



Department of
Theoretical Physics

THE QUANTUM SPACETIME SEMINAR SERIES

Causality constraints on corrections to Einstein gravity

(Zoom Seminar)

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Zoom link shall be shared separately



Modifications of Einstein's theory of gravity can be systematically analyzed using the framework of effective field theory (EFT). In this setup, new physics is captured in a set of higher-dimension operators whose coefficients must be measured experimentally, or matched from a UV completion such as string theory. It has been known for some time that causality, together with other basic principles, such as unitarity and Lorentz invariance, imposes constraints on the allowed values of such coefficients. However, a method to explore these constraints in an exhaustive and rigorous way has only emerged recently. In this talk I will explain how ideas from scattering amplitudes and the conformal bootstrap allowed us to understand these constraints in detail. Our result is a set of sharp two-sided numerical bounds on these EFT coefficients. Among other things, these bounds imply that all gravitational interactions must turn off as Newton's constant goes to zero, and that gravity is weakly coupled at all scales below the Planck scale. In addition, these bounds, when combined with collider limits, could have direct implications for the possibility of testing modifications of General Relativity experimentally in the near future.

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