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Positivity bounds with gravity in 4 dimensions

We formulate Positivity Bounds for scattering amplitudes including exchange of gravitons in four dimensions. We generalize the standard construction through dispersion relations to include the presence of a branch cut along the real axis in the complex plane for the Maldestam variable s . In general, validity of these bounds require the cancellation of divergences in the forward limit of the amplitude. We show that this is possible only if one assumes a Regge behavior of the amplitude at high energies. As a non-trivial fact, a concrete UV behaviour of the amplitude is uniquely determined by the structure of IR divergences. We discuss also possible phenomenological applications of these bounds.

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