Inclusive photon production at forward rapidities for pp collisions at $\sqrt{s}$= 0.9 TeV and 7 TeV in ALICE at the LHC

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Introduction

Measurements of multiplicity and pseudorapidity distributions of produced particles in p-p collisions are important to study the particle production mechanism and provide the base line for the study of heavy ion collisions. Recently ALICE[1], CMS[2] and ATLAS[3] have published charged particle multiplicity and pseudorapidity distributions at midrapidity in p-p collisions. As the photon measurements are complementary to the charged particle measurements this work highlights the particle production mechanism in forward rapidity region and in addition it provides the information about longitudinal scaling of produced particles which is found to hold at lower energies[4].

In this article, we will report the measurements of multiplicity and pseudorapidity distributions of inclusive photon at forward rapidity (2.3< η <3.9) in the ALICE experiment at the CERN-LHC for p-p collisions at centre-of-mass energies $\sqrt{s}$= 0.9 TeV and 7 TeV.

Analysis and Result

In this work we have taken data from the Photon Multiplicity Detector (PMD) in the ALICE experiment which has been precisely designed to measure the multiplicity of inclusive photons in the forward rapidity region on an event-by-event basis. Events sample corresponds to inelastic (INEL) class and events with vertex-Z positions within ±10 cm from the interaction point are analyzed. Photon-like clusters are obtained by applying a suitable threshold on the ADC values of the hit clusters. Correct photon multiplicities are obtained by applying the method of unfolding [5] based on PYTHIA Perugia-0[6] and PHOJET[7] event generators.

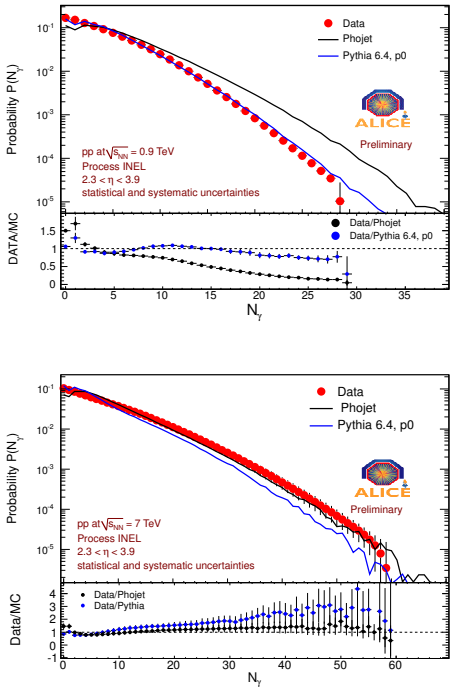

FIG. 1: Multiplicity distributions of photons (solid red circles) within 2.3 < η < 3.9 as measured for $\sqrt{s}$=0.9 TeV (upper) and 7 TeV (lower). Comparison of the data have been made to two event generators PYTHIA Perugia-0 (solid blue line) and PHOJET (solid black line).

Figure 1 shows the multiplicity distribution of photons in forward rapidity (2.3< η <3.9) for p-p collisions at $\sqrt{s}$ = 0.9 TeV and 7 TeV. In the lower panels, the comparisons of data are shown with respect to the two event gen-

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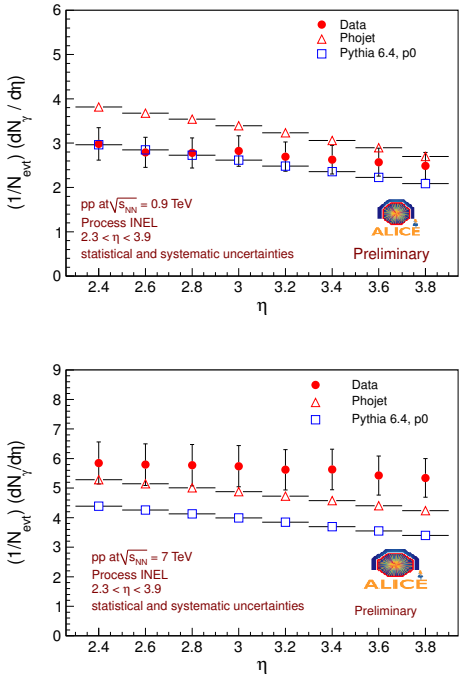

FIG. 2: Pseudorapidity distribution of photons (solid red circles) are plotted within 2.3< η <3.9 with two models PYTHIA Perugia-0 (open blue square) and PHOJET (open red triangle). Upper: data at $\sqrt{s}$=0.9 TeV. Lower: data at $\sqrt{s}$=7 TeV.

erators. The error bars in data points include both statistical and systematic uncertainties.

Figure 2 shows the pseudorapidity distributions of photons ($\frac{1}{N_{evt}}\frac{dN_\gamma}{d\eta}$) in forward rapidity (2.3< η <3.9) in comparison with the models for both the energies.

It is observed that PYTHIA Perugia-0 is closer to data and PHOJET over predict the data at 0.9 TeV and both the models underpredict the data at 7 TeV.

The average photon multiplicity within 2.3< η <3.9 is shown as a function of $\sqrt{s}$ in figure 3. Data points at lower energies are taken from UA5 experiment[8] for the non-single diffractive (NSD) events, therefore we have scaled our data points from INEL to NSD using simulation. It is observed that average photon multiplicity in forward rapidity increases with $\sqrt{s}$ as ln$\sqrt{s}$.

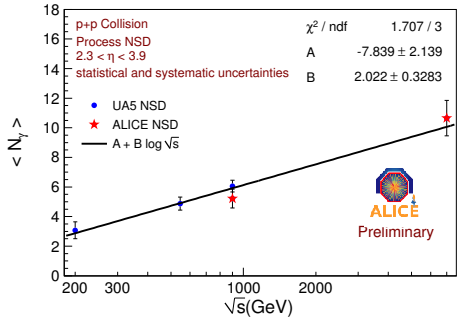

FIG. 3: Average photon multiplicity within 2.3< η <3.9 in proton-proton (ALICE) and proton-antiproton (UA5) interactions as a function of centre-of-mass energy for NSD interactions. Solid line is a logarithm fit to data.

References

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