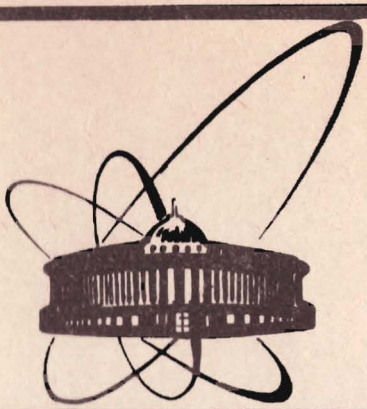

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NEW "PUTTING-ONTO-MASS-SHELL" ALGORITHM

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In our previous paper /1/ an algorithm, enabling to satisty the energy-momentum conservation law and take into account the Fermi-motion of constituents during simulation of the bounded system interactions, was suggested. Unfortunately, formulation of the algorithm is not relativistically invariant. This drawback can be to some extent eliminated.

It is well known that the use of infinite momentum frame allows for partial relativistically invariant description of the bounded systems. Namely, the constituent distribution over variables p_{Ti} and $x_i = (E_i + p_{\|i})/(E_0 + p_{\|0})$ is invariant with respect to the transformations conserving the direction of p_0 and its large value. Here E_0 and p_0 are the energy and the momentum of the system; E_i, $p_{\|i}$ and p_{Ti} are i-th constituent energy, longitudinal (along the momentum p_0) and transverse momenta, respectively. Let us invoke these variables to formulate a new "putting-onto-mass-shell" algorithm.

Let us suppose the two systems, containing A and B constituents with the longitudinal momenta p_A^0 and p_B^0, respectively, came from the mass shell and their constituents came onto the mass shell during the interaction. Let the energies and momenta in this state be E_A, E_B, p_A and p_B. Let us define values $x_i = (E_i + p_i)/W_A^+$ and $y_i = (\epsilon_i + q_i)/W_B^-$. Here $E_i(\epsilon_i)$ and $p_i(q_i)$ are the energy and momentum of the i-th constituent of the system A(B) and $W_A^+ = E_A + p_A$, $W_B^- = E_B - p_B$. Using these variables let us write the energy-momentum conservation law in the form:

$$\frac{W_A^+}{2} + \frac{1}{2W_A^+}\sum_{i=1}^{A}\frac{m_{Ti}^2}{x_i} + \frac{W_B^-}{2} + \frac{1}{2W_B^-}\sum_{i=1}^{B}\frac{\mu_{Ti}^2}{y_i} = E_A^0 + E_B^0$$

$$\frac{W_A^+}{2} - \frac{1}{2W_A^+}\sum_{i=1}^{A}\frac{m_{Ti}^2}{x_i} - \frac{W_B^-}{2} + \frac{1}{2W_B^-}\sum_{i=1}^{B}\frac{\mu_{Ti}^2}{y_i} = p_A^0 + p_B^0, \qquad (1)$$

$$\Sigma p_{Ti} + \Sigma q_{Ti} = 0, \qquad (2)$$

where $m_{Ti}^2 = m_i^2 + p_{Ti}^2$, $\mu_{Ti}^2 = \mu_{Ti}^2 + q_{Ti}^2$ and $m_i(\mu_i)$ is the mass of the i-th constituent of the system A(B).

The system (1) allows one to define W_A^+, W_B^- and the kinematic characteristics of all particles at given (x_i, p_{Ti}) and (y_i, q_{Ti}):

$$W_A^+ = (W_0^- W_0^+ + \alpha - \beta + \sqrt{\Delta})/2W_0^-; \quad (3)$$

$$W_B^+ = (W_0^- W_0^+ - \alpha + \beta + \sqrt{\Delta})/2W_0^-; \quad (4)$$

$$W_0^+ = (E_A^0 + E_B^0) + (p_A^0 + p_B^0),$$

$$W_0^- = (E_A^0 + E_B^0) - (p_A^0 + p_B^0),$$

$$\alpha = \sum_{i=1}^{A} \frac{m_{Ti}^2}{x_i}, \qquad \beta = \sum_{i=1}^{B} \frac{\mu_{Ti}^2}{y_i};$$

$$\Delta = (W_0^- W_0^+)^2 + \alpha^2 + \beta^2 - 2W_0^- W_0^+ \alpha - 2W_0^- W_0^+ \beta - 2\alpha\beta; \quad (5)$$

$$p_i = (W_A^+ x_i - \frac{m_{Ti}^2}{x_i W_A^+})/2; \quad (6)$$

$$q_i = -(W_B^- y_i - \frac{\mu_{Ti}^2}{y_i W_B^-})/2. \quad (7)$$

Thus, the task of taking into account binding energy and the Fermi-motion of the constituents during simulation of the bounded system interactions is solved by the relations (3)-(6). To take into consideration various elements of the Fock-column one should assign the probabilities of appearance of various constituent numbers in the colliding systems. Besides, the constituent distribution function over $\{p_{Ti}, x_i\}$ should be known. To describe the proton and meson yields in the high energy reactions, for example, the following assumption is well enough: the nucleus consists of the nucleons to be distributed as follows*

In principle, such a type of distributions can result from the generalization of some nonrelativistic nucleus model, but this task is rather complicated.

$$dP \propto \prod_{i=1}^{A} [(\frac{1}{\pi \langle p_T^2 \rangle} e^{-p_{Ti}^2/\langle p_{Ti}^2 \rangle}) (\frac{1}{\sqrt{\pi \delta^2}} e^{-(x_i - 1/A)/\delta^2}) \times) \times$$

$$\times \delta(\Sigma p_{Ti}) \cdot \delta(1 - \Sigma x_i), \quad (8)$$

$$\delta = 0.3/A.$$

The total algorithm consists of the following steps:

1. Determining the sets of $\{x_i, p_{Ti}\}$ and $\{y_i, q_{Ti}\}$ from the distribution like that one of (8);
2. Determining Δ (see formulae (5)). If $\Delta < 0$, then go to step i;
3. Determining W_A^+, W_B^-, p_i, q_i according to formulae (3)-(7).

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