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Cosmological constraints on Lorentz Invariance of the Universe

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Lorentz Invariance is believed to be a fundamental property of Nature. However, recently this assertion has come under scrutiny, which is motivated on one hand by the Lorentz-violating proposals for quantum gravity and on the other hand, by the fact that Lorentz Invariance has been tested with ultimately high precision only in the sector of Standard Model of particles. For other sectors the bounds are milder or even non-existent.

My talk will be devoted to the question how cosmological data can be used to test Lorentz Invariance in gravity and dark matter. I will focus on the case, where Lorentz Invariance is violated by a preferred frame, parametrized by a unit time-like vector u^μ described within Einstein-aether and khronometric gravity theories. I will describe how this preferred frame and its possible coupling to dark matter particles affect the homogeneous expansion of the Universe and the behaviour of cosmological perturbations. Finally, I will present the most stringent results to date on constrains for the departures from Lorentz Invariance in the dark matter and gravity sectors, based on current cosmological data.

Summary

My talk will be devoted to the question how cosmological data can be used to test Lorentz Invariance of gravity and dark matter. I will present the most stringent results to date on departures from Lorentz symmetry in these sectors, based on recent Cosmic Microwave Background and Large Scale Structure data.

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