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Dr. Tamás Sándor Biró
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Guest Editors, Special Issue "Particles and Plasmas"
European Physical Journal Special Topics

Dear Editors,

I am pleased to submit our manuscript titled "Short note on spin magnetization in QGP" as a contribution to the special issue “Particles and Plasmas” for European Physical Journal Special Topics (EPJ ST). Our work is co-authored by myself, Dr. Andrew Steinmetz, and Dr. Johann Rafelski.

In this manuscript we present a theoretical framework for evaluating the spin magnetization of quark-gluon plasma (QGP) under conditions relevant to the primordial Universe and laboratory heavy-ion collisions. We use a grand partition function formalism, evaluate magnetized Fermi-Dirac integrals, and derive explicit expressions that elucidate how magnetization depends on temperature, particle masses, and magnetic field strength. Notably, our analysis indicates that even a modest (pico-scale) degree of spin polarization in the light-quark and electron-positron sectors could generate cosmic magnetic fields of extraordinary magnitude – potentially exceeding 10^{15} Tesla. We hope to introduce a fresh perspective on the generation of large-scale cosmic magnetic fields and suggest implications for the interplay between QGP and EM phenomena in both astrophysical and experimental settings.

Our manuscript is 7 pages long with 1 figure. I am the first and corresponding author and I confirm that this manuscript has not been published elsewhere and is not under consideration by another journal. All authors have approved the manuscript and agree with its submission to EPJ ST. We suggest the following referees (in no order):

- Dr. Igor A. Shovkovy, Department of Physics, Arizona State University, Tempe, Arizona 85287, USA. Email: igor.shovkovy@asu.edu
- Dr. Karsten Jedamzik, Laboratoire de Univers et Particules de Montpellier, UMR5299-CNRS, Universite de Montpellier, 34095 Montpellier, France. Email: Karsten.JEDAMZIK@umontpellier.fr
- Dr. Efrain Ferrer, Department of Physics and Astronomy, The University of Texas Rio Grande Valley, Edinburg, Texas 78539, USA. Email: efrain.ferrer@utrgv.edu
- Dr. Chris Grayson, Department of Physics, The University of Arizona, Tucson, Arizona 85721, USA. Email: chrisgray1044@arizona.edu

We believe that this work will contribute to the broader discussion on the role of spin polarization in high-energy plasmas. We appreciate the opportunity to submit our work to EPJ ST and look forward to your feedback. Should you need any further information or clarification, please do not hesitate to contact me at ajsteinmetz@arizona.edu.

Thank you very much for your consideration.

Sincerely,

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On behalf of co-author
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