Particle Physics Challenges



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Gravitational Waves from Sub-MeV Cosmolocial Phase Transitions

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The next generation of gravitational-wave (GW) observatories will cover a vast array of frequencies, enabling us to probe astronomical and cosmological phenomena in a way complementary to current and future collider experiments. One such phenomenon is a cosmological first-order phase transition (PT) driven by the temperature dependence of the effective potential in the expanding and cooling universe. The transition proceeds by the nucleation of bubbles, which expand and finally collide, thereby sourcing gravitational radiation.

In our work we focus on the detection capabilities of pulsar timing arrays (PTAs), which are sensitive to PTs around the keV to MeV scale. Light relics in this mass range can easily come in conflict with cosmological bounds, which I will also discuss. I will further present two toy models featuring first-order transitions, induced at tree-level and at one-loop level respectively.

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