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## LHCf Run II physics results in proton-proton collisions at $\sqrt{s} = 13$ TeV

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The LHC-forward experiment (LHCf), located at the Large Hadron Collider (LHC), is designed to measure the production cross section of neutral particles in the very-forward region, covering the pseudorapidity region above 8.4 (up to zero-degree particles). By measuring the very-forward particle production rates at the highest energy possible at an accelerator, LHCf will provide fundamental informations to improve phenomenological hadronic interaction models used in the simulation of air-showers induced by ultra-high-energy cosmic rays in the atmosphere. The experiment consists of two small independent detectors placed 140 metres away from the ATLAS interaction point (IP1), on opposite sides. Each detector is made of two sampling and position sensitive calorimeters.

This contribution will focus on the Run II physics results of LHCf in proton-proton collisions at 13 TeV. At first the photon energy spectrum will be presented and compared with the predictions of several hadronic interaction models. The advantages of the ATLAS-LHCf combined analysis will then be discussed and the preliminary spectrum of very-forward photons produced in diffractive collisions (tagged by ATLAS) will be shown together with models predictions. The preliminary Feynman-x and transverse momentum spectrum of  $\pi^0$ , and the Feynman-x spectrum of  $\eta$  will also be presented. Photons and  $\pi^0$  production cross section provides important information about the electromagnetic component of an air-shower, while  $\eta$  measurements give the possibility to probe the strange-quark related contribution. Finally, the neutron energy spectrum measured in several pseudorapidity regions will be shown and compared with the predictions of various hadronic interaction models. From these measurements the average inelasticity of the collisions, which strongly affects the development of an air-shower, has also been extracted.

### In-person participation

Yes

**Primary author:** Dr TIBERIO, Alessio (INFN)**Presenter:** Dr TIBERIO, Alessio (INFN)**Session Classification:** Astroparticle Physics and Cosmology**Track Classification:** Astroparticle Physics and Cosmology