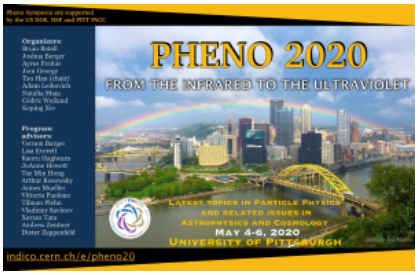

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Braneworld Cosmological Effect on Freeze-in Dark Matter Density and Lifetime Frontier

Monday 4 May 2020 16:45 (15 minutes)

In the 5-dimensional braneworld cosmology, the Friedmann equation of our 4-dimensional universe on a brane is modified at high temperatures while the standard Big Bang cosmology is reproduced at low temperatures. Based on two well-known scenarios, the Randall-Sundrum and Gauss-Bonnet braneworld cosmologies, we investigate the braneworld cosmological effect on the relic density of a non-thermal dark matter particle whose interactions with the Standard Model particles are so weak that its relic density is determined by the freeze-in mechanism. For dark matter production processes in the early universe, we assume a simple scenario with a light vector-boson mediator for the dark matter particle to communicate with the Standard Model particles. We find that the braneworld cosmological effect can dramatically alters the resultant dark matter relic density from the one in the standard Big Bang cosmology. As an application, we consider a right-handed neutrino dark matter in the minimal B–L extended Standard Model with a light B–L gauge boson (Z′) as a mediator. We find an impact of the braneworld cosmological effect on the search for the long-lived Z′ boson at the planned/proposed Lifetime Frontier experiments.

Summary

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