

A simulation study for one-pion exchange contribution on very forward neutron productions in ATLAS-LHCf common events

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The mass composition is one of the key information to understand the origin of ultra-high energy cosmic rays. The interpretations of the mass composition from results by air shower experiments depend on hadronic interaction models used for the simulation. The uncertainties due to interaction models are reduced using recent experimental results at LHC.

However, due to no experimental results of pion-proton or pion-nucleus collisions at high energy, uncertainties remain in these collisions and it affects predictions of muon productions in air showers.

Recent results for very forward neutrons in pseudo-rapidity larger than 10.76 by the LHCf experiment show large differences from predictions by interaction models.

As a fundamental process of forward neutron production, the contribution of one pion exchange is proposed. Though LHC can not circulate the pion beam, a virtual pion emitted from a proton in a proton beam can collide with a proton in the other proton beam.

In this work, we discuss a possibility to measure contributions from one-pion exchange on very forward neutrons using ATLAS and LHCf detectors in LHC RUN 3.

Expected energy resolution for neutrons and statistics in Run 3 are taken into account in the discussion. The prospect of measurements of one-pion exchange contributions is also presented.

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Collaboration

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Subcategory

Experimental Methods & Instrumentation

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