LENS-QSTAR Seminar
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Quantum technologies as tools to deepen our understanding of quantum theory and relativity

Quantum information and quantum metrology can be used to study gravitational effects such as gravitational waves and the universality of the equivalence principle. On one hand, the possibility of carrying out experiments to probe gravity using quantum systems opens an avenue to deepen our understanding of the overlap of these theories. On the other hand, incorporating relativity in quantum technologies promises the development of a new generation of relativistic quantum applications of relevance in Earth-based and space-based setups. In this talk, I will introduce a framework for the application of quantum information and quantum metrology techniques to relativistic quantum fields. I will show how, using this framework, we have been able to develop an accelerometer and a gravitational wave detector which exploit both quantum and relativistic effects. Moreover, our framework can be used to estimate with high precision spacetime parameters such as the Earth's Schwarzchild radius and the gravitational constant.

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