

Universidade de São Paulo
Instituto de Física de São Carlos

XIV Semana Integrada do Instituto de
Física de São Carlos

Livro de Resumos da Pós-Graduação

São Carlos
2024

Ficha catalográfica elaborada pelo Serviço de Informação do IFSC

Semana Integrada do Instituto de Física de São Carlos
(13: 21-25 ago.: 2023: São Carlos, SP.)

Livro de resumos da XIII Semana Integrada do Instituto de
Física de São Carlos – Universidade de São Paulo / Organizado
por Adonai Hilário da Silva [et al.]. São Carlos: IFSC, 2023.
358p.

Texto em português.

1.Física. I. Silva, Adonai Hilário da, org. II. Título.

ISSN: 2965-7679

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Cosmic ray acceleration under Lorentz invariance violation

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This study reexamines the acceleration of particles in astrophysical sources through Fermi mechanisms, (1-2) incorporating the assumption of Lorentz invariance violation (LIV). (3) The symmetry violation is approached from a phenomenological perspective, manifested as a modification in Einstein's dispersion relation. We calculate the energy spectrum and acceleration time of particles leaving the source as a function of the LIV parameter δn . Lorentz invariance violation leads to significant changes in the particle acceleration processes, specifically, it causes a strong suppression in first order acceleration and alters the energy spectral index in second order acceleration. Both behaviors are consistent with the results obtained for the modified acceleration time. The impacts of losses such as synchrotron and inverse Compton is, later, considered via the single-zone model. This study completes the trajectory of astroparticles in the context of searching for Lorentz invariance violation, allowing for an enhanced analysis of the breaking parameters through the full LIV scenario.

Palavras-chave: Cosmic ray; Quantum gravity, Acceleration.

Agência de fomento: CAPES (88887.839584/2023-00)

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