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Diffractive oxygen-proton interactions O^16+ 〖p□〗 ^ p^'+4□ and O^16+ 〖p□〗 ^ p^'+ p_f+N^15 at 3.25 GeV per nucleon- the parameter free Monte-Carlo approach

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In diffractive oxygen-proton interactions 〖〖O〗 ^16+p□〗 ^ p^'+4□ and p+O^(16)⟶ p^'+p_f+N^15 at 3.25 GeV per nucleon we have investigated the process of formation of final state particles. Parameter free Monte Carlo simulation model is proposed to describe the kinematic characteristics of particles in the final state. The algorithm of the model for the first reaction takes into account 2887 energetically allowed channels of direct (or cascade) O^(16^*)□ 4□ *decay. To form the masses of O^(16^*)* and intermediate C^(12^*) *nuclei, experimental tables of their excitation levels were used. All decays were generated isotropically in the rest frame of each unstable nucleus -O^(16^*), C^(12^*), Be^8.The results of the MonteCarlo calculations are in a good agreement with distributions of various kinematic characteristics of the final state □-particles taken from the experiment. Good agreement is possible to reach if, after simulation of the mass of the excited nucleus O^(16^*)*, energetically allowed decay channel was selected, for which the sum of the total energy, released in this channel, and the masses of four secondary α-particles turns out to be less, but most close to the mass of the excited nucleus O^(16^*).

For the second reaction the angular, momentum, rapidity and correlation Monte Carlo characteristics for final state p_f and N^15 are consistent with the distributions of similar quantities obtained experimentally. The relative probabilities were found for coherent diffraction (68%) of a p proton on the O^(16) nucleus as a whole, when an excited 〖O〗 ^(16) nucleus is formed, decaying into N^15 and p_f (which is not necessarily the nucleon on which, in fact, the diffraction interaction occurred), and for incoherent diffraction (32%) of a p proton on one of the nucleons of the O^(16) nucleus, when this latter nucleon is observed as a p_f fragment.

Section

Nuclear physics (Section 1)

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