Relative Pseudorapidity Density in Inelastic Proton-Proton Collisions

Sylwester Kornowski

Abstract: Here within the lacking part of ultimate theory, i.e. the Everlasting Theory, I calculated the relative pseudorapidity density in inelastic proton-proton collisions. The derived very simple formula is consistent with all experimental data.

1. Introduction

The lacking part of ultimate theory, i.e. the Everlasting Theory, is based on two fundamental axioms [1]. There are the phase transitions of the fundamental spacetime composed of the superluminal and gravitationally massless pieces of space (the tachyons). The phase transitions follow from the saturated interactions of the tachyons and lead to the superluminal binary systems of closed strings responsible for the entanglement, to the binary systems of neutrinos i.e. to the Einstein-spacetime components, to the cores of baryons and to the cosmic objects that appeared after the era of inflation but before the observed expansion of our Universe. The second axiom follows from the symmetrical decays of bosons that appear on the surface of the core of baryons. It leads to the Titius-Bode law for the strong interactions i.e. to the atom-like structure of baryons. Within such theory I derived the very simple formula for the pseudorapidity density in inelastic proton-proton collisions (see formula (161) [1]; the version v1 was published on 6 March 2012 i.e. before the experimental data for E = sqrt(s_{NN}) = 5.02 TeV were published (12 October 2012) [2])

$$x = \mathrm{sqrt}(\mathrm{sqrt}(0.37434 \cdot E)), \qquad (1)$$

where E = sqrt(s_{NN}) is in TeV.

2. Calculations

We can write formula (1) for E = sqrt(s_{NN}) = 0.2 TeV

$$y = \mathrm{sqrt}(\mathrm{sqrt}(0.37434 \cdot 0.2)). \qquad (2)$$

Now we can calculate the relative pseudorapidity density X = x/y

$$X = x/y = \mathrm{sqrt}(\mathrm{sqrt}(E[\mathrm{TeV}]/0.2)). \qquad (3)$$

It is the relative charged-particle pseudorapidity density in relation to the pseudorapidity density at 0.2 TeV, for the inelastic proton-proton collisions. Formula (3) is consistent with all experimental data presented here [2], even at low sqrt(s_{NN}) (see the lowest curve and the associated experimental data in Fig.2, page 6). Some results calculated on the base of formula

(3) are as follows (there is a 5% uncertainty for the experimental pseudorapidity density ratios [3])

For sqrt(s_{NN}) = 0.02 TeV we obtain X = 0.56. This result is consistent with the data obtained in the NA35 experiment.

For sqrt(s_{NN}) = 2.76 TeV we obtain X = 1.93. This result is consistent with the data obtained in the ALICE experiment.

For sqrt(s_{NN}) = 5.02 TeV we obtain X = 2.24. This result is consistent with the data obtained in the ALICE experiment.

3. Summary

Here within the lacking part of ultimate theory, i.e. the Everlasting Theory, I calculated the relative pseudorapidity density in the inelastic proton-proton collisions. The derived very simple formula is consistent with all experimental data. It was published on 6 March 2012 i.e. before the experimental data at 5.02 TeV were published. This means that within the Everlasting Theory, I predicted the experimental result.

References

[1] Sylwester Kornowski (6 March 2012). “The Everlasting Theory and Special Number Theory”.
http://www.rxiv.org/abs/1203.0021 [v1].

[2] ALICE Collaboration (12 October 2012). “Pseudorapidity density of charged particles in p-Pb collisions at sqrt(sNN) = 5.02 TeV”.
Phys. Rev. Lett. 110, 032301 (2013).
http://arxiv.org/abs/arXiv:1210.3615.

[3] BRAHMS Collaboration: I. Arsene, et al. (21 January 2004). “Centrality dependence of charged-particle pseudorapidity distributions from d+Au collisions at sqrt(s_{NN})=200 GeV”.
Phys. Rev. Lett. 94: 032301 (2005).
http://arxiv.org/abs/nucl-ex/0401025.