## Phenomenology 2019 Symposium



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## **Reparametrization Invariance in SCET for Gravity**

Tuesday 7 May 2019 17:30 (15 minutes)

Soft-Collinear Effective Theory (SCET) for gravity has recently been developed at leading and next-to-leading powers of a small parameter,  $\lambda$ . Being an effective theory, SCET for gravity is halfway between full theory of gravity (below Planck scale) and gravity scattering amplitudes. This reveals many interesting properties of gravity amplitudes which are obscure in full theory and usually need lengthy calculations or ingenious tricks to realize, such as soft graviton theorem and absence of collinear IR divergences at the leading power. More importantly, SCET for gravity significantly simplifies calculation of scattering amplitudes that include gravitons. Reparametirization invariance (RPI) is a redundancy of SCET for gravity and it arises in two ways. First, there is redundancy in choosing two reference unit vectors for defining light cone coordinates of each collinear sector. The choice of these reference vectors is not unique and physics should be independent of them. However, since effective operators in the Lagrangian depend explicitly on these vectors, the invariance means that different operators at the same power of  $\lambda$  and different powers would be canceling each others transformations. Thus their Wilson coefficients can be related to each other and this makes matching to full theory much easier. Second type of RPI is our freedom in choosing the  $\lambda^2$  component of collinear momentum and soft momentum. In this talk I will be presenting our findings on RPI in SCET for gravity as well as the structure of NNLP operators.

## Summary

Soft-Collinear Effective Theory

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