Contribution ID: **77**   Type: **not specified**

Talk 12: Explicit gravity amplitudes on self-dual backgrounds

Thursday 23 June 2022 10:00 (40 minutes)

We give formulae for all tree-level graviton scattering amplitudes in curved self-dual radiative space-times; these are chiral, source-free, asymptotically flat spaces determined by free characteristic data at null infinity. Such space-times admit an elegant description in terms of twistor theory, which manifests their underlying integrability. The tree-level S-matrix is written in terms of an integral over the moduli space of holomorphic maps from the Riemann sphere to twistor space, with the degree of the map corresponding to the helicity configuration of the external gravitons. For the MHV sector, the amplitude formula is derived directly from general relativity, while the others arise from ambitwistor-strings. The amplitudes exhibit novel features that are absent in Minkowski space, including back-scattering and tail effects. Our formulae have many fewer integrals than expected from space-time perturbation theory. In special cases, such as self-dual plane waves, the formulae become particularly explicit with few residual integrals. This is joint work with Tim Adamo and Atul Sharma, arxiv:2203.02238 and 2103.16984.

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