LHCf plan for proton-oxygen collisions at LHC

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The LHCf experiment is designed to provide precise measurements of very forward neutral particle production from high energy proton-proton, proton-ion and ion-ion collisions. This information is necessary to test and tune hadronic interaction models used by ground-based cosmic rays experiments to extract the average composition of Ultra High Energy Cosmic Rays. In order to reach this goal, LHCf makes use of two small sampling calorimeters installed in the LHC tunnel at ±140 m from Interaction Point 1, both able to detect neutral particles having pseudo-rapidity $\eta > 8.4$. In LHC Run I and II, the LHCf experiment acquired data relative to p-p collisions at $\sqrt{s}$ = 0.9, 2.76, 7 and 13 TeV, and p-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 and 8.16 TeV. Forward production from p-p and p-Pb collisions are not directly applicable to the tuning of the model used to simulate extensive air showers, since the first interaction between a cosmic ray and an atmospheric nucleus generally involves a light nucleus, like N or O. In LHC Run III, we will have the unique opportunity to directly measure forward production from high energy p-O collisions, without the need to obtain this information by interpolating the measurements from p-p and p-Pb collisions. In this contribution, we discuss the importance of such a measurement, focusing on all the benefits in terms of a more direct and complete input for model tuning, and on the operation plans, including the importance to take data both from high energy p-O and O-O collisions.