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Cooking Pasta with Dark Matter

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Neutron stars serve as excellent next-generation thermal detectors of dark matter, heated by the scattering and annihilation of dark matter accelerated to relativistic speeds in their deep gravitational wells. However, the dynamics of neutron star cores are uncertain, making it difficult at present to unequivocally compute dark matter scattering in this region. On the other hand, the physics of an outer layer of the neutron star, the crust, is more robustly understood. I will show that dark matter scattering solely with the low-density crust still kinetically heats neutron stars to infrared temperatures detectable by forthcoming telescopes. I will discuss the strong sensitivities obtained for both spin-independent and spin-dependent dark-matter scattering on nucleons, with the leading sensitivity arising from dark matter scattering with a crust constituent called nuclear pasta (including gnocchi, spaghetti, and lasagna phases).

Summary

Author: LEANE, Rebecca (Massachusetts Institute of Technology)

Presenter: LEANE, Rebecca (Massachusetts Institute of Technology)

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