

Seminar na doktorskom studiju Fizika

Vrijeme: četvrtak, 10. ožujka 2022. u 10:00

Mjesto: *uživo* O-152 Odjel za fiziku, Sveučilišni kampus, Radmile Matejčić 2;

online <https://meet.google.com/ows-bojg-wni>

Jezik: engleski

Searches for Lorentz invariance violation with imaging atmospheric Cerenkov telescopes

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Abstract

Some candidates for the theory of quantum gravity allow Lorentz invariance violation (LIV). Possible deviations from the Lorentz symmetry affect interaction and propagation of the very high-energy gamma rays (VHE, >100 GeV) through space-time. These effects of quantum gravity, if they exist, are minuscule. However, they can accumulate over large distances. Therefore, they could leave a trace on the spectrum and light curve of VHE gamma rays emitted from various astronomical sources, traveling up to billions of light-years from their point of emission to the Earth. Currently, there are two main lines of LIV studies with imaging atmospheric Cerenkov telescopes (IACTs). The *Universe transparency* method investigates how the change of the reaction energy threshold (due to LIV) is changing the spectrum of the observed source. On the other hand, the *Time of flight* method investigates the influence of LIV on the photon speed. Since the analysis sensitivity to LIV energy scale depends on the highest energies of detected photons, light curve variability timescale, and the redshift of the source, three kinds of sources emerged as suitable for LIV searches with IACTs. Those are pulsars, gamma-ray bursts, and active galactic nuclei.

In this seminar, we will present the development of the gLike code for LIV searches. gLike is an open-source, ROOT-based code framework for numerical maximization. Originally it was developed for dark matter signals searches. Due to the modularity of the original code, extension to LIV studies is possible. Our goal is to implement two different analysis methods: an unbinned likelihood and a binned likelihood. We will also discuss some suitable data sets for the LIV studies, such as the flare of BL Lac detected by MAGIC telescopes in September 2020 and August 2021.