	+ 352	+ 393	+ 106	538	2770	2820
-	- 201	+ 94	+ 8	222	625	663
+	+ 238	- 248	- 929	990	- 28	345
122. p	- 161	- 693	- 38	713	2620	2720
+	+ 275	+ 256	- 74	383	753	842
123. p	- 18	- 94	+ 241	260	2860	2860
+	- 961	+ 782	+ 260	1265	3590	3800
124. p	- 695	+ 370	- 316	848	2130	2270
-	+ 30	+ 67	- 38	83	278	289
+	- 345	- 85	+ 89	369	1130	1190
+	- 747	+ 188	+ 289	814	2650	2760
125. p	+ 941	- 829	- 389	1312	2750	3020
+	- 94	+ 106	+ 400	424	2040	2050
126. +	+ 570	- 390	- 348	774	938	1165
+	- 677	+ 537	+ 881	1234	5080	5150
127. p	- 167	- 349	- 45	389	2230	2270
p	- 1	+ 180	+ 47	186	2330	2340
+	- 97	+ 158	+ 134	229	955	973
-	- 572	+ 279	+ 182	662	2020	2120
128. p	- 844	+ 506	+ 214	1007	3720	3840
p	- 456	+ 633	+ 678	1034	4930	4990
129. p	- 53	+ 124	- 30	138	2120	2120
p	+ 143	+ 154	+ 203	292	2780	2790
-	+ 686	- 545	+ 494	998	3570	3670
+	- 779	+ 411	- 785	1180	767	1170
130. p	- 60	+ 45	- 103	127	1930	1930
p	- 498	+ 357	- 87	619	2380	2460
+	- 459	- 13	- 86	467	910	1020
-	- 60	- 215	+ 523	569	2670	2680
+	+ 528	+ 79	+ 95	543	1530	1620

	p_x^*	p_y^*	p_z^*	p^*	p_z	p		p_x^*	p_y^*	p_z^*	p^*	p_z	p
131. +	- 6	-1316	+ 389	1372	4160	4360	143. +	+ 0	- 149	+ 187	239	1110	1120
+	- 28	+ 154	- 459	485	11	157	+	+ 295	- 61	- 571	646	89	314
132. p	- 968	- 364	+ 240	1061	3870	4010	144. p	+ 590	- 587	+ 854	1193	5650	5710
+	+ 330	- 260	+ 71	427	1210	1280	+	+ 28	+ 62	- 55	88	242	251
133. p	+ 301	+ 938	+ 152	996	3540	3670	+	+ 434	+ 583	- 15	728	1670	1820
-	- 101	- 69	+ 78	145	1300	1310	-	+ 177	+ 298	- 205	403	469	583
+	+ 106	- 508	- 371	637	573	773	145. p	+ 466	- 123	- 168	511	2040	2100
+	- 74	- 523	+ 696	874	3790	3830	p	- 392	- 438	- 378	699	1750	1850
134. p	+ 474	+ 211	+ 128	535	2820	2870	+	+ 183	+ 400	- 63	444	913	1010
+	- 116	+ 117	+ 190	252	1130	1140	+	+ 274	- 69	+ 506	580	2650	2660
135. p	- 500	+ 116	+ 671	843	4600	4630	-	- 273	- 100	- 233	372	333	442
+	- 185	- 447	+ 356	600	2320	2370	-	- 258	+ 206	+ 601	686	3130	3140
136. p	- 318	- 265	- 614	740	1220	1280	146. p	- 168	+ 493	- 407	661	1630	1710
-	- 362	+ 431	+ 176	589	1840	1920	+	+ 132	+ 421	+ 186	478	1620	1680
+	- 326	- 755	- 5	822	1910	2080	-	+ 548	- 262	- 64	611	1280	1420
+	- 179	+ 135	+ 96	244	890	918	+	- 758	- 337	- 651	1055	817	1165
137. p	+ 244	+ 57	- 904	938	793	832	147. p	- 199	+ 501	+ 291	612	3320	3360
p	- 246	+ 161	+ 651	714	4360	4370	+	- 243	-1040	-1430	1785	536	1200
+	+ 311	+ 191	- 192	412	521	636	148. p	-1271	+ 219	+ 206	1306	4230	4420
-	- 914	- 548	+ 178	1080	2960	3150	+	- 243	- 253	+ 618	710	3220	3240
138. -	+ 180	+ 124	+ 32	221	684	718	149. p	+ 774	+ 140	+ 13	786	2860	2970
+	- 273	- 55	- 674	730	19	279	p	- 923	+ 805	+ 234	1247	4190	4370
+	+ 59	+ 241	- 117	274	418	486	+	+ 636	+ 105	- 125	656	1230	1390
+	+ 84	- 70	+ 35	115	513	525	-	- 184	- 668	+ 99	700	1890	2020
139. p	- 447	- 347	- 274	629	1920	2000	150. p	- 376	+ 122	+ 404	566	3550	3570
+	- 100	+ 176	+ 805	830	3970	3970	-	+ 171	+ 141	+ 147	266	1060	1080
-	+ 268	- 233	- 238	427	441	566	+	+1120	- 225	+ 361	1198	3690	3860
+	+ 185	- 371	- 158	444	678	794	+	- 211	- 565	- 390	718	711	932
140. p	- 631	- 458	+ 672	1029	4910	4970	151. p	- 544	- 430	+ 493	851	4160	4220
p	- 116	- 180	+ 23	215	2280	2290	p	+ 108	- 437	- 684	819	1160	1240
+	+ 81	- 141	+ 338	375	1770	1780	-	- 315	- 491	+ 42	584	1490	1600
-	+ 436	+ 445	+ 193	652	2030	2120	+	+ 541	+ 811	- 11	975	2250	2450
141. p	+ 883	- 906	+ 458	1345	4940	5100	152. p	+ 196	- 225	+ 97	313	2530	2550
p	+ 271	+ 605	-1117	1299	889	1110	+	- 82	+ 198	- 23	216	535	576
+	- 18	+ 64	+ 49	83	499	503	+	+ 108	+ 531	+ 672	863	3710	3750
-	-1136	+ 237	+ 610	1311	4580	4720	-	- 630	- 290	-1032	1242	289	750
142. p	- 334	+ 377	+ 163	529	2900	2940	153. p	- 862	- 708	- 156	1126	2990	3190
p	+ 375	- 740	- 758	1123	1470	1690	-	+ 106	+ 120	+ 255	301	1410	1420
+	+ 182	+ 31	+ 138	230	968	985	+	+ 47	+ 534	- 568	781	403	671
-	+ 81	- 52	+ 258	275	1360	1365	+	+ 512	+ 79	+ 162	543	1700	1780

		p_x^*	p_y^*	p_z^*	p^*	p_z	p
154.	p	+ 680	+ 79	+ 134	698	3040	3110
	p	– 843	– 87	+ 39	849	3020	3130
	–	– 311	– 283	– 392	575	381	568
	+	– 281	+ 401	+ 91	498	1420	1500
155.	+	+ 337	+ 95	– 166	387	533	638
	+	– 542	– 253	– 329	683	777	980
156.	p	– 515	– 399	+ 878	1093	5530	5570
	+	+ 153	– 238	– 49	287	617	679
	–	– 394	+ 390	– 252	609	809	980
	+	+ 128	– 8	+ 517	533	2570	2580
157.	p	– 23	+1331	– 515	1428	2650	2960
	+	+ 159	+ 49	+ 13	167	536	561
	–	– 298	+ 389	+ 71	496	1370	1450
	+	+ 364	– 551	+ 254	707	2300	2400
158.	p	– 504	– 579	+ 25	768	2860	2960
	+	+ 197	+ 569	+ 68	606	1610	1720
159.	p	– 881	– 288	+ 107	933	3330	3450
	+	+ 145	+ 375	+ 41	404	1090	1160
	–	+1027	+ 271	– 22	1062	2420	2640
	+	– 392	– 710	+ 186	832	2420	2550
160.	p	+ 786	– 392	– 694	1119	1630	1850
	+	+ 116	+ 124	+ 46	176	635	657
	–	+ 152	+ 9	+ 94	179	762	777
	+	– 45	+ 174	+ 961	978	4690	4700
161.	p	+ 641	– 190	– 109	677	2400	2490
	p	–1011	– 624	+ 935	1512	6460	6560
	+	+ 199	+ 201	– 192	342	369	465
	–	– 45	+ 40	– 760	762	– 123	137
162.	p	– 79	– 412	+ 691	808	4600	4620
	–	+ 180	+ 197	+ 250	365	1530	1550
	+	+ 120	– 32	– 360	379	32	128
	+	– 888	– 318	– 672	1158	1000	1370
163.	p	– 44	+ 502	– 597	781	1320	1410
	+	+1176	–1316	+ 327	1794	4970	5280
164.	p	+ 742	+ 366	– 73	831	2710	2830
	+	– 317	– 289	– 416	597	370	566
	–	+ 295	+ 36	+ 829	881	4140	4150
	+	– 618	– 140	+ 25	634	1560	1680
165.	p	+ 510	– 176	+ 389	665	3640	3680
	–	+ 51	– 38	+ 202	212	1100	1100
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

		p_x^*	p_y^*	p_z^*	p^*	p_z	p
166.	p	+ 658	+ 800	+ 748	1278	5540	5640
	p	– 661	– 0	– 646	925	1420	1560
	+	+ 227	+ 21	+ 304	380	1700	1710
	–	+ 265	– 262	– 510	631	210	428
167.	p	+ 217	– 81	– 375	441	1450	1470
	+	– 219	+ 74	– 138	270	354	424
	–	– 572	– 645	+ 214	888	2613	2751
	+	– 431	+ 419	+ 437	743	2840	2910
168.	p	+ 7	+ 340	+ 498	603	3830	3850
	+	– 215	– 32	– 30	219	525	568
	+	– 242	– 152	+ 123	311	1100	1130
	–	– 536	+ 800	– 380	1035	1450	1740
169.	p	+ 408	– 373	– 680	876	1250	1370
	+	+ 75	+ 58	– 18	96	347	360
	+	– 510	+ 362	+ 511	807	3180	3240
	–	+ 516	+ 189	– 802	972	249	603
170.	p	– 300	+ 868	– 305	967	2340	2520
	–	– 132	+ 240	– 35	276	626	684
	+	+ 129	– 674	– 53	689	1490	1640
	+	+ 845	– 238	+ 606	1066	4000	4100
171.	p	–1111	–1445	– 339	1854	3950	4350
	p	+ 469	+ 477	+ 12	669	2690	2770
	–	+ 51	– 57	+ 24	80	432	439
	+	+ 351	+ 281	+ 257	518	1885	1940
172.	p	+ 76	– 176	– 389	434	1410	1420
	+	– 8	– 369	– 214	427	497	620
	+	– 661	– 369	+ 246	796	2460	2570
	–	+ 207	+ 495	+ 96	540	1530	1620
173.	p	– 892	+ 310	– 272	982	2450	2630
	–	+ 203	+ 208	– 84	303	559	630
	+	– 43	+ 303	– 103	323	553	632
	+	+ 861	– 243	– 53	896	1960	2150
174.	p	+ 502	+ 618	– 609	1002	1640	1820
	–	– 11	+ 39	+ 258	261	1330	1330
	+	– 292	– 383	– 169	510	796	930
	+	– 68	– 553	+ 125	571	1670	1760
175.	p	+ 520	+ 21	+ 223	567	3090	3140
	+	+ 457	– 109	– 52	474	1010	1110
	–	+ 36	– 174	+ 74	192	735	756
	+	– 591	– 233	– 8	636	1480	1610

		p_x^*	p_y^*	p_z^*	p^*	p_z	p
176.	p	− 42	+ 159	− 407	438	1370	1380
	+	− 567	− 846	+ 951	1393	5620	5713
177.	p	+ 74	+ 266	+1152	1185	6390	6390
	+	+ 115	+ 369	− 678	781	126	406
178.	p	− 519	+ 434	+ 257	723	3380	3450
	p	+ 478	+ 342	− 237	634	2020	2100
	−	− 424	− 17	+ 204	471	1650	1700
	+	− 105	+ 55	+ 130	176	846	854
	−	− 219	− 166	− 559	623	68	283
	+	+ 788	− 648	+ 204	1040	2940	3110
179.	+	− 92	− 84	− 34	129	353	374
	−	+ 12	+ 559	+ 73	564	1520	1620
	+	− 243	+ 122	− 564	626	62	279
	+	− 63	− 0	+ 626	629	3060	3060
180.	p	− 331	+ 536	+ 568	849	4350	4390
	+	− 72	+ 87	− 154	191	160	196
	−	+ 189	+ 595	− 577	850	536	823
	+	− 334	− 889	+ 98	955	2470	2650
181.	p	+1081	+ 58	+ 477	1183	4690	4810
	p	+ 101	− 418	+ 347	553	3390	3410
	+	+ 113	+ 271	− 661	724	39	296
	−	− 363	− 129	− 51	389	824	910
182.	p	+ 541	+ 326	+ 226	671	3230	3290
	−	− 201	− 142	+ 60	253	818	854
	+	+ 41	− 135	− 95	170	271	306
	+	− 135	+ 380	− 11	404	957	1040
183.	p	−1133	+ 644	+ 54	1305	3840	4060
	+	− 99	+ 228	− 206	323	294	385
	−	+ 775	+ 358	+ 105	860	2280	2430
	+	+ 18	− 420	− 296	514	485	642
184.	p	+ 918	+ 179	+ 189	954	3570	3690
	+	− 388	+ 211	− 15	442	1030	1120
185.	p	+ 294	+ 253	− 129	409	2040	2080
	+	+ 83	+ 18	− 344	354	14	86
	+	− 541	− 8	+ 178	570	1800	1880
	+	− 248	− 146	− 240	375	322	432
	−	+ 160	− 83	+ 44	185	649	674
	−	+ 514	− 267	+ 142	596	1770	1860
	+						
186.	p	+ 493	+ 881	− 288	1050	2530	2720
	−	− 94	− 280	+ 22	297	813	865
	+	− 538	+ 5	+ 398	669	2580	2630
	+	− 76	+ 330	+ 410	532	2300	2320
187.	p	+ 179	− 12	− 150	234	1860	1870
	−	+ 77	− 140	+ 121	200	867	882
	+	− 64	+ 124	− 302	333	74	158
	+	−1098	− 23	+ 494	1204	4040	4180
188.	p	− 286	+ 151	− 276	425	1690	1720
	+	− 202	+ 50	+ 196	286	1230	1250
	+	− 30	− 100	+ 764	771	3730	3730
	−	+ 159	+ 793	− 604	1009	833	1160
189.	+	+ 140	− 90	+ 224	279	1280	1290
	+	− 412	+ 836	− 754	1199	888	1290
190.	+	+ 14	− 0	− 5	14	311	311
	+	+ 865	− 101	− 309	924	1380	1630
191.	p	+ 406	+ 57	− 291	503	1730	1780
	+	+ 39	+ 10	+ 210	214	1120	1120
	+	+ 152	+ 273	+ 204	373	1430	1470
	−	− 12	− 653	− 413	773	774	1010
192.	p	+ 658	− 700	− 395	1038	2240	2440
	p	−1487	+ 199	+ 682	1648	6090	6280
193.	p	+ 338	+ 43	− 95	354	2080	2110
	p	+ 548	− 281	+ 689	924	4770	4810
	+	+ 198	+ 240	+ 162	351	1280	1320
	−	− 108	+ 258	+ 346	445	1930	1950
	+	− 502	− 259	− 782	964	281	631
	−	− 474	− 1	− 321	572	554	729
194.	p	+ 230	+ 470	+ 744	909	4890	4920
	−	+ 75	− 325	− 33	335	754	824
	+	+ 497	− 206	− 64	541	1130	1250
	+	− 683	+ 628	+ 230	956	2810	2960
195.	p	+ 842	+ 372	− 458	1028	2060	2260
	p	− 340	− 548	+ 254	693	3330	3390
	+	− 56	− 50	+ 48	89	504	510
	+	− 114	+ 116	− 88	185	314	354
	−	+ 390	+ 32	− 545	672	213	446
	−	− 722	+ 77	+ 789	1072	4480	4540
196.	p	+ 96	+ 100	− 31	142	2110	2120
	p	− 13	+ 932	− 897	1293	1430	1710
	+	− 30	+ 335	+ 27	338	912	972
	−	− 139	− 952	+ 952	1354	5530	5620

		p_x^*	p_y^*	p_z^*	p^*	p_z	p
197.	p	- 474	+ 757	+ 100	899	3250	3370
	p	- 592	- 446	-1172	1387	919	1180
	-	+ 539	- 18	+ 976	1115	5050	5080
	+	+ 527	- 293	+ 96	610	1680	1790
198.	p	- 202	+ 506	- 752	929	1160	1280
	p	+ 1	- 248	+ 545	599	3940	3950
	-	- 243	- 141	- 5	281	712	765
	+	+ 572	+ 420	+ 226	745	2320	2420
199.	p	+ 107	- 336	- 173	392	1915	1950
	p	- 230	+ 374	+1277	1350	7000	7020
	+	- 10	- 191	- 366	413	85	209
	-	- 64	+ 35	- 834	838	- 139	157

		p_x^*	p_y^*	p_z^*	p^*	p_z	p
200.	p	- 348	+ 272	- 371	577	1610	1670
	-	+ 187	+ 59	- 237	308	183	268
	+	+ 307	- 667	- 277	785	1140	1360
	+	- 490	- 500	+ 485	852	3200	3280
201.	p	- 702	- 174	- 117	733	2460	2560
	+	- 196	- 46	- 193	279	235	309
	+	+ 78	- 56	- 179	203	120	154
	-	- 69	- 171	+ 177	255	1120	1130

Appendix

TABLE I

Efficiency of Sampling

Reaction	n	ν	Efficiency	Reaction	n	ν	Efficiency
$N'N\pi$	3	–	30 ± 15	$\tilde{N}3N$	4	2	10 ± 9
$N'N'\pi$	3	–	30 ± 14	$N'N3\pi$	5	3	10 ± 2
$NN\pi$	3	–	40 ± 30	$N'N'3\pi$	5	3	10 ± 3
$N'N2\pi$	4	2	10 ± 2	$NN3\pi$	5	3	15 ± 5
$N'N'2\pi$	4	2	10 ± 2	$N'N'4\pi$	6	3	5 ± 3
$NN2\pi$	4	2	10 ± 3	$NN4\pi$	6	3	10 ± 6
$\tilde{N}'3N$	4	2	25 ± 17	$N'N4\pi$	6	4	6 ± 2

($\vec{p}_1, \ldots, \vec{p}_{n-\nu}$ – were chosen using the rejection technique
$\vec{p}_{n-\nu+1}, \ldots, \vec{p}_{n-1}$ – using the direct method)

TABLE 2

the number	Reactions taken into account			
	Products of the reaction	Statistical weight	Statistical weight normalized to 100	Number of events in the table
1	$N'N2\pi$	15,17	19,19	38
2	$N'N3\pi$	13,92	17,61	35
3	$N'N'2\pi$	11,70	14,80	30
4	$N'N'3\pi$	9,28	11,74	24
5	$NN3\pi$	6,21	7,86	15
6	$NN2\pi$	5,25	6,64	14
7	$N'N4\pi$	4,43	5,60	11
8	$N'N'\pi$	3,53	4,46	9
9	$N'N\pi$	3,15	3,98	8
10	$N'N'4\pi$	2,09	2,64	5
11	$NN4\pi$	2,04	2,58	5
12	$NN\pi$	1,00	1,26	3
13	$\tilde{N}'3N$	0,80	1,01	2
14	$\tilde{N}3N$	0,49	0,62	2
TOTAL:		79,06	100	201

Rejected reaction

number		weight	number		weight
15	$N'N5\pi$	0,54	20	$N'\tilde{N}2N$	0,27
16	$N'N'5\pi$	0,49	21	$\tilde{N}3N\pi$	0,20
17	$NN5\pi$	0,47	22	$\tilde{N}'3N\pi$	0,18
18	$\tilde{N}'N'2N$	0,36	23	$N'\tilde{N}2N\pi$	0,06
19	$\tilde{N}N2N'$	0,36		и т.д.	

TABLE 3

<u>Coefficients</u> $c_k^{(1)}$

T	t \ T_k=	0	1	1	1	2	2	2	2	2	3	3	3	3	3	3	3
	t_k=	0	-1	0	1	-2	-1	0	1	2	-3	-2	-1	0	1	2	3
0	0		$\frac{1^+}{3}$	$\frac{1}{3}$	$\frac{1^-}{3}$												
1	-1	1^-	$\frac{1}{2}$	$\frac{1^-}{2}$		$\frac{3^+}{5}$	$\frac{3}{10}$	$\frac{1^-}{10}$									
1	0	1	$\frac{1^+}{2}$		$\frac{1^-}{2}$		$\frac{3^+}{10}$	$\frac{2}{5}$	$\frac{3^-}{10}$								
1	1	1^+		$\frac{1^+}{2}$	$\frac{1}{2}$			$\frac{1^+}{10}$	$\frac{3}{10}$	$\frac{3^-}{5}$							
2	-2		1^-			$\frac{2}{3}$	$\frac{1^-}{3}$				$\frac{5^+}{7}$	$\frac{5}{21}$	$\frac{1^-}{21}$				
2	-1		$\frac{1}{2}$	$\frac{1^-}{2}$		$\frac{1^+}{3}$	$\frac{1}{6}$	$\frac{1^-}{2}$				$\frac{10^+}{21}$	$\frac{8}{21}$	$\frac{1^-}{7}$			
2	0		$\frac{1^+}{6}$	$\frac{2}{3}$	$\frac{1^-}{6}$		$\frac{1^+}{2}$		$\frac{1^-}{2}$				$\frac{2^+}{7}$	$\frac{3}{7}$	$\frac{2^-}{7}$		
2	1			$\frac{1^+}{2}$	$\frac{1}{2}$			$\frac{1^+}{2}$	$\frac{1}{6}$	$\frac{1^-}{3}$				$\frac{1^+}{7}$	$\frac{8}{21}$	$\frac{10^-}{21}$	
2	2				1^+				$\frac{1^+}{3}$	$\frac{2}{3}$					$\frac{1^+}{21}$	$\frac{5}{21}$	$\frac{5^-}{7}$

T	t \ T_k=	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4
	t_k=	-2	-1	0	1	2	-3	-2	-1	0	1	2	3	-4	-3	-2	-1	0	1	2	3	4
3	-3	1^-					$\frac{3}{4}$	$\frac{1^-}{4}$						$\frac{7^+}{9}$	$\frac{7}{36}$	$\frac{1^-}{36}$						
3	-2	$\frac{1}{3}$	$\frac{2^-}{3}$				$\frac{1^+}{4}$	$\frac{1}{3}$	$\frac{5^-}{12}$						$\frac{7^+}{12}$	$\frac{1}{3}$	$\frac{1^-}{12}$					
3	-1	$\frac{1^+}{15}$	$\frac{8}{15}$	$\frac{2^-}{5}$				$\frac{5^+}{12}$	$\frac{1}{12}$	$\frac{1^-}{2}$						$\frac{5^+}{12}$	$\frac{5}{12}$	$\frac{1^-}{6}$				
3	0		$\frac{1^+}{5}$	$\frac{3}{5}$	$\frac{1^-}{5}$				$\frac{1^+}{2}$		$\frac{1^-}{2}$						$\frac{5^+}{18}$	$\frac{4}{9}$	$\frac{5^-}{18}$			
3	1			$\frac{2^+}{5}$	$\frac{8}{15}$	$\frac{1^-}{15}$				$\frac{1^+}{2}$	$\frac{1}{12}$	$\frac{5^-}{12}$						$\frac{1^+}{6}$	$\frac{5}{12}$	$\frac{5^-}{12}$		
3	2				$\frac{2^+}{3}$	$\frac{1}{3}$					$\frac{5^+}{12}$	$\frac{1}{3}$	$\frac{1^-}{4}$						$\frac{1^+}{12}$	$\frac{1}{5}$	$\frac{7^-}{12}$	
3	3					1^+						$\frac{1^+}{4}$	$\frac{3}{4}$							$\frac{1^+}{36}$	$\frac{7}{36}$	$\frac{7^-}{9}$

Notations
(taking as an example the 1 line)

$$(0,0) = \frac{1}{3}(1,-1;\ \pi^+) + \frac{1}{3}(1,0;\ \pi^\circ) + \frac{1}{3}(1,1;\ \pi^-).$$

TABLE 3

(continuation)

T	t \ T_K	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5
	t_K	-3	-2	-1	0	1	2	3	-4	-3	-2	-1	0	1	2	3	4	-5	-4	-3	-2	-1	0	1	2	3	4	5
4	-4	1^-							$\frac{4}{5}$	$\frac{1^-}{5}$								$\frac{9^+}{11}$	$\frac{9}{55}$	$\frac{1^-}{55}$								
4	-3	$\frac{1}{4}$	$\frac{3^-}{4}$						$\frac{1^+}{5}$	$\frac{9}{20}$	$\frac{7^-}{20}$								$\frac{36^+}{55}$	$\frac{16}{55}$	$\frac{3^-}{55}$							
4	-2	$\frac{1^+}{28}$	$\frac{3}{7}$	$\frac{15^-}{28}$						$\frac{7^+}{20}$	$\frac{1}{5}$	$\frac{9^-}{20}$								$\frac{28^+}{55}$	$\frac{21}{55}$	$\frac{6^-}{55}$						
4	-1		$\frac{3^+}{28}$	$\frac{15}{28}$	$\frac{5^-}{14}$						$\frac{9^+}{20}$	$\frac{1}{20}$	$\frac{1^-}{2}$								$\frac{21^+}{55}$	$\frac{24}{55}$	$\frac{2^-}{11}$					
4	0			$\frac{3^+}{14}$	$\frac{4}{7}$	$\frac{3^-}{14}$						$\frac{1^+}{2}$		$\frac{1^-}{2}$								$\frac{3^+}{11}$	$\frac{5}{11}$	$\frac{3^-}{11}$				
4	1				$\frac{5^+}{14}$	$\frac{15}{28}$	$\frac{3^-}{28}$						$\frac{1^+}{2}$	$\frac{1}{20}$	$\frac{9^-}{20}$								$\frac{2^+}{11}$	$\frac{24}{55}$	$\frac{21^-}{55}$			
4	2					$\frac{15^+}{28}$	$\frac{3}{7}$	$\frac{1^-}{28}$						$\frac{9^+}{20}$	$\frac{1}{5}$	$\frac{7^-}{20}$								$\frac{6^+}{55}$	$\frac{21}{55}$	$\frac{28^-}{55}$		
4	3						$\frac{3^+}{4}$	$\frac{1}{4}$							$\frac{7^+}{20}$	$\frac{9}{20}$	$\frac{1^-}{5}$								$\frac{3^+}{55}$	$\frac{16}{55}$	$\frac{36^-}{55}$	
4	4							1^+								$\frac{1^+}{5}$	$\frac{4}{5}$									$\frac{1^+}{55}$	$\frac{9}{55}$	$\frac{9^-}{11}$

TABLE 4

Coefficients $C_k^{(n)}$ for the state (I,I)

n	$T_k\ t_k$ mesons		0 0	1-1	1 0	1 1	2-2	2-1	2 0	2 1	2 2	3-3	3-2	3-1	3 0	3 1	3 2	3 3
1		+	1		1/2				1/10									
		0				1/2				3/10								
		−									3/5							
2	+	+		3/5				1/5						1/35				
	+	0	1		4/5				2/5						3/35			
	+	−				6/5				2/5						2/35		
	0	0				2/5				1/5						4/35		
	0	−									4/5						2/7	
	−	−																3/7
3	‡	+					3/7						3/28					
	+0	+		6/5				24/35						33/140				
	±	+	9/5		6/5				18/35						9/70			
	+0	0	6/5		9/10				39/70						9/35			
	±	0				12/5				48/35						33/70		
	±	−									9/7						9/28	
	00	0				3/10				3/14						3/35		
	0̲	0									33/35						3/7	
	0̲	−																27/28
4	‡	‡										1/3						
	‡	+0					9/7						4/7					
	++	+−		12/7				172/175						2/7				
	+0	+0		66/35				188/175						3/5				
	+0	+−	24/5		132/35				78/35						32/35			
	±	±				18/7				9/7						3/7		
	+0	00	6/5		36/35				24/35						38/105			
	+0	0−				132/35				12/5						6/5		
	±	0̲									27/7						12/7	
	±	=																4/3
	00	00				9/35				6/35						4/35		
	00	0−									36/35						4/7	
	0̲	0̲																11/7

Example: $(1,1) = (0,0;\pi^+) + \frac{1}{2}(1,0;\pi^+) + \frac{1}{10}(2,0;\pi^+) + \frac{1}{2}(1,1;\pi^0) +$

$+\ \frac{3}{[illegible]}(2,1;\pi^0) + \frac{3}{[illegible]}(2,2;\pi^-)$

Probabilities of charge states of the systems N'N (or N'N')

state	0 0	1 -1	1 0	1 1	2 -2	2 -1	2 0	2 1	2 2	3 -3	3 -2	3 -1	3 0	3 1	3 2	3 3	T t
N'N																	
p^+p									1								
p^+n				$\frac{3}{4}$				$\frac{1}{4}$									
p^0p				$\frac{1}{6}$				$\frac{1}{2}$									
p^0n			$\frac{1}{3}$				$\frac{1}{3}$										
p^-p			$\frac{1}{6}$				$\frac{1}{6}$										
p^-n		$\frac{1}{12}$				$\frac{1}{4}$											
n^+p				$\frac{1}{12}$				$\frac{1}{4}$									
n^+n			$\frac{1}{6}$				$\frac{1}{6}$										
n^0p			$\frac{1}{3}$				$\frac{1}{3}$										
n^0n		$\frac{1}{6}$				$\frac{1}{2}$											
n^-p		$\frac{3}{4}$				$\frac{1}{4}$											
n^-n					1												
N'N'																	
p^+p^+																1	
p^+p^0									$\frac{2}{3}$						$\frac{2}{3}$		
p^+p^-				$\frac{1}{5}$				$\frac{1}{3}$						$\frac{2}{15}$			
p^+n^+									$\frac{1}{3}$						$\frac{1}{3}$		
p^+n^0				$\frac{2}{5}$				$\frac{2}{3}$						$\frac{4}{15}$			
p^+n^-	$\frac{1}{2}$		$\frac{9}{10}$				$\frac{1}{2}$						$\frac{1}{10}$				
p^0p^0				$\frac{8}{45}$										$\frac{4}{15}$			
p^0p^-	$\frac{1}{9}$		$\frac{1}{45}$				$\frac{1}{9}$						$\frac{1}{5}$				
p^0n^+				$\frac{8}{45}$										$\frac{4}{15}$			
p^0n^0	$\frac{2}{9}$		$\frac{2}{45}$				$\frac{2}{9}$						$\frac{2}{5}$				
p^0n^-		$\frac{2}{5}$				$\frac{2}{3}$						$\frac{4}{15}$					
p^-p^-		$\frac{2}{45}$										$\frac{1}{15}$					
p^-n^+	$\frac{1}{18}$		$\frac{1}{90}$				$\frac{1}{18}$						$\frac{1}{10}$				
p^-n^0		$\frac{8}{45}$										$\frac{4}{15}$					
p^-n^-					$\frac{1}{3}$						$\frac{1}{3}$			$\frac{1}{15}$			
n^+n^+				$\frac{2}{45}$													
n^+n^0	$\frac{1}{9}$		$\frac{1}{45}$				$\frac{1}{9}$						$\frac{1}{5}$				
n^+n^-		$\frac{1}{5}$				$\frac{1}{3}$						$\frac{2}{15}$					
n^0n^0		$\frac{8}{45}$										$\frac{4}{15}$					
n^0n^-					$\frac{2}{3}$						$\frac{2}{3}$						
n^-n^-										1							

Example: $(2, -1) = \frac{2}{3}(p^0n^-) + \frac{1}{3}(n^+n^-)$

TABLE 6

Probabilities of charge states of the systems N'Nnπ and N'N'nπ

(S is a normalization factor)

1. N'N'π; S=1/3

state	probability state	state	probability state	state	probability state
1 $p^{+}n^{-}+$	1	5 $n^{+}n^{0}+$	2/15	9 $p^{0}n^{+}0$	4/45
2 $p^{0}p^{-}+$	2/15	6 $p^{+}p^{-}0$	1/5	10 $n^{+}n^{+}0$	1/45
3 $p^{-}n^{+}+$	1/15	7 $p^{+}n^{0}0$	2/5	11 $p^{+}p^{0}-$	2/5
4 $p^{0}n^{0}+$	4/15	8 $p^{0}p^{0}0$	4/45	12 $p^{+}n^{+}-$	1/5

2. N'N'2π ; S =1/7

1	$p^{+}n^{-}+0$	10/7	9	$p^{0}n^{-}++$	8/21	17	$p^{+}n^{0}00$	34/105
2	$p^{0}p^{-}+0$	4/21	10	$n^{+}n^{-}++$	4/21	18	$p^{0}p^{0}00$	32/315
3	$p^{-}n^{+}+0$	2/21	11	$p^{+}p^{-}+-$	8/21	19	$p^{0}n^{+}00$	32/315
4	$p^{0}n^{0}+0$	8/21	12	$p^{+}n^{0}+-$	16/21	20	$n^{+}n^{+}00$	8/315
5	$n^{+}n^{0}+0$	4/21	13	$p^{0}p^{0}+-$	8/35	21	$p^{+}p^{0}-0$	76/105
6	$p^{-}p^{-}++$	1/35	14	$p^{0}n^{+}+-$	8/35	22	$p^{+}n^{+}-0$	38/105
7	$p^{-}n^{0}++$	4/35	15	$n^{+}n^{+}+-$	2/35	23	$p^{+}p^{+}--$	3/7
8	$n^{0}n^{0}++$	4/35	16	$p^{+}p^{-}00$	17/105			

3. N'N'3π ; S =1/18

1	$p^{+}n^{\mp}+-$	9/4	12	$p^{-}n^{0}++0$	29/1o5	23	$p^{0}p^{0}000$	8/105
2	$p^{0}p^{-}++-$	13/42	13	$n^{0}n^{0}++0$	29/210	24	$p^{0}n^{+}000$	8/1o5
3	$p^{-}n^{+}++-$	13/84	14	$p^{0}n^{-}++0$	1	25	$n^{+}n^{+}000$	2/105
4	$p^{0}n^{0}++-$	13/21	15	$n^{+}n^{-}++0$	1/2	26	$p^{-}n^{-}+++$	5/28
5	$n^{+}n^{0}++-$	13/42	16	$p^{+}p^{-}+-0$	1	27	$n^{0}n^{-}+++$	5/14
6	$p^{+}n^{-}+00$	12/7	17	$p^{+}n^{0}+-0$	2	28	$p^{+}p^{0}+--$	15/14
7	$p^{0}p^{-}+00$	4/15	18	$p^{0}p^{0}+-0$	58/105	29	$p^{+}n^{+}+--$	15/28
8	$p^{-}n^{+}+00$	2/15	19	$p^{0}n^{+}+-0$	58/105	30	$p^{+}p^{0}-00$	32/35
9	$p^{0}n^{0}+00$	8/15	20	$n^{+}n^{+}+-0$	29/210	31	$p^{+}n^{+}-00$	16/35
10	$n^{+}n\ -00$	4/15	21	$p^{+}p^{-}000$	1/7	32	$p^{+}p^{+}--0$	27/28
11	$p^{-}p^{-}++0$	29/420	22	$p^{+}n^{0}000$	2/7			

4. N'N'4π ; S = 1/46

1	p^+n^- ++–0	7	16	p^-p^- ++00	13/105	31	p^+p^- 0000	13/105
2	p^0p^- ++–0	22/21	17	p^-p^0 ++00	52/105	32	p^+n^0 0000	26/105
3	p^-n^+ ++–0	11/21	18	n^0n^0 ++00	52/105	33	p^0p^0 0000	8/105
4	p^0n^0 ++–0	44/21	19	p^0n^- ++00	856/525	34	p^0n^+ 0000	8/105
5	n^+n^0 ++–0	22/21	20	n^+n^- ++00	428/525	35	n^+n^+ 0000	2/105
6	p^+n^- +000	40/21	21	p^+p^- ++––	1	36	p^-n^- +++0	13/21
7	p^0p^- +000	32/105	22	p^+n^0 ++––	2	37	n^0n^- +++0	26/21
8	p^-n^+ +000	16/105	23	p^0p^0 ++––	4/7	38	p^+p^0 +–0	26/7
9	p^0n^0 +000	64/105	24	p^0n^+ ++––	4/7	39	p^+n^+ +–0	13/7
10	n^+n^0 +000	32/105	25	n^+n^+ ++––	1/7	40	p^+p^0 –000	16/15
11	p^-p^- +++–	2/21	26	p^+p^- +–00	12/7	41	p^+n^+ –000	8/15
12	p^-n^0 +++–	8/21	27	p^+n^0 +–00	24/7	42	p^+p^+ –00	11/7
13	n^0n^0 +++–	8/21	28	p^0p^0 +–00	104/105	43	p^+p^- +––	4/3
14	p^0n^- +++–	744/525	29	p^0n^+ +–00	104/105	44	n^-n^- ++++	1/3
15	n^+n^- +++–	372/525	30	n^+n^+ +–00	26/105			

5. N'N π ; S=1/2

1	p^0n +	1/5	4	n^0p+	1/5	7	n^+p0	7/60
2	n^+n +	1/10	5	p^+n 0	9/20	8	p^+p –	3/5
3	p^-p +	1/10	6	p^0p 0	7/30			

6. N'N 2π ; S =1/5

1	p^+p 0–	4/5	6	p^0n +0	2/5	11	n^+n +0	1/5
2	p^+n +–	1	7	p^-p +0	1/5	12	n^0p +0	2/5
3	p^+n00	7/20	8	p^-n ++	1/10	13	n^0n ++	1/5
4	p^0p +–	2/5	9	n^+p +–	1/5	14	n^-p ++	1/2
5	p^0p 00	1/6	10	n^+p 00	1/12			

7. N'N 3π ; S =1/12

1	p^-n ++0	19/70	8	p^0n ++–	4/7	15	p^+n 000	39/140
2	n^0n ++0	19/35	9	n^+n ++–	2/7	16	p^0p 000	11/70
3	n^-p ++0	15/14	10	p^-p ++–	2/7	17	n^+p 000	11/140
4	p^0n +00	17/35	11	n^0p ++–	4/7	18	n^-n +++	3/7
5	n^+n +00	17/70	12	p^+n +–0	15/7	19	p^+p –00	33/35
6	p^-p +00	17/70	13	p^0p +–0	38/35	20	p^+p^+ +––	9/7
7	n^0p +00	17/35	14	n^+p +–0	19/35			

8. $N'N\,4\pi$; S =1/30

1	$p^- n$ +++–	67/175	10	$n^0 p$ ++–0	2	19	$p^0 p$ +–00	64/35
2	$n^0 n$ +++–	136/175	11	$p^0 n$ +000	4/7	20	$n^+ p$ +–00	32/35
3	$n^- p$ +++–	268/175	12	$n^+ n$ +000	2/7	21	$p^+ n$ 0000	33/140
4	$p^- n$ ++00	149/350	13	$p^- p$ +000	2/7	22	$p^0 p$ 0000	9/70
5	$n^0 n$ ++00	149/175	14	$n^0 p$ +000	4/7	23	$n^+ p$ 0000	9/140
6	$n^- p$ ++00	589/350	15	$p^+ n$ ++––	9/4	24	$n^- n$ +++0	9/7
7	$p^0 n$ ++–0	2	16	$p^0 p$ ++––	15/14	25	$p^+ p$ +––0	27/7
8	$n^+ n$ ++–0	1	17	$n^+ p$ ++––	15/28	26	$p^+ p$ –000	36/35
9	$p^- p$ ++–0	1	18	$p^+ n$ +–00	24/7			

9. $3N\tilde{N}$;	S = 1/3
$ppn\tilde{n}$	9/4
$ppp\tilde{p}$	3/4

10. $3N\tilde{N}'$; S = 1/3

1	$pnn\tilde{n}^+$	9/5	4	$ppp\tilde{p}^0$	1/5
2	$ppn\tilde{n}^0$	3/5	5	$ppp\tilde{n}^-$	1/10
3	$ppn\tilde{p}^+$	3/10			

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