

Abstract Submitted
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Searching for Lorentz and CPT violation using charge-to-mass ratio comparisons in Penning traps¹ MOHAMMAD FARHAN RAWNAK, YUNHUA DING , Gettysburg College — Lorentz and CPT symmetries are the fundamental symmetries of our current best theories describing nature- General Theory of Relativity and the Standard Model of Particle Physics. Many theories such as string theory and quantum loop gravity suggest that tiny violations of Lorentz and CPT symmetries could emerge naturally via spontaneous symmetry breaking. Studying these symmetry-violating signals is of great importance because it could give birth to new physics beyond the Standard Model. One way to test these symmetries is to compare the fundamental properties of a particle to those of its antiparticle. In our work, we explore the theoretical and experimental prospect for Lorentz and CPT violation using charge-to-mass ratio comparisons from penning trap experiments. We first derive the leading order contributions due to Lorentz and CPT violation to the cyclotron frequencies of a confined particle and antiparticle and then relate them with the experimental charge-to-mass ratios comparisons. By identifying the relations between the comparisons and coefficients for Lorentz and CPT violation, we obtain first-time constraints on 69 coefficients for Lorentz and CPT violation from published Penning-trap results.

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