

Abstract Submitted  
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**Relabeling symmetry in relativistic fluids and plasmas**<sup>1</sup> YOHEI KAWAZURA, ZENSHO YOSHIDA, Graduate School of Frontier Sciences, University of Tokyo, YASUhide FUKUMOTO, Institute of Mathematics for Industry Kyushu University — The conservation of the recently formulated relativistic canonical helicity<sup>2,3</sup> is derived from Noether's theorem with the fluid elements' relabeling symmetry. Upon Eulerianizing the Noether current, the purely spatial volume integral on the Lagrangian coordinates is mapped to a space-time mixed three-dimensional integral on the four-dimensional Eulerian coordinates. The relativistic conservation law in the Eulerian coordinates is no longer represented by any divergence-free current. We have also formulated a relativistic action principle of MHD on the Lagrangian coordinates, and have derived the relativistic MHD cross helicity.

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<sup>2</sup>Z. Yoshida, Y. Kawazura, and T. Yokoyama, *J. Math. Phys.* **55** 043101 (2014).

<sup>3</sup>Y. Kawazura, Z. Yoshida and Y. Fukumoto, arXiv:1405.3544 [math-ph]

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