PROCEEDINGS OF SCIENCE

Λ_c/D^0 ratio on high multiplicity pp collisions at LHC

A. I. Ruiz-Olivares*
Facultad de Ciencias Físico Matemáticas, Benémerita Universidad Autónoma de Puebla
E-mail: alan.ruizo@alumno.buap.mx

I. Bautista
Facultad de Ciencias Físico Matemáticas, Benémerita Universidad Autónoma de Puebla
E-mail: irais.bautista.guzman@cern.ch

High multiplicity pp collisions had shown signals of the possible formation of a collective state on which the clustering color sources give a natural description of the production of strong color fields due to the partonic interactions. We explore the production of Λ_c/D^0 ratio on high multiplicity pp collisions at 7 TeV, in the frame of the heavy quark production given by a percolation color sources approach.

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*Speaker.

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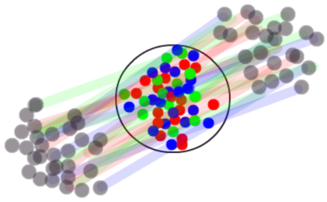
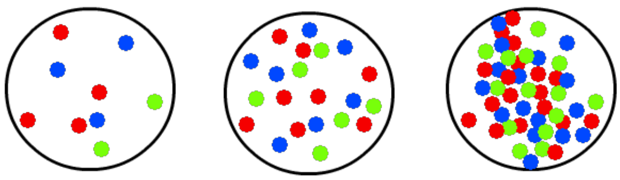
The String Percolation Model (SPM) assumes that when a collision takes place, color flux tubes are extended between the partons of the projectiles namely strings, the projection of these strings in the impact parameter plane form small discs with the radius $r_0 \sim 0.25 fm$ taking from QCD [1]. The two dimensional percolation theory is apply on the transverse plane with the number of small discs or strings.



In the model we define a quantity related with the fraction of area occupied by the discs, the local order parameter is the density of color string transverse areas, defined as: $\xi = (S_0/S)N^s$, where S_0 is the transverse area of a single string, S is the overlap area and N^s is the average of the number of strings in the cluster given by $N^s = 2+4\frac{S_0}{S}(\frac{\sqrt{s}}{m_p})^{2\lambda}$ which directly depends on the center mass energy of the collision. When the system reaches a critical density of strings, a cluster is formed, which indicates a geometrical phase transition to a expand system.



The geometric scaling function of the percolation system is given by the color reduction color factor [2]: $F(\xi) \equiv \sqrt{\frac{(1-e^{-\xi})}{\xi}}$ related to multiplicity as $\frac{dN}{dy} = kF(\xi)$, where $k \simeq 0.63$ is a normalization factor [3] , and the transverse momentum distribution is given by:

$$\frac{1}{N}\frac{d^2N}{d\eta dp_T} = \frac{a\left(p_0\frac{F(\xi_{pp})}{F(\xi_{HM})}\right)^{\alpha-2}}{\left[p_0\sqrt{\frac{F(\xi_{pp})}{F(\xi_{HM})}}+p_T\right]^{\alpha-1}}. \tag{1}$$

In this equation, a, p_0 and α are parameters obtained fitting minimum bias distributions for a fixed energy:

$\sqrt{s}$	a	p_0	α
7	33.11 ± 9.31	$2.31 \pm .87$	9.78 ± 2.53

Table 1: Parameters for transverse momentum distributions.

By including the dependence of the spectra by different species one gets

$$\frac{1}{N}\frac{d^2N}{d\eta dp_T} = \beta \exp\left(\frac{-(m_{\kappa,p})^2 F(\xi_{pp})}{\langle p_T\rangle^2 + \langle p_{\kappa,p}\rangle^2}\right)\frac{1}{N}\frac{d^2N}{d\eta dp_T}\bigg|_{\pi}. \tag{2}$$

By fitting to the minimum bias transverse momentum distribution of Λ_c and D^0 data from pp collisions at $\sqrt{s} = 7$ TeV [4][5]. We obtain the corresponding values of the parameters

	β	p
Λ_c	4.677$\pm$ 0.494	0.081090$\pm$0.0104
D^0	9.2034$\pm$ 0.7648	0.0012$\pm$ 0.0005

Table 2: Parameters for different hadron species.

The description of the production ratio of Λ_c/D^0 is obtained with the corresponding normalization to compare to data [6]:

$$\frac{\frac{1}{N}\frac{d^2N}{d\eta dp_T}\Big|_{\Lambda_c}}{\frac{1}{N}\frac{d^2N}{d\eta dp_T}\Big|_{D^0}} = \frac{\beta_{\Lambda_c}\exp\left(\frac{-(m_{\Lambda_c})^2F(\xi_{pp})}{\langle p_T\rangle^2+\langle p_{\Lambda_c}\rangle^2}\right)\frac{1}{N}\frac{d^2N}{d\eta dp_T}\Big|_{\pi}}{\beta_{D^0}\exp\left(\frac{-(m_{D^0})^2F(\xi_{pp})}{\langle p_T\rangle^2+\langle p_{D^0}\rangle^2}\right)\frac{1}{N}\frac{d^2N}{d\eta dp_T}\Big|_{\pi}}. \tag{3}$$

1. Results

By using the same parameters obtained from the fit off the minimum bias transverse momentum distribution, in figure 2 we present our predictions for the production ratio Λ_c/D^0 for the high multiplicity distributions using color reduced factor obtained for the high multiplicity distributions obtained in [7].

2. Conclusions

The results show that there is scaling with the string density of the system which grows with the multiplicity of the system in low p_T regime as expected in the model, nevertheless the model works in the low p_T regime and the results for intermediate and high p_T should have a different description mechanism contributing to the results.

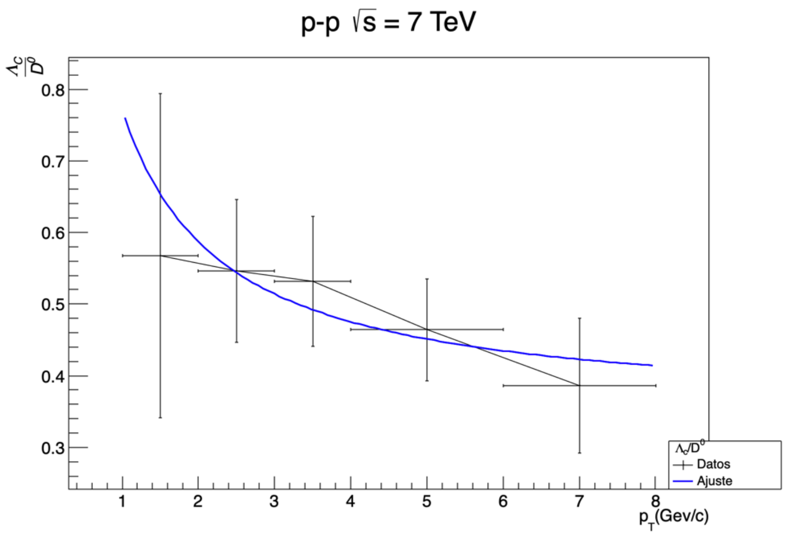


Figure 1: Fit for MinBias.

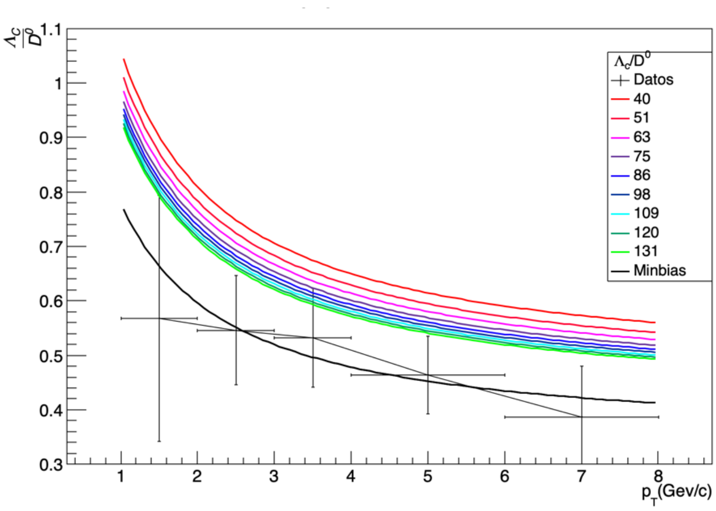


Figure 2: Prediction for different multiplicity.

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