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Modern Trends of Lorentz Symmetry and Lorentz Violation

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Message from the Guest Editor

Physical laws are Lorentz-covariant among inertial frames; namely, the form of a physical law is invariant under the Lorentz group of spacetime transformations. The Lorentz symmetry sets a fundamental constraint for physical theories and has been well incorporated in the Standard Model of particle physics. It is thus very crucial to investigate its fundamentals and its potential breaking, which would help identify the underlying physics beyond the Standard Model.

Modern precision experiments designed to test the Lorentz symmetry and the Lorentz violation have achieved spectacularly high sensitivities that demand the deepest knowledge at the Planck-scale and challenge current theories of quantum gravity. Because Lorentz symmetry is almost perfect, the theoretical framework that contains Lorentz-violating effects must necessarily modify some of the basic concepts in fundamental physics. Therefore, current research trends of the Lorentz symmetry lead to two different but related perspectives.

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Message from the Editor-in-Chief

Symmetry is ultimately the most important concept in natural sciences. It is not surprising then that very basic and fundamental research achievements are related to symmetry. For instance, the Nobel Prize in Physics 1979 (Glashow, Salam, Weinberg) was received for a unified symmetry description of electromagnetic and weak interactions, while the Nobel Prize in Physics 2008 (Nambu, Kobayashi, Maskawa) was received for the discovery of the mechanism of spontaneous breaking of symmetry, including CP symmetry. Our journal is named *Symmetry* and it manifests its fundamental role in nature.

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