Dipartimento di Fisica
Università di Cagliari
INFN, Sezione di Cagliari

High Energy Physics Colloquia

22 marzo 2017 · ore 15:00 · aula B

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The Dark Side of Gravity: A Universe Without Dark-Matter

Abstract

Galaxies rotational curves, bullet cluster, structure formation are some of the famous astrophysical phenomena winking to the existence of some (still) mysterious form of matter, the so-called dark matter. However, there are no reasons to exclude *a priori* that general relativity can be an uncomplete theory, lacking some fundamental aspect about the nature of our universe. Many theoretical attempts have been done in order to correct general relativity without adding some dark-matter components, from quantum gravity models to slight modifications of Einstein's theory. Since the former are still uncomplete, the latter are favourite especially because they provide testable predictions. For example, this is the case of MOND (MOdified Newtonian Dynamics), a phenomenological model aimed to reproduce galaxies rotational curves. MOND works very well at galaxy scales, however it does not explain other phenomena as the gravitational lensing and so on. Moreover, it has not a clear theoretical explanation. Recently, Verlinde proposed a formulation of gravity as an emergent phenomenon through which it is possible to obtain the same results obtained by MOND but with a more robust mathematical derivation. The novel aspect of this theory is that the the emergent laws of gravity provide the evidence for the existence of an additional "dark gravity force" which can explains the observed phenomena in galaxies and clusters currently attributed to dark matter.
In this seminar I will discuss about this new perspective and its consequences, both theoretical (about the nature of gravity and matter) and experimental (the galaxies rotational curves).

Based on: Erik P. Verlinde, "Emergent Gravity and the Dark Universe," (2016). [arXiv:1611.02269].

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