

Quantum simulators for fundamental physics

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Analogue gravity summarises an effort to mimic physical processes that occur in the interplay between general relativity and field theory in a controlled laboratory environment. The aim is to provide insights in phenomena that would otherwise elude observation: when gravitational interactions are strong, when quantum effects are important, and/or on length scales that stretch far beyond the observable Universe. The most promising analogue gravity systems up-to-date are fluids, superfluids, superconducting circuits, ultra-cold atoms and optical systems. While deepening our understanding of the laboratory systems at hand, the long term vision of analogue gravity studies is to advance fundamental physics through interdisciplinary research, by establishing and nurturing a new culture of collaboration between the various communities involved. I will discuss recent efforts to explore the quantum origin of the Universe, accelerated observer radiation, and rotating black hole physics in the laboratory.