MAP-fis Essay Proposal, 2015-2016

(*please write in English*)

Supervisor

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Title

The pomeron in the ATLAS Forward Proton project

(*Materials, Optics, Condensed Theory, High Energy Theory,....*);

High Energy Physics

Summary of Proposal

The ATLAS Forward Proton (AFP) project [1] will study a number of elastic, diffractive and double-diffractive processes that are dominated by the exchange of the QCD pomeron [2,3]. The first goal of this project is to review the physical processes in this project that will be determinant to understand the Pomeron structure and the physics of saturation. The student should then consider the specific process of double diffractive vector meson production [4-7] and consider the gauge gravity approach to this problem. A first step can be reproducing the AdS black disk computation of [8], extending it to the case of vector meson production. The next step would be to consider the pomeron in the gauge/gravity duality [9], generalizing the analysis of [10] and [11] to the case of double vector meson production.

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References

(*to allow students first look at topic*)

[1] ATLAS Forward Proton Tecnhical Design Report.

[2] S. Donnachie, G. Dosch, P. Landshoff, O. Nachtmann, “Pomeron Physics and QCD”, Cambridge Monographs on Particle Physics, Nuclear Physics and Cosmology

[3] J.R. Forshaw and D.A. Ross, QCD and the Pomeron, Cambridge University Press.

[4] J. Kwiecinski and L. Motyka, “Diffractive J / psi production in high-energy gamma gamma collisions as a probe of the QCD pomeron”, Phys. Lett. B 438 (1998) 203, [hep-ph/9806260].

[5] B. Pire, L. Szymanowski and S. Wallon, “Double diffractive rho-production in gamma*

gamma* collisions", Eur. Phys. J. C 44 (2005) 545, [hep-ph/0507038].

[6] F. Carvalho, V.P. Goncalves, B.D. Moreira and F.S. Navarra, "Double vector meson production in the International Linear Collider", Eur. Phys. J. C 75 (2015) no.8, 392, arXiv:1504.04416 [hep-ph].

[7] V.P. Goncalves, B.D. Moreira and F.S. Navarra, "Double vector meson production in $\gamma \gamma$ interactions at hadronic colliders", Eur. Phys. J. C 76 (2016) no.3, 103, arXiv:1512.07482 [hep-ph].

[8] L. Cornalba, M.S. Costa and J. Penedones, "AdS black disk model for small-x DIS", Phys. Rev. Lett. 105 (2010) 072003, arXiv:1001.1157 [hep-ph].

[9] R.C. Brower, J. Polchinski, M.J. Strassler and C.I. Tan, "The Pomeron and gauge/string duality", JHEP 0712 (2007) 005, [hep-th/0603115].

[10] M.S. Costa and M. Djuric, "Deeply Virtual Compton Scattering from Gauge/Gravity Duality", Phys. Rev. D (2012) 016009, arXiv:1201.1307 [hep-th].

[11] M.S. Costa, M. Djurić and N. Evans, "Vector meson production at low x from gauge/gravity duality", JHEP 1309 (2013) 084, arXiv:1307.0009 [hep-ph].