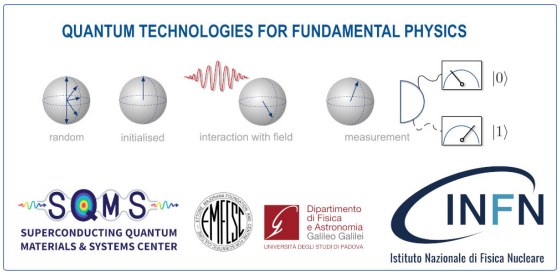

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Making the case for a quantum computer for quantum gravity

Wednesday, 6 September 2023 11:30 (25 minutes)

There are many directions to explore in fundamental physics. I will tell why quantum gravity is the most promising and urgent, and will point to specific theoretical open issues, related to black hole entropy, that need to be settled with an experiment. This can eventually open the doors to the next era.

Then I will discuss why this program can be pursued by using equivalences between different quantum systems. This approach, opened-up by Feynman in two seminal pieces of work, one on analogs and one on quantum computers, today reached the necessary level of maturity.

I will close by pointing to a couple of concrete cases, to measure black hole entropy or related quantities, where graphene plays a prominent role: the analog of a BTZ black hole and the SYK model with its AdS/CFT-corresponding JT gravity.

A properly conceived quantum computer should be able to realize these scenarios and more, becoming a CERN-like facility for the next generation of experiments in fundamental physics.

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