

Department of Physics,
The University of Arizona,
Tucson, AZ 85721, USA

May 19, 2023

MDPI Universe

Dear Editors,

Thank you for reviewing our submission to Dr. Remo Ruffini's Festschrift. With this letter, we submit our revised manuscript with changes requested by the reviewers and minor changes we ourselves wished to make. Within the revised manuscript, added or revised text has been highlighted in blue. Minor grammatical changes or corrections remain unmarked. Below we provide a list of relevant changes with the Section of Figure number denoted where appropriate.

- Fig. 16 - Caption has been rewritten.
- Fig. 19 - replaced with a corrected figure.
- Fig. 22 - Caption rewritten for clarity.
- Sec. 4.2 - Introductory paragraph rewritten for clarity.
- Sec. 4.2 - Several sentences rewritten for clarity.
- Sec. 5.5 - Final paragraph rewritten for clarity.
- Sec. 5.6 - Introductory paragraph expanded.
- Sec. 6 - The photographs honoring Remo Ruffini and Lizhi Fang have been grouped together and moved to an acknowledgements section after the concluding section. The first line of the abstract, as well as the last paragraph of the conclusions have also been moved to that section.

The following references were added:

- K. Eguchi *et al.*, "First results from KamLAND: Evidence for reactor anti-neutrino disappearance," *Phys. Rev. Lett.*, vol. 90, p. 021802, 2003.
- G. L. Fogli, E. Lisi, A. Marrone, and A. Palazzo, "Global analysis of three-flavor neutrino masses and mixings," *Prog. Part. Nucl. Phys.*, vol. 57, pp. 742–795, 2006.
- Y. Fukuda *et al.*, "Evidence for oscillation of atmospheric neutrinos," *Phys. Rev. Lett.*, vol. 81, pp. 1562–1567, 1998.
- S. F. King and C. Luhn, "Neutrino Mass and Mixing with Discrete Symmetry," *Rept. Prog. Phys.*, vol. 76, p. 056201, 2013.
- E. Fernandez-Martinez, J. Hernandez-Garcia, and J. Lopez-Pavon, "Global constraints on heavy neutrino mixing," *JHEP*, vol. 08, p. 033, 2016.
- S. Pascoli, S. T. Petcov, and A. Riotto, "Leptogenesis and Low Energy CP Violation in Neutrino Physics," *Nucl. Phys. B*, vol. 774, pp. 1–52, 2007.

- M. D. Schwartz, *Quantum field theory and the standard model*. Cambridge university press, 2014.
- H. Fritzsch, “Neutrino Masses and Flavor Mixing,” *Mod. Phys. Lett. A*, vol. 30, no. 16, p. 1530012, 2015.
- H. Fritzsch and Z.-z. Xing, “Mass and flavor mixing schemes of quarks and leptons,” *Prog. Part. Nucl. Phys.*, vol. 45, pp. 1–81, 2000.
- C. Giunti and C. W. Kim, *Fundamentals of neutrino physics and astrophysics*. Oxford university press, 2007.
- J. A. Casas and A. Ibarra, “Oscillating neutrinos and $\mu \rightarrow e, \gamma$,” *Nucl. Phys. B*, vol. 618, pp. 171–204, 2001.
- N. Arkani-Hamed, S. Dimopoulos, G. R. Dvali, and J. March-Russell, “Neutrino masses from large extra dimensions,” *Phys. Rev. D*, vol. 65, p. 024032, 2001.
- J. R. Ellis and S. Lola, “Can neutrinos be degenerate in mass?,” *Phys. Lett. B*, vol. 458, pp. 310–321, 1999.
- F. T. Avignone, III, S. R. Elliott, and J. Engel, “Double Beta Decay, Majorana Neutrinos, and Neutrino Mass,” *Rev. Mod. Phys.*, vol. 80, pp. 481–516, 2008.
- I. Esteban, M. C. Gonzalez-Garcia, M. Maltoni, T. Schwetz, and A. Zhou, “The fate of hints: updated global analysis of three-flavor neutrino oscillations,” *JHEP*, vol. 09, p. 178, 2020.
- B. Abi *et al.*, “Deep Underground Neutrino Experiment (DUNE), Far Detector Technical Design Report, Volume II: DUNE Physics.” 2 2020.
- L. Alvarez-Ruso *et al.*, “NuSTEC White Paper: Status and challenges of neutrino–nucleus scattering,” *Prog. Part. Nucl. Phys.*, vol. 100, pp. 1–68, 2018.
- J. Rafelski, M. Formanek, and A. Steinmetz, “Relativistic Dynamics of Point Magnetic Moment,” *Eur. Phys. J. C*, vol. 78, no. 1, p. 6, 2018.
- M. Formanek, A. Steinmetz, and J. Rafelski, “Motion of classical charged particles with magnetic moment in external plane-wave electromagnetic fields,” *Phys. Rev. A*, vol. 103, no. 5, p. 052218, 2021.
- M. Formanek, A. Steinmetz, and J. Rafelski, “Radiation reaction friction: Resistive material medium,” *Phys. Rev. D*, vol. 102, no. 5, p. 056015, 2020.
- Rubakov, V.A.; Shaposhnikov, M.E. Electroweak baryon number nonconservation in the early universe and in high-energy collisions. *Usp. Fiz. Nauk* **1996**, *166*, 493–537.
- Affleck, I.; Dine, M. A New Mechanism for Baryogenesis. *Nucl. Phys. B* **1985**, *249*, 361–380.
- Khlopov, M.Y.; Lecian, O.M. The Formalism of Milky-Way Antimatter-Domains Evolution. *Galaxies* **2023**, *11*, 50.
- Caldwell, R.R.; Kamionkowski, M.; Weinberg, N.N. Phantom energy and cosmic doomsday. *Phys. Rev. Lett.* **2003**, *91*, 071301.
- Bilic, N.; Tupper, G.B.; Viollier, R.D. Unification of dark matter and

dark energy: The Inhomogeneous Chaplygin gas. *Phys. Lett. B* **2002**, 535, 17–21.

- Benevento, G.; Hu, W.; Raveri, M. Can Late Dark Energy Transitions Raise the Hubble constant? *Phys. Rev. D* **2020**, 101, 103517.

The following references were removed:

- Yang, C.T.; Rafelski, J. Bottom quark chemical nonequilibrium in primordial QGP. Update in preparation, **2023**.
- Demiański, M.; Doroshkevich, A.G. Beyond the standard Λ CDM cosmology: the observed structure of DM halos and the shape of the power spectrum, arXiv:astro-ph.CO/1511.07989. **2015**.

The first reference (Yang, 2023, in preparation) was a duplicate of another article which is on arXiv, and will be submitted for publication once updated. The second (Demiański, 2015) was replaced with a more relevant reference which has been fully published as requested by Reviewer #2.

Additionally, a note was added in the bibliography that the references

We look forward to having our work accepted for publication.

Sincerely,

Johann Rafelski
Jeremiah Birrell
Andrew Steinmetz
Cheng Tao Yang