

How to bootstrap a Dark Photon

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Bootstrapping provides theoretical constraints of the parameter space allowed by the S-matrix properties: analyticity, unitarity, crossing symmetry. It has been applied to constrain different theories without making assumptions about their ultraviolet completions. However, its application in the forward limit of the scattering amplitudes is problematic when considering graviton exchange.

In this talk, I will review the different approaches for gravity bootstrap, in the particular case of a Dark Photon model. We will focus on the smearing method, which replaces the forward limit by a weighted integral over the transfer momentum. This approach has already been applied to the scattering of scalar particles mediated by graviton exchange. The pioneering contribution of this work is the implementation into scattering of vector particles, extending the existing forward-limit bootstrap of spin-1 particles.

From the phenomenological point of view, finding bounds for graviton mass and coupling in this setup would help probing models of gravitational particle production with vector particles as Dark Matter, as well as giving constraints for the quantum gravity swampland.

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