

# Cosmic photons from LHAASO as probes of Lorentz symmetry violations

*Friday, 29 October 2021 15:20 (20 minutes)*

The Large High Altitude Air Shower Observatory (LHAASO) is one of the most sensitive gamma-ray detector arrays currently operating at TeV and PeV energies. Recently the LHAASO experiment detected ultra-high-energy (UHE) photon emissions up to 1.4 PeV from twelve astrophysical gamma-ray sources. We point out that the detection of cosmic photons at such energies can constrain the photon self-decay motivated by superluminal Lorentz symmetry violation (LV) to a higher level, thus can put strong constraints to certain LV frameworks. Meanwhile, we suggest that the current observation of the PeV-scale photon with LHAASO may provide hint to permit a subluminal type of Lorentz violation in the proximity of the Planckian regime, and may be compatible with the light speed variation at the scale of  $3.6 \times 10^{17}$  GeV recently suggested from gamma-ray burst (GRB) time delays. We further propose detecting PeV photons coming from extragalactic sources with future experiments, based on LV-induced threshold anomalies of  $e^+e^-$  pair-production, as a crucial test of subluminal Lorentz violation. We comment that these observations are consistent with a D-brane/string-inspired quantum-gravity framework, the space-time foam model.

**Primary author:** Prof. MA, Bo-Qiang (Peking University)

**Co-author:** Mr LI, Chengyi (Peing University)

**Presenter:** Prof. MA, Bo-Qiang (Peking University)

**Session Classification:** Session 2