

PARTICLE PHYSICS SEMINAR SERIES

Unlocking neutron stars as probes of fundamental physics

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Over the past few decades, terrestrial experiments have placed increasingly strong limits on dark matter/standard model interactions. However, a significant fraction of the reasonable dark matter parameter space remains beyond our reach. Due to their extreme densities and magnetic fields, neutron stars stand as optimal targets to probe rare dark matter interactions. For example, the mere existence of Gyr-age neutron stars has placed strong limits on models of asymmetric dark matter, while radio observations of highly magnetized pulsars have powerfully probed the axion parameter space. In this talk, I will discuss a program aimed at unlocking the potential for future neutron star observations to constrain, or potentially detect dark matter. The program is multifaceted, including theoretical efforts to better model dark matter/neutron star interactions, modeling efforts to constrain the uncertainties in astrophysical neutron star emission, and observational efforts aimed at detecting the right optimal neutron star(s) required for each study. Finally, I will show how upcoming experimental advances offer the hope of transformative progress over the next decade.



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