

Dr. G.R.Boroun
Professor of Physics
Particle and High Energy Physics
Phenomenological (HEP-PH)

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Brief biodata

Prof. G.R.Boroun had obtained his Ph. D from Shiraz University in 2003 under the supervision of Prof. N.Ghahramany in the field of high energy Physics. So far, Prof. Boroun had guided 6 Ph. D and 2 postdoc student. Thesis and now he has 2 new Ph.D student. He has been in the department from 2003.

Research

We are currently studying the color dipole model and the nonlinear effects on hadron structure functions, as well as parameterization models at small Bjorken variable x . We are exploring the connection between particle physics theory and future collider experiments, with a particular emphasis on phenomenological models. Our research includes the search for top quark pair production and the measurement of top quark and Higgs boson properties in ep colliders. We are also investigating physics beyond the Standard Model in new colliders associated with the LHeC and FCC-he experiments. Additionally, we are collaborating with Tezpur University in India on nuclear structure functions. G.R.Boroun is also working jointly with the LHeC Collaboration and the FCC-he study group.

Recently, we have started collaborative work with Towson University in the US on the longitudinal structure function in momentum space. The behavior of distribution functions at low x and low Q^2 values is being discussed in the color dipole model by collaborations at Bielefeld University in Germany and Meijigakuin University in Japan.

Invited Positions and Distinctions

Visitor: 2019- CERN-TH (Theoretical Physics Department)-Geneva, CH

Visitor: 2017- CERN-TH (Theoretical Physics Department)-Geneva, CH

Visitor: 2014- University of Zurich (Physics Department) - Zurich, CH

External seminar and conference presentations

LHeC workshop, 25-26 June 2015, Chavannes-de-Bogis, Switzerland.

The XIth International Conference on Heavy Quarks and Leptons, 11-15 June 2012, Prague, Czech Republic.

EPS-HEP, 16-22 July 2009, Krakow, Poland.

XIII International Conference, 23-27 June 2008, Dubna, Russia.

Teaching experience

Modern physics, Quantum Mechanics I & 2,

Modern Quantum Mechanics, Modern Particle Physics, Quantum Chromodynamics,

The structure of the proton

Referee

The European Physical Journal C (EPJC)

The European Physical Journal A (EPJA)

Europhysics Letters (EPL)

International Journal of Theoretical Physics (IJTP)

Communications in Theoretical Physics (CTP)

Physics Scripta (PS)

Chinese Physics C (CPC)

Computer skills

Packages: Mathematica, Maple,...

OS: Windows [XP,10],....

Language skills

Persian: Native speaker

English: Advanced

Selected List of Recent Publications (2020-2023)

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- Analysis of the fragmentation function of gluon at next-to-leading order approximation, *Phys.Rev.D* ***, 0***** (2025), e-Print: 2508.05256 [hep-ph].
- Dipole-pion cross section in the saturation regime, *Phys.Rev.D* 112, 014027 (2025), e-Print: 2504.12837 [hep-ph].
- Effects of heavy quarks in the dipole cross section with the Kharzeev-Levin-Nardi model, *Phys.Rev.C* 111, 045201 (2025), e-Print: 2412.08115 [hep-ph].
- An analysis of the longitudinal structure function at next-to-leading order approximation at small x , *Chin.Phys.C* 49, 053104 (2024), e-Print: 2412.08115 [hep-ph].
- Reduced cross section and gluon distribution in a momentum-space approach, *Phy.Rev.D* 111, 034012 (2025), e-Print: 2408.02254 [hep-ph].
- Evolution of the color dipole cross section, *Eur.Phys.J.C* 84, 960 (2024), e-Print: 2407.02800 [hep-ph].
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- On Deep inelastic Electron-Proton Scattering, the gluon density and DGLAP evolution in the low- x , low- Q^2 domain, *Phy.Rev.D* ***** (2024), e-Print: 2407.03708 [hep-ph].
- Decoupling of structure functions in momentum space based on the Laplace transformation, *Phy.Rev.D* 109, 094037 (2024), e-Print: 2403.08560 [hep-ph].
- Nonlinear corrections to the Momentum sum rule, *Eur.Phys.J.A* 60, 162 (2024), e-Print: 2312.04228 [hep-ph].
- Heavy quark structure functions from unifying the color dipole picture and double asymptotic scaling approaches, *Phy.Rev.D* 109, 0542012 (2024), e-Print: 2401.00660 [hep-ph].
- A simple model for the charm structure function of nuclei, *Phys.Lett.B* 849, 138440 (2024), e-Print: 2312.05574 [hep-ph].
- The unintegrated gluon distribution from the GBW and BGK models, *Eur.Phys.J.A* 60, 130 (2024), e-Print: 2309.04832 [hep-ph].
- Nonlinear corrections for the nuclear gluon distribution in eA processes, *Chin.Phys.C* 48, 033107 (2024), e-Print: 2305.01893 [hep-ph].
- Top cross section in the LHeC and FCC-he energy range, *Phys.Lett.B* 838, 137712 (2023), e-Print: 2301.03261 [hep-ph].

Dipole cross section from the unintegrated gluon distribution at small x , [Phys.Rev.D 108, 034025 \(2023\)](#), [e-Print: 2301.01083 \[hep-ph\]](#).

One-to-One correspondence of soft and hard Pomeron with the CDP of the gluon density at low x , [e-Print: 2208.13036](#), [JETP Letters 117, 247 \(2023\)](#).

- Beyond DGLAP improved saturation model, [Eur.Phys.J.C 83, 42 \(2023\)](#), [e-Print: 2208.13037 \[hep-ph\]](#).
- The proton distribution from the color dipole picture, [e-Print: 2206.05672 \[hep-ph\]](#).
- Color dipole cross section in the DGLAP improved saturation model, [Eur.Phys.J.C 82, 740 \(2022\)](#), [e-Print: 2205.04889 \[hep-ph\]](#).
- Geometrical scaling of heavy-quark contributions in the low x region, [e-Print: 2204.07981 \[hep-ph\]](#), [Eur.Phys.J Plus 137, 1212 \(2022\)](#).
- Parametrization of the nuclear structure function, [Phys.Rev.C 107, 025209 \(2023\)](#), [e-Print: 2202.05483 \[hep-ph\]](#).
- Higher order approximations to the longitudinal structure function F_L from the parametrization of F_2 based on the Laplace transformation, [e-Print: 2111.08925 \[hep-ph\]](#), [Phys.Rev.D 105 \(2022\) 0340026](#).
- Masses of fully heavy tetraquark states from a four-quark static potential model, [e-Print: 2112.11028 \[hep-ph\]](#), [Phys.Rev.D 105 \(2022\) 014006](#).
- LHeC Collaboration and FCC-he Study Group. P.Agostini et al., The Large Hadron-Electron Collider at the HL-LHC, [e-Print:2007.14491 \[hep-ex\]](#), [J.Phys.G:Nucl.Part.Phys.48 \(2021\)110501](#)
- A determination of the longitudinal structure function F_L from the parametrization of F_2 based on the Laplace transformation, [e-Print: 2108.09465 \[hep-ph\]](#), [Eur.Phys.J.Plus 137 \(2022\)32](#).
- Analytic derivation of the nonlinear gluon distribution function, [e-Print: 2110.11716 \[hep-ph\]](#), [Eur.Phys.J.Plus 137 \(2022\) 259](#).
- Nonlinear corrections to the longitudinal structure function F_L from the parametrization of F_2 :Laplace transform approach
- , [e-Print: 2109.08878 \[hep-ph\]](#), [Eur.Phys.J.Plus 137 \(2022\) 371](#).
- Non-linear corrections to the parametrization methods, [e-Print:2107.11033 \[hep-ph\]](#), [Eur.Phys.J.C 81 \(2021\) 851](#).

- Collinear approach for top quark production at ep colliders, [e-Print:2109.09583 \[hep-ph\]](#). Will be appear in EPJC.
- Effect of the parameterization of the distribution functions on the longitudinal structure function at small x , [e-Print:2105.11079 \[hep-ph\]](#), *JETP Letters*, 114 (2021) 1.
- Physical limits in the Color Dipole Model Bounds, [e-Print:2102.04867 \[hep-ph\]](#), *Eur.Phys.J.A* 57 (2021) 219.
- Color dipole model bounds with the gluon-gluon recombination correction, [e-Print:2105.01121 \[hep-ph\]](#), *Phys.Rev.C* 103 (2021)6, 065202.
- Importance of heavy quark longitudinal structure measurements at future circular collider energies, [e-Print:2101.11829 \[hep-ph\]](#), *Chin.Phys.C* 45 (2021)6, 063105.
- Influence of gluon behavior on heavy-quark pair production, [e-Print: 2101.11831 \[hep-ph\]](#), *EPL* 133 (2021) 61002.
- An evaluation of the proton structure functions F_2 and F_L at small x , [e-Print:2010.15357 \[hep-ph\]](#), *Phys.Lett.B* 816 (2021)136274.
- Universal function of the diffractive process in color dipole picture, [e-Print:2010.04138 \[hep-ph\]](#), *Chin.Phys.C* 45 (2021)2, 023101.
- Searching for top quark pair production cross section at LHeC and FCC-eh, [e-Print:2006.07394 \[hep-ph\]](#), *EPL* 130 (2020)5, 51002.
- The study of the gluon distribution function and reduced cross section behavior using the proton structure function, [e-Print:1911. 11635 \[hep-ph\]](#), *Nucl.Phys.A* 1006 (2021)122062.
- Color dipole picture and extracting the ratio of structure functions at small x , [e-Print:1911.13180 \[hep-ph\]](#), *Phys.Rev.C* 101 (2020)4, 045202.
- Longitudinal structure function from the parton parametrization, [e-Print:1911.06954 \[hep-ph\]](#), *Eur.Phys.J.A* 56 (2020)10, 262.
- The exponent of the longitudinal structure function F_L at low x , [e-Print:1903.04316 \[hep-ph\]](#), *Eur.Phys.J.Plus* 135 (2020)1, 68.
- The non-singlet structure function of light and heavy nuclei up to next-to-leading order analysis at low x region, *Nucl. Phys. A* **986**, (2019)195.